Data Talk Series
HOUSING FINANCE POLICY CENTER

#LiveAtUrban
Fintech and Regulatory Arbitrage in Mortgage Lending

Tomasz Piskorski
Columbia Business School and NBER
Based On:

_Fintech, Regulatory Arbitrage, and the Rise of Shadow Banks_
Greg Buchak, University of Chicago
Gregor Matvos, UT Austin and NBER
Tomasz Piskorski, Columbia and NBER
Amit Seru, Stanford and NBER

Available at:
Two Trends in Residential Mortgages

Assess role of technology and regulation in recent increase of market disruptors: Focus on largest consumer finance market

1. Growth of shadow bank origination share

2. Growth of fintech origination share
Possible Mechanisms

1. **Regulation**: Shadow banks fill regulatory gaps.
   - Traditional banks face rising capital costs.
   - Traditional banks face greater capital constraints.
   - Traditional banks face greater regulatory scrutiny.

2. **Technology**: Fintech possesses better technology.
   - Fintech lends at lower cost.
   - Fintech offers higher quality products.
   - Fintech uses big data and different models.
Our Objective

Our objective:

• Understand some facts about fintech and non-fintech lenders during recent expansion of shadow bank lending in the largest consumer loan market ($10 trillion)

• How much of shadow bank and fintech growth is regulation, how much is better technology?

Note: No cost / benefit analysis
Basic Approach

1. **Effects of Regulation**
   - Compare banks to shadow banks.
   - Look for differences associated with regulations.

2. **Role of Technology**
   - *Within* shadow banks, compare fintech and non-fintech.
   - Holding regulation constant, look for differences across types.

3. **Disentangling the Effects**
   - Structural model of lender choice and entry.
   - Contribution of regulation and technology to big-picture market trends.
Road Map

1. Data and definitions
2. Facts on shadow banking and fintech loans
3. Effect of regulation
4. Effect of technology
5. Model
Data and Definitions
Data

1. **HMDA**
   - All loans (can analyze entry)
   - Originator name, borrower demographics
   - **No** loan outcomes

2. **Fannie Mae and Freddie Mac**
   - Conforming loans purchased by Fannie Mae or Freddie Mac
   - Originator name, FICO, interest rates, location, purpose
   - **Includes** loan outcomes

3. **Regulatory Data**
   - Lawsuit settlements arising out of Financial Crisis (Law360, SEC, SNL Financial)
   - Bank capital ratios, mortgage assets (Federal Reserve)

4. **Census**
   - County-level demographic information
Lender Classification

1. Traditional bank vs. shadow bank
   • Bank: Depository institution

2. Within shadow banks: Fintech vs. non-fintech
   • Fintech: all or nearly all of origination process is online, including firm rate offer
   • Platform automatically aids in data collection (wage, assets...)

3. Implementation
   • Manual classification
   • Fannie and Freddie: Classify all identified lenders (Top 50)
   • HMDA: F&F lenders plus next largest to get 80% market share
What to expect.

Understand the refinance process from application through closing.

Here is a quick overview of the approval process: A Home Loan Specialist can answer any questions you may have.

Initial review

You are assigned a loan processor who works with you through your closing—organizing your paperwork and making sure your documentation is complete prior to the final review.

Underwriting

Once we have your documentation, an underwriter reviews your loan package to make sure it fits loan guidelines, evaluates your loan application, and then makes a credit decision. In some cases, we may request additional information before making a decision. Your loan processor can assist you with this.

Approval decision

Once your loan is approved, a closing date will be set. At least three business days before your closing date, we will
A “Fintech” Shadow Bank

ROCKET MORTGAGE
by Quicken Loans
A “Fintech” Shadow Bank
A “Fintech” Shadow Bank

Your rate is now locked!

Property Address:
123 Main Street, Detroit, MI, 48226

Here’s what you’ve locked in:

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<thead>
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<th>Interest Rate</th>
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<td>Loan Type</td>
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<td>New Loan Amount</td>
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<tr>
<td>Your Rate Lock Expiration Date</td>
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The Steps to Get You to Closing

- Use our powerful online tools to get you through the mortgage process with ease.
- Complete your simple to do list by 11/25/2015.

Save & Continue
Basic Facts:
The Decline of Traditional Banks
Shadow Bank Share: All Loans
Shadow Bank Share: Conforming
Shadow Bank Share: FHA
Fintech Shadow Bank Share: Conforming

Basic Facts

Which segments see growth of shadow banks (and fintech)?

Idea: Comparative Advantage
• Larger growth = larger comparative advantage

Approach:
• Banks vs. Shadow Banks (different regulation)
  • Fintech vs. Non-Fintech (same regulation, different tech.)

Analysis:
• Within Market (loan level)
  • Market level analysis (across markets)
Borrower Characteristics

1. **Race/Ethnicity**
   - Shadow banks more active among minorities
   - Fintech shadow banks more active among non-minorities

2. **FHA and FICO**
   - **Shadow banks** originate roughly 75% of FHA loans
   - FHA loan segment: Particularly high risk (only 3% downpayment)
   - Both fintech and non-fintech active among lower FICO borrowers

3. **Economic Situations**
   - Shadow banks more active in high-unemployment areas
   - Fintech shadow banks more active in low-unemployment areas
   - Shadow banks borrowers less-likely to be first-time borrowers
Purpose and Financing

1. Loan Purpose
   • 75% of fintech loans are refinances vs. 50% for others
   • Likely possess comparative advantage in refinance

2. Loan Financing
   • Banks more likely to retain mortgages on balance sheet
   • Shadow banks mainly sell to GSEs (even more fintech)
   • Shadow banks sell at a faster pace
Loan Financing: Banks

The chart shows the distribution of loan financing among different entities from 2007 to 2015. The categories include:

- Not Sold/Affiliate
- GSE
- Private Securitization
- Bank
- Insurer
- Other

The data indicates a significant trend where Not Sold/Affiliate financing has increased over the years, while other categories have shown a decrease.
Loan Financing: Fintech

[Graph showing the percentage distribution of loan financing across different sectors from 2007 to 2015. The sectors include Not Sold/Affiliate, GSE, Private Securitization, Bank, Insurer, and Other.]
Interest Rates and Performance

1. How did shadow banks increase market share?
   • Cheaper mortgages?

2. Is the cost of regulation passed through to consumers?

3. Non-price characteristics (performance)
Interest Rates and Performance

1. Interest Rates (controlling for other observables)
   - Non-fintech shadow banks 3-5 bps cheaper than banks
   - Fintech lenders 14-16 bps more expensive than banks

2. Performance (given interest rates)
   - Shadow banks loans 0.02%-0.04% more likely to default
   - Shadow bank loans 2%-2.5% more likely to prepay
Basic Facts Summary

1. Loan Types, Purposes, and Financing
   • Shadow banks specialize in high risk FHA sector
   • Fintech specifically specializes in refinances
   • Shadow banks rely on originate-to-distribute (GSE)

2. Borrower Characteristics
   • Shadow banks target higher risk borrowers

3. Pricing and Performance
   • Fintech charges significant premium, suggests higher quality or convenience value
   • Shadow banks perform slightly worse
Role of Regulation
County-Level Shadow Bank Share (2008)
County-Level Shadow Bank Share (2015)
Spatial Tests: County Level Changes

**Bartik Style:** County exposure to traditional banks shocks
- Changes in **Bank Capital Ratios**
- **Mortgage Servicing Rights** as a % of Tier 1 Capital
- Exposure to **Mortgage Lawsuits**

**Example:** Capital requirements

For every county from 2008-2015:

\[ \Delta \text{Local Capital Ratio}_c = \text{lending-weighted change in local bank capital ratio} \]
\[ \Delta \text{Shadow Bank Lending Share}_c = \text{Change in shadow bank share} \]

\[ \Delta \text{Shadow Bank Lending Share}_c = \beta_0 + \beta_1 \Delta \text{Local Capital Ratio}_c + X'_c \Gamma + \epsilon_c \]
Evidence: Regulatory Tests

- Tightening bank capital/regulatory constraints associated with a significant expansion of the shadow bank market share

  - Growth in Capital Ratios
    - Banks that rebuild capital ratio by 5% lose 2.7% market share
  - Mortgage Servicing Rights (MSR)
    - One S.D. higher MSR as % of T1 Capital banks lose 0.5% market share
  - Mortgage Lawsuits arising out of financial crisis
    - Mean lawsuit exposure associated with 6.5% loss of market share
### Regulation: Capital Recovery

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<td>-0.453</td>
<td>-0.766***</td>
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<td>(8.331)</td>
<td>(-1.776)</td>
<td>(-4.377)</td>
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Other Controls: Y Y Y Y

| N    | 3095 | 3095 | 3095 | 3095 |

| R²   | 0.082 | 0.055 | 0.072 | 0.053 |

Economically significant association:
- Banks rebuild 5% capital ratio
- Lose 2% county-level market share
## Regulation: MSR Assets

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<td>$R^2$</td>
<td>0.064</td>
<td>0.057</td>
<td>0.069</td>
<td>0.056</td>
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Economically significant association:
- 1% greater MSR% of Tier-One capital:
- Banks lose 0.22% county-level market share
Economically significant association:
• County with mean traditional bank lawsuit exposure relative to a county with no exposure sees 6.5% percentage point increase in shadow bank market share ($18.6 \times 0.35).
Role of Technology
Technology and Rise of Fintech

1. Mortgage Interest Rate Levels:
   • Fintech charges **significant premium** versus non-fintech
   • Suggests fintech provides convenience rather than cost savings
     • Fintech premium higher for more creditworthy

2. Mortgage Interest Rate Pricing Models:
   • Look at explanatory power of standard credit variables
     • FICO, LTV, ..., within ZIP x Quarter
   • $R^2$ smaller for fintech
   • Suggests fintech uses different data/models
Significance of Model Differences (R2)

Distribution of Bootstrapped R2
(with all controls)
Model
1. What we know so far:
   • Shadow banks gain market share in areas where banks are subject to more regulatory oversight.
   • *Within* shadow banks, fintech commands significant premium and appears to use different model.

2. Model objectives:
   • Combine regulatory and technology effects.
   • Decomposition: source of comparative advantage?
   • Counterfactuals turning on/off channels.
Model Setup: Borrowers

1. Borrower $b$ with mortgage of face value $F$ faces $N$ offers
   - Interest rate $r_i$
   - Non-price attributes
     I. Vertical ("quality") $q_i$
     II. Horizontal $\epsilon_{ib}$

2. Utility from offer $i$ is:

   $$u_{ib} = -\alpha r_i + q_i + \epsilon_{ib}$$

3. Borrower’s optimal choice implies probability of choosing $i$ is:

   $$p_{ib}(r_i, q_i; \{r_j, q_j\}) = \frac{\exp(-\alpha r_i + q_i)}{\sum_{j=1}^{N} \exp(-\alpha r_j + q_j)}$$
Model Setup: Lenders

1. **Lender types**
   - Banks
   - Non-fintech shadow banks
   - Fintech shadow banks

2. **Endogenous number of lenders**, $N_b, N_n, N_f$

3. **Lenders differ in**
   - Costs
   - Quality
   - Regulatory burden
Model Setup: Lenders

1. **Lenders differ on costs**
   - Funding cost $\rho_i \in \{\rho_b, \rho_n, \rho_f\}$
   - Operating (fixed) cost $c_i \in \{c_b, c_n, c_f\}$

2. **Lenders differ on quality**
   - Quality measures service quality, convenience, ease of access.
   - $q_i \in \{q_b, q_n, q_f\}$

3. **Banks differ on regulatory burden**
   - $\gamma_b$ scales probability of a bank lending to borrower $b$
   - i.i.d. across borrower-bank pairs
Find **symmetric equilibrium** within types

- Lender chooses entry and rate $r_i$ to maximize expected profit:

$$ r_i^* = \arg\max_{r_i} (r_i - \rho_i)p_{ib}(r_i, q_i; \{r_j, q_j\}) $$

- Given fixed cost ($c_i$), lender profit is

$$ \pi_i = (r_i^* - \rho_i)\gamma_i s_i(r_i^*, q_i; \{r_j, q_j\})F - c_i $$

- Free entry $\rightarrow$ zero profit condition (taking costs into account)
Model Setup: Equilibrium

- Interest rate markup depends on market share $s_i$:
  \[ r_i^* - \rho_i = \frac{1}{\alpha} \frac{1}{1 - s_i} \]

- Market share depends on rate, quality, and regulation:
  \[ S_b = \frac{\gamma_b N_b \exp(-\alpha r_b + q_b)}{\gamma_b N_b \exp(-\alpha r_b + q_b) + N_n \exp(-\alpha r_n + q_n) + N_f \exp(-\alpha r_f + q_f)} \]
  \[ S_n = \frac{N_n \exp(-\alpha r_n + q_n)}{\gamma_b N_b \exp(-\alpha r_b + q_b) + N_n \exp(-\alpha r_n + q_n) + N_f \exp(-\alpha r_f + q_f)} \]
  \[ S_f = \frac{N_f \exp(-\alpha r_f + q_f)}{\gamma_b N_b \exp(-\alpha r_b + q_b) + N_n \exp(-\alpha r_n + q_n) + N_f \exp(-\alpha r_f + q_f)} \]
Calibration: Approach

1. Aggregate HMDA data to year level and calibrate to observed data in average zip
   • Calibrate **model each year**
   • Market Shares, rates, number of lenders

2. Normalizations needed for identification
   • Funding costs: relative to bank and 10-year yield
   • Regulatory burden relative to 2008., \( \gamma_{b2008} = 1 \)
   • Quality trend only in fintech, i.e., \( q_{nt} = q_{n2008} \)
Calibration: Bank Regulatory Burden

Tightening bank constraints
Counterfactuals

1. No fintech, no changes in regulations

2. No fintech, changes in regulations

3. Fintech, no changes in regulation

Observe changes in non-fintech and fintech market shares under each counterfactual
Counterfactuals: Shadow Bank Growth

-5% 0% 5% 10% 15% 20% 25%

No Changes  Regulatory Burden  Fintech Quality Increase  Actual

Fintech  Non-Fintech
Conclusion

Assess role of technology and regulation in recent increase of market disruptors: Focus on largest consumer finance market

1. **Regulatory arbitrage seems the dominant force**
   - Shadow banks now control riskiest segment (FHA)
   - Shadow banks issue large amounts of guarantees on behalf of taxpayers in a lightly regulated market

2. **Technology does play role in the rise of fintech firms**
   - Fintech focuses on refinancing of already creditworthy
   - Does not appear to democratize credit access
   - Does not appear to reduce cost of credit (fintech premium)
   - Fintech uses different models/data

3. **Shadow Bank Expansion: 70% regulation, 30% technology**
ESCAPING THE HIGH COST LENDING TRAP—FIN TECH ALTERNATIVES TO HIGH COST SHORT TERM BORROWING FOR LOW-WAGE WORKING AMERICANS

THE URBAN INSTITUTE
FEBRUARY 8, 2018

Todd H. Baker
MRCBG Senior Fellow
M-RCBG Associate Working Paper No. 75

FinTech Alternatives to Short-Term Small-Dollar Credit: Helping Low-Income Working Families Escape the High-Cost Lending Trap

Todd H. Baker

2017

https://www.hks.harvard.edu/sites/default/files/centers/mrcbg/files/75_final.pdf
LOW-INCOME WORKING PEOPLE ARE IN A BIND—WHICH CURRENT CREDIT PRACTICES ARE MAKING WORSE

- We spent a long time studying the "whats" and the "whys"
  - Why are low-income working families financially stressed day-to-day?
  - What financial products do they use today and why?
  - Why are many of these products so damaging?
    - To working families
    - To employers
    - To communities
  - What impact has regulation had?
  - Why don’t the banks help?
- Political developments meant no help was coming from government any time soon
We asked ourselves--how could Financial Technology play a role in fixing the current system?

We had no illusions that FinTech—or any Financial Services—would solve the underlying problem of income inequality and the impoverishment of the working class.

But today’s solutions—payday loans and overdraft plans-- were doing more harm than good.

New alternatives were desperately needed.

These challenges were the impetus for our study.
OUR RESEARCH FOCUSED ON ALTERNATIVES TO SHORT-TERM SMALL-DOLLAR CREDIT

- **What is Short-Term Small-Dollar Credit?** We defined short-term, small-dollar credit (STSDC) as general purpose consumer credit or credit equivalent with a very short term (9 months or less) in an amount between $50 and $2,000. It is generally used to deal with “day to day” cash flow problems.
  - Payday loans
  - Auto title loans
  - Bank overdraft fees
  - Pawn Loans
  - Deposit Advance Products

- **Excluded High-Cost Loan Products.** While many other credit products serve a similar customer base, they are distinct from STSDC in that they are generally used for the purchase of a product (e.g., car, furniture,) or have a longer term. These products are typically not used by consumers to deal with “day to day” cash flow problems.
  - Subprime Installment Loans
  - Subprime Auto Purchase
  - “Rent to Own” Contracts
  - Point of Sale Finance
  - Secured Credit Cards
  - SF Mortgages and Home Equity Loans
LIW Families are those families earning less than 200% of the federal poverty line. In 2016, the low-income threshold for a family of four with two children was $48,500

- Our research uses the US Census Bureau’s American Community Survey definition.

In 2011, LIW Families made up 32% of all American working families and 71% of low-income families were classified as “working.”

- In 2011, “about one-fourth of adults in low-income working families were employed in just eight occupations, as cashiers, cooks, health aids, janitors, maids, retail salespersons, waiters and waitresses, or drivers. Some of these occupations—especially those involving health care—are among the fastest-growing occupations in the country.

- Cashiers make up the single-largest occupational group, with nearly a million people in low-income working families in 2011

- Coincidentally cashiers, drivers and retail salespersons are among the job categories most vulnerable to technological replacement over the next decades
According to CFSI research, consumers use STSDC principally to manage recurring expenses such as utility bills, rent, and food, which can be thought of as “day-to-day” household obligations.

- Approximately 42% of users of STSDC borrowed to pay utility bills, and 41% borrowed for general living expenses such as food and clothing.

The top four reasons CFSI noted for use of STSDC (respondents could give more than one answer):

- **Timing Mismatch.** Bill or payment due before paycheck arrived (38%)
- **Unexpected Expense.** Unexpected expense (medical, car breakdown) (30%)
- **Negative Cash Flow.** General living expenses consistently more than income (33%)
- **Unexpected Income Drop.** Unexpected drop in income (lost job, hours cut, benefits cut) (28%)
In a 2015 study of bank customers by the JP Morgan Institute (JPMI), average participant in the bottom two income quintiles of the survey population experienced an income increase of between 11 and 14%, respectively, or an income decrease of between 9% and 11% in half the months of the year. This income volatility is accompanied by similarly high levels of monthly expense volatility.

The leading cause for income variability cited by those surveyed by the Federal Reserve Board was an irregular work schedule, followed by being paid through bonuses or commissions, temporary unemployment, and seasonality of work. An irregular work schedule is cited almost as much as all the other reasons combined.

The 2015 JPMI study also demonstrated that monthly and annual income and expense changes did not move in tandem. Only a slightly positive correlation between changes in income and changes in expense on an annual basis regardless of income level.

JPMI’s study also indicated that consumers in the first two income quintiles would require $1,600 and $2,800 in liquid savings to handle normal monthly income and expense fluctuations, but had less than half of that amount available in transaction accounts at any given time. More than half of American households earning less than $40,000 annually are not saving anything from their income. Only 34% of American households earning less than $40,000 could pay a $400 emergency expense.
ADVERSE EFFECTS OF STSDC SYSTEM ARE WELL KNOWN

- Debt traps
- Excessive Fees and Interest
- Bank account closure
- Default Impacts
- Exclusion from Financial System
EMPLOYERS ARE HARMED BY EMPLOYEE FINANCIAL STRESS

- **Tangible Bottom Line Financial Impact**
  - Reduced Productivity
  - Absenteeism
  - Increased Turnover—between $3-$6k/incidence
  - Higher Administrative Costs
  - Pilferage

- **Big addressable market for employer-based FinTech solutions**
  - In 2014, almost 65 million Americans, or a little over 41% of wage earners, worked in jobs paying between $15,000 and $50,000. Over 55 million individuals worked for companies with more than 500 employees (47 million of these worked for companies with over 1,000 employees.)

- If superior FinTech-enabled alternatives to STSDC were to reach only 15% of the workers employed by large companies, 8.25 million employees would be better off. If these alternatives reached 40% of those employees, the number helped could rise to 22 million.
REGULATORY AND POLICY INTERVENTIONS HAVE HAD LIMITED EFFECT

- Regulatory and policy interventions have not materially curbed the expansion—or the adverse effects—of STSDC products nationally
  - State law efforts—Pew initiatives
  - Federal law efforts—CFPB seesaw
- Why?
  - Concerns about the consequences of limiting forms of credit on which so many Americans have become dependent
  - Successful industry lobbying efforts to protect successful and profitable business models
  - A product-by-product approach to regulation which has been undermined by the so-called “Balloon Effect,” as efforts to regulate one type of STSDC product diverts demand into other, less regulated, STSDC products
BANKS ARE NOT LIKELY TO BE THE ANSWER—FINTECH MAY BE

- Banks are not likely to play a significant role in the STSDC market for a variety of reasons
  - Bank forays into high-risk consumer lending in the mid-20th and early 21st century generally had poor success, and there is a long history of banks entering and then exiting the business
  - Banks have a big stake in overdrafts
- Today, private sector FinTech alternatives offer the best opportunity to help low-income working Americans manage their day-to-day finances without resorting to STSDC
OUR ANALYSIS IDENTIFIED SIX RELEVANT GROUPINGS IN THE FINTECH SPACE (2017 DATA)

1. Digital Credit Access/Cost Improvement Lenders
   • Lend money to consumers but seek to do so in a less costly/better structured manner than STSDC and/or lend at a lower cost to people with “no file,” “thin file” or “damaged file” credit profile

2. Digital Credit Builder Lenders & Service Providers
   • Lenders but through their lending activities also help consumers improve their credit score so as to be able to access “standard” credit in the future
   • Not lenders but focus on providing services to help consumers improve their credit score so as to be able to access “standard” credit in the future

   • Provide financial management software/mobile apps to guide consumers toward financially healthy outcomes, often in conjunction with other services

4. Alt Digital Banks
   • Although not banks, facilitate transaction deposit solutions for consumers, often in conjunction with other services

5. Digital Income/Expense Variability Management
   • Through Employers provide liquidity solutions to handle income & expense variability

6. Digital Savings Solutions
   • Mobile apps that facilitate savings for various purposes
Our study focused on FinTech companies providing alternatives to STSDC.

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We interviewed 30+ founders and CEOs of these FinTech firms.
We analyzed and rated fintech companies for utility and scalability.

- "Utility" was defined as the ability of the products offered by a company to either (a) provide a superior substitute for current STSDC products in managing the factors leading to STSDC use, or (b) provide an effective mechanism for consumers to avoid the use of credit products of any kind in managing the key precipitating actors for STSDC use.

- "Scalability," was defined as the potential for a company's business model to support rapid penetration of the low-income working family market to serve a significant portion of low-income working families.
WE ASSESSED THE ABILITY OF FINTECH PRODUCTS TO MEET LIW FAMILY LIQUIDITY NEEDS

<table>
<thead>
<tr>
<th>FinTech Product</th>
<th>Category</th>
<th>Potential Monthly Utility details</th>
<th>Utility Yes/No/Partial?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Earned Income Payroll Advance</td>
<td>Digital Income/Expense Variability Management Solutions</td>
<td>$450/$900/$1,350/$2,000 @ $24,000 annual</td>
<td>Yes, particularly later in pay period</td>
</tr>
<tr>
<td></td>
<td>Digital Income/Expense Variability Management Solutions</td>
<td>$800/$1,600/$2,400/$3,200 @48,000 annual</td>
<td>Amounts available depend on when borrowing occurs in monthly pay cycle</td>
</tr>
<tr>
<td>Digital Income Smoothing Advance</td>
<td>Digital Income/Expense Variability Management Solutions</td>
<td>$270 @ $24,000 annual</td>
<td>Yes, Partial, but only for income shortfall</td>
</tr>
<tr>
<td>Digital Payday Alternative or Revolving Credit</td>
<td>Digital Credit Access/Cost Improvement Lenders</td>
<td>$250 -&gt; $2,000</td>
<td>Yes, but often highest cost product</td>
</tr>
<tr>
<td>Digital Unsecured Credit Card</td>
<td>Digital Credit Access/Cost Improvement Lenders</td>
<td>$500-$1,000</td>
<td>Yes, Partial at low end of credit line</td>
</tr>
<tr>
<td>Digital Very Short Installment (6 months or less)</td>
<td>Digital Credit Access/Cost Improvement Lenders</td>
<td>$100 -&gt; $2,000</td>
<td>Yes</td>
</tr>
<tr>
<td>Digital Emergency Savings Account</td>
<td>Digital Savings Solutions</td>
<td>$90-$540 @ $24,000 annual $160-$960 @ $48,000 annual (5% of after-tax monthly income at 1 month and 6 months)</td>
<td>Yes, Partial, but gradual buildup of impact</td>
</tr>
<tr>
<td>Digital Financial Management Application</td>
<td>Digital Financial &amp; Cash Flow Management Solutions</td>
<td>$90-$540 @ $24,000 annual $160-$960 @ $48,000 annual (5% of after-tax monthly income at 1 month and 6 months)</td>
<td>Yes Partial, but gradual buildup of impact</td>
</tr>
</tbody>
</table>

### Relevant FinTech Category and Calculation Inputs

<table>
<thead>
<tr>
<th>Base Case (in millions)</th>
<th>Aggressive Case (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Digital Income/Expense Variability Management Solutions</td>
<td></td>
</tr>
<tr>
<td># workers in companies that employ &gt;500 or &gt;1,000</td>
<td>47</td>
</tr>
<tr>
<td>Low-income working families as % of total</td>
<td>0.32</td>
</tr>
<tr>
<td>Est. # members of low-income working families employed in companies that employ &gt;500 or &gt;1,000</td>
<td>15.04</td>
</tr>
<tr>
<td>% of low-income workers experiencing income/expenditure volatility</td>
<td>0.55</td>
</tr>
<tr>
<td>Total large company low-income employees experiencing volatility</td>
<td>8.72</td>
</tr>
<tr>
<td>2. Digital Credit Access/Cost Improvement Lenders &amp; Digital Credit Builder Lenders and Services</td>
<td></td>
</tr>
<tr>
<td>Total thin and damaged file people in U.S.</td>
<td>54</td>
</tr>
<tr>
<td>% of thin/damaged that can be re-scored</td>
<td>0.35</td>
</tr>
<tr>
<td>Total re-scoreable thin/damaged file</td>
<td>18.9</td>
</tr>
<tr>
<td>% working age employed</td>
<td>0.785</td>
</tr>
<tr>
<td>Low-income working families as % of total</td>
<td>0.32</td>
</tr>
<tr>
<td>Total re-scoreable workers in low-income working families</td>
<td>4.75</td>
</tr>
<tr>
<td>3. Digital Savings Solutions</td>
<td></td>
</tr>
<tr>
<td># low-income working families</td>
<td>10.4</td>
</tr>
<tr>
<td>% households &lt;$40,000 not saving @100% and 150%</td>
<td>0.55</td>
</tr>
<tr>
<td>Number of full-time workers per low-income working family @100% and 125%</td>
<td>1.2</td>
</tr>
<tr>
<td># workers in low-income working families without emergency savings but could save</td>
<td>6.9</td>
</tr>
<tr>
<td># of low-income working families</td>
<td>10.4</td>
</tr>
<tr>
<td>Number of full-time workers per low-income working family @100% and 125%</td>
<td>1.2</td>
</tr>
<tr>
<td>Total low-income working family workers who could use digital management products</td>
<td>12.5</td>
</tr>
</tbody>
</table>
WE REACHED SOME GENERAL CONCLUSIONS

- Private sector adoption of a set of FinTech-centered alternatives to STSDC has the potential to shift a significant fraction of low-income working families away from reliance on the current STSDC system over time
  - *FinTech products, alone or in combination, appear sufficient in most cases to manage negative monthly variances in income/expenses for low-income working families*
  - *Collectively, FinTech products could benefit virtually all of the 10.4 million low-income working families and, indirectly the 47 million individual members of those families*
  - *No need for government financial support or new laws or regulations*

- The employer channel is the best vehicle for dissemination of FinTech products
  - *Superior Scalability plus potential for employer subsidization*
WE DREW CONCLUSIONS ABOUT THE STRENGTHS & WEAKNESSES OF RELEVANT FINTECH MODELS—TWO STOOD OUT

- **Digital Income/Expense Variability Management Solutions** providers show potential to create consistently Scalable and high Utility business models, which could reduce costs for employers while having a major impact in increasing the “financial health” of low-income working families.
  - Provides least expensive and most immediately useful substitutes for STSDC
  - Significant potential for becoming the “center post” of a more extensive set of financial health solutions delivered through a Financial Health Benefit Plan.

- **Digital Credit Access/Cost Improvement Lenders**, collectively, are also assessed positively in terms of both Utility and Scalability and should be able to provide significant amounts of alternative credit to low-income working families, subject to several important caveats
  - Some companies are still very “high cost” lenders in absolute terms, which compromises Utility, although all provide their loans at lower cost (sometimes significantly so) than current STSDC providers and most provide a path towards improved rates and terms over time. The ability of these lenders to charge consistently lower rates over time will be the test of whether they provide truly high or merely acceptable Utility to low-income working families.
  - The companies in this group charging the lowest costs are also the most selective, which affects their Scalability.
  - All companies in this category are also subject to material risks associated with their funding model—which is dependent on the willingness of institutional lenders of various types to advance funds--during a credit or financial crisis.
Assessing Utility and Scalability: One Category—Digital Income/Expense Variability Management is Highest in Utility and Scalability Today

Digital Income/Expense Variability Management Solutions
Digital Credit Access/Cost Improvement Lenders
Digital Financial & Cash Flow Management Solutions
Digital Credit Builder Lenders & Service Providers
Digital Savings Solutions
Alt Digital Banks
The Employer as Center Post: Digital Income/Expense Variability Management Solutions Companies Could Add Products from Other Categories to Employer-based Platforms to Further Build Scalability and Revenue
Assessing Digital Credit Access/Cost Improvement Lenders’ Utility and Scalability: Credit & Funding Stability Will Determine Whether Longer-Term Scalability Possible—Long-Term Level of Utility Depends on Cost of Credit to Consumer

- Lower Cost of Credit = Higher Utility
- Higher Cost of Credit = Lower Utility
- Stable Funding = Higher Scalability
- Unstable Funding = Lower Scalability
Assessing Utility and Scalability: Some Digital Credit Builder Companies May Join with Lenders While Others May Build Niche Businesses or Combine with Larger Credit Data Providers.
Assessing Utility and Scalability: A New High Utility and Scalability Model Could Also Emerge by Combining Categories that May Not be Viable Alone

- Scalable but Challenged by Utility
- High Utility and Scalability
- Challenged by Utility and Scalability
- Good Utility but Challenged by Scalability

- Digital Income/Expense Variability Management Solutions
- Digital Credit Access/Cost Improvement Lenders
- Digital Financial & Cash Flow Management Solutions
- Digital Credit Builder Lenders & Service Providers
- Digital Savings Solutions
- Alt Digital Banks

Theoretical Combined Alt Digital Bank, Digital Savings Solutions and Digital Financial and Cash Flow Management Solutions
AND WE MADE SOME RECOMMENDATIONS

- Employers Should Adopt and Subsidize Employee Financial Health Benefit Plans
- Employee Benefits Intermediaries Should Support Adoption of Plans
- FinTech Companies Should Broaden their Offerings
- Non FinTech Financial Companies Should Adopt FinTech Products
- FinTechs and Financial Sector Should Resolve Data Governance Issues
- The Non-profit Sector Should Advocate for FinTech Benefits and Data Governance and Consider Subsidizing Test Cases
- Public Sector Employers Should Adopt Plans Too
- Public Sector Legislative/Regulatory Actions Can Also Help
SUBSEQUENT RESEARCH HAS STRENGTHENED THE CASE FOR THE EMPLOYER CHANNEL

Conducted Research on two FinTech companies:

- **Payactiv**, which offers an “earned income advance” product for employees of participating employers
  - Allows employees to access portion of earned salary prior to payday
  - Currently participating in WalMart trial with Even Responsible Finance
  - Cost is $5 per use—in most cases subsidized by employer

- **SalaryFinance**, which provides low-cost, short-medium term installment loans to employees, which are repaid from payroll
  - Focus is on debt consolidation
  - Company estimates cost is 1/3 of competing loan products due to low losses—average rate is 7.9%
  - Currently only in UK, although preparing to enter US market through partnership with United Way.
PAYACTIV PROVIDES ACCESS TO EARNED BUT UNPAID INCOME TO LOW-INCOME WORKING AMERICANS
By giving employees access to PayActiv product, employers on average experienced a **19% reduction** in turnover rates.

~**90%** of PayActiv users are under 40 years of age and earn $15/hour or less.
SALARYFINANCE PROVIDES LOW COST FIXED-INTEREST RATE EMPLOYEE LOANS THAT ARE REPAID VIA PAYROLL DEDUCTION
By giving access to SalaryFinance product, employers on an average experienced a 44% reduction in turnover rates.

~60-70% of SalaryFinance users are under 40 years of age and have been in the company for 5 years or under.

~80% of users earn less than £30,000 per year.
THIS COULD MEAN $474MM-$1B SAVINGS ANNUALLY FOR A LARGE EMPLOYER LIKE WALMART

Potential Savings for WalMart Using PayActiv Product

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of employee turnover for each low income wage worker ($10/hr)</td>
<td>$3328 Per employee</td>
</tr>
<tr>
<td>Average annual rate of attrition at Walmart</td>
<td>50%</td>
</tr>
<tr>
<td>Total number of employees in Walmart</td>
<td>1,500,000 In the US</td>
</tr>
<tr>
<td>Total annual attrition at Walmart</td>
<td>750,000</td>
</tr>
<tr>
<td>Reduction in attrition rate due to provision of financial wellness product</td>
<td>19% PayActiv number</td>
</tr>
<tr>
<td>Reduced attrition due to provision of financial wellness product</td>
<td>607,500</td>
</tr>
<tr>
<td>Difference in annual attrition</td>
<td>142,500</td>
</tr>
<tr>
<td><strong>Total cost saved (142,500 x $3328)</strong></td>
<td><strong>$474,240,000.00</strong> In <strong>USD/Year</strong></td>
</tr>
</tbody>
</table>

Reduced turnover savings for WalMart using 44% turnover reduction achieved by SalaryFinance could be approximately $1,000,000,000 annually.

Sources
https://corporate.walmart.com/newsroom/company-facts
NUMBERS LIKE THESE SHOULD MAKE EMPLOYERS PAY ATTENTION—AND THEY ARE

Retailer joins financial technology startups Even and PayActiv to launch industry-first tools for personal money management, financial planning and on-demand access to earned wages

BENTONVILLE, Ark. — Dec. 13, 2017 — Walmart today announced a suite of new financial wellness services for more than 1.4 million associates nationwide. The new offering was created in collaboration with Silicon Valley-based financial technology startups Even and PayActiv. Associates will access the tools through the Even app, available for both iOS and Android devices.
FinTech alternatives to STSDC are here today and already helping some low-income working families make better financial choices.

- But the impact of these innovative solutions on an old and difficult problem will be limited unless they can be deployed more broadly.
- The risk of delay is real. Like most startup technology companies, FinTech companies have a relatively short window to achieve scale and demonstrate a clear path to profitability.
- If they fail to connect with enough customers, the power of their innovations to change a broken STSDC system will be lost.

Promoting FinTech Solutions Through Employer Channel is a Simple Way to Reduce Negative Impact of Current STSDC System Without the Need for Government Intervention

- Simple to Implement
- Win-Win for Employers and Employees
- No Government Intervention Required
- Outcomes can be Measured and Solutions Calibrated
- Avoids Unintended Consequences