

WINTER RESEARCH WEBINAR

2021



ON TODAY'S CALL



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AGENDA

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CHRISTIAN THUN

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USMAN JAMIL

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USMAN JAMIL

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USMAN JAMIL

FORECASTING LOAN DEFAULT IN EUROPE WITH MACHINE LEARNING

LUCA BARBAGLIA

HOUSEHOLD DEBT AND ECONOMIC GROWTH

LUCA BARBAGLIA

RECENT PUBLICATION ON MONITORING MORATORIA THROUGH COVID-19

MONITORING MORATORIA THROUGH COVID-19

Our contributions were published in the Annual Report of the European Mortgage Federation



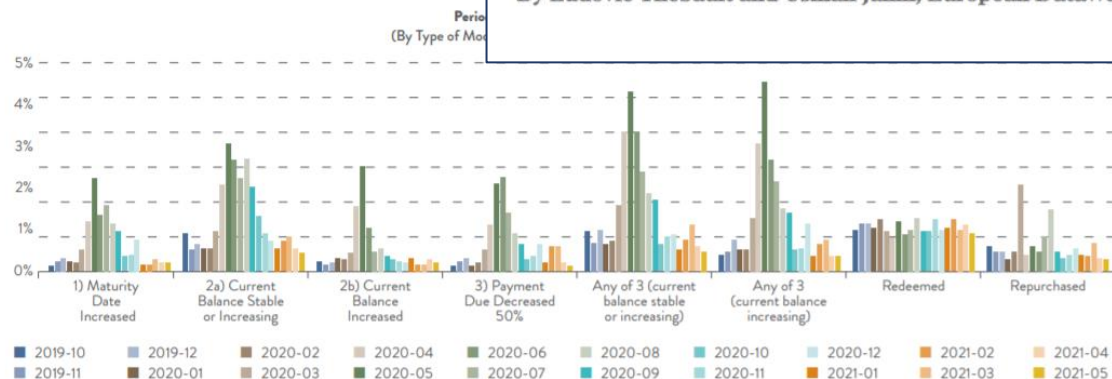
HYPOSTAT
2021

MONITORING MORATORIA
THROUGH COVID-19

Monitoring Moratoria Through COVID-19 – The Impact of Payment Holidays on Europe's Securitised Mortgages

By Ludovic Thébault and Usman Jamil, European DataWarehouse

EXHIBIT 3a | FIRST-TIME MORATORIA PEAKED IN

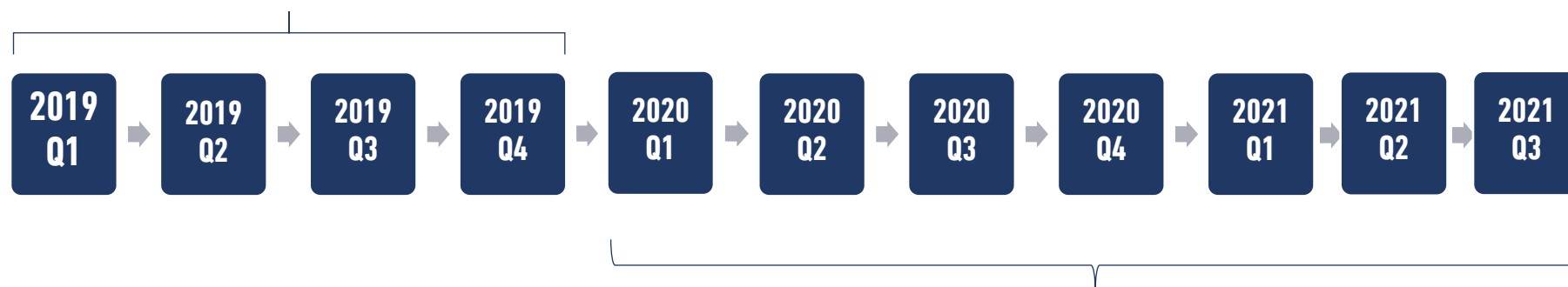


Source: European DataWarehouse

MONITORING MORATORIA THROUGH COVID-19 – AMORTISATION LEVELS

Methodology - We check if the loans that amortised regularly before COVID also amortised after

Select loans whose Current Balance at the end of each quarter is less than the quarter before



Calculate the portion of selected loans that still had a decrease in balance in each of the following quarters

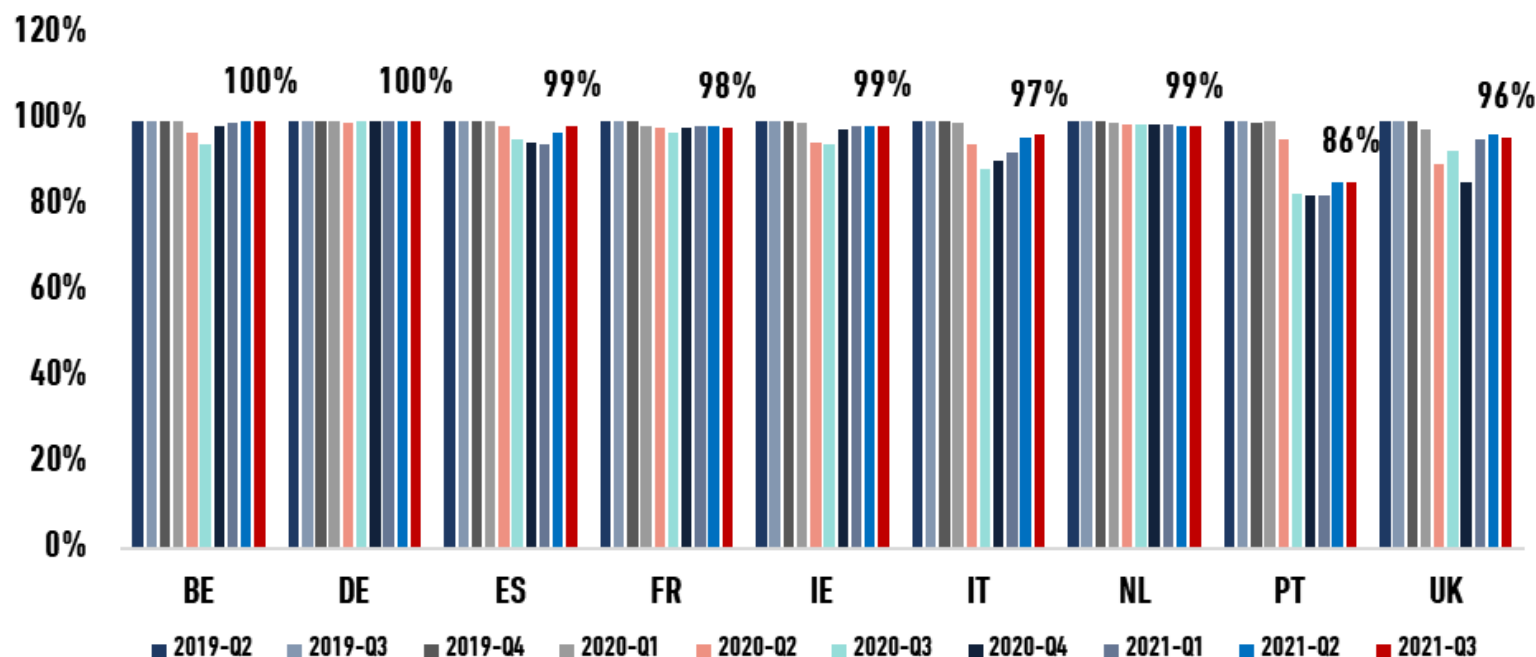
Note: Only the loans with a positive Current Balance from 2019 Q1 to 2021 Q3 are used in the analysis

MONITORING MORATORIA THROUGH COVID-19 – AMORTISATION LEVELS

Amortisation levels show RMBS performance has largely returned to Pre-Covid norms

MORTGAGES THAT AMORTISED SINCE THE PREVIOUS QUARTER

(as % of Outstanding Amount, Considering Mortgages that Amortised Consistently Prior to the Crisis)



PREPAYMENTS IN SPANISH RMBS

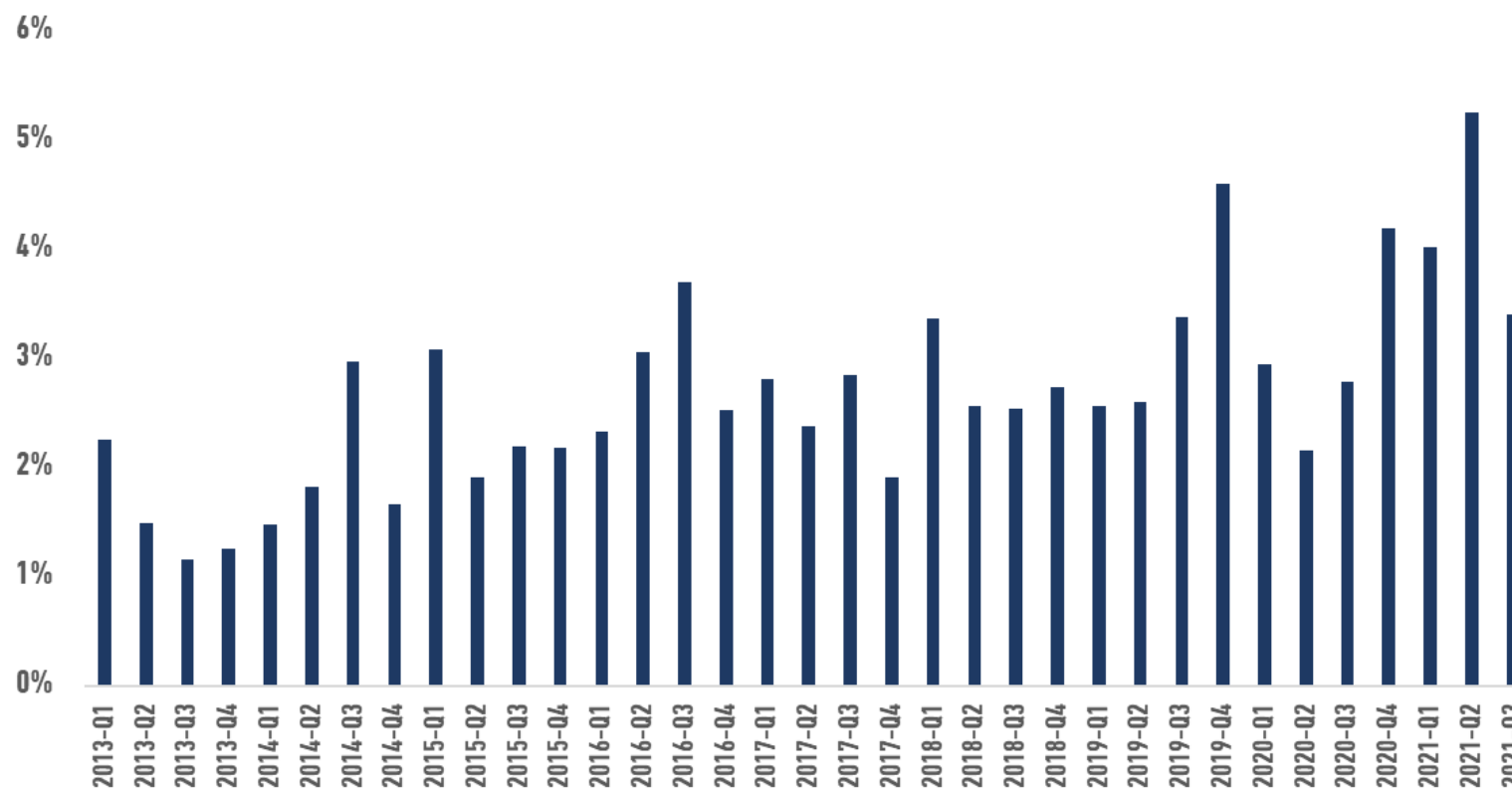
CPR – SPANISH RMBS

METHODOLOGY

- **ONLY FULL PREPAYMENTS TAKEN INTO ACCOUNT - PERFORMING LOANS THAT ARE REMOVED FROM THE RMBS POOL AND HAVE A MATURITY DATE BEYOND THE NEXT 6 MONTHS ARE CONSIDERED PREPAID**
- **Constant Prepayment Rate** $= 1 - \left(1 - \left(\frac{\text{Cumulative volume of loans prepaid over the quarter}}{\text{Balance of Performing loans at the start of the quarter}} \right) \right)^4$
- **DATA FROM 100+ RMBS TRANSACTIONS USED**

CPR – SPANISH RMBS

Quarterly CPRs range from 1 to 5%



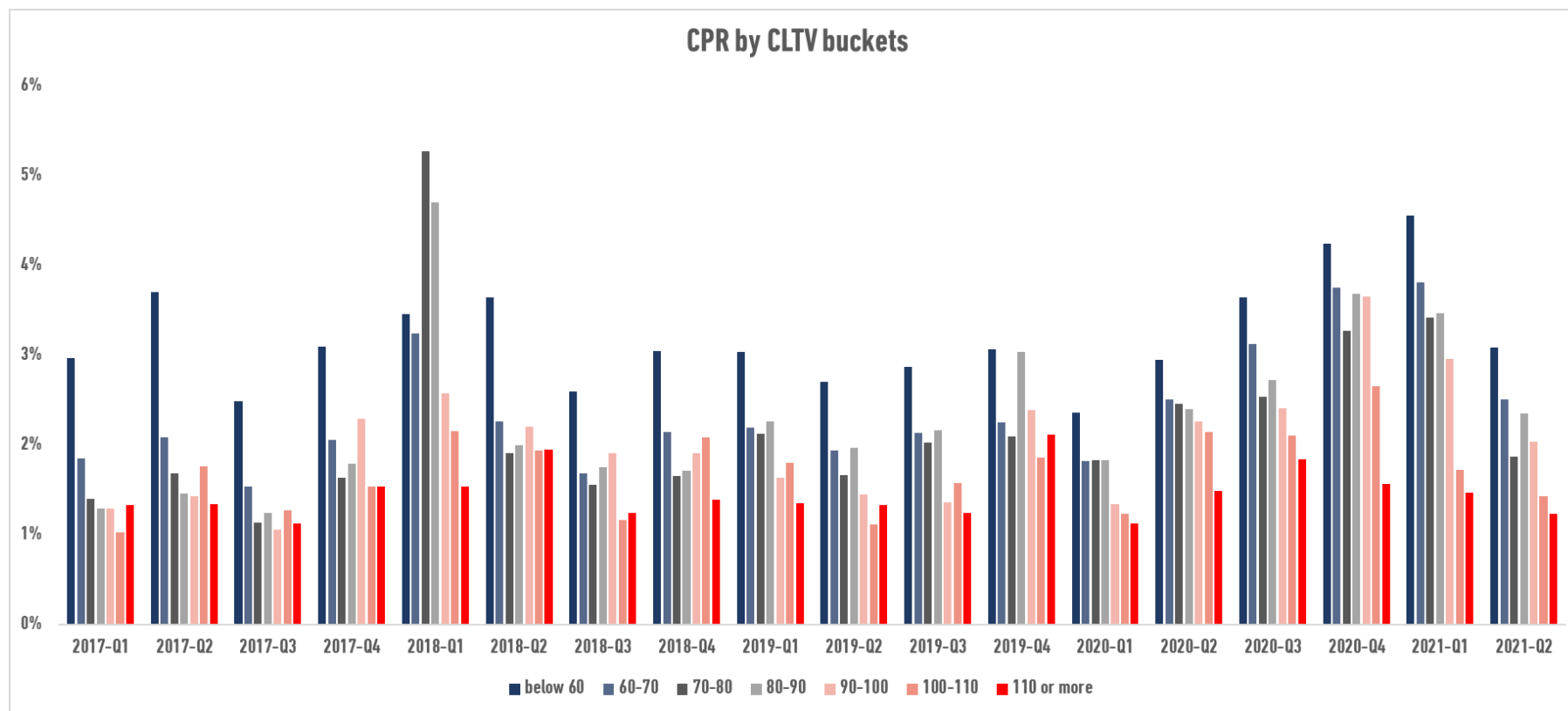
CPR – SPANISH RMBS

Loans originated between 2012 and 2014 have higher CPRs

AR55	2015-Q1	2015-Q2	2015-Q3	2015-Q4	2016-Q1	2016-Q2	2016-Q3	2016-Q4	2017-Q1	2017-Q2	2017-Q3	2017-Q4	2018-Q1	2018-Q2	2018-Q3	2018-Q4	2019-Q1	2019-Q2	2019-Q3	2019-Q4	2020-Q1	2020-Q2	2020-Q3	2020-Q4	2021-Q1	2021-Q2	AR55
2005	1.9%	2.0%	2.2%	2.4%	2.4%	2.3%	1.9%	2.1%	2.6%	3.2%	2.1%	2.4%	2.8%	2.8%	2.3%	2.9%	3.1%	2.8%	2.9%	3.1%	2.1%	2.9%	3.5%	3.7%	4.3%	3.3%	2005
2006	1.4%	1.6%	2.1%	1.9%	2.0%	1.4%	1.4%	1.7%	1.9%	2.8%	1.6%	1.8%	2.2%	2.2%	1.8%	1.9%	2.1%	2.0%	2.0%	2.1%	1.7%	2.8%	3.3%	3.5%	3.0%	2.8%	2006
2007	1.8%	1.7%	2.0%	2.1%	2.2%	1.9%	1.5%	1.7%	1.8%	2.6%	1.7%	2.3%	3.8%	2.2%	1.6%	1.9%	2.1%	1.9%	1.9%	2.3%	1.7%	2.2%	2.4%	2.6%	2.9%	2.6%	2007
2008	1.8%	2.2%	1.9%	2.0%	2.1%	1.8%	1.3%	1.7%	1.8%	2.1%	1.3%	2.5%	2.5%	2.4%	1.8%	2.2%	2.2%	1.9%	2.0%	2.2%	1.6%	2.2%	2.4%	3.0%	3.1%	2.8%	2008
2009	1.6%	1.3%	1.4%	1.8%	1.7%	1.5%	1.5%	1.7%	2.1%	2.0%	1.5%	2.4%	5.5%	2.4%	1.9%	2.1%	2.2%	1.9%	2.4%	2.6%	1.6%	2.7%	2.6%	3.0%	3.7%	3.1%	2009
2010	1.2%	1.3%	1.1%	1.7%	1.3%	1.3%	1.3%	1.3%	1.5%	2.1%	1.5%	2.0%	6.1%	1.9%	1.9%	2.0%	2.6%	1.9%	2.2%	2.2%	1.6%	2.4%	3.0%	2.9%	3.7%	3.0%	2010
2011	1.2%	1.6%	1.2%	2.7%	1.8%	1.6%	1.3%	1.7%	2.0%	2.0%	1.7%	2.5%	2.5%	2.1%	2.1%	2.1%	3.0%	2.2%	2.4%	2.5%	1.6%	2.4%	2.7%	3.4%	4.1%	2.9%	2011
2012	2.7%	4.8%	3.1%	4.2%	3.1%	2.6%	2.9%	2.5%	2.9%	3.0%	2.2%	3.6%	3.8%	3.0%	2.5%	3.3%	3.3%	2.7%	3.2%	4.0%	2.5%	3.3%	3.5%	3.9%	5.1%	3.1%	2012
2013	3.2%	4.2%	3.7%	2.9%	4.5%	4.5%	3.4%	4.3%	4.1%	4.4%	3.5%	3.4%	3.2%	4.4%	3.8%	4.5%	4.2%	4.2%	3.7%	4.5%	3.2%	4.5%	4.5%	5.2%	6.2%	3.9%	2013
2014	1.6%	1.0%	1.5%	1.5%	2.5%	3.3%	2.6%	3.4%	2.8%	3.1%	2.2%	2.6%	3.6%	3.9%	3.2%	4.3%	4.5%	3.3%	4.0%	5.3%	3.9%	4.4%	4.7%	6.9%	7.1%	4.2%	2014
2015					1.2%	1.3%	1.2%	1.6%	1.8%	1.6%	2.0%	1.9%	2.3%	2.8%	2.6%	3.3%	3.4%	3.1%	2.9%	4.2%	3.2%	3.5%	4.1%	5.9%	5.5%	3.6%	2015
2016									2.1%	1.0%	1.4%	2.1%	2.0%	2.0%	1.9%	1.8%	2.3%	2.4%	3.1%	4.2%	3.1%	4.0%	3.6%	5.8%	5.6%	3.9%	2016
2017													1.4%	1.5%	1.2%	2.0%	1.9%	2.3%	3.6%	3.1%	2.3%	3.2%	3.7%	5.7%	5.6%	3.3%	2017
2018																				1.3%	1.4%	2.1%	2.3%	4.1%	4.4%	1.6%	2018
2019																							0.9%	2.7%	2.9%	0.9%	2019
2020																								1.5%	2.1%	0.7%	2020
2021																										1.2%	2021

CPR – SPANISH RMBS

Low CLTV loans seem to have higher CPRs



ENERGY PERFORMANCE DATA AVAILABILITY

ENERGY PERFORMANCE CERTIFICATES WERE NOT REQUIRED UNDER ECB REGIME

High demand led to Researchers finding ways to imply Energy Efficiency from EDW data

Paper on Dutch Mortgages

Journal of Real Estate Finance & Economics
<https://doi.org/10.1007/s11146-021-09838-0>

Buildings' Energy Efficiency and the Probability of Mortgage Default: The Dutch Case

Monica Billio¹ · Michele Costola¹  · Loriana Pelizzon^{1,2} · Max Riedel¹

Accepted: 13 April 2021 / Published online: 11 May 2021
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Table 1 This table presents the energy rating distribution across property types and construction years

Property type	Construction year									
	1900– 1945	1946– 1964	1965– 1974	1975– 1982	1983– 1987	1988– 1991	1992– 1999	2000– 2005	2006 or later	
House, (semi-)detached	G	F	D	C	C	C	B	B	A	
Flat/Apartment	G	E	F	C	C	C	B	B	A	
Terraced House	F	E	C	C	C	C	B	A	A	

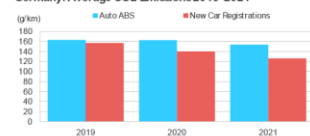
The rating scale ranges from A to G, with A being the highest rating. RVO's rating categories are obtained from <http://energielabelatlas.nl/info/index.html> and adjusted according to the property type definition in the mortgage dataset. Property type "residential detached/semi-detached house" in ED's dataset

Report on German Auto loans

German Auto ABS CO2 Emissions Are on the Right Path – Further Improvement Coming

Clear Trend Towards Sustainable Mobility but Offsetting Forces Exist

Germany: Average CO2 Emissions 2019–2021



Source: Fitch Ratings, European DataWarehouse, Kraftfahrt-Bundesamt

Emission Levels Are Heading Downwards

Fitch Ratings believes that reporting CO2 emissions is crucial when defining European green auto ABS. In the absence of transaction-specific emission data, we derive transaction pools' CO2 levels from official registration data that can serve as a first step for investors to rank-order auto ABS deals according to their own definition of sustainability.

Fitch combined manufacturer-specific annual average CO2 emission data from the Federal Motor Transport Authority (Kraftfahrt-Bundesamt, or KBA) with pool data from the European DataWarehouse, disclosing a portfolio's manufacturer distribution and vehicle registration years. On this basis, we estimate

manufacturers.

- Transaction-specific pool data for transactions launched between 2019 and 2021 (at closing date and still live) were obtained from European DataWarehouse.
- Pools with line-by-line data on vehicle registration year:** The median car age at loan/lease origination for used cars (median: four years) and for demonstration cars (median: one year) was calculated.
- Pools without line-by-line data for car registration date:** The vehicle age was calculated using the median car age from step 3. for demonstration and used vehicles and, for new cars, the loan/lease year was used as proxy for the registration date.
- Pool distribution by manufacturer and the respective cars' year

ENERGY PERFORMANCE CERTIFICATES ARE REQUIRED UNDER ESMA REGIME

ESMA Templates for loan level data contain relevant fields for Energy Performance

Fields RREC10 and RREC11 for underlying loans in Residential Mortgage-Backed Securities (RMBS):

RREC10	Energy Performance Certificate Value	<p>The energy performance certificate value of the collateral at the time of origination:</p> <p>A (EPCA) B (EPCB) C (EPCC) D (EPCD) E (EPCE) F (EPCF) G (EPCG) Other (OTHR)</p>
RREC11	Energy Performance Certificate Provider Name	<p>Enter the full legal name of the energy performance certificate provider. The name entered must match the name associated with the LEI in the Global Legal Entity Foundation (GLEIF) database.</p>

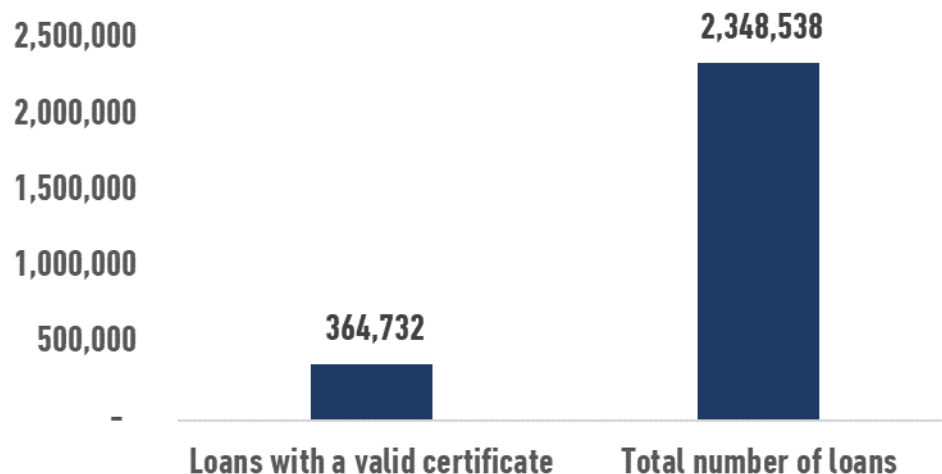
Fields AUTL57 and AUTL58 for underlying loans in AUTO ABS:

AUTL57	Energy Performance Certificate Value	<p>Other (OTHR)</p> <p>The energy performance certificate value of the collateral at the time of origination:</p> <p>A (EPCA) B (EPCB) C (EPCC) D (EPCD) E (EPCE) F (EPCF) G (EPCG) Other (OTHR)</p>
AUTL58	Energy Performance Certificate Provider Name	<p>Enter the full legal name of the energy performance certificate provider. The name entered must match the name associated with the LEI in the Global Legal Entity Foundation (GLEIF) database.</p>

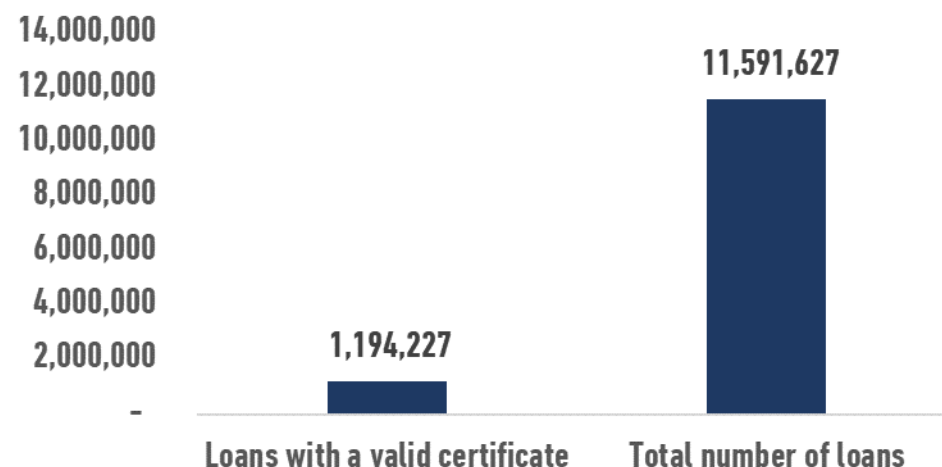
ENERGY PERFORMANCE CERTIFICATES – HOW MUCH DATA IS AVAILABLE

Still early days and most originators are struggling to provide this data

MORTGAGES



AUTO LOANS

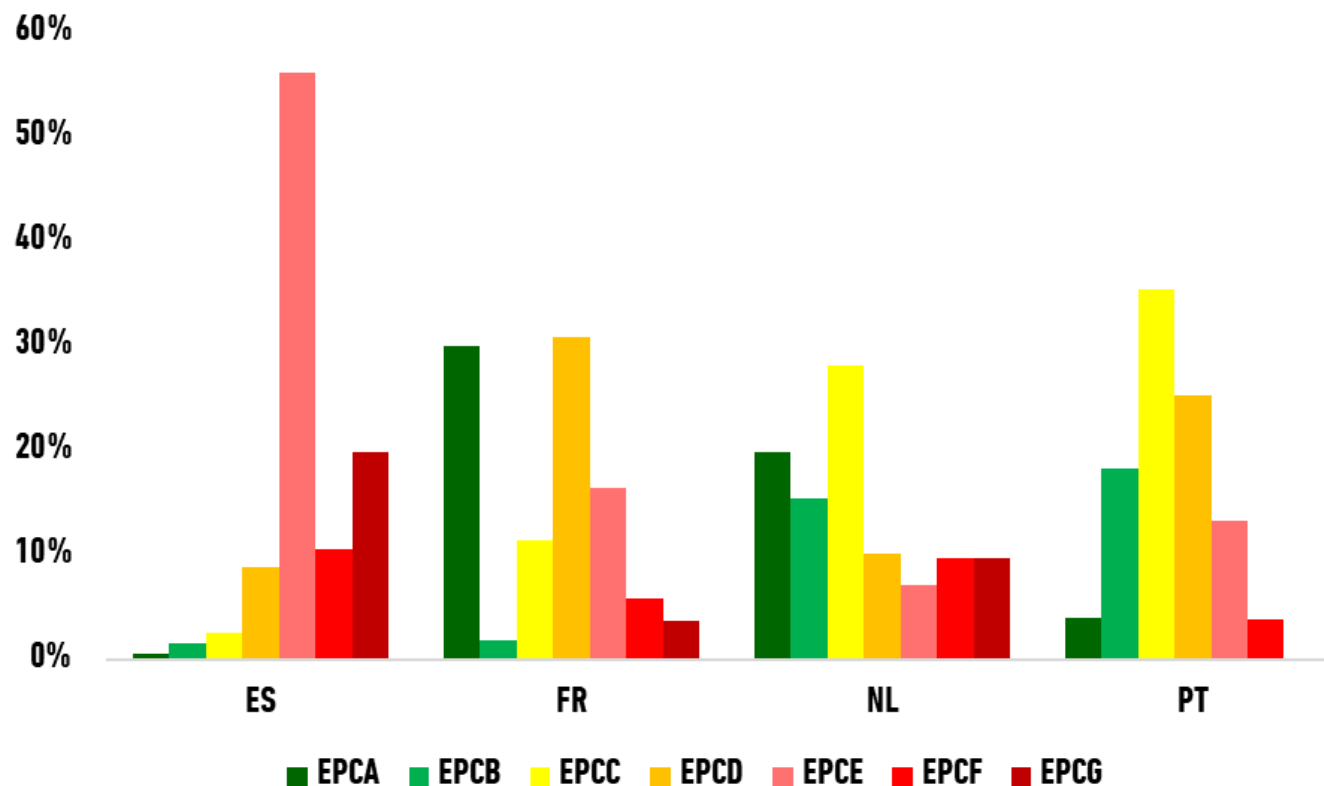


- **Data Quality is improving every day - Number of loans with a valid certificate value have recently increased by 16%**

ENERGY PERFORMANCE DATA FOR RESIDENTIAL MORTGAGES

ENERGY PERFORMANCE CERTIFICATES – RMBS

EPC distribution differs greatly across countries

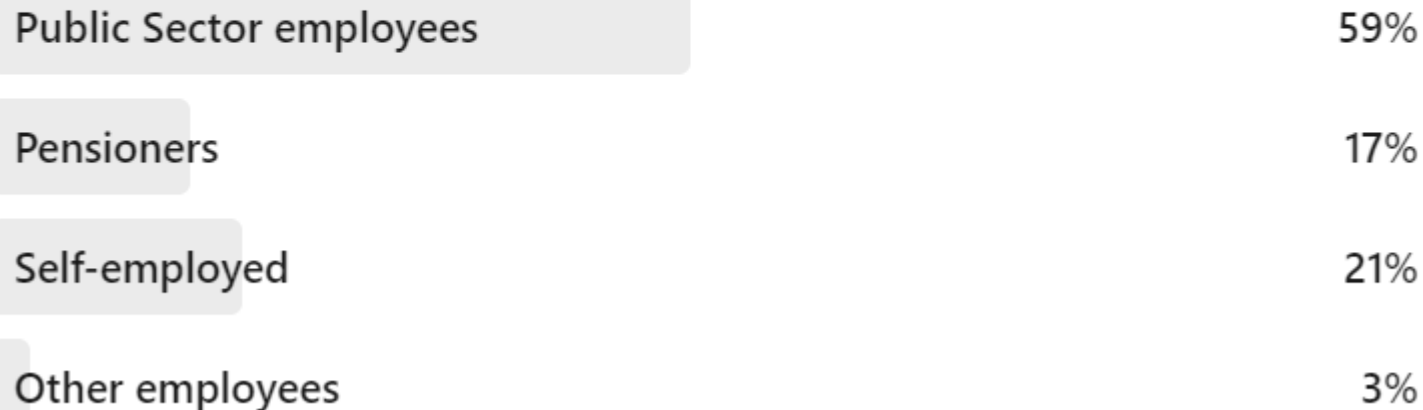


ENERGY PERFORMANCE CERTIFICATES – RMBS NETHERLANDS

Linkedin Poll Results

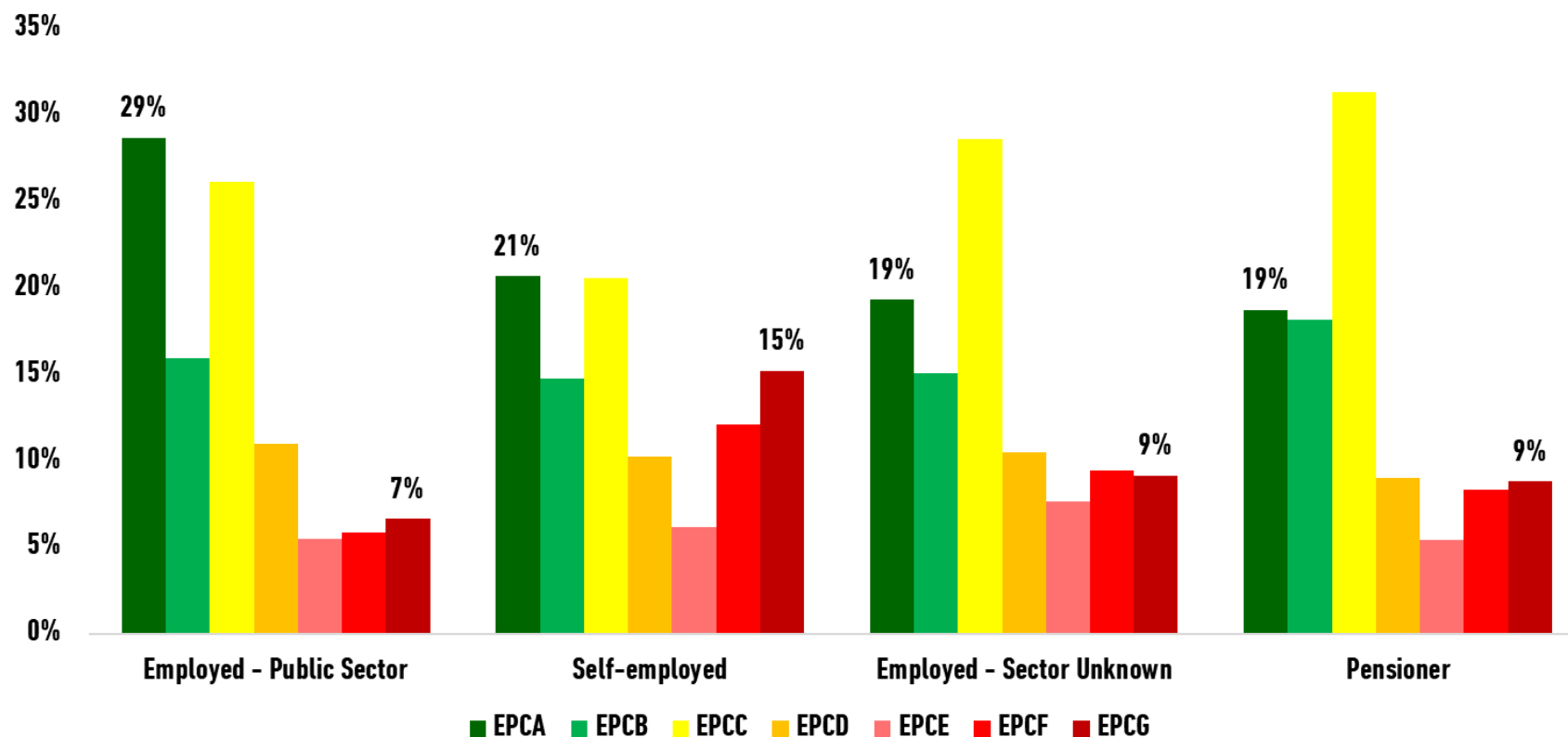
Which type of Mortgage Borrowers in Netherlands have the most Energy Efficient houses?

You can see how people vote. [Learn more](#)



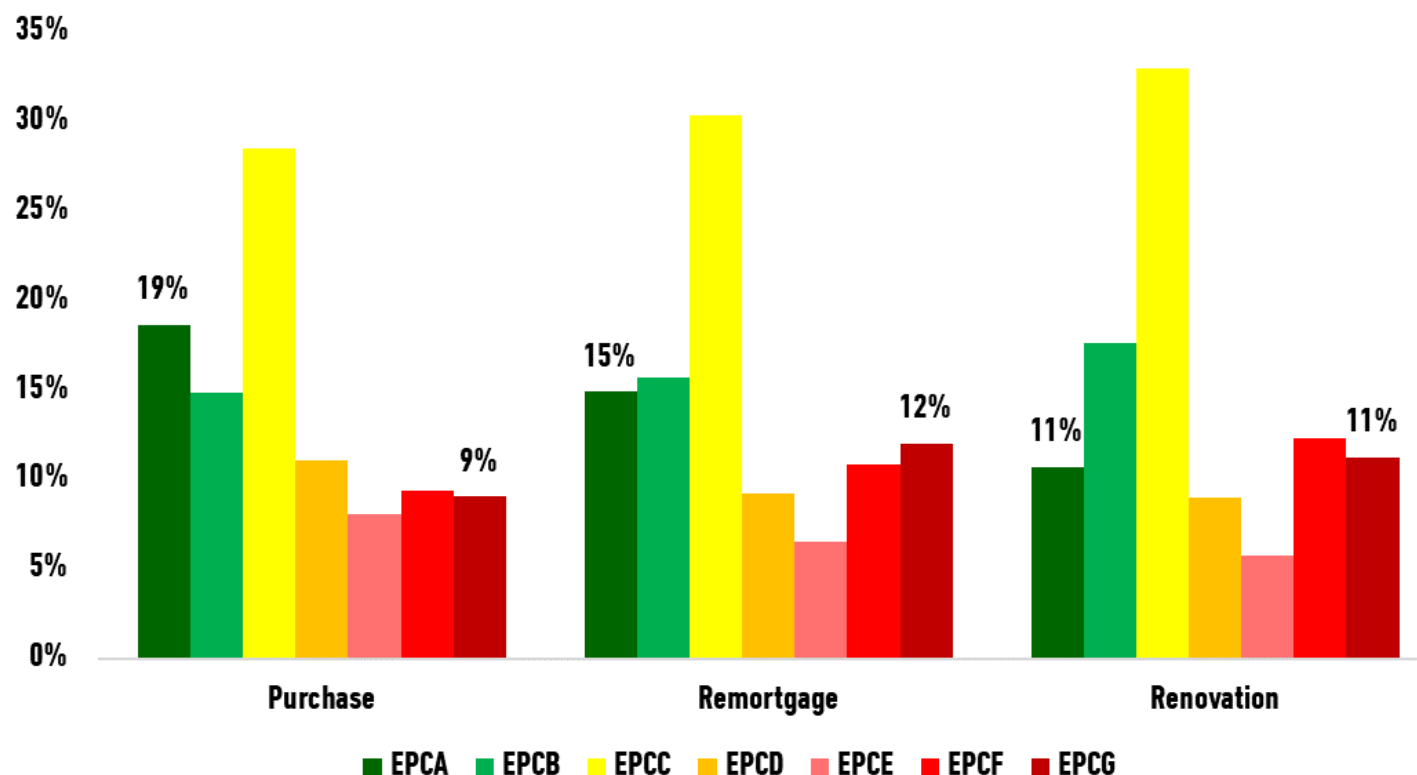
ENERGY PERFORMANCE CERTIFICATES – RMBS NETHERLANDS

Borrowers employed in the Public Sector have the most Energy Efficient houses



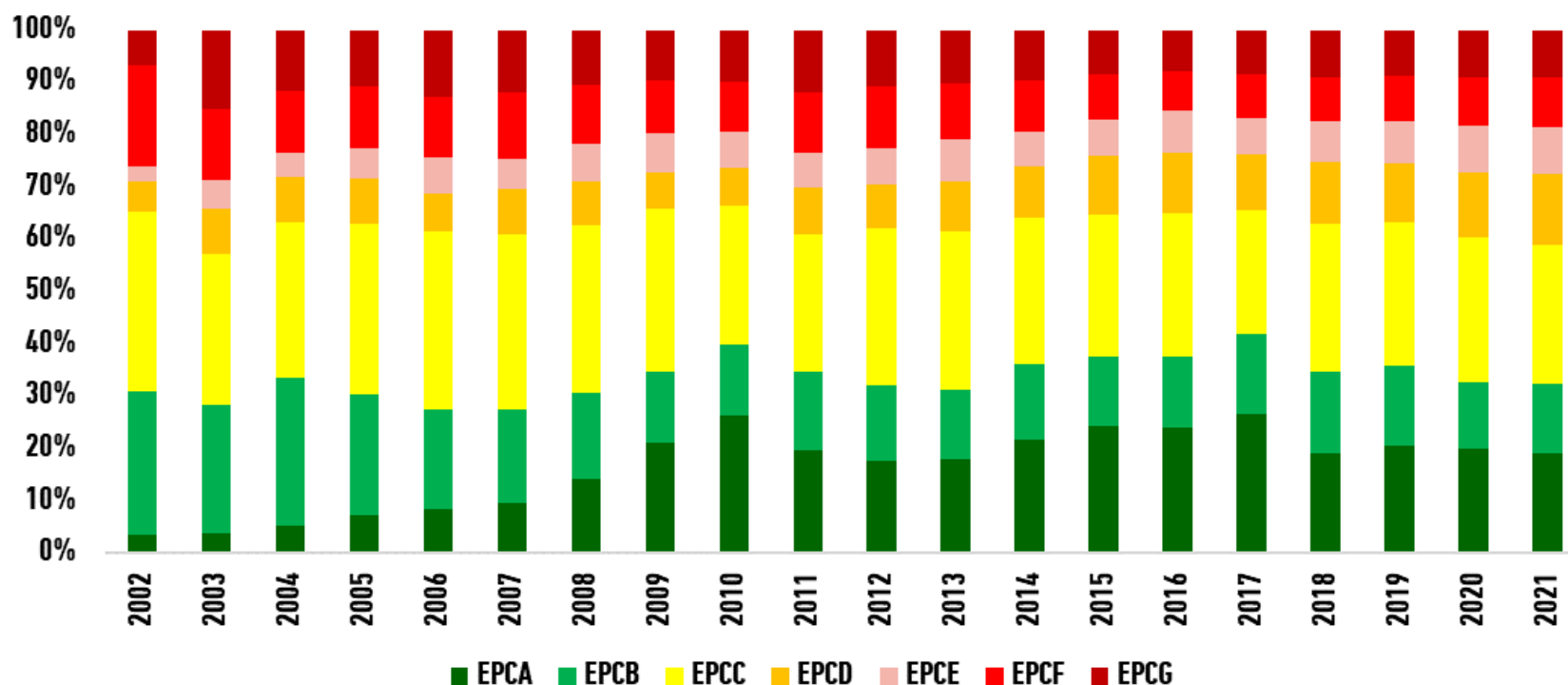
ENERGY PERFORMANCE CERTIFICATES – RMBS NETHERLANDS

Loans for Purchasing a Property have the best Energy Performance Ratings



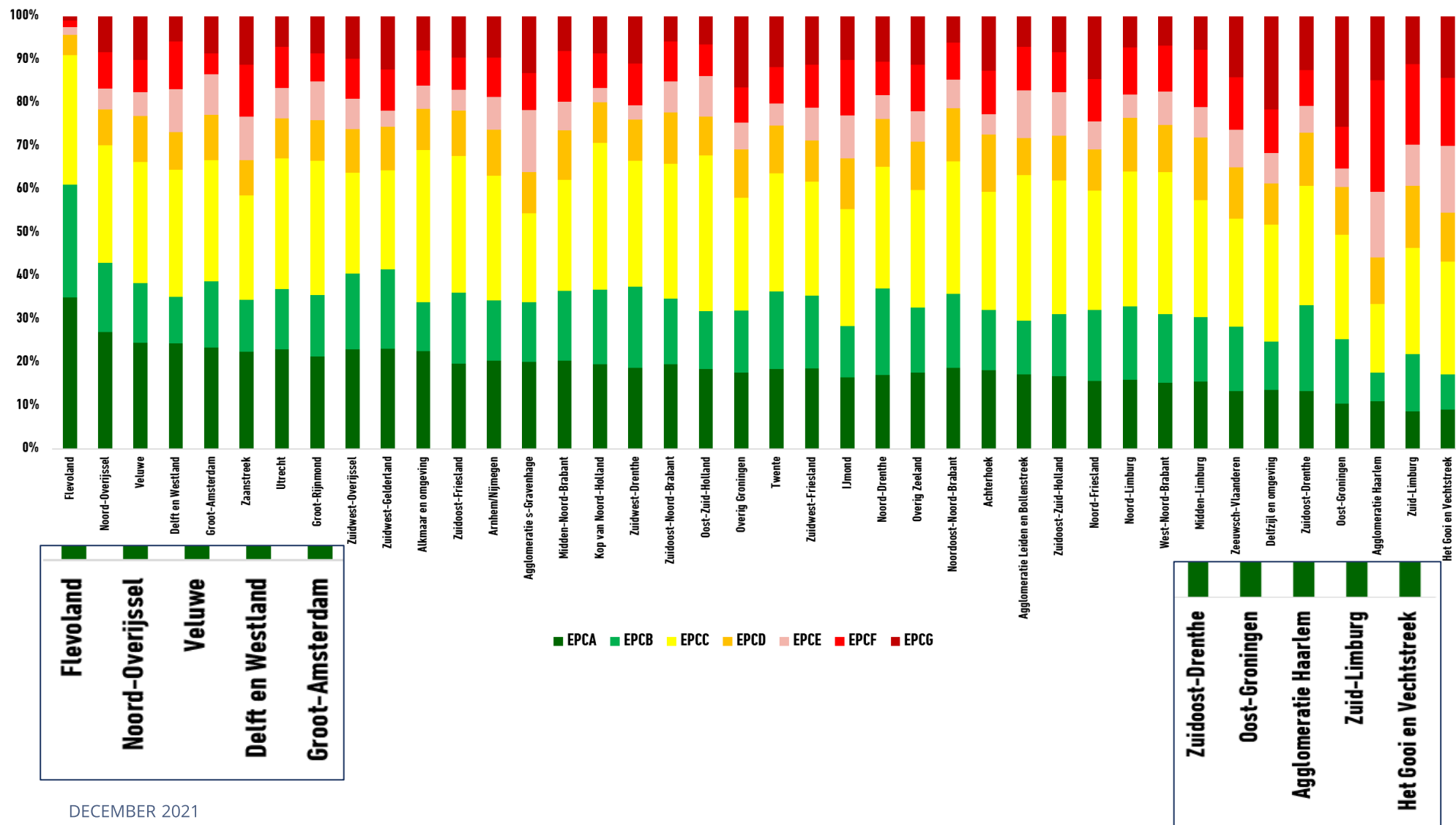
ENERGY PERFORMANCE CERTIFICATES – RMBS NETHERLANDS

EPC distribution by Year of loan origination shows a slight improvement over time



ENERGY PERFORMANCE CERTIFICATES – RMBS NETHERLANDS

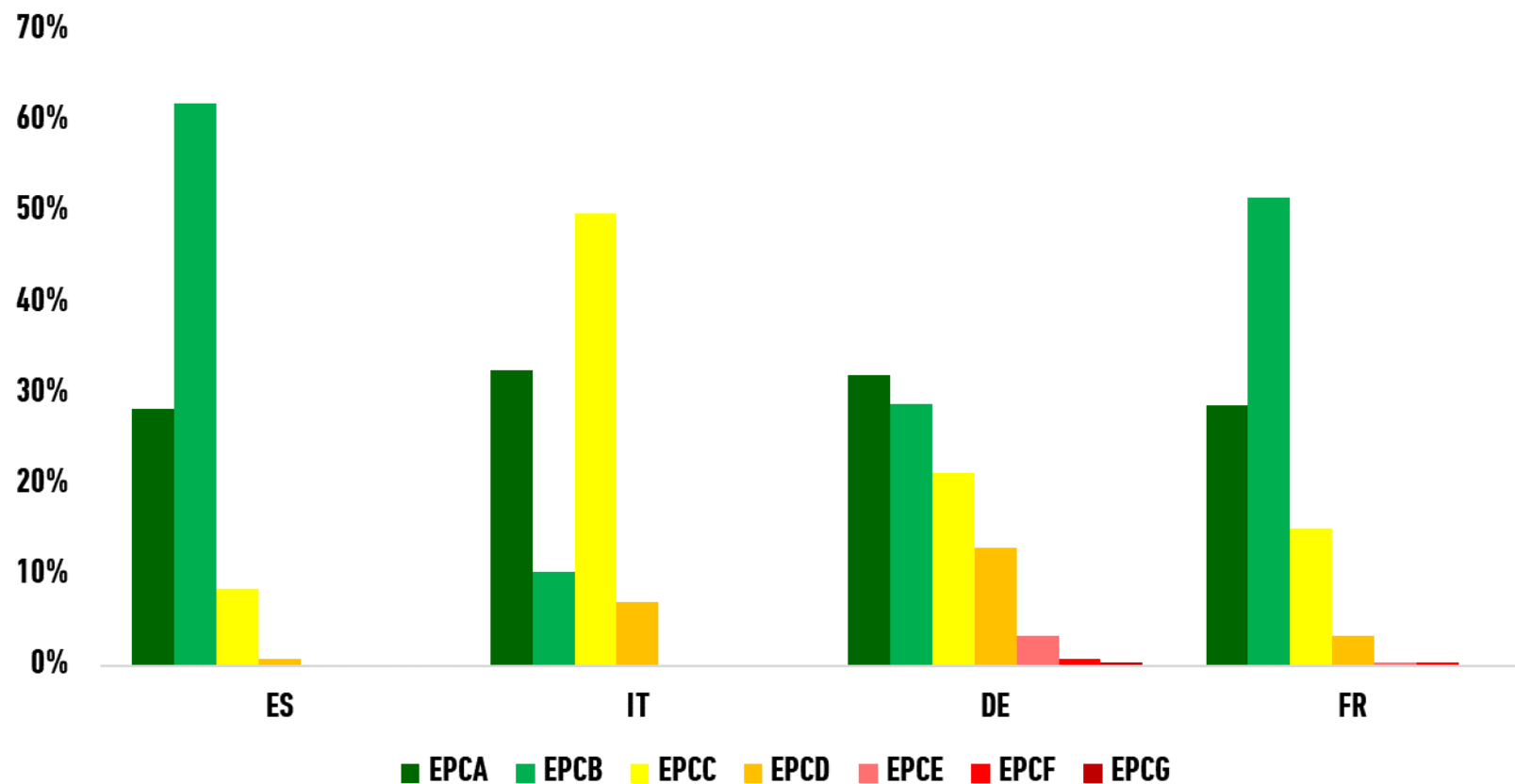
Data suggests that Flevoland has the most energy efficient houses across Netherlands



ENERGY PERFORMANCE DATA FOR AUTO LOANS

ENERGY PERFORMANCE CERTIFICATES – AUTO LOANS

EPC distribution by Country - Most cars have a Rating of C or better

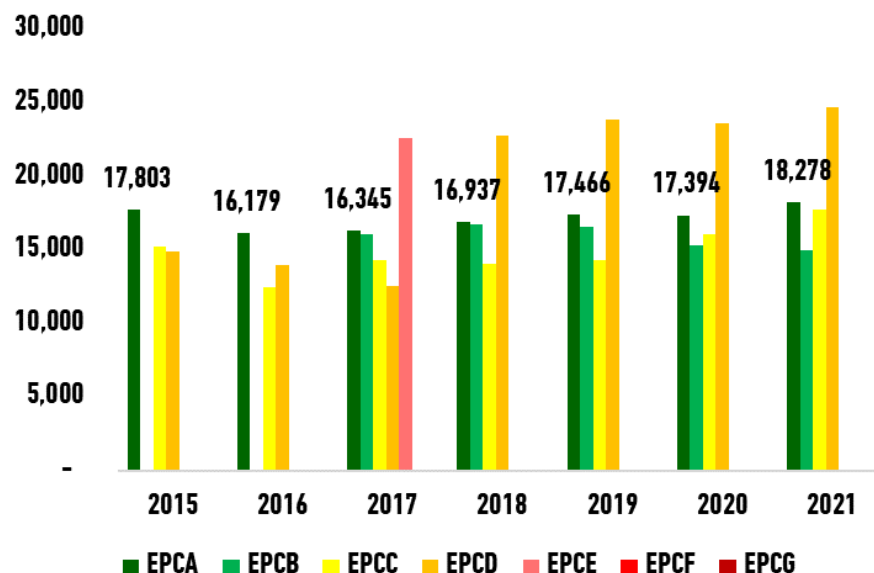


ENERGY PERFORMANCE CERTIFICATES – AUTO LOANS

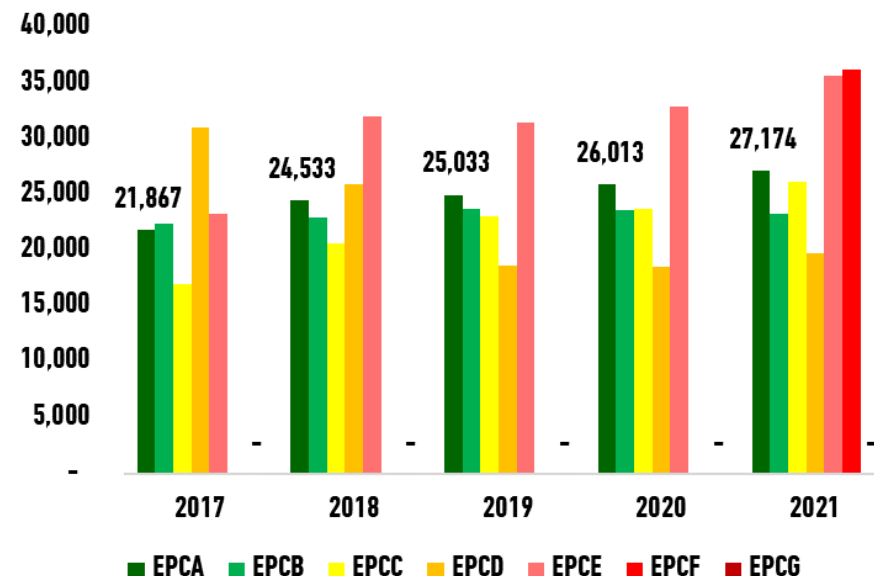
Is there a price premium on cars with high Energy Efficiency

Average Price of New Cars grouped by Loan Origination Year and EPC

FORD FIESTA



HYUNDAI i30

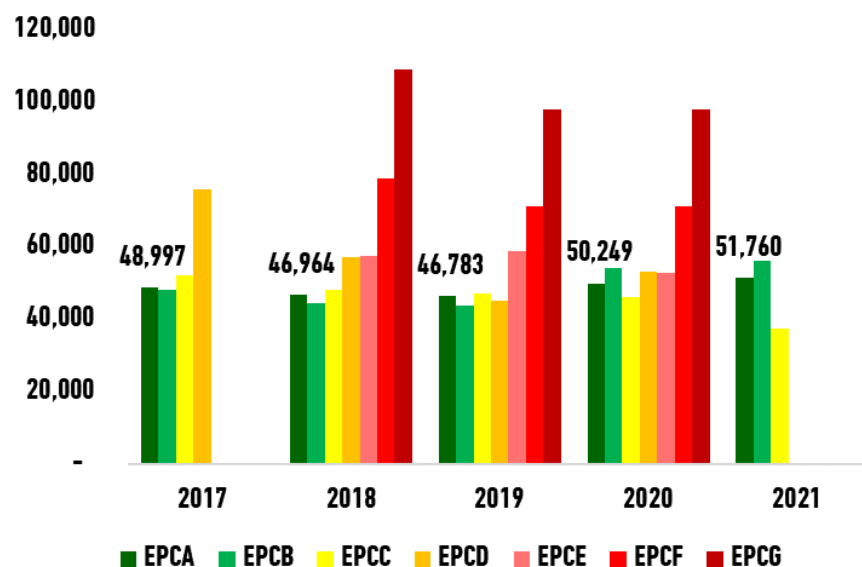


ENERGY PERFORMANCE CERTIFICATES – AUTO LOANS

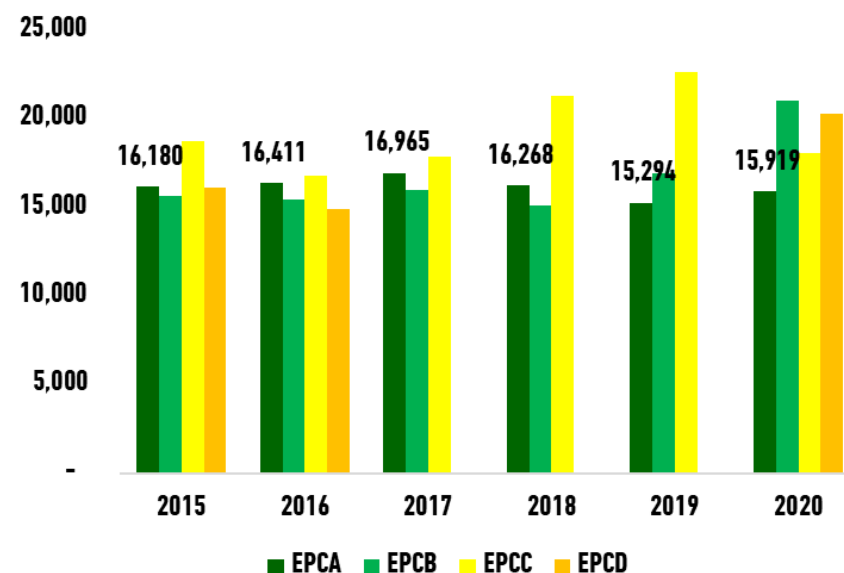
Is there a price premium on cars with high Energy Efficiency

Average Price of New Cars grouped by Loan Origination Year and EPC

MERCEDES C CLASS



CITROEN C3

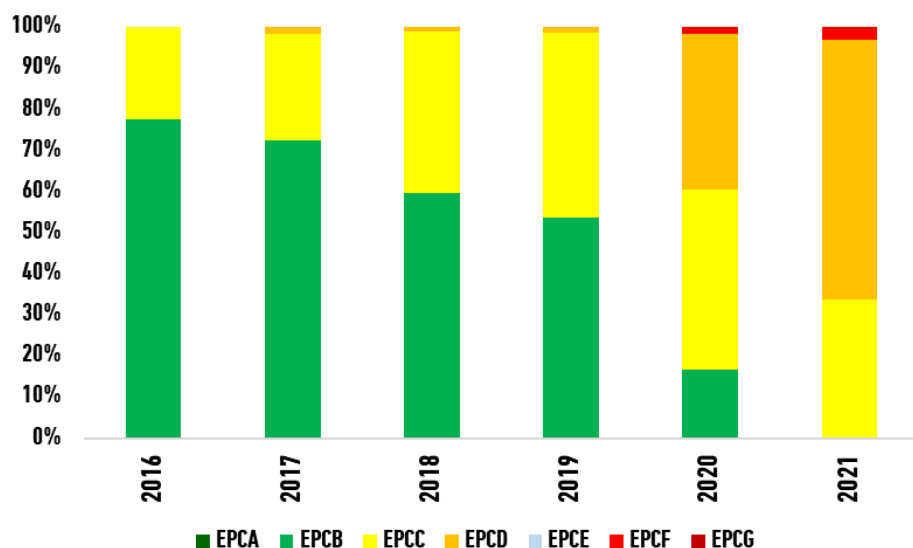


ENERGY PERFORMANCE CERTIFICATES – AUTO LOANS

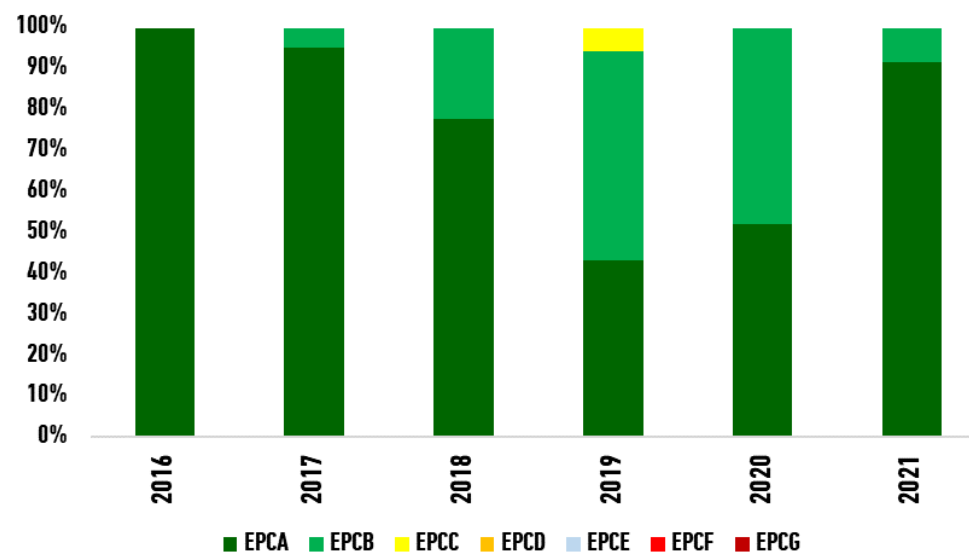
Different EPCs for the same cars across countries – Is Germany too lenient?

EPC Distribution of New Cars grouped by Loan Origination Year

BMW X1 (FRANCE)



BMW X1 (GERMANY)

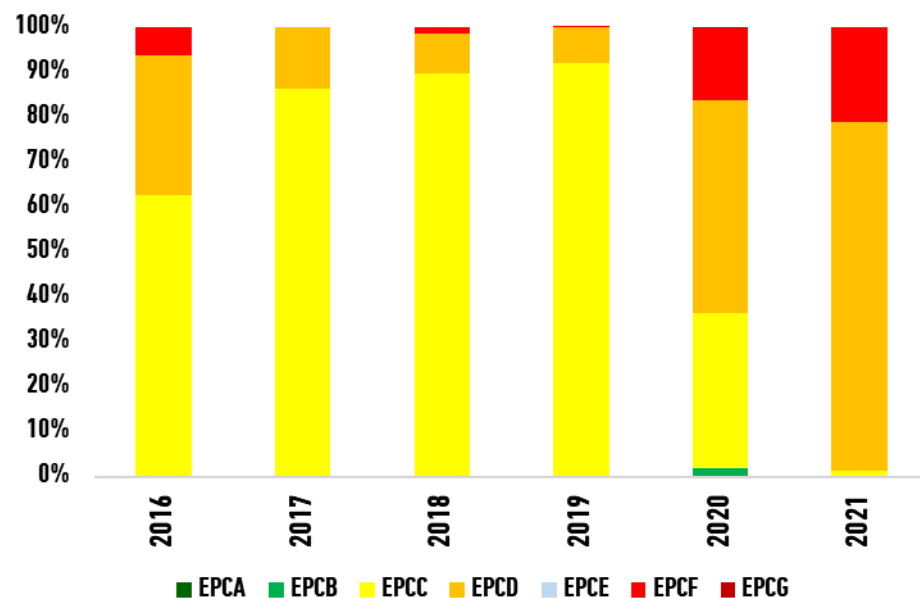


ENERGY PERFORMANCE CERTIFICATES – AUTO LOANS

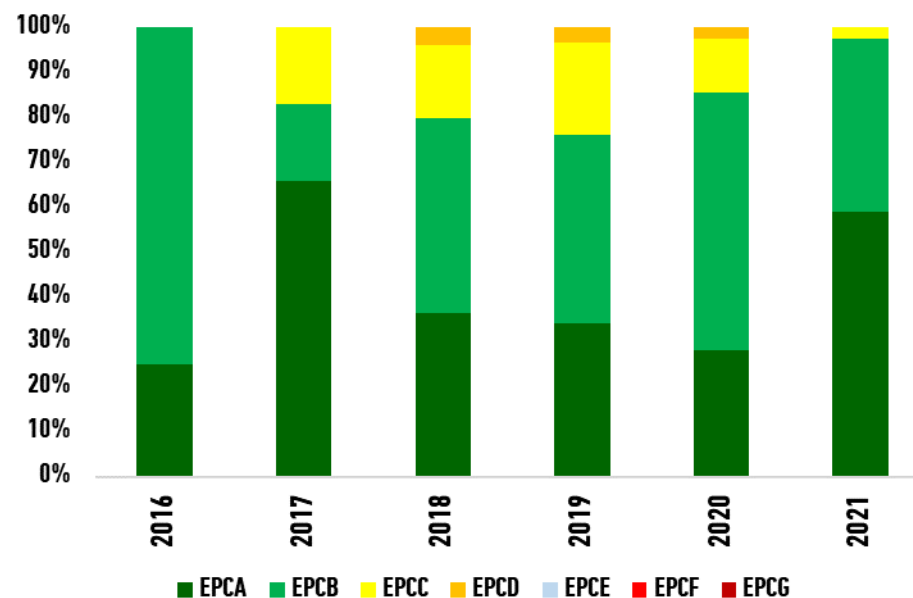
Different EPCs for the same cars across countries – Is Germany too lenient?

EPC Distribution of New Cars grouped by Loan Origination Year

VW TIGUAN (FRANCE)



VW TIGUAN (GERMANY)

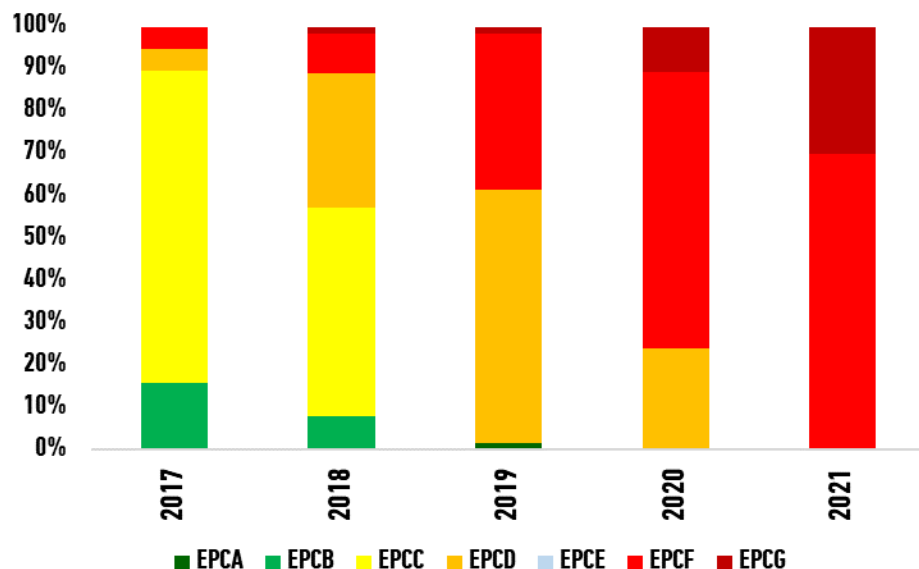


ENERGY PERFORMANCE CERTIFICATES – AUTO LOANS

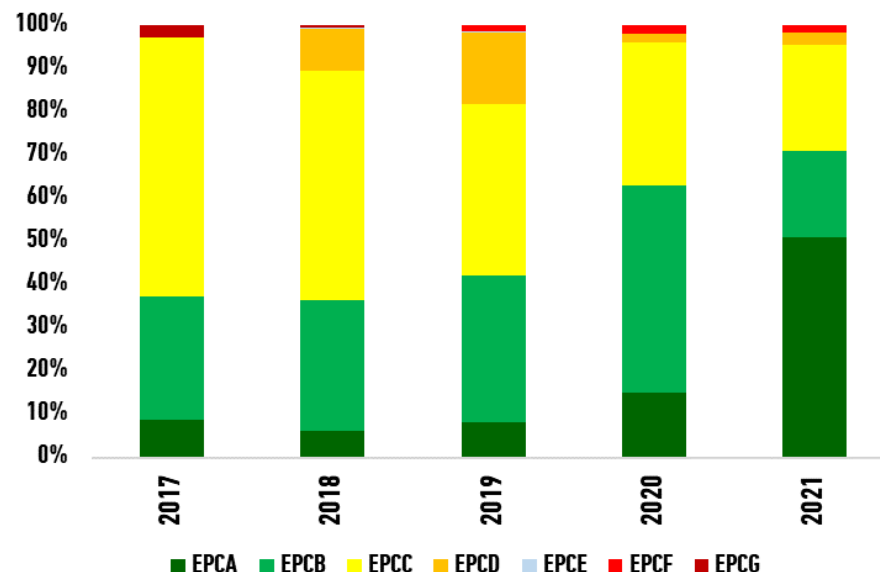
Different EPCs for the same cars across countries – Is Germany too lenient?

EPC Distribution of New Cars grouped by Loan Origination Year

LAND ROVER (FRANCE)



LAND ROVER (GERMANY)

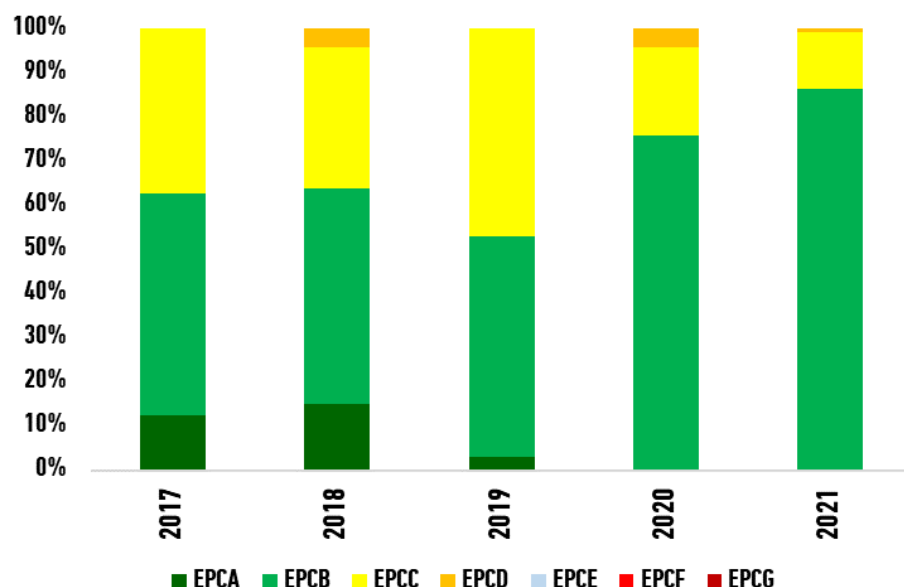


ENERGY PERFORMANCE CERTIFICATES – AUTO LOANS

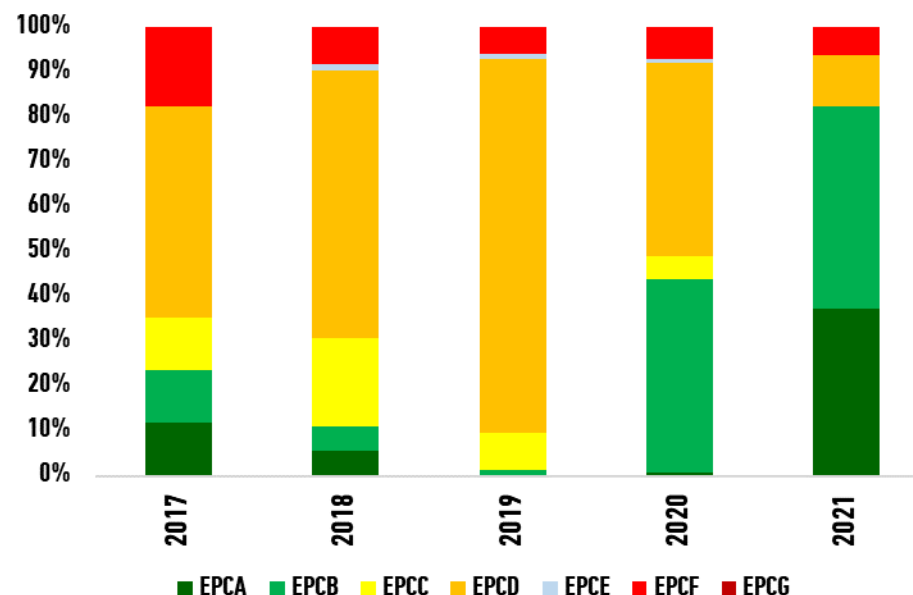
Different EPCs for the same cars across countries – EPC in Germany is scaled to the weight of the car!

EPC Distribution of New Cars grouped by Loan Origination Year

FIAT 500 (FRANCE)



FIAT 500 (GERMANY)



- **FORECASTING LOAN DEFAULT IN EUROPE WITH MACHINE LEARNING**
- **HOUSEHOLD DEBT AND ECONOMIC GROWTH IN EUROPE**



Q&A

THANK YOU//CONTACT US

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