The Cross Section of Bank Value

Mark Egan, Stefan Lewellen, and Adi Sunderam

September 2018
Basic question: How do banks create value?

Three possible answers:
- Liabilities: consumers value deposits.
- Assets: banks have an advantage at making loans.
- Synergies: deposits allow banks to hold different assets than other intermediaries.

Empirical evidence on existence of each channel.

But little is known about the relative contributions of these channels.
This paper

- Treat the bank as a two-division firm:
  - Deposit producing division raises funding by offering services and interest payments.
  - Revenue producing division takes funding as an input and converts it into risk-adjusted revenue.

- Use tools from industrial organization to construct measures of productivity for each division:
  - **Deposit productivity**: A bank with higher deposit productivity collects more deposits, holding fixed inputs (e.g., deposit rate, number of branches).
  - **Asset productivity**: A bank with higher asset productivity generates more risk-adjusted revenue with the same asset base.

- We then relate these primitives to:
  - Stock market based measures of bank value.
  - Potential drivers of productivity (production technologies, banks’ geographic/demographic footprints).
  - Each other.
1. Deposit productivity explains 2-4x as much variation in bank value as asset productivity.

2. Multiple factors contribute to the productivity-value relationship.
   - Differences in production technologies across banks.
   - Consumer demographics/market power.

3. Synergies exist between lending and deposit-taking.
   - Deposit prod. explains 25% of variation in asset prod.
Sources:
- Bank Income and Balance Sheet Data: Federal Reserve FR Y-9C reports
- Branch Level Deposit Data: Summary of Deposits
- Branch Level Deposit Rate Data: RateWatch
- Stock Market Data: CRSP

Sample:
- Unbalanced sample of 847 bank holding companies
- Quarterly observations over the period 1994-2015
Economic Framework

- Per-period profits given by:

\[ \pi_{jt} = f(A_{jt}, \phi_{jt}) - c(D_{jt}, \delta_{jt}). \]

where

\[ A_{jt} = D_{jt} + E_{jt} \]

- \( f(\cdot; \cdot) \) is the revenue production function, and \( \phi_{jt} \) is asset productivity.

- \( c(\cdot; \cdot) \) is the funding cost function, and \( \delta_{jt} \) is deposit productivity.

- Equilibrium profits (and scale) depend on both productivity measures.

- Market value of equity given by

\[ M_{jt}(\phi_{jt}, \delta_{jt}) = \frac{\lambda \pi^*_{jt}(\phi_{jt}, \delta_{jt})}{k - g}. \]
Cost of funding $\iff$ deposit demand curve bank faces.

- High deposit productivity $= \text{deposit demand curve shifted up.}$

Estimate the bank-level specification:

$$\ln(N_t s_{jt}) = \alpha i_{jt} + \beta X_{jt} + \mu_j + \mu_t + \xi_{jt}.$$ 

where

- $s_{jt}$ is market share of bank $j$ at time $t$, and $N_t$ is market size at time $t$
- $i_{jt}$ is deposit rate, and $X_{jt}$ are other slow-moving bank characteristics

Two sets of instruments:

1. Traditional BLP instruments (i.e., characteristics of competitors’ products).
2. Deposit rate pass through.

Recover each bank’s quarterly deposit productivity as

$$\hat{\delta}_{jt} = \ln(N_t s_{jt}) - \hat{\alpha} i_{jt} - \hat{\beta} X_{jt} - \hat{\mu}_t.$$
Estimate the bank’s production function as

\[ \ln Y_{jt} = \theta \ln A_{jt} + \Gamma X_{jt} + \phi_j + \phi_t + \varepsilon_{jt}. \]

where:
- \( Y_{jt} \): Interest income
- \( A_{jt} \): Assets (lagged by one year)
- \( X_{jt} \): Bank observable controls, including proxies for risk taking.

We instrument for \( \ln A_{jt} \) using the demand productivity of a bank’s competitors: \( \delta_{-jt} \).

Recover each bank’s quarterly asset productivity

\[ \hat{\phi}_{jt} = \ln Y_{jt} - \hat{\theta} \ln A_{jt} - \hat{\Gamma} X_{jt} - \hat{\phi}_t. \]
What is productivity?

- Productivity is always a residual: what part of output cannot be explained by observed inputs.

- Conceptually, broad drivers of productivity differences across banks could include:
  1. Differences in production “technology.”
     - E.g. better employees, better ATMs/website/branch hours, more innovative products.
  2. Differences in demographic and competitive factors.
     - E.g. better market selection, less within-market competition.


\[
\left( \frac{M}{B} \right)_{jt} = \gamma_0 + \gamma_1 \hat{\delta}_{jt} + \gamma_2 \hat{\phi}_{jt} + \Gamma X_{jt} + \mu_t + \varepsilon_{jt}.
\]

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposit Productivity</td>
<td>0.236***</td>
<td>0.496***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0188)</td>
<td>(0.101)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asset Productivity</td>
<td></td>
<td></td>
<td>0.240***</td>
<td>0.154***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0264)</td>
<td>(0.0276)</td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Other Controls</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>26,742</td>
<td>26,742</td>
<td>26,742</td>
<td>26,742</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.420</td>
<td>0.453</td>
<td>0.386</td>
<td>0.438</td>
</tr>
</tbody>
</table>

- Controls = size, leverage, equity beta, stdev of ROA.

Mark Egan, Stefan Lewellen, and Adi Sunderam
The Cross Section of Bank Value
Deposit-driven Value vs. Asset-driven Value

\[
\left( \frac{M}{B} \right)_{jt} = \gamma_0 + \gamma_1 \hat{\delta}_{jt} + \gamma_2 \hat{\phi}_{jt} + \Gamma X_{jt} + \mu_t + \epsilon_{jt}.
\]

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposit Productivity</td>
<td>0.200***</td>
<td>0.451***</td>
</tr>
<tr>
<td></td>
<td>(0.0355)</td>
<td>(0.105)</td>
</tr>
<tr>
<td>Asset Productivity</td>
<td>0.0967***</td>
<td>0.113***</td>
</tr>
<tr>
<td></td>
<td>(0.0294)</td>
<td>(0.0309)</td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Other Controls</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>26,742</td>
<td>26,742</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.425</td>
<td>0.459</td>
</tr>
</tbody>
</table>

- Effect of deposit productivity 2-4x larger than asset productivity.

Mark Egan, Stefan Lewellen, and Adi Sunderam
The Cross Section of Bank Value
Model generally fits empirical M/B well.
Our framework implies that 1σ of deposit productivity has \( \approx 2 \times \) impact on net income as 1σ of asset productivity.

- Red: \( \delta_j \times \frac{\text{Deposits}}{\text{Assets}} \times \frac{1}{\alpha} \); Blue: \( \exp(\phi_j) \times \frac{\text{Assets}}{\text{Assets}}^\theta \exp(\Gamma X_{jt}) \)
Interest Income vs. Interest Expense

Heterogeneity in Interest Income and Expense

Mark Egan, Stefan Lewellen, and Adi Sunderam

The Cross Section of Bank Value
Deposit-driven Value vs. Asset-driven Value

Heterogeneity in share of net income framework attributes to deposit productivity.
Decomposing Our Productivity Measures
Dimensions of Productivity and Market to Book

<table>
<thead>
<tr>
<th>Dep. Var</th>
<th>Market to Book</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Deposit Productivity:</strong></td>
<td></td>
</tr>
<tr>
<td>Savings</td>
<td>0.237***</td>
</tr>
<tr>
<td></td>
<td>(0.0419)</td>
</tr>
<tr>
<td>Small Time</td>
<td>-0.242***</td>
</tr>
<tr>
<td></td>
<td>(0.0461)</td>
</tr>
<tr>
<td>Large Time</td>
<td>0.0257</td>
</tr>
<tr>
<td></td>
<td>(0.0290)</td>
</tr>
<tr>
<td>Transaction</td>
<td>0.0626*</td>
</tr>
<tr>
<td></td>
<td>(0.0337)</td>
</tr>
<tr>
<td><strong>Asset Productivity</strong></td>
<td></td>
</tr>
<tr>
<td>Loans</td>
<td>0.115***</td>
</tr>
<tr>
<td></td>
<td>(0.0274)</td>
</tr>
<tr>
<td>Securities</td>
<td>0.0608***</td>
</tr>
<tr>
<td></td>
<td>(0.0230)</td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
</tr>
<tr>
<td>Other Controls</td>
<td>X</td>
</tr>
</tbody>
</table>

- Savings deposit productivity explains 3x as much M/B variation as much as any other measure.

Mark Egan, Stefan Lewellen, and Adi Sunderam
The Cross Section of Bank Value
Determinants of Productivity

- What are our productivity measures capturing?
  - Traditional: differences in production technologies.
  - Alternative: differences in banks’ market footprints, within-market competition.

- Technology-based determinants:
  - Better employees, better rate-setting technologies, and so on.
  - Look at CFPB complaints, adviser misconduct filings, rate-setting technologies.

- Customer-based determinants:
  - Market power; catering to specific demographic groups, etc.
  - Look at correlations between regional demographic and economic conditions and productivity measures.
"Technological" Productivity
Deposit Productivity and Rate-Setting Technologies

<table>
<thead>
<tr>
<th>Dep. Var</th>
<th>Deposit Productivity</th>
<th>Asset Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Variation in Deposit Rates ($\sigma_{CD}$)</td>
<td>0.237***</td>
<td>0.0299**</td>
</tr>
<tr>
<td></td>
<td>(0.0359)</td>
<td>(0.0131)</td>
</tr>
<tr>
<td>Variation in Mortgage Rates ($\sigma_{MTG}$)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Other Controls</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Observations</td>
<td>3,141</td>
<td>3,141</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.059</td>
<td>0.910</td>
</tr>
</tbody>
</table>

- Deposit productivity positively correlated with cross-county heterogeneity in deposit rates.
- Asset productivity less correlated with heterogeneity in mortgage rates.
### “Technological” Productivity
Productivity and Complaints

Productivity negatively correlated with customer complaints.

<table>
<thead>
<tr>
<th>Dep. Var</th>
<th>Deposit Productivity</th>
<th>Asset Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFPB Complaints</td>
<td>-0.274**</td>
<td>0.0627</td>
</tr>
<tr>
<td>(0.108)</td>
<td>(0.172)</td>
<td>(0.152)</td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Other Controls</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>222</td>
<td>222</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.100</td>
<td>0.036</td>
</tr>
</tbody>
</table>

Mark Egan, Stefan Lewellen, and Adi Sunderam

The Cross Section of Bank Value
### Bank Footprint and Productivity

<table>
<thead>
<tr>
<th>Dep. Var.</th>
<th>Asset Productivity</th>
<th>Deposit Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>ln(Population)</td>
<td>0.244***</td>
<td>0.593***</td>
</tr>
<tr>
<td></td>
<td>(0.0347)</td>
<td>(0.0558)</td>
</tr>
<tr>
<td>ln(Population)$^2$</td>
<td>-0.0457***</td>
<td>-0.119***</td>
</tr>
<tr>
<td></td>
<td>(0.0158)</td>
<td>(0.0244)</td>
</tr>
<tr>
<td>ln(Wage)</td>
<td>-0.194***</td>
<td>-0.163**</td>
</tr>
<tr>
<td></td>
<td>(0.0505)</td>
<td>(0.0753)</td>
</tr>
<tr>
<td>ln(Wage)$^2$</td>
<td>-0.0522*</td>
<td>0.0241</td>
</tr>
<tr>
<td></td>
<td>(0.0280)</td>
<td>(0.0237)</td>
</tr>
<tr>
<td>ln(Branch Age)</td>
<td>-0.0013</td>
<td>0.383***</td>
</tr>
<tr>
<td></td>
<td>(0.0259)</td>
<td>(0.0371)</td>
</tr>
<tr>
<td>ln(House Prices)</td>
<td>0.141***</td>
<td>0.103</td>
</tr>
<tr>
<td></td>
<td>(0.0459)</td>
<td>(0.0661)</td>
</tr>
<tr>
<td>HMDA HHI</td>
<td>0.108***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0246)</td>
<td></td>
</tr>
<tr>
<td>Deposit HHI</td>
<td>0.177***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0352)</td>
<td></td>
</tr>
</tbody>
</table>

*Demographic characteristics matter...*

---

Mark Egan, Stefan Lewellen, and Adi Sunderam

The Cross Section of Bank Value
### Bank Footprint and Productivity

<table>
<thead>
<tr>
<th></th>
<th>Dep. Var.</th>
<th>Market-to-Book</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Deposit Productivity</td>
<td>0.330***</td>
<td>0.506***</td>
</tr>
<tr>
<td></td>
<td>(0.0607)</td>
<td>(0.108)</td>
</tr>
<tr>
<td>Asset Productivity</td>
<td>0.171***</td>
<td>0.169***</td>
</tr>
<tr>
<td></td>
<td>(0.0389)</td>
<td>(0.0382)</td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>MSA F.E.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Other Controls</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>23,617</td>
<td>23,617</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.608</td>
<td>0.628</td>
</tr>
</tbody>
</table>

- However, controlling for geographic/demographic footprint does not change our previous conclusions.
- Suggests there is a role for technology in driving productivity differences.
Synergies

Deposit productivity explains 25% of the variation in asset productivity.
Synergies
Market to Book and Synergies

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposit Productivity</td>
<td>0.198***</td>
<td>0.501***</td>
</tr>
<tr>
<td></td>
<td>(0.0355)</td>
<td>(0.114)</td>
</tr>
<tr>
<td>Asset Productivity</td>
<td>0.0817***</td>
<td>0.0882***</td>
</tr>
<tr>
<td></td>
<td>(0.0292)</td>
<td>(0.0306)</td>
</tr>
<tr>
<td>Deposit Productivity × Asset Productivity</td>
<td>0.0349*</td>
<td>0.0536***</td>
</tr>
<tr>
<td></td>
<td>(0.0181)</td>
<td>(0.0155)</td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Other Controls</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>26,742</td>
<td>26,742</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.427</td>
<td>0.464</td>
</tr>
</tbody>
</table>

- Deposit productivity correlated with C&I loans and credit lines.
### Synergies

*Composition of Assets and Deposit Productivity*

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposit Prod.</td>
<td>0.165 (0.141)</td>
<td>0.705*** (0.146)</td>
<td>0.255*** (0.119)</td>
<td>-0.0280 (0.167)</td>
<td>-0.131 (0.079)</td>
<td>-0.665* (0.276)</td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Other Controls</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Observations</td>
<td>24,633</td>
<td>23,685</td>
<td>26,742</td>
<td>26,713</td>
<td>26,732</td>
<td>18,047</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.314</td>
<td>0.090</td>
<td>0.136</td>
<td>0.068</td>
<td>0.193</td>
<td>0.123</td>
</tr>
</tbody>
</table>

- Deposit productivity correlated with C&I loans and credit lines.
Robustness

1. Alternative Production Function and Demand Estimates
   1. Semi-Parametric Production Function Estimates
   2. Alternative Measures of Risk
   3. County-Level Demand Estimates

2. Measurement Error
   1. IV
   2. Empirical Bayes Estimates

3. Alternative Measures of Value
   1. ROE
   2. Tobin’s Q

4. Sub-sample Analysis
   1. Exclude Large Banks
   2. Excluding the Financial Crisis
   3. Restricting to “Traditional” Banks
Conclusion

- Take an IO-motivated approach to understanding bank value creation.

- Deposit productivity explains 2-4x as much variation in bank value as asset productivity.
  - Deposit productivity is primarily driven by savings deposits.
  - Asset productivity is primarily driven by illiquid assets.
  - Both customer-driven and technological aspects of productivity matter.

- Synergies: deposit productivity explains 25% of variation in asset productivity.

Thanks!
### Bank Liabilities: Deposit Demand Estimation

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Deposit Rate</strong></td>
<td>12.61***</td>
<td>20.88***</td>
</tr>
<tr>
<td></td>
<td>(1.848)</td>
<td>(4.620)</td>
</tr>
<tr>
<td><strong>No. Branches</strong></td>
<td>0.0405***</td>
<td>0.0441***</td>
</tr>
<tr>
<td></td>
<td>(0.0093)</td>
<td>(0.0096)</td>
</tr>
<tr>
<td><strong>No. Empl</strong></td>
<td>0.0271***</td>
<td>0.0278***</td>
</tr>
<tr>
<td></td>
<td>(0.0082)</td>
<td>(0.0084)</td>
</tr>
<tr>
<td><strong>Non-Int. Exp.</strong></td>
<td>-0.0886</td>
<td>-0.120</td>
</tr>
<tr>
<td></td>
<td>(0.101)</td>
<td>(0.104)</td>
</tr>
<tr>
<td><strong>Time Fixed Effects</strong></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Bank Fixed Effects</strong></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>IV-1</strong></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>IV-2</strong></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>26,742</td>
<td>26,742</td>
</tr>
<tr>
<td><strong>R-squared</strong></td>
<td>0.981</td>
<td>0.981</td>
</tr>
</tbody>
</table>

- 1% in rate raises market share from 10% to 11.8%.
**BLP instruments:** lagged average of competitors’ characteristics: number of bank branches, number of employees, non-interest expenditures, and banking fees.

- **First stage:** bank must offer higher deposit rates if its competitors offer better products.
- **Exclusion restriction:** lagged average competitor product characteristics are orthogonal to $\xi_{jt}$, the bank-quarter specific demand shock.

**Deposit rate pass through:** fitted value of a bank-specific regression of $i_{jt}$ on 3-month LIBOR.

- **First stage:** pass through is driven by supply (investment opportunities, market power).
- **Exclusion restriction:** average degree of pass-through interacted with rate changes in the time series is orthogonal to $\xi_{jt}$. 
### Bank Assets: Bank Production Function Estimation

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\ln A_{kt} (\theta)$</td>
<td>0.848***</td>
<td>0.837***</td>
<td>0.887***</td>
<td>0.859***</td>
</tr>
<tr>
<td></td>
<td>(0.0132)</td>
<td>(0.0144)</td>
<td>(0.0454)</td>
<td>(0.0504)</td>
</tr>
<tr>
<td>Beta</td>
<td>-0.0067</td>
<td>-0.0076</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0058)</td>
<td>(0.0061)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beta (fwd 2 yr)</td>
<td>0.0173***</td>
<td>0.0164***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0049)</td>
<td>(0.0052)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD ROA</td>
<td>-0.0258***</td>
<td>-0.0261***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0030)</td>
<td>(0.0034)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD ROA (fwd 2 yr)</td>
<td>0.0030</td>
<td>0.00217</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0029)</td>
<td>(0.0035)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank F.E.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>26,742</td>
<td>21,289</td>
<td>26,742</td>
<td>21,289</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.992</td>
<td>0.992</td>
<td>0.992</td>
<td>0.992</td>
</tr>
</tbody>
</table>
### Decomposing Our Productivity Measures

**Demand Estimates by Type of Deposit**

<table>
<thead>
<tr>
<th>Deposit Type</th>
<th>Savings (1)</th>
<th>Small Time (2)</th>
<th>Large Time (3)</th>
<th>Transaction (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Deposit Rate</strong></td>
<td>-9.594</td>
<td>63.17***</td>
<td>75.39***</td>
<td>-1.188</td>
</tr>
<tr>
<td></td>
<td>(12.73)</td>
<td>(23.21)</td>
<td>(18.25)</td>
<td>(12.51)</td>
</tr>
<tr>
<td><strong>No. Branches</strong></td>
<td>0.0825***</td>
<td>0.113***</td>
<td>0.0265</td>
<td>0.0142</td>
</tr>
<tr>
<td></td>
<td>(0.0211)</td>
<td>(0.0412)</td>
<td>(0.0263)</td>
<td>(0.0143)</td>
</tr>
<tr>
<td><strong>No. Empl</strong></td>
<td>0.00932</td>
<td>0.0241</td>
<td>0.0479***</td>
<td>0.0377***</td>
</tr>
<tr>
<td></td>
<td>(0.0102)</td>
<td>(0.0185)</td>
<td>(0.0135)</td>
<td>(0.0104)</td>
</tr>
<tr>
<td><strong>Non-Int. Exp.</strong></td>
<td>-0.192</td>
<td>-0.920***</td>
<td>-0.656***</td>
<td>0.0724</td>
</tr>
<tr>
<td></td>
<td>(0.154)</td>
<td>(0.347)</td>
<td>(0.247)</td>
<td>(0.0881)</td>
</tr>
<tr>
<td><strong>Time Fixed Effects</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Bank Fixed Effects</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>IV</strong></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>24,609</td>
<td>24,500</td>
<td>24,556</td>
<td>22,345</td>
</tr>
<tr>
<td><strong>R-squared</strong></td>
<td>0.970</td>
<td>0.868</td>
<td>0.809</td>
<td>0.941</td>
</tr>
</tbody>
</table>
### Synergies

Decomposition of Deposit Productivity

<table>
<thead>
<tr>
<th>Dep. Var</th>
<th>Asset Productivity</th>
<th>Loan Productivity</th>
<th>Sec. Productivity</th>
<th>Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td></td>
</tr>
<tr>
<td>Deposit Prod.:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Savings</td>
<td>0.275***</td>
<td>0.215***</td>
<td>0.0667</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0429)</td>
<td>(0.0676)</td>
<td>(0.0506)</td>
<td></td>
</tr>
<tr>
<td>Small Time</td>
<td>0.194***</td>
<td>0.296***</td>
<td>0.00589</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0270)</td>
<td>(0.0645)</td>
<td>(0.0255)</td>
<td></td>
</tr>
<tr>
<td>Large Time</td>
<td>0.124***</td>
<td>0.109***</td>
<td>0.0193</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0268)</td>
<td>(0.0339)</td>
<td>(0.0226)</td>
<td></td>
</tr>
<tr>
<td>Transaction</td>
<td>0.0414</td>
<td>-0.0172</td>
<td>-0.0510</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0406)</td>
<td>(0.0408)</td>
<td>(0.0381)</td>
<td></td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Other Controls</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>22,345</td>
<td>16,753</td>
<td>17,269</td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.666</td>
<td>0.607</td>
<td>0.650</td>
<td></td>
</tr>
</tbody>
</table>

Transactions deposit productivity not correlated with asset productivity.
## Robustness

### Alternative Production Function Estimates: Spline Estimates

<table>
<thead>
<tr>
<th>Dep. Var.</th>
<th>Market-to-Book</th>
<th>Asset Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Deposit Productivity</td>
<td>0.233***</td>
<td>0.329***</td>
</tr>
<tr>
<td></td>
<td>(0.0315)</td>
<td>(0.128)</td>
</tr>
<tr>
<td>Asset Productivity</td>
<td>0.0467</td>
<td>0.131***</td>
</tr>
<tr>
<td></td>
<td>(0.0326)</td>
<td>(0.0350)</td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Other Controls</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>21,362</td>
<td>21,362</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.414</td>
<td>0.455</td>
</tr>
</tbody>
</table>
**Additional Risk Measures:**
- Fama French Factors
- Asset Composition

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposit Productivity</td>
<td>0.193*** (0.0518)</td>
<td>0.467*** (0.117)</td>
<td>0.383** (0.161)</td>
<td>0.421** (0.203)</td>
</tr>
<tr>
<td>Asset Productivity</td>
<td>0.169*** (0.0394)</td>
<td>0.166*** (0.0437)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Time F.E.: X X X X X
- Other Controls: X X
- Observations: 18,564 18,564 18,564 18,564
- R-squared: 0.436 0.468 0.703 0.708
### Robustness
#### Alternative Demand Estimates: County Level Demand

<table>
<thead>
<tr>
<th>Dep. Var.</th>
<th>Market-to-Book</th>
<th>Asset Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Deposit Productivity</td>
<td>0.123***</td>
<td>0.138***</td>
</tr>
<tr>
<td></td>
<td>(0.0323)</td>
<td>(0.0387)</td>
</tr>
<tr>
<td>Asset Productivity</td>
<td>0.0785**</td>
<td>0.0806**</td>
</tr>
<tr>
<td></td>
<td>(0.0345)</td>
<td>(0.0368)</td>
</tr>
</tbody>
</table>

- Time F.E.: X X X X X
- Other Controls: X X
- Observations: 3,045 3,045 3,045 3,045
- R-squared: 0.436 0.487 0.499 0.525
<table>
<thead>
<tr>
<th>Dep. Var.</th>
<th>Market-to-Book</th>
<th></th>
<th>Asset Productivity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Deposit Productivity</td>
<td>0.184***</td>
<td>0.508***</td>
<td>0.393***</td>
<td>0.533***</td>
</tr>
<tr>
<td></td>
<td>(0.0331)</td>
<td>(0.106)</td>
<td>(0.0265)</td>
<td>(0.130)</td>
</tr>
<tr>
<td>Asset Productivity</td>
<td>0.0692</td>
<td>0.0933**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0461)</td>
<td>(0.0458)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Other Controls</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>IV</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Observations</td>
<td>16,724</td>
<td>16,724</td>
<td>22,345</td>
<td>22,345</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.428</td>
<td>0.470</td>
<td>0.633</td>
<td>0.646</td>
</tr>
</tbody>
</table>
Robustness
Measurement Error: Empirical Bayes Estimates

Deposit Productivity vs. Asset Productivity

Density

Change in Return/Assets

Deposit Productivity

Asset Productivity

Mark Egan, Stefan Lewellen, and Adi Sunderam
The Cross Section of Bank Value
## Robustness

### Sub-sample Analysis: Excluding the Top 5% of Banks

<table>
<thead>
<tr>
<th>Dep. Var.</th>
<th>Market-to-Book</th>
<th>Asset Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Deposit Productivity</td>
<td>0.218***</td>
<td>0.458***</td>
</tr>
<tr>
<td></td>
<td>(0.0350)</td>
<td>(0.115)</td>
</tr>
<tr>
<td>Asset Productivity</td>
<td>0.103***</td>
<td>0.112***</td>
</tr>
<tr>
<td></td>
<td>(0.0294)</td>
<td>(0.0337)</td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Other Controls</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>IV</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Observations</td>
<td>24,881</td>
<td>24,881</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.427</td>
<td>0.459</td>
</tr>
</tbody>
</table>
Robustness
Sub-sample Analysis: Excluding the Financial Crisis

<table>
<thead>
<tr>
<th>Dep. Var.</th>
<th>Market-to-Book</th>
<th>Asset Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Deposit Productivity</td>
<td>0.205*** (0.0374)</td>
<td>0.463*** (0.105)</td>
</tr>
<tr>
<td>Asset Productivity</td>
<td>0.117*** (0.0299)</td>
<td>0.127*** (0.0311)</td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Other Controls</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Observations</td>
<td>24,211</td>
<td>24,211</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.403</td>
<td>0.433</td>
</tr>
</tbody>
</table>
Robustness
Sub-sample Analysis: Only Traditional Banks

<table>
<thead>
<tr>
<th>Dep. Var.</th>
<th>Market-to-Book</th>
<th>Asset Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Deposit Productivity</td>
<td>0.156***</td>
<td>0.761***</td>
</tr>
<tr>
<td></td>
<td>(0.0355)</td>
<td>(0.105)</td>
</tr>
<tr>
<td>Asset Productivity</td>
<td>0.204***</td>
<td>0.199***</td>
</tr>
<tr>
<td></td>
<td>(0.0294)</td>
<td>(0.0309)</td>
</tr>
</tbody>
</table>

Time F.E. | X | X | X | X
Other Controls | X | X
Observations | 23,942 | 23,942 | 23,942 | 23,942
R-squared | 0.467 | 0.534 | 0.706 | 0.710
<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposit Productivity</td>
<td>0.232***</td>
<td>0.527***</td>
<td></td>
<td>0.244***</td>
<td>0.515***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0228)</td>
<td>(0.108)</td>
<td></td>
<td>(0.0306)</td>
<td>(0.116)</td>
<td></td>
</tr>
<tr>
<td>Asset Productivity</td>
<td></td>
<td></td>
<td>0.141***</td>
<td>0.0772***</td>
<td>-0.0329</td>
<td>0.0309</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0303)</td>
<td>(0.0299)</td>
<td>(0.0376)</td>
<td>(0.0379)</td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Other Controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Observations</td>
<td>26,742</td>
<td>26,742</td>
<td>26,742</td>
<td>26,742</td>
<td>26,742</td>
<td>26,742</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.388</td>
<td>0.462</td>
<td>0.346</td>
<td>0.442</td>
<td>0.388</td>
<td>0.462</td>
</tr>
</tbody>
</table>
### Robustness

#### ROE

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposit Productivity</td>
<td>0.113***</td>
<td>0.313***</td>
<td></td>
<td>0.0726***</td>
<td>0.264***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0129)</td>
<td>(0.0795)</td>
<td></td>
<td>(0.0257)</td>
<td>(0.0907)</td>
<td></td>
</tr>
<tr>
<td>Asset Productivity</td>
<td></td>
<td></td>
<td>0.161***</td>
<td>0.151***</td>
<td>0.110***</td>
<td>0.128***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.0208)</td>
<td>(0.0217)</td>
<td>(0.0234)</td>
<td>(0.0256)</td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Other Controls</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>26,742</td>
<td>26,742</td>
<td>26,742</td>
<td>26,742</td>
<td>26,742</td>
<td>26,742</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.194</td>
<td>0.223</td>
<td>0.195</td>
<td>0.223</td>
<td>0.198</td>
<td>0.228</td>
</tr>
</tbody>
</table>
The bank sets the deposit rate to maximize

$$\max_i \phi_j A_j^\theta - i_j M s_j - r_j K_j.$$ 

The corresponding bank first order condition is given by

$$\phi_j \theta A_j^{\theta-1} = \left( \frac{1}{\alpha(1 - s_j)} + i_j \right).$$
## Bank Liabilities: Deposit Demand Estimation

### Results: County Level Demand

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposit Rate</td>
<td>20.33</td>
<td>18.19**</td>
<td>21.02**</td>
</tr>
<tr>
<td></td>
<td>(13.59)</td>
<td>(8.213)</td>
<td>(8.812)</td>
</tr>
<tr>
<td>Deposit Rate × Avg. Weekly Wage</td>
<td></td>
<td>11.78***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.353)</td>
<td></td>
</tr>
<tr>
<td>Deposit Rate × Pct College</td>
<td></td>
<td>-10.87***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.762)</td>
<td></td>
</tr>
<tr>
<td>Deposit Rate × Pct Over 65</td>
<td></td>
<td>6.013***</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.916)</td>
<td></td>
</tr>
<tr>
<td>No. of Branches (County Level)</td>
<td>1.257***</td>
<td>1.256***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0272)</td>
<td>(0.0269)</td>
<td></td>
</tr>
<tr>
<td>County×Year Fixed Effects</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Bank Fixed Effects</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>IV</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Observations</td>
<td>260,881</td>
<td>260,881</td>
<td>254,662</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.659</td>
<td>0.779</td>
<td>0.777</td>
</tr>
<tr>
<td>Variable</td>
<td>Obs</td>
<td>Mean</td>
<td>Std. Dev.</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>------</td>
<td>--------</td>
<td>-----------</td>
</tr>
<tr>
<td>Deposit Int. Expense</td>
<td>26,742</td>
<td>2.18%</td>
<td>1.34%</td>
</tr>
<tr>
<td>Deposit Int. Expense (Net of Fees)</td>
<td>26,742</td>
<td>1.73%</td>
<td>1.36%</td>
</tr>
<tr>
<td>Non Int. Expense (Millions)</td>
<td>26,742</td>
<td>142.44</td>
<td>517.53</td>
</tr>
<tr>
<td>No. Branches</td>
<td>26,742</td>
<td>119.50</td>
<td>307.73</td>
</tr>
<tr>
<td>No. Employees</td>
<td>26,742</td>
<td>3,456.47</td>
<td>10,511.54</td>
</tr>
<tr>
<td>Assets (Billions)</td>
<td>26,742</td>
<td>26.50</td>
<td>161.00</td>
</tr>
<tr>
<td>Interest Income (Millions)</td>
<td>26,742</td>
<td>281.85</td>
<td>1,524.57</td>
</tr>
<tr>
<td>Deposits (Billions)</td>
<td>26,742</td>
<td>14.20</td>
<td>78.90</td>
</tr>
<tr>
<td>Leverage</td>
<td>26,742</td>
<td>0.91</td>
<td>0.04</td>
</tr>
<tr>
<td>Beta</td>
<td>26,742</td>
<td>0.63</td>
<td>0.58</td>
</tr>
<tr>
<td>Std. Dev. ROA</td>
<td>26,742</td>
<td>0.14%</td>
<td>0.18%</td>
</tr>
<tr>
<td>Market-to-Book</td>
<td>26,742</td>
<td>1.71</td>
<td>0.85</td>
</tr>
<tr>
<td>Variable</td>
<td>Obs</td>
<td>Mean</td>
<td>Std. Dev.</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------</td>
<td>------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>Liabilities (Relative to Total Liabilities)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deposits</td>
<td>26,742</td>
<td>0.83</td>
<td>0.13</td>
</tr>
<tr>
<td>Small Time Deposits</td>
<td>26,736</td>
<td>0.20</td>
<td>0.11</td>
</tr>
<tr>
<td>Large Time Deposits</td>
<td>26,736</td>
<td>0.13</td>
<td>0.08</td>
</tr>
<tr>
<td>Savings Deposits</td>
<td>24,633</td>
<td>0.34</td>
<td>0.15</td>
</tr>
<tr>
<td>Transaction Deposits</td>
<td>24,627</td>
<td>0.15</td>
<td>0.10</td>
</tr>
<tr>
<td>FF+Repo</td>
<td>18,051</td>
<td>0.04</td>
<td>0.06</td>
</tr>
<tr>
<td><strong>Assets (Relative to Total Assets)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loans</td>
<td>26,742</td>
<td>0.65</td>
<td>0.13</td>
</tr>
<tr>
<td>RE Loans</td>
<td>24,633</td>
<td>0.46</td>
<td>0.16</td>
</tr>
<tr>
<td>C&amp;I Loan</td>
<td>23,685</td>
<td>0.11</td>
<td>0.07</td>
</tr>
<tr>
<td>Loan Commitments</td>
<td>26,742</td>
<td>0.14</td>
<td>0.17</td>
</tr>
<tr>
<td>Securities</td>
<td>26,713</td>
<td>0.22</td>
<td>0.12</td>
</tr>
<tr>
<td>Cash</td>
<td>26,732</td>
<td>0.02</td>
<td>0.04</td>
</tr>
<tr>
<td>FF+Repo</td>
<td>18,047</td>
<td>0.01</td>
<td>0.03</td>
</tr>
</tbody>
</table>
Trends in Productivity

Deposit Productivity

The Cross Section of Bank Value
Trends in Productivity

Dispersion of Deposit Productivity

- Mark Egan, Stefan Lewellen, and Adi Sunderam
- The Cross Section of Bank Value
Trends in Productivity

Asset Productivity

Mark Egan, Stefan Lewellen, and Adi Sunderam

The Cross Section of Bank Value
## Bank Productivity and Bank Characteristics

### Composition of Liabilities and Deposit Productivity

<table>
<thead>
<tr>
<th>Dep. Var</th>
<th>Leverage (1)</th>
<th>Deposits Liabilities (2)</th>
<th>Small Time Liabilities (3)</th>
<th>Large Time Liabilities (4)</th>
<th>Savings Liabilities (5)</th>
<th>Trans. Liabilities (6)</th>
<th>FF+Repo Liabilities (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deposit Prod.</td>
<td>0.0225***</td>
<td>1.773***</td>
<td>-0.347*</td>
<td>0.137</td>
<td>1.354***</td>
<td>0.432**</td>
<td>-0.320</td>
</tr>
<tr>
<td></td>
<td>(0.00843)</td>
<td>(0.255)</td>
<td>(0.186)</td>
<td>(0.146)</td>
<td>(0.199)</td>
<td>(0.177)</td>
<td>(0.290)</td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Other Controls</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Observations</td>
<td>26,742</td>
<td>26,742</td>
<td>26,736</td>
<td>26,736</td>
<td>24,633</td>
<td>24,627</td>
<td>18,051</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.969</td>
<td>0.558</td>
<td>0.376</td>
<td>0.160</td>
<td>0.383</td>
<td>0.232</td>
<td>0.142</td>
</tr>
</tbody>
</table>

- Deposit productivity strongly correlated with savings deposits.
- Little correlation with overall leverage.
## Synergies
### Decomposition of Asset Productivity

<table>
<thead>
<tr>
<th>Dep. Var</th>
<th>Asset Productivity</th>
<th>Loan Productivity</th>
<th>Sec. Productivity</th>
<th>Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td></td>
</tr>
<tr>
<td>Deposit Productivity</td>
<td>0.441***</td>
<td>0.340***</td>
<td>0.0985</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0937)</td>
<td>(0.110)</td>
<td>(0.0966)</td>
<td></td>
</tr>
</tbody>
</table>

- Time F.E.    | X                  | X                 | X                 |
- Other Controls | X                | X                 | X                 |
- Observations | 26,742             | 18,360            | 19,467            |
- R-squared    | 0.644              | 0.420             | 0.647             |

- Deposit productivity mostly correlated with loan productivity, not security productivity.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset Prod.</td>
<td>0.319***</td>
<td>0.134***</td>
<td>0.0805**</td>
<td>-0.460***</td>
<td>-0.308***</td>
<td>-0.248**</td>
</tr>
<tr>
<td>Time F.E.</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Other Controls</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Observations</td>
<td>24,633</td>
<td>23,685</td>
<td>26,742</td>
<td>26,713</td>
<td>26,732</td>
<td>18,047</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.346</td>
<td>0.054</td>
<td>0.133</td>
<td>0.145</td>
<td>0.226</td>
<td>0.106</td>
</tr>
</tbody>
</table>

- Asset productivity associated with loans.