Wholesale funding dry-ups

Christophe Pérignon  David Thesmar  Guillaume Vuillemeay

HEC Paris  MIT  HEC Paris

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Banque de France
September 2016
Wholesale funding:

- **A growing source of bank funding**
  - Repurchase agreements, interbank loans, certificates of deposit
Wholesale funding:

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  - Repurchase agreements, interbank loans, certificates of deposit

- Prevailing view: Wholesale funding is fragile
  - Uninsured, short-term, unsecured
Wholesale funding:

- A growing source of bank funding
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- Prevailing view: Wholesale funding is fragile
  - Uninsured, short-term, unsecured

- Penalized by new liquidity regulation (LCR, NSFR)
Related literature

- **Aggregate resilience of unsecured markets**
  - U.S.: Schoar et al. (2011)
  - Europe: Gabrieli & Georg (2015)

- **Aggregate resilience of secured markets**
  - U.S.: Krishnamurthy et al. (2014), Copeland et al. (2014)
  - Europe: Boissel et al. (2015), Mancini et al. (2015)

- **Our focus**: Beyond aggregate, explore cross-section
Theory

- Key friction: asymmetric information.
Theory

- Key friction: **asymmetric information**.

- **Lenders equally uninformed** (*Akerlof 1970; Stiglitz & Weiss 1981*)
  - High- and low-quality banks indistinguishable by lenders
  - Adverse selection: high-quality banks withdraw as rates increase
    ⇒ Relative quality of pool of borrowers **decreases** in periods of stress

- Some lenders are informed (*Gorton & Pennacchi 1990*)
  - Debt derives value from being information-insensitive
  - When information-sensitive: uninformed lenders cut funding
  - Informed lenders still lend to high-quality banks
    ⇒ Relative quality of pool of borrowers **increases** in periods of stress

- Test competing theories
  - Ideal laboratory: European market for certificates of deposits (CDs)
  - Different policy implications: transparency vs. opacity

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Main results

- **R1: No market-wide freeze**
  - But many bank-specific funding dry-ups
Main results

R1: No market-wide freeze
- But many bank-specific funding dry-ups

R2: Low-quality banks are more likely to lose access to wholesale funding in times of stress
- Inconsistent with adverse selection
- Consistent with heterogeneity across lenders
Main results

- **R1: No market-wide freeze**
  - But many bank-specific funding dry-ups

- **R2: Low-quality banks are more likely to lose access to wholesale funding in times of stress**
  - Inconsistent with adverse selection
  - Consistent with heterogeneity across lenders

- **R3: In times of stress, funds are reallocated towards high-quality banks**
  - Inconsistent with adverse selection
  - Consistent with heterogeneity across lenders
Data on certificates of deposit

- **Certificate of deposit (CD)**
  - Issued by credit institutions
  - Initial maturity between 1 day and 1 year (median = 33 days)
  - Unsecured
  - Issued over-the-counter, placed mostly to money market funds
Data on certificates of deposit

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- **CD dataset**
  - From Banque de France, over 2008-2014
  - 1,383,202 ISIN-level observations, with 838,703 individual ISINs
  - All events: issuance, re-issuances, buybacks
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  - 1,383,202 ISIN-level observations, with 838,703 individual ISINs
  - All events: issuance, re-issuances, buybacks

- More than 80% of all euro-denominated CDs
CD market versus other wholesale markets

- **CD vs. repo**
  - CD outstanding vs. repo market

- **CD vs. ECB**
  - CD outstanding vs. MRO outstanding

- **CD vs. interbank**
  - CD outstanding vs. interbank market

- CD is a large segment of wholesale funding
  - Similar size as the repo market
  - Larger than ECB funding and unsecured interbank market
  - No previous study on the CD market
Pricing in the CD market

CD yields vs. Euribor

CD yields vs. ECB MRO rate

- CDs are cheaper than close substitutes
No market freeze

- **R1:** No market-wide freeze in CD market
  - ... even when CDS spreads increase

![Graph showing aggregate CD volume and bank CDS over time](image)
CD issuers

- 276 individual issuers
- 196 French, 80 from IT, DE, UK, NL, IE, etc.
- Most large European banks
CD issuers

- CD issuers
  - 276 individual issuers
  - 196 French, 80 from IT, DE, UK, NL, IE, etc.
  - Most large European banks

- Matching with balance sheet and market data
  - 263 issuers matched with balance sheet data (Bankscope)
  - Short-term credit ratings (Fitch)
  - Stock price and CDS spread data (Bloomberg)
The importance of bank-specific dry-ups

- **Definitions of funding dry-ups**
  - Full dry-up: Amount outstanding falls to zero
  - Partial dry-up: Loses 50% or more in 50 days or less
The importance of bank-specific dry-ups

- Definitions of funding dry-ups
  - Full dry-up: Amount outstanding falls to zero
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- 75 events, including 29 full dry-ups
The importance of bank-specific dry-ups

- Definitions of funding dry-ups
  - Full dry-up: Amount outstanding falls to zero
  - Partial dry-up: Loses 50% or more in 50 days or less

- 75 events, including 29 full dry-ups

- One full and one partial dry-up

![Graph 1](image1.png)

Banca Monte dei Paschi

![Graph 2](image2.png)

Dexia

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Wholesale funding dry-ups
Year with highest number of funding dry-ups is 2011
Banks facing a funding dry-up are weaker on observables

<table>
<thead>
<tr>
<th></th>
<th>One year before event</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diff. from mean</td>
<td>Diff. from median</td>
</tr>
<tr>
<td>ROA</td>
<td>-1.249***</td>
<td>-0.577***</td>
</tr>
<tr>
<td>Net income / Assets</td>
<td>-0.014***</td>
<td>-0.006***</td>
</tr>
<tr>
<td>Impaired loans / Equity</td>
<td>55.879***</td>
<td>52.790***</td>
</tr>
<tr>
<td>Equity / Assets</td>
<td>-0.036***</td>
<td>-0.033***</td>
</tr>
<tr>
<td>CDS spread</td>
<td>82.180</td>
<td>110.245**</td>
</tr>
<tr>
<td>Short-term credit rating</td>
<td>-0.424***</td>
<td>-0.474**</td>
</tr>
</tbody>
</table>
Dry-ups predict future bank characteristics

- **R2:** Low-quality banks are more likely to lose access to wholesale funding in times of stress
  - Quality: *Unobservable* quality $\rightarrow$ *Changes* in performance
Dry-ups predict future bank characteristics

- **R2:** Low-quality banks are more likely to lose access to wholesale funding in times of stress
  - Quality: *Unobservable* quality $\rightarrow$ *Changes* in performance

- **Base regression**

  $$\Delta ROA_{i,t} = \beta_0 1 \{ t - 1 \leq \tau_{DryUp_i} < t \} + \beta_1 \text{Size}_{i,t-1} + \beta_2 \text{Controls}_{i,t-1} + \beta_3 \text{Controls}_{c,t-1} + FE_c + FE_t + \varepsilon_{i,t},$$

  - $\Delta ROA_{it} = ROA_{it} - ROA_{it-1}$
  - Coefficient of interest: $\beta_0$
Dry-ups predict future bank characteristics

\[
\Delta ROA_t = ROA_t - ROA_{t-1}
\]

\[\tau_{DryUp}\]
Dry-ups predict future bank characteristics

- Facing a dry-up predicts a decrease in ROA
- Inconsistent with adverse selection being large

Dependent variable: $\Delta ROA = ROA_t - ROA_{t-1}$

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Share CD</th>
<th>Crisis</th>
</tr>
</thead>
<tbody>
<tr>
<td>DryUp</td>
<td>-0.341***</td>
<td>-0.508***</td>
<td>-0.874***</td>
</tr>
<tr>
<td></td>
<td>(0.135)</td>
<td>(0.139)</td>
<td>(0.176)</td>
</tr>
<tr>
<td>Size_{t-1}</td>
<td>-0.018</td>
<td>-0.004</td>
<td>-0.017</td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
<td>(0.025)</td>
<td>(0.025)</td>
</tr>
<tr>
<td>ROA_{t-1}</td>
<td>-0.713***</td>
<td>-0.717***</td>
<td>-0.717***</td>
</tr>
<tr>
<td></td>
<td>(0.038)</td>
<td>(0.037)</td>
<td>(0.038)</td>
</tr>
<tr>
<td>Impaired / Loans_{t-1}</td>
<td>-0.025***</td>
<td>-0.026***</td>
<td>-0.026***</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.009)</td>
<td>(0.009)</td>
</tr>
<tr>
<td>GDP growth</td>
<td>38.957***</td>
<td>37.561***</td>
<td>38.732***</td>
</tr>
<tr>
<td></td>
<td>(4.969)</td>
<td>(4.955)</td>
<td>(4.954)</td>
</tr>
<tr>
<td>DryUp * Share CD $\in [4%, 9%]$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DryUp * Share CD $\geq 9%$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DryUp * Crisis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adj. $R^2$</td>
<td>-0.001</td>
<td>0.407</td>
<td>0.415</td>
</tr>
<tr>
<td>N. Obs.</td>
<td>948</td>
<td>684</td>
<td>684</td>
</tr>
</tbody>
</table>
Dry-ups predict future market outcomes

- Concern for tests of asymmetric information
  - Information of market agents $\neq$ information of the econometrician
Dry-ups predict future market outcomes

- **Concern for tests of asymmetric information**
  - Information of market agents ≠ information of the econometrician

- **Use market data → Incorporate information in real time**
  - Dry-ups predict increases in CDS spreads
  - Also predict negative excess stock return, but insignificant

\[ \Delta CDS \text{ spread} \]

<table>
<thead>
<tr>
<th></th>
<th>6 months</th>
<th>1 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>DryUp</td>
<td>36.443*** (15.748)</td>
<td>43.824* (25.510)</td>
</tr>
<tr>
<td>Size(_t-1)</td>
<td>-0.707 (0.901)</td>
<td>-1.680 (1.770)</td>
</tr>
<tr>
<td>ROA(_t-1)</td>
<td>-2.354 (1.552)</td>
<td>3.948 (2.756)</td>
</tr>
<tr>
<td>Impaired / Loans(_t-1)</td>
<td>-2.041** (0.787)</td>
<td>-2.410** (1.180)</td>
</tr>
<tr>
<td>GDP growth</td>
<td>-1214.823* (650.329)</td>
<td>-2187.64 (1437.262)</td>
</tr>
</tbody>
</table>

\(\text{Adj. } R^2\) | 0.570 | 0.585 | 0.563 | 0.573 |
\(N. \text{ Obs.}\)    | 2,099 | 956  | 1,937 | 956  |

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Wholesale funding dry-ups
Endogeneity concerns

- Evidence consistent with presence of informed lenders
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- However, reverse causality concern
  - Can funding dry-ups cause decreases in ROA?
  - As in models of bank runs (Diamond & Dybvig 1983).
Endogeneity concerns

- **Evidence consistent with presence of informed lenders**

- **However, reverse causality concern**
  - Can funding dry-ups cause decreases in ROA?
  - As in models of bank runs (Diamond & Dybvig 1983).

- **Three solutions**
  - Use changes in impaired loans as dependent variable → [See results]
  - Interact $DryUp$ dummy with share of CD funding → [See results]
  - Banks do not downsize significantly → No fire sales [See results]
Maturity shortening

- Uninformed lenders value information-insensitive securities
- In stress, long-term debt becomes information-sensitive first
- Predicts maturity shortening before dry-ups

<table>
<thead>
<tr>
<th>Dependent variable: Weighted average maturity of new issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel A: Partial and full dry-ups</td>
</tr>
<tr>
<td>$\tau - 1$</td>
</tr>
<tr>
<td>(2.281)</td>
</tr>
<tr>
<td>$\tau - 2$</td>
</tr>
<tr>
<td>(3.939)</td>
</tr>
<tr>
<td>$\tau - 3$</td>
</tr>
<tr>
<td>(1.699)</td>
</tr>
<tr>
<td>$\tau - 4$</td>
</tr>
<tr>
<td>(4.902)</td>
</tr>
<tr>
<td>$\tau - 5$</td>
</tr>
<tr>
<td>(3.750)</td>
</tr>
<tr>
<td>$\tau - 6$</td>
</tr>
<tr>
<td>(4.132)</td>
</tr>
</tbody>
</table>

Adj. $R^2$ 0.166 0.165
N. Obs. 11,420 11,420
Reallocation

- **R3**: In times of stress, funds are reallocated to high-quality banks

\[
E_{i,t} = \left[ \log (C_{D_{i,t}}) - \log (C_{D_{i,t}-1}) \right] - \left[ \log (C_{D_{m,t}}) - \log (C_{D_{m,t}-1}) \right]
\]

- \(C_{D_{i,t}}\): Outstanding amount by \(i\) in month \(t\)
- \(C_{D_{m,t}}\): Aggregate size of CD market in month \(t\)

\[
\text{Prob}(I_{i,t} = 1 | X_t) = \Phi (\beta_0 \Delta \text{ROA}_{i,t} + \beta_1 \text{Controls}_{i,t} - 1 + \beta_2 \text{Controls}_{c,t} - 1 + FE_c + FE_m)
\]

- \(I_{i,t} = 1\) if \(E_{i,t}\) above median or 75th percentile

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Wholesale funding dry-ups
Reallocation

- **R3:** In times of stress, funds are reallocated to high-quality banks

- **Issuance in excess of the market**

\[
E_{i,t} = \left[ \log(CD_{i,t}) - \log(CD_{i,t-1}) \right] - \left[ \log(CD_{m,t}) - \log(CD_{m,t-1}) \right]
\]

- \( CD_{it} \): Outstanding amount by \( i \) in month \( t \)
- \( CD_{mt} \): Aggregate size of CD market in month \( t \)
R3: In times of stress, funds are reallocated to high-quality banks

Issuance in excess of the market

\[ E_{i,t} = \left[ \log(CD_{i,t}) - \log(CD_{i,t-1}) \right] - \left[ \log(CD_{m,t}) - \log(CD_{m,t-1}) \right] \]

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- \( CD_{mt} \): Aggregate size of CD market in month \( t \)

Probit specification

\[ \Pr(I_{i,t} = 1|X_t) = \Phi(\beta_0 \Delta \text{ROA}_{i,t} + \beta_1 \text{Controls}_{i,t-1} + \beta_2 \text{Controls}_{c,t-1} + FE_c + FE_m) \]

- \( I_{it} = 1 \) if \( E_{it} \) above median or 75th percentile
Banks increasing ROA increase relative CD funding

... Regardless of whether market is stressed

<table>
<thead>
<tr>
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<th>Above median</th>
<th>Above 75th percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Delta \text{ROA} )</td>
<td>0.024*** (0.005)</td>
<td>0.031** (0.014)</td>
</tr>
<tr>
<td>Controls</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Month FE</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Country FE</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N. Obs.</td>
<td>10,979</td>
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</tr>
</tbody>
</table>

Dependent variable: Prob. of CD issuance in excess of the market

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Wholesale funding dry-ups
Reallocation in times of stress

**Stress Index**

\[
Stress\ Index_t = \frac{\sum_i R_{i,t}}{CD_{m,t}},
\]

- \( R_{i,t} \): Euro amount of dry-up by \( i \) at \( t \)
- \( CD_{m,t} \): Aggregate CD market size at \( t \)
- Computed at monthly frequency \( \rightarrow \) [See index]
Reallocation in times of stress

**Stress Index**

\[ \text{Stress Index}_t = \frac{\sum_i R_{i,t}}{CD_{m,t}}, \]

- \( R_{i,t} \): Euro amount of dry-up by \( i \) at \( t \)
- \( CD_{m,t} \): Aggregate CD market size at \( t \)
- Computed at monthly frequency → [See index]

**Interact \( \Delta ROA \) with quantiles of Stress Index**

- If effect magnified → Accelerated reallocation
- If effect disappears → Adverse selection worsens

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# Reallocation in times of stress

- **Reallocation magnified when market stress is high**
  - ... Increasing in quantiles of the Stress Index

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<th>Above 75th percentile</th>
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<tr>
<td>Δ ROA</td>
<td>0.024***</td>
<td>0.018***</td>
<td>0.031**</td>
<td>0.016***</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.009)</td>
<td>(0.014)</td>
<td>(0.006)</td>
</tr>
<tr>
<td>Δ ROA * Stress Index in Quartile 2</td>
<td>-0.003 (0.016)</td>
<td>0.033*** (0.012)</td>
<td>0.008 (0.006)</td>
<td>0.039 (0.033)</td>
</tr>
<tr>
<td>Δ ROA * Stress Index in Quartile 3</td>
<td>0.031** (0.020)</td>
<td>0.048** (0.020)</td>
<td>0.030** (0.015)</td>
<td></td>
</tr>
<tr>
<td>Δ ROA * Stress Index in Quartile 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Month FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Country FE</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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High-quality banks do not reduce but increase funding, inconsistent with adverse selection being first-order.
Reallocation in times of stress

- **Reallocation magnified when market stress is high**
  - ... Increasing in quantiles of the Stress Index

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<td>0.008 (0.006)</td>
</tr>
<tr>
<td>( \Delta \text{ROA} \times \text{Stress Index in Quartile 3} )</td>
<td>0.033*** (0.012)</td>
<td>0.039 (0.033)</td>
</tr>
<tr>
<td>( \Delta \text{ROA} \times \text{Stress Index in Quartile 4} )</td>
<td>0.048** (0.020)</td>
<td>0.030** (0.015)</td>
</tr>
</tbody>
</table>

- Controls: Yes, Yes, Yes, Yes
- Month FE: Yes, Yes, Yes, Yes
- Country FE: Yes, Yes, Yes, Yes
- N. Obs.: 10,979, 10,979, 10,979, 10,979

- **High-quality banks do not reduce but *increase* funding**
  - Inconsistent with adverse selection being first-order
Conclusion and implications

- **Frictions on wholesale funding markets**
  - No evidence that asymmetric information is first-order
    - No market freeze
    - Dry-ups predict low future performance
  - Investors value information-insensitive ("safe") securities
    - Dry-ups occur when debt turns information-sensitive
    - Reallocation not random → From low- to high-quality banks
Conclusion and implications

- **Frictions on wholesale funding markets**
  - No evidence that asymmetric information is first-order
    - No market freeze
    - Dry-ups predict low future performance
  - Investors value information-insensitive ("safe") securities
    - Dry-ups occur when debt turns information-sensitive
    - Reallocation not random \(\rightarrow\) From low- to high-quality banks

- **Implications of our results**
  - Disciplinary role of wholesale funding ("tough creditors")
  - Challenge to liquidity ratios?... No account for externalities
  - Lender of last resort most likely to benefit weakest banks
  - Private production of safe assets
The absence of market freeze

- No system-wide drop in volume
  - ... Even when CDS spreads increase

Back
Average maturity of new issues

- No system-wide drop in average maturity
CD Yields

Negative spread with the Euribor of same maturity

Back
CD Yields

- Yields on CDs with initial maturity up to 7 days

![Graph showing CD yields and ECB rates from 2008 to 2015](image_url)

- ECB lending rate
- ECB MRO rate
- CD yield
- ECB deposit rate

Back
Dry-ups predict future bank characteristics

- Facing a dry-up predicts an increase in impaired loans

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<th>Crisis</th>
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<td><strong>DryUp</strong></td>
<td>0.582***</td>
<td>0.507***</td>
<td>0.640***</td>
</tr>
<tr>
<td></td>
<td>(0.139)</td>
<td>(0.138)</td>
<td>(0.177)</td>
</tr>
<tr>
<td><strong>Size_{t−1}</strong></td>
<td>-0.038</td>
<td>-0.042*</td>
<td>-0.064</td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
<td>(0.025)</td>
<td>(0.025)</td>
</tr>
<tr>
<td><strong>ROA_{t−1}</strong></td>
<td>-0.011</td>
<td>-0.010</td>
<td>-0.007</td>
</tr>
<tr>
<td></td>
<td>(0.038)</td>
<td>(0.038)</td>
<td>(0.038)</td>
</tr>
<tr>
<td><strong>Impaired / Loans_{t−1}</strong></td>
<td>-0.017*</td>
<td>-0.017*</td>
<td>-0.017*</td>
</tr>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.009)</td>
<td>(0.009)</td>
</tr>
<tr>
<td></td>
<td>(5.044)</td>
<td>(5.068)</td>
<td>(5.031)</td>
</tr>
<tr>
<td><strong>DryUp * Share CD ∈ [4%, 9%]</strong></td>
<td>-0.490</td>
<td>-0.490</td>
<td>-0.490</td>
</tr>
<tr>
<td></td>
<td>(0.385)</td>
<td>(0.385)</td>
<td>(0.385)</td>
</tr>
<tr>
<td><strong>DryUp * Share CD ≥ 9%</strong></td>
<td>-0.233</td>
<td>-0.233</td>
<td>-0.233</td>
</tr>
<tr>
<td></td>
<td>(0.306)</td>
<td>(0.306)</td>
<td>(0.306)</td>
</tr>
<tr>
<td><strong>DryUp * Crisis</strong></td>
<td>-0.052</td>
<td>-0.052</td>
<td>-0.052</td>
</tr>
<tr>
<td></td>
<td>(0.093)</td>
<td>(0.093)</td>
<td>(0.093)</td>
</tr>
<tr>
<td><strong>Adj. R^2</strong></td>
<td>0.100</td>
<td>0.140</td>
<td>0.140</td>
</tr>
<tr>
<td><strong>N. Obs.</strong></td>
<td>676</td>
<td>675</td>
<td>675</td>
</tr>
</tbody>
</table>

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Christophe Pérignon, David Thesmar, Guillaume Vuillemey

Wholesale funding dry-ups
## Endogeneity checks

### Effect not magnified for banks with large CD exposure

**Dependent variable:** $\Delta ROA = ROA_t - ROA_{t-1}$

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Share CD</th>
<th>Crisis</th>
</tr>
</thead>
<tbody>
<tr>
<td>DryUp</td>
<td>-0.341** (0.135)</td>
<td>-0.874*** (0.176)</td>
<td>-0.610*** (0.143)</td>
</tr>
<tr>
<td>Size$_{t-1}$</td>
<td>-0.018 (0.025)</td>
<td>-0.004 (0.025)</td>
<td>-0.017 (0.025)</td>
</tr>
<tr>
<td>ROA$_{t-1}$</td>
<td>-0.713*** (0.038)</td>
<td>-0.717*** (0.037)</td>
<td>-0.717*** (0.038)</td>
</tr>
<tr>
<td>Impaired / Loans$_{t-1}$</td>
<td>-0.025*** (0.009)</td>
<td>-0.026*** (0.009)</td>
<td>-0.026*** (0.009)</td>
</tr>
<tr>
<td>GDP growth</td>
<td>38.957*** (4.969)</td>
<td>37.561*** (4.955)</td>
<td>38.732*** (4.954)</td>
</tr>
<tr>
<td>DryUp * Share CD $\in [4%, 9%]$</td>
<td></td>
<td>0.372 (0.407)</td>
<td>0.133 (0.192)</td>
</tr>
<tr>
<td>DryUp * Share CD $\geq 9%$</td>
<td></td>
<td>0.351 (0.302)</td>
<td></td>
</tr>
<tr>
<td>DryUp * Crisis</td>
<td></td>
<td></td>
<td>0.415</td>
</tr>
</tbody>
</table>

**Adj. $R^2$**
- Baseline: -0.001
- Share CD: 0.407
- Crisis: 0.411

**N. Obs.**
- Baseline: 948
- Share CD: 684
- Crisis: 684
Endogeneity checks

- Facing a dry-up does not predict a decrease in size

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Share CD</th>
<th>Crisis</th>
</tr>
</thead>
<tbody>
<tr>
<td>DryUp</td>
<td>-0.039</td>
<td>-0.014</td>
<td>-0.008</td>
</tr>
<tr>
<td></td>
<td>(0.035)</td>
<td>(0.013)</td>
<td>(0.017)</td>
</tr>
<tr>
<td>Size_{t-1}</td>
<td><strong>-0.005</strong></td>
<td><strong>-0.005</strong></td>
<td><strong>-0.005</strong></td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>ROA_{t-1}</td>
<td><strong>0.008</strong></td>
<td><strong>0.008</strong></td>
<td><strong>0.008</strong></td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
</tr>
<tr>
<td>Impaired / Loans_{t-1}</td>
<td>-0.000</td>
<td>-0.000</td>
<td>-0.000</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.001)</td>
<td>(0.001)</td>
</tr>
<tr>
<td>GDP growth</td>
<td>0.028</td>
<td>0.054</td>
<td>0.014</td>
</tr>
<tr>
<td></td>
<td>(0.497)</td>
<td>(0.500)</td>
<td>(0.497)</td>
</tr>
<tr>
<td>DryUp * Share CD ∈ [4%, 9%]</td>
<td></td>
<td>-0.009</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.041)</td>
<td></td>
</tr>
<tr>
<td>DryUp * Share CD ≥ 9%</td>
<td></td>
<td>-0.017</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.030)</td>
<td></td>
</tr>
<tr>
<td>DryUp * Crisis</td>
<td></td>
<td></td>
<td>0.008</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.007)</td>
</tr>
<tr>
<td>Adj. $R^2$</td>
<td>0.031</td>
<td>0.197</td>
<td>0.195</td>
</tr>
<tr>
<td>N. Obs.</td>
<td>950</td>
<td>685</td>
<td>685</td>
</tr>
</tbody>
</table>
Consistency checks

**Predictability remains when market stress is high**

Dependent variable: $\Delta ROA = ROA_t - ROA_{t-1}$

<table>
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<td>DryUp</td>
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<td>(0.037)</td>
<td>(0.038)</td>
</tr>
<tr>
<td>Impaired / Loans$_{t-1}$</td>
<td>-0.025***</td>
<td>-0.026***</td>
<td>-0.026***</td>
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<tr>
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<td>(0.009)</td>
<td>(0.009)</td>
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<td>38.732***</td>
</tr>
<tr>
<td></td>
<td>(4.969)</td>
<td>(4.955)</td>
<td>(4.954)</td>
</tr>
<tr>
<td>DryUp $\times$ Share CD $\in [4%, 9%]$</td>
<td></td>
<td>0.372</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.407)</td>
</tr>
<tr>
<td>DryUp $\times$ Share CD $\geq 9%$</td>
<td></td>
<td>0.351</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.302)</td>
</tr>
<tr>
<td>DryUp $\times$ Crisis</td>
<td></td>
<td></td>
<td>0.133</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>(0.192)</td>
</tr>
<tr>
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<td>-0.001</td>
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<td>0.415</td>
</tr>
<tr>
<td>N. Obs.</td>
<td>948</td>
<td>684</td>
<td>684</td>
</tr>
</tbody>
</table>

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Wholesale funding dry-ups
Stress Index

- Captures number and magnitude of dry-ups
  - Both partial and full

![Graph showing Stress Index over time from 2008 to 2015. The x-axis represents years from 2008 to 2015, with specific years marked as 2008, 2009, 2010, 2011, 2012, 2013, 2014, and 2015. The y-axis represents the stress index with values ranging from 0 to 0.08. The graph shows fluctuations in the stress index over time.]