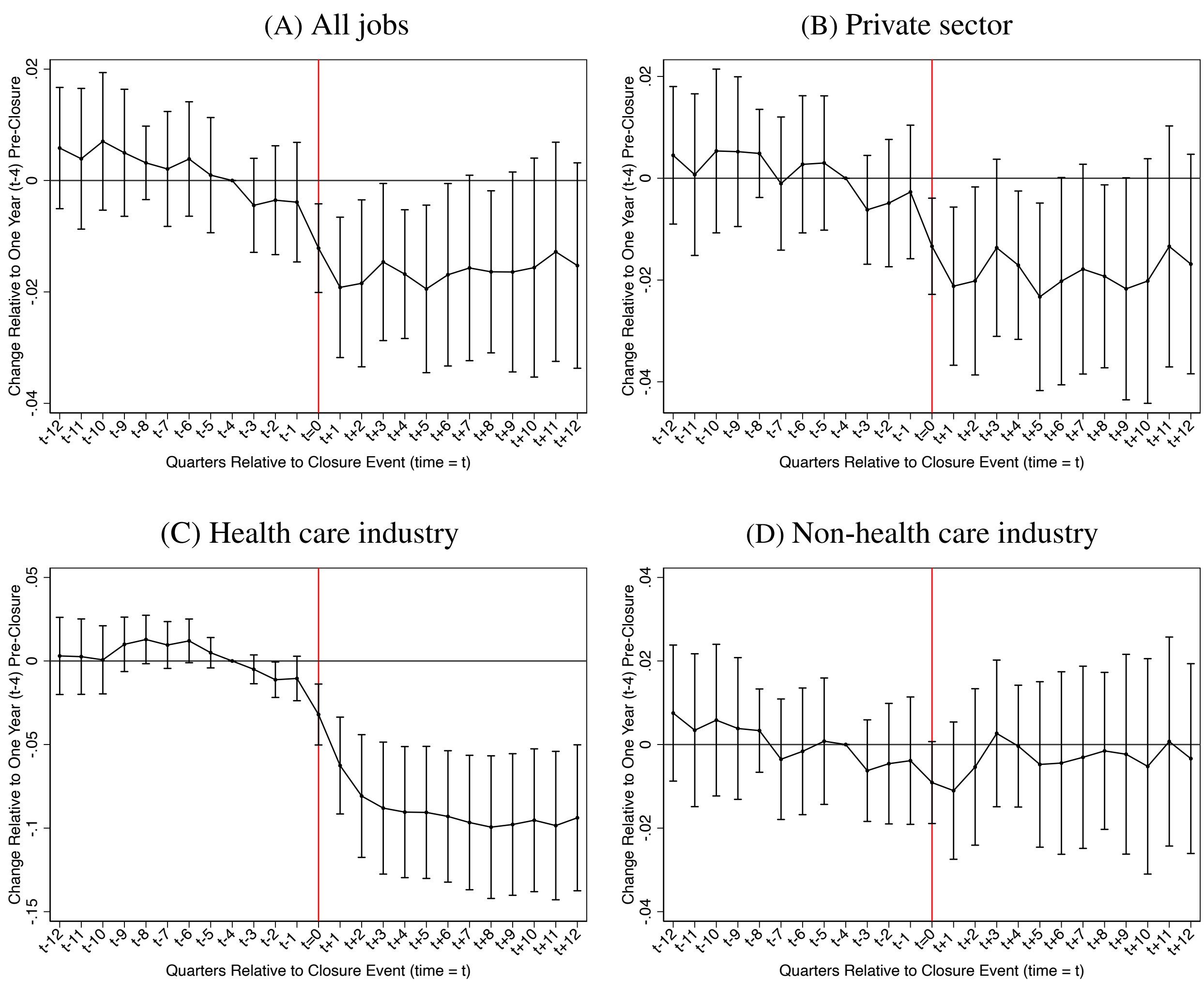
Appendix (for online publication)

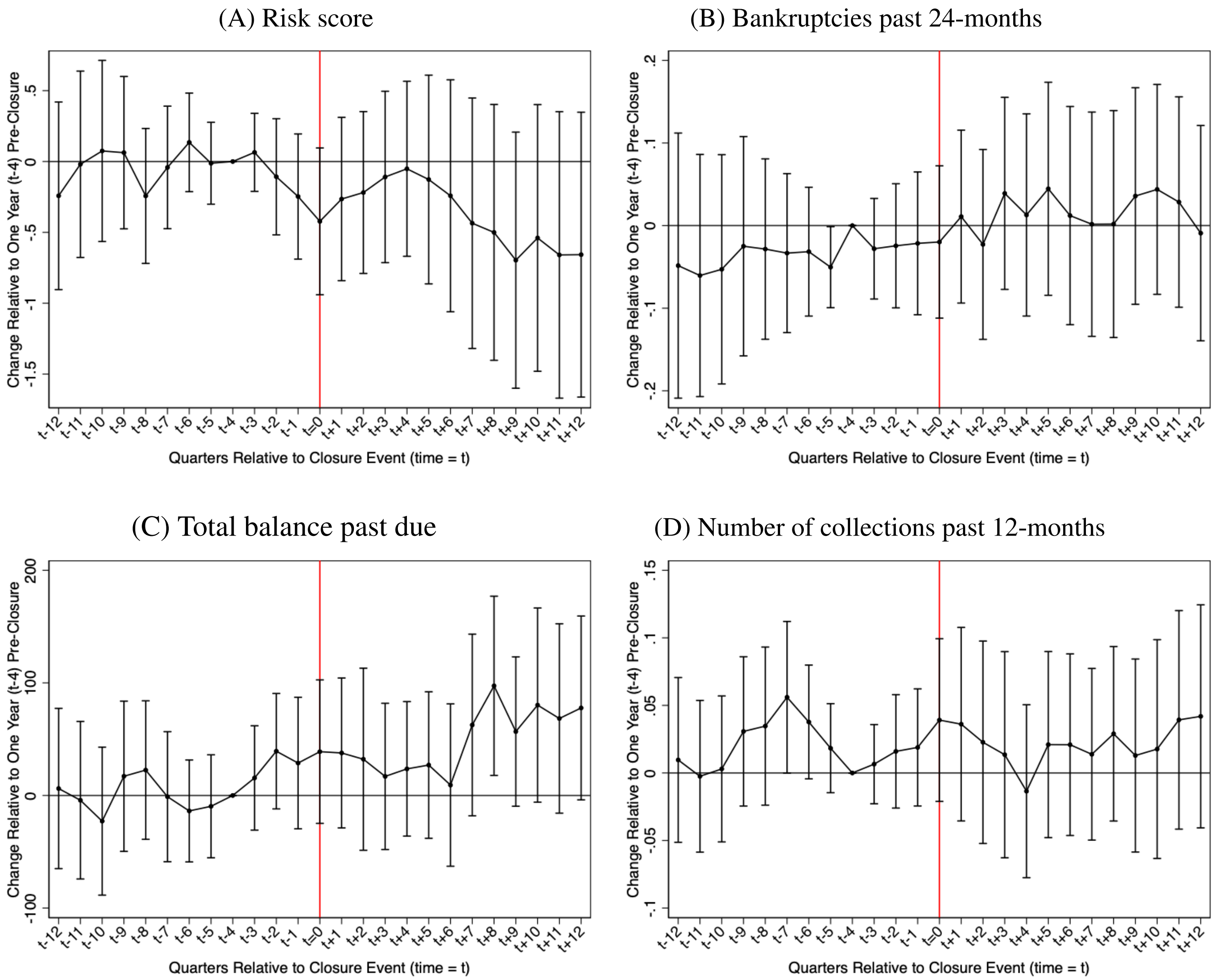
A Stacked Event Study Figures

Figure A1: Results for rural closure effects on county-level employment: stacked



Notes: Control counties are randomly assigned a closure date from the sample of dates of actual closures. Event time dummies are defined based on real dates for actual closures and the assigned closure dates for the control sample. Only counties with observations for the full 12 quarters before and after the closure or assisnged closure are used, and observations that fall outside the -12 to +12 quarter window are dropped. The event time regression is described in Equation 1; the event time coefficients plotted are those on the interaction of treatment and event time. The omitted time point is the fourth quarter (i.e., one year) prior to the rural hospital closure. Event time point estimates and 95% confidence intervals plotted.

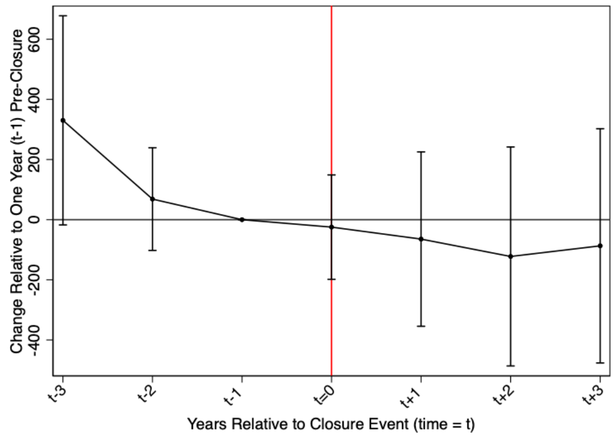
Figure A2: Rural hospital closure effects on consumer finances: stacked



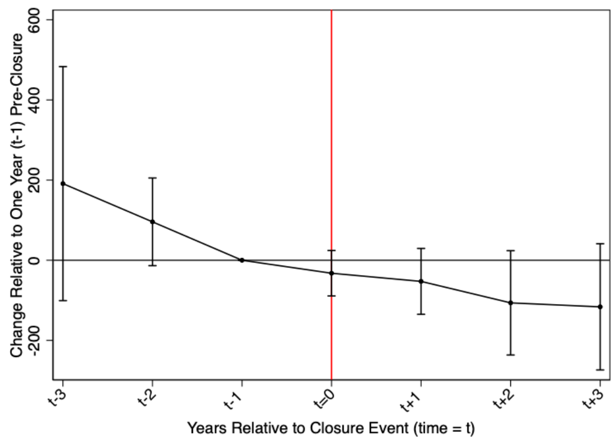
Notes: Control counties are randomly assigned a closure date from the sample of dates of actual closures. Event time dummies are defined based on real dates for actual closures and the assigned closure dates for the control sample. Only counties with observations for the full 12 quarters before and after the closure or assisnged closure are used, and observations that fall outside the -12 to +12 quarter window are dropped. The event time regression is described in Equation 1; the event time coefficients plotted are those on the interaction of treatment and event time. The omitted time point is the fourth quarter (i.e., one year) prior to the rural hospital closure. Event time point estimates and 95% confidence intervals plotted.

Figure A3: Rural hospital closure effects on housing markets: stacked

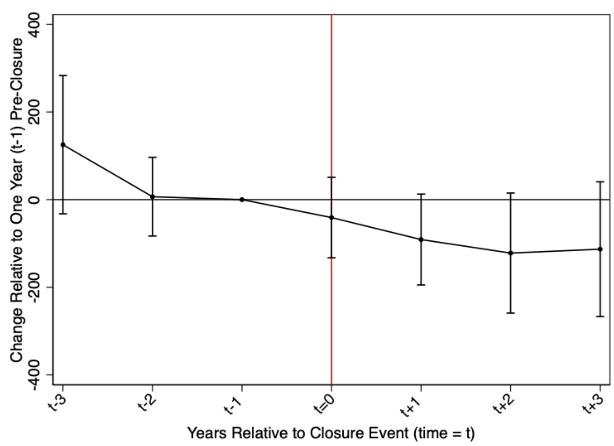
(A) Number of loans originated



(B) Number of loans denied

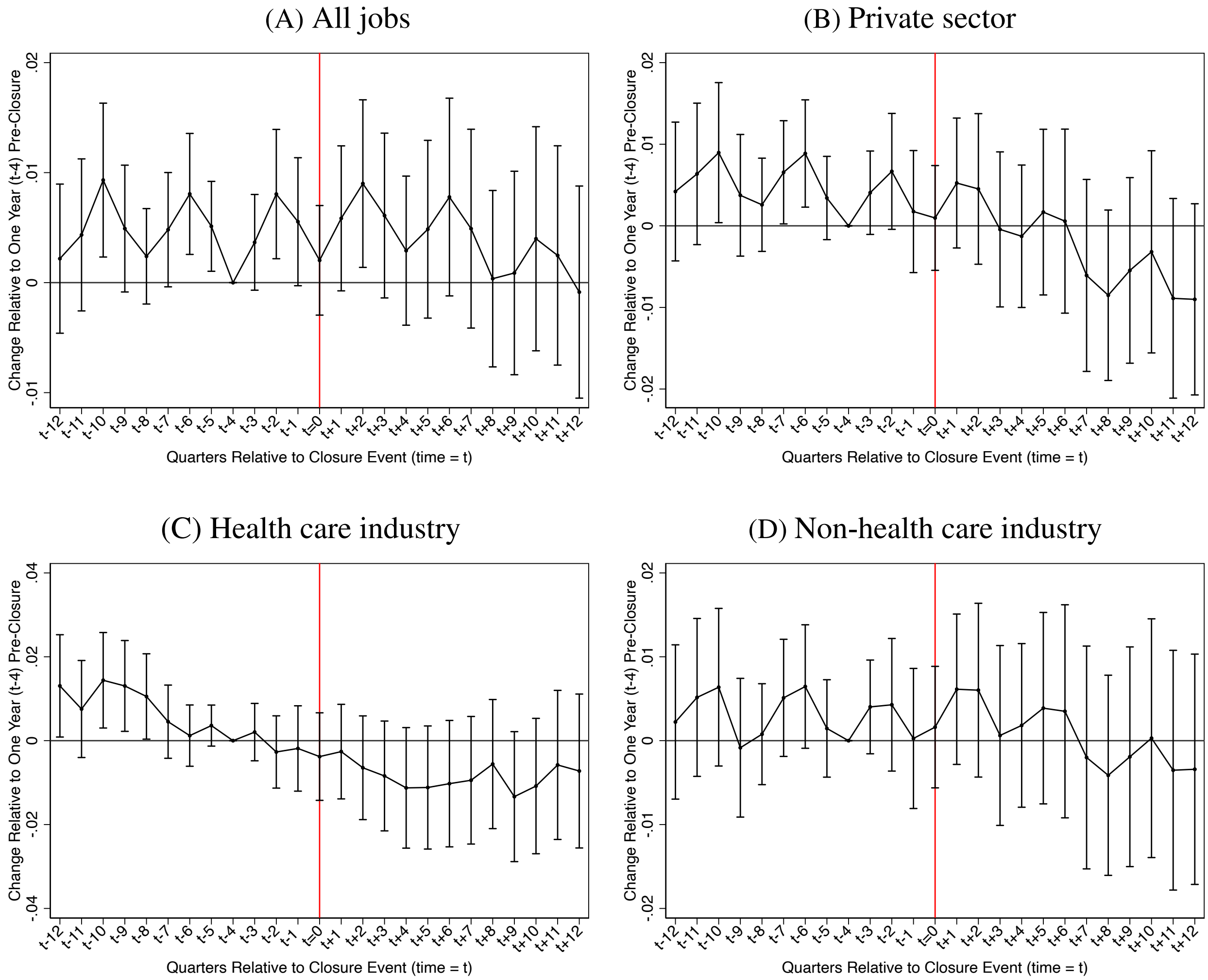


(C) Number of loans purchased



Notes: Control counties are randomly assigned a closure date from the sample of dates of actual closures. Event time dummies are defined based on real dates for actual closures and the assigned closure dates for the control sample. Only counties with observations for the full 3 years before and after the closure or assisnged closure are used, and observations that fall outside the -3 to +3 year window are dropped. The event time regression is described in Equation 1; the event time coefficients plotted are those on the interaction of treatment and event time. The omitted time point is the fourth quarter (i.e., one year) prior to the rural hospital closure. Event time point estimates and 95% confidence intervals plotted.

Figure A4: Rural hospital closure effects on county-level employment: border county analysis, stacked

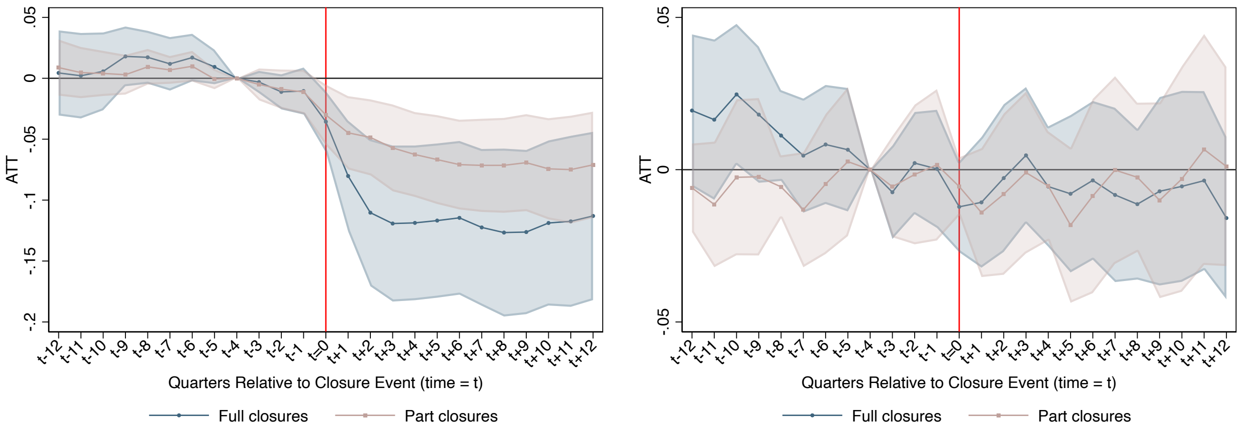


Notes: Analysis conducted using counties sharing a border with counties that experience a closure as the treated counties. Control counties are randomly assigned a closure date from the sample of dates of actual closures. Event time dummies are defined based on real dates for actual closures and the assigned closure dates for the control sample. Only counties with observations for the full 12 quarters before and after the closure or assisnged closure are used, and observations that fall outside the -12 to +12 quarter window are dropped. The event time regression is described in Equation 1; the event time coefficients plotted are those on the interaction of treatment and event time. The omitted time point is the fourth quarter (i.e., one year) prior to the rural hospital closure. Event time point estimates and 95% confidence intervals plotted.

Figure A5: Rural closure effects on county-level employment: heterogeneity analysis, stacked

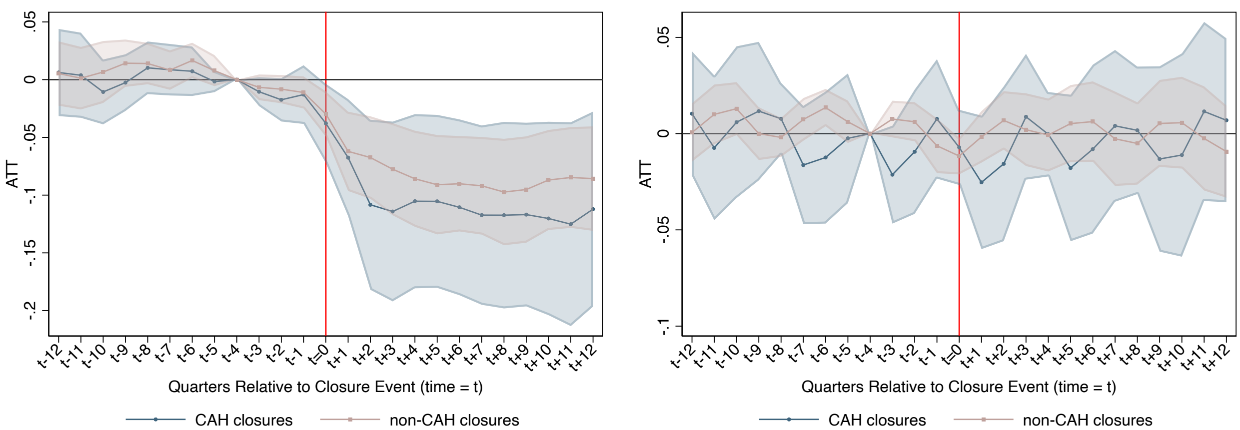
By type of closure: full or partial

(A) Health care industry (B) Non-health care industry



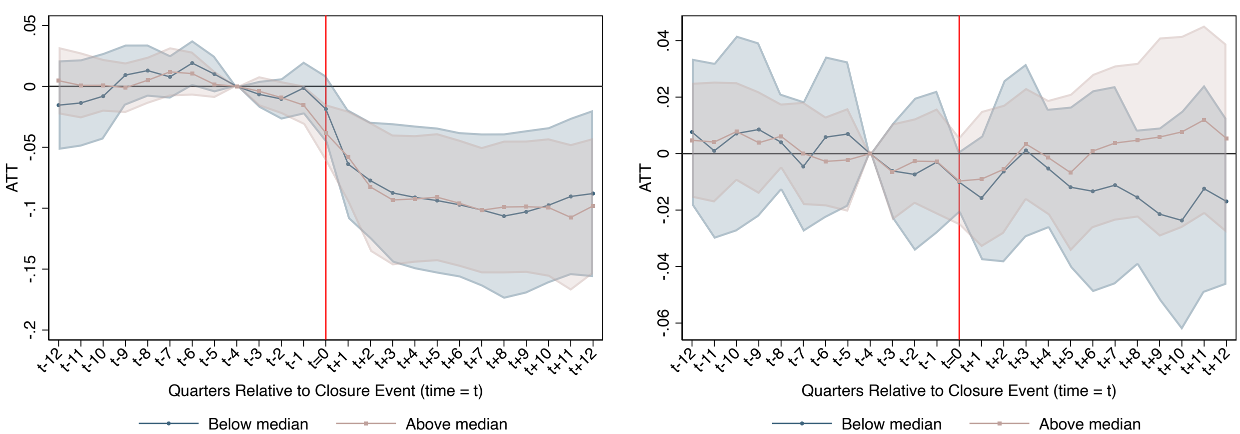
By type of closure: Critical Access Hospital

(C) Health care industry (D) Non-health care industry



By county-level share employed in health jobs (2004)

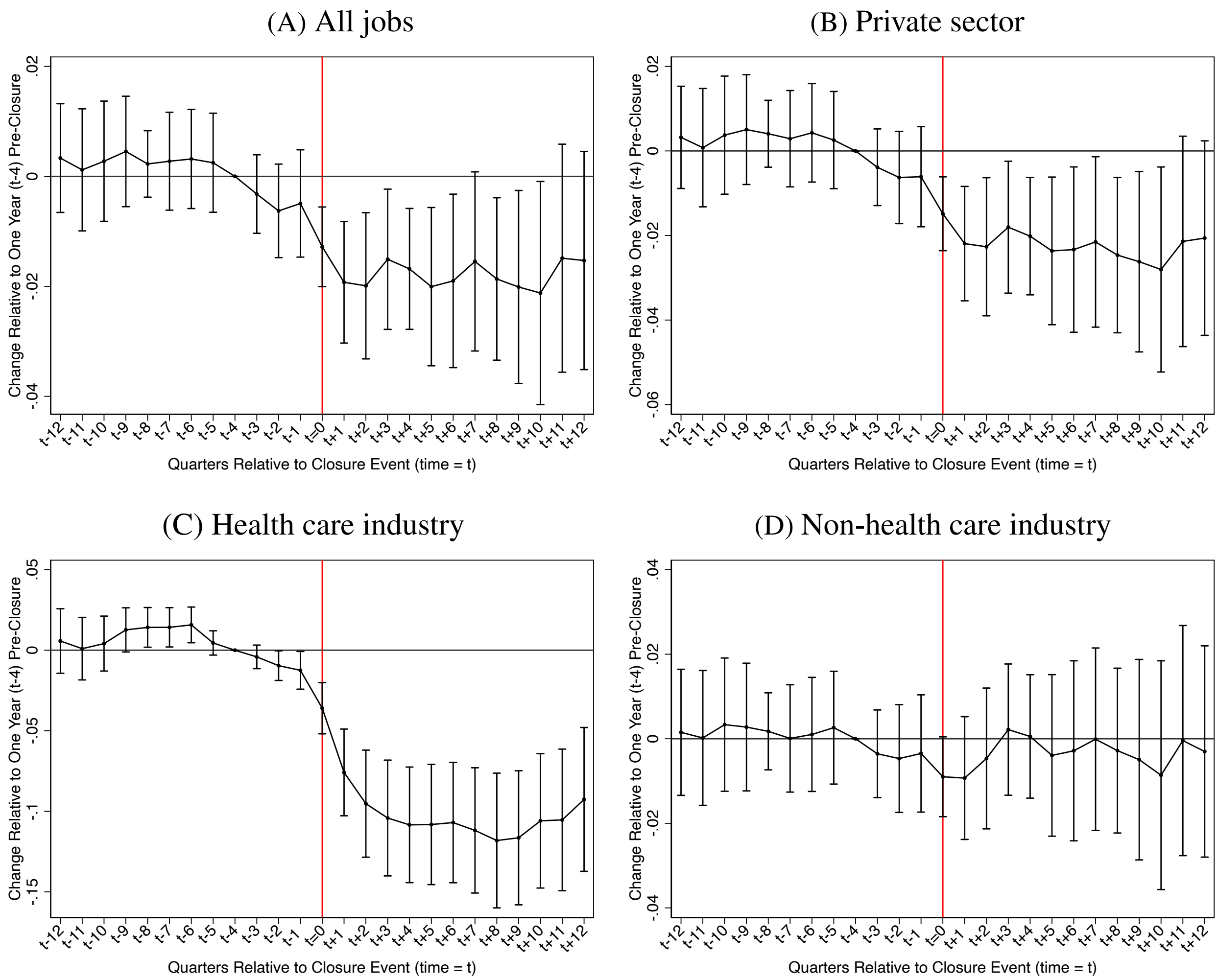
(E) Health care industry (F) Non-health care industry



Notes: Control counties are randomly assigned a closure date from the sample of dates of actual closures. Event time dummies are defined based on real dates for actual closures and the assigned closure dates for the control sample. Only counties with observations for the full 12 quarters before and after the closure or assisnged closure are used, and observations that fall outside the -12 to +12 quarter window are dropped. The event time regression is described in Equation 1; the event time coefficients plotted are those on the interaction of treatment and event time. The omitted time point is the fourth quarter (i.e., one year) prior to the rural hospital closure. Event time point estimates and 95% confidence intervals plotted.

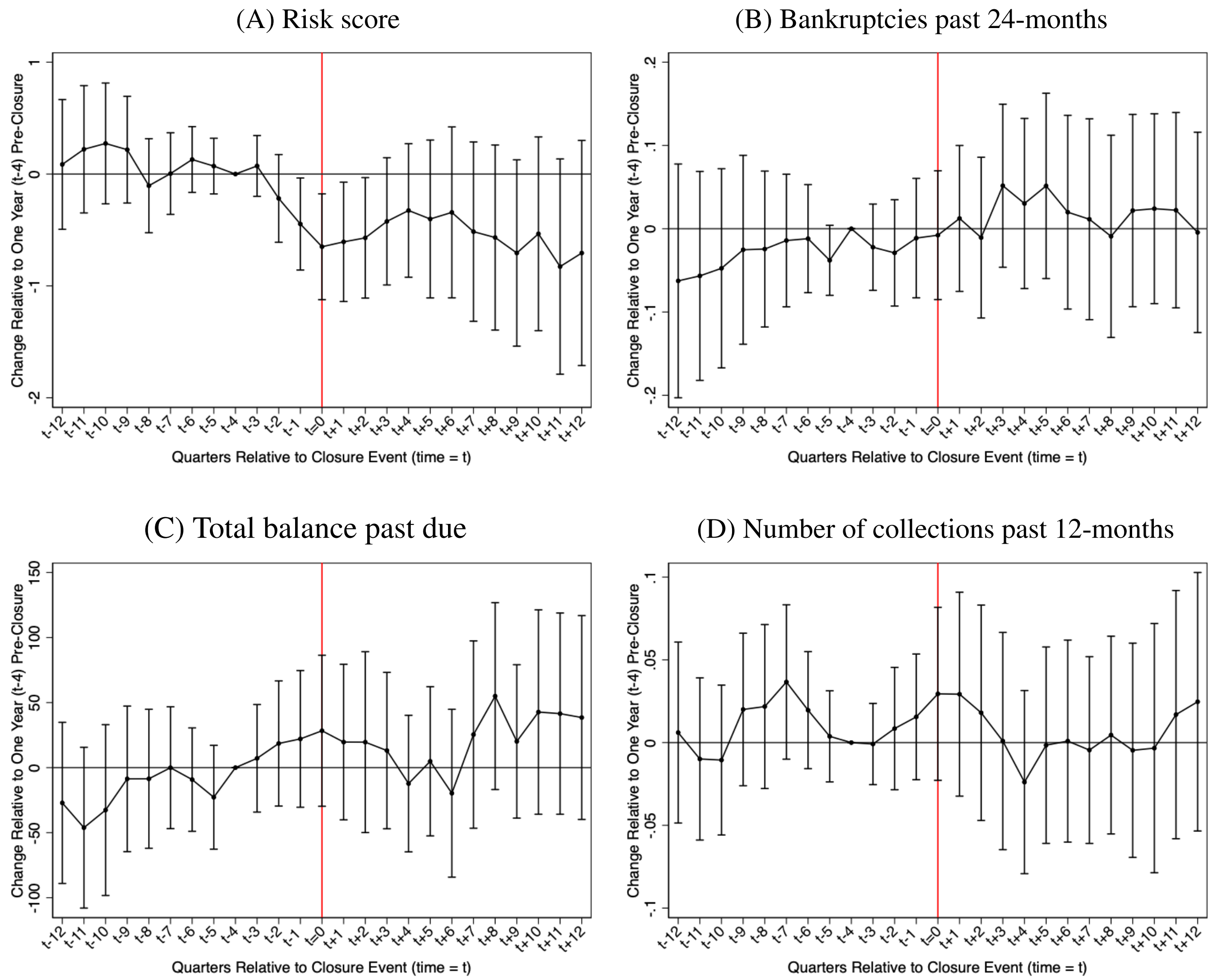
B Two Way Fixed Effects Figures

Figure B1: Rural hospital closure effects on county-level employment: TWFE



Notes: Employment data from the BLS QCEW, at the county-quarter level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001Q1-2018Q4). County and year-quarter fixed effects included, and standard errors clustered at the county level. Event time point estimates and 95% confidence intervals plotted. The omitted time point is the fourth quarter (i.e., one year) prior to the rural hospital closure.

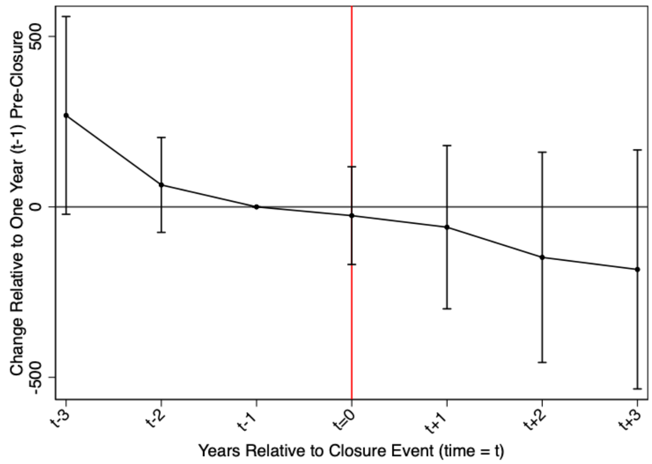
Figure B2: Rural hospital closure effects on consumer finances: TWFE



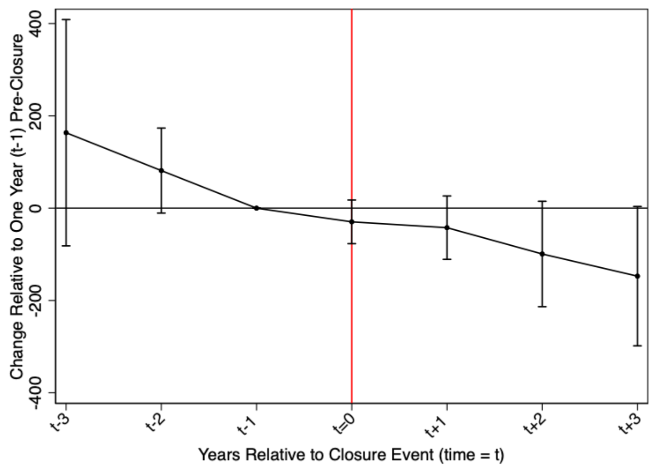
Notes: Data on consumer financial information comes from the Consumer Credit Panel, at the county-quarter level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001Q1-2018Q4). County and year-quarter fixed effects included, and standard errors clustered at the county level. Event time point estimates and 95% confidence intervals plotted. The omitted time point is the fourth quarter (i.e., one year) prior to the rural hospital closure.

Figure B3: Rural hospital closure effects on housing markets: number of loans: TWFE

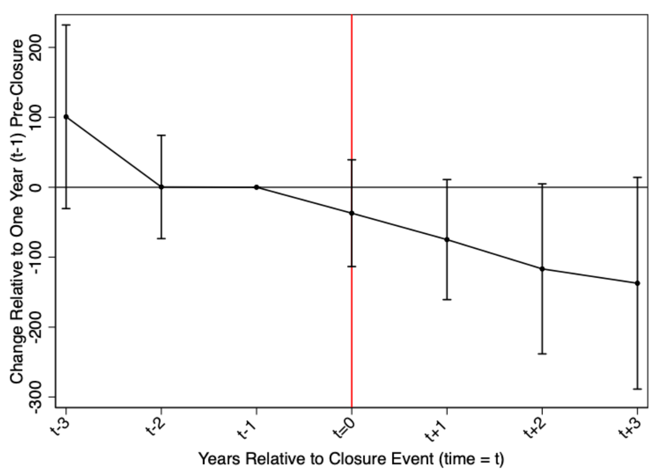
(A) Number of loans originated



(B) Number of loans denied

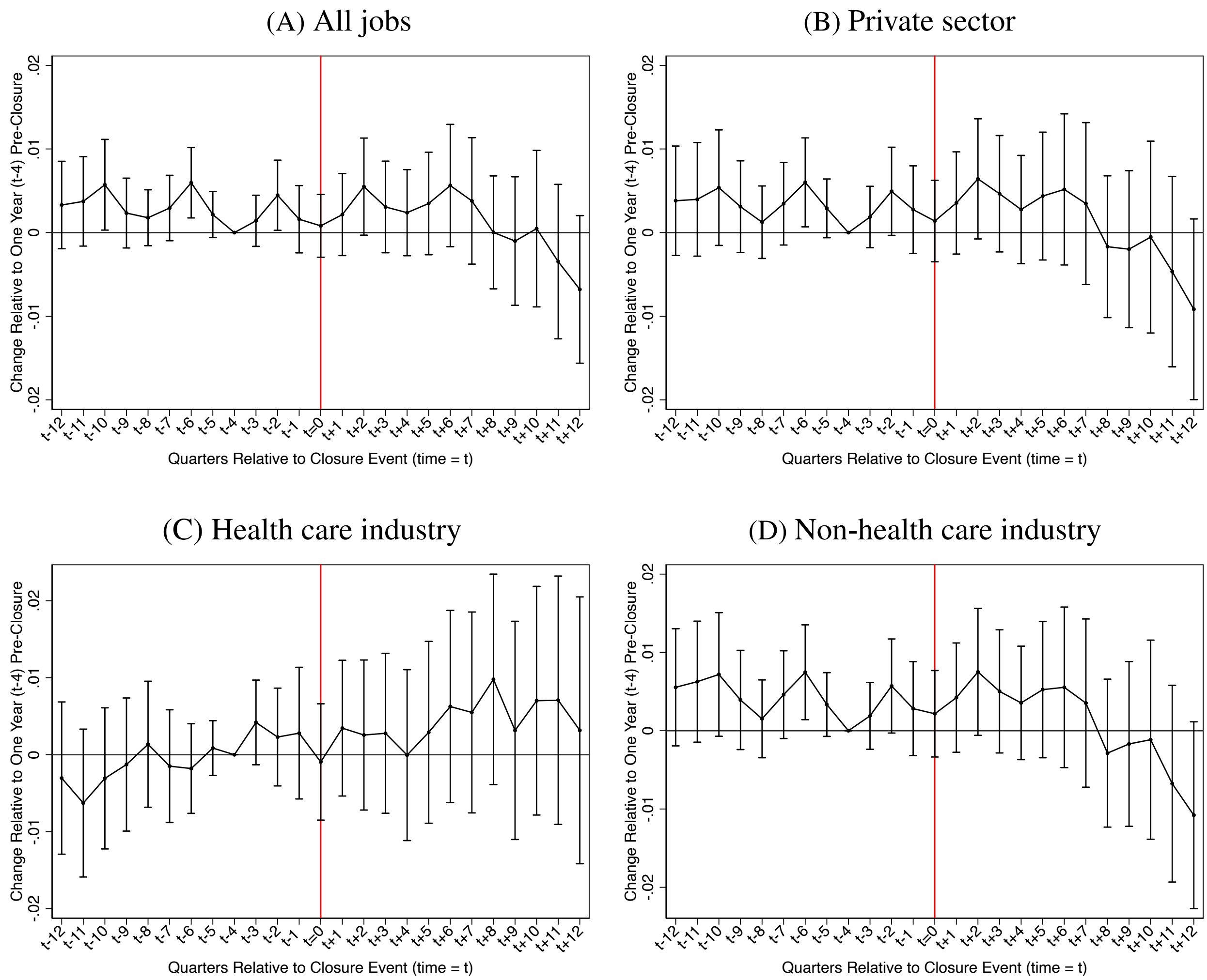


(C) Number of loans purchased



Notes: Data on loans from HMDA, at the county-year level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001-2018). County and year fixed effects included, and standard errors clustered at the county level. Event time point estimates and 95% confidence intervals plotted. The omitted time point is one year prior to the rural hospital closure.

Figure B4: Rural hospital closure effects on county-level employment: border county analysis, TWFE

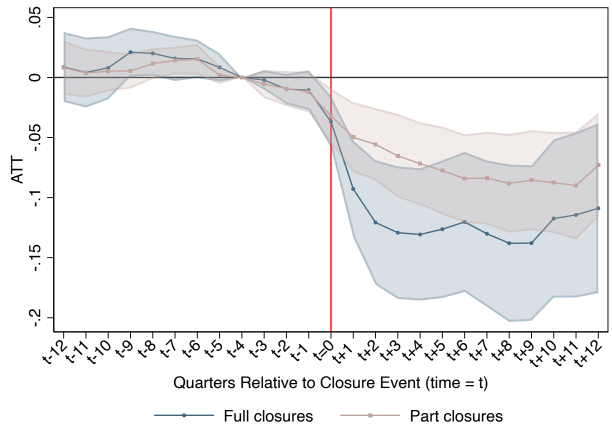


Notes: Analysis conducted using counties sharing a border with counties that experience a closure as the treated counties. Employment data from the BLS QCEW, at the county-quarter level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001Q1-2018Q4). County and year-quarter fixed effects included, and standard errors clustered at the county level. Event time point estimates and 95% confidence intervals plotted. The omitted time point is the fourth quarter (i.e., one year) prior to the rural hospital closure.

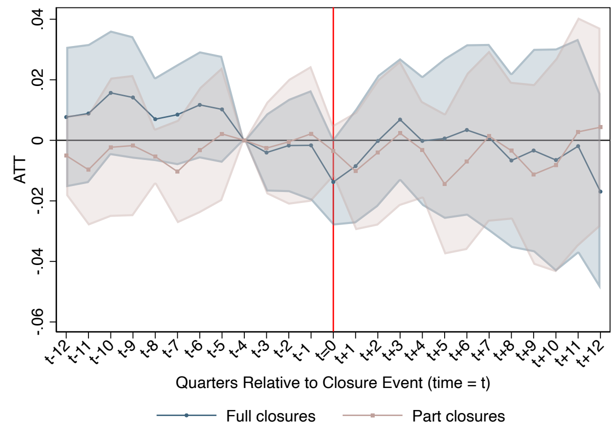
Figure B5: Rural closure effects on county-level employment: heterogeneity analysis, TWFE

By type of closure: full or partial

(A) Health care industry

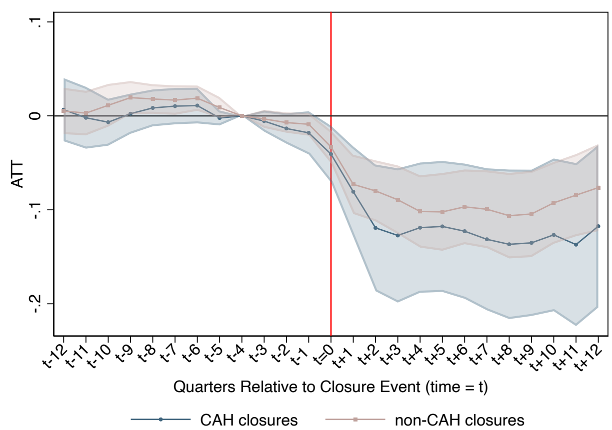


(B) Non-health care industry

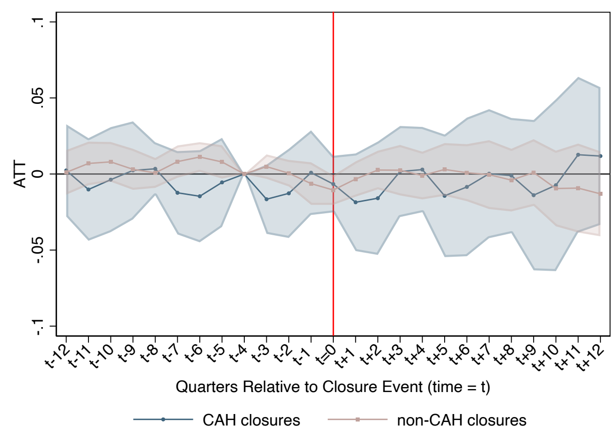


By type of closure: Critical Access Hospital

(C) Health care industry

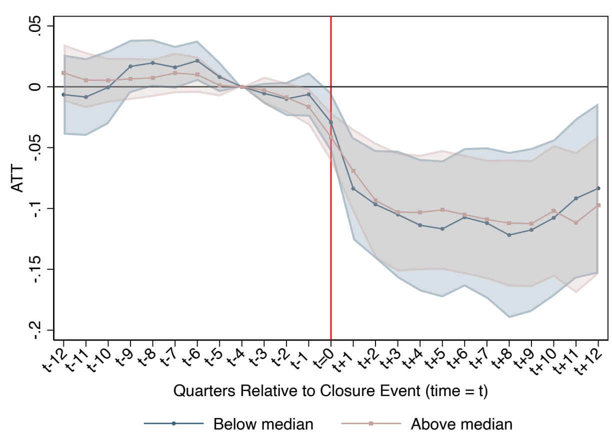


(D) Non-health care industry

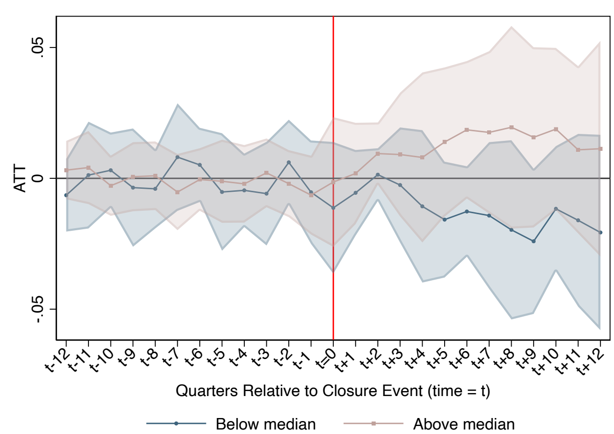


By county-level share employed in health jobs (2004)

(E) Health care industry



(F) Non-health care industry



Notes: Employment data from the BLS QCEW, at the county-quarter level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001Q1-2018Q4). County and year-quarter fixed effects included, and standard errors clustered at the county level. Event time point estimates and 95% confidence intervals plotted. The omitted time point is the fourth quarter (i.e., one year) prior to the rural hospital closure.

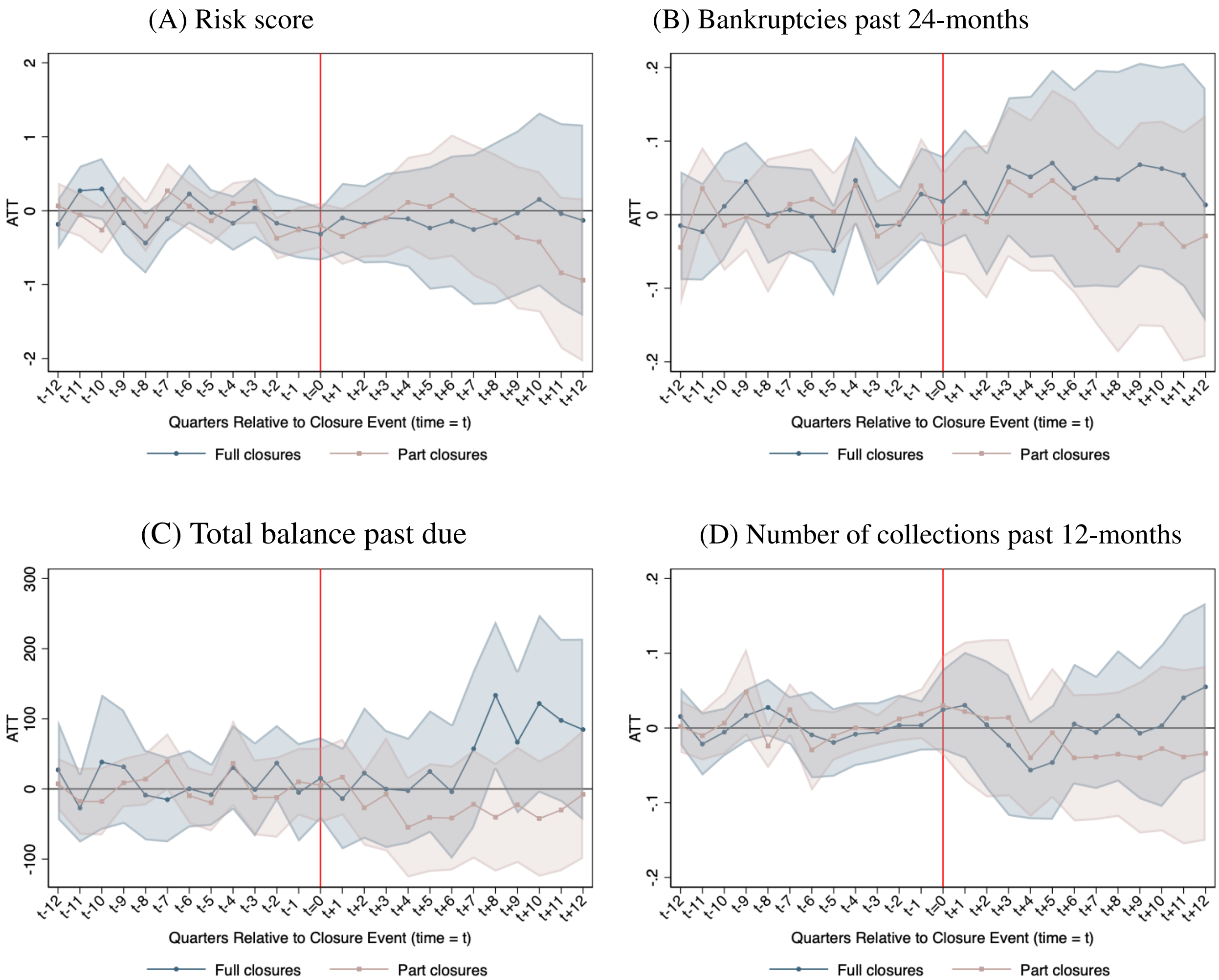
C Additional heterogeneity: cs-did analysis

C.1 By partial versus full closures

Figure C1: Rural closure effects on county-level employment: partial versus full closures

Notes: Employment data from the BLS QCEW, at the county-quarter level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001Q1-2018Q4). Callaway and Sant'Anna (2021) estimator for DID models with panel data implemented using csdid in Stata. Event time point estimates and 95% confidence intervals plotted. ATT stands for average treatment effect on the treated.

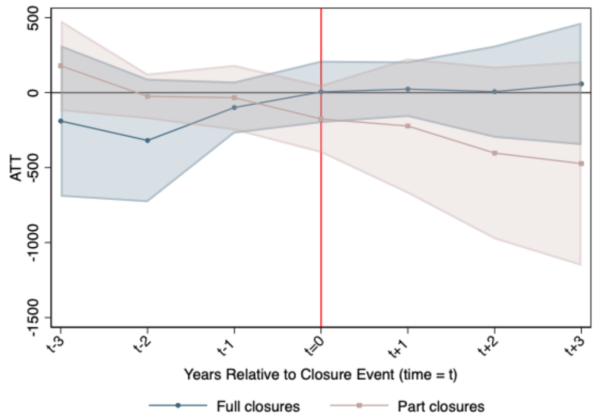
Figure C2: Rural closure effects on consumer finances: partial versus full closures



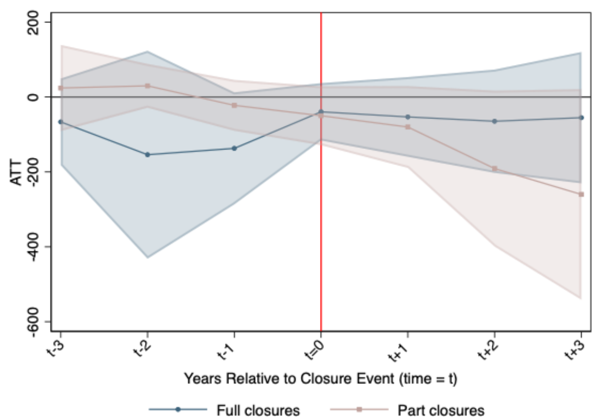
Notes: Employment data from the BLS QCEW, at the county-quarter level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001Q1-2018Q4). Callaway and Sant'Anna (2021) estimator for DID models with panel data implemented using csdid in Stata. Event time point estimates and 95% confidence intervals plotted. ATT stands for average treatment effect on the treated.

Figure C3: Rural hospital closure effects on housing markets: partial versus full closures

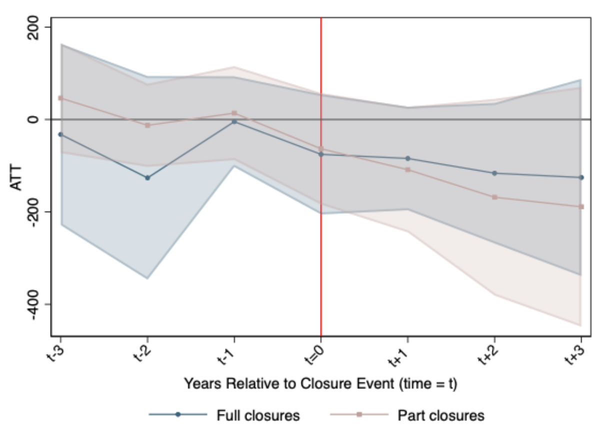
(A) Number of loans originated



(B) Number of loans denied



(C) Number of loans purchased



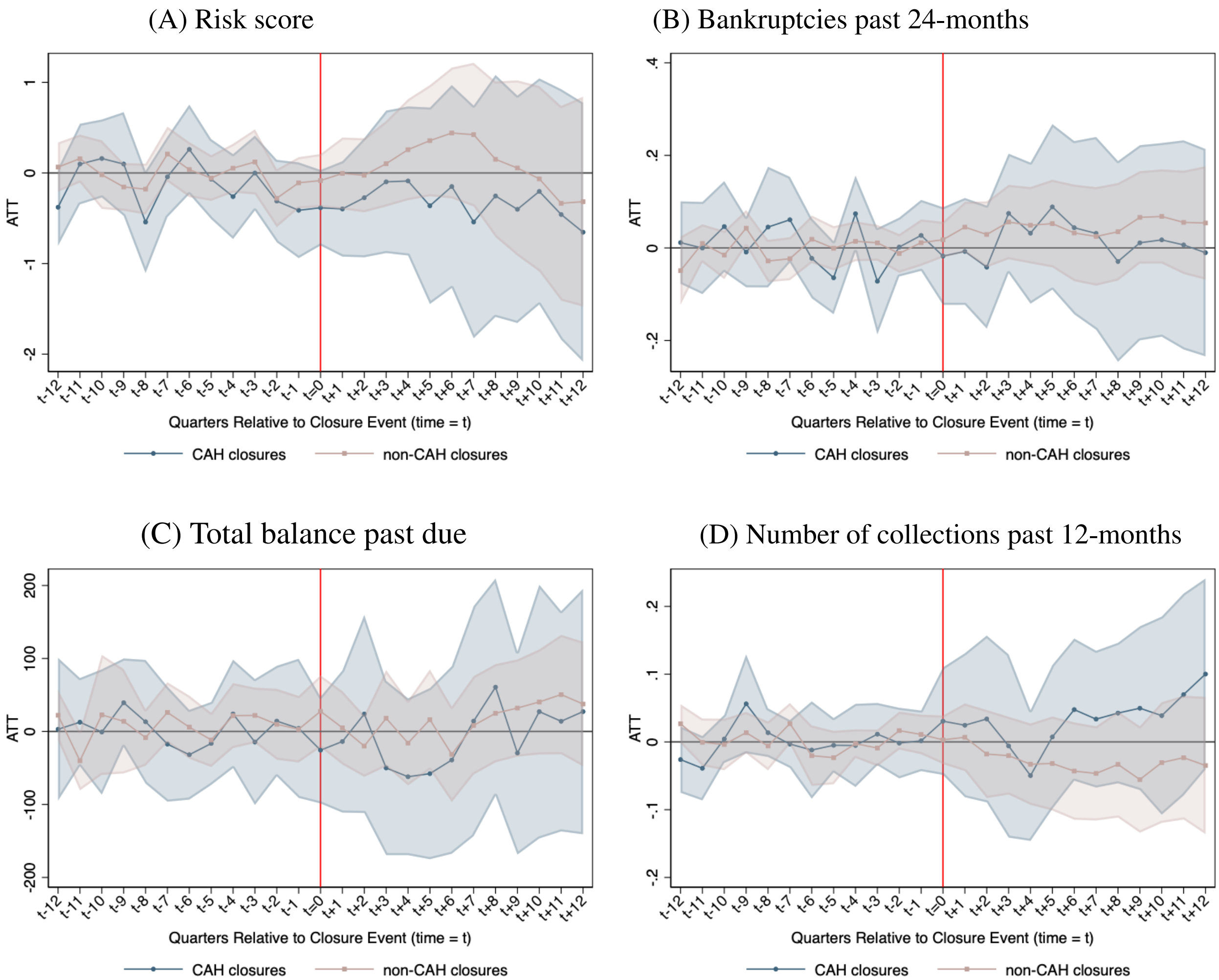
Notes: Data on loans from HMDA, at the county-year level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001-2018). Callaway and Sant'Anna (2021) estimator for DID models with panel data implemented using csdid in Stata. Event time point estimates and 95% confidence intervals plotted. ATT stands for average treatment effect on the treated.

C.2 By closing hospital type: Critical Access Hospitals (CAH) versus other hospitals

Figure C4: Rural hospital closure effects on county-level employment: by Critical Access Hospital status

Notes: Employment data from the BLS QCEW, at the county-quarter level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001Q1-2018Q4). Callaway and Sant'Anna (2021) estimator for DID models with panel data implemented using csdid in Stata. Event time point estimates and 95% confidence intervals plotted. ATT stands for average treatment effect on the treated.

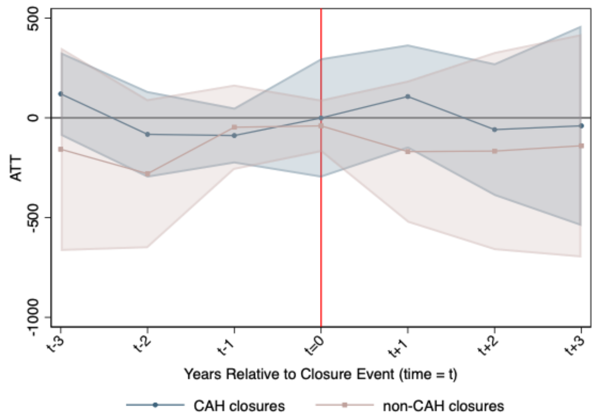
Figure C5: Rural closure effects on consumer finances: by Critical Access Hospital status



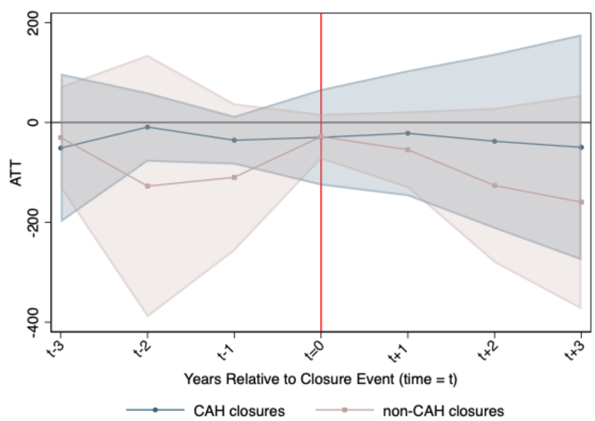
Notes: Employment data from the BLS QCEW, at the county-quarter level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001Q1-2018Q4). Callaway and Sant'Anna (2021) estimator for DID models with panel data implemented using csdid in Stata. Event time point estimates and 95% confidence intervals plotted. ATT stands for average treatment effect on the treated.

Figure C6: Results for rural hospital closure effects on housing markets: by Critical Access Hospital status

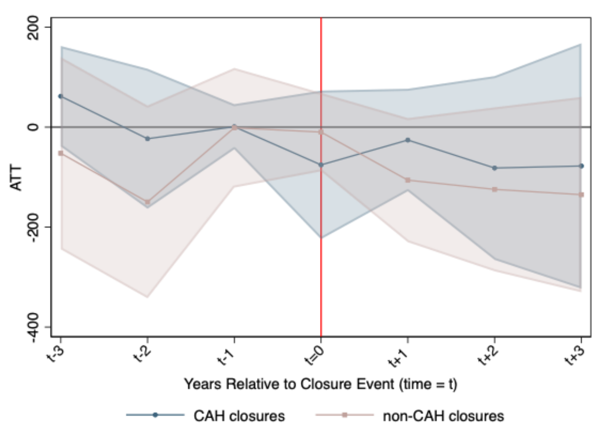
(A) Number of loans originated



(B) Number of loans denied



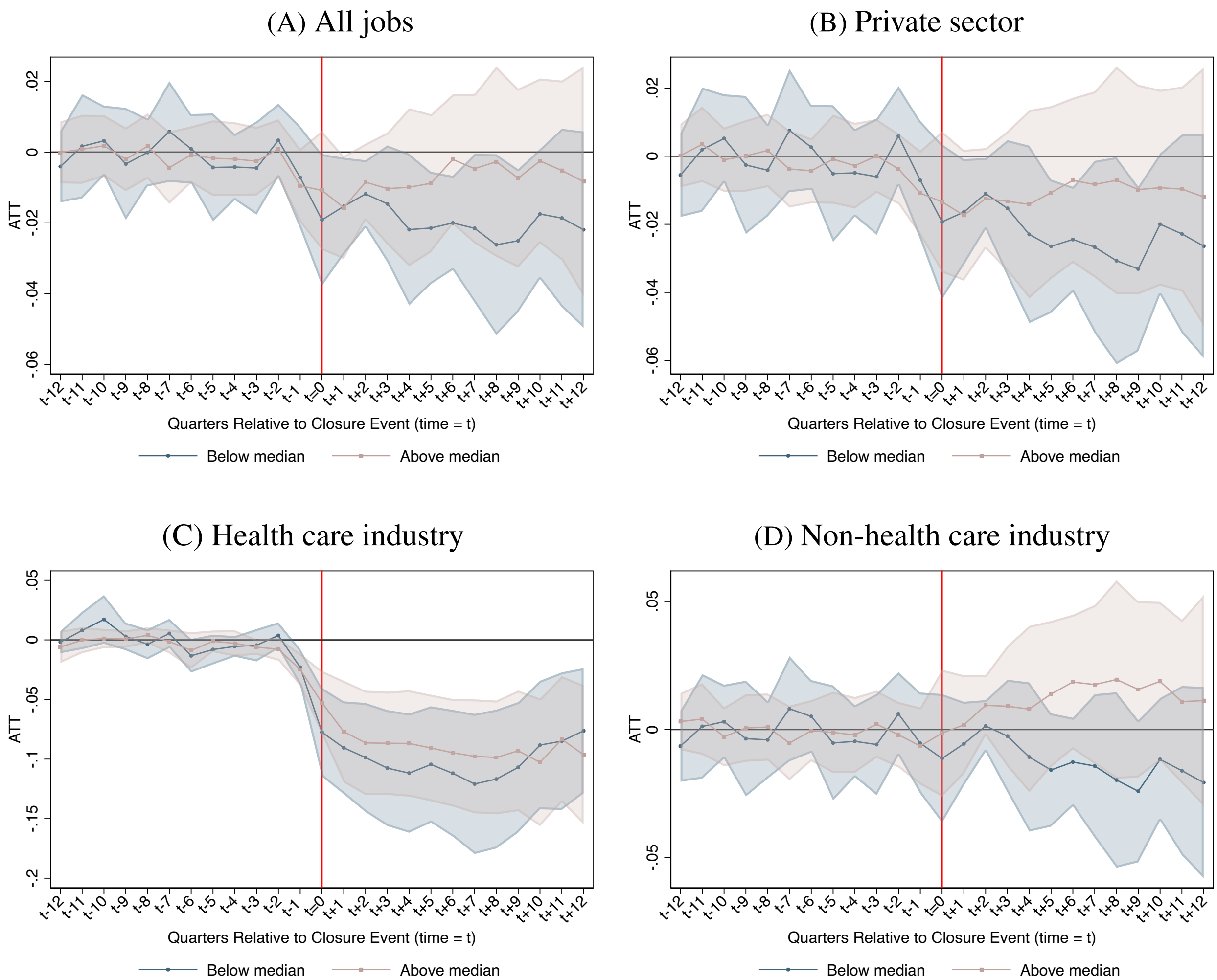
(C) Number of loans purcahsed



Notes: Data on loans from HMDA, at the county-year level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001-2018). Callaway and Sant'Anna (2021) estimator for DID models with panel data implemented using csdid in Stata. Event time point estimates and 95% confidence intervals plotted. ATT stands for average treatment effect on the treated.

C.3 By share employed in health jobs in 2004

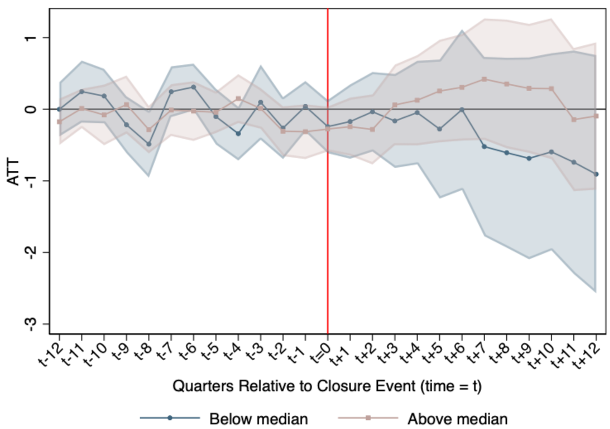
Figure C7: Rural hospital closure effects on county-level employment: by share employed in health jobs (2004)



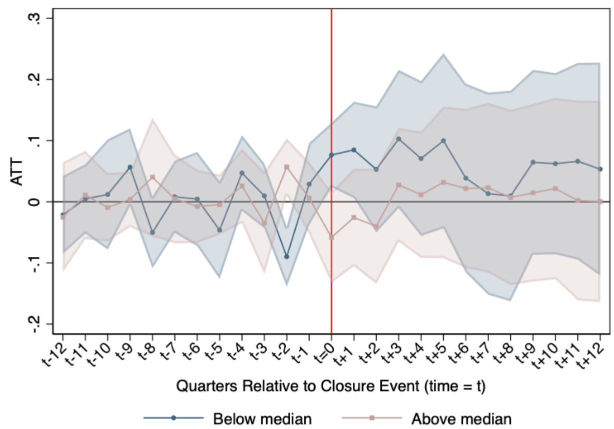
Notes: Employment data from the BLS QCEW, at the county-quarter level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001Q1-2018Q4). Callaway and Sant'Anna (2021) estimator for DID models with panel data implemented using csdid in Stata. Event time point estimates and 95% confidence intervals plotted. ATT stands for average treatment effect on the treated.

Figure C8: Rural closure effects on consumer finances: by share employed in health jobs (2004)

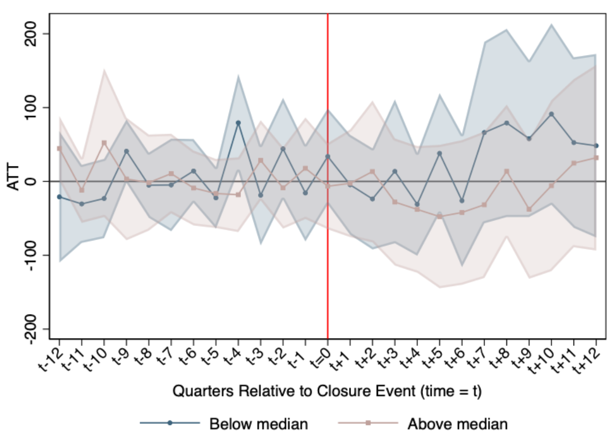
(A) Risk score



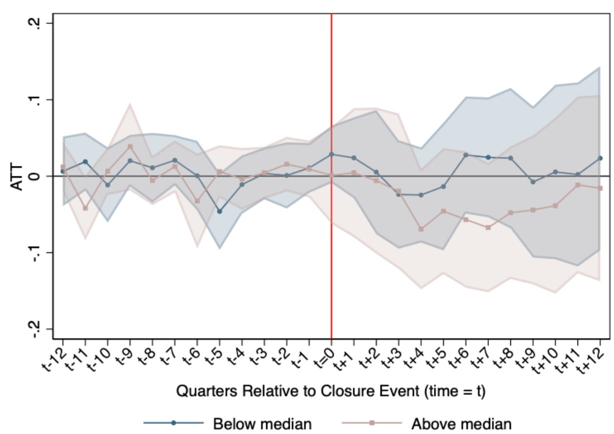
(B) Bankruptcies past 24-months



(C) Total balance past due



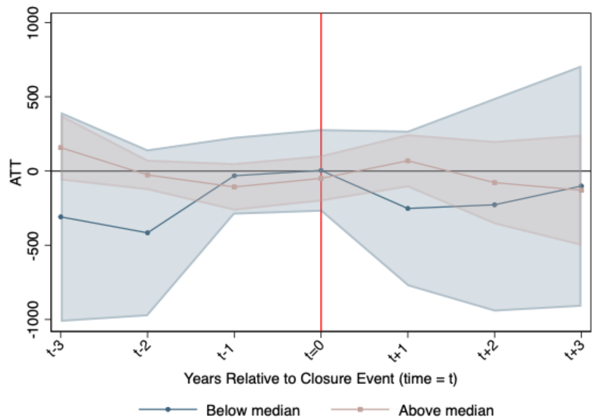
(D) Number of collections past 12-months



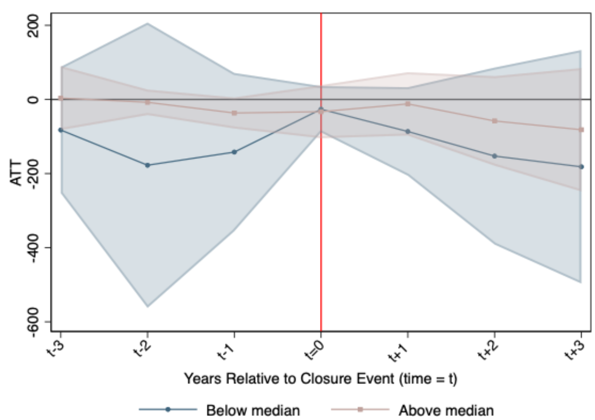
Notes: Employment data from the BLS QCEW, at the county-quarter level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001Q1-2018Q4). Callaway and Sant'Anna (2021) estimator for DID models with panel data implemented using csdid in Stata. Event time point estimates and 95% confidence intervals plotted. ATT stands for average treatment effect on the treated.

Figure C9: Results for rural hospital closure effects on housing markets: by share employed in health jobs (2004)

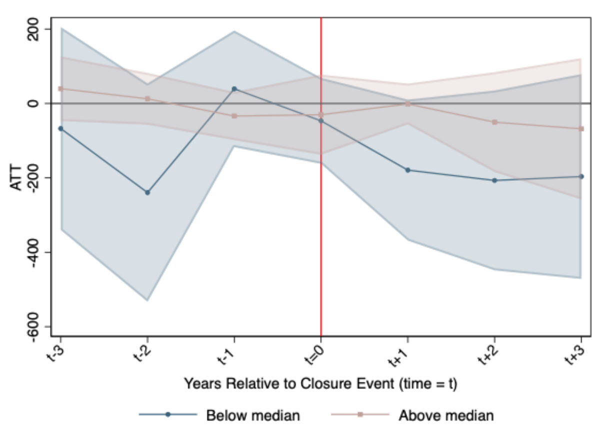
(A) Number of loans originated



(B) Number of loans denied



(C) Number of loans purchased

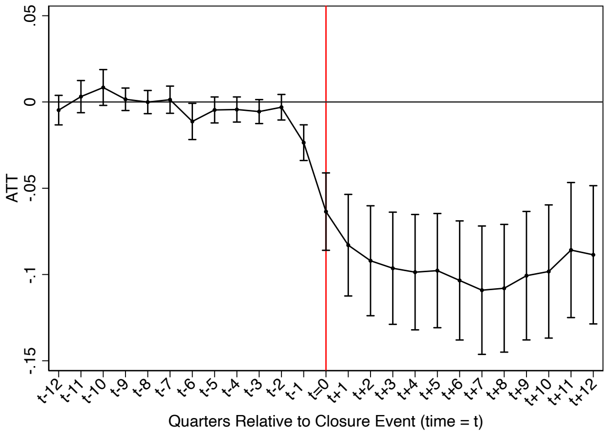


Notes: Data on loans from HMDA, at the county-year level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001-2018). Callaway and Sant'Anna (2021) estimator for DID models with panel data implemented using csdid in Stata. Event time point estimates and 95% confidence intervals plotted. ATT stands for average treatment effect on the treated.

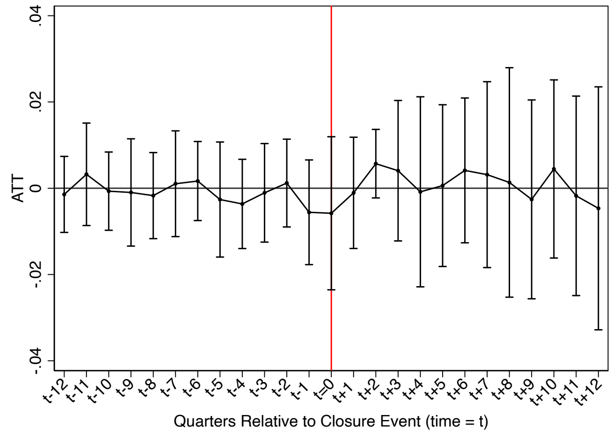
D Additional Figures

Figure D1: Rural closure effects on county-level employment: by varying rurality threshold

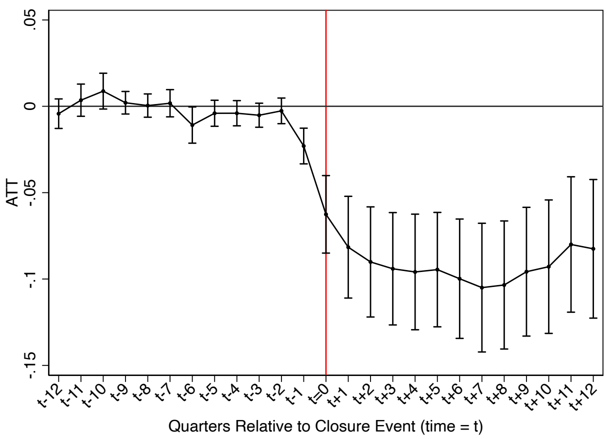
(A) Health care industry: 25% threshold



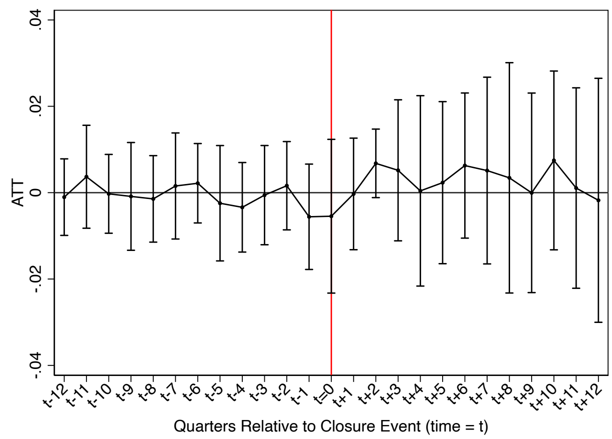
(B) Non-health care: 25% threshold



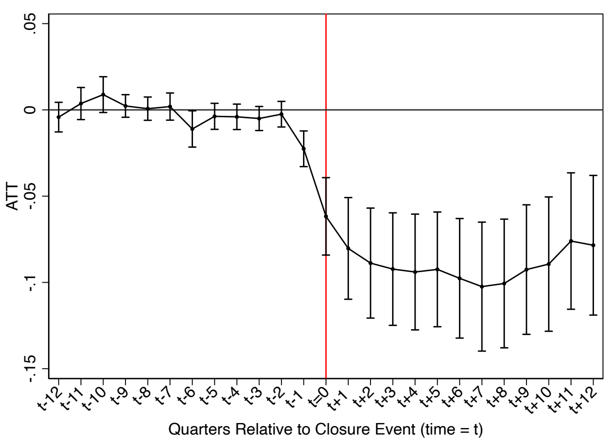
(C) Health care industry: 50% threshold



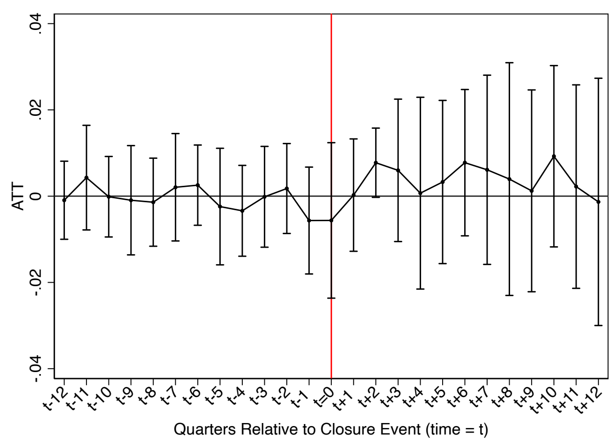
(D) Non-health care: 50% threshold



(E) Health care industry: 75% threshold



(F) Non-health care industry: 75% threshold

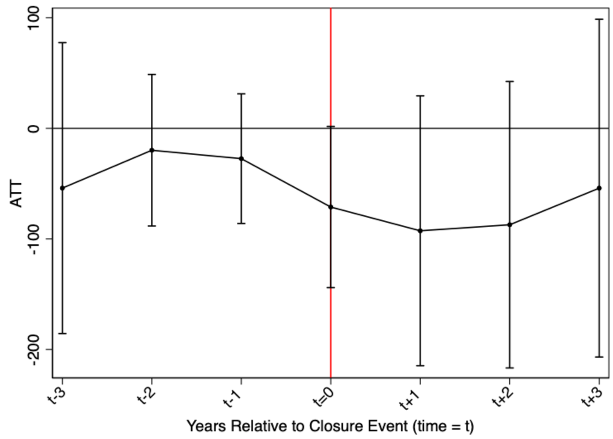


Notes: Employment data from the BLS QCEW, at the county-quarter level. Control group (never closure) counties are those that never experienced a rural hospital closure, and had 25 percent, 50 percent, or 75 percent or more of the county population living in a rural area according to the 2000 Census. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001Q1-2018Q4). Callaway and Sant'Anna (2021) estimator for DID models with panel data implemented using *csdid* in Stata. Event time point estimates and 95% confidence intervals plotted. ATT stands for average treatment effect on the treated.

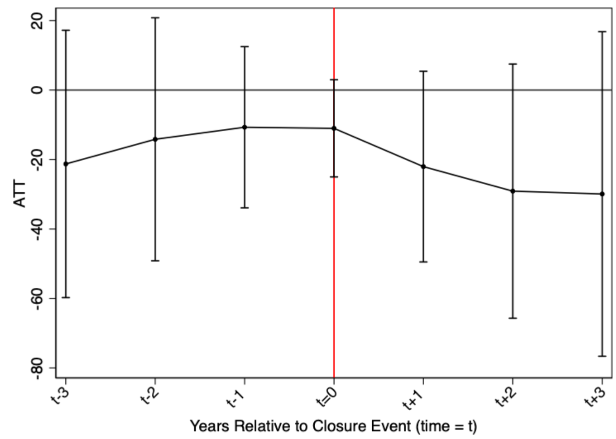
Figure D2: Rural hospital closure effects on housing markets: by purpose

Home purchase

(A) Number of loans originated

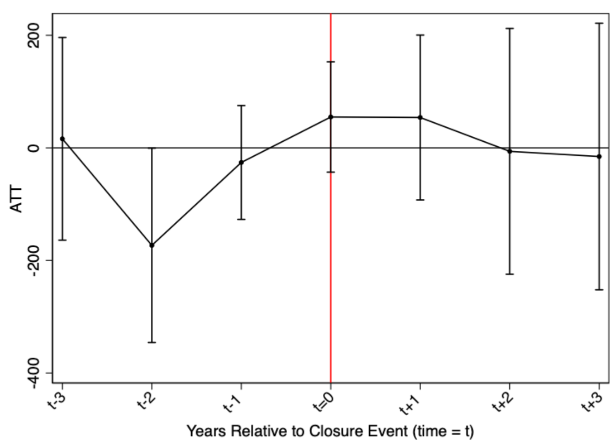


(B) Number of loans denied

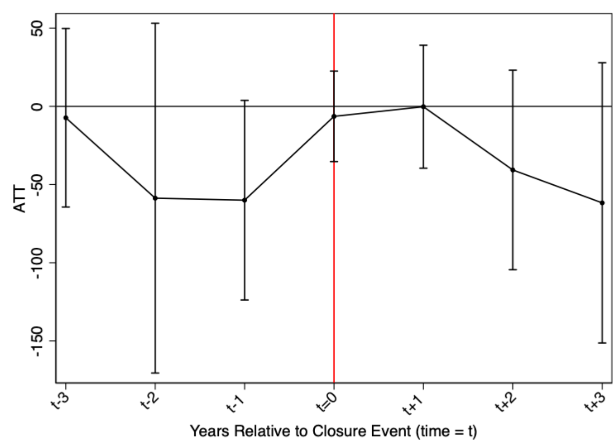


Refinance

(C) Number of loans originated

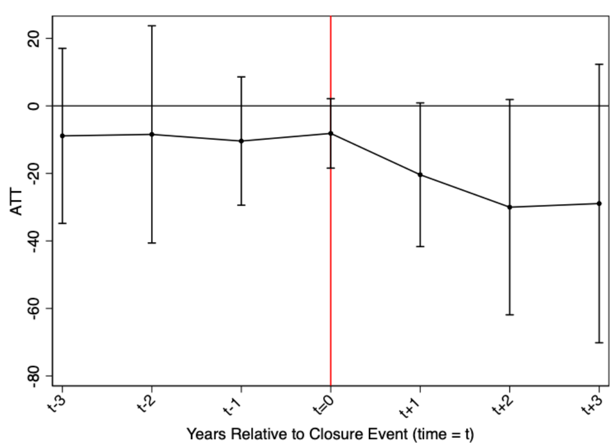


(D) Number of loans denied

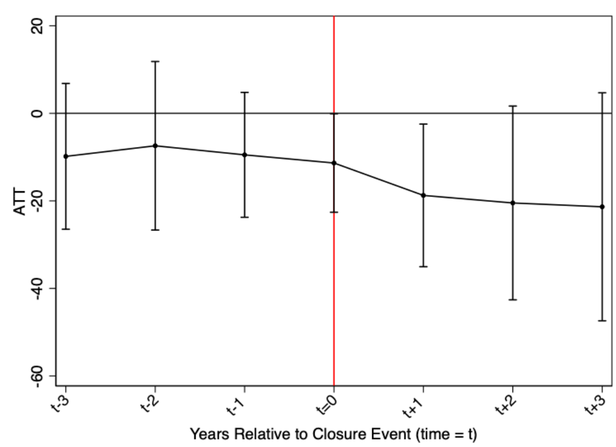


Home improvement

(E) Number of loans originated



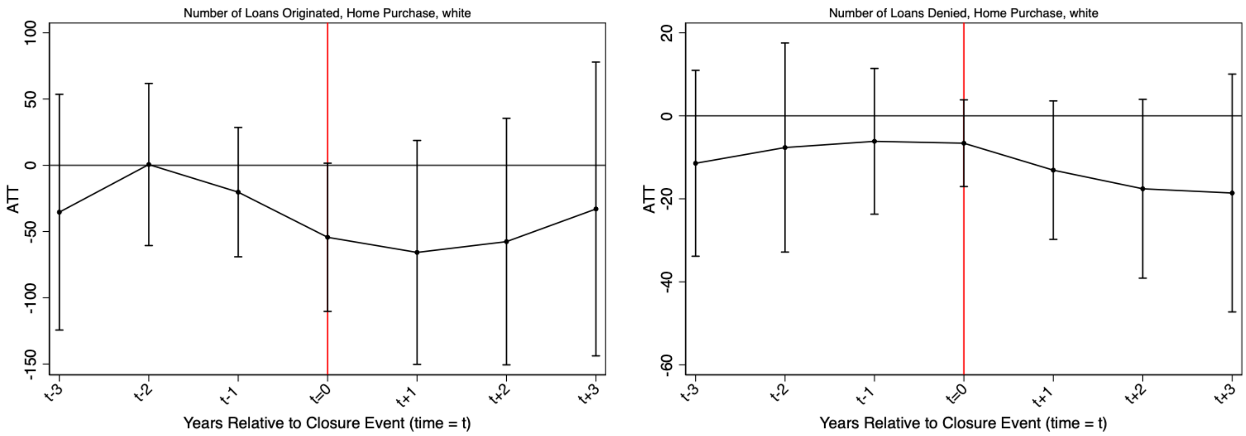
(F) Number of loans denied



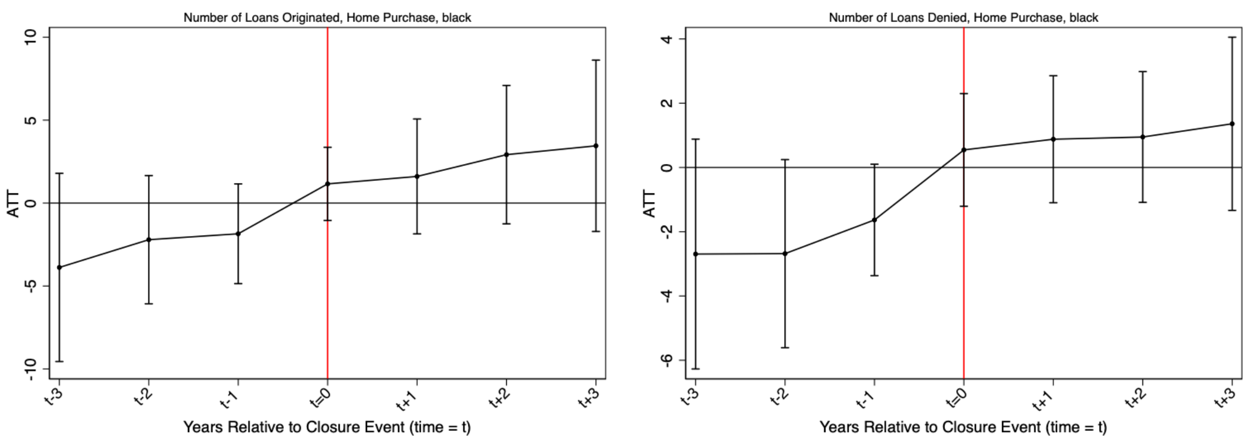
Notes: Data on loans from HMDA, at the county-year level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001-2018). Callaway and Sant'Anna (2021) estimator for DID models with panel data implemented using csdid in Stata. Event time point estimates and 95% confidence intervals plotted. ATT stands for average treatment effect on the treated.

Figure D3: Rural hospital closure effects on home purchases: by race

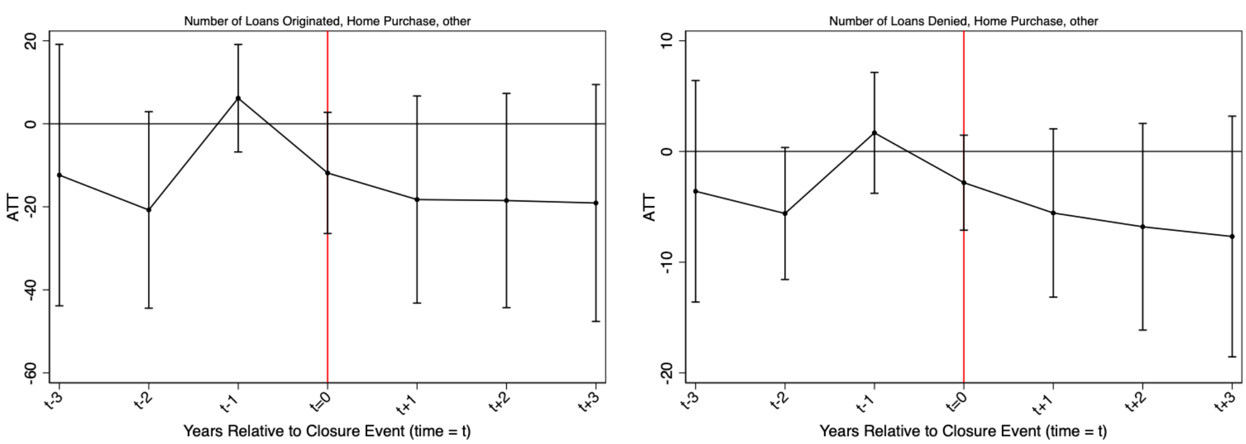
White



Black



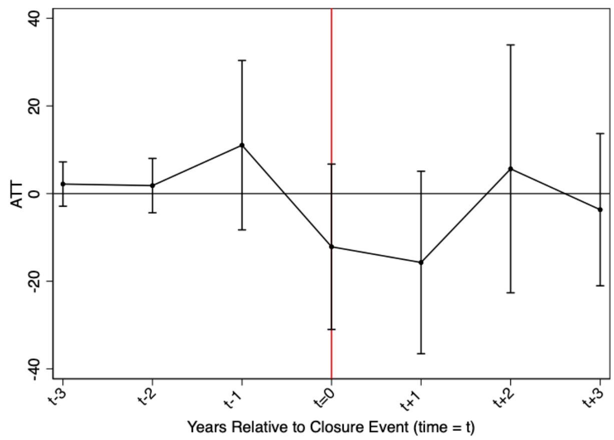
Other



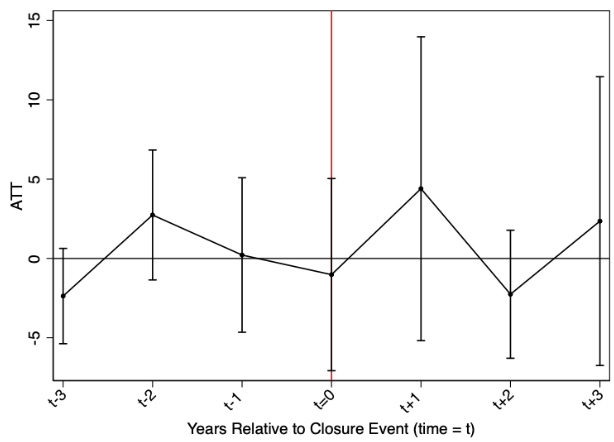
Notes: Data on loans from HMDA, at the county-year level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001-2018). Callaway and Sant'Anna (2021) estimator for DID models with panel data implemented using csdid in Stata. Event time point estimates and 95% confidence intervals plotted. ATT stands for average treatment effect on the treated.

Figure D4: Rural hospital closure effects on housing markets: average loan amount

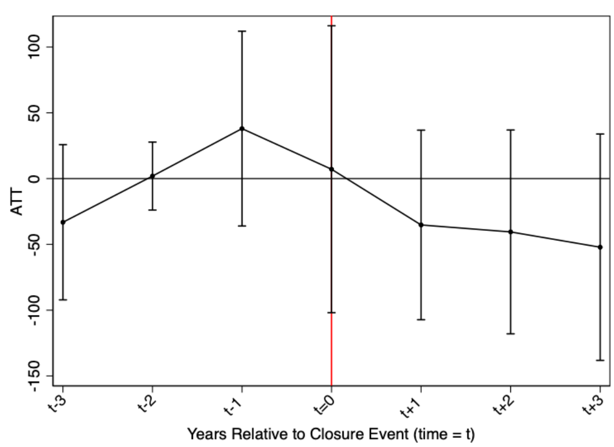
(A) Average amount of loans originated



(B) Average amount of loans denied



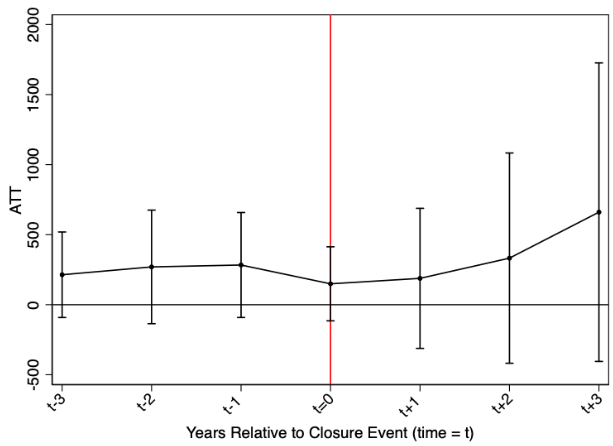
(C) Average amount of loans purchased



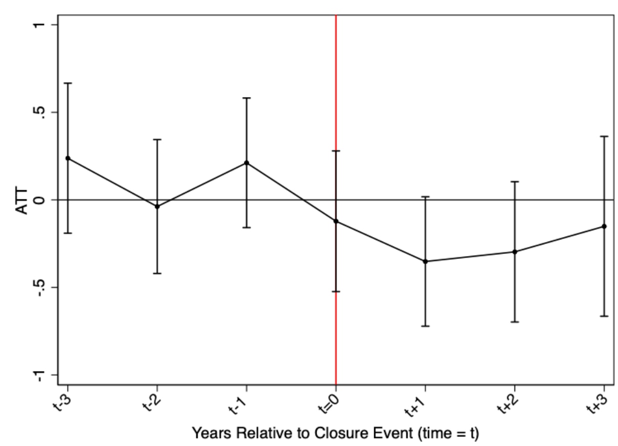
Notes: Data on loans from HMDA, at the county-year level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001-2018). Callaway and Sant'Anna (2021) estimator for DID models with panel data implemented using csdid in Stata. Event time point estimates and 95% confidence intervals plotted. ATT stands for average treatment effect on the treated.

Figure D5: Rural hospital closure effects on county-level characteristics

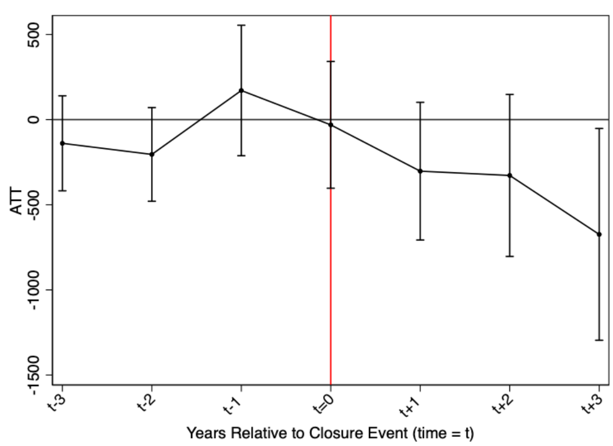
(A) Population



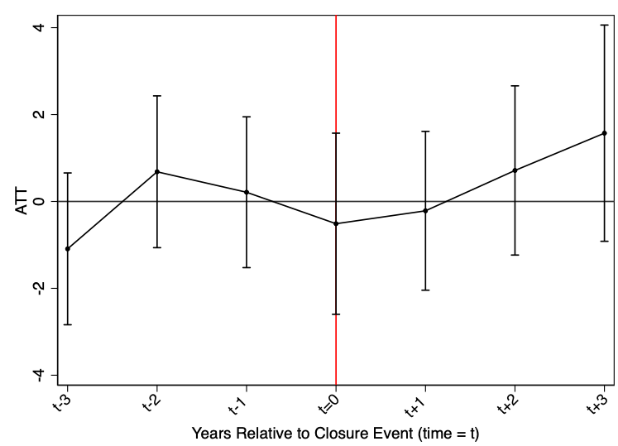
(B) Poverty rate



(C) Median household income



(D) Net migration



Notes: Data from the Small Area Income and Poverty Estimates, and the annual resident population estimates, estimated components of resident population change, and rates of the components of resident population change for states and counties from the U.S. Census Bureau, at the county-year level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001-2018). Callaway and Sant'Anna (2021) estimator for DID models with panel data implemented using csdid in Stata. Event time point estimates and 95% confidence intervals plotted. ATT stands for average treatment effect on the treated.

E Additional Tables

Table E1: Rural hospital closure effects on employment, county-level consumer financial health, and housing markets

	Employment (in logs)			
	(1) All	(2) Private sector	(3) Health care industries	(4) Non-health care industries
1(Rural closure)	-0.022**	-0.028**	-0.086***	-0.015
	(0.010)	(0.011)	(0.019)	(0.013)
Observations	126,648	126,648	126,648	126,648
Mean dep. var.	10.32	10.06	8.16	9.87

	Consumer finances			
	(1) Risk score	(2) Tot. balance past due	(3) Collections (past 12m)	(4) Bankruptcies (past 24m x100)
1(Rural closure)	0.259	2.699	0.010	0.036
	(0.398)	(34.348)	(0.036)	(0.059)
Observations	143,765	143,765	143,765	143,765
Mean dep. var.	690.19	860.20	0.80	1.47

	Housing market activity		
	(1) Originated	(2) Denied	(3) Purchased
1(Rural closure)	-228.15	-153.86	-182.94
	(238.83)	(102.28)	(111.41)
Observations	35,946	35,946	35,946
Mean dep. var.	1,327.78	527.31	412.61

Notes: Employment data from the BLS QCEW, at the county-quarter level. Data on loans from HMDA, at the county-year level. Data on consumer financial information comes from the Consumer Credit Panel, at the county-quarter level. Control group (never closure) counties are those that never experienced a rural hospital closure, had 25 percent or more of the county population living in a rural area according to the 2000 Census, and had a hospital present in the county as of 2005. Analytic data restricted to a balanced panel of counties with valid data across all variables for all time periods (2001-2018). Callaway and Sant'Anna (2021) estimator for DID models with panel data implemented using csdid in Stata. Panel is at the county-quarter level in the BLS QCEW and Consumer Credit Panel, and at the county-year level in the HMDA data. *** P-value at 0.01 ** P-value at 0.05 * P-value at 0.10