

**Economic Analysis and Research Department** 

Bank of Greece



## Public and Private Liquidity during Crises Times: Evidence from Greek Banks

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#### The policy experiment



- □We explore the impact of a unique policy shock on the banking system and the Greek economy.
- The shock: ECB's exclusion of GGBs from the set of eligible collateral in monetary policy operations (suspension of the waiver) and the switch of Greek banks to ELA financing in February 2015.

Announcement: Feb 4, 2015.

□ Implementation: Feb 11, 2015.

- Policy shock occurred at the time of a bank run during which banks had lost 25% of their deposit base and a run on repos, with banks loosing 50% of their repo funding in the interbank market.
- □ Total central bank liquidity *increased* after the shock to make up for banks' losses of deposits and repo funding.



#### Borrowing and lending in the interbank market and CB Liquidity



Run on repos: Repo borrowing collapsed (ca -50%) in the run-up to general elections of Jan 25 due to heightened political uncertainty.

Banks increased MRO in January to fill funding gap.

- Unsecured lending in the IB market declined even earlier (ca -25%), in December 2014, as the failure of the Parliament to elect a new President of the Hellenic Republic triggered a run on deposits.
  - But remained fairly stable afterwards, despite rising political uncertainty.
- □ Unsecured lending collapsed after February 4, when ECB announced lift of waiver and switch to ELA.



## Size of banks' aggregate balance sheet remained stable: ELA as LOLR





December 2014: Interbank market is a crucial source of liquidity for Greek banks

EUR 32.2 bn of interbank liabilities

□EUR 56 bn of Eurosystem financing

February 2015: Total liabilities are stable at preshock level. ELA replenished losses from all funding sources (LOLR)

#### Why may a switch from Eurosystem funding to ELA matter?



- □ ELA came at a higher cost (155 bps) compared to MRO and LTRO (5 bps).
- □ ELA imposed strict conditionality on banks (solvency, exit plans)
  - Only solvent banks were eligible for ELA
  - Banks had to present a detailed plan on how to achieve repayment of ELA funds within a reasonable timeframe
  - □ Funding plans were monitored by supervisors and had to be updated on a quarterly basis
  - Banks had to report regulatory ratios on a monthly basis

#### **Questions we ask**



- 1. Did banks cut back on lending in the unsecured interbank market in response to the ECB policy shock? Along which margins?
- 2. Could affected borrowers in the interbank market substitute losses one-for-one from less affected lenders?
- 3. If not, did ELA fulfil its role as a LOLR?
- 4. Did affected banks reduce their corporate lending after the shock? Did bank solvency and stability of funding play a role in banks' reaction?
- 5. Did firms with a single bank relationship suffer more from the credit contraction?
- 6. Did firms which experienced a reduction in bank credit reduce their exports?

#### **Results preview**



- 1. Unsecured lending in the interbank market contracted. Banks with higher reliance on ECB financing against GGB collateral were less likely to lend in the interbank market after the suspension of the waiver.
- 2. ELA allowed banks (especially the most vulnerable) to fully replenish their losses from the closure of the ECB window, the run on deposits and the freeze of the repo market. In this sense BoG (through ELA) acted as a LOLR.
- 3. Affected banks reduced their corporate lending. Effect was more pronounced among banks with lower capital ratios and less stable funding.
- 4. Affected banks reallocated their portfolios towards more GGBs.
- 5. Firms with multiple banking relationships were able to compensate credit losses from other less affected banks.
- 6. Firms with a single bank relationship suffered a credit squeeze. They reduced their exports by terminating export relationships.



### **Contribution to the Literature**

#### Literature on central bank interventions

□ LOLR interventions can have positive effects on economy:

By expanding collateral eligibility requirements (Nyborg, 2017; van Bekkum, Gabarro and Irani, 2018). By increasing the maturity of CB's loans (Carpinelli and Crosignani, 2021; Jasova, Mendicino, Peydro and Supera 2021)

#### □ But they can also have side effects:

More risk taking by banks (Drechsler, Drechsel, Marques-Ibanez and Schnabl, 2016).

Exacerbation of the bank-sovereign nexus (Crosignani, Faria-e-Castro and Fonseca, 2020).

Systemic interconnectedness (Jasova, Laeven, Mendicino, Peydro and Supera, 2021).

Contribution: explore impact of ELA on banking system and the economy.

#### Literature on the importance of interbank markets for the transmission of monetary policy

- Distortions in the interbank markets generate aggregate real effects (e.g. De Fiore, Hoerova and Uhlig, 2021; Bianchi and Bigio, 2022).
- Nonstandard monetary policy improves euro-area interbank liquidity (Garcia-de-Andoain, Heider, Hoerova and Manganelli, 2016, Abbassi, Brauning, Fecht and Peydro, 2021).
- Contribution: identify effects of ELA on IB liquidity supply during crisis times.

#### Literature on how bank liquidity shocks transmit to the real economy

Peek and Rosengren, 2000; Khwaja and Mian, 2008; Paravisini, 2008; Schnabl, 2012; Iyer, Peydro, da Rocha-Lopes and Schoar, 2013; Chodorow-Reich, 2014; Paravisini, Rappoport, Schnabl and Wolfenzon, 2015.

Contribution: explore how bank funding *costs* affect lending while keeping funding *volume* stable.

#### Data: We merge eight datasets



**Collateral pledged with the ECB.** Confidential data on the collateral class that each bank pledges with the ECB as of November 2014. Main asset classes: Greek Government Bonds (GGBs), Greek Government Guaranteed Bank Bonds (GGGBBs) and supranational bonds (=95% of total collateral pledged).

*Interbank data.* Banks' daily interbank trades in the period 1 December 2014 – 31 March 2015. Data report all unsecured and repo transactions, both lending and borrowing on a daily basis. The level of observation is a bank entity (i.e. unconsolidated level) and the collateral data are matched for the parent of each entity. We aggregate trades at the group level.

**Data on bank borrowing from ECB and ELA.** Banks' daily borrowing from two central bank liquidity facilities, the ECB's MROs and ELA. Merging banks' unsecured and repo borrowing, our final dataset provides a comprehensive overview of banks' private and public borrowing on a daily basis.

*Credit Registry Data.* Bank-firm loan-level data from the Greek credit registry. These data are available for the four systemic banks on a quarterly basis and report all outstanding loans of each firm with each bank. The reporting threshold is 1 mn Euros.

*Customs Data.* Firm exports at the product-destination-month level (5-digit SITC). Data are collected by the Greek customs authorities as part of the Intrastat and Extrastat reporting. Unique tax identifier that is common with the credit registry data.

Bank balance sheet data, Firm balance sheet data, Bank securities portfolio data, Bank deposits data

#### Measures of exposure to the shock



Lenders l = 1, ..., L. Borrowers b = 1, ..., B.

Lenders in the unsecured interbank market:

 $Direct \ Exposure_l = \frac{GGB \ collateral \ pledged \ with \ ECB_l}{Total \ collateral_l}$ 

Borrowers in the unsecured interbank market:

$$Indirect \ Exposure_{b} = \sum_{l=1}^{L} \left( a_{l} \frac{GGB \ collateral \ pledged \ with \ ECB_{l}}{Total \ collateral_{l}} \right)$$

 $a_l$ : share of borrowing from lender l in total borrowing of borrower b.

Firms' exposure through it's banks:

Firm 
$$Exposure_i = \sum_{k=1}^{K} a_k (Direct \ Exposure_k + Indirect \ Exposure_k)$$

 $a_k$ : share of borrowing from bank k in total borrowing of firm.

#### Impact of the suspension of the waiver on the interbank market

 $Y_{lbt} = \beta_1 \times Bank's Exposure_l \times Post Waiver_t + a_l + a_{bt} + \varepsilon_{lbt}$ 

We use four outcomes  $(Y_{lbt})$ :

Access: =1 if a lender *l* grants a new loan to borrower *b* on day *t*, and =0 otherwise.

*Lending:* Log(**unsecured lending**) of lender *l* to borrower *b* on day *t*.

*Rate:* average rate lender *l* charges borrower *b* on day *t*.

Maturity: Log(average loan maturity) of all interbank loans lender / extends to borrower b on day t.

*Bank's Exposure:* share of GGBs in total collateral lender *I* pledged with the ECB as of November 2014. *Post Waiver:* =1 after February 4, =0 otherwise.

Sample: Dec 1, 2014 – Mar 31, 2015, daily. Borrower x day FE: We look at the same borrower receiving loans from two or more lenders with different exposure to the shock.



#### A bank with 1 stdev higher exposure was 4.7% less likely to lend



| labl                                | e I: Im  | pact of  | the Susp | Dension | of the V | valver o | n Inter | bank M  | arket   |         |          |         |
|-------------------------------------|----------|----------|----------|---------|----------|----------|---------|---------|---------|---------|----------|---------|
|                                     |          | Access   |          | lo      | g(Lendin | ıg)      |         | Rate    |         | log     | g(Maturi | ity)    |
|                                     | 1        | 2        | 3        | 4       | 5        | 6        | 7       | 8       | 9       | 10      | 11       | 12      |
| Bank's Direct Exposure *            | -0.116** | -0.111** |          | 2.603   | 0.265    |          | 0.008   | 0.012   |         | -1.046  | 0.443    |         |
| Post Waiver                         | (0.036)  | (0.038)  |          | (2.047) | (1.995)  |          | (0.009) | (0.009) |         | (1.617) | (1.734)  |         |
| Bank's Direct Exposure *            |          |          | -0.137*  |         |          | -5.476   |         |         | 0.040** |         |          | 3.385   |
| Post Waiver Announcement            |          |          | (0.059)  |         |          | (3.219)  |         |         | (0.015) |         |          | (2.112) |
| Bank's Direct Exposure *            |          |          | -0.108** |         |          | 0.810    |         |         | 0.009   |         |          | 0.164   |
| Post Waiver Implementation          |          |          | (0.036)  |         |          | (1.853)  |         |         | (0.009) |         |          | (1.859) |
| Lender FE                           | yes      | yes      | yes      | yes     | yes      | yes      | yes     | yes     | yes     | yes     | yes      | yes     |
| Borrower x Day FE                   | yes      | yes      | yes      | yes     | yes      | yes      | yes     | yes     | yes     | yes     | yes      | yes     |
| Control for Deposits and Repo share | no       | yes      | yes      | no      | yes      | yes      | no      | yes     | yes     | no      | yes      | yes     |
| Observations                        | 10790    | 10790    | 10790    | 3408    | 3408     | 3408     | 3408    | 3408    | 3408    | 3408    | 3408     | 3408    |
| $R^2$                               | 0.451    | 0.452    | 0.452    | 0.479   | 0.481    | 0.481    | 0.952   | 0.952   | 0.952   | 0.538   | 0.539    | 0.539   |

*Note:* Access is a dummy variable equal to one if lender grants a new loan to borrower on day t, zero otherwise. Log(Lending) is the log of unsecured interbank lending. Rate is the unsecured interbank rate. Log(Maturity) is the log maturity of unsecured interbank lending, in days. Bank's Direct Exposure is a lender's share of Greek Government bonds pledged as collateral with the ECB in total ECB collateral as of November 2014. Post Waiver is a dummy variable equal to one in period {February 04, 2015 - February 04, 2015 - Narch 31, 2015}. Deposits share is the share of bank deposits in total liabilities. Repo share is the share of repos in total liabilities. Standard errors are three-way clustered at the lender, borrower and day level. Statistical significance is denoted as \*p<0.1, \*\*p<0.05, \*\*\*p<0.01.

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#### Conditional on lending, no effects on amount of lending



| Tabl                                | le 1: Im | pact of t | the Susp | pension | of the <b>V</b> | aiver o | n Inter | bank Ma | arket   |               |         |         |
|-------------------------------------|----------|-----------|----------|---------|-----------------|---------|---------|---------|---------|---------------|---------|---------|
|                                     |          | Access    |          | lo      | g(Lendin        | lg)     | Rate    |         |         | log(Maturity) |         |         |
|                                     | 1        | 2         | 3        | 4       | 5               | 6       | 7       | 8       | 9       | 10            | 11      | 12      |
| Bank's Direct Exposure *            | -0.116** | -0.111**  |          | 2.603   | 0.265           |         | 0.008   | 0.012   |         | -1.046        | 0.443   |         |
| Post Waiver                         | (0.036)  | (0.038)   |          | (2.047) | (1.995)         |         | (0.009) | (0.009) |         | (1.617)       | (1.734) |         |
| Bank's Direct Exposure *            |          |           | -0.137*  |         |                 | -5.476  |         |         | 0.040** |               |         | 3.385   |
| Post Waiver Announcement            |          |           | (0.059)  |         |                 | (3.219) |         |         | (0.015) |               |         | (2.112) |
| Bank's Direct Exposure *            |          |           | -0.108** |         |                 | 0.810   |         |         | 0.009   |               |         | 0.164   |
| Post Waiver Implementation          |          |           | (0.036)  |         |                 | (1.853) |         |         | (0.009) |               |         | (1.859) |
| Lender FE                           | yes      | yes       | yes      | yes     | yes             | yes     | yes     | yes     | yes     | yes           | yes     | yes     |
| Borrower x Day FE                   | yes      | yes       | yes      | yes     | yes             | yes     | yes     | yes     | yes     | yes           | yes     | yes     |
| Control for Deposits and Repo share | no       | yes       | yes      | no      | yes             | yes     | no      | yes     | yes     | no            | yes     | yes     |
| Observations                        | 10790    | 10790     | 10790    | 3408    | 3408            | 3408    | 3408    | 3408    | 3408    | 3408          | 3408    | 3408    |
| $R^2$                               | 0.451    | 0.452     | 0.452    | 0.479   | 0.481           | 0.481   | 0.952   | 0.952   | 0.952   | 0.538         | 0.539   | 0.539   |

*Note:* Access is a dummy variable equal to one if lender grants a new loan to borrower on day t, zero otherwise. Log(Lending) is the log of unsecured interbank lending. Rate is the unsecured interbank rate. Log(Maturity) is the log maturity of unsecured interbank lending, in days. Bank's Direct Exposure is a lender's share of Greek Government bonds pledged as collateral with the ECB in total ECB collateral as of November 2014. Post Waiver is a dummy variable equal to one in period {February 04, 2015 - February 04, 2015 - Narch 31, 2015}. Deposits share is the share of bank deposits in total liabilities. Repo share is the share of repos in total liabilities. Standard errors are three-way clustered at the lender, borrower and day level. Statistical significance is denoted as \*p<0.1, \*\*p<0.05, \*\*\*p<0.01.

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#### Conditional on lending, banks charged a higher interest rate



|                                     | <b>c I. III</b> | pact of t | ine Sush | CIISIUII     | UT THE V |         |         |         | ai kti  |         |               |         |  |
|-------------------------------------|-----------------|-----------|----------|--------------|----------|---------|---------|---------|---------|---------|---------------|---------|--|
|                                     |                 | Access    |          | log(Lending) |          |         |         | Rate    |         |         | log(Maturity) |         |  |
| -                                   | 1               | 2         | 3        | 4            | 5        | 6       | 7       | 8       | 9       | 10      | 11            | 12      |  |
| Bank's Direct Exposure *            | -0.116**        | -0.111**  |          | 2.603        | 0.265    |         | 0.008   | 0.012   |         | -1.046  | 0.443         |         |  |
| Post Waiver                         | (0.036)         | (0.038)   |          | (2.047)      | (1.995)  |         | (0.009) | (0.009) |         | (1.617) | (1.734)       |         |  |
| Bank's Direct Exposure *            |                 |           | -0.137*  |              |          | -5.476  |         | Г       | 0.040** |         |               | 3.385   |  |
| Post Waiver Announcement            |                 |           | (0.059)  |              |          | (3.219) |         |         | (0.015) |         |               | (2.112) |  |
| Bank's Direct Exposure *            |                 |           | -0.108** |              |          | 0.810   |         |         | 0.009   |         |               | 0.164   |  |
| Post Waiver Implementation          |                 |           | (0.036)  |              |          | (1.853) |         |         | (0.009) |         |               | (1.859) |  |
| Lender FE                           | yes             | yes       | yes      | yes          | yes      | yes     | yes     | yes     | yes     | yes     | yes           | yes     |  |
| Borrower x Day FE                   | yes             | yes       | yes      | yes          | yes      | yes     | yes     | yes     | yes     | yes     | yes           | yes     |  |
| Control for Deposits and Repo share | no              | yes       | yes      | no           | yes      | yes     | no      | yes     | yes     | no      | yes           | yes     |  |
| Observations                        | 10790           | 10790     | 10790    | 3408         | 3408     | 3408    | 3408    | 3408    | 3408    | 3408    | 3408          | 3408    |  |
| $R^2$                               | 0.451           | 0.452     | 0.452    | 0.479        | 0.481    | 0.481   | 0.952   | 0.952   | 0.952   | 0.538   | 0.539         | 0.539   |  |

Table 1. Impact of the Suspension of the Weiver on Interbank Market

*Note:* Access is a dummy variable equal to one if lender grants a new loan to borrower on day t, zero otherwise. Log(Lending) is the log of unsecured interbank lending. Rate is the unsecured interbank rate. Log(Maturity) is the log maturity of unsecured interbank lending, in days. Bank's Direct Exposure is a lender's share of Greek Government bonds pledged as collateral with the ECB in total ECB collateral as of November 2014. Post Waiver is a dummy variable equal to one in period {February 04, 2015 - February 10, 2015}. Post Waiver Announcement is a dummy variable equal to one in period {February 04, 2015 - March 31, 2015}. Deposits share is the share of bank deposits in total liabilities. Repo share is the share of repos in total liabilities. Standard errors are three-way clustered at the lender, borrower and day level. Statistical significance is denoted as \*p<0.1, \*\*p<0.05, \*\*\*p<0.01.

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#### No effect on loan maturities



| Tabl                                | le 1: Im | pact of t | the Susp | ension  | of the <b>V</b> | Vaiver o | n Interl | bank M  | arket   |         |          |         |
|-------------------------------------|----------|-----------|----------|---------|-----------------|----------|----------|---------|---------|---------|----------|---------|
|                                     |          | Access    |          | lo      | g(Lendir        | ıg)      |          | Rate    |         | log     | g(Maturi | ty)     |
|                                     | 1        | 2         | 3        | 4       | 5               | 6        | 7        | 8       | 9       | 10      | 11       | 12      |
| Bank's Direct Exposure *            | -0.116** | -0.111**  |          | 2.603   | 0.265           |          | 0.008    | 0.012   |         | -1.046  | 0.443    |         |
| Post Waiver                         | (0.036)  | (0.038)   |          | (2.047) | (1.995)         |          | (0.009)  | (0.009) |         | (1.617) | (1.734)  |         |
| Bank's Direct Exposure *            |          |           | -0.137*  |         |                 | -5.476   |          |         | 0.040** |         |          | 3.385   |
| Post Waiver Announcement            |          |           | (0.059)  |         |                 | (3.219)  |          |         | (0.015) |         |          | (2.112) |
| Bank's Direct Exposure *            |          |           | -0.108** |         |                 | 0.810    |          |         | 0.009   |         |          | 0.164   |
| Post Waiver Implementation          |          |           | (0.036)  |         |                 | (1.853)  |          |         | (0.009) |         |          | (1.859) |
| Lender FE                           | yes      | yes       | yes      | yes     | yes             | yes      | yes      | yes     | yes     | yes     | yes      | yes     |
| Borrower x Day FE                   | yes      | yes       | yes      | yes     | yes             | yes      | yes      | yes     | yes     | yes     | yes      | yes     |
| Control for Deposits and Repo share | no       | yes       | yes      | no      | yes             | yes      | no       | yes     | yes     | no      | yes      | yes     |
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| $R^2$                               | 0.451    | 0.452     | 0.452    | 0.479   | 0.481           | 0.481    | 0.952    | 0.952   | 0.952   | 0.538   | 0.539    | 0.539   |

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# Could borrowers substitute losses from less affected lenders after the shock? Indirect exposure of borrowers



|                                  | log(Unsec | ured Borrowing) |                                 |
|----------------------------------|-----------|-----------------|---------------------------------|
|                                  | All banks | Greek banks     |                                 |
|                                  | 1         | 2               |                                 |
|                                  |           |                 | A Greek bank wit 1 stdev higher |
| Bank's Indirect Exposure through | -9.936**  | -4.468**        | indirect exposure received 58%  |
| Interbank Lenders * Post Waiver  | (4.060)   | (1.220)         | less funding                    |
| Borrower FE                      | yes       | yes             |                                 |
| Day FE                           | yes       | yes             |                                 |
| Observations                     | 10043     | 498             |                                 |
| $R^2$                            | 0.649     | 0.904           |                                 |

#### Table 2: Exposure to the Shock and Interbank Liquidity Crunch

*Note:* Log(Unsecured Borrowing) is the log of unsecured interbank borrowing. Bank's Indirect Exposure through Interbank Lenders is the weighted average of a borrower's interbank lenders' share of Greek Government bonds in total ECB collateral as of November 2014. As weights, we use the share of borrower-lender interbank loan volume in a borrower's total interbank borrowing before February 04, 2015. Post Waiver is a dummy variable equal to one after February 04, 2015. Standard errors are two-way clustered at the borrower and day level. Statistical significance is denoted as \*p<0.1, \*\*p<0.05, \*\*\*p<0.01.

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## Assessing negative side effects of ELA on banks' terms of borrowing



|   | Volume of To | otal Borrowing | Cost of Tota | al Borrowing | Maturity of Total Borrowing |          |  |
|---|--------------|----------------|--------------|--------------|-----------------------------|----------|--|
| . –   | 1            | 2              | 3            | 4            | 5                           | 6        |  |
| Bank's Total Exposure *                     | 0.055        | 0.055          | 5.983        | 7.295        | -15.984                     | -18.567  |  |
| Post Waiver Announcement                    | (0.061)      | (0.105)        | (7.194)      | (9.639)      | (9.025)                     | (9.866)  |  |
| Bank's Total Exposure *                     | 0.100        | 0.101          | 52.011**     | 53.323**     | -28.395                     | -30.978  |  |
| Post Waiver Implementation                  | (0.082)      | (0.122)        | (16.984)     | (17.497)     | (16.092)                    | (17.202) |  |
| Bank's Total Exposure *                     |              | 0.006          |              | 1.504        |                             | 0.670    |  |
| Post Announcement of Presidential Elections |              | (0.014)        |              | (1.311)      |                             | (1.171)  |  |
| Bank's Total Exposure *                     |              | 0.019          |              | -0.076       |                             | 0.053    |  |
| Post First Parliament Ballot                |              | (0.011)        |              | (1.863)      |                             | (1.204)  |  |
| Bank's Total Exposure *                     |              | 0.003          |              | -0.594       |                             | 1.928    |  |
| Post Second Parliament Ballot               |              | (0.011)        |              | (1.832)      |                             | (2.222)  |  |
| Bank's Total Exposure *                     |              | -0.003         |              | 1.974        |                             | -4.993** |  |
| Post Political Uncertainty                  |              | (0.081)        |              | (3.652)      |                             | (1.716)  |  |
| Bank FE                                     | yes          | yes            | yes          | yes          | yes                         | yes      |  |
| Day FE                                      | yes          | yes            | yes          | yes          | yes                         | yes      |  |
| Observations                                | 581          | 581            | 581          | 581          | 581                         | 581      |  |
| $R^2$                                       | 0.975        | 0.975          | 0.882        | 0.883        | 0.886                       | 0.888    |  |

*Note:* Total borrowing is defined as: (unsecured borrowing/liabilities) + (repo borrowing/liabilities) + (ECB borrowing/liabilities) + (ELA borrowing/liabilities). Post Announcement of Presidential Elections is a dummy variable equal to one in period {December 08, 2014 - December 16, 2014}. Post First Parliament Ballot is a dummy variable equal to one in period {December 08, 2014 - December 23, 2014 - December 29, 2014}. Post Second Parliament Ballot is a dummy variable equal to one in period {December 23, 2014 - December 29, 2014}. Post Political Uncertainty is a dummy variable equal to one in period {December 30, 2014 - February 03, 2015}. Post Waiver Announcement is a dummy variable equal to one in period {February 04, 2015 - February 10, 2015}. Post Waiver Implementation is a dummy variable equal to one in period {February 11, 2015 - March 31, 2015}. Post Political Uncertainty is a dummy variable equal to one in period {December 30, 2014 - February 03, 2015}. Standard errors are two-way clustered at the bank and day level. Statistical significance is denoted as \*p<0.1, \*\*p<0.05, \*\*\*p<0.01.

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### Lending to the real economy



We compare lending to the same firm by banks with different exposure to the liquidity shock (cross section).

 $\Delta \log(Lending)_{bf} = \beta \times Banks' Total Exposure_{b} + a_{f} + \varepsilon_{bf}$ 

 $\Delta \log(Lending)_{bf}$ : log change in lending from bank *b* to firm *f* between March 2015 and December 2014. Zooming into firms with multiple lenders allows isolating the credit supply shock from a demand-driven change in lending.

Bank's Total Exposure: sum of bank's direct and indirect exposure to the shock.

We cluster standard errors at the bank level to account for commonality of the exposure variables across firms with the same lender and at the sectoral level to deal with unobserved correlation across industries.

#### Banks with 1 stdev higher total exposure reduced their lending by 2pp



**Table 5: Lending to the Real Economy**  $\Delta \log(\text{Lending})$ 2 3 -0.113\*\*\* Bank's Total Exposure -0.109\* -0.159\*\* (0.059)(0.062)(0.038)Firm with >1 Bank Relationship no yes yes Firm FE no yes no Number of Firms 5143 1575 1575 Coverage in total number of firm 0.62% 0.19% 0.19% Coverage in total corporate debt 38.5% 29% 29% Observations 7541 3973 3973  $\mathbf{R}^2$ 0.001 0.001 0.457

*Note:*  $\Delta \log(\text{Lending})$  is the log change in lending in period March 2015 - December 2014. Bank's Total Exposure is the sum of direct and indirect exposure. Standard errors are two-way clustered at the bank and firm industry level. Statistical significance is denoted as \*p<0.1, \*\*p<0.05, \*\*\*p<0.01.

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Bank of Greece

BANK OF GREECE EUROSYSTEM

## How did ELA conditionality affect lending to the real economy?



ELA eligibility requires: Solvency (distance from minimum CET1/Tier1/total capital ratio)

Exit plans (Dependence on long-term funding, e.g., time/total deposits)

We compare lending to the same firm by banks with different exposure to the liquidity shock, different solvency and different reliance on stable funding (cross section).

 $\Delta \log(\text{Lending})_{bf} = \beta \times \text{Banks' Total Exposure}_{b} + \gamma \times \text{Bank Balance Sheet Measure}_{b} + \delta \times \text{Banks' Total Exposure}_{b} \times \text{Bank Balance Sheet Measure}_{b} + a_{f} + \varepsilon_{bf}$ 

Interaction term measures whether banks with lower solvency and/or less stable funding cut lending relatively more.

## Quantifying the role of banks' exposure to ELA conditionality on corporate lending



|                                  |          |                | Δlog(I        | ending)                |                                 |                                 |
|----------------------------------|----------|----------------|---------------|------------------------|---------------------------------|---------------------------------|
| _                                | 1        | 2              | 3             | 4                      | 5                               | 6                               |
|                                  |          | Solvency ratio | DS            |                        | Exit plans                      |                                 |
| _                                |          |                | Total Capital | Time<br>Deposits/Total | Time deposits ><br>l year/Total | Time deposits ><br>1 year/Total |
| _                                | CETI     | Tier1          | Ratio         | deposits               | deposits                        | liabilities                     |
| Bank's Total Exposure            | -1.361** | -1.150**       | -0.829**      | -3.553**               | -0.847**                        | -3.407**                        |
|                                  | (0.289)  | (0.242)        | (0.189)       | (0.814)                | (0.208)                         | (0.791)                         |
| Bank balance sheet measure       | 1.117**  | 1.119*         | 0.979         | 1.122*                 | 1.845**                         | 13.985**                        |
|                                  | (0.342)  | (0.357)        | (0.457)       | (0.356)                | (0.471)                         | (3.246)                         |
| Bank's Total Exposure *          | 13.963** | 13.955**       | 12.882**      | 0.000**                | 16.633**                        | 136.246**                       |
| Bank balance sheet measure       | (3.269)  | (3.277)        | (3.220)       | (0.000)                | (4.265)                         | (32.584)                        |
| Firm with >1 Bank Relationship   | yes      | yes            | yes           | yes                    | yes                             | yes                             |
| Firm FE                          | yes      | yes            | yes           | yes                    | yes                             | yes                             |
| Number of Firms                  | 1575     | 1575           | 1575          | 1575                   | 1575                            | 1575                            |
| Coverage in total number of firm | 0,19%    | 0,19%          | 0,19%         | 0,19%                  | 0,19%                           | 0,19%                           |
| Coverage in total corporate debt | 29%      | 29%            | 29%           | 29%                    | 29%                             | 29%                             |
| Observations                     | 3973     | 3973           | 3973          | 3973                   | 3973                            | 3973                            |
| $\mathbf{R}^2$                   | 0.460    | 0.460          | 0.460         | 0.460                  | 0 460                           | 0 460                           |

*Note:*  $\Delta \log(\text{Lending})$  is the log change in lending in period March 2015 - December 2014. Bank's Total Exposure is the sum of direct and indirect exposure. Bank balance sheet measure is a continuous variable to proxy for ELA conditionalities. In the case of solvency ratios (columns 1-3), it measures the distance from capital ratio thresholds (4.5% for CET1, 6% for Tier1 and 8% for Total Capital Ratio). In the case of exit plans, it measures reliance on stable funding which is proxied by the ratio of time deposits to total deposits, time deposits with maturity more than one year to total liabilities. Balance sheet measures are as of December 2014. Standard errors are two-way clustered at the bank and firm industry level. Statistical significance is denoted as \*p<0.1, \*\*p<0.05, \*\*\*p<0.01.

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## Could firms which faced a reduction in bank credit substitute credit from other less affected banks?



|                                | INDIC   |           | er eure s  | appij ne | aaeeron  |           |           |           |
|--------------------------------|---------|-----------|------------|----------|----------|-----------|-----------|-----------|
|                                | Nev     | w Lending | g Relation | ship     | Δ        | log(Total | Borrowin  | g)        |
| -                              | 1       | 2         | 3          | 4        | 5        | 6         | 7         | 8         |
| Firm's Banks' Total Exposure   | 0.004   | -0.000    | -0.007     | -0.004   | -0.100** | -0.120**  | -0.134*** | -0.151*** |
|                                | (0.007) | (0.005)   | (0.008)    | (0.007)  | (0.045)  | (0.051)   | (0.051)   | (0.054)   |
| Firm's Banks' Total Exposure * |         | 0.006     |            | -0.008   |          | 0.160     |           | 0.165     |
| Multi-Lender Firm              |         | (0.038)   |            | (0.038)  |          | (0.113)   |           | (0.125)   |
| Multi-Lender Firm              |         | 0.007     |            | -0.005   |          | -0.038*   |           | -0.054*   |
|                                |         | (0.008)   |            | (0.007)  |          | (0.023)   |           | (0.028)   |
| Firm Size                      |         |           | 0.009***   | 0.010*** |          |           | 0.006     | 0.009*    |
|                                |         |           | (0.002)    | (0.002)  |          |           | (0.005)   | (0.006)   |
| Firm Industry FE               | no      | no        | yes        | yes      | no       | no        | yes       | yes       |
| Firm Province FE               | no      | no        | yes        | yes      | no       | no        | yes       | yes       |
| Observations/Firms             | 5143    | 5143      | 4545       | 4545     | 5143     | 5143      | 4545      | 4545      |
| $R^2$                          | 0.000   | 0.002     | 0.096      | 0.097    | 0.001    | 0.002     | 0.104     | 0.105     |

*Note:* New Lending Relationship is a dummy variable equal to one if a firm establishes a new lending relationship in March 2015.  $\Delta \log(\text{Total Borrowing})$  is the log change in firm's total borrowing in period March 2015 - December 2014. Firm's Banks' Total Exposure is the weighted average of firm's banks' total exposure. As weights, we use the share of firm-bank loan volume in firm's total borrowing before the policy change. Multi-lender firm is a dummy variable equal to one if a firm has more than one banking relationships. Standard errors are clustered at the firm industry level. Statistical significance is denoted as \*p<0.1, \*\*p<0.05, \*\*\*p<0.01.

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#### Could firms which faced a reduction in bank credit substitute credit from other less affected banks? Table 7: Firm Credit Supply Reduction



|                                | Nev     | v Lending | Relation | ship     | Δ        | log(Total | Borrowin  | g)        |  |
|--------------------------------|---------|-----------|----------|----------|----------|-----------|-----------|-----------|--|
|                                | 1       | 2         | 3        | 4        | 5        | 6         | 7         | 8         |  |
| Firm's Banks' Total Exposure   | 0.004   | -0.000    | -0.007   | -0.004   | -0.100** | -0.120**  | -0.134*** | -0.151*** |  |
|                                | (0.007) | (0.005)   | (0.008)  | (0.007)  | (0.045)  | (0.051)   | (0.051)   | (0.054)   |  |
| Firm's Banks' Total Exposure * |         | 0.006     |          | -0.008   |          | 0.160     |           | 0.165     |  |
| Multi-Lender Firm              |         | (0.038)   |          | (0.038)  |          | (0.113)   |           | (0.125)   |  |
| Multi-Lender Firm              |         | 0.007     |          | -0.005   |          | -0.038*   |           | -0.054*   |  |
|                                |         | (0.008)   |          | (0.007)  |          | (0.023)   |           | (0.028)   |  |
| Firm Size                      |         |           | 0.009*** | 0.010*** |          |           | 0.006     | 0.009*    |  |
|                                |         |           | (0.002)  | (0.002)  |          |           | (0.005)   | (0.006)   |  |
| Firm Industry FE               | no      | no        | yes      | yes      | no       | no        | yes       | yes       |  |
| Firm Province FE               | no      | no        | yes      | yes      | no       | no        | yes       | yes       |  |
| Observations/Firms             | 5143    | 5143      | 4545     | 4545     | 5143     | 5143      | 4545      | 4545      |  |
| $R^2$                          | 0.000   | 0.002     | 0.096    | 0.097    | 0.001    | 0.002     | 0.104     | 0.105     |  |

*Note:* New Lending Relationship is a dummy variable equal to one if a firm establishes a new lending relationship in March 2015.  $\Delta \log(\text{Total Borrowing})$  is the log change in firm's total borrowing in period March 2015 - December 2014. Firm's Banks' Total Exposure is the weighted average of firm's banks' total exposure. As weights, we use the share of firm-bank loan volume in firm's total borrowing before the policy change. Multi-lender firm is a dummy variable equal to one if a firm has more than one banking relationships. Standard errors are clustered at the firm industry level. Statistical significance is denoted as \*p<0.1, \*\*p<0.05, \*\*\*p<0.01.

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#### **Trade effects**



We match the loan-level data with administrative data on firm exports at the product-destination level (5-digit SITC). We collapse the monthly data into two two-month periods, before and after the suspension of waiver. To deal with seasonality in exports, the *pre* period corresponds to February 2014 – March 2014 and the *post* period corresponds to February 2015 - March 2015. We estimate with LS the following regression:

 $Y_{fpd} = \beta_1 \times Firm's \ Banks' \ Total \ Exposure_f + a_{pd} + \varepsilon_{fpd}$ (4)

The dependent variable denotes exports (volume, value, and exit) of product *p* to destination country *d* by firm *f*. To study the extensive margin, we define an *Exit* indicator that equals one if firm *f* terminates in the *post* period an export flow (of product *p* to destination *d*), active in the *pre* period.

For the intensive margin, we look at  $\Delta \log(Exports)$ , the change in the logarithm of export flows over the two periods.

Product-destination fixed effects: estimates compare changes in exports of the same product to the same destination by firms with different exposure to the shock through their banking network.

# Trade effects: Single-lender firms reduced exports on the extensive margin

|                                      | Tabl      | e 8: Trade I | Effects          |             |          |            |
|--------------------------------------|-----------|--------------|------------------|-------------|----------|------------|
|                                      | E         | xit          | <b>Δlog(Expo</b> | ort Volume) | Δlog(Exp | ort Value) |
|                                      | 1         | 2            | 3                | 4           | 5        | 6          |
| Firm's Banks' Total Exposure         | -0.036    | 0.125*       | -0.283           | 0.037       | -0.248   | -0.089     |
|                                      | (0.048)   | (0.073)      | (0.247)          | (0.336)     | (0.173)  | (0.228)    |
| Firm's Banks' Total Exposure *       |           | -0.434**     |                  | -0.883      |          | -0.605     |
| Multi-Lender Firm                    |           | (0.186)      |                  | (0.633)     |          | (0.512)    |
| Multi-Lender Firm                    |           | 0.089*       |                  | 0.217       |          | 0.229*     |
|                                      |           | (0.050)      |                  | (0.138)     |          | (0.119)    |
| Firm Size                            | -0.030*** | -0.030***    | 0.013            | 0.005       | 0.022    | 0.004      |
|                                      | (0.005)   | (0.007)      | (0.018)          | (0.021)     | (0.019)  | (0.022)    |
| Product x Destination FE             | yes       | yes          | yes              | yes         | yes      | yes        |
| Number of firms                      | 1161      | 1161         | 921              | 921         | 921      | 921        |
| Coverage in total number of exporter | 6%        | 6%           | 5%               | 5%          | 5%       | 5%         |
| Coverage in total exports            | 67%       | 67%          | 64%              | 64%         | 64%      | 64%        |
| Observations                         | 11519     | 11519        | 6716             | 6716        | 6716     | 6716       |
| $R^2$                                | 0.368     | 0.369        | 0.325            | 0.326       | 0.335    | 0.336      |

*Note:* Exit is a dummy variable equal to one if an active export flow in the Pre period (February 2014-March 2014) terminates in the Post period (February 2015-March 2015), zero otherwise.  $\Delta \log(\text{Export Volume})$  is the log change in firm's export volume in the Pre period (February 2014-March 2014) relative to the Post period (February 2015-March 2015).  $\Delta \log(\text{Export Value})$  is the log change in firm's export value in the Pre period (February 2014-March 2014) relative to the Post period (February 2015-March 2015).  $\Delta \log(\text{Export Value})$  is the log change in firm's export value in the Pre period (February 2014-March 2015). Firm's Banks' Total Exposure is the weighted average of firm's banks' total exposure. As weights, we use the share of firm-bank loan volume in firm's total borrowing before the policy change. Multi-lender firm is a dummy variable equal to one if a firm has more than one banking relationships. Standard errors are two-way clustered at the product and destination. Statistical significance is denoted as \*p<0.1, \*\*p<0.05, \*\*\*p<0.01.

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#### **Concluding remarks**



- There are two, not necessarily contradictory, readings of the chain linking the unexpected ECB policy shock and the LOLR intervention of the Bank of Greece to corporate lending and firm exports.
- □ The first suggests that the Greek central bank's liquidity provision, even at higher costs, helped contain the crisis.
- Second, although the switch to ELA allowed banks to fully replenish their funding, following the adverse liquidity shock, its higher cost and conditionality had adverse effects on the economy, as even when looking at large corporates, we find that the relatively smaller ones depending on impacted banks experienced a credit squeeze and cut their exports.