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Assessing the effectiveness of Directive 16

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Research Motivation

- Directive aim: Directive 16 **was announced on 29th March 2019**, having the objective of curbing the build-up of systemic risk by preventing borrowers' excessive indebtedness. Directive 16 **became effective on 15th July 2019**.

- Research objective: to investigate whether the adoption of Directive 16 caused any change in the loan characteristics **(e.g., loan amount and loan maturities)** of the borrowers impacted.

- Research questions:

  1. How did the **implementation of Directive 16 impact financial resilience**, such as the loan amounts and collateral being granted?

  2. To what extent has **the Directive impacted banks' lending standards**, mainly the loan-to-value (LTV) ratio?

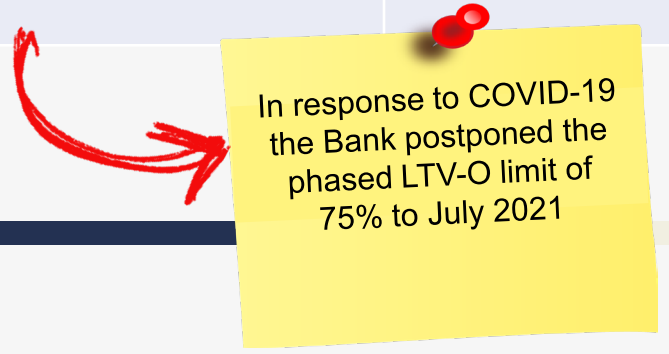
  3. How would **the lending landscape have evolved in the absence of the Directive**?

Core Concepts

Directive 16 applies to lenders issuing Residential Real Estate (RRE) credit and to borrowers (resident & non-resident) being granted RRE loans.

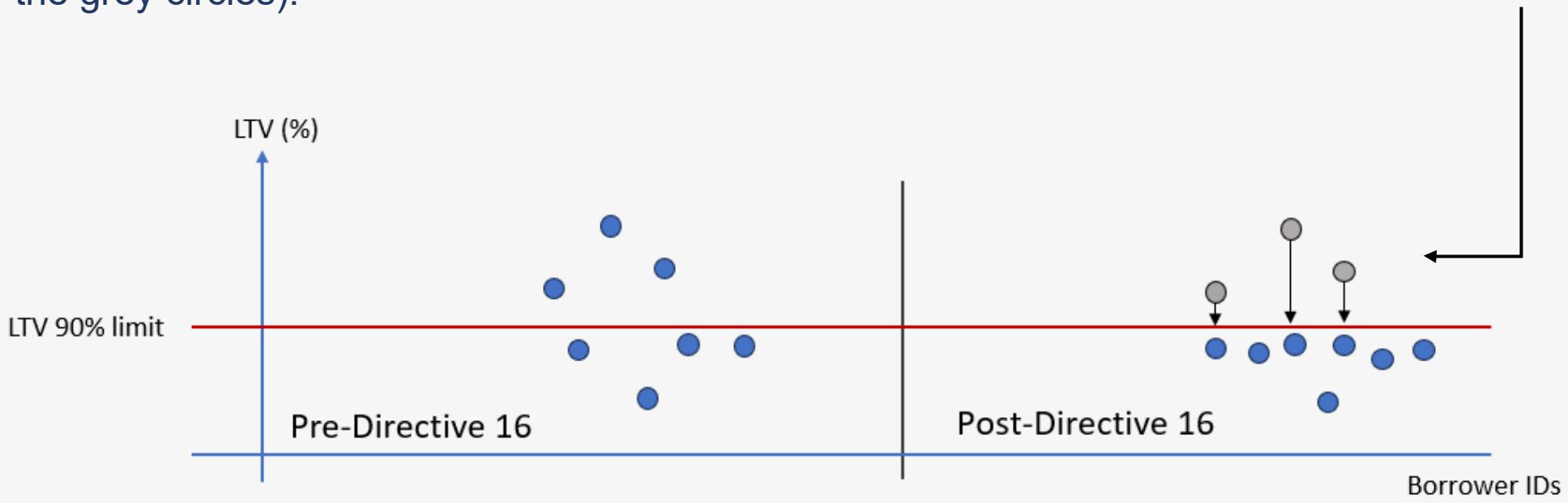
Borrower type	Loan-To-Value	Debt Service-To-Income
Category I Borrower: Borrowers purchasing their primary residence, having no outstanding RRE liabilities at origination A maturity term of **40 years** or the official retirement age – whichever occurs first	**90% LTV-O** cap with a *Speed Limit** of 10% on the volume of loans, for loans with a market value in excess of €175,000	A stressed **DSTI-O of 40%** for loans with a market value in excess of €175,000 with a shock to interest rates of **+150 bps**
Category II Borrower: Residual category to capture the rest of exposures under the scope of Directive 16 A maturity term of **25 years** or the official retirement age – whichever occurs first	**75% LTV-O** (**85%** one-year post implementation) cap with a *Speed Limit** of 20% on the volume of loans	A stressed **DSTI-O of 40%** with a shock to interest rates of **+150 bps**

Notes: Speed Limit means the restriction of the volume (in terms of number of loans) of new RRE lending at LTV-O over the thresholds stipulated in D16



Directive 16 comes into play: the identification challenge

In the absence of the Directive, the actual LTV and sDSTI ratios preferred by borrowers after its implementation cannot be observed, since their behaviour is now constrained (borrowers represented by the grey circles).



We employ **statistical** and **machine-learning** techniques to infer the LTV level a borrower would have chosen had Directive 16 not been in place: this information is crucial for constructing a counterfactual.

How to quantify potential impacts?

We estimate the average policy effect on a set of variables of interest via the ***Average Treatment effect on the Treated*** (ATT) → change relative to what would have occurred had Directive 16 not been introduced:

$$ATT = \left(Y_{after} - Y_{before}\right)_{Treated} - \left(Y_{after} - Y_{before}\right)_{Control}$$

here:

- Y_{after} : outcome variable after the implementation of Directive 16
- Y_{before} : outcome variable before the announcement of Directive 16
- **Treated**: Borrowers with LTV > 90%, LTV > 85%, or sDSTI > 40% before March 2019, or borrowers recorded after July 2019 identified as similar to them — i.e., those likely to be highly leveraged had Directive 16 not been implemented.
- **Control***:* Borrowers with LTV ≤ 90%, LTV ≤ 85%, or sDSTI ≤ 40% before March 2019, or borrowers recorded after July 2019 identified as similar to them — i.e., those likely to be low-leveraged.

The outcome variables span several key risk-metrics and contract-related characteristics, such as LTV, sDSTI, loan amount, loan maturity, loan-to-income ratio (LTI), house appraisal (house price), maturity, collateral, etc.

The estimation of ATT can be performed by using several statistical techniques (OLS, GMM etc.).

Preview of Main Results

- **In the absence of Directive 16, Category 1 high-LTV borrowers** (representing 2.5% of whole loan population and 5.1% of eligible population) would have had:

  - A **larger loan amount of about 10%**
  - A **higher collateral value (as a measure of house prices) by about 12%**
  - A **higher sDSTI of about 6 percentage points**

  In aggregate terms, over the whole portfolio of new mortgage loans, such variations account for a reduction of **0.31%** of total outstanding credit issued and **0.28%** of collateral values.

- Only few **Category 2 high-LTV borrowers** are present in the data. This small representation makes it challenging to draw meaningful conclusions regarding the Directive's impact on this specific group of borrowers.

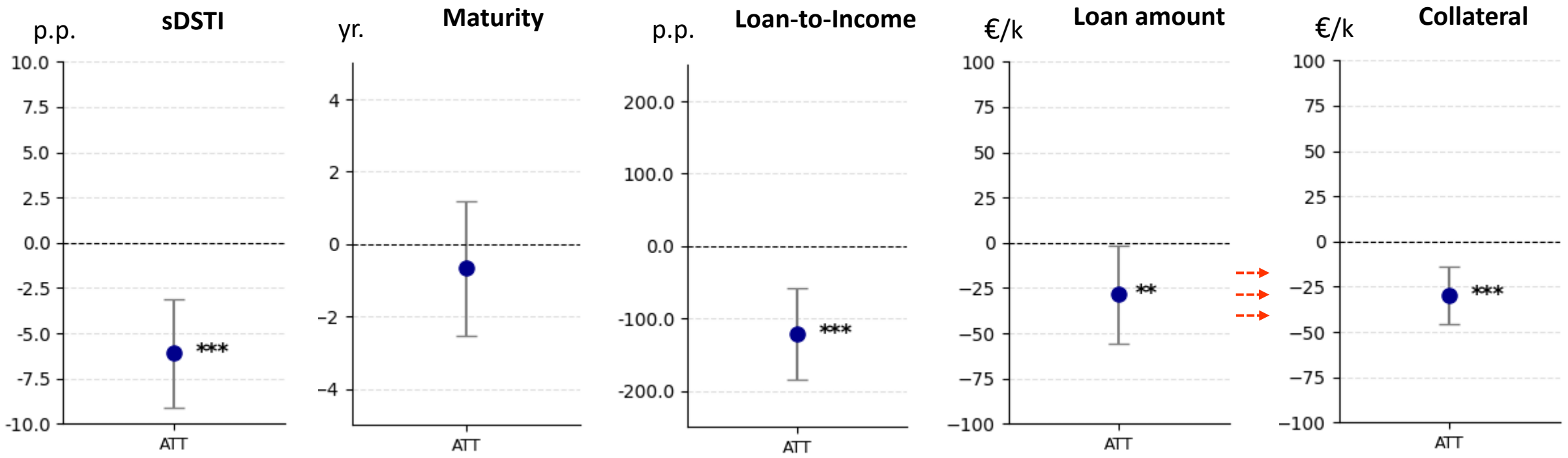
- Borrowers **constrained by sDSTI** (representing historically 6.6% of the whole population), do not experience any significant variation in loan measures such as loan amount, on average.

Results: LTV – Category 1 borrowers

Main findings

The overall impact of Directive 16 is limited, affecting only **5.1% of Category 1 borrowers** and **2.5% of the whole loan population**.

In absence of the Directive, Category 1 borrowers impacted by the LTV limit would have had a **larger loan amount and collateral value by approximately 10%**, and a **larger sDSTI by approximately 6 p.p.**



Notes: The LOGIT model used to estimate propensity scores shows McFadden's and Tjur's R2 values of about 15%, with both the LR and Wald tests significant (***).

Results: LTV – Category 2 borrowers

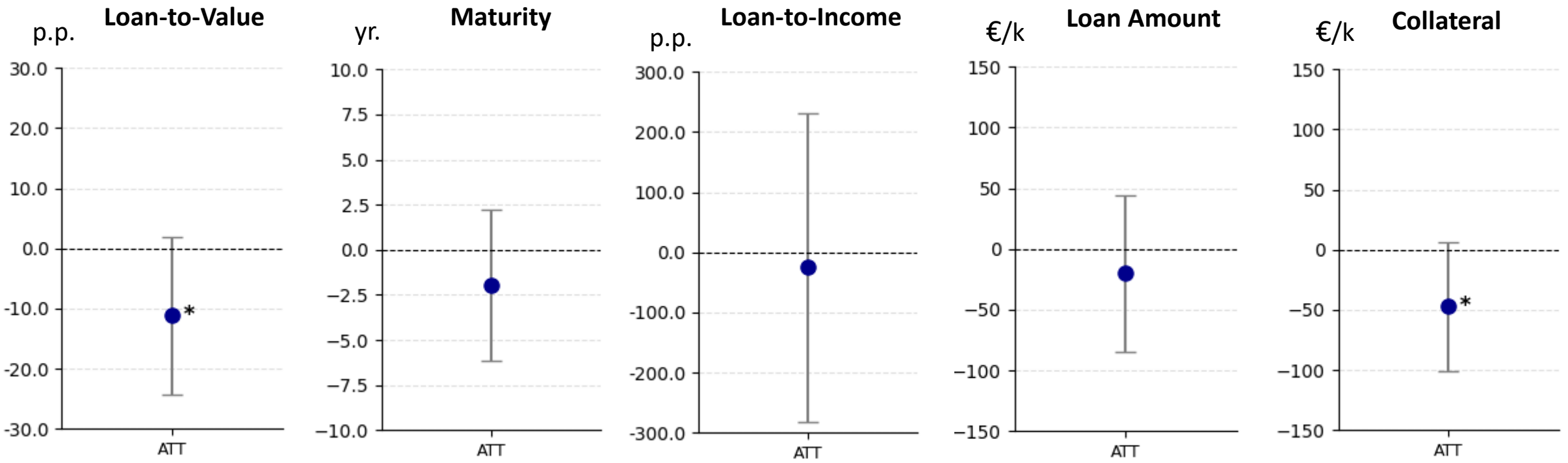
Main findings

- Exploring Directive 16 impacts requires a migration of high-LTV borrowers to lower LTV values, such distributional shift is an essential assumption for model identification and reliability.
- Such shift is not visible enough for Category 2 borrowers: only a small portion of those borrowers recorded a LTV close to the regulatory cap after the introduction of Directive 16.
- This data gap renders the borrower segment of interest extremely sparse.
- Given the small sample size, it is **not possible to accurately assess and make inference** about the impact of the LTV limit on this group.
- In fact, when analysing these borrowers, **no consistent or reliable patterns** have emerged following the introduction of the Directive.

Results: sDSTI – Category 1 & Category 2 borrowers

Main & Additional findings

The results for the stressed-DSTI indicate a **less pronounced pattern**, exhibiting similar dynamics to those observed for LTV Category 1 borrowers, marked **by lower statistical significance across estimates**.



Notes: The LOGIT model used to estimate propensity scores shows McFadden's and Tjur's R2 values of about 3-4%, with both the LR and Wald tests significant (**).

Results: stressed Debt-to-Income

Main findings

- The introduction of the sDSTI limit yields **an uncertain and statistical insignificant set of outcomes**.

- A summary of key observations is provided below:

  In absence of the sDSTI limit:
  - Loan amounts *may* have been higher for borrowers impacted by the sDSTI limit;
  - No significant change in property values was observed;
  - Consequently, both the loan-to-income (LTI) and LTV ratios *may* have been higher for borrowers impacted by the sDSTI limit.

- It is important to note that these **findings are indicative** and **do not constitute definitive evidence of the sDSTI impact**.

Conclusion

- Directive 16 rationed credit among high-LTV borrowers: Category 1 borrowers would have taken out loans that are about 10% larger, backed by collateral values (composed mainly of house prices) of about 12% higher, and with an sDSTI higher by about 6 percentage points (corresponding to an increase of roughly 4 p.p. in the DSTI ratio).

- If we consider the entire portfolio of new loans issued over the 6-month period, this reduction came at a minor cost: the total outstanding amount would have been 0.31% higher, and the collateral value 0.28% higher.

- **These constrained borrowers represents only a minority of borrowers (2.5% of population).**

- Our results are consistent with the literature on borrower-based measures: Norway −6/–10% for both house prices and loan amounts (Aastveit 2021); Israel FTB prices −10% (Tzur-Ilan 2023); Brazil −10/–30% for house prices and −5/–20% for loan amounts (De Araujo 2020).[1]

[1] *The definition of house prices differs across literature. Moreover, different LTV limits in terms of magnitude were analysed across these studies.*