The Real Effects of Financial Technology: Marketplace Lending and Personal Bankruptcy

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University of Bristol

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The Real Effects of FinTech

Study how new financial technology affects household welfare in terms of personal bankruptcy focusing on relatively new type of credit, marketplace lending.
Marketplace Lending: Risk and Benefits

Benefits: Potential to *decrease* personal bankruptcies.

- Rationed borrowers get credit access (De Roure, Pelizzon, Tasca, 2016; Jagtiani - Lemieux, 2017; Schweitzer - Barkley, 2017).
- Quickly granted (Fuster, Plosser, Schnabl, Vickery, 2018).
- Lowers debt refinancing cost, particularly card debt (Balyuk, 2017).

Risks: Potential to *increase* personal bankruptcies.

- Providing credit to less credit-worthy HHs (Jagtiani-Lemieux, 2017).
- Borrowers overestimate ability to pay (Ausubel, 1991).
- Debt increases personal bankruptcies (Domowitz and Sartain, 1999; Gross and Souleles, 2002; Fay, Hurst, and White, 2002; Dick and Lehnert, 2010; Livshits, Macgee and Tertilt, 2007, 2010, 2016).

We find benefits: *rationing of marketplace credit raises personal bankruptcies among low-income households.*
Identification Strategy – Diff-in-Difference

We exploit the decision by U.S. Second Circuit Court of Appeals in the case of *Madden vs Midland Funding*. [↩]

The court, covering CT, VE, and NY, ruled in May 2015 that

- loans originated to borrowers in those states with interest rate above borrower’s state usury limit are null and void if loans held by non-bank financial institutions.

Case unrelated to marketplace industry but cast doubt on enforceability of marketplace loans

- Most marketplace loans are originated [↩] by a fronting bank located in a state without usury cap and immediately sold to marketplace platforms, non-banks under current OCC rules.
Difference-in-Difference Estimation

Compare changes in bankruptcy filings and marketplace lending in treatment (Connecticut and New York) and control group (all other states), before and after treatment event.

\[
(1) \quad \ln(Y)_{sm} = \beta_1 \text{Madden}_m \times \text{State}_s + \beta_2 \text{State}_s + \beta_3 \text{Madden}_m + \epsilon_{sm}
\]

\[
(2) \quad \ln(Y)_{sm} = \alpha_s + \beta \text{Madden}_m \times \text{State}_s + \delta \text{Controls}_{sm} + \gamma_m + \epsilon_{sm}
\]

where \( s \) denotes state and \( m \) month:

- \( \ln(Y)_{sm} \): log of marketplace loans; bankruptcy rates/workforce.
- \( \text{Madden} \): equal to 1 for months June 2015 – Dec 2017.
- \( \text{State} \): equal to 1 for Connecticut and New York states.
- \( \text{Controls} \): incl. marketplace loan demand (volume of funds requested via P2P platforms).
- \( \alpha \): state dummies.
- \( \gamma \): month dummies.
Data

Lending Club and Prosper: Marketplace lending data
- No of loan requests, borrower’s residence, origination date, loan purpose, loan size, internal risk rating of applicant, loan status.
- We exclude states whose residents were or still are unable to raise funds through Prosper / Lending Club: IW, MN, MI, NE, ND, WV

U.S. Courts Administrative Office: bankruptcy cases filed per month in every state since 2013 by: [1]
- Bankruptcy chapter (Chapter 7, 11, 12, 13), nature of filing (personal business and consumer), annual income of each filer.

NY FRB CMD: annual volume of card, student and auto loans.

U.S. BLS: unemployment rates and labor force data.

Sample: 60-months (01/2013 – 12/2017), 2,700 obs, 45 states [1]
Difference-in-Difference Assumptions

(I.) *Exogeneity*:
- Court case was unrelated to marketplace industry. [44]
- No evidence conditions related to bankruptcy rates in affected states was considered by court in reaching its verdict.

(II.) *Parallel Trends*:

*FIGURE I*

**PARALLEL TRENDS**
Why focus on rationing of marketplace lending?

As opposed to other types of consumer credit, because:

Madden leaves non-marketplace consumer credit unaffected.

FIGURE II
EFFECT OF MADDEN ON CONSUMER LOANS

TABLE V
MADDEN AND CONSUMER CREDIT

Panel A: Effect of Madden on consumer credit

<table>
<thead>
<tr>
<th>Dependent var</th>
<th>Mktplace loans</th>
<th>Credit card loans</th>
<th>Auto loans</th>
<th>Student loans</th>
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<tbody>
<tr>
<td>$LN(1+X)$:</td>
<td>-0.098***</td>
<td>-0.004</td>
<td>-0.019*</td>
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<tr>
<td></td>
<td>(-6.50)</td>
<td>(-0.47)</td>
<td>(-1.87)</td>
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</table>

<table>
<thead>
<tr>
<th>Madden*State</th>
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<tr>
<td></td>
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<tr>
<td>SE Cluster</td>
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Danisewicz and Elard (2018) The Real Effects of Financial Technology
The Effect of Madden on Marketplace Lending
TABLE II  
THE EFFECT OF MADDEN ON MARKETPLACE LENDING

**Panel A: Intensive margin**  
*Dependent variable:* LN(1+Volume of marketplace loans)  

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</table>

**Volume of marketplace lending declines by 10%.** From $13 million to $11.7 million for avg state.

**Panel B: Extensive margin**  
*Dependent variable:* LN(1+Number of marketplace loans)  

<table>
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</table>

**Number of marketplace loans decline by 13.4%.** From 900 to 780 marketplace loans for avg state.

**Panel C: By purpose of the loan**  
*Dependent variables:* LN(1+Relevant loans) LN(1+Relevant loans) LN(1+ Relevant loans) LN(1+ medical expenses loans) LN(1+ small business loans) LN(1+other loans)  

| Madden*State | -0.160*** | -0.101*** | -0.162*** | -1.130*** | -0.395*** | -0.164*** |
|--------------| (-4.65)  | (-8.67)  | (-6.92)  | (-4.96)  | (-2.78)  | (-7.19)  |

**Danisewicz and Elard (2018) The Real Effects of Financial Technology**
### TABLE II
#### THE EFFECT OF Madden ON MARKETPLACE LENDING

**Panel A: Intensive margin**

*Dependent variable:* LN(1+Volume of marketplace loans)

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*Controls*

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</tr>
</tbody>
</table>

**Credit rationing intensifies with borrower credit risk**
(1 high-risk, 7 low-risk)

**Panel B: Extensive margin**

*Dependent variable:* LN(1+Number of marketplace loans)

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
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</tbody>
</table>

**Panel C: By purpose of the loan**

<table>
<thead>
<tr>
<th></th>
<th>LN(1+Relevant loans)</th>
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<th>LN(1+ debt refinancing loans)</th>
<th>LN(1+ medical expenses loans)</th>
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<th>LN(1+other loans)</th>
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<tr>
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**THE EFFECT OF MADDEN ON MARKETPLACE LENDING**

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<th>Panel A: Intensive margin</th>
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</thead>
<tbody>
<tr>
<td><strong>Dependent variable:</strong> LN(1+Volume of marketplace loans)</td>
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</tr>
<tr>
<td><strong>Borrower rating:</strong></td>
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</tr>
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<th>Panel B: Extensive margin</th>
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<tr>
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<tr>
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</table>

**Decline in marketplace loans for medical cost (68%), debt refinancing (15%), and small business loans (33%)**

<table>
<thead>
<tr>
<th>Panel C: By purpose of the loan</th>
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Danisewicz and Elard (2018) *The Real Effects of Financial Technology*
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**The Effect of Madden on Marketplace Lending**

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**Note:** State FE, Month FE, Controls, NO: YES

**Observations:** 2,700

**R-squared:** 0.147

#### Panel B: Extensive margin

<table>
<thead>
<tr>
<th>Borrower rating</th>
<th>ALL</th>
<th>ALL</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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</thead>
<tbody>
<tr>
<td>Madden*State</td>
<td>-0.174***</td>
<td>-0.134***</td>
<td>-0.799***</td>
<td>-0.793***</td>
<td>-0.519***</td>
<td>-0.359***</td>
<td>-0.039</td>
<td>0.002</td>
<td>-0.005</td>
</tr>
<tr>
<td></td>
<td>(-5.55)</td>
<td>(-7.62)</td>
<td>(-8.46)</td>
<td>(-28.41)</td>
<td>(-29.88)</td>
<td>(-21.89)</td>
<td>(-0.79)</td>
<td>(0.12)</td>
<td>(-0.36)</td>
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</table>

**Note:** State FE, Month FE, Controls, NO: YES

**Observations:** 2,700

**R-squared:** 0.993

#### Panel C: By purpose of the loan

<table>
<thead>
<tr>
<th>Dependent variables:</th>
<th>LN(1+Relevant loans)</th>
<th>LN(1+Relevant loans)</th>
<th>LN(1+ debt refinancing loans)</th>
<th>LN(1+ medical expenses loans)</th>
<th>LN(1+small business loans)</th>
<th>LN(1+other loans)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madden*State</td>
<td>-0.160***</td>
<td>-0.101***</td>
<td>-0.162***</td>
<td>-1.130***</td>
<td>-0.395***</td>
<td>-0.164***</td>
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<tr>
<td></td>
<td>(-4.65)</td>
<td>(-8.67)</td>
<td>(-6.92)</td>
<td>(-4.96)</td>
<td>(-2.78)</td>
<td>(-7.19)</td>
</tr>
</tbody>
</table>

**Decline in marketplace loans for medical cost (68%), debt refinancing (15%), and small business loans (33%)**

**Cost of medical expenses and credit card debt important determinants of personal bankruptcy, particularly for low-income households.**

(See: Gross and Notowidigdo, 2011; Domowitz and Sartain, 1999).
The Effect of Madden on Personal Bankruptcy
# TABLE III
THE EFFECT OF MADDEN ON PERSONAL BANKRUPTCY

**PANEL A: Total bankruptcies**

*Dependent variable: LN(1+Total number of bankruptcies/workforce)*

<table>
<thead>
<tr>
<th></th>
<th>All chapters</th>
<th>All chapters</th>
<th>Chapter 7</th>
<th>Chapter 11</th>
<th>Chapter 12</th>
<th>Chapter 13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madden*State</td>
<td>0.067**</td>
<td>0.079**</td>
<td>0.059***</td>
<td>0.005</td>
<td>-0.000</td>
<td>0.103**</td>
</tr>
<tr>
<td></td>
<td>(2.35)</td>
<td>(2.60)</td>
<td>(3.87)</td>
<td>(0.45)</td>
<td>(-1.56)</td>
<td>(2.58)</td>
</tr>
<tr>
<td>State</td>
<td>-0.346***</td>
<td></td>
<td>-0.169***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-5.56)</td>
<td></td>
<td>(-12.08)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Madden</td>
<td>-0.169***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-12.08)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>State FE</td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Month FE</td>
<td>NO</td>
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<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
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<td>Observations</td>
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<td>2,700</td>
<td>2,700</td>
<td>2,700</td>
<td>2,700</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.063</td>
<td>0.959</td>
<td>0.950</td>
<td>0.714</td>
<td>0.196</td>
<td>0.977</td>
</tr>
<tr>
<td>SE Cluster</td>
<td>State</td>
<td>State</td>
<td>State</td>
<td>State</td>
<td>State</td>
<td>State</td>
</tr>
</tbody>
</table>

**PANEL B: Business bankruptcies**

*Dependent variable: LN(1+Number of business bankruptcies/workforce)*

<table>
<thead>
<tr>
<th></th>
<th>All chapters</th>
<th>Chapter 7</th>
<th>Chapter 11</th>
<th>Chapter 12</th>
<th>Chapter 13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madden*State</td>
<td>0.021</td>
<td>0.023</td>
<td>0.005</td>
<td>-0.000</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(1.34)</td>
<td>(1.48)</td>
<td>(0.52)</td>
<td>(-1.56)</td>
<td>(1.41)</td>
</tr>
</tbody>
</table>

**PANEL C: Consumer bankruptcies**

*Dependent variable: LN(1+Number of consumer bankruptcies/workforce)*

<table>
<thead>
<tr>
<th></th>
<th>All chapters</th>
<th>Chapter 7</th>
<th>Chapter 11</th>
<th>Chapter 12</th>
<th>Chapter 13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madden*State</td>
<td>0.064**</td>
<td>0.076***</td>
<td>0.056***</td>
<td>0.000</td>
<td>0.103**</td>
</tr>
<tr>
<td></td>
<td>(2.58)</td>
<td>(2.84)</td>
<td>(3.77)</td>
<td>(0.22)</td>
<td>(2.55)</td>
</tr>
</tbody>
</table>

Personal bankruptcy filings increase by 8%. Increase from 1,573 to 1,698 bankruptcy filings in avg state.
### TABLE III
THE EFFECT OF MADDEN ON PERSONAL BANKRUPTCY

**PANEL A: Total bankruptcies**

Dependent variable: LN(1+Total number of bankruptcies/workforce)

<table>
<thead>
<tr>
<th></th>
<th>All chapters</th>
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<td></td>
<td>(2.35)</td>
<td>(2.60)</td>
<td>(3.87)</td>
<td>(0.45)</td>
<td>(-1.56)</td>
<td>(2.58)</td>
</tr>
<tr>
<td>State</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Madden</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
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<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
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<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
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<tr>
<td>Month FE</td>
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<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Observations</td>
<td>2,700</td>
<td>2,700</td>
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<td>2,700</td>
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<td>R-squared</td>
<td>0.063</td>
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<td>0.950</td>
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<td>0.196</td>
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<tr>
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<td>State</td>
<td>State</td>
<td>State</td>
<td>State</td>
<td>State</td>
<td>State</td>
</tr>
</tbody>
</table>

**PANEL B: Business bankruptcies**

Dependent variable: LN(1+Number of business bankruptcies/workforce)

<table>
<thead>
<tr>
<th></th>
<th>All chapters</th>
<th>All chapters</th>
<th>Chapter 7</th>
<th>Chapter 11</th>
<th>Chapter 12</th>
<th>Chapter 13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Madden*State</td>
<td>0.021</td>
<td>0.023</td>
<td>0.018**</td>
<td>0.005</td>
<td>-0.000</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(1.34)</td>
<td>(1.48)</td>
<td>(2.49)</td>
<td>(0.52)</td>
<td>(-1.56)</td>
<td>(1.41)</td>
</tr>
</tbody>
</table>

**PANEL C: Consumer bankruptcies**

Dependent variable: LN(1+Number of consumer bankruptcies/workforce)

<table>
<thead>
<tr>
<th></th>
<th>All chapters</th>
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<th>Chapter 11</th>
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</thead>
<tbody>
<tr>
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<td>0.064**</td>
<td>0.076***</td>
<td>0.056***</td>
<td>0.000</td>
<td>0.103**</td>
</tr>
<tr>
<td></td>
<td>(2.58)</td>
<td>(2.84)</td>
<td>(3.77)</td>
<td>(0.22)</td>
<td>(2.55)</td>
</tr>
</tbody>
</table>

**Danisewicz and Elard (2018) The Real Effects of Financial Technology**

Consumer bankruptcy filings increase most. But there is a rise also in personal business bankruptcies.
TABLE IV
THE EFFECT OF MADDEN ACROSS DIFFERENT INCOME GROUPS

Panel A: Effect of Madden on non-marketplace consumer credit

<table>
<thead>
<tr>
<th>Income range:</th>
<th>Dependent variable:</th>
<th>LN(1+Vol. of loans)</th>
<th>LN(1+No. of loans)</th>
<th>LN(1+No. of bankruptcies/workforce)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>Business</td>
<td>Consumer</td>
</tr>
<tr>
<td>$&lt;25,000</td>
<td>Madden*State</td>
<td>-1.022*** (-4.05)</td>
<td>-0.519*** (-4.96)</td>
<td>0.085*** (7.96)</td>
</tr>
<tr>
<td>$25,000-$49,999</td>
<td>Madden*State</td>
<td>-0.558*** (-5.08)</td>
<td>-0.475*** (-6.11)</td>
<td>0.073*** (5.11)</td>
</tr>
<tr>
<td>$50,000-$74,999</td>
<td>Madden*State</td>
<td>-0.316*** (-5.60)</td>
<td>-0.269*** (-5.26)</td>
<td>0.047*** (5.66)</td>
</tr>
<tr>
<td>$75,000-$99,999</td>
<td>Madden*State</td>
<td>0.026 1.31</td>
<td>-0.064*** (-5.23)</td>
<td>0.002 (0.15)</td>
</tr>
<tr>
<td>&gt;$100,000</td>
<td>Madden*State</td>
<td>-0.006 (-0.30)</td>
<td>-0.029 (-1.63)</td>
<td>0.000 (0.56)</td>
</tr>
</tbody>
</table>

Bankruptcy filings rise in proportion to credit rationing across different income groups

- high-income: no marketplace credit rationing, no rise in bankruptcy.
- low-income: severest credit rationing (64%), largest rise in BK (8.5%)
Rule out alternative explanations for BK rise post-Madden

1. BK rise not a temporary effect of marketplace credit rationing. Personal BKs remain persistently higher (2 year later) [+]  

2. BK rise not due to borrowers switching to forms of high-interest credit, such as payday loans. [+]  

3. BK rise not due to higher marketplace NPL. [+]
4. Matched sampling: match states based on pre-treatment volume of marketplace lending. [↩]

5. Including Vermont in the treatment group. [↩]

6. Placebo tests for treatment event

7. Alternative bankruptcy rates measures. [↩]

8. Bootstrapped SEs [↩] and state-month clustered SEs. [↩]
Our paper suggests marketplace lending’s positive welfare effects:

- **Reversing access to new lending technology increases personal bankruptcies among low-income HHs.**

In contrast, bank credit (Dick-Lehnert, 2010), credit cards (Livshits, Macgee, Tertilt, 2016), payday loans (Melzer, 2011) all associated with adverse welfare effects.

Important b/c bankruptcy’s impact household welfare \[\uparrow\downarrow\]

Immediate policy implications as we show that Madden raises personal bankruptcies and leads to a “lack of access to safe and affordable financial services” for low-income HHs specifically as claimed in bill H.R.3299 currently pending in U.S. Senate.