

# SPRING RESEARCH UPDATE

**6 JUNE 2023**



## ON TODAY'S CALL



**DR. CHRISTIAN THUN**  
CHIEF EXECUTIVE OFFICER,  
EUROPEAN DATAWAREHOUSE

✉ [christian.thun@eurodw.eu](mailto:christian.thun@eurodw.eu)



**LUDOVIC THEBAULT, PHD**  
HEAD OF RESEARCH,  
EUROPEAN DATAWAREHOUSE

✉ [ludovic.thebault@eurodw.eu](mailto:ludovic.thebault@eurodw.eu)



**LAURA GÖTZ**  
DOCTORAL CANDIDATE & RESEARCH ASSISTANT,  
EBS UNIVERSITÄT FÜR WIRTSCHAFT UND RECHT

✉ [laura.goetz@ebs.edu](mailto:laura.goetz@ebs.edu)

# AGENDA

**WELCOME & INTRODUCTION**

**RECENT PUBLICATIONS**

**RESEARCH TIPS**

**STATUS OF EDW'S ADJUSTED DATABASE**

**CALCULATED FIELDS (Q4 2022 UPDATE)**

**MORTGAGE RISK MANAGEMENT AND CLIMATE CHANGE**

- Laura Götz, EBS University of Business & Law

**Q & A**

# **WELCOME & INTRODUCTION**

**DR. CHRISTIAN THUN, EUROPEAN DATAWAREHOUSE**

# **RECENT PUBLICATIONS**

**LUDOVIC THEBAULT, EUROPEAN DATAWAREHOUSE**

# IMPACT OF HIGHER ENERGY PRICES ON ABS SMES

[https://eurodw.eu/research\\_articles/impact-of-higher-energy-prices-on-abs-smes-still-appears-limited/](https://eurodw.eu/research_articles/impact-of-higher-energy-prices-on-abs-smes-still-appears-limited/)

## EDW LOAN-LEVEL ANALYSIS

The EU Guidelines 2020/1 mentions NACE codes of energy-intensive industry sectors in Annex 3 and Annex 5. These NACE codes can in turn easily be found in our database.

Exhibit 1 lists the exposure of ABS SME portfolio to energy-intensive industries per country, as a percentage of total loan balance and a percentage of the number of loans.

EXHIBIT 1: Exposure of SME Securitizations to Energy-Intensive Industries

Country	Loan Balance	No. of Loans	% of Loans	% of Loans
Italy	18.15	517,263	25.8%	11.1%
Germany	8.25	51,260	23.8%	13.3%
Portugal	6.8	201,269	17.4%	13.4%
Spain	5.3	42,348	14.5%	6.5%
France	8.8	52,463	4.2%	5.4%
Netherlands	25.4	123,218	7.5%	6.2%
Belgium	22.6	7,516	5.2%	4.3%

Source: European DataWarehouse (data as of Q4 2022)

Note: Only active loans with a valid NACE code were considered (NACE code different from one of the ND options presents in the Securitization Regulation)

Notably, Italian and German securitisations display the highest exposure to energy-intensive SMEs. The fact that the loan balance percentage generally exceeds the number of loans percentage indicates that energy intensive SMEs require rather larger loans than other SMEs, and perhaps also, that they are larger SMEs.

Exhibit 2 lists the share of the various industries within the high-energy consumption subset. Mining and quarrying are notoriously energy intensive but only represent a very small portion of the securitised pools (1%).

EXHIBIT 2: Composition of EDW's Energy Intensive SME Subset

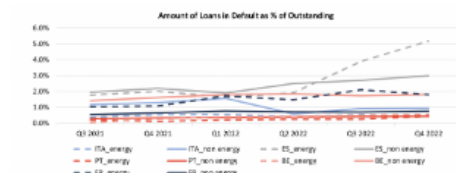
NACE code	% of SMEs with high energy consumption
08 - Manufacture of fabricated metal products, except machinery and equipment	14.4%
10 - Manufacture of machinery and equipment	13.7%
11 - Manufacture of food products	13.4%
12 - Other manufacturing	7.2%
13 - Manufacture of chemical and allied products, except basic inorganic chemical	6.4%
14 - Manufacture of textiles	5.4%
15 - Manufacture of other non-metallic mineral products	5.3%
16 - Manufacture of rubber and plastic products	5.3%
17 - Manufacture of leather and leather products	5.3%
18 - Manufacture of wood and wood products	5.3%
19 - Manufacture of paper and paper products	5.3%
20 - Manufacture of other non-metallic mineral products	5.3%
21 - Manufacture of metal machinery and equipment	5.3%
22 - Manufacture of electrical machinery and equipment	5.3%
23 - Manufacture of transport equipment	5.3%
24 - Manufacture of other transport equipment	5.3%
25 - Manufacture of furniture and other household goods	5.3%
26 - Manufacture of electronic and optical equipment	5.3%
27 - Manufacture of other electronic and optical equipment	5.3%
28 - Manufacture of other metal machinery and equipment	5.3%
29 - Manufacture of other metal machinery and equipment	5.3%
30 - Manufacture of other metal machinery and equipment	5.3%
31 - Manufacture of other metal machinery and equipment	5.3%
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98 - Manufacture of other metal machinery and equipment	5.3%
99 - Manufacture of other metal machinery and equipment	5.3%

Source: European DataWarehouse (Q4 2022)

Note: Only active loans with a valid NACE code were considered (NACE code different from one of the ND options presents in the Securitization Regulation). This data reflects the latest loan-by-loan submission for each SME public deal made in Q3 2022.

Spain, Portugal, and France are the jurisdictions where we observe an increase in defaults for energy intensive industries since Q3 2021. Spain shows the highest percentage of loans in default with 3% for non-energy-intensive and 5.2% for energy intensive SMEs. In France, the proportion of defaulted loans progressed faster for energy intensive SMEs than for the others, but we note that they were already underperforming in Q3 2021. In Italy however, defaults are higher for non-energy intensive SMEs.

EXHIBIT 3: Defaults Show Gradual Increase Since Q3 2021



Source: European DataWarehouse

EXHIBIT 4: Share of all Loans vs Share of all Defaulted Loans, by Country

	ITALY		SPAIN		PORTUGAL		NETHERLANDS		BELGIUM		FRANCE	
Summary	% Loans	% Def.	% Loans	% Def.	% Loans	% Def.	% Loans	% Def.	% Loans	% Def.	% Loans	% Def.
A - Agriculture, forestry and fishing	5%	3%	15%	4%	4%	1%	29%	37%	6%	3%	1%	1%
B - Mining and quarrying	0%	0%	0%	6%	0%	0%	0%	0%	0%	0%	0%	0%
C - Manufacturing	28%	16%	16%	19%	19%	19%	8%	8%	8%	8%	11%	25%
D - Electricity, gas, steam and air conditioning supply	1%	0%	1%	0%	3%	0%	1%	0%	0%	0%	0%	3%
F - Construction	8%	12%	4%	4%	5%	6%	5%	5%	5%	2%	3%	5%
H - Transporting and storage	3%	3%	5%	4%	4%	8%	6%	2%	2%	2%	2%	2%
I - Accommodation and food service activities	7%	16%	11%	23%	12%	7%	4%	1%	3%	9%	5%	7%
J - Information and communication	2%	3%	1%	2%	1%	2%	1%	0%	2%	1%	2%	3%
K - Financial and insurance activities	0%	0%	3%	0%	1%	0%	1%	0%	8%	4%	8%	3%
L - Real estate activities	9%	13%	11%	5%	13%	0%	18%	2%	20%	8%	30%	16%
M - Professional, scientific and technical activities	4%	2%	5%	4%	5%	3%	3%	11%	13%	25%	5%	9%
N - Administrative and support service activities	8%	4%	3%	2%	2%	2%	2%	7%	3%	8%	3%	1%
P - Education	0%	0%	1%	1%	1%	0%	1%	0%	1%	0%	0%	0%
Q - Human health and social work activities	1%	2%	2%	1%	3%	0%	4%	2%	13%	7%	1%	5%
R - Arts, entertainment and recreation	1%	1%	1%	4%	0%	1%	1%	0%	1%	13%	0%	0%
S - Other services activities	1%	1%	4%	3%	1%	0%	1%	0%	2%	0%	0%	0%

Source: European DataWarehouse (Q4 2022)

# LOAN IDENTIFIER REOCCURRENCE SCORE

<https://eurodw.eu/understanding-edws-loan-identifier-reoccurrence-score/>

## THE EVOLUTION OF ID REPORTING CONSISTENCY

For RMBS deals, ID reporting consistency has improved over time, as shown in EXHIBIT 1 below.

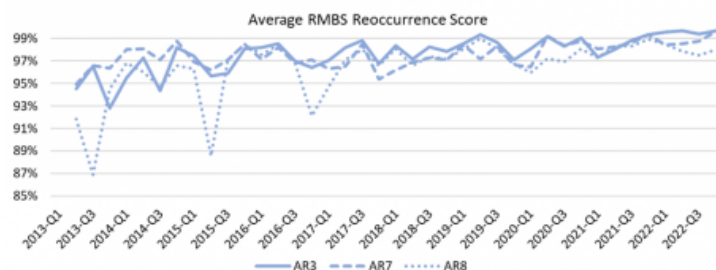


Exhibit 1: Evolution of the Average Reoccurrence Scores for RMBS

Source: European DataWarehouse

EDW's Loan ID Reoccurrence Score is a traceability score rather than a data quality score, and a change of ID is not necessarily a data quality error. For instance, as per the ECB taxonomy for RMBS, loan ID changes were acceptable as long as the new ID featured the old ID followed by the new ID and comma separated. This requirement was often not applied.

When a loan ID changes for a given EDCODE+PCD, EDW encourages users to check if the borrower ID changes as well. When this is not the case, the borrower ID completed by other static loan characteristics (such as loan rank or origination date) may make loan tracking easier.

Loan and Borrower ID reporting consistency matters when loans are tracked over time, as is the case when performing certain defaults, recovery, and prepayment calculations.

In summary, the reports tracks the reoccurrence of 13 identifiers for 6 asset classes for all public deals from 2013 to 2022.

For each asset class, the ECB taxonomy has a loan identifier and a borrower identifier; RMBS also has a property identifier.

The calculations are based on EDW's Adjusted Database, in which the identifiers have not been modified until now, but from which some submissions were excluded due to data quality issues.



# EUROPEAN BENCHMARKING EXERCISE – UPDATED REPORT ON PRIVATE DEALS (1)

The European Benchmarking Exercise was recently updated and is available on the EDW website

European DataWarehouse (EDW), in partnership with TSI and AFME, has co-authored a report as part of the European Benchmark Exercise on private securitisations.

In particular, EDW has collected and aggregated confidential data on private securitisations provided for this specific purpose by 12 European banks.

This is the third report following the inaugural issue featuring data as of June 2021 and a follow-up report featuring data as of December 2021. Now including data as of June 2022, this updated report covers one full year period for the first time.

## THE EVOLUTION OF PRIVATE TRANSACTION RATINGS

This new report includes a transition matrix, comparing the evolution of the ratings on the private transactions from Q4 2021 to Q4 2022.

Looking at the combination of Participant ID and Asset ID as a unique commitment identifier, 31 new commitments were found and 33 were dropped in the first half of 2022.

With this new approach in identifying commitments over time a migration matrix for commitments was produced.

## SECURITISATION AS A STABLE AND RELIABLE FUNDING SOURCE

The matrix below shows that transaction ratings were fairly stable in the first half of 2022, and even improved somewhat. This may be due to transaction-related measures such as the increase of collateralization or an economic improvement despite the Ukraine war and the impact on energy prices.

Evolution of the Ratings on Private Transactions From 2021-Q4 to 2022-Q4

	30-06-2022											
	AAA	AA	A	BBB	BB	B	CCC	C	D	NR	ND	Dropped
31-12-2021	67	6	-	1	-	-	-	-	-	-	-	9
AA	18	156	9	1	-	-	-	-	-	-	-	5
A	4	11	125	6	-	-	-	-	-	-	-	10
BBB	-	1	4	56	1	-	-	-	-	-	-	6
BB	-	-	-	-	6	-	-	-	-	-	-	-
B	-	-	-	-	-	-	-	-	-	-	-	-
CCC	-	-	-	-	-	-	-	-	-	-	-	-
C	-	-	-	-	-	-	-	-	-	-	-	-
D	-	-	-	-	-	-	-	-	-	-	-	-
NR	-	-	-	-	-	-	-	-	-	18	-	3
ND	-	-	-	-	-	-	-	-	-	3	1	-
NEW IN 2022	6	10	7	8	-	-	-	-	-	-	-	-

Source: Updated EBE Report

Evolution of the Ratings on Private Transactions From 2021-Q4 to 2022-Q4

	30-06-2022											
	AAA	AA	A	BBB	BB	B	CCC	C	D	NR	ND	Dropped
31-12-2021	67	6	-	1	-	-	-	-	-	-	-	9
AA	18	156	9	1	-	-	-	-	-	-	-	5
A	4	11	125	6	-	-	-	-	-	-	-	10
BBB	-	1	4	56	1	-	-	-	-	-	-	6
BB	-	-	-	-	6	-	-	-	-	-	-	-
B	-	-	-	-	-	-	-	-	-	-	-	-
CCC	-	-	-	-	-	-	-	-	-	-	-	-
C	-	-	-	-	-	-	-	-	-	-	-	-
D	-	-	-	-	-	-	-	-	-	-	-	-
NR	-	-	-	-	-	-	-	-	-	18	-	3
ND	-	-	-	-	-	-	-	-	-	3	1	-
NEW IN 2022	6	10	7	8	-	-	-	-	-	-	-	-

Source: Updated EBE Report



## EUROPEAN BENCHMARKING EXERCISE – UPDATED REPORT ON PRIVATE DEALS (2)

<https://eurodw.eu/european-benchmarking-exercise-for-private-securitisations-now-covers-one-complete-year/>

- Report co-authored with AFME and TSI
- Data provided in aggregated form by 12 banks from 6 EU countries
- Data received accounts for €67 billion in commitments
- Amount of assets for private deals estimated to exceed €183 billion
- Trade Receivables and Auto Loans or Leasing make up ca. 82% of the market, of which 33% and 88% respectively are funded through syndicated transactions
- Of all transactions by volume, 88% were undertaken by sellers with ratings of BBB and below at inception
- In contrast, the average transaction rating is in the range A to AA. This shows that private cash securitisations provide a cost-effective means of financing for lower rated sellers

# EUROPEAN BENCHMARKING EXERCISE – UPDATED REPORT ON PRIVATE DEALS (3)

The European Benchmarking Exercise now covers one complete year

This report now includes a ratings transition matrix, which shows that in the first half of 2022, transaction ratings were fairly stable and even have improved

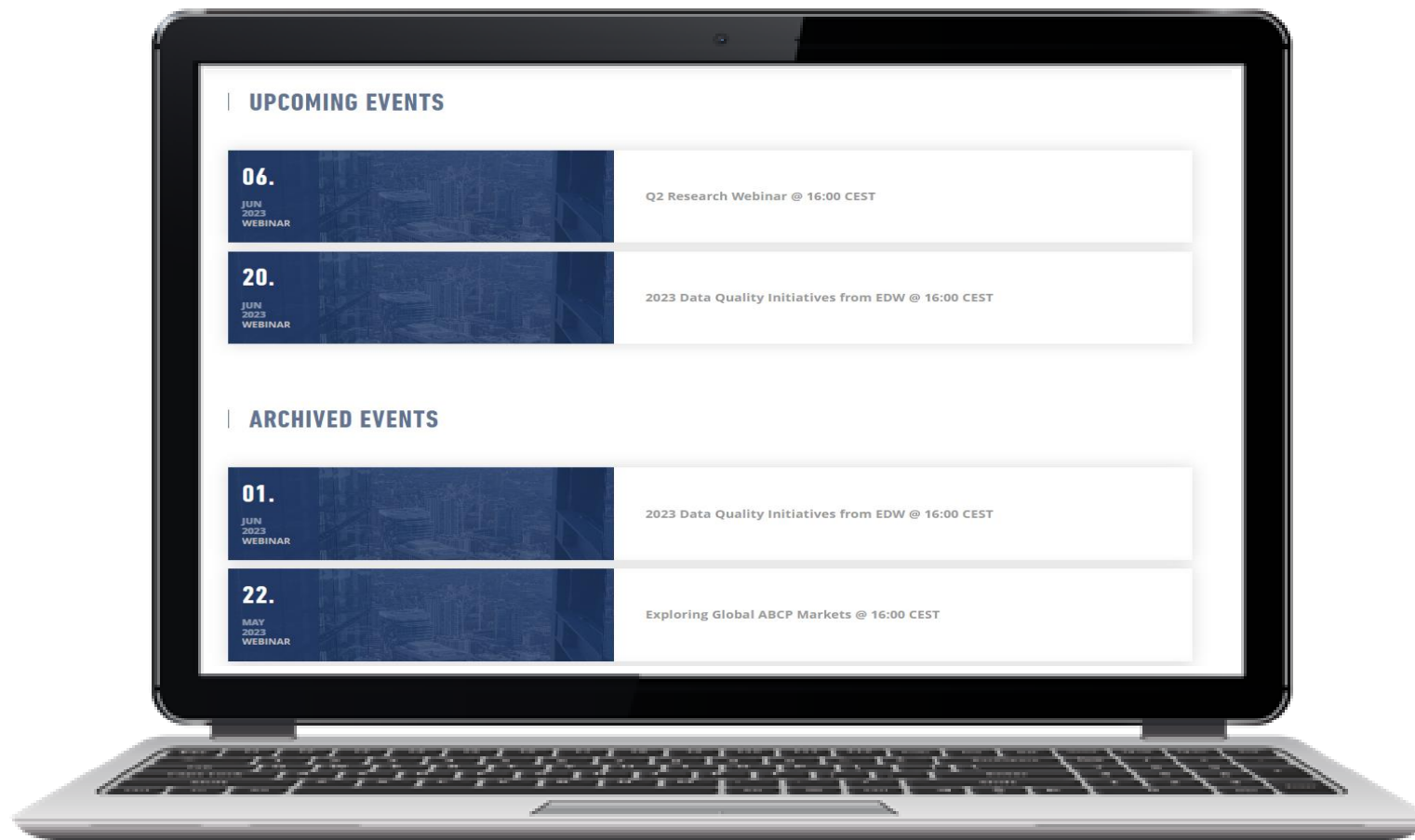
	# Commitments	AAA	AA	A	BBB	BB	B	NR	ND	Dropped	Total
2021-H2	AAA	67	6	-	1	-	-	-	-	9	83
	AA	18	156	9	1	-	-	-	-	5	189
	A	4	11	125	6	-	-	-	-	10	156
	BBB	-	1	4	56	1	-	-	-	6	68
	BB	-	-	-	-	6	-	-	-	-	6
	B	-	-	-	-	-	-	-	-	-	-
	NR	-	-	-	-	-	-	18	-	3	21
	ND	-	-	-	-	-	-	3	1	-	4
	New in 2022	6	10	7	8	-	-	-	-	-	31
Total 2022-06		95	184	145	72	7	-	21	1	33	

# **RESEARCH TIPS**

**LUDOVIC THEBAULT, EUROPEAN DATAWAREHOUSE**

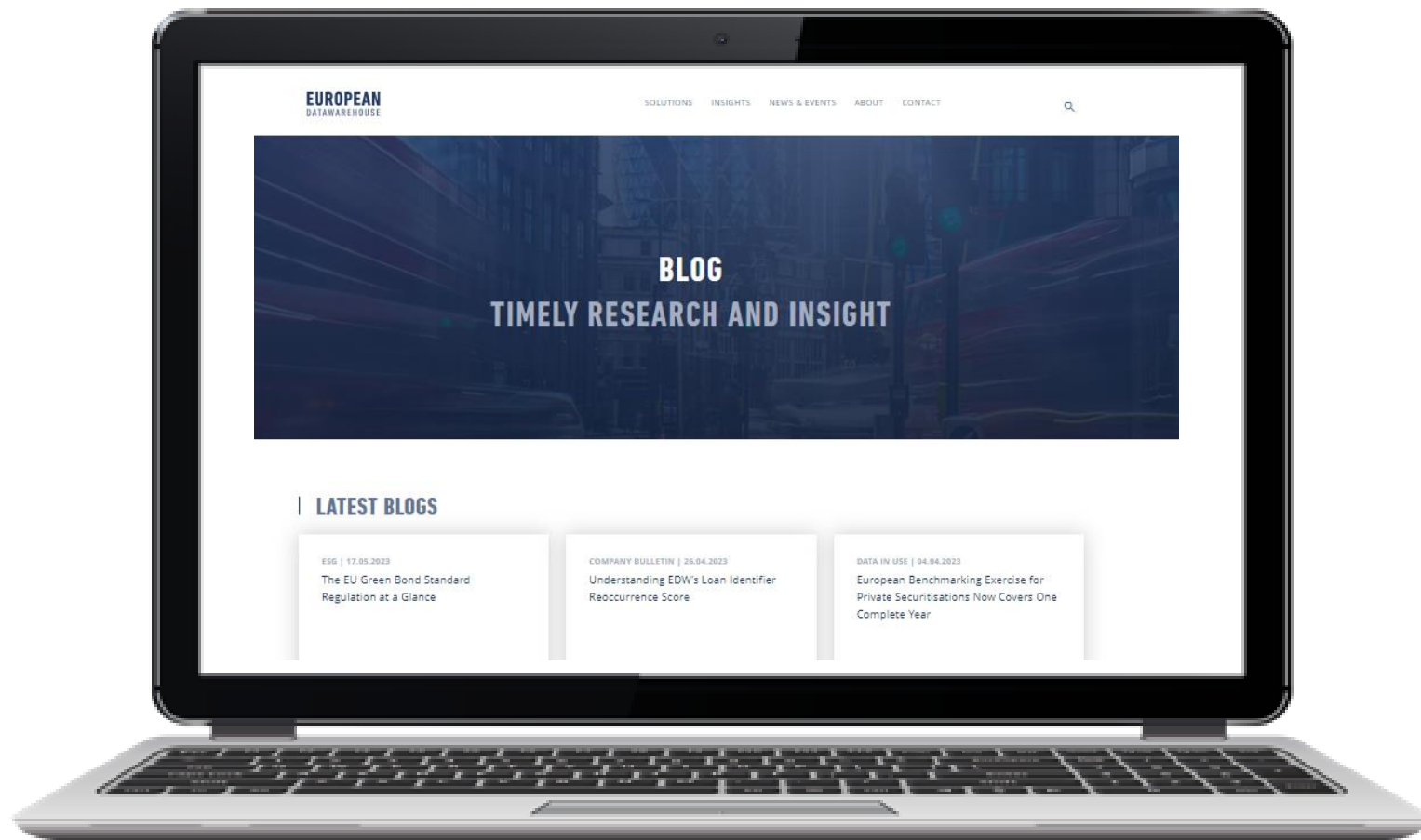
# WEBINARS

Slides and recordings of EDW webinars: <https://eurodw.eu/news-events-and-multimedia/events/>



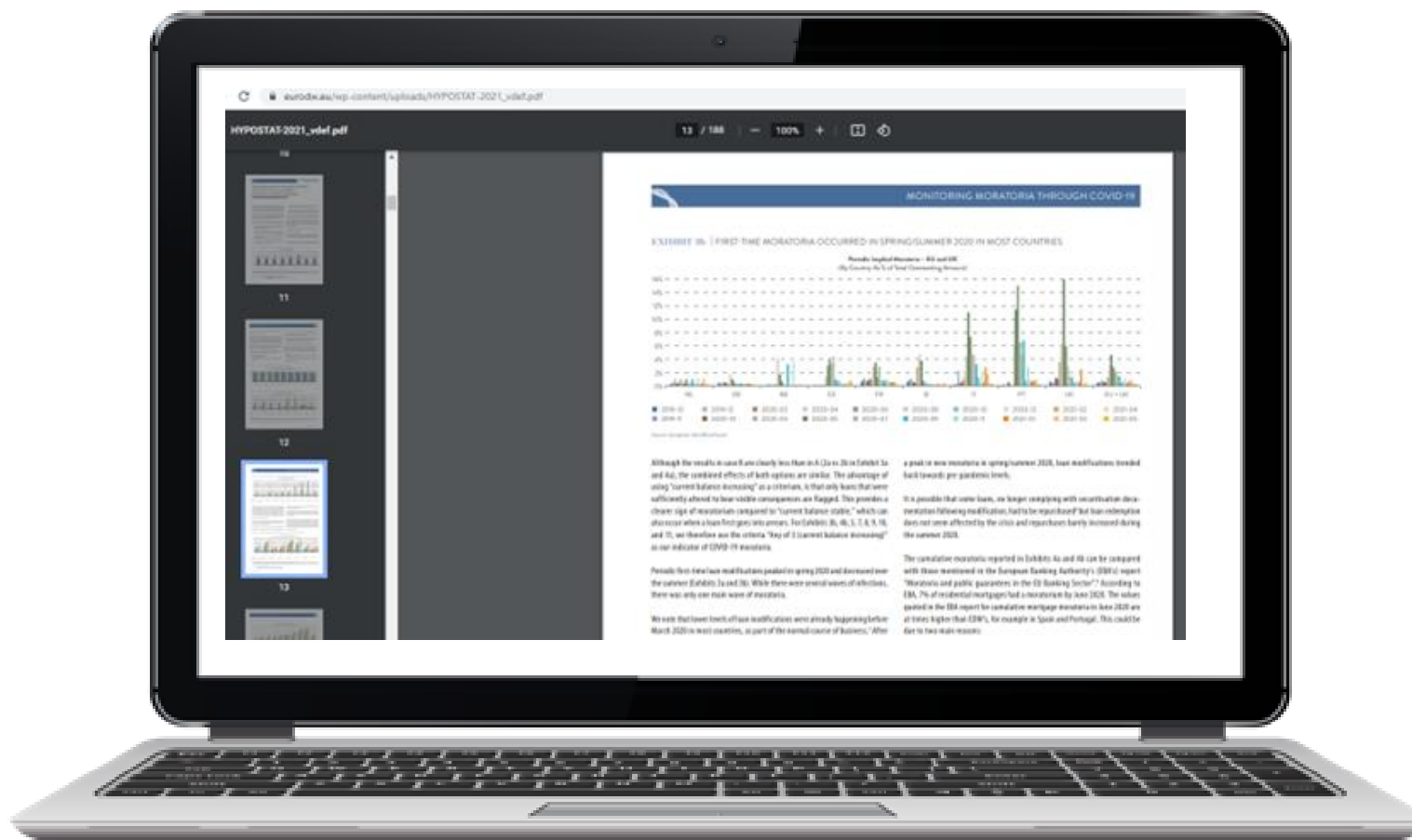
# BLOG POSTS

Short articles on current topics: <https://eurodw.eu/knowledge/magazine/>



# RESEARCH ARTICLES & REPORTS

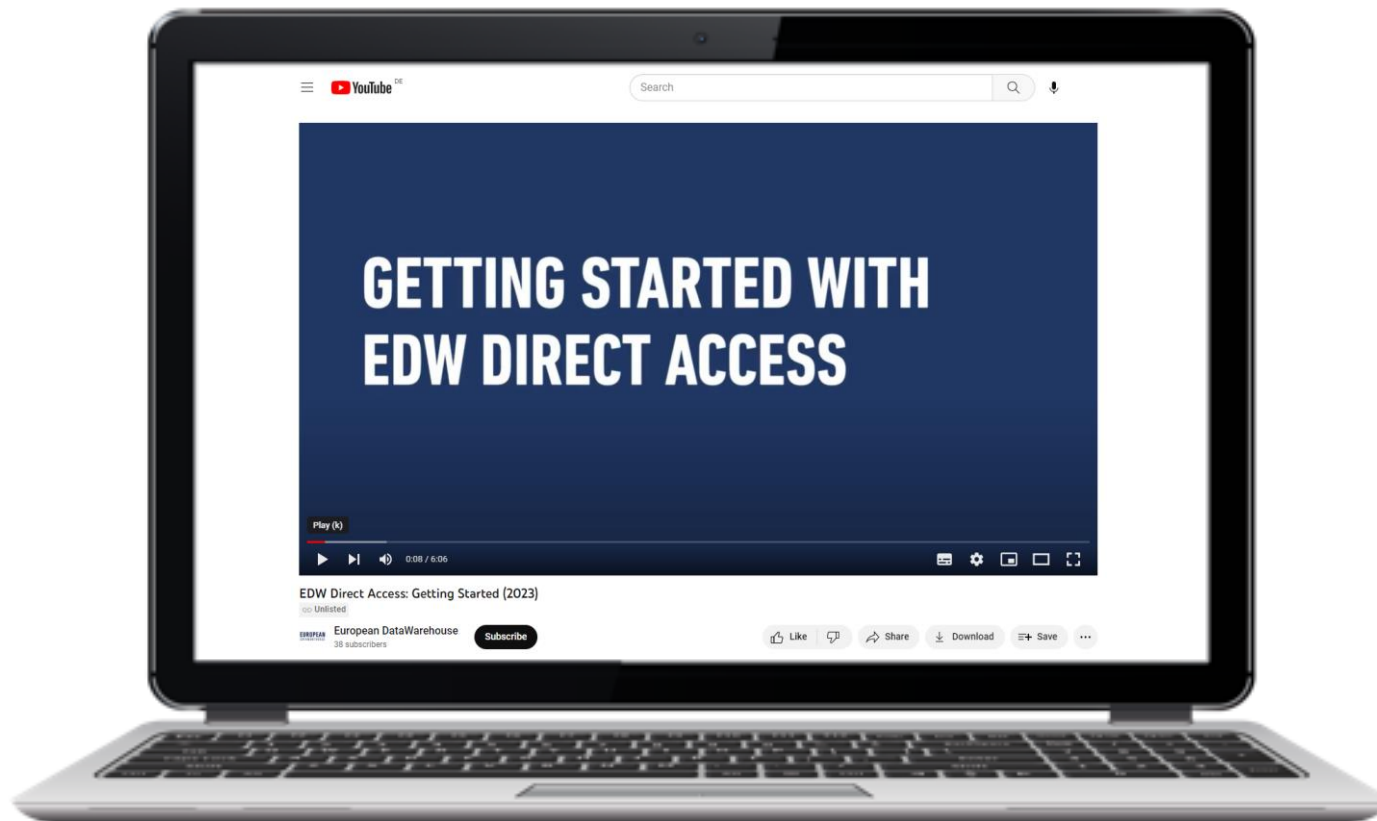
EDW insights and reports, plus third-party research: <https://eurodw.eu/knowledge/research/>



# VIDEO USER GUIDES

Step-by-step guidance in accessing EDW's loan-level data

- [EDW Direct Access: Getting Started](#)
- [EDW Direct Access: Using the ESMA & FCA Area](#)
- [EDW Direct Access: Using the ECB Area](#)



YEAR	MONTH	TITLE	PUBLISHER	PUBLICATION TYPE + KEYWORDS	ACCESSIBILITY - EDWTHIRD PARTY*
2021	July	Activation Systems Risk Report (ASRR) Monitoring System	EDW	Central bank publicat	Direct
2022	June	2022 Q2 Research Webinar	EDW (Guest speaker from Universität)	Loan performance, data availability, energy performance, adjusted DBV	EDW
2022	June	Deutsche Bundesbank discussion paper on the implications	Deutsche Bundesbank	Central bank publicat	Direct
2022	May	Model's Assessment of the Impact of the EU Taxonomy	Model's	Data comment	Central bank
2022	April	Introducing the EDW Adjusted Database	EDW	Adjusted database	Rating agency
2022	February	New Year 2022 Research Webinar	EDW	Loan performance, energy performance, adjusted database, COV	EDW
2022	February	ASRR Report: ESG-sustainable insurance increases 27% in 2021	ASRR	Data comment	Direct
2021	December	Winter 2021 Research Webinar	EDW (Guest speaker from European)	COVID impact	Others
2021	November	ESG Report 2021 - From the ERM ERM (European Mortgage)	EDW	COVID impact, mortgage, mortgage	Others
2021	October	Journal of Financial Economics Forecasting Loan Defaults	Journal of Financial Economics	Academic publication	Academic Publication
2021	September	Spring 2021 Research Webinar	EDW	COVID impact, mortgage, mortgage	EDW
2022	May	2022 Q2 Research Webinar	EDW	Data availability, COVID, energy efficiency, payment holidays	EDW
2021	May	Journal of Real Estate Finance & Economics Buildings Energy	Academic publication	mortgage defaults, energy efficiency	Academic Publication
2021	May	Data Availability Report Q2 2021	Data comment	Data availability	EDW
2021	March	Monitoring the Impact of COVID-19 on 2021 RMBG Report	EDW	COVID impact	EDW
2021	February	New Year 2021 Research Webinar	EDW (Guest speaker from European)	COVID, RMBG performance, Loan amortization, Cover your assets	EDW
2021	February	Monitoring the Impact of COVID-19 on 2021 RMBG Tracker	EDW	COVID impact	EDW
2021	February	COVID-19 Risk: Has Identified Most from COVID-19 Auto Loans	EDW	COVID impact	EDW
2020	December	COVID-19: Survey of Payment Holidays Reporting Practices	EDW	COVID impact	EDW
2020	November	Model's Analysis COVID-19: RMBG, Auto Loans, Mortgage	Model's	COVID impact, mortgage, mortgage	EDW
2020	November	Model's Analysis Contract Status of the UK Mortgage Market	Model's	Credit research	Rating agency
2020	November	Monitoring the Impact of COVID-19 on 2020 Auto Tracker	EDW	COVID impact	EDW
2020	September	Credit Default Swaps: A Review	EDW	COVID impact	EDW
2020	August	Monitoring the Impact of COVID-19 on 2020 RMBG Tracker	EDW	COVID impact	EDW
2020	July	Model's Report: The Impact of COVID-19 on 2020 RMBG Tracker	Academic Publication	Academic publication	Academic Publication
2020	June	Thomas: The Impact of COVID-19 on 2020 RMBG Tracker	Academic Publication	Academic publication	Academic Publication
2020	June	Model's Report: The Impact of COVID-19 on 2020 RMBG Tracker	EDW	COVID impact	EDW
2020	February	Data Training and Enablement	EDW	Data comment	EDW
2019	December	Global Analysis: Version 3.0 and 2.1	EDW	Data comment	EDW
2019	November	RMBG Index: Insights from European Database	EDW	Data comment	EDW
2019	November	New Year 2019 Webinar	EDW	ESG performance	EDW
2019	October	ESG: The Impact of Lending Standards on Default Rates of RMBG	EDW	Central bank publicat	Central bank

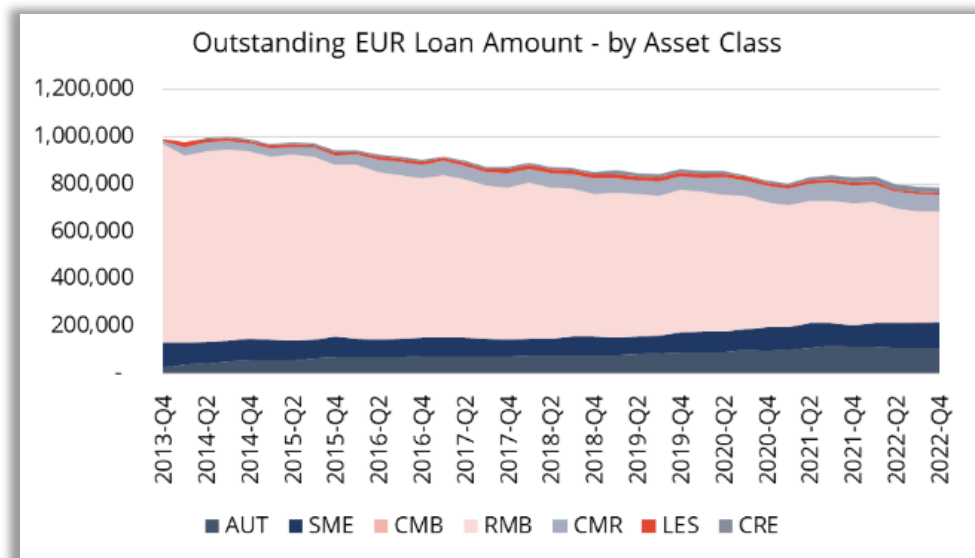


# DATA FIELDS AND DEFINITIONS

- Historical data is reported in ECB format
  - The [ECB templates and definitions](#) are available online
  - More details available in the [FAQ section](#)
  - The ECB template features optional fields. We wrote a report ([More is better](#)) on this topic
  - Balance sheet and income statement info for SME are typical optional fields, typically NULL
- Recently, data has been reported in ESMA format
  - The ECB and ESMA formats partially overlap, with some ECB fields dropped, some fields added; The ESMA templates mention which ECB field was used before, if applicable
  - The ESMA templates are also available online (see [Technical Standards](#))
- Data quality issues
  - The reporting requirements are not always respected...
  - Our data quality team has tracked data quality issues
  - They affect mostly 2013-2015 ECB data submissions, as well as ESMA data
  - Corrections are only done in subsequent uploads, past errors stay in the database
  - Our [EDW Adjusted Database Report](#) gives useful tips on data quality problems and how to deal with them

# DATA AVAILABILITY

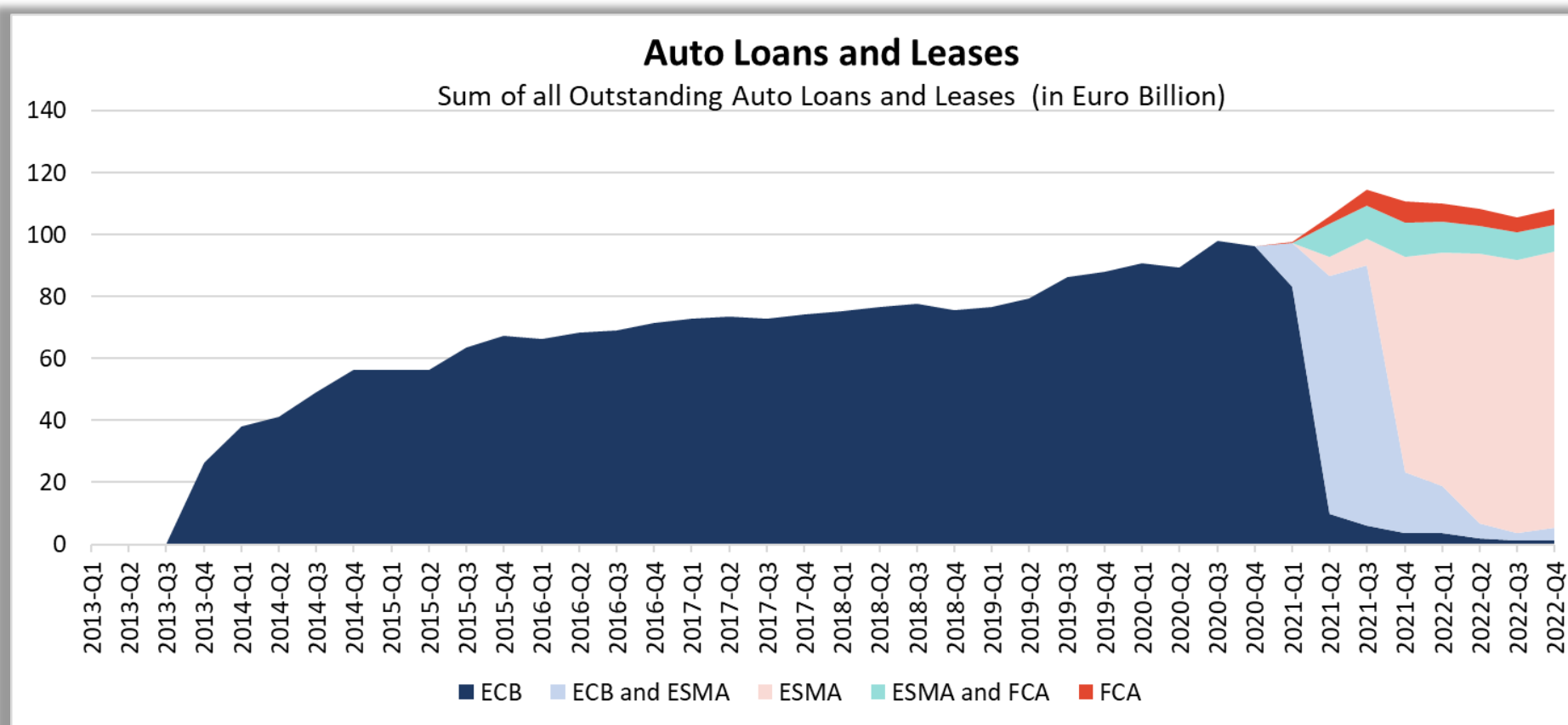
- Securitised loans
  - Not all lenders from all countries issue public securitisations
  - There is a securitisation bias, a selection bias
  - Securitised loans tend to perform better than non-securitised loans
  - Compare info from EDW's database to info from other sources
- Please refer to the [Data Availability Report Q4 2022](#) for an overview of available data
  - The excel report can be downloaded by clicking on the ,**DOWNLOAD EXCEL FILE**' button
  - Provides info on an asset class, country, deal by deal basis
  - Can check data amounts and number of loans by period
  - Please note that some deal info is provided in both ECB and ESMA format



# ECB VS ESMA VS FCA DATA AVAILABILITY

## Auto Loans and Leases

Sum of all Outstanding Auto Loans and Leases (in Euro Billion)



# LOAN PERFORMANCE

- Loan performance has been a key topic so far, with many publications:
  - Performance indices
  - About COVID (see [Monitoring Moratoria through COVID-19](#))
  - About LTV vs loan performance...
    - [Loan performance and LTV](#)
    - [Report on calculated LTV](#)
  - [Report on default rates](#)
  - As well as many third party reports on related topics
- When working with performance data:
  - Normally, if a loan has a default status, it should have a default date, a static default amount, and eventually, it should show recoveries/losses
  - Recoveries are not always explicitly reported
  - Losses / recoveries can take years to materialise
  - Inactive loans (repaid or defaulted/worked out) can be dropped from subsequent LLD
  - Ability to track the loans overtime is therefore important (cf report on loan Ids)
  - Securitisations can have very different default definitions (3 months or 18 months or loan liquidation etc...)

# LOAN IDENTIFIER REOCCURRENCE SCORE (1)

<https://eurodw.eu/understanding-edws-loan-identifier-reoccurrence-score/>

## THE EVOLUTION OF ID REPORTING CONSISTENCY

For RMBS deals, ID reporting consistency has improved over time, as shown in EXHIBIT 1 below.

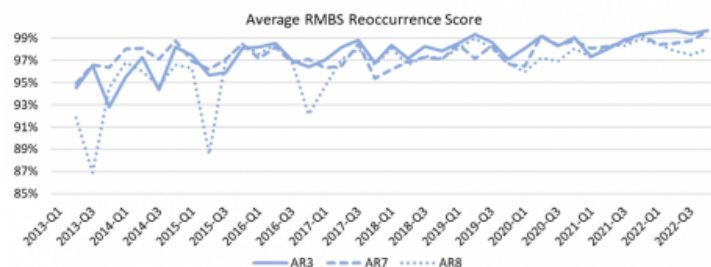


Exhibit 1: Evolution of the Average Reoccurrence Scores for RMBS

Source: European DataWarehouse

EDW's Loan ID Reoccurrence Score is a traceability score rather than a data quality score, and a change of ID is not necessarily a data quality error. For instance, as per the ECB taxonomy for RMBS, loan ID changes were acceptable as long as the new ID featured the old ID followed by the new ID and comma separated. This requirement was often not applied.

When a loan ID changes for a given EDCODE+PCD, EDW encourages users to check if the borrower ID changes as well. When this is not the case, the borrower ID completed by other static loan characteristics (such as loan rank or origination date) may make loan tracking easier.

Loan and Borrower ID reporting consistency matters when loans are tracked over time, as is the case when performing certain defaults, recovery, and prepayment calculations.

In summary, the reports tracks the reoccurrence of 13 identifiers for 6 asset classes for all public deals from 2013 to 2022.

For each asset class, the ECB taxonomy has a loan identifier and a borrower identifier; RMBS also has a property identifier.

The calculations are based on EDW's Adjusted Database, in which the identifiers have not been modified until now, but from which some submissions were excluded due to data quality issues.



## LOAN IDENTIFIER REOCCURENCE SCORE (2)

Excel report freely available for download

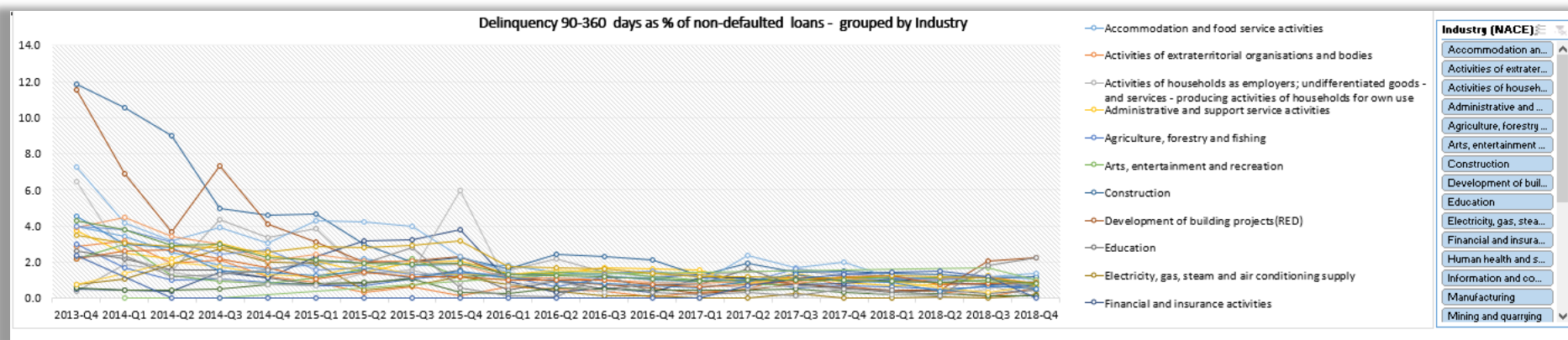
- Discussed in 2023 Q1 Research Webinar
- Excel document now freely available to download via: <https://eurodw.eu/understanding-edws-loan-identifier-reoccurrence-score/>
- Checks for loan, borrower, and property ID, if the IDs available in a given quarter were already reported in the previous quarter
- The score indicates if all the loan IDs reported at T+1 were already reported at T 0:
  - A score of 100% implies that all of the identifiers provided in the T+1 data upload were already provided in the upload at T0
  - A score of 0% implies that none of the identifiers provided in the T+1 data upload were already provided in the upload at T0
  - A score of 99% implies that all but 1% of the identifiers provided in the T+1 data upload were already provided in the upload at T0
  - A 0% score is possible if all the loan IDs were changed even while respecting the ECB taxonomy
  - A 99 % score looks “almost perfect”, but what if the 1% of loan ID s that changed were the loans in arrears?

JUNE 2023

# PERFORMANCE INDICES IN EXCEL FORMAT NOW ONLINE

Update as of June 2023

- PDF versions with methodologies are also available online
  - [May 2016: Spanish SME Index \(PDF\)](#)
  - [August 2018: ED Spanish RMBS Index \(PDF\)](#)
  - [November 2019: Italian SME Index \(PDF\)](#)
- Recently published excel versions can also be downloaded
  - [October 2019: Italian SME Index Q2 2019](#)
  - [June 2019: Spanish RMBS Index Q1 2019](#)
  - [March 2018: Spanish SME Index 2018 Q4](#)



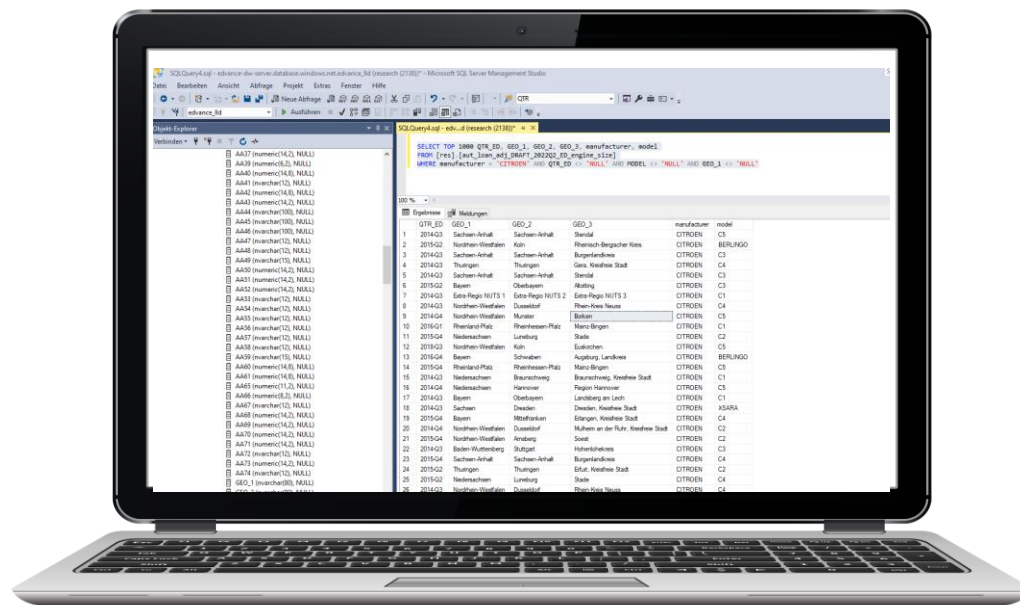
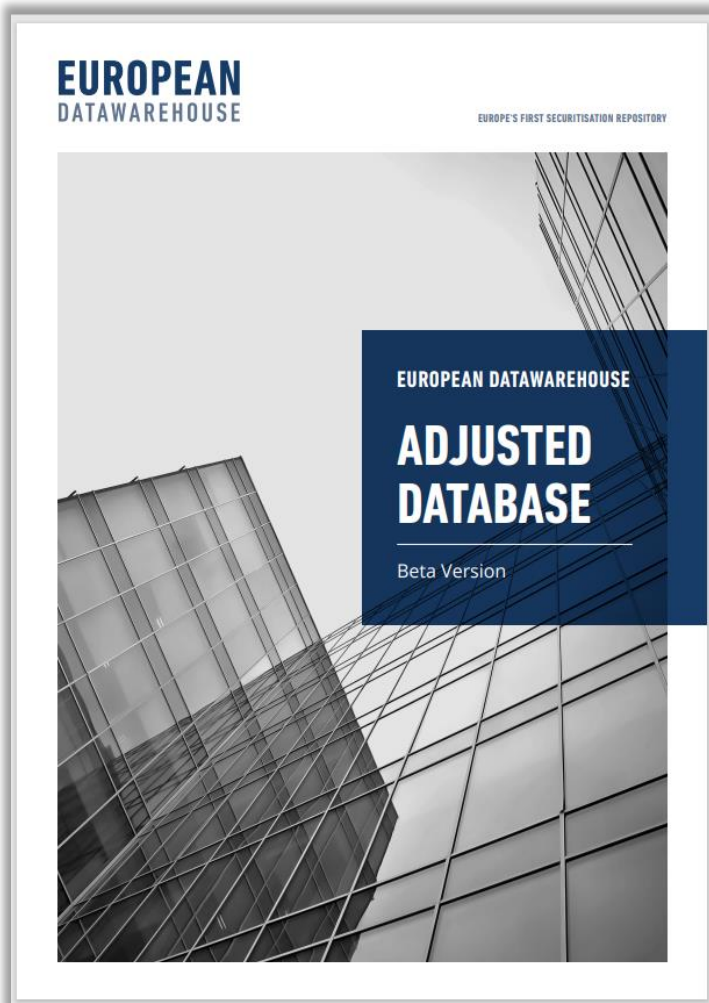


# **STATUS OF EDW'S ADJUSTED DATABASE**

**LUDOVIC THEBAULT, EUROPEAN DATAWAREHOUSE**

## ADJUSTED DATABASE REPORT

**Available online:** [https://eurodw.eu/research\\_articles/edw-adjusted-database-beta-report/](https://eurodw.eu/research_articles/edw-adjusted-database-beta-report/)



# LIST OF CALCULATED FIELDS IN ADJUSTED DATABASE AT JUNE 2023

	Auto	Consumer	Credit Cards	Leasings	RMBS	SME
EDCODE	yes	yes	yes	yes	yes	yes
PCD	yes	yes	yes	yes	yes	yes
GEO_1	yes	yes	yes	yes	yes	yes
GEO_2	yes	yes	yes	yes	yes	yes
GEO_3	yes	yes	yes	yes	yes	yes
QTR	yes	yes	yes	yes	yes	yes
COUNTRY	yes	yes	yes	yes	yes	yes
Manufacturer	yes	No	No	No	No	No
Model	yes	No	No	No	No	No
Fuel_Type	yes	No	No	No	No	No
Year_Model	yes	No	No	No	No	No
Vehicle_type	yes	No	No	No	No	No
Engine_size	yes	No	No	No	No	No

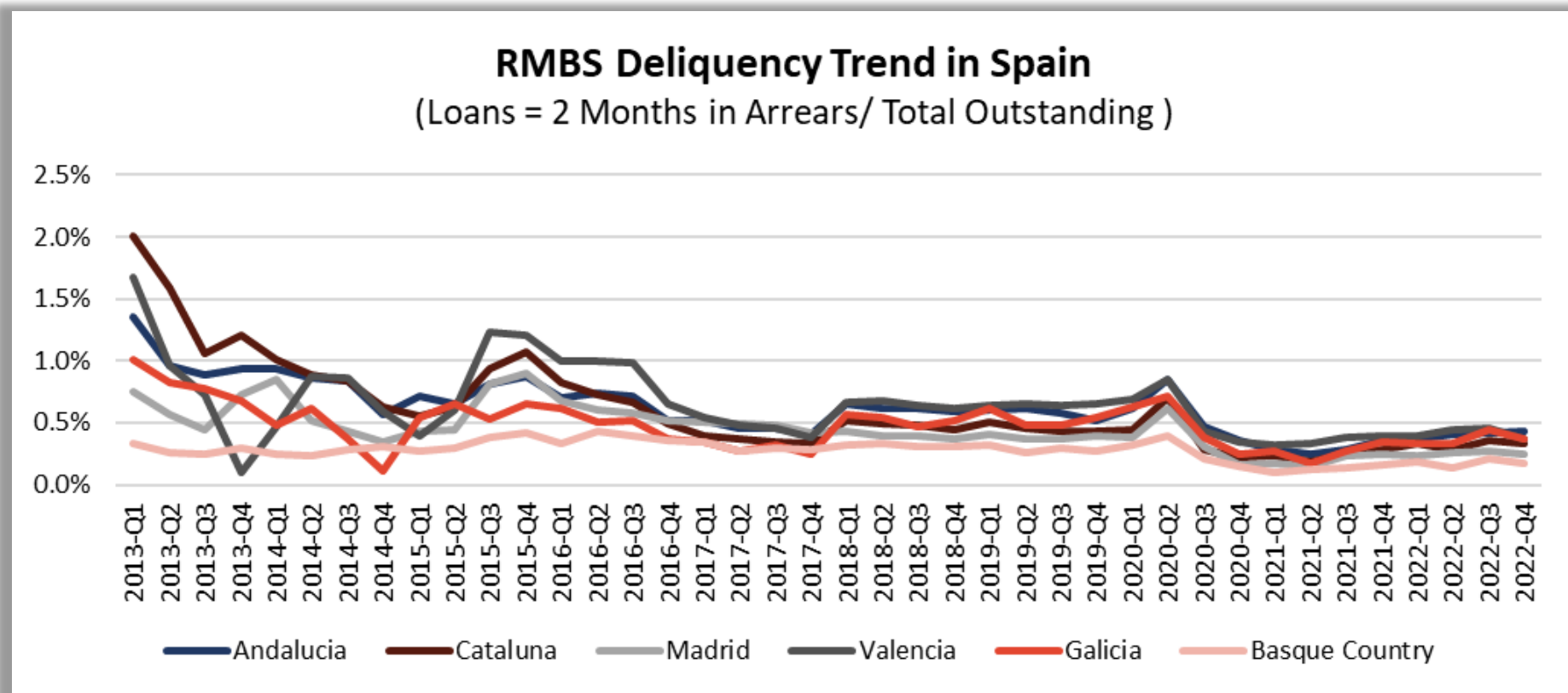
# **CALCULATED FIELDS**

**(Q4 2022 UPDATE)**

**LUDOVIC THEBAULT, EUROPEAN DATAWAREHOUSE**

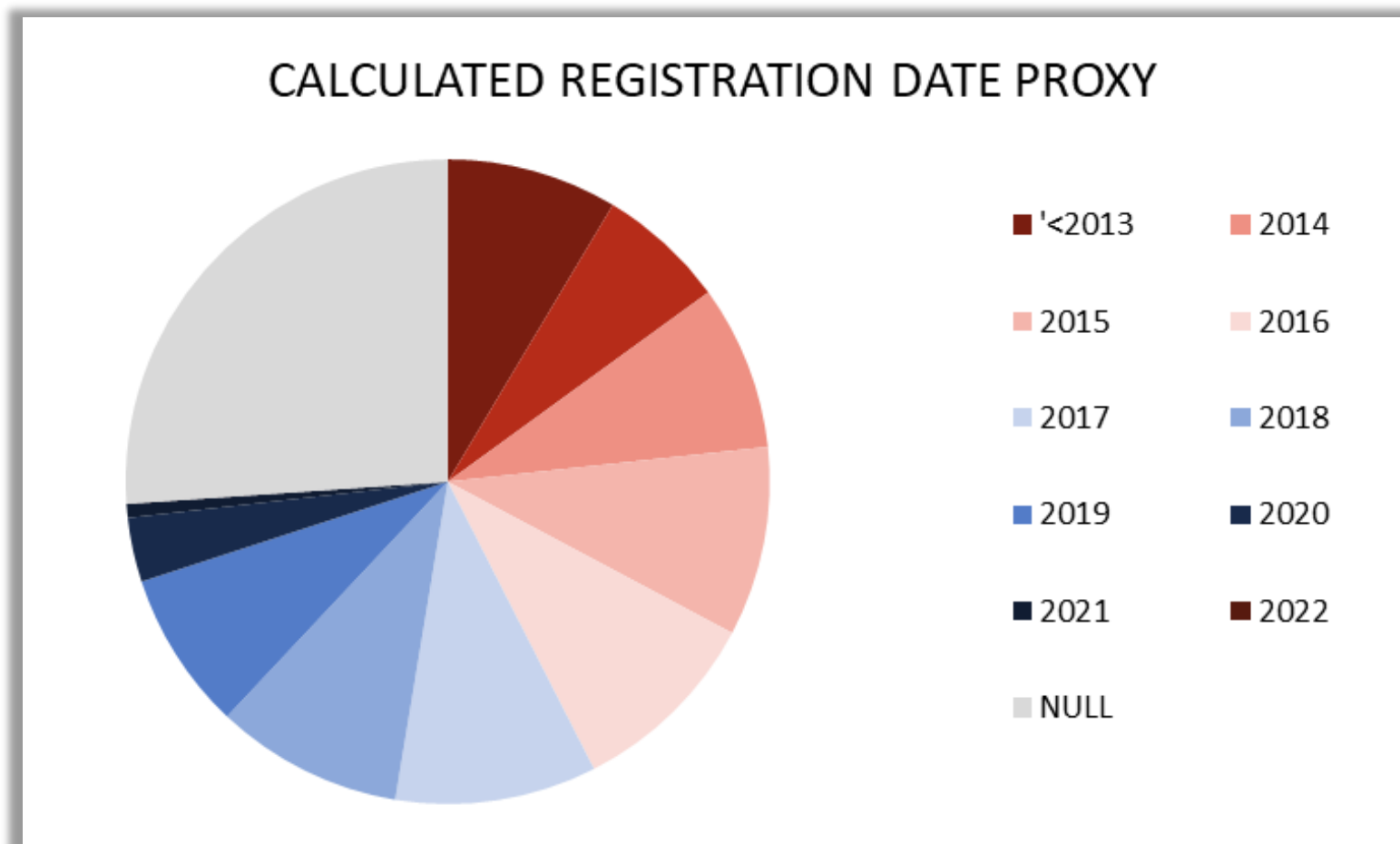
## GEO FIELDS (GEO\_1, GEO\_2, GEO\_3)

Region IDs either provided as first digits of postcode or NUTS codes, Geo\_1, Geo\_2, Geo\_3 calculated fields translate these identifiers into plain English



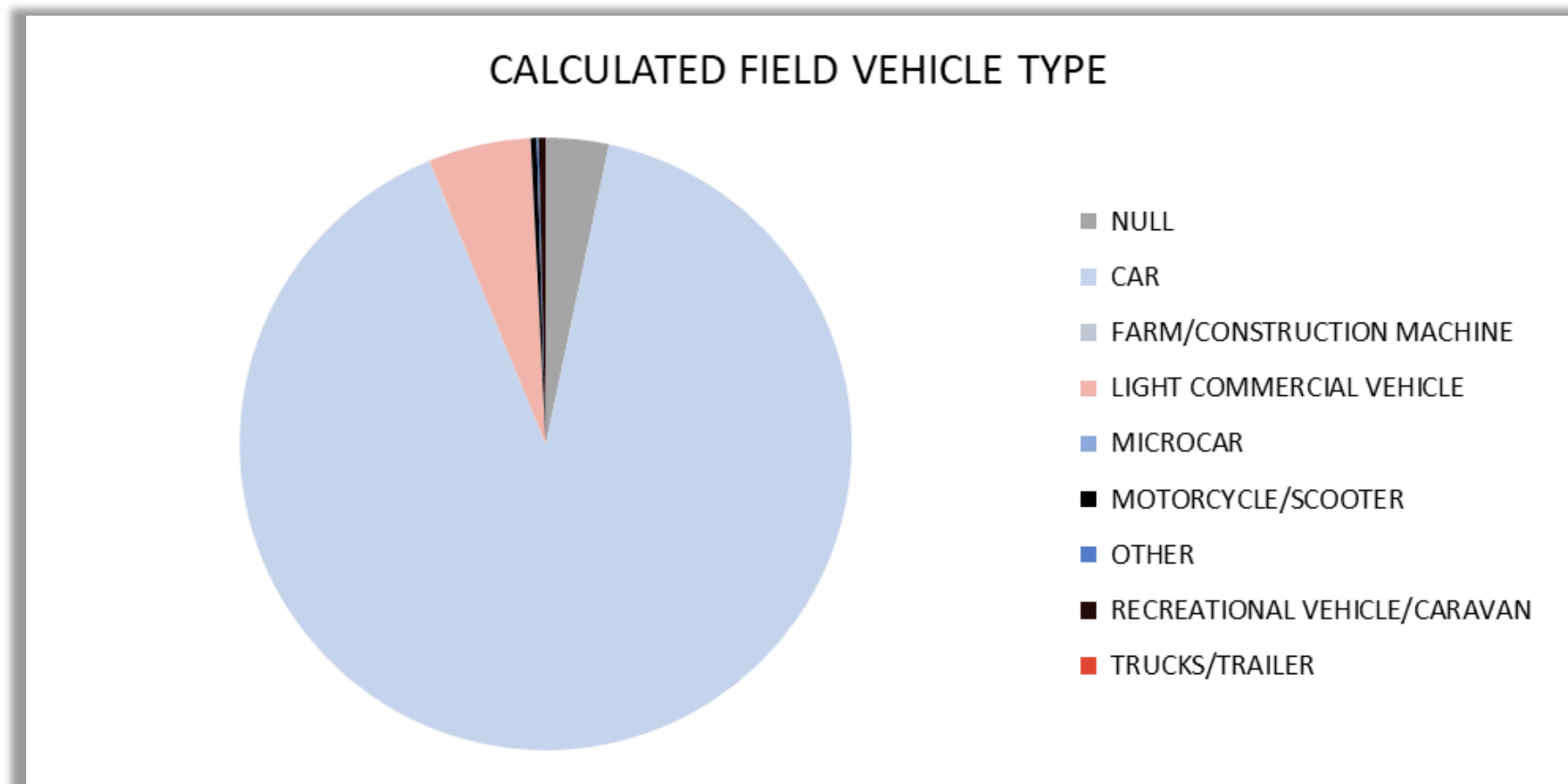
# EDW ADJUSTED DATABASE AT Q4 2022 – CALCULATED FIELDS

Engine Size in Liters

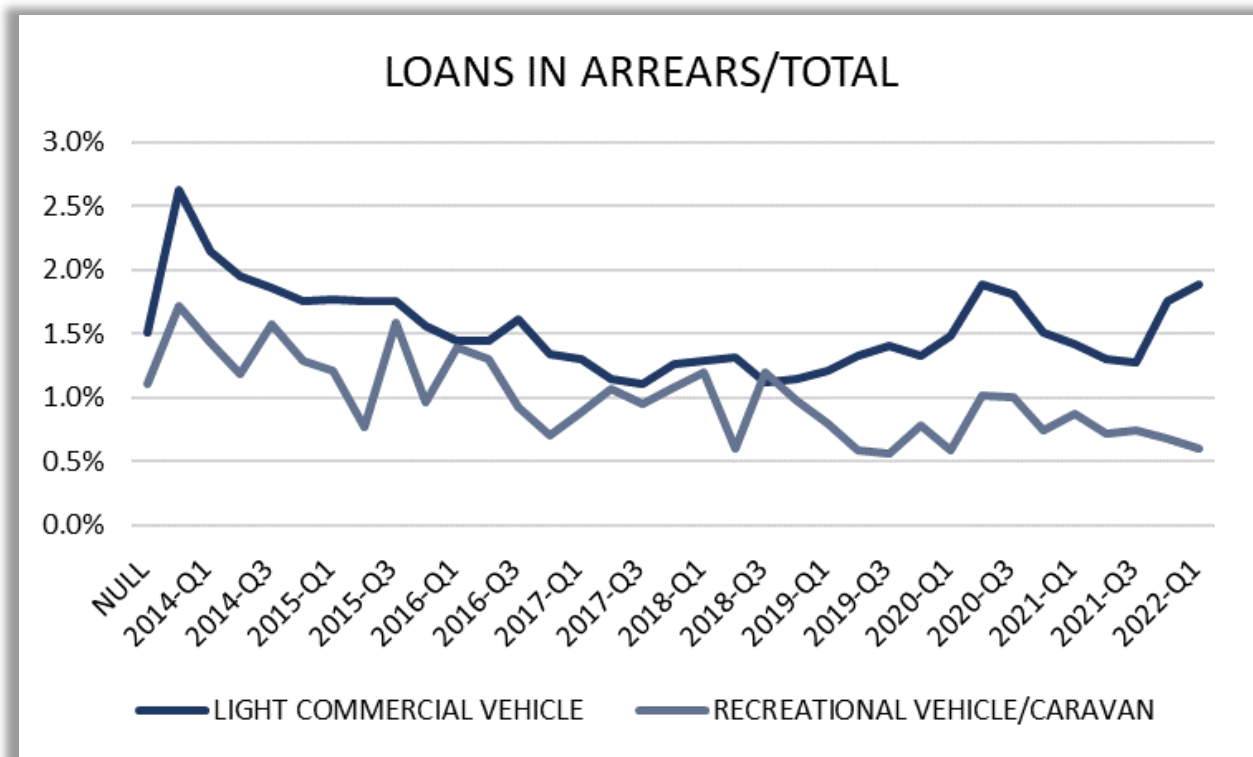


# EDW ADJUSTED DATABASE AT Q4 2022 – CALCULATED FIELDS

Calculated Field: Vehicle Type



# CALCULATED FIELD: VEHICLE TYPE



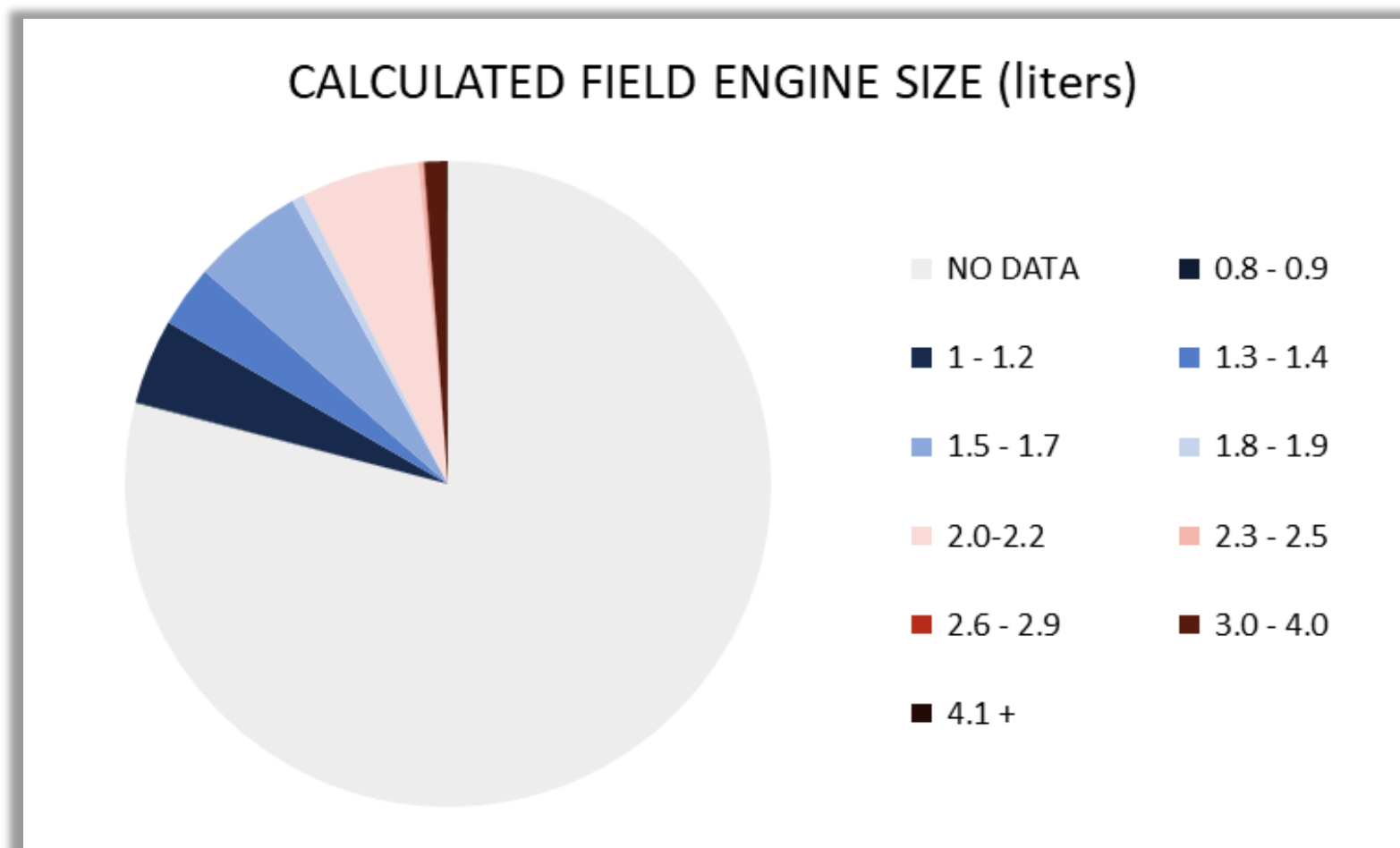
<https://www.fiatprofessional.com/de>



<https://www.fiatcamper.com/de>

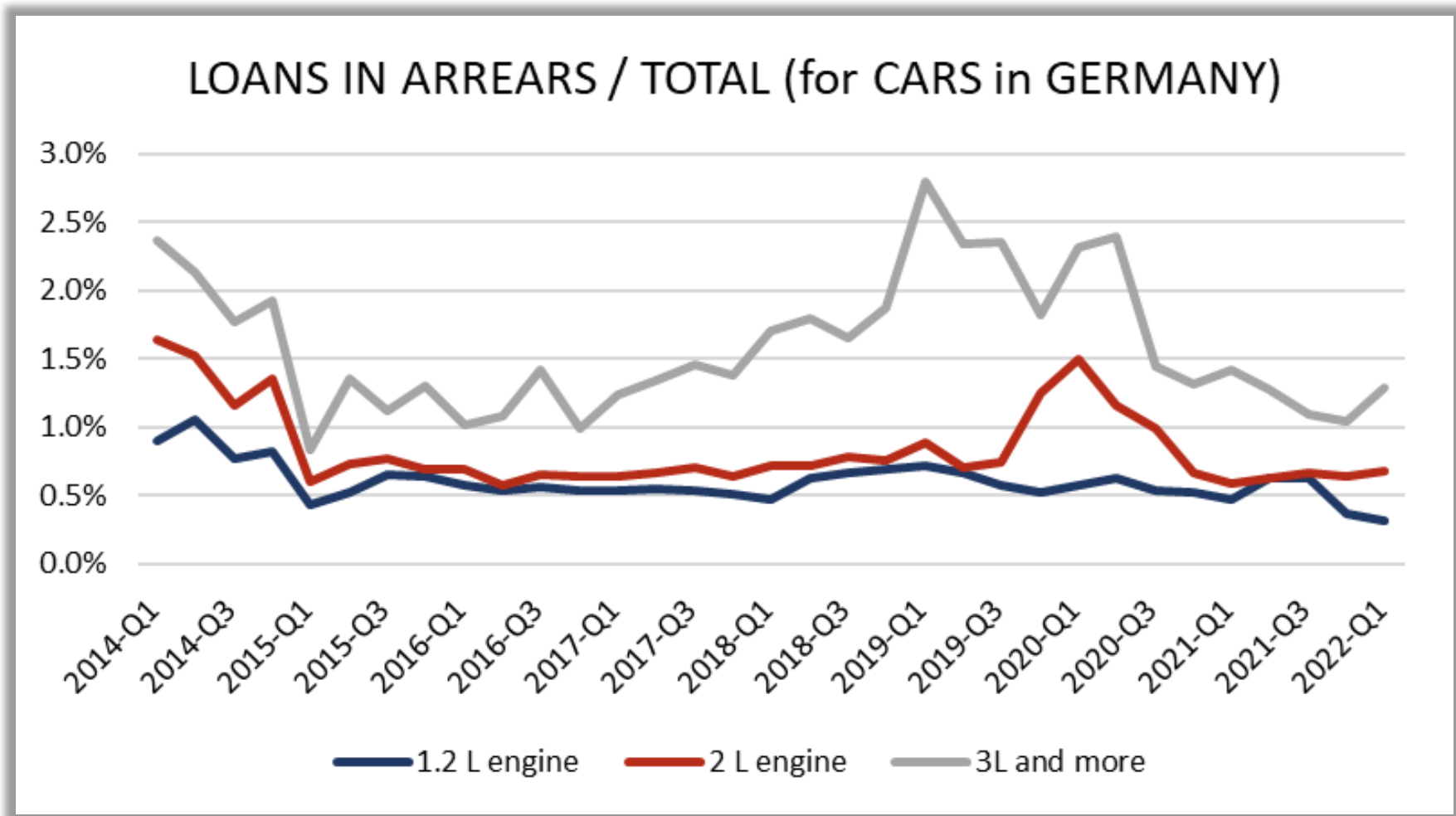


## CALCULATED FIELD: ENGINE SIZE IN LITERS

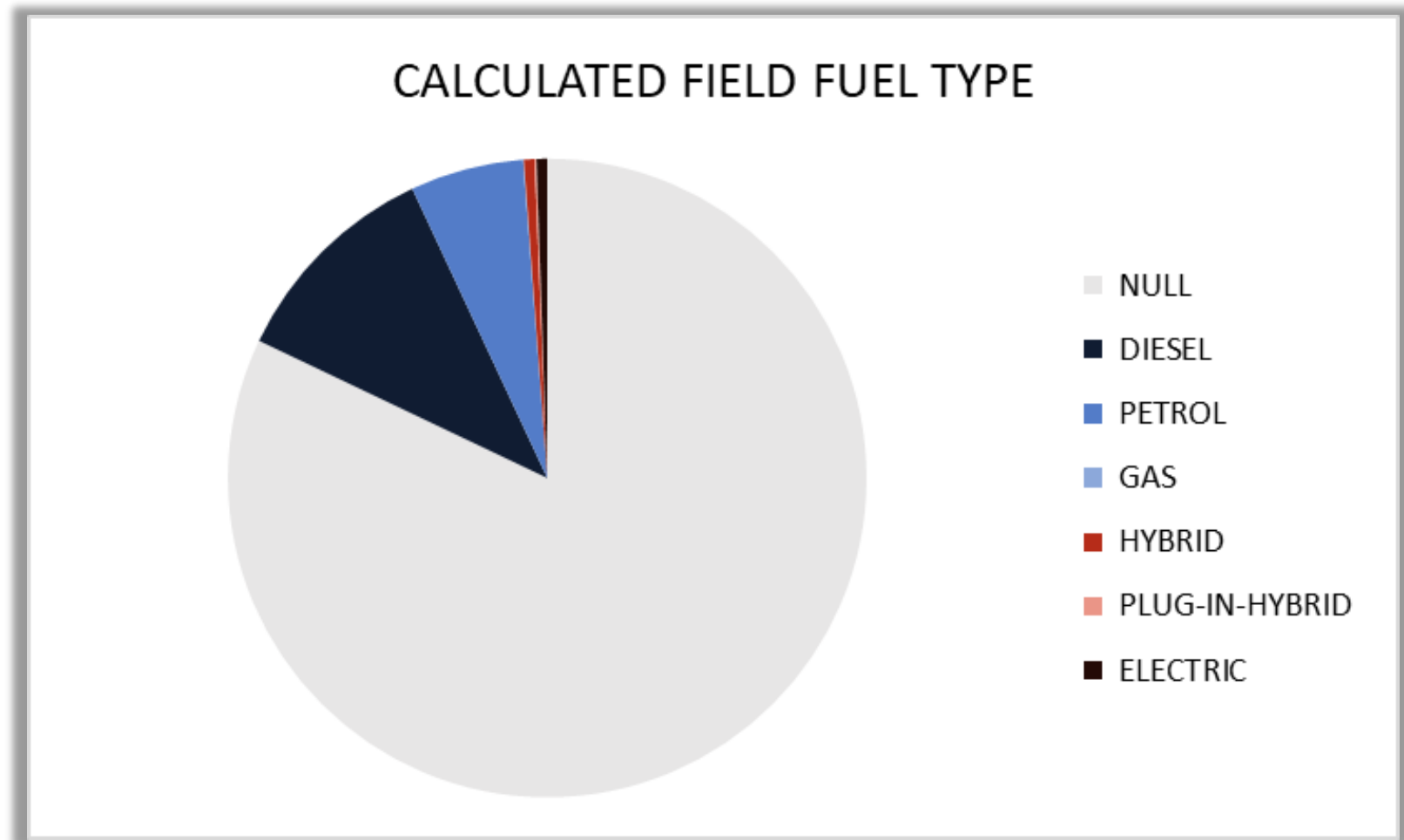


# DOES ENGINE SIZE MATTER?

Loan in Arrears / Total Outstanding

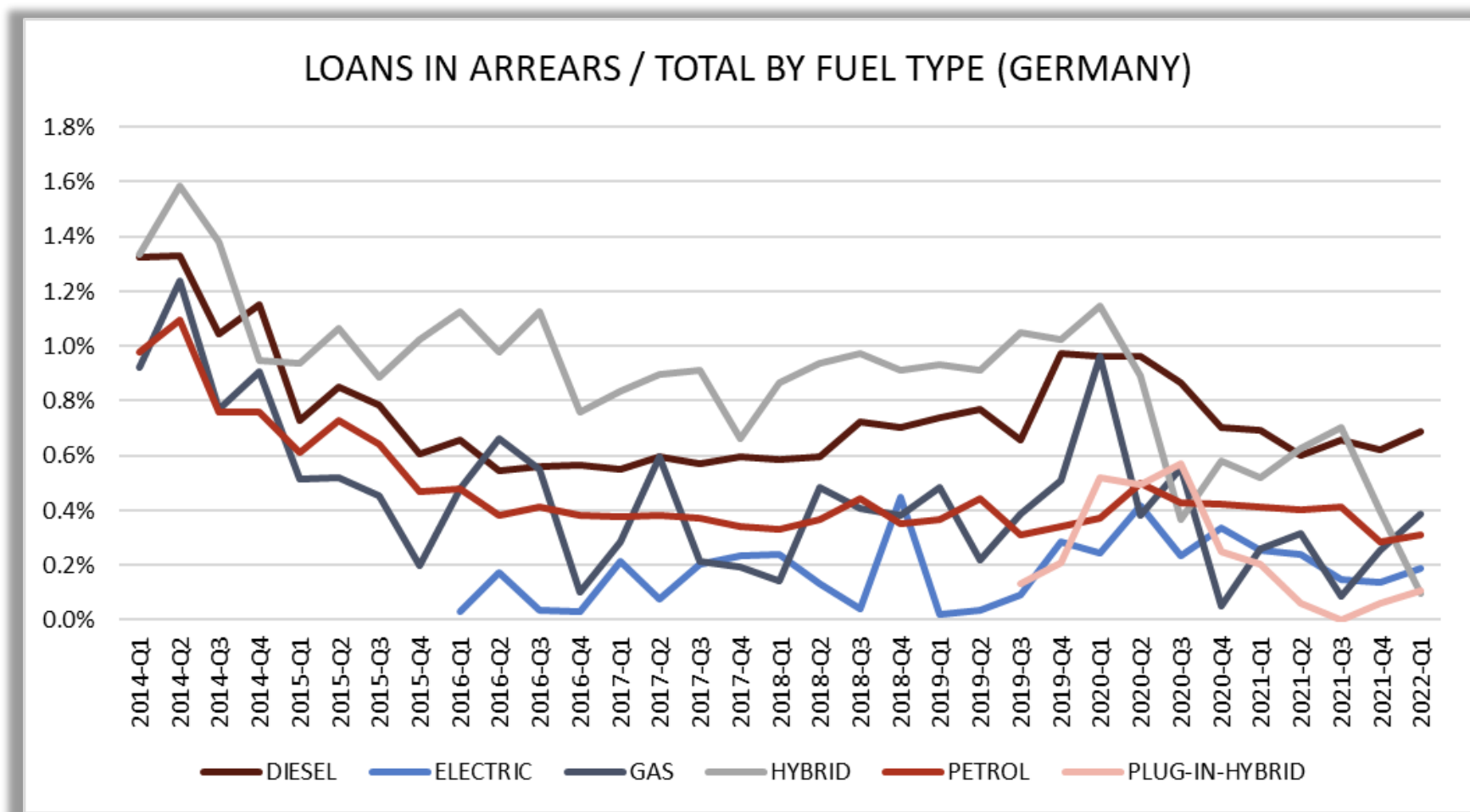


## CALCULATED FIELD: FUEL TYPE



# DOES FUEL TYPE MATTER?

Loans in Arrears / Total Outstanding



# MORTGAGE RISK MANAGEMENT AND CLIMATE CHANGE

SMOKE SIGNALS AFTER WILDFIRE DISASTERS

**LAURA GÖTZ, EBS UNIVERSITY OF BUSINESS AND LAW**



EBS BUSINESS SCHOOL

# Mortgage risk management and climate change – smoke signals after wildfire disasters

EDW Q2 research webinar

June 6, 2023

Laura Götz  
laura.goetz@ebs.edu  
EBS University of Business and Law

Ferdinand Mager  
ferdinand.mager@ebs.edu  
EBS University of Business and Law

Joachim Zietz  
joachim.zietz@ebs.edu  
EBS University of Business and Law

# Executive summary



Rising climate risk, including those from wildfires, challenges banks' resilience as they need to account for these environmental risks in their lending practices.

**Research question:** How do climate shocks shape lenders' mortgage pricing? Do they adjust credit terms after natural disasters?

## ✓ Method and data:

- ✓ 2017 wildfires in Portugal as natural experiment
- ✓ Diff-in-diff framework
- ✓ Mapping of mortgage data with wildfire data
- ✓ Securitized mortgage data from the *European DataWarehouse*
- ✓ Wildfire data from the *European Forest Fire Information System*

## ✓ Findings:

- ✓ Banks charged a premium on interest margins pursuant to the wildfire shock
- ✓ The increase in interest rates varies between 8 to 12 bps for identification strategies that cover a wider area of risk around the 2017 wildfires
- ✓ Considering mortgages related to lower-income households separately, these premiums rise to 19 and 25 bps

# Related literature



## Closely related:

- ✓ **Climate risk and mortgage credit pricing**
  - ✓ Garbarino and Guin, 2021, for the Thames flooding catastrophe in the UK;
  - ✓ Sastry, 2021, for flood risk in Florida;
  - ✓ Nguyen et al., 2022, for sea-level rise risk in the US

## Related:

- ✓ **Climate risk and gentrification**
  - ✓ Keenan et al., 2018; Thompson et al., 2023
- ✓ **Climate risk, climate change awareness, and lending behavior**
  - ✓ Bos and Li, 2017; Duan and Li, 2021; Nguyen et al., 2022



# The 2017 wildfires in Portugal



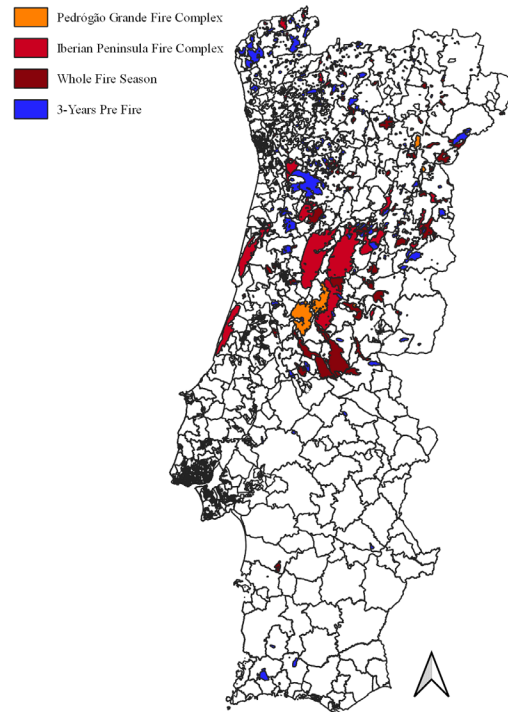
Picture source: The Financial Times Limited, "Portugal's PM pledges action after deadly wildfires", [www.ft.com/content/d8749a56-b33e-11e7-aa26-bb002965bce8](https://www.ft.com/content/d8749a56-b33e-11e7-aa26-bb002965bce8).

- / In 2017, parts of Portugal were hit by unprecedented wildfires
  - / Most destructive and deadly wildfires on Portugal's record
  - / Costs related to the fires between June and October 2017 at ~1.5 billion Euros (= 3.2% of Portugal's GDP) (San-Miguel-Ayanz et al., 2018 as cited in San-Miguel-Ayanz, et al., 2020)
- / Wildfires are projected to increase globally by up to 14% by 2030 and 30% by 2050 (UNEP, 2022)

# Background on the 2017 wildfires in Portugal



## Wildfire map



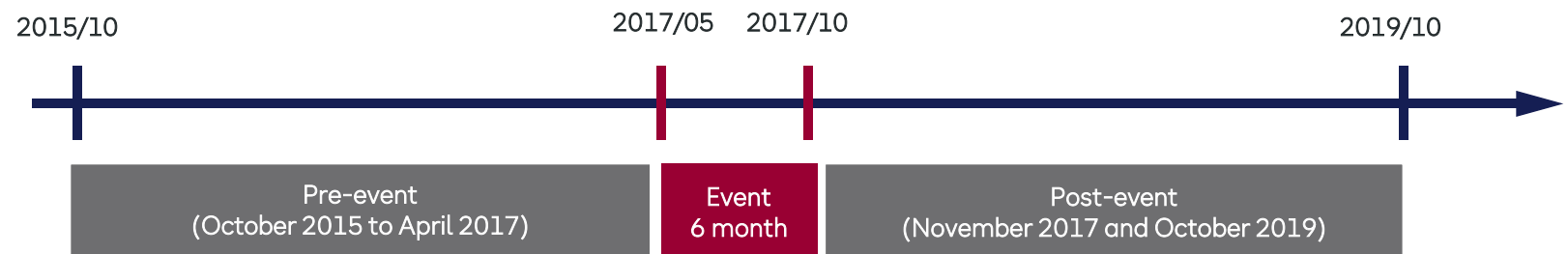
- ✓ The 2017 wildfires were marked by two massive fire outbreaks
- ✓ The Pedrógão Grande Fire Complex (in orange):
  - ✓ Originated on June 17, 2017
  - ✓ Burnt more than 526 sq. km. within six days
- ✓ The Iberian Peninsula Fire Complex in October (in red):
  - ✓ Originated on October 14, 2017
  - ✓ Hit Portugal and north-west Spain
  - ✓ Was even more devastating than the first one
  - ✓ Burnt about 2,860 sq. km within four days
- ✓ Several smaller fires occurred in between (in dark red)
- ✓ In total, more than 5,630 sq. km land burnt (= 6.1% of Portugal's surface)

Source: Map based on fire data from *European Forest Fire Information System*

# Data and timing



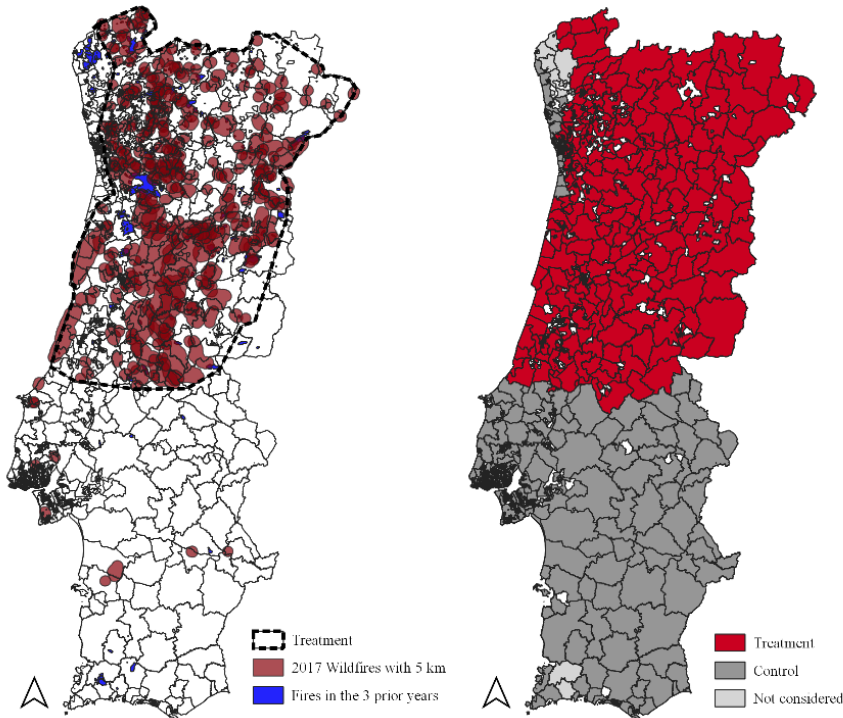
- ✓ Mortgage data from the *European DataWarehouse*
  - ✓ Mortgage originations for which the property is located in Portugal between October 2015 and October 2019 (-> cross-sectional data)
  - ✓ Development of a relatively homogeneous sample; final data set comprises 12,205 individual loans
- ✓ Burnt areas from the *European Forest Fire Information System*
- ✓ Wildfire data are combined with the four-digit postcodes to match them with mortgage data
- ✓ Most granular geographical information for a property is the 4-digit postcode; thus, the postcode of a property determines whether the associated loan is counted as "treated" or as "control"
- ✓ Pre-event period from October 2015 to April 2017, post-event period from November 2017 to October 2019, and 6-month event period



# Identification approach



Identification strategy: *RiskWide*



Source: Maps based on fire data from *European Forest Fire Information System*

✓ Treatment:

- ✓ A postcode and all mortgages originated in its area are treated if more than 10% of its surface is covered by our map-based treatment area
- ✓ *RiskWide*: defines a geographically wide area of risk, including not only areas close to large fires but also areas around smaller, isolated ones
- ✓ *RiskNarrow*: defines a geographically narrow area of risk, with focus on the larger-sized, coherent fires
- ✓ *RiskNorth*: separates the country into a northern (fire-prone) and southern (not fire-prone) part

✓ Control:

- ✓ Not all untreated postcodes are by implication control postcodes: Postcodes that were affected by any sizable\* wildfires in the 3-year-window before the 2017 disaster are omitted

\*We consider a past wildfire to be sizable if the past fire covered more than 5% of a postcode surface

# Empirical specification



Expanded diff-in-diff regression on the cross-sectional loan origination data:

$$\text{Interest margin}_i = \beta_1 \text{Post}_i + \beta_2 \text{Treated}_i + \beta_3 \text{Post}_i \times \text{Treated}_i + \theta' X_i + \text{Bank}_k + \text{PC}_j + \text{Time}_t + \varepsilon_i \quad (1)$$

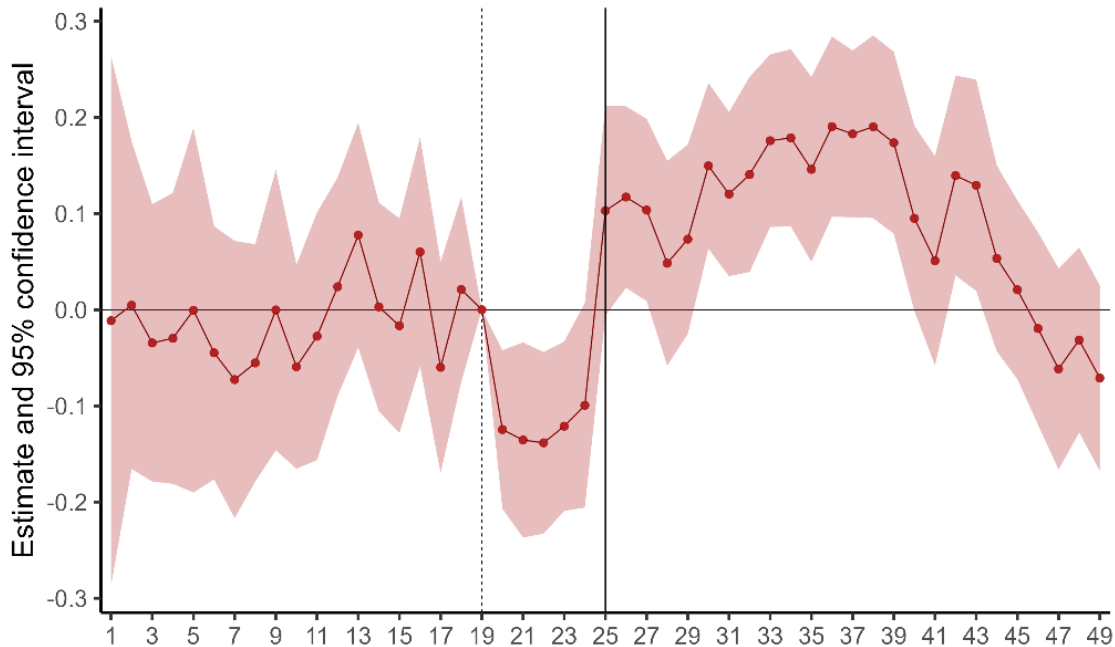
where

- ✓ The dependent variable is the *Interest Margin<sub>i</sub>* of mortgage *i*
- ✓ *Post<sub>i</sub>* is a 0/1 indicator variable equal to 1 for all loans initiated following the wildfire event window, and 0 for all loans before the wildfire event
- ✓ *Treated<sub>i</sub>* is a 0/1 indicator variable that is equal to 1 if the property's postcode was affected by fires and, hence, belongs to the treatment group, and zero if it belongs to the control group
- ✓ The interaction *Post<sub>i</sub> × Treated<sub>i</sub>* equals 1 only if both conditions hold, the mortgaged property is located in one of the postcode areas affected by the wildfires and the mortgage was originated after the wildfire disasters. The coefficient of interest is  $\beta_3$ . It measures the impact of the wildfire disaster on the banks' mortgage pricing
- ✓ *X<sub>i</sub>* is a vector of loan-, property-, and borrower-level characteristics at the individual property level,  $\theta'$  is a corresponding vector of coefficients
- ✓ *Bank<sub>k</sub>*, *PC<sub>j</sub>* and *Time<sub>t</sub>* are fixed effects at the bank, postcode, and time (month) dimension

# Parallel trends



Coefficient estimates on interest margins for *RiskWide*



- ✓ Check for the validity of the parallel trends assumption
- ✓ Modification of Equation (1) by removing the variables  $Post_i$  and  $Post_i \times Treated_i$  and interacting the remaining variable  $Treated_i$  with each of the monthly 0/1 indicator variables from 1 to 49 (October 2015 to October 2019):

$$Interest\ margin_i = \sum_{t=1}^{49} \gamma_t 1\{month = t\} \times$$

$$Treated_i + \theta' X_i + \mu' M_t + Bank_k + PC_j + \varepsilon_i \quad (2)$$

where

- ✓  $M_t$  are country-wide market developments,  $\mu'$  is the corresponding coefficient vector
- ✓ Graph indicates that there is no difference between the treatment and control group before the wildfire event period

# Main results (full sample)



Identification strategy:	<i>RiskWide</i>	<i>RiskNarrow</i>	<i>RiskNorth</i>
	(1)	(2)	(3)
<i>Post</i> × <i>Treated</i>	0.0809*** (0.0302)	0.0459 (0.0333)	0.1210*** (0.0289)
Bank FE	Yes	Yes	Yes
Postcode FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Observations	9,349	9,311	9,440
Adjusted R <sup>2</sup>	0.3539	0.3526	0.3539

Standard errors are clustered at the postcode level and reported in parentheses.  
Statistical significance is denoted by \*\*\*, \*\*, and \* at the 1%, 5%, and 10% level, respectively.

- Statistically positive effects of interest margins for *RiskWide* and *RiskNorth*
- For *RiskWide* the interest premium amounts to 8.09 bps and for *RiskNorth* to 12.10 bps
- Lenders perceived the “smoke signals” from the wildfires and attached a risk premium for areas they consider to be at future risk
- A wider definition of the treatment area is associated with a larger treatment effect on interest margins

Note: the results are robust when we add interacted bank-by-time fixed effects to the regression



# Results for different risk profiles



Identification strategy:	<i>RiskWide</i>		<i>RiskNarrow</i>		<i>RiskNorth</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Panel A:</b>	lower versus upper incomes		lower versus upper incomes		lower versus upper incomes	
<i>Post</i> × <i>Treated</i>	0.1894*** (0.0504)	0.0283 (0.0449)	0.1147** (0.0545)	-0.0216 (0.0519)	0.2465*** (0.0483)	0.0500 (0.0398)
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Postcode FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,234	2,356	2,221	2,350	2,274	2,368
Adjusted R <sup>2</sup>	0.3008	0.3120	0.2999	0.3128	0.3016	0.3162
<b>Panel B:</b>	lower versus upper LTV ratios		lower versus upper LTV ratios		lower versus upper LTV ratios	
<i>Post</i> × <i>Treated</i>	0.0174 (0.0412)	0.1254** (0.0491)	0.0144 (0.0431)	0.1011* (0.0533)	0.0446 (0.0387)	0.1400** (0.0474)
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Postcode FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,411	2,977	2,400	2,963	2,432	3,005
Adjusted R <sup>2</sup>	0.3507	0.3688	0.3533	0.3679	0.3462	0.3661

Standard errors are clustered at the postcode level and reported in parentheses.  
Statistical significance is denoted by \*\*\*, \*\*, and \* at the 1%, 5%, and 10% level, respectively.

- ✓ To disentangle underlying drivers that affect the riskiness of a mortgage, we compare the lower and the upper 25th and 75th percentile of the income and the LTV ratio
- ✓ Low-incomes attract significantly higher interest premiums in the fire-prone areas
- ✓ These amount to 18.94 bps for *RiskWide* and to 24.65 bps for *RiskNorth*
- ✓ Interest margins are very significant even for *RiskNarrow*, amounting to about 11.47 bps for low-income households
- ✓ Higher LTV ratios are related to higher interest premiums, but effects are less pronounced



# Recap of results



- ／ Lenders did raise interest premiums after wildfires
- ／ Lower-income households pay the highest premiums
- ／ High-leveraged loans attract higher interest premiums
- ／ Lenders attach fire risk to a large geographical area

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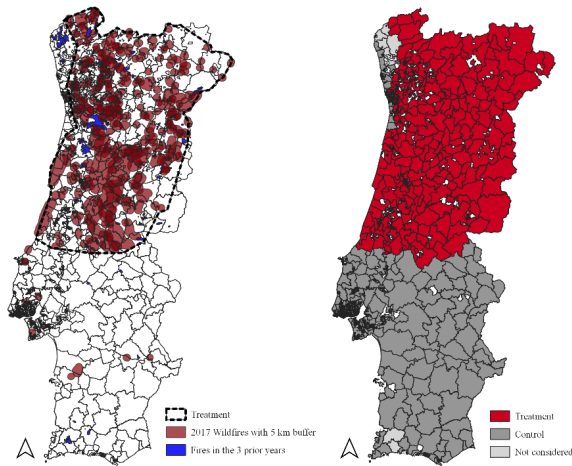


Thank you!

[laura.goetz@ebs.edu](mailto:laura.goetz@ebs.edu)

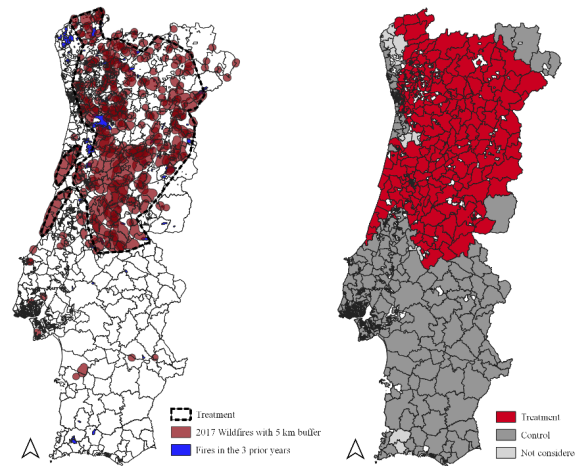
# Back up

## Identification strategies



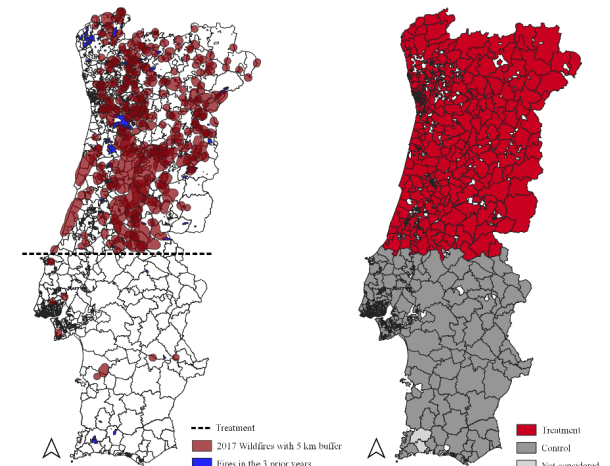
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defines a geographically wide area of risk, including not only areas close to large fires but also areas around smaller, isolated ones



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defines a geographically narrow area of risk, with focus on the larger-sized, coherent fires



### *RiskNorth.*

separates the country into a northern (fire-prone) and southern (not fire-prone) part



**Q&A**

# THANK YOU//CONTACT US

## EUROPEAN DATAWAREHOUSE GMBH

**Walther-von-Cronberg-Platz 2**

**60594 Frankfurt am Main**

 **[www.eurodw.eu](http://www.eurodw.eu)**

 **[enquiries@eurodw.eu](mailto:enquiries@eurodw.eu)**

 **+49 (0) 69 50986 9017**

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