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* Views expressed are those of the authors and do not necessarily reflect official positions of De Nederlandsche Bank.

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Impact of targeted credit easing by the ECB: bank-level evidence¹

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Abstract

The interest rate in the second series of ECB targeted longer-term refinancing operations is conditional on a participant-specific lending benchmark. The restrictiveness of this benchmark varies between banks. We employ fixed effects estimations on a unique micro-dataset and investigate the relationship between the benchmark restrictiveness and net bank lending. We find that a more restrictive benchmark is associated with more total net lending and net lending to non-financial corporates by relatively large banks. Banks that are relatively large and face the most restrictive benchmark increase their lending to the real economy with 9 to 17 percent. We find no significant effects on net lending by relatively small banks. Furthermore, the restrictiveness of the benchmark does not affect net lending to households. Our findings suggest that the design of targeted lending benchmarks influences bank credit flows and that a more binding benchmark would have been even more effective in stimulating bank lending.

Keywords: TLTRO, monetary policy, refinancing operations, credit easing, bank credit

JEL classifications: C23, E51, E58, G21

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1. Introduction

As part of its unconventional policies, the Eurosystem has implemented a first and second series of targeted longer-term refinancing operations (TLTRO-I in 2014 and TLTRO-II in 2016, respectively). The objective of the TLTROs is to stimulate bank lending to the real economy. They offer attractive funding to banks for periods up to four years. TLTROs are ‘targeted’ credit easing operations, since the amount that banks can borrow is linked to the stock of loans to non-financial corporates and households; banks with larger claims on the real economy were allowed to borrow more in the TLTROs than banks with smaller claims. Prior to the TLTROs, the ECB also conducted untargeted longer-term refinancing operations to support bank lending.²

Recent literature has examined the effectiveness of these ECB operations. Both untargeted (Andrade et al. 2015, Darracq-Paries and De Santis, 2015, Garcia-Posada and Marchetti, 2015, Casiraghi et al. 2016, Boeckx et al. 2017, De Haan et al. 2017, Jasova et al. 2018) and targeted (Altavilla et al. 2016, Balfoussia and Gibson 2016, Benetton and Fantino 2018) long term refinancing operations by the ECB supported bank lending to the real economy. However, untargeted operations also created unintended effects, such as carry trades through government bond purchases (Carpinelli and Crosignani, 2017, Crosignani et al. 2019, De Haan et al. 2019). Untargeted long-term central bank funding can incentivize banks to purchase government bonds, which they can pledge as collateral for central bank loans (Van der Kwaak, 2017). By contrast, De Haan et al. (2019) highlight the benefits of targeted credit easing and show that the TLTRO-I did not generate carry trades. The effectiveness of credit easing by the central bank thus depends on its design. Banks may be better incentivized to extend credit when their lending behavior is targeted.

The TLTRO-II creates an extra incentive for credit easing, since the interest rate is linked to a participant’s net lending.³ An increase in net lending relative to outstanding loans, compared to a

² The ECB conducted three 12-month longer-term refinancing operations (LTROs) in 2009 and one 12-month LTRO in 2011, followed by 36-month very long-term refinancing operations (VLTROs) in 2011 and 2012. See Bats et al. (2017) for an overview of all ECB’s unconventional liquidity measures in the global financial crisis.

³ The ECB has suggested that the TLTRO-II has supported bank lending to non-financial corporates. The evidence provided is based on a comparison of lending behavior between TLTRO participants and non-participants at the aggregate level (European Central Bank, 2017).

participant-specific benchmark, results in a lower interest rate charged by the central bank. The resulting interest rates lies between the rate of the main refinancing operation (MRO) and the deposit facility (DF), respectively 0 and -0.4 percent since the start of the TLTRO-II.⁴ Banks that beat the benchmark thus receive cheaper funding for their TLTRO-II liabilities.⁵

The restrictiveness of the TLTRO-II benchmark varies between banks. For the same interest rate discount, some banks are required to increase their net lending by more than others, relative to outstanding loans. By implication, the TLTRO-II benchmark may impact net lending by banks differently, as banks with a more restrictive benchmark are better incentivized to increase their net lending. The goal of this paper is to study the relationship between the restrictiveness of the TLTRO-II benchmark and net bank lending. We test the hypothesis that the benchmark restrictiveness is positively associated with net lending by banks and seek to explore whether the design of targeted credit easing operations can influence bank credit flows.

Fixed effects regressions are estimated using a unique microdata panel of all participating banks from January 2015 until January 2018. Our results suggest that a more restrictive benchmark results in more total net lending and net lending to non-financial corporates by relatively large banks, but not by relatively small banks. We find no significant positive effects on net lending to households.

The rest of this paper is organized as follows. Section 2 discusses the TLTRO-II benchmark methodology and the calculation of the TLTRO-II interest rate. Section 3 presents the methodology and data. Section 4 offers the results. Section 5 concludes.

2. Benchmark methodology and calculation of the TLTRO-II interest rate

The TLTRO-II interest rate is based on a participant's net lending to non-financial corporates and households relative to a participant-specific lending benchmark. Loans for house purchases are excluded (also in the remainder of this study, unless explicitly mentioned). The benchmark is based on the participant's net lending to non-financial corporates and households in the first reference period

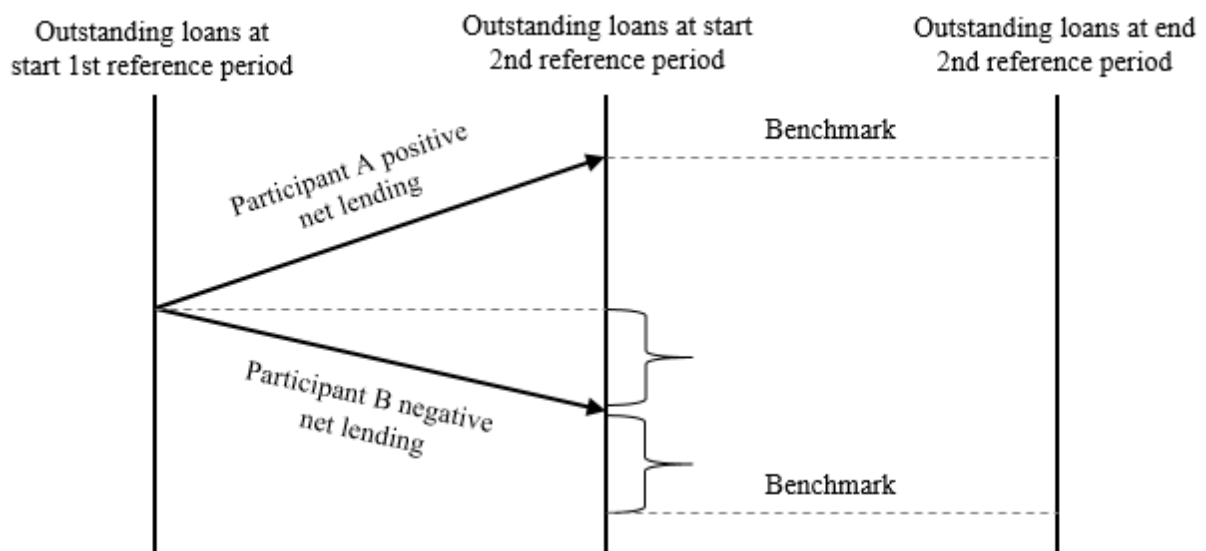
⁴ The MRO and DF are, respectively, the one-week liquidity-providing operation and the overnight standing facility for banks.

⁵ This is in contrast with the targeted credit easing operation of the Bank of England – the extension of the funding for lending scheme – where participants were penalized for lending declines via interest rate increases (Bank of England, 2016).

(February 2015 – January 2016). The restrictiveness of the benchmark differs between institutions that had positive or negative net lending in the run up to the TLTRO-II. The value of the benchmark equals outstanding loans in January 2016 for participants whose net lending was positive and equals the sum of outstanding loans in January 2016 and the net lending amount in the first reference period for participants whose net lending was negative (Figure 1 illustrates; the online appendix provides further details). The deviation of a participant’s outstanding amount of loans from the benchmark at the end of the second reference period (February 2016 – January 2018) determines the interest rate. There are three possible outcomes:

- 1) If the outstanding amount of loans at the end of the second reference period does not exceed the benchmark, the interest rate equals the MRO rate.
- 2) If the deviation from the benchmark is positive, but smaller than 2.5 percent, the interest rate equals a proportionally determined rate between the MRO and the DF rate.
- 3) If the deviation from the benchmark exceeds 2.5 percent, the interest rate equals the DF rate.

Figure 1: participant-specific lending benchmark of TLTRO-II



This figure shows the TLTRO-II benchmark methodology for participants experiencing positive and negative net lending in the first reference period. The benchmark is based on the participant’s net lending to non-financial corporates and households in the first reference period (February 2015 – January 2016). The value of the benchmark equals outstanding loans in January 2016 for participants whose net lending was positive and equals outstanding loans in January 2016 minus the net lending amount for participants whose net lending was negative.

3. Methodology and data

We model fixed effects regressions that measure the effect of the restrictiveness of the TLTRO-II benchmark on net lending. We use four dependent variables. The first three variables are net lending relative to outstanding loans in January 2016 for:

1. households;
2. non-financial corporates;
3. households and non-financial corporates.

The fourth dependent variable is net lending to households relative to total net lending (i.e. including loans for house purchases).

The following regression models are estimated:

$$HH_{i,j,t} = \alpha + \beta TLTRO_{i,j,t} + \gamma' X_{j,t} + \zeta Z_{i,j,t} + \mu_i + \varepsilon_{i,j,t} \quad (1)$$

$$NFC_{i,j,t} = \alpha + \beta TLTRO_{i,j,t} + \gamma' X_{j,t} + \zeta Z_{i,j,t} + \mu_i + \varepsilon_{i,j,t} \quad (2)$$

$$T_{i,j,t} = \alpha + \beta TLTRO_{i,j,t} + \gamma' X_{j,t} + \zeta Z_{i,j,t} + \mu_i + \varepsilon_{i,j,t} \quad (3)$$

$$HP_{i,j,t} = \alpha + \beta TLTRO_{i,j,t} + \gamma' X_{j,t} + \zeta Z_{i,j,t} + \mu_i + \varepsilon_{i,j,t} \quad (4)$$

where $HH_{i,j,t}$ represents net lending to households as a ratio of outstanding household loans in January 2016; $NFC_{i,j,t}$ is net lending to non-financial corporates as a ratio of outstanding non-financial corporate loans in January 2016; $T_{i,j,t}$ represents the total sum of net lending to households and non-financial corporates as a ratio of the total sum of outstanding non-financial corporate and household loans in January 2016; $HP_{i,j,t}$ is net lending to households as a ratio of total net lending to households (including loans for house purchases) and indicates the extent to which loans included in the benchmark increase more than loans excluded from the benchmark.; $TLTRO_{i,j,t}$ represents the indicator for the TLTRO-II benchmark restrictiveness; $X_{j,t}$ comprises the set of country-specific controls; $Z_{i,j,t}$ is a

bank-specific control variable; μ_i are bank fixed effects; $\varepsilon_{i,t}$ is the error term and the subscripts i, j, t denote the participating bank, country and the two reference periods, respectively.⁶

The benchmark restrictiveness indicator equals 0 in the first reference period, as the TLTRO-II benchmark is not yet binding in the first reference period, *de facto* implying zero restrictiveness. In the second reference period, the indicator equals the ratio of the benchmark value to the sum of outstanding non-financial corporate and household loans at the end of the first reference period; the value lies between 0 and 1 (higher values indicate a more binding constraint). Note that the indicator is a predetermined regressor, since the benchmark's restrictiveness is endogenous to a bank's past performance (see Section 2). This implies that the effects are underestimated, i.e. the effects are generally larger than our models suggest (proof available upon request). Also note that the calculation of the benchmark restrictiveness differs between banks with positive and negative net lending before the start of the TLTRO-II; while the restrictiveness varies for banks with negative net lending in the first reference period, the restrictiveness equals 1 for all banks with positive net lending in the first reference period, independent of their net lending size in the first reference period. To account for this, we perform two robustness checks. In the first check, we eliminate the difference and assume a bank's benchmark restrictiveness proportionally rises above 1 when its positive net lending is relatively larger (Figure 4 illustrates this). In the second check, we perform our original estimations on the group of banks with negative net lending in the first reference period and exclude the group of banks with positive net lending, as the restrictiveness of their benchmark is invariant.

We address demand-effects and indexation by including country-specific control variables: the quarterly-average of GDP growth, the monthly-average of the growth of the total industrial production index (excluding construction; seasonally adjusted), the monthly-average of an economic sentiment indicator and the monthly-average of HICP inflation. We control for financial shocks by including a country-specific sovereign risk (SRSK) variable that proxies a sovereign's default probability. Furthermore, we control for real economic demand by including the monthly-average of bank-specific

⁶ As a robustness check, we also substitute bank fixed effects with country fixed effects.

lending interest rates on 1- to 5-year bank loans. Bank fixed effects take account of differences between banks, such as their corporate structure, bank capitalization, funding stress and the amount borrowed under TLTRO-II.⁷

Our analysis relies on different data sources. For data on lending to the first three groups of borrowers and the calculation of the participant-specific benchmark, we use the lending data that participants provided to their national central bank for the calculation TLTRO-II interest rates. This dataset allows us to calculate the benchmark restrictiveness for all participating banks in the TLTRO-II. Data for the last group of borrowers is obtained from the ECB's Individual Balance Sheet Items (IBSI) database, since loans for house purchases are excluded from the benchmark calculation (see Section 2). We obtain all country-specific variables that control for demand-effects and indexation from Eurostat. The country-specific variable SRSK is provided by Bloomberg. The bank-specific lending rates are obtained from the ECB's interest rates statistics (IMIR) database.

The total panel includes all 755 participating banks and the two reference time periods. However, data for lending to households including loans for house purchases and bank-specific lending rates are only available for, respectively, 116 and 114 banks, since not all participants report in the IBSI and IMIR database. We therefore also model regressions without controlling for bank-specific lending interest rates. We split the sample into small and large banks, based on the median of banks' outstanding loans in January 2016.⁸ Figure 2 shows that the size of participating banks is highly skewed.⁹ Therefore, we also analyze the top 50 largest banks; they have balance sheet sizes larger than 40 billion euros and make up 57 percent of the panel's outstanding loans in January 2016. Due to data confidentiality issues, we do not provide additional descriptive statistics.

While a selection effect emerges when banks have only participated in the TLTRO-II if they knew *ex ante* that they were likely to beat the benchmark, our results are not subject to this selection bias; we

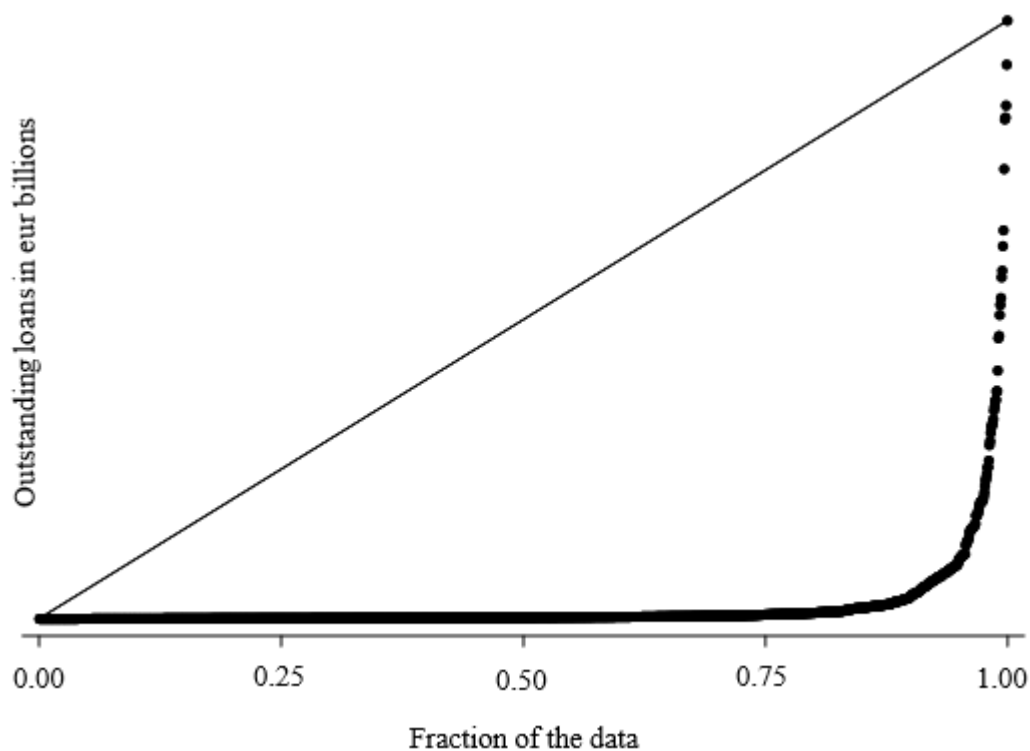
⁷ Bank fixed effects prevent a potential underestimation of the effects of the benchmark restrictiveness indicator; a less restrictive benchmark may incentivize banks to increase their total take-up amount in the TLTRO-II, *de facto* resulting in larger net lending increases.

⁸ We use outstanding loans as an indicator for banks' balance sheet size, as we do not have data on total assets for all participating banks.

⁹ The y-axis represents the sum of a bank's outstanding loans to households and non-financial corporates, but we present shares and not the actual values, given that the data used is confidential.

examine the relationship between the benchmark restrictiveness and bank net lending within the group of TLTRO-II participants. We are not studying the effectiveness of the TLTRO-II by comparing participants and non-participants. Moreover, in terms of bank credit size, more than 70 percent of all Eurosystem monetary financial institutions participated in the TLTRO-II.¹⁰ Any selection effect is therefore small. Also, deviations from the benchmark tend to be much larger than the required 2.5 percent for participants receiving the DF rate (see Figure 3).¹¹ This suggests that the benchmark was not a major hurdle for banks to receive the DF rate.

Figure 2: quantile plot of banks' size

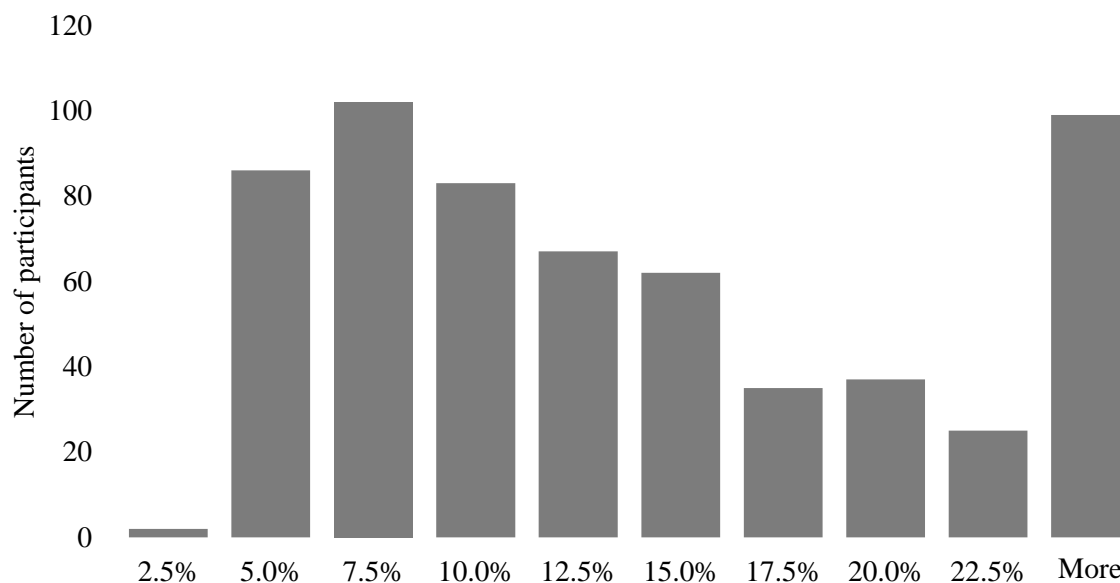


This figure shows the distribution of the sum of bank's outstanding loans to households and non-financial corporates between February 2015 and January 2018. The straight line represents an equal distribution. The distribution has 1,510 observations and includes 755 banks.

¹⁰ We use aggregated Balance Sheet Items (BSI) data from the ECB statistical data warehouse and find that relative to total outstanding loans to non-financial corporates in the Eurosystem, the percentage of participants' outstanding loans to non-financial corporates equals 73 percent.

¹¹ More than 75 percent of all participants have fully beaten the benchmark.

Figure 3: benchmark deviations for participants receiving DF rate



This figure shows the benchmark deviations for participants receiving the rate on the central bank’s deposit facility (i.e. participants that have deviated by more than 2.5 percent from the TLTRO-II benchmark). There are in total 596 participants that fully beat the benchmark.

4. Results

We employed estimations for all participating banks, for banks with outstanding loans below and above the sample median, and for the 50 largest banks. All regressions include HAC standard errors. Our results suggest that a more restrictive TLTRO-II benchmark is associated with more total net lending and net lending to non-financial corporates by relatively large banks (see Tables 1 and 2). Relatively large banks that face the most restrictive benchmark increase their net lending to the real economy with 9 to 17 percent. These effects are significant at the 1 percent confidence level.¹² We find no significant positive effects on net lending to households by large banks, both as a ratio of outstanding loans to households and relative to net lending to households including loans for house purchases (see Tables 1 and 2). For banks with outstanding loans below the sample median, we find no positive significant relationship for all borrower groups (see Table 3). Furthermore, for the entire sample, we find that the

¹² We find similar results when bank fixed effects are substituted with country fixed effects in these estimations (available upon request).

positive effects on net lending to non-financial corporates and total net lending remain statistically significant and increase to 24 and 11 percent, respectively (see Table 4).

Table 1: Results for banks with outstanding loans above the sample median

Regressors	Dependent variable							
	$HH_{i,j,t}$	$HH_{i,j,t}$	$NFC_{i,j,t}$	$NFC_{i,j,t}$	$T_{i,j,t}$	$T_{i,j,t}$	$HP_{i,j,t}$	$HP_{i,j,t}$
Benchmark restrictiveness	0.014 (0.079)	0.030 (0.057)	0.172*** (0.048)	0.139*** (0.046)	0.096*** (0.032)	0.120*** (0.034)	-123.265 (126.692)	-358.756 (333.498)
Constant	-0.051 (0.072)	0.110 (0.099)	-0.000 (0.053)	0.059 (0.122)	0.007 (0.034)	0.052 (0.084)	63.679 (84.535)	1566.505 (1458.162)
Country controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	No	Yes	No	Yes	No	Yes	No	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sqr (within)	0.015	0.133	0.072	0.317	0.098	0.316	0.024	0.115
N	748	215	750	217	754	217	210	207

Notes: This table presents fixed effects estimations for models (1), (2), (3) and (4) for banks with outstanding loans above the sample median. The dependent variables are net lending to households as a ratio of outstanding household loans in January 2016 ($HH_{i,j,t}$), net lending to non-financial corporates as a ratio of outstanding non-financial corporate loans in January 2016 ($NFC_{i,j,t}$), the total sum of net lending to households and non-financial corporates as a ratio of the total sum of outstanding non-financial corporate and household loans in January 2016 ($T_{i,j,t}$) and net lending to households as a ratio of net lending to households including loans for house purchases in January 2016 ($HP_{i,j,t}$). HAC standard errors are given in parentheses. The regressions control for demand-effects and indexation in all columns by including the following country-specific control variables: the quarterly-average of GDP growth, the monthly-average of total industrial production index growth (excluding construction; seasonally adjusted), the monthly-average of an economic sentiment indicator, the monthly-average of HICP inflation. Columns 2, 4, 6 and 8 control for real economic demand by including the monthly-average of bank-specific lending interest rates on 1- to 5-year bank loans. All columns include bank fixed effects. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

Table 2: Results for the 50 largest banks

Regressors	Dependent variable							
	$HH_{i,j,t}$	$HH_{i,j,t}$	$NFC_{i,j,t}$	$NFC_{i,j,t}$	$T_{i,j,t}$	$T_{i,j,t}$	$HP_{i,j,t}$	$HP_{i,j,t}$
Benchmark restrictiveness	-0.033 (0.042)	-0.062 (0.057)	0.115*** (0.042)	0.141*** (0.045)	0.094** (0.036)	0.107** (0.043)	-148.965 (183.906)	-968.044 (737.433)
Constant	0.045 (0.090)	0.195 (0.138)	-0.086 (0.058)	-0.136 (0.091)	-0.092 (0.058)	-0.092 (0.084)	226.533 (294.273)	4455.196 (3520.736)
Country controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	No	Yes	No	Yes	No	Yes	No	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sqr (within)	0.135	0.152	0.504	0.550	0.456	0.476	0.049	0.304
N	100	92	100	92	100	92	89	89

Notes: This table presents fixed effects estimations for models (1), (2), (3) and (4) for the 50 largest banks. The dependent variables are net lending to households as a ratio of outstanding household loans in January 2016 ($HH_{i,j,t}$), net lending to non-financial corporates as a ratio of outstanding non-financial corporate loans in January 2016 ($NFC_{i,j,t}$), the total sum of net lending to households and non-financial corporates as a ratio of the total sum of outstanding non-financial corporate and household loans in January 2016 ($T_{i,j,t}$) and net lending to households as a ratio of net lending to households including loans for house purchases in January 2016 ($HP_{i,j,t}$). HAC standard errors are given in parentheses. The regressions control for demand-effects and indexation in all columns by including the following country-specific control variables: the quarterly-average of GDP growth, the monthly-average of total industrial production index growth (excluding construction; seasonally adjusted), the monthly-average of an economic sentiment indicator, the monthly-average of HICP inflation. Columns 2, 4, 6 and 8 control for real economic demand by including the monthly-average of bank-specific lending interest rates on 1- to 5-year bank loans. All columns include bank fixed effects. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

Table 3: Results for banks with outstanding loans below the sample median

Regressors	$HH_{i,j,t}$	$NFC_{i,j,t}$	$T_{i,j,t}$
Benchmark restrictiveness	-1.167** (0.568)	0.336 (0.267)	0.198 (0.260)
Constant	1.645 (1.412)	0.055 (0.085)	0.151* (0.080)
Country controls	Yes	Yes	Yes
Bank controls	No	No	No
Bank fixed effects	Yes	Yes	Yes
R-sqr (within)	0.342	0.087	0.049
N	730	752	756

Notes: This table presents fixed effects estimations for models (1), (2) and (3) for banks with outstanding loans below the sample median. The dependent variables are net lending to households as a ratio of outstanding household loans in January 2016 ($HH_{i,j,t}$), net lending to non-financial corporates as a ratio of outstanding non-financial corporate loans in January 2016 ($NFC_{i,j,t}$) and the total sum of net lending to households and non-financial corporates as a ratio of the total sum of outstanding non-financial corporate and household loans in January 2016 ($T_{i,j,t}$). Net lending to households as a ratio of outstanding household loans including loans for house purchases is not depicted as there are almost no observations for banks with outstanding loans below the sample median. HAC standard errors are given in parentheses. The regressions control for demand-effects and indexation in all columns by including the following country-specific control variables: the quarterly-average of GDP growth, the monthly-average of total industrial production index growth (excluding construction; seasonally adjusted), the monthly-average of an economic sentiment indicator, the monthly-average of HICP inflation. The regressions do not control for bank-specific lending interest rates, since there are too little observations for small banks. All columns include bank fixed effects. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

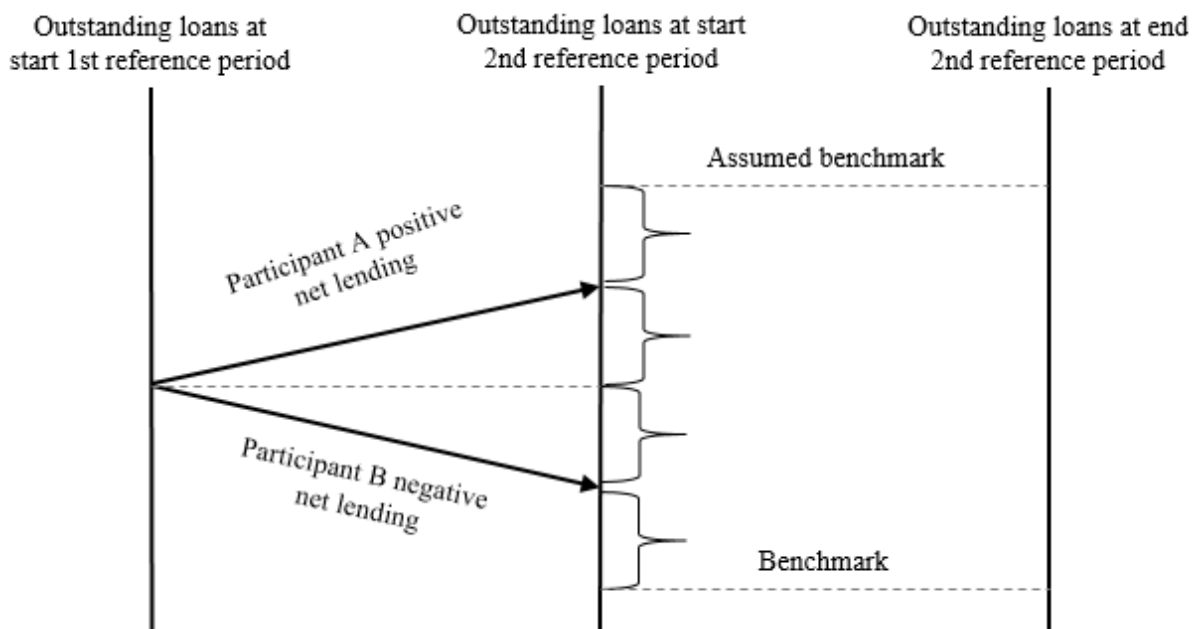
Table A.4: Results for total panel

Regressors	Dependent variable							
	$HH_{i,j,t}$	$HH_{i,j,t}$	$NFC_{i,j,t}$	$NFC_{i,j,t}$	$T_{i,j,t}$	$T_{i,j,t}$	$HP_{i,j,t}$	$HP_{i,j,t}$
Benchmark restrictiveness	-0.318 (0.198)	0.037 (0.058)	0.241*** (0.082)	0.129*** (0.045)	0.121 (0.076)	0.110*** (0.033)	-120.967 (124.073)	-328.379 (310.124)
Constant	0.801 (0.590)	0.002 (0.210)	0.006 (0.046)	0.146 (0.103)	0.151* (0.080)	0.128* (0.072)	31.832 (53.560)	1285.194 (1222.134)
Country controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank controls	No	Yes	No	Yes	No	Yes	No	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-sqr (within)	0.186	0.116	0.072	0.340	0.049	0.332	0.023	0.097
N	1478	221	1502	223	756	223	214	211

Notes: This table presents fixed effects estimations for models (1), (2), (3) and (4) for the total panel. The dependent variables are net lending to households as a ratio of outstanding household loans in January 2016 ($HH_{i,j,t}$), net lending to non-financial corporates as a ratio of outstanding non-financial corporate loans in January 2016 ($NFC_{i,j,t}$), the total sum of net lending to households and non-financial corporates as a ratio of the total sum of outstanding non-financial corporate and household loans in January 2016 ($T_{i,j,t}$) and net lending to households as a ratio of net lending to households including loans for house purchases in January 2016 ($HP_{i,j,t}$). HAC standard errors are given in parentheses. The regressions control for demand-effects and indexation in all columns by including the following country-specific control variables: the quarterly-average of GDP growth, the monthly-average of total industrial production index growth (excluding construction; seasonally adjusted), the monthly-average of an economic sentiment indicator, the monthly-average of HICP inflation. Columns 2, 4, 6 and 8 control for real economic demand by including the monthly-average of bank-specific lending interest rates on 1- to 5-year bank loans. All columns include bank fixed effects. Significance levels: * p<0.1, ** p<0.05, *** p<0.01.

We perform two robustness checks to account for the heterogeneous calculation of the benchmark’s restrictiveness between banks with positive and negative net lending in the first reference period (see the methodology for an explanation). In the first robustness check, we eliminate the difference and assume that the benchmark restrictiveness indicator proportionally rises above 1 when net lending in the first reference period is positive. This indicator thus controls for the trend in net lending in the first reference period across all participating banks homogeneously (see Figure 4). In the second robustness check, we exclude banks with positive net lending in the first reference period from the sample of relatively large banks and perform our estimations solely on the group of banks for which the restrictiveness of the benchmark is heterogeneous.¹³ We find that the results are similar (available upon request). A more restrictive benchmark is associated with more total net lending and net lending to non-financial corporates, even when banks are required to beat their own positive net lending trend, or when the group of banks with invariant benchmark restrictiveness indicators are excluded.

Figure 4: homogenous participant-specific lending benchmark of TLTRO-II



This figure illustrates our robustness check approach to account for the heterogeneous calculation of the benchmark’s restrictiveness between banks with positive and negative net lending in the first reference period (see the methodology for an explanation). We eliminate the difference between the groups of banks and assume a bank’s benchmark restrictiveness proportionally rises above 1 when its positive net lending is relatively larger. The benchmark is based on the participant’s net lending to non-financial corporates and households in the first reference period (February 2015 – January 2016). The value of the benchmark equals outstanding loans in January 2016 plus the net lending amount for both groups.

¹³ Note that performing our estimations solely on the group of banks with positive net lending in the first reference period is uninformative, as the benchmark restrictiveness indicator is a dummy variable for those banks.

5. Conclusion

This study uses a unique dataset and sheds light on the success of the ECB's TLTRO-II benchmark. We find that a more restrictive benchmark results in more total net lending and net lending to non-financial corporates by relatively large banks, but not by relatively small banks. This implies that the TLTRO-II benchmark was an effective credit easing instrument; the large banks make up the largest share in total bank credit supply and are most relevant for the bank lending channel. The restrictiveness of the TLTRO-II benchmark did not impact net lending to households, however.

Our findings suggests that the design and restrictiveness of targeted lending benchmarks can influence bank credit flows. This is relevant for monetary policy makers. However, the TLTRO-II benchmark was relatively easy to beat. Our results suggest that a more binding benchmark would have been even more effective in stimulating net lending by relatively large banks. Likewise, lending benchmarks targeted on specific groups of borrowers can change the borrowing composition of bank credit, and negative lending benchmarks may even restrict bank credit flows to particular borrowers, but this cannot be tested.

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7. Online appendix

Box A.1: The TLTRO-II benchmark and calculation of the interest rate

A participant's TLTRO-II interest rate is conditional on the following outstanding amount benchmark:

$$Benchmark_i = OL_{i,Jan16} + \min(NL_{i,Feb15-Jan16}, 0) \quad (A.1)$$

where $Benchmark_i$ represents the outstanding amount benchmark; $OL_{i,Jan16}$ is the amount of eligible loans outstanding in January 2016 and $NL_{i,Feb15-Jan16}$ is the amount of eligible net lending during the first reference period (Feb 2015 – Jan 2016) and the subscript i represents the TLTRO-II participant.

The performance of a TLTRO-II participant is measured by summing $OL_{i,Jan16}$ and a participant's eligible net lending in the second reference period between February 2016 and January 2018. This is defined as:

$$LS_i = OL_{i,Jan16} + NL_{i,Feb16-Jan18} \quad (A.2)$$

where LS_i represents the amount of eligible loans outstanding after the second reference period (Feb 2016 – Jan 2018) and $NL_{i,Feb16-Jan18}$ is eligible net lending during the second reference period.

A performance measure calculates the percentage deviations of LS_i from $Benchmark_i$, and is defined as:

$$PM_i = \frac{(LS_i - Benchmark_i)}{Benchmark_i} * 100 \quad (A.3)$$

where PM_i is the performance measure. Ratio (A.3) does not hold when $Benchmark_i$ equals zero.

PM_i is then assumed to equal 2.5.¹⁴

Finally, the TLTRO-II interest rate is calculated on the basis of PM_i and has three outcomes:

- 1) If $PM_i \leq 0$, then $r_{i,k} = MRO_k$
- 2) If $PM_i \geq 2.5$, then $r_{i,k} = DF_k$
- 3) If $0 < PM_i < 2.5$, then $r_{i,k} = MRO_k - \frac{(MRO_k - DF_k) * PM_i}{2.5}$

¹⁴ In the data we find that this only applies to two banks, however.

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