Credit Fire Sales:

Captive Lending as Liquidity in Distress*

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Abstract

We study the role of captive finance in the car loan market when manufacturers' liquidity demand increases. Captive lending enables manufacturers to create liquidity, at the cost of future losses, by changing loan terms and relaxing lending standards to high-risk borrowers: a *credit fire sale*. We show evidence of credit fire sales using a new multi-country dataset on securitized car loans. Captive lenders expand lending to high-risk borrowers—relative to traditional non-integrated lenders— when the parent manufacturing company's liquidity cost (CDS price) and need (large fraction of outstanding bonds expiring) are high. Loan fire sales have new implications for the transmission of shocks to durable consumption and household leverage.

PRELIMINARY, COMMENTS WELCOME

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1 Introduction

Over the last 50 years an increasing number of industrial firms have internalized financial intermediation by creating units that perform bank-like activities - so called "captive lenders" (Banner, 1958; Greenwood and Scharfstein, 2013; Bodnaruk et al., 2016). This phenomenon has been particularly pronounced for durable good industries such as houses (Stroebel, 2016), cars (Benmelech et al., 2017), and equipment (Murfin and Pratt, 2019).[1] Given the central role durable goods played in the global financial crisis (Bernanke, 2018; Gertler and Gilchrist, 2018; Mian and Sufi, 2018), a natural question arises: does the vertical integration of manufacturing and credit provision affect the manner in which shocks to manufacturers/lenders propagate to consumer credit and durable good consumption?

In this paper we uncover a new channel through which captive lending affects the propagation of shocks from durable-good manufacturers to consumers. Using a new multi-country dataset on securitized car loans, we show that captive lending allows manufacturers to create liquidity when in distress by changing loan terms and lowering lending standards. Lower lending standards expand the supply of auto loans to, and induces additional auto purchases by, high-risk borrowers. The down-payments from the induced car purchases create liquidity today, at the cost of an increased exposure to default risk tomorrow.

We label this behavior a *credit fire sale*. Credit fire sales serve the same purpose of a fire sale, but its implications for manufacturers, investors, and consumers are distinct. For the manufacturer, a credit fire sale affects the book value of assets in the same way a regular sale does, because its costs are realized in the future. In contrast, the balance sheet implications of fire sales are immediate. For investors, while the cost of a fire sale is straightforward to evaluate (the difference between the market value of a car and its fire-sale price), the cost of a credit fire sale is not, as it requires information on buyers' credit risk which may not be observable. Finally, while fire sales and credit fire sales boost durable consumption, only

[1] According to Benmelech et al. (2017) before the crisis nonbank lenders financed more than half of all new cars bought in the United States. In in 2019 captive lenders account for about 28 percent of total car financing in the United States (see https://www.experian.com/content/dam/marketing/na/automotive/quarterly-webinars/credit-trends/q1-2019-safm-final-v2.pdf)

the latter increase the leverage of riskier households.

We focus on the European car market, in which specialized captive lenders coexist with traditional diversified banks in the market for auto-loans.[2] Car-buyers can either obtain a car/loan bundle from the manufacturer or buy the car from the manufacturer using financing from a bank. The car price and credit terms differ substantially across these two options, reflecting differences in clienteles, market power, ancillary services, etc. To account for these cross-sectional differences, our empirical approach looks at the time variation in the relative credit terms and borrower characteristics of captive and stand-alone lenders in response to manufacturer shocks. Our baseline specification measures how captive-lenders' credit terms change when the manufacturer is in distress, relative to the terms provided by stand-alone banks to purchase the same car model-make, in the same geographical market, and in the same month of purchase (brand-model $\times$ market $\times$ time fixed effects). Following Hortaçsu et al. (2013), we measure distress using the car manufacturer Credit Default Swap (CDS) price.

Our first set of results looks at loan terms. Our basic specification indicates that a 100 basis point increase in a manufacturer's CDS spread increases the relative rate by captive lender by 13 basis points, or about 2 percent of the average loan rate. At the same time we find that captive lenders shorten the maturity and decrease the loan-to-value (and loan amount) relative to standard banks when the car manufacturer CDS increases. Taken together, these results imply that captive lenders adjust loan terms to increase the liquidity generated by financing the car purchase when the parent manufacturing company experiences financial distress. The higher liquidity for the manufacturers comes with relative worse condition for car buyers who finance their purchase from captive lenders, as they now have to pay relative higher rates, come up with a larger down payment and repay faster. The changes in loan terms may thus generate a trade-off between liquidity and volumes, as the worse financing conditions can discourage potential buyers.

To explore this possibility we study an additional margin of adjustment that owning the

[2]According to a study by Roland Berger in 2016 the captive market share is around 36 percent in France, Italy and Spain, and 45 percent in Germany.

lending unit gives to the car manufacturer: lending standard. In the absence of detailed data on application and rejections, we proxy changes in risk-taking and lending standard by looking at changes in ex-ante demographics of borrowers, the fraction of verified loans and ex-post performances. Our basic specification indicates that a 100 basis points increase in a manufacturer's CDS spread decreases the relative share of verified income by captive lender by 5 percent, and increases the relative fraction of unemployed and self-employed by 0.6 and 1.5 percent, respectively. Additionally, we find that loans originated by captive when manufacturer's CDS spread increases by 100 basis points are about 3 percent more likely to be in arrears. Thus captive lenders seem to relax lending standards when the parent manufacturing company experiences financial distress.

Taken together, our results show that captive lenders differentially adjust loan terms and lending standards relative to stand-alone lenders when the parent manufacturing company is in financial distress. Most notably, the combination of the loan term adjustment and lending standard that allow the manufacturers through the captive unit to extract liquidity from inframarginal buyers, without loosing (or even increasing) marginal risky buyers.

In the second part of the paper, we delve into the mechanism further and test the hypothesis that credit fires sales are more valuable when the manufacturer's liquidity need increases. We exploit pre-determined variation in the fraction of outstanding bonds that matures in a month as a time-varying measure of manufacturer liquidity needs. The idea is that if the differential behavior of captive lenders relative to stand-alone lenders when the manufacturing company is in financial distress is driven by a liquidity creation motive we expect our results to be stronger when the manufacturer needs liquidity (a large fraction of existing bonds are expiring) relative to when the manufacturer has enough liquidity (a small fraction of existing bonds are expiring). We find that the effects of manufacturers' CDS price on loan terms by the captive unit relative to stand-alone lenders are significantly larger when car manufacturers have a larger fraction of outstanding expiring bonds. We also find that when a distressed manufacturer has high liquidity needs, captive lenders extend loans to borrowers with relative lower income than stand-alone lenders, income is less likely to be

verified, and borrowers have a large probability of future arrears. The same patterns are either non significant or less pronounced when the distressed manufacturer has low liquidity needs. Overall, these finding supports the interpretation that credit fire sales represent a tool for the manufacturer to manage liquidity.

Finally, to provide causal evidence on the role of captive lending as liquidity providers in distress, we exploit a quasi-natural experiment that generated exogenous variation in manufacturers' financial distress. On September 18, 2015, the U.S. Environmental Protection Agency (EPA) found that approximately 500,000 Volkswagen diesel-engine vehicles sold in the US contained a defeat device that could detect when the car was being tested, changing the performance accordingly to improve results.[3] The shock generated a vast press coverage and immediate effects, with the CDS of Volkswagen quadrupling in a few days. Other manufacturers also experienced increases in their CDS, albeit lower. We create a measure of exposure to the shock based on the fraction of bonds maturing from September to November 2015 and estimate a difference-in-differences model exploiting the variation in the months after the event relative to before for manufacturers with high liquidity needs (treatment group) relative to manufacturers with low liquidity needs (control group).[4] Treated manufacturers increase loan rates relative to stand-alone lenders by more than 35 basis points, decrease maturity almost 8 percent, loan-to-values by more than 2 percentage points and loan amounts by almost 10 percent. Control manufacturers, despite experiencing a similar increase in CDS, barely change loan terms. With respect to risk-taking, we find that after the shock manufacturers with high liquidity needs originate loans to lower income borrower, who ex-post are more likely to default, while manufacturers with low liquidity need if anything increase significantly the share of borrowers with verified income.

Related literature. Our findings imply that vertical integration between production

[3] A number of recent papers study the Volkswagen emission scandal and its implication for example for health outcomes (Alexander and Schwandt, 2019) and collective reputation (Bachmann et al., 2019).

[4] In our exercise we exclude on purpose loans for buying Volskwagen cars and other brands of the group (Audi, Porsche, Seat, and Skoda), given the largely different change in CDS, and to minimize direct demand effects. We also show that manufacturers in the treatment and control groups face a very similar pattern in terms of changes in CDS as a result of the scandal.

and financing fundamentally alters the responses to shocks relative to the case in which the two functions are performed by separate entities. Existing literature documents how stand-alone lenders that face a liquidity shock tighten credit supply, especially to high-risk borrowers (Khwaja and Mian, 2008; Paravisini, 2008; Ivashina and Scharfstein, 2010; Amiti and Weinstein, 2011). This paper demonstrates that a liquidity shock to a captive lender may lead to the exact opposite: an expansion in credit to high-risk borrowers. Existing literature also documents how stand-alone manufacturers that experience a demand shock suffer immediate revenue losses and may resort to fire sales to generate liquidity (Pulvino, 1998; Benmelech and Bergman, 2008; Shleifer and Vishny, 2011; Hortaçsu et al., 2013). We demonstrate that when production and financing are integrated, credit fire sales allow avoiding the immediate and certain losses due to a fire sale. The cost of credit fire sales to the manufacturer/lender, due to increased risk-taking in lending, accrue in the future. These findings imply that the integration of manufacturing and financial intermediation can change the sign, magnitude, and timing of the real effects of liquidity shocks to lenders and manufacturers. These new insights complement existing work on the transmission of financing shocks to the real economy (Almeida et al., 2009; Paravisini et al., 2014, 2015).

Our work also contributes to the literature on captive finance, which has proposed different explanations for the existence of captive lenders: price discrimination (Brennan et al., 1988); asymmetric information (Stroebel, 2016); commitment problems and the Coase conjecture (Murfin and Pratt, 2019). In this paper we show that captive lending adds a new tool for liquidity managements for manufacturers in distress.

We also contribute to the literature that studies car finance (Attanasio et al., 2008; Argyle et al., 2017, 2018, 2019; Melzer and Schroeder, 2017). While most previous work has focused on the demand for car loans, we focus on the supply side. Thus, our paper is mostly related to the work by Benmelech et al. (2017) who study the effect of the collapse of the asset-baked commercial paper market on auto sales, though illiquidity of nonbank lenders. We complement their work by looking at how captive lenders can instead provide liquidity in the presence of shocks to the manufacturers. In this way our paper is also closely related

to Hortaçsu et al. (2013), who show that financial distress can decrease demand for the distressed firm products, thus affecting cash flows. We show how car manufacturers manage cash flows in response to financial distress through its captive lending unit.

Overview. The remainder of the paper is organized as follows. Section 2 describes the data sources and provides empirical facts on the difference between traditional banks and captive lenders. Section 3 details the main empirical results. Section 4 explores the mechanism and discuss additional results. Section 5 concludes.

2 Data and Facts

2.1 Data

Our analysis combines four different data sources. Our main dataset comprises those car loans securitised by European banks and captive lenders over the period December 2013 to December 2017. These data are available through the European Data Warehouse (EDW) and are reported according to the ABS template used by ECB within the framework of the 100 percent transparent policy on securitized loans. EDW collects information on all outstanding car loan securitizations from 2013. However, the information available in the first (and successive) reports of each securitization does not necessarily include all loans that were part of the pool of the securitization at origination, unless the first report is the one corresponding to the origination date. For instance, non-performing loans and loans maturing before the first reporting date could have been excluded. To avoid any bias due this issue, we restrict our initial sample to those securitizations for which we observe the whole pool of securitized car loans over the whole life of the securitization (i.e., up to December 2017). Thus, we use information on all data reports (usually on a quarterly basis) corresponding to securitizations originated between December 2013 and December 2017.[5]

[5]We screen all the reports available for each securitization given that new loans are added to the pool over time whereas some others disappear. Moreover, if any information is updated for any of the loans coming from a previous report, we use the new information to replace missing observations.

Our initial dataset consists of 182 car loan securitizations originated in Austria, Finland, France, Germany, Italy, Netherlands, Portugal and Spain.

We restrict our sample to those loans originated between December 2013 and December 2017, which, given the previous requirement, means that we are considering the vast majority of loans securitized during this period. In addition, we restrict our sample to all loans for which we have information on the interest rate, the maturity, the amount granted at origination, the value of the car, and the car model. We also discard loans without information on borrower characteristics such as income, employment status, and region in which his/her domicile is located (i.e., NAUTS codes). In addition, we apply the following filters. First, we restrict our sample to amortising car loans, which means that we discard leasing, balloon loans and any other type of non-standard car loans. Second, we consider just customers with the legal form of individuals such that we do not consider public and limited companies, partnerships, government entities and any other type of customers. Third, our sample is winsorized at 0.1 and 99.9 percent levels for the car value of each specific model and the following loan characteristics: interest rate, maturity, and size. Fourth, we discard new cars and focus on the used ones because the coverage of new cars is poor for diversified lenders (only 6 percent of the loans for the purchase of new cars are granted by diversified lenders whereas this fraction is 41 percent for the used cars). Fifth, we exclude duplicated loans given that although each loan and borrower has a unique identifier in each securitization, they could appear in more than one securitization of the same lender. We consider that a loan is duplicated when there is more than one loan granted by the same lender at the same date for the same interest rate, amount, down-payment, and maturity; to individuals that buy the same car model at the same price and who are domiciled in the same region, with the same employment status, and the same income. Sixth, we discard motorbikes, caravans, trucks and those car models that appear less than 100 times. Seventh, we exclude from our sample brands of manufacturer without a captive lender in the group. Finally, we restrict our sample to loans with a LTV above 10 percent at origination.

Our final sample consists of 1,155,450 car loans granted by banks (Banco Santander,

Bank Deutsches Kraftfahrzeuggewerbe, Bank 11, BNP Paribas, Socram Banque) and captive lenders (BMW, Fiat Chrysler, Ford, Mercedes, Opel/GM, Peugeot, Renault, Toyota and Volkswagen) over the period December 2013 to December 2017 to individuals domiciled in France, Germany, Italy and Spain.[6] These loans are part of the pool of 37 securitizations and are granted for the purchase of 25 different brands and 272 different models made by the manufacturers which are the parent firms of the previously enumerated captive lenders. All the loans that form of our final sample are fixed-rate loans with a monthly payment frequency. In terms of coverage of our sample, we find that the total amount of loans granted in Spain over the period 2013Q2 - 2017Q4 with maturities between 1 and 5 years for the purchase of both old and new cars represent around 20 percent of all consumer credit with similar maturities for the purchase of durable and non-durable goods. Of course, this coverage would be higher if one considers just durable goods but this information is not available.

Our analysis combines the previously described dataset and three additional ones. The information on the lender's balance sheet is obtained from SNL (at branch or subsidiary level) and include proxies for size (logarithm of total assets), risk (equity over total assets) and profitability (ROA). CDS prices for the underlying lenders' debt securities are obtained from Reuters. Finally, we use Dealogic to conduct the analysis based on the financing needs of lenders. More specifically, we use information on all individual debt securities issued by the parent firm or its subsidiaries (issuance and maturity dates and amount issued) to define the liquidity needs of lenders.

Table 1 shows the main variables used in the analysis. Panel A shows the main contract characteristics. The average car loan in the sample has an interest rates of 6.2 percent, a

[6]Note that within each group there are different subsidiaries and branches that operate in different countries: Banco Santander (Santander Consumer EFC, Santander Consumer Bank AG, Santander Consumer Bank S.p.A.), Bank Deutsches Kraftfahrzeuggewerbe GmbH, Bank11 fur Privatkunden und Handel GmbH, BNP Paribas Personal Finance, Socram Banque, BMW Bank, Fiat Chrysler (FCA Bank Deutschland GmbH, FCA Bank S.p.A., FCA Capital Espana, FGA Capital S.p.A.), Ford (FCE Bank German Branch), Mercedes-Benz Bank, Opel/GM (GMAC Bank GmbH, Opel Bank GmbH), PSA (Banque PSA Finance, Banque PSA Finance Espana, BPF Italy, PSA Bank Deutschland GmbH, Credipar), Renault (RCI Banque, RCI Banque S.A. Niederlassung Deutschland), Toyota (TKG), Volkwagen (Volkswagen Bank GmbH, Volkswagen Bank Branch Italy, Volkswagen Finance S.A.).

maturity of 51 months and a loan-to-value of 73 percent. There is lots of variation in all contract dimensions with rates ranging from 3 to 10 percent, maturities from 14 to 84 months and loan-to-value from about 20 to more than 110 percent. The average car value is about 13 thousands euros and car values go from about 4 to 25 thousands euros.

Panel B and C of Table 1 show borrowers characteristics and performances, respectively. The average annual gross income is about 36 thousands euros and it goes from about 7 thousands euros to more than 60 thousands euros. About 81 percent of borrowers are paid employee, 6 percent are self-employed, 1 percent student or unemployed and 11 percent pensioners. Income is verified in about 62 percent of loans. Finally, about 5 percent of loans are in arrears.

Panel D and E of Table 1 show manufacturers' and lenders' variables, respectively. The average CDS in the sample is 1.2 percent, but there is a lot of variation with CDS as high as 3 percent. The average value of maturing bonds as a fraction of the total outstanding value is about 4 percent. There are manufacturers-month pairs with no maturing bonds, and months in which a manufacturer has more than 14 bonds maturing. Finally, we report lenders controls that we use in our regressions. Lenders average return on assets is about one, while the ratio of equity over total assets is around 11 percent. The average lenders' total assets are around 16 millions, ranging from one to more than one hundred millions.

2.2 Captive lenders and traditional banks

In this section we describe some preliminary facts about car loans issued by captive lenders and traditional banks. Figure 1 shows the share of loans made by two captive and two traditional lenders for approximately 25 different brands. Captive lenders fully specialize in their brands: approximately 45% of PSA loans are for Citroen and 55% for Peugeot; more than 60% of Volskwagen finance loans goes to Volskwagen and Seat, which is also part of the group. Diversified lenders spread their loans across different brands. BNP loans are more tilted toward French brands, such as Renault, Peugeot, Citroen, but none of them has a share greater than 30%. Santander loans are even more diversified with no single brands

accounting for more than 15% of the loans.

Table 2 shows the main variables used in the analysis for captive lenders and traditional banks. The first fact to notice is that loans granted by captive lenders have on average a significantly higher interest rate than loans by traditional banks. The average rate for captive lenders is 6.8 percent, while the average rate for traditional banks is about 5.2 percent. Captive lenders also offer on average shorter maturities and lower loan-to-values that traditional bank. The average loan by a captive has a 48 months maturity and approximately a 65 percent loan-to-value; while the average loan by a bank has a 7 months longer maturity and a 20 percentage points higher loan-to-value. The large difference in the latter comes from captive lenders both financing relatively more expensive cars (€13.7 vs 12.4 thousands) and lending smaller amounts (€8.5 vs 10.2 thousands).

One of the concerns with Table 2 is that the differences in contract terms may be driven by observable or unobservables differences in borrowers or collateral characteristics. In Panel B of Table 2 we look at borrowers characteristics at origination. Borrowers from captives and banks have similar income level. Captive lenders are more likely to lend to unemployed borrowers and pensioners, while diversified lenders are more likely to lend to self-employed borrowers. The most striking difference perhaps is that all banks verify income at origination, while this is the case only for 35 percent of the loans issued by captive lenders.[7] Finally, borrowers from captive are 1 percentage point more likely to be in default than borrowers from banks, 5 relative to 4 percent respectively.

Another important factor that can affect pricing and other loan terms is the quality of the collateral, which matters for the resale value in case of default. To control for differences in collateral we exploit the fact that both captive lenders and traditional banks finance the same brand-model in the same market and time. We can then exploit the variation within brand-model across lenders to study how loan terms vary for similar cars. Two remarks are in order. First, we do not observe some relevant cars characteristics such as engine type

[7]One reason for this difference may be that it is easier for banks to verify the information on other assets or liabilities of the households. Suppose for example that the household is already a customer of the bank though a mortgage loan. Moreover, due to data protection, captive lenders cannot verify the income status of some borrowers.

or year of manufacturing which can affect the resale value upon default. This is why the comparison is for similar, but not identical cars.[8] Second, even if the two cars are identical the valuation for a captive can be different from the one for a bank. For example the captive can attribute a higher value to a specific brand-model than a bank, because the former may incur less losses when reselling the car than the latter.

We begin by simply showing if the differences in loan terms between captive and banks persist after controlling for a rich set of observable borrower and collateral characteristics. Most notably, we estimate the following empirical model:

$$y_{ilbmt} = \alpha Captive_l + \theta X_{ilt} + \gamma_{bmt} + \epsilon_{ilbmt}; \tag{1}$$

where $Captive_l$ is a dummy equal to one if the lender is a captive firm; X_{ilt} are borrower and lenders controls; γ_{bmt} are interacted brand-model, market and time fixed effects (market is defined using 2-digits NUTS code, while time is a year-month pair). The coefficient of interest is α which captures the difference in loan terms of a loan issued by a captive lender relative to a traditional bank for the same brand-model issued in the same market at the same time to similar borrowers.

Table 3 shows the results.[9] The positive difference in rates between captive and banks that we discuss in Table 2 is now lower, but still statistically significant and large in magnitude. On average a borrower taking a loan from a captive lender for an old car of a certain brand-model in a market pay about 1.3 percentage points higher rate borrowing from a captive rather than a diversified lender. Similarly the differences in maturity and loan-to-value remain statistically significant and large in magnitude, after controlling for borrowers and collateral characteristics. Most notable, loans from captive have approximately a 8 percent

[8] In a robustness exercise of the main analysis we replicate our analysis controlling for bins of car value within each brand-model, thus capturing differences in observed value possible unobserved differences in car attributes. We report the results in Appendix 5

[9] In Appendix 5 we show the result for new cars. We focus our main analysis on old cars because on new car our data have only a relatively small number of originations by diversified lenders. Our identification strategy requires that for a brand-model in a market at a certain time we always observe at least a loan issued by a captive and a loan issued by a diversified lender.

shorter duration and a 9 percentage points lower loan-to-value. The difference in loan-to-value seems to be driven by captive lenders financing more expensive cars.

We provide additional evidence on differences in loan terms by captive and banks exploiting an event study that change the status of a captive lender. In 2015 Santander (a traditional bank) acquires a large stake in PSA (a captive lender).[10] We estimate a difference in difference specification using RCI, another French captive lenders, as a control group:

$$y_{ilbmt} = \alpha RCI_l \times Post_t + \theta X_{ilt} + \gamma_b + \gamma_{mt} + \epsilon_{ilbmt}; \tag{2}$$

where RCI_l is a dummy equal to one for RCI and $Post_t$ is a dummy equal to one after the acquisition; γ_b are brand-model fixed effects; γ_{mt} are market-time fixed effects; and all other variables are as in equation (1).[11] The coefficient of interest is α which captures the difference in loan terms of a loan issued in the same market at the same time to similar borrowers by a captive lender relative to another captive lenders which is now partially controlled by a stand-alone bank. Table A2 in Appendix 5 reports the results. We find that after the acquisition by Santander PSA decreases rates and increases maturity and loan-to-value, thus behaving more like a bank relative to RCI, which fully maintain its captive lender status.

To summarize, captive lenders offer relatively worse financing conditions (higher rate, lower maturity, lower loan-to-value) to similar customers for the same brand-model in the same market and time. These results seem to be consistent with captive lenders having some market power over customers with high shopping costs, as captives provides a convenient one-stop shop alternative. At the same time, captive may target some segment of the population that are less likely to get credit by banks. Irrespective of the main determinants, the existence

[10]The agreement between Santander and PSA affects 11 euro area countries including the four we use in our analysis (France: February 2015; Spain: October, 2015; Italy: January, 2016; Germany: July, 2016). See Santander annual reports in 2015 and 2016 for more details about the operations (https://www.santanderconsumer.com/wp-content/uploads/2018/05/Annual-Report-2015.pdf and https://www.santanderconsumer.com/wp-content/uploads/2018/06/Annual-Report-2016.pdf).

[11]Notice that in this specification we cannot have interacted brand-model, market and time fixed effects, because we are only using variation within captive lenders which are specialized in different brands.

of persistent differences in loan terms for similar loan profiles between captive and banks gives captive the flexibility to adjust loan terms following shocks to their parent manufactures, which is the main object of our analysis.

3 Manufacturers' distress and captive lenders credit supply

This section presents our main result on the role of captive lending as liquidity creations in distress. First, we discuss our distress measure and framework. Then we show how captive lenders adjust loan terms and risk-taking relative to traditional lenders. We depart from the vast literature on the effect of credit shocks on the real economy by looking at financial distress to the producer of the product, namely the car manufactures. We follow Hortaçsu et al. (2013) and measure financial distress using the car manufacturers credit default swaps (CDS).

Figure 2 shows a stylized example with a one-period loan for financing a car in two cases: (a) with only traditional stand-alone lenders; (b) with captive lenders. Define q_0 the loan amount at origination, p_0 is the price of the car, d_0 the borrower down payment and r the interest rate on the loan. In a situation without captive lending the only options for a stand-alone manufacturer experiencing a liquidity shock are: 1) drawing down available credit lines; 2) investment cuts and fire sales (adjustment in the price of the car p_0). After the purchase in period 1 there is no cash flow between the manufacturer and the buyer-borrower.[12]

With captive finance an array of possibilities arises. At origination the loan is provided by the own lending unit, so that the only cash flow from the borrower-buyer to the lenders is now the down payment. However, given the borrower down payment, the price of the car at origination p_0 affects the loan amount q_0 that is repaid (and the monthly payments in a multi-period contract). The interest rate r_0 becomes now payoff relevant for the manufacturer, because the cash flows from the buyer-borrower extend beyond period 0. This simple

[12] We exclude possible cash flow related to replacement or complementary goods.

framework captures the main loan terms we observe, interest rate and loan-to-value, and can be extended to a multi-period setting where captive lenders can also adjust the maturity of the loan, which we also observe. Furthermore, the captive lending unit can adjust the approval rate for potential buyers seeking financing for the purchase of the car. In the rest of the section we study empirically how captive lenders adjust loans terms and risk-taking when the parent company experience financial distress.

3.1 Manufacturers' distress and captive lenders loan terms

In this section we focus on the effect of financial distress on loan terms offered by captive lenders relative to traditional banks. Our baseline empirical model is given by:

$$y_{ilbmt} = \alpha Manuf.CDS_{bt} \times Captive_l + \theta X_{ilt} + \gamma_l + \gamma_{bmt} + \epsilon_{ilbmt}; \tag{3}$$

where y_{ilbmt} is loan term y (e.g. interest rate) for individual i borrowing from lender l and buying brand-model b in market m and period t; $Manuf.CDS_{bt}$ is the manufacturer credit default swap; $Captive_l$ is a dummy equal to one if the lender is a captive firm; X_{ilt} are borrower and lenders controls; γ_l are lender fixed effects; and γ_{bmt} are interacted brand-model, market and time fixed effects. The coefficient of interest is α which captures the effect of variation in manufacturer CDS on loan terms offered by captive lenders relative to their effect on loan terms offered by traditional banks. Note that equation (3) includes lenders' fixed effects, thus removing the time-invariant differences in loan terms between captive and standalone lenders that we discussed in Section 2.

Table 4 shows the results. The effect of financial distress on car loan rates is a priori ambiguous. On the one hand, the higher financing costs for the manufacturer (and possibly for the integrated captive lender) may lead to pass-through to higher interest rates for car loans. On the other hand, the manufactures may now use the rates as a tool to promote sales by lowering the interest rate. We find that when the car manufacturer CDS increases captive lenders increases the interest rate for car loans relative to diversified banks. Our

basic specification indicates that a 100 basis point increase in a manufacturer's CDS spread increases the relative rate by captive lender by 13 basis points, or about 2 percent of the average loan rate.

At the same time we find that captive lenders shorten the maturity and decrease the loan-to-value relative to standard banks when the car manufacturer CDS increases. The decline in maturity is statistically significant, but small in magnitude at 0.8 percent. The decline in loan-to-value is approximately 0.8 percentage points, or about 1 percent of the average loan-to-value. The decline in the loan-to-value is driven by a statistically and economic significant decline in the loan size which drops by about 2 percent. Interestingly, we do not find evidence of differential changes in the price of the car between captive lenders and traditional banks when the CDS of the manufacturers increase.[13]

Another way to gauge a sense of the magnitude of the result is to compare them to the average differences between captive and banks that we have shown in Table 3 in Section 2. The 13 basis points differential increase in the rates offered by captive lenders when the car manufacturer is in financial distress corresponds to about 10 percent of the average difference between captive and banks. The relative magnitude are similar for maturity and loan-to-value. The additional decline in maturity and loan-to-value relative to the average difference between captive and banks is in the order of 9 percent. Thus manufacturer financial distress increases pre-existing differences in loan terms between captive lenders and traditional banks.

3.2 Manufacturers' distress and captive lenders risk-taking

We have shown that owning the financing arm give additional flexibility to the car manufacturer by allowing adjust to loan terms when the manufacturer is experiencing financial distress. However, owning the lending unit gives the manufacturer an extra margin: adjust-

[13]This result does not mean that the price of the car may increase or decrease when the the car manufacturer experience financial distress. Our null result is about differential changes between captive and bank, not overall changes for the manufacturer. In Table A3 in Appendix 5 we show the result of a regression of loan quantities on the interaction of manufacturers' CDS and a dummy for loans originated by a captive lender. We do not find significant effects on the relative number of loans originated by captive when the manufacturer experience financial distress.

ing lending standards. Unfortunately, we do not observe approvals and rejections, but we observe some information on borrowers demographics, an indicator if the income on the loan contract is verified and additional information on the performances of the loans over time. Thus, we proxy changes in risk-taking and lending standard by looking at changes in ex-ante demographics of borrowers, the fraction of verified loans and ex-post performances.

We estimate a model similar to equation (3) with a different set of dependent variables. Table 5 shows the result the fraction of verified income and borrower characteristics. When the manufacturing company experience financial distress, captive lenders decrease the share of verified loans relative to diversified banks, potentially taking on more risk. Our basic specification indicates that a 100 basis points increase in a manufacturer's CDS spread decreases the relative share of verified income by captive lender by 5 percent. As we showed in Table 2 in Section 2 while traditional banks always verify borrower income, captive lenders do it in approximately for 35 percent of car loans. Thus, when the car manufacturers are suffering, their captive units are decreasing the share of verified income by about 15 percent relative to their average share of verified income.

The results for demographics variables at origination also suggest an increasing risk-taking behavior by the captive unit once the parent company is in financial distress. The average income associated to a loan by a captive relative to a traditional bank for the same brand-model in the same market decreases, but the effects are imprecisely estimated. When the manufacturing company experience financial distress, captive lenders increase the fraction of loans to unemployed and self-employed relative to diversified banks, potentially taking on more risk. The effects are statistically significant and large in magnitude. A 100 basis points increase in the manufacturer's CDS spread increase the relative fraction of unemployed and self-employed by captive lender by 0.6 and 1.5 percent, respectively. Relative to their baseline fraction shown in Table 2 in Section 2, captive lenders increase their lending to both unemployed and self employed by more than 30 percent.

The result on verified income and borrowers characteristics at origination suggest an increase in risk-taking by captive lenders relative to traditional banks when the car manufac-

turing company experience an increase in CDS. In Table 6 we look at ex-post performances, to verify if the increase in ex-ante risk taking is indeed associated to ex-post riskier loans. We look at arrears for different fraction of time to maturity. We find that loans originated by captive lenders when the car manufactures CDS are higher are more likely to experience future arrears. Up to loan to maturities of 50 percent the effects are not significant, but the effect become significant in the last part of the loan time to maturity.[14] Our basic specification indicates that loans originated by captive when manufacturer's CDS spread increases by 100 basis points increase are about 3 percent more likely to be in arrears over the course of the loan. In the last column of Table 6 we control for loans terms that can have an effect on the probability of arrears, namely rates, maturity and loan-to-value. The coefficient is slightly lower, but still significant and large in magnitude. Loans originated by captive lenders when the parent company experience financial distress are approximately 2.5 percent more likely to be in default. Given a baseline default probability of approximately 5 percentage points, our results represent a 50 percent increase in the probability of future arrears.

Our analysis thus far provides two main findings about the propagation of shock to manufacturers with vertical integration between production and financing. First, the loan term results imply that a shock to manufacturers generates a response by captive lenders akin to a credit tightening by a traditional standalone lenders. Captive lenders increase rates, lower LTV and shorten maturities. Additionally, the larger down payment and shorter maturity generate a reallocation of cash flows toward the present when liquidity is more costly, potentially avoiding the need to draw down liquidity or restore to fire sales. Second, the risk-taking results imply that a shock to manufacturers generates a response by captive lenders that is the opposite of a credit tightening by a traditional standalone lenders. Captive lenders relax lending standard to promote sales and, combined with larger down payments and shorter maturities, increase liquidity in the short term, at the cost of uncertain higher

[14] Agarwal et al. (2008) study a large pool of US direct car loans with a competing risks model of auto loan termination through default and prepayment and find that account seasoning (time since loan origination) increases the probability of default.

losses in the longer term. Both the loan terms adjustments and the risk-taking are consistent with the integrated manufacturer maximizing current liquidity. In Section 4 we explore further the mechanism.

3.3 Additional results and robustness

In Appendix 5 we show the results of additional analyses and robustness checks. First, while we control for car type with brand-model fixed effects, there can be unobservable characteristics that vary systematically between captive and traditional lenders and are correlated with both financing terms and manufacturers distress. To lower the concern about omitted characteristics we re-estimate our model (3) controlling within each brand-model for quartile of the car value. Table A4 shows the estimates. All our results are similar in both significance and magnitude.

Second, we look at the number of loans originated. One concern is that by raising rates and increasing the down payment requirement the manufacturer in distress may loose volumes. For each market-time we count the number of loans included in the securitizations originated by each lender for each brand-model. We then regress the logarithm of this variable on the manufacturing CDS interacted with a dummy for captive lenders. Table A3 shows the estimates. We do not find significant differential effects on originations from captive lenders when the manufacturer experiences financial distress. One possible explanation is our risk-taking channel. By extending loans to ex-ante riskier borrowers the captive unit can offer worse financing terms without sacrificing volumes.

Third, another possible effect of changing loan terms and extending loans to riskier borrowers is their impact on the financing cost for the captive lender itself. If the information on the pool of borrowers is priced in by investors the securitization may become more or less costly depending on the net effect of changing in loans terms relative to changes in the quality of borrowers. First, It is worth mentioning that the average age of the loan is about 24 months when it is securitized. Given such a long lag, lenders may not internalize the

impact on the cost of the securitization of loans originated today.[15] However, even if the price of the securitization is not available, we explore this possibility by looking at the coupon payment of the different tranches of the securitizations in our sample. The total number of securitization is 37 and there are on average about 2 tranches for each securitization. Table A5 shows the estimates. As expected securitization with longer maturity are more expensive. We also find that securitization with a larger principal are less expensive, but the effect is small in magnitude. We do not find differences for tranches issued by captive lenders or differential effect of financial distress on tranches issued by captive lenders. We also include in the specification the average characteristics of the borrowers and loan terms of the car loans included but the coefficients (unreported) turn out not to be significant.

Finally, while our identification strategy relies on differential changes between captive and traditional lenders, we study in our setting the response of standalone lenders to distress, measured by their CDSs. We estimate the following empirical model:

$$y_{ilbmt} = \alpha LenderCDS_{lt} + \theta X_{ilt} + \gamma_l + \gamma_{bmt} + \epsilon_{ilbmt}; \tag{4}$$

where $LenderCDS_{lt}$ is the CDS for stand-alone lender l; and all other variables are as in equation (3). Table A6 shows the results. When CDS of stand-alone lenders are higher, we find that lenders increase rates, but the results are not significant and small in magnitude. Perhaps surprisingly we find that lenders increase maturity, while the increase in the loan-to-value is not significant. In terms of risk taking, stand-alone lenders originated car loans to lower income borrower, but ex-post these borrowers are significantly less likely to default, perhaps suggesting that they are safer on dimensions unobservable to the econometrician (and observable to the lender). Additionally, stand-alone lenders in distress decrease their loan originations to ex-ante riskier categories, such as unemployed and self-employed borrowers.

[15] We also run a regression of the lag in months from origination to securitization and find that when manufacturer CDS are high, loans originated by their captive unit tend to be securitized later.

4 Exploring the mechanism

Our results so far have focused on showing how captive lenders differentially adjust loan terms and lending standards when the parent manufacturing company is in financial distress. We now delve into the mechanism by exploiting additional variation in the parent manufacturing company's liquidity needs. The evidence presented is consistent with captive lenders adjusting lending standard to push demand for the car manufacturer good, by lending to riskier borrowers. At the same time the evidence is consistent with captive lenders adjusting loan terms to increase the car manufacturer current liquidity, with or without increasing demand. As an example, we find that when the CDS are high captive requires larger down payments. All else equal, larger down payment requirements increase the liquidity today for the manufacturers, but without increasing demand along the extensive margin, all else equal. A larger down payment requirement may even reduce overall demand if more constraint borrowers cannot afford it and delay buying the good or move to a competitor. Is this therefore the combination of the loan term adjustment and lending standard that allow the manufacturers through the captive unit to extract liquidity from inframarginal buyers, without loosing (or even increasing) marginal buyers.

4.1 Evidence on the liquidity creation channel

To understand the importance of liquidity creation when manufacturers experience financial distress we construct a measure of liquidity need for the car manufacturer using additional information on the fraction of expiring bonds. The idea is that if the differential behavior of captive lenders relative to stand-alone lenders when the manufacturing company is in financial distress is driven by a liquidity creation motive we expect our results to be stronger when the manufacturer needs liquidity (a larger fraction of existing bonds are expiring) relative to when the manufacturer has enough liquidity (a small fraction of existing bonds are expiring). Practically we estimate our baseline empirical model given by:

$$y_{ilbmt} = \alpha Manuf.CDS_{bt} \times Captive_l + \theta X_{ilt} + \gamma_l + \gamma_{bmt} + \epsilon_{ilbmt}; \quad (5)$$

separating the full sample into two subgroups based on measure which we label $Manuf.Needs_{bt}$. This measure is computed for each manufacturers in each period as the face value of manufacturer b expiring bonds over its total amount of outstanding bonds. Then we estimate equation (5) twice. When car manufacturers have high liquidity need, which we define as the top quartile of the distribution of the ratio of the face value of maturing bonds in a given month over the total amount of bonds outstanding in that month; and when car manufacturers have low liquidity need, which we define as the bottom quartile of the same ratio. We expect the coefficient β to in the high liquidity need sample to capture the effect of captive lenders as liquidity providers in distress.

Table 7 shows the results. Panel A reports the results obtained for the periods in which the car manufacturer has a high relative need of liquidity, while Panel B contains the results for the period in which the car manufcaturer has relatively low liquidity needs. We find that the find that the differential adjustment of loan terms by captive lenders when the manufacturer's CDS is high are more likely to be significant and stronger in magnitude when the average value of maturing bond as a fraction of the total outstanding is high. Captive lenders increase rate by about 30 basis points when they have high liquidity needs, while the increase is about 7 basis point and not significant when the manufacturer's liquidity needs are low. Both maturity and loan-to-value decrease by a significant and large amount when the manufacturers needs liquidity. The relative decline in maturity is more than twice when the manufacturer liquidity needs are high compared to low, while the difference in the relative decrease in loan-to-value is even larger and the effects is not significant when liquidity needs are low. The relative decrease in loan size is strongly significant and about 4.5 percent when liquidity needs are high, relative to a baseline decline of about 2 percent in the full sample (see Table 4), and a marginally significant decline of 1.5 percent when liquidity needs are low. We also look at how captive risk-taking ex-ante and ex-post during financial distress interacts with manufacturers liquidity needs. When the manufacturers has

high liquidity need, captive lenders extend loans to borrowers with relative lower income than stand-alone lenders. Furthermore, this income is less likely to be verified. When the liquidity needs are high captive lenders reduce the relative share of verified income by 9 percent, while the decrease about 2.5 percent when the manufacturers liquidity needs are low. Finally, we find that loans originated by captive lenders when the car manufactures CDS and liquidity needs are high have almost an 8 percent higher probability of future arrears, while when only the CDS is high the increase is about 2.5 percent.

All in all, our additional result show that the differential behavior of captive lenders relative to stand-alone lenders when the parent manufacturers experience distress is driven by liquidity needs. Both the loan terms adjustments and the risk-taking are stronger when the integrated manufacturer liquidity needs are higher.

4.2 Liquidity creation during the Volkswagen emissions scandal

Our results so far shows that captive lenders adjust loan terms and extend credit to ex-ante riskier borrowers when the parent manufacturing company is in financial distress and its liquidity need are high. We have relied on the full data and find strong correlation controlling for a rich set of fixed effects to rule out alternative explanation for the differences in loan terms and borrower characteristics. Now we add to this evidence exploiting quasi-experimental variation in manufacturers' CDS following the Volkswagen emissions scandal. On September 18, 2015, the U.S. Environmental Protection Agency (EPA) found that approximately 500,000 Volkswagen diesel-engine vehicles sold in the US contained a defeat device that could detect when the car was being tested, changing the performance accordingly to improve results. Figure A1 in Appendix A1 shows the CDS for Volkswagen and other car manufactures. We show both the level of CDS and a version normalized to 100 in September 2015. Before the scandal the different brands have a similar trend in CDS, with minor deviations and with Volkswagen having a lower average CDS than other manufacturers. After the onset of the scandal we observe a huge increase in the CDS of Volkswagen, which quadruple in the month of September and remain more than twice higher than before

the event for several months. Other car manufacturers also experienced large increases in their CDS although to a lower extent relative to Volkswagen.

We provide two complementary strategies to understand the role of captive lenders as liquidity providers when the parent manufacturer experience financial distress. First, we build on the approach in Section 4.1, but exploit the clear change in CDS arising from the emission scandal. Most notably, we divide the brands in our sample into high and low liquidity needs based on the fraction of bonds maturing in the three months after the event (i.e. September to November 2015). This is our ex-ante measure of exposures to the shock. We then estimate the following difference in difference empirical model separately for the treatment group (high liquidity needs) and the control group (low liquidity needs):[16]

$$y_{ilbmt} = \alpha Post_t \times Captive_l + \theta X_{ilt} + \gamma_{bmt} + \epsilon_{ilbmt}; \tag{6}$$

where $Post_t$ is a dummy equal to one after the Volkswagen emissions scandal; and all other variables are as in equation (3). The coefficient of interest is α which captures the differential changes on loan terms offered by captive lenders relative to standalone banks after the outbreak of the scandal. Our key estimates of interest are the αs for the manufacturers which are mostly exposed to the increase in CDS, due to a high fraction of expiring bonds.

Before discussing the results Figure 3 shows that the treatment and control group face a very similar pattern in terms of changes in CDS as a result of the scandal.Table 8 shows the result for loan terms. Consistently with our results for the overall sample in Table 7, we find that a lot of the action is driven by captive lenders of manufacturers which face distress and have higher liquidity needs. Treated manufacturers increase loan rates relative to stand-alone lenders by more than 35 basis points, decrease maturity almost 8 percent, loan-to-values by more than 2 percentage points and loan amounts by almost 10 percent.

[16] In our exercise we exclude on purpose loans for buying Volskwagen cars and other brands of the group (Audi, Porsche, Seat, and Skoda), given the largely different change in CDS, and to minimize direct demand effects. In our high liquidity need group we have Ford, Mercedes and Renault, while in our low liquidity need group we have Toyota, Fiat, Opel, Peugeot and BMW. We check the number of bonds issued in the two months after the Volkswagen emissions scandal and we find that the average number of issuance for the high liquidity group is five, while the average number of issuance for the low liquidity group is 1.2.

Control manufacturers, despite experiencing a similar increase in CDS, barely change loan terms. We only find a significant results for maturity, which is in magnitude less than half the effect for treated manufactures. With respect to risk-taking, we find that manufacturers which experience an increase in CDS with high liquidity needs originate loans to lower income borrower, who ex-post are more likely to default. Perhaps surprising we find a negative effect on the fraction of originations to unemployed borrowers.[17] On the other hand manufactures which experience an increase in CDS with low liquidity need if anything increase significantly the share of borrowers with verified income.

Our second test also exploits the variation in CDS coming from the Volkswagen emissions scandal, together with variation in the "captiveness" of captive lenders. As we discussed in Section 2.2 in February 2015 Santander (a traditional bank) acquires a large stake in PSA (a captive lender). We now focus on France given that the takeover in other countries occurred after the Volkswagen emissions scandal and compare the differential behavior after the scandal of RCI, the captive lender unit of Renault, relative to PSA, the captive lender of Peugeot which is now partially controlled by Santander. As we have discussed in Section 2, after the takeover by Santander PSA behave relatively more like a traditional bank. Controlling for time invariant difference between the two captive lenders, we now test if they also react differently to similar changes in CDS. Figure 4 shows that indeed the two car manufacturers experience very similar changes in CDS after the emissions scandal. We estimate the following difference in difference specification:

$$y_{ilbmt} = \alpha Post_t \times RCI_l + \theta X_{ilt} + \gamma_b + \gamma_{mt} + \epsilon_{ilbmt}; \tag{7}$$

where RCI_l is a dummy equal to one for RCI and $Post_t$ is a dummy equal to one after the Volkswagen emissions scandal; γ_b are brand-model fixed effects; γ_{mt} are market-time fixed effects; and all other variables are as in equation (1).[18] The coefficient of interest is α which captures the differential changes on loan terms offered by RCI relative to PSA after

[17] Notice that less than 1 percent of the borrowers are unemployed in this specific sample period.

[18] Notice that in this specification we cannot have interacted brand-model, market and time fixed effects, because we are only using variation within captive lenders which are specialized in different brands.

the outbreak of the scandal.

Table 9 shows the coefficients for RCI (the relative more captive lender) in the aftermath of the Volkswagen emissions scandal. We find that RCI increases rates by significantly more than PSA despite the two manufacturers experiences similar changes in CDS. The economic magnitude is also large. RCA increases rates by 24 basis points more than PSA after the Volkswagen emissions scandal. We do not find significant differences in relative maturity adjustment, but we find that RCA lower the loan-to-value by about 2 percentage points, which is driven by a decline by approximately 5 percent of the loan balance relative to car loans made by RCI. In terms of risk-taking we find that RCI decrease the share of originations with verified income after the Volkswagen emissions scandal relative to PSA.

To summarize, both our event studies around the Volkswagen emissions scandal support our main findings. First, captive lenders adjust loan term and lending standard when the parent manufacturers experience financial distress. Second, this behavior is stronger when the manufacturers liquidity needs are higher.

5 Conclusions

In this paper we study the role of captive finance in the car loan market when the parent manufacturing company's liquidity cost (CDS price) and need (large fraction of outstanding bonds expiring) are high. Using a new multi-country dataset on securitized car loans, we show that captive lending enables manufacturers to create liquidity, at the cost of future losses, by changing loan terms and relaxing lending standards to high-risk borrowers relative to stand-alone lenders. We label this mechanism a *credit fire sale*. We discuss how our mechanism have new implications for the transmission of shocks to durable consumption and household leverage.

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Table 1: Summary statistics

	Mean	Median	SD	P5	P95	N
Panel A: Loan terms and car value						
Interest (%)	6.18	6.00	2.21	3.00	10.00	1,155,450
Maturity (Months)	50.95	49.00	18.79	14.00	84.00	1,155,450
Size (euro)	9,216	8,269	5,640	2,125	19,599	1,155,450
Car value (euro)	13,192	12,387	6,281	4,707	24,440	1,155,450
LTV (%)	72.79	80.00	30.37	17.65	112.36	1,155,450
Panel B: Ex - ante risk measures						
Income (euro)	35,855	24,000	7,192,142	7,200	63,000	1,113,559
Paid-employed (0/1)	0.81	1	0.39	0	1	1,155,450
Self-employed (0/1)	0.06	0	0.24	0	1	1,155,450
Unemployed (0/1)	0.01	0	0.12	0	0	1,155,450
Student (0/1)	0.01	0	0.08	0	0	1,155,450
Pensioner (0/1)	0.11	0	0.31	0	1	1,155,450
Verified (0/1)	0.62	1	0.49	0	1	1,155,450
Panel C: Ex - post risk measures						
In arrears (0/1)	0.05	0.00	0.21	0.00	0.00	1,155,450
Panel D: Manufacturers						
CDS (%)	1.252	1.034	0.915	0.279	3.020	441
Maturing bonds month t (%)	3.968	2.128	6.362	0.000	14.286	441
Panel E: Lenders						
ROA (%)	0.919	0.910	0.692	0.000	1.970	763
Equity / TA (%)	11.070	10.550	8.789	6.750	13.730	763
Log(TA)	16.597	16.902	1.273	14.487	18.414	763

Note: Summary statistics for the main variables used in the analysis. Panel A shows the main contract characteristics. The interest rate is in percentage points; maturity is in months; the size of the loan and the loan amount is in euros; the loan-to-value is in percentage points. Panel B shows borrowers characteristics. Income is in in euros; paid-employed, self-employed, unemployed, student, pensioner are dummies for the status of the borrower; verified is a dummy equal to one if the income in the application has been verified by the lender. Panel C shows the ex-post performances. Arrears is a dummy equal to one if the loan is late payment. Panel D reports the characteristics for the manufacturers. CDS is the credit default swap of the manufacturer; maturing bonds is the face value of maturing bonds in each period t as a percentage of total outstanding bonds value. Panel E reports the characteristics for the lenders. ROA is return on assets; TA is total assets. The tables reports the mean, the standard deviation, the median, and 5th and 95th percentile in the full sample. N is the number of observations.

Table 2: Summary statistics by lender type

	Captive lenders			Diversified banks			Difference
	Mean	SD	N	Mean	SD	N	
Panel A: Loan terms and car value							
Interest (%)	6.81	2.17	681,633	5.26	1.94	473,817	1.55***
Maturity (Months)	47.98	17.38	681,633	55.22	19.89	473,817	-7.24***
Size (euro)	8,508	5,304	681,633	10,235	5,945	473,817	-1,727***
Car value (euro)	13,711	6,094	681,633	12,445	6,469	473,817	1,265***
LTV (%)	64.22	30.41	681,633	85.13	25.71	473,817	-20.90***
Panel B: Ex - ante risk measures							
Income (euro)	36,352	9,479,542	640,971	35,180	69,096	472,588	1,172
Paid-employed (0/1)	0.82	0.38	681,633	0.80	0.40	473,817	0.03***
Self-employed (0/1)	0.04	0.19	681,633	0.10	0.30	473,817	-0.06***
Unemployed (0/1)	0.02	0.14	681,633	0.00	0.05	473,817	0.02***
Student (0/1)	0.01	0.09	681,633	0.01	0.07	473,817	0.00***
Pensioner (0/1)	0.11	0.31	681,633	0.10	0.30	473,817	0.01***
Verified (0/1)	0.35	0.48	681,633	1.00	0.02	473,817	-0.6***
Panel C: Ex - post risk measures							
In arrears (0/1)	0.05	0.22	681,633	0.04	0.20	473,817	0.01***

Note: Summary statistics for the main variables used in the analysis. Panel A shows the main contract characteristics. The interest rate is in percentage points; maturity is in months; the size of the loan and the loan amount is in euros; the loan-to-value is in percentage points. Panel B shows borrowers characteristics. Income is in in euros; paid-employed, self-employed, unemployed, student, pensioner are dummies for the status of the borrower; verified is a dummy equal to one if the income in the application has been verified by the lender. Panel C shows the ex-post performances. Arrears is a dummy equal to one if the loan is late payment. The tables reports the mean and the standard deviation for captive and diversified lenders in the full sample. N is the number of observations. The last column reports the difference in means between the means for captive and diversified lenders. *** denotes statistical significance at the 1% level.

Table 3: Captive lenders VS traditional banks

	Rate (%)	Maturity (log)	LTV (%)	Car value (log)	Loan Size (log)
Captive Lender	1.278***	-0.082***	-9.276***	0.138***	0.052
	[0.170]	[0.027]	[1.407]	[0.033]	[0.050]
BrandModel-Region-YearMonth FE	YES	YES	YES	YES	YES
Lender-time Controls	YES	YES	YES	YES	YES
Borrower Controls	YES	YES	YES	YES	YES
Avg Dep Var	6.177	3.868	72.795	9.372	8.94
R-squared	0.731	0.326	0.460	0.572	0.445
Adj. R-squared	0.659	0.147	0.317	0.459	0.297
Observations	906,085	906,085	906,085	906,085	906,085

Note: The Table shows the results from equation (1) on the sample of old cars. The dependent variables are the interest rate in percentage points, maturity in log, loan-to-value in percentage points, car value in loan and loan size in log. Captive is a dummy equal to one if the lender originating the loan is a captive lender. Brand-model, region and year-month fixed effect are interacted fixed effects for the brand-model, the region where the car was sold and the month and year in which it was sold. Region is defined as NUTS2. Lender-time controls are ROA, Equity as a fraction of total assets and the logarithm of total assets. Borrowers controls are income, employment status dummy and and dummy for verified income. Standard errors are double clustered at brand-model and region-lender levels. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 4: Distress and captive lending: loan terms

	Rate (%)	Maturity (log)	LTV (%)	Car value (log)	Loan Size (log)
Manuf. CDS × Captive Lender	0.133***	-0.008**	-0.805**	-0.006	-0.019**
	[0.049]	[0.004]	[0.341]	[0.008]	[0.008]
BrandModel-Region-YearMonth FE	YES	YES	YES	YES	YES
Lender FE	YES	YES	YES	YES	YES
Lender-time Controls	YES	YES	YES	YES	YES
Borrower Controls	YES	YES	YES	YES	YES
Avg Dep Var	6.177	3.868	72.795	9.372	8.94
R-squared	0.780	0.334	0.470	0.586	0.464
Adj. R-squared	0.721	0.157	0.329	0.476	0.321
Observations	906,085	906,085	906,085	906,085	906,085

Note: The Table shows the results from equation (3) on the sample of old cars. The dependent variables are the interest rate in percentage points, maturity in log, loan-to-value in percentage points, car value in loan and loan size in log. Manuf. CDS is the CDS of the manufacturer of the car. Captive is a dummy equal to one if the lender originating the loan is a captive lender. Brand-model, region and year-month fixed effect are interacted fixed effects for the brand-model, the region where the car was sold and the month and year in which it was sold. Region is defined as NUTS2. Lender-time controls are ROA, Equity as a fraction of total assets and the logarithm of total assets. Borrowers controls are income, employment status dummy and and dummy for verified income. Standard errors are double clustered at brand-model and region-lender levels. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 5: Distress and captive lending: ex-ante risk

	Income (log)	Unemployed (dummy)	Self-Employed (dummy)	Verified (dummy)
Manuf. CDS × Captive Lender	-0.008	0.006***	0.015***	-0.054***
	[0.005]	[0.001]	[0.005]	[0.013]
BrandModel-Region-YearMonth FE	YES	YES	YES	YES
Lender FE	YES	YES	YES	YES
Lender-time Controls	YES	YES	YES	YES
Borrower Controls	NO	NO	NO	YES
Avg Dep Var	.615	.013	.062	.615
R-squared	0.478	0.593	0.375	0.887
Adj. R-squared	0.339	0.485	0.209	0.856
Observations	906,085	906,085	906,085	906,085

Note: The Table shows the results from equation (3) on the sample of old cars. The dependent variables are the borrower income in log, a dummy for unemployed, a dummy for self-employed, a dummy for student, a dummy for pensioner and a dummy for verified income. Manuf. CDS is the CDS of the manufacturer of the car. Captive is a dummy equal to one if the lender originating the loan is a captive lender. Brand-model, region and year-month fixed effect are interacted fixed effects for the brand-model, the region where the car was sold and the month and year in which it was sold. Region is defined as NUTS2. Lender-time controls are ROA, Equity as a fraction of total assets and the logarithm of total assets. Borrowers controls are income, employment status dummy and and dummy for verified income. Standard errors are double clustered at brand-model and region-lender levels. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 6: Distress and captive lending: ex-post risk

	arrears (>25% time to maturity)	arrears (>50% time to maturity)	arrears (>75% time to maturity)	arrears (>75% time to maturity)
Manuf. CDS × Captive Lender	0.005	0.006	0.030***	0.026***
	[0.004]	[0.004]	[0.007]	[0.007]
BrandModel-Region-YearMonth FE	YES	YES	YES	YES
Lender FE	YES	YES	YES	YES
Lender-time Controls	YES	YES	YES	YES
Borrower Controls	YES	YES	YES	YES
Loan Term Controls	NO	NO	NO	YES
Avg Dep Var	.053	.056	.049	.049
Adj. R-squared	0.122	0.119	0.126	0.141
R-squared	0.317	0.333	0.360	0.371
Observations	656,977	366,874	162,813	162,813

Note: The Table shows the results from equation (3) on the sample of old cars. The dependent variable is a dummy variable that is equal to one if the loan is in arrears. Each column corresponds to different subsamples of loans with a remaining time to maturity of more than 25% of the maturity at origination (first column), more than 50% of maturity at origination (second column) and more than 75% (third and fourth columns). Manuf. CDS is the CDS of the manufacturer of the car. Captive is a dummy equal to one if the lender originating the loan is a captive lender. Brand-model, region and year-month fixed effect are interacted fixed effects for the brand-model, the region where the car was sold and the month and year in which it was sold. Region is defined as NUTS2. Lender-time controls are ROA, Equity as a fraction of total assets and the logarithm of total assets. Borrowers controls are income, employment status dummy and and dummy for verified income. Standard errors are double clustered at brand-model and region-lender levels. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 7: Liquidity Channel

	Loan Terms					Risk-taking				
	Rate (%)	Maturity (log)	LTV (%)	Car value (log)	Loan Size (log)	Income (log)	Unemployed (dummy)	Self-Employed (dummy)	Verified (dummy)	Arrears (dummy)
Panel A: High manuf. liquidity need										
Manuf. CDS × Captive Lender	0.306***	-0.044***	-1.463**	-0.021	-0.046***	-0.032***	0.001	0.001	-0.092***	0.076**
	[0.066]	[0.010]	[0.626]	[0.013]	[0.014]	[0.012]	[0.001]	[0.006]	[0.015]	[0.037]
Avg Dep Var	6.223	3.858	70.292	9.406	8.917	10.034	0.006	0.059	0.614	0.045
R-squared	0.803	0.355	0.484	0.591	0.469	0.468	0.242	0.358	0.844	0.433
Adj. R-squared	0.750	0.181	0.344	0.481	0.326	0.324	0.037	0.184	0.804	0.199
Observations	203,392	203,392	203,392	203,392	203,392	203,392	203,392	203,392	203,392	22,257
Panel B: Low manuf. liquidity need										
Manuf. CDS × Captive Lender	0.071	-0.018***	-0.164	-0.011	-0.014*	-0.010	0.001	0.013**	-0.024***	0.026***
	[0.048]	[0.005]	[0.304]	[0.007]	[0.008]	[0.006]	[0.001]	[0.006]	[0.009]	[0.009]
Avg Dep Var	6.323	3.852	71.514	9.386	8.932	10.037	.016	.059	0.598	0.049
R-squared	0.816	0.337	0.470	0.589	0.460	0.475	0.611	0.376	0.882	0.344
Adj. R-squared	0.768	0.162	0.330	0.480	0.318	0.337	0.509	0.212	0.852	0.119
Observations	529,316	529,316	529,316	529,316	529,316	529,316	529,316	529,316	529,316	110,181
BrandModel-Region-YearMonth FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Lender FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Lender-time Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Borrower Controls	YES	YES	YES	YES	YES	NO	NO	NO	YES	YES

Note: The Table shows the results from equation (5) on the sample of old cars. Panel A reports the case when the face value of expiring bonds over the face value of outstanding bonds is above the 75 percentile of the distribution of this ratio for car manufacturers on a monthly basis; Panel B reports the case when the same fraction is below the 25 percentile. The dependent variables are the interest rate in percentage points, maturity in log, loan-to-value in percentage points, car value in log, loan size in log, income in logs, two dummy variables denoting the employment situation (unemployed and self-employed), a dummy variable denoting if the income is verified and an indicator of whether loan has been every in arrears. Manuf. CDS is the CDS of the manufacturer of the car. Captive is a dummy equal to one if the lender originating the loan is a captive lender. Brand-model, region and year-month fixed effect are interacted fixed effects for the brand-model and the type of car (old vs new), the region where the car was sold and the month and year in which it was sold. Region is defined as NUTS2. Lender-time controls are ROA, Equity as a fraction of total assets and the logarithm of total assets. Borrowers controls are income, employment status dummy and and dummy for verified income. Standard errors are double clustered at brand-model and region-lender levels. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 8: Liquidity Channel during the VW emission scandal

	Loan Terms					Risk-taking				
	Rate (%)	Maturity (log)	LTV (%)	Car value (log)	Loan Size (log)	Income (log)	Unemployed (dummy)	Self-Employed (dummy)	Verified (dummy)	Arrears (dummy)
Panel A: High manuf. liquidity need										
Post × Captive Lender	0.366***	-0.078***	-2.188***	-0.045	-0.099***	-0.027**	-0.001**	-0.007	-0.000	0.015*
	[0.068]	[0.016]	[0.732]	[0.029]	[0.029]	[0.012]	[0.001]	[0.005]	[0.000]	[0.009]
Avg Dep Var	5.719	3.79	70.804	9.380	8.899	10.029	.003	.031	.484	.036
R-squared	0.799	0.302	0.413	0.551	0.377	0.473	0.283	0.283	1.000	0.298
Adj. R-squared	0.754	0.144	0.280	0.450	0.237	0.354	0.121	0.121	1	0.0437
Observations	35,215	35,215	35,215	35,215	35,215	35,215	35,215	35,215	35,215	8,400
Panel B: Low manuf. liquidity need										
Post × Captive Lender	0.092	-0.036**	-0.641	-0.013	-0.031	-0.003	-0.001	0.008*	0.039***	-0.000
	[0.081]	[0.016]	[0.624]	[0.016]	[0.020]	[0.015]	[0.001]	[0.005]	[0.013]	[0.019]
Avg Dep Var	5.879	3.9	76.329	9.27	8.893	10.078	.009	.048	.637	.061
R-squared	0.726	0.334	0.494	0.582	0.462	0.461	0.201	0.312	0.761	0.454
Adj. R-squared	0.651	0.151	0.356	0.467	0.314	0.313	-0.0178	0.123	0.696	0.143
Observations	37,830	37,830	37,830	37,830	37,830	37,830	37,830	37,830	37,830	3,875
BrandModel-Region-YearMonth FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Lender FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Lender-time Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Borrower Controls	YES	YES	YES	YES	YES	NO	NO	NO	YES	YES

Note: The Table shows the results from equation (6) on the sample of old cars. Panel A reports the case when the face value of expiring bonds over the face value of outstanding bonds is above the 75 percentile of the distribution of this ratio for car manufacturers on a monthly basis; Panel B reports the case when the same fraction is below the 25 percentile. The dependent variables are the interest rate in percentage points, maturity in log, loan-to-value in percentage points, car value in log, loan size in log, income in logs, two dummy variables denoting the employment situation (unemployed and self-employed), a dummy variable denoting if the income is verified and an indicator of whether loan has been every in arrears. Post is a dummy equal to one after the Volkswagen Emission Scandal. Captive is a dummy equal to one if the lender originating the loan is a captive lender. Brand-model, region and year-month fixed effect are interacted fixed effects for the brand-model and the type of car (old vs new), the region where the car was sold and the month and year in which it was sold. Region is defined as NUTS2. Lender-time controls are ROA, Equity as a fraction of total assets and the logarithm of total assets. Borrowers controls are income, employment status dummy and and dummy for verified income. Standard errors are double clustered at brand-model and region-lender levels. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 9: Liquidity Channel during the VW emission scandal: PSA-Santander VS RCA

	Loan Terms					Risk-taking				
	Rate (%)	Maturity (log)	LTV (%)	Car value (log)	Loan Size (log)	Income (log)	Unemployed (dummy)	Self-Employed (dummy)	Verified (dummy)	Arrears (dummy)
Post × RCI	0.239***	-0.017	-1.965**	-0.002	-0.052***	0.002	-0.001	-0.005	-0.058***	0.003
	[0.076]	[0.012]	[0.941]	[0.005]	[0.018]	[0.013]	[0.001]	[0.004]	[0.004]	[0.013]
BrandModel FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Region-YearMonth FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Lender FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Lender-time Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Borrower Controls	YES	YES	YES	YES	YES	NO	NO	NO	YES	YES
Avg Dep Var	7.086	3.792	58.201	9.428	8.715	9.772	.007	.051	.243	.072
R-squared	0.361	0.197	0.179	0.472	0.189	0.125	0.027	0.044	0.411	0.081
Adj. R-squared	0.349	0.182	0.164	0.463	0.174	0.109	0.009	0.026	0.401	0.032
Observations	25,675	25,675	25,675	25,675	25,675	25,675	25,675	25,675	25,675	8,768

Note: The Table shows the results from equation (7) on the sample of old cars. The dependent variables are the interest rate in percentage points, maturity in log, loan-to-value in percentage points, car value in log, loan size in log, income in logs, two dummy variables denoting the employment situation (unemployed and self-employed), a dummy variable denoting if the income is verified and an indicator of whether loan has been every in arrears. Post is a dummy equal to one after the Volkswagen Emission Scandal. RCI is a dummy for Renault group. Brand-model, region and year-month fixed effect are interacted fixed effects for the brand-model and the type of car (old vs new), the region where the car was sold and the month and year in which it was sold. Region is defined as NUTS2. Lender-time controls are ROA, Equity as a fraction of total assets and the logarithm of total assets. Borrowers controls are income, employment status dummy and and dummy for verified income. Standard errors are double clustered at brand-model and region-lender levels. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

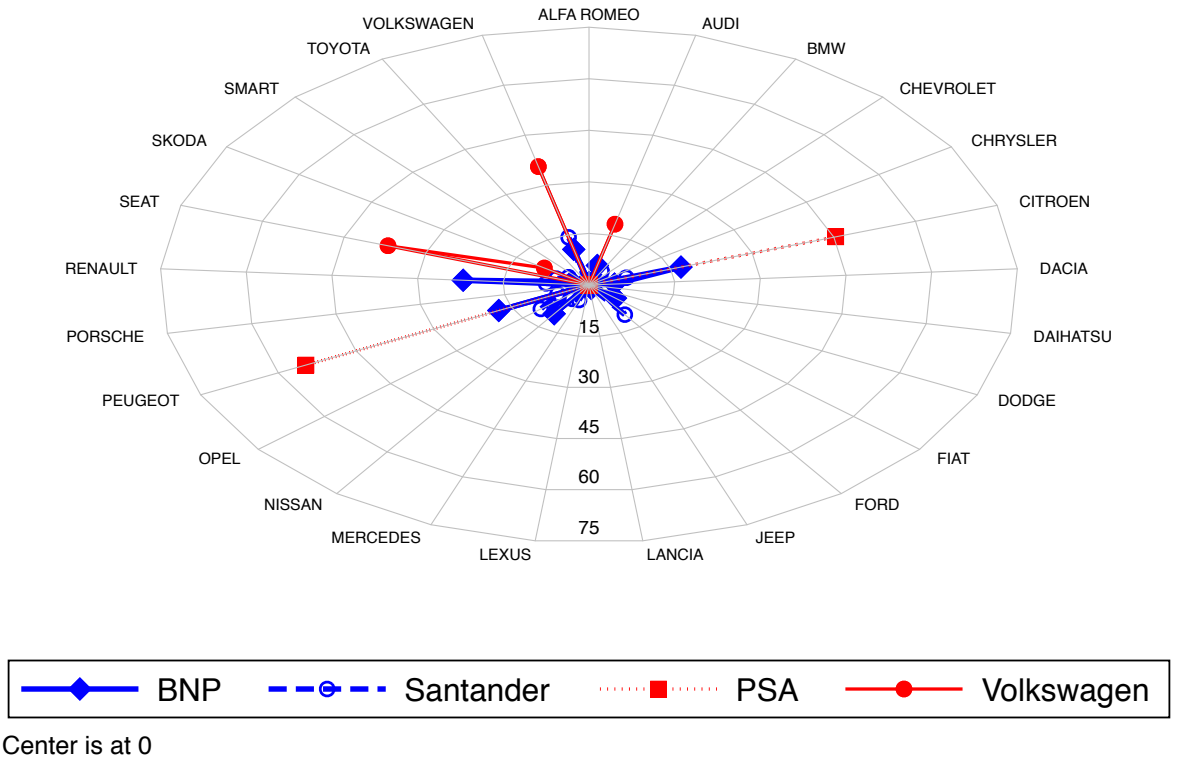
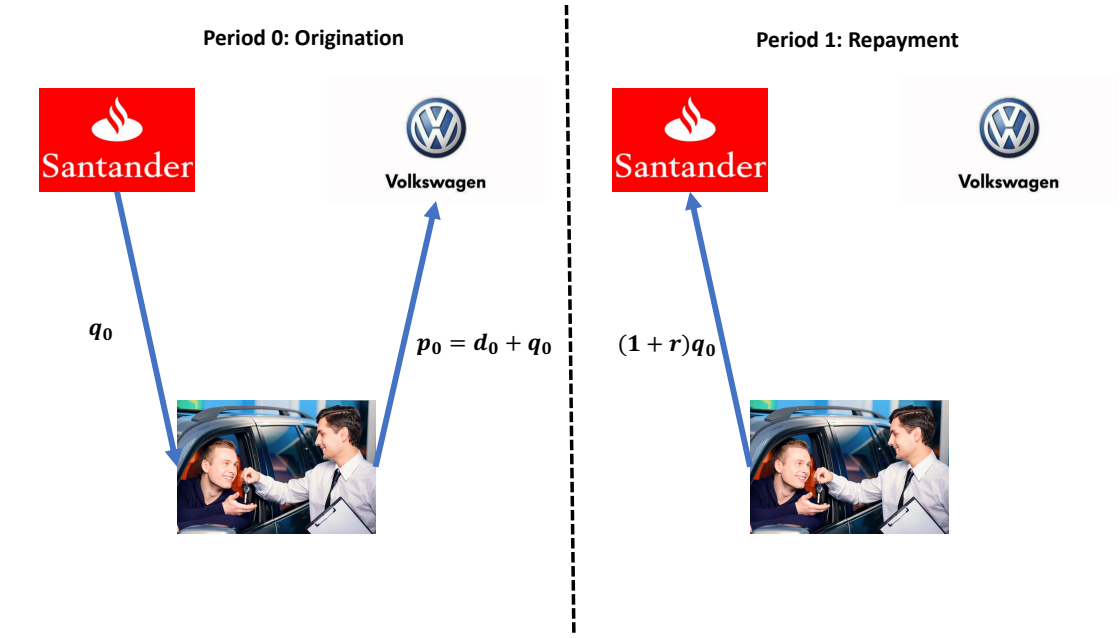
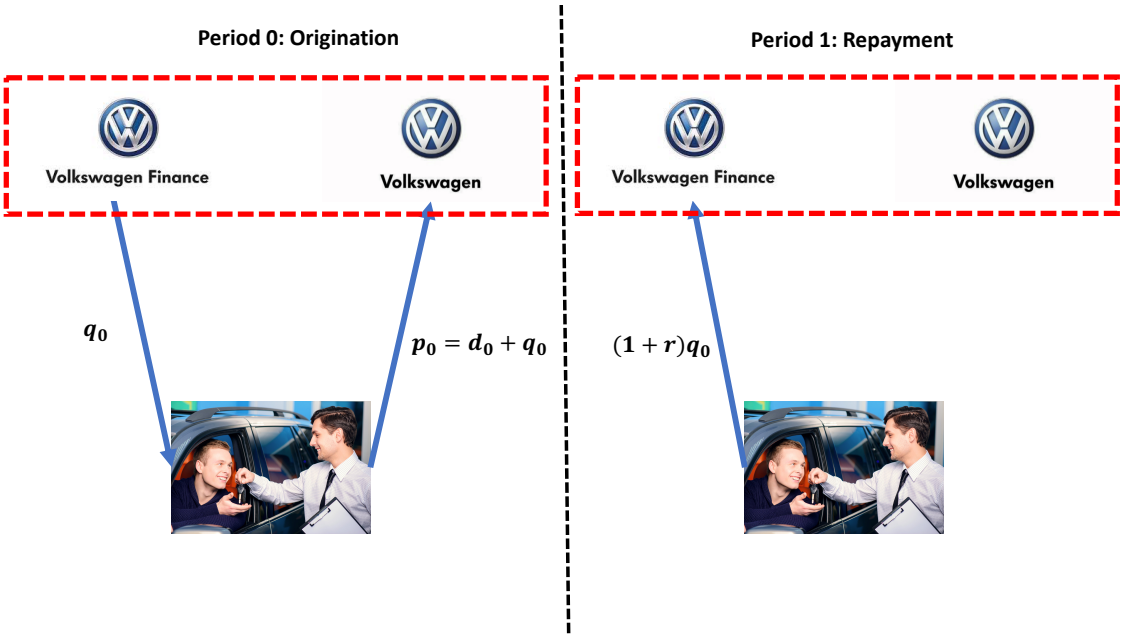


Figure 1: Specialization by brands

Note: The figure shows the share of loans made by two captive and two diversified lenders for approximately 25 different brands. The captive lenders are PSA finance and Volskwagen Finance. The diversified lenders are Santander and BNP Paribas. The data comes from securitized loans issued by the four lenders between December 2013 and December 2017 in four European Countries (Spain, France, Germany and Italy).



(a) Traditional bank financing



(b) Captive financing

Figure 2: Cash flows with traditional bank and captive lenders

Note: The figure show the key flow and contract term for a car purchase with financing at origination and repayment (assuming a one period contract). q_0 is the original loan amount, p_0 is the car value, d_0 is the down payment and r is the interest rate. Panel (a) shows the case with traditional bank financing, while panel (b) shows the case with captive financing. The red dotted line that circles the car maker and the captive lender indicates that they are part of the same group.

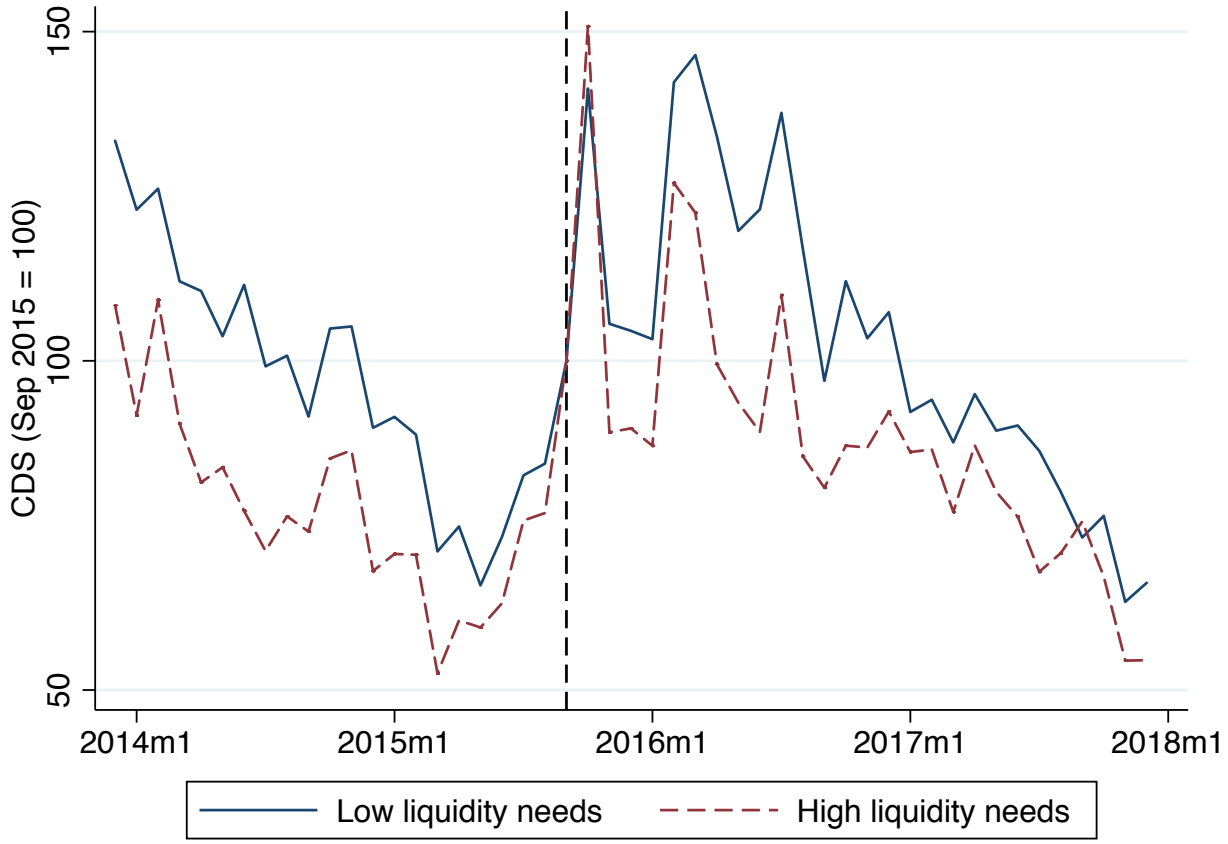


Figure 3: Volkswagen Emissions Scandal: CDS high and low liquidity manufacturers

Note: The figure shows the CDS for two French car manufactures (Peugeot and Renault) during our sample period (December 2013 - December 2017). The figures plots the monthly averages of daily CDS. The CDS value are normalized to 100 in September 2015.

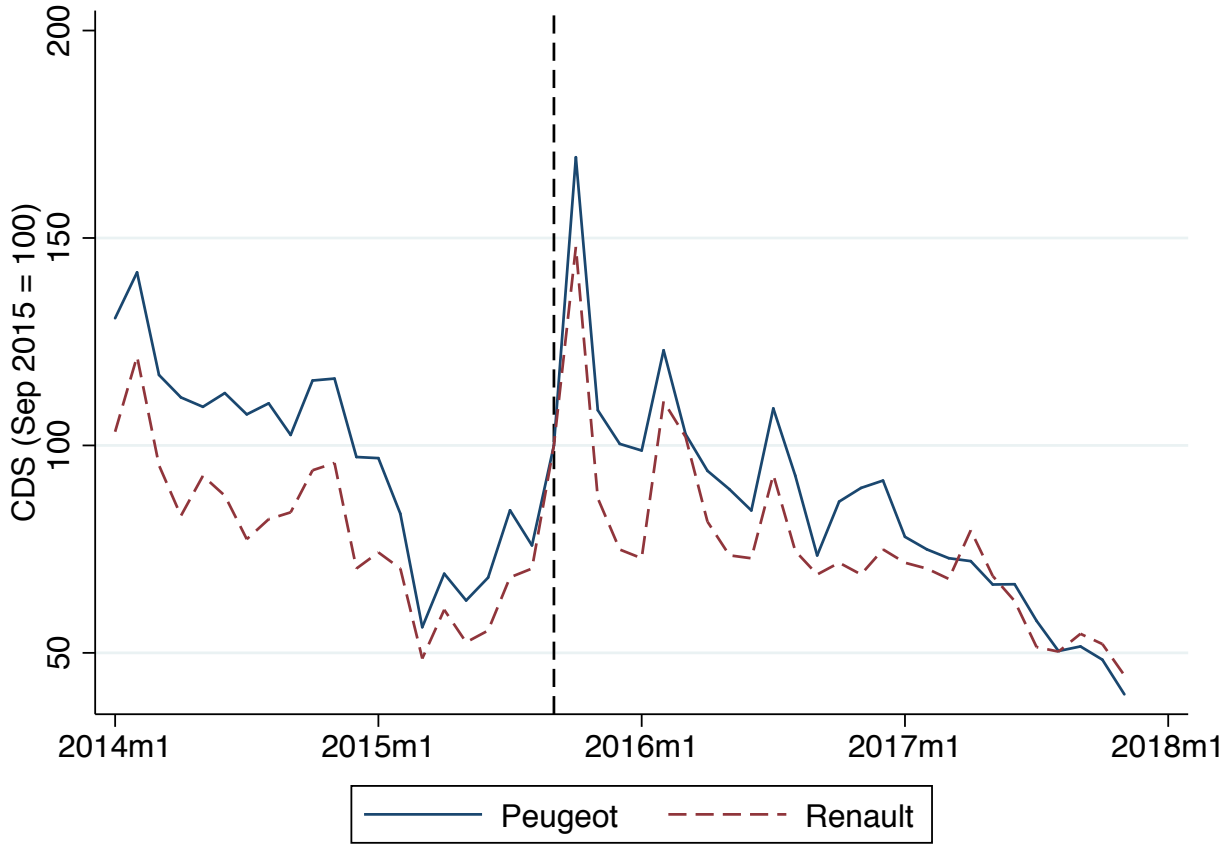


Figure 4: Volkswagen Emissions Scandal: CDS Peogeot and Renault

Note: The figure shows the CDS for two French car manufactures (Peugeot and Renault) during our sample period (December 2013 - December 2017). The figures plots the monthly averages of daily CDS. The CDS value are normalized to 100 in September 2015.

Appendix

Appendix For Online Publication

Table A1: Captive lenders VS traditional banks: New cars

	Rate (%)	Maturity (log)	LTV (%)	Car value (log)	Loan Size (log)
Captive Lender	1.962***	-0.246***	-11.360***	-0.070***	-0.277***
	[0.122]	[0.024]	[2.819]	[0.023]	[0.044]
BrandModel-Region-YearMonth FE	YES	YES	YES	YES	YES
Lender-time Controls	YES	YES	YES	YES	YES
Borrower Controls	YES	YES	YES	YES	YES
Avg Dep Var	7.106	3.884	68.337	9.69	9.21
R-squared	0.818	0.335	0.481	0.760	0.450
Adj. R-squared	0.789	0.229	0.399	0.722	0.362
Observations	1,257,034	1,257,034	1,257,034	1,257,034	1,257,034

Note: The Table shows the results from equation (1) on the sample of new cars. The dependent variables are the interest rate in percentage points, maturity in log, loan-to-value in percentage points, car value in loan and loan size in log. Captive is a dummy equal to one if the lender originating the loan is a captive lender. Brand-model, region and year-month fixed effect are interacted fixed effects for the brand-model and the type of car (old vs new), the region where the car was sold and the month and year in which it was sold. Region is defined as NUTS2. Lender-time controls are ROA, Equity as a fraction of total assets and the logarithm of total assets. Borrowers controls are income, employment status dummy and and dummy for verified income. Standard errors are double clustered at brand-model and region-lender levels. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table A2: Santander acquisition of PSA

	Rate (%)	Maturity (log)	LTV (%)	Car value (log)	Loan Size (log)
Post × RCI	0.665***	-0.018*	-2.335***	0.014	-0.045***
	[0.063]	[0.010]	[0.341]	[0.009]	[0.008]
BrandModel FE	YES	YES	YES	YES	YES
Region-YearMonth FE	YES	YES	YES	YES	YES
Lender FE	YES	YES	YES	YES	YES
Lender-time Controls	YES	YES	YES	YES	YES
Borrower Controls	YES	YES	YES	YES	YES
Avg Dep Var	7.282	3.801	56.442	9.416	8.673
R-squared	0.578	0.183	0.255	0.560	0.212
Adj. R-squared	0.566	0.159	0.234	0.548	0.189
Observations	38,046	38,046	38,046	38,046	38,046

Note: The Table shows the results from equation (2) on the sample of old cars. The dependent variables are the interest rate in percentage points, maturity in log, loan-to-value in percentage points, car value in loan and loan size in log. Post is a dummy equal to one after the acquisition of PSA by Santander. RCI is a dummy for Renault group. Brand-model, region and year-month fixed effect are interacted fixed effects for the brand-model and the type of car (old vs new), the region where the car was sold and the month and year in which it was sold. Region is defined as NUTS2. Lender-time controls are ROA, Equity as a fraction of total assets and the logarithm of total assets. Borrowers controls are income, employment status dummy and and dummy for verified income. Standard errors are double clustered at brand-model and region-lender levels. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table A3: Quantity results

	All cars	Old cars	Old cars by income		Old cars by segment			
			Low	High	A	B	C	D
Manuf. CDS × Captive Lender	-0.001	-0.006	-0.010	0.004	-0.018	0.016	-0.014	0.008
	[0.049]	[0.004]	[0.341]	[0.008]	[0.012]	[0.023]	[0.012]	[0.009]
BrandModel-Region-YearMonth FE	YES	YES	YES	YES	YES	YES	YES	YES
Lender FE	YES	YES	YES	YES	YES	YES	YES	YES
Lender-time Controls	YES	YES	YES	YES	YES	YES	YES	YES
Adj. R-squared	0.341	0.291	0.316	0.249	0.348	0.351	0.226	0.275
Observations	2,267,009	2,267,009	2,267,009	2,267,009	526,927	309,281	777,995	652,806

Note: The dependent variable is the logarithm of the number of car financed in each market-time for each brand-model. Manuf. CDS is the CDS of the manufacturer of the car. Captive is a dummy equal to one if the lender originating the loan is a captive lender. Brand-model, region and year-month fixed effect are interacted fixed effects for the brand-model and the type of car (old vs new), the region where the car was sold and the month and year in which it was sold. Region is defined as NUTS2. Lender-time controls are ROA, Equity as a fraction of total assets and the logarithm of total assets. Borrowers controls are income, employment status dummy and and dummy for verified income. Standard errors are double clustered at brand-model and region-lender levels. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table A4: Main result controlling for bins of car value

	Loan Terms					Risk-taking				
	Rate (%)	Maturity (log)	LTV (%)	Car value (log)	Loan Size (log)	Income (log)	Unemployed (dummy)	Self-Employed (dummy)	Verified (dummy)	Arrears (dummy)
Manuf. CDS × Captive Lender	0.127**	-0.008*	-0.893**	-0.009	-0.022***	-0.012**	0.005***	0.014***	-0.057***	0.039***
	[0.058]	[0.005]	[0.407]	[0.007]	[0.007]	[0.006]	[0.001]	[0.005]	[0.014]	[0.009]
BrandModel-Region-YearMonth FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Lender FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Lender-time Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Borrower Controls	YES	YES	YES	YES	YES	NO	NO	NO	YES	YES
Car value bins	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Avg Dep Var	6.177	3.868	72.795	9.372	8.94	.615	.013	.062	.615	.049
R-squared	0.814	0.448	0.564	0.886	0.601	0.545	0.651	0.433	0.904	0.425
Adj. R-squared	0.731	0.201	0.369	0.836	0.424	0.343	0.495	0.180	0.861	0.109
Observations	685,268	685,268	685,268	685,268	685,268	685,268	685,268	685,268	685,268	109,707

Note: The Table shows the results from equation (3) on the sample of old cars. The dependent variables are the interest rate in percentage points, maturity in log, loan-to-value in percentage points, car value in loan and loan size in log. Manuf. CDS is the CDS of the manufacturer of the car. Captive is a dummy equal to one if the lender originating the loan is a captive lender. Brand-model, region and year-month fixed effect are interacted fixed effects for the brand-model and the type of car (old vs new), the region where the car was sold and the month and year in which it was sold. Region is defined as NUTS2. Lender-time controls are ROA, Equity as a fraction of total assets and the logarithm of total assets. Borrowers controls are income, employment status dummy and and dummy for verified income. Standard errors are double clustered at brand-model and region-lender levels. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table A5: Securitization cost

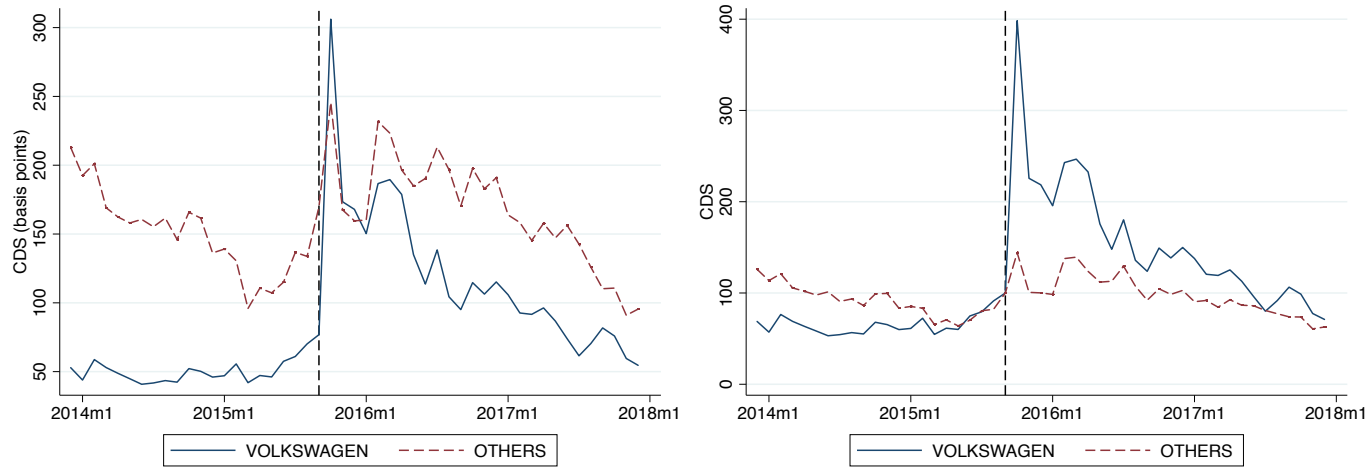
	All tranches					Equity tranche				
Log(Bond tranche maturity)	0.014***	0.015***	0.012***	0.015***	0.012*	0.016***	0.017**	0.016*	0.024**	0.017
	[0.002]	[0.003]	[0.004]	[0.004]	[0.007]	[0.004]	[0.007]	[0.009]	[0.011]	[0.017]
Log(Bond tranche principal)	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.004**	-0.003*	-0.003	-0.003	-0.004
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.002]	[0.002]	[0.002]	[0.003]
Captive Lender		0.000	0.008	0.010	-0.010		0.002	0.012	0.014	-0.002
		[0.003]	[0.007]	[0.008]	[0.022]		[0.005]	[0.014]	[0.015]	[0.053]
Lender CDS			0.876*	0.753	-1.169			0.953	0.570	-1.075
			[0.507]	[0.536]	[1.738]			[0.985]	[1.074]	[4.115]
Lender CDS x Captive Lender			-0.697	-0.600	1.306			-0.912	-0.421	1.107
			[0.529]	[0.563]	[1.852]			[1.028]	[1.131]	[4.468]
Average Security Controls	NO	NO	NO	YES	YES	NO	NO	NO	YES	YES
YearMonth FE	NO	NO	NO	NO	YES	NO	NO	NO	NO	YES
Avg Dep Var	.01	.01	.01	.01	.01	.015	.015	.015	.015	.015
R-squared	0.297	0.297	0.333	0.365	0.549	0.188	0.191	0.208	0.276	0.647
Adj. R-squared	0.280	0.272	0.291	0.290	0.401	0.140	0.117	0.0764	0.0254	0.118
Observations	87	87	86	86	86	37	37	36	36	36

Note: The dependent variable is the coupon rate of the securitization tranche. Bond tranche maturity and principal are the maturity and principal on the tranche of the security. Captive is a dummy equal to one if the lender originating the loan is a captive lender. Lender CDS is the CDS of the lender. Brand-model, region and year-month fixed effect are interacted fixed effects for the brand-model and the type of car (old vs new), the region where the car was sold and the month and year in which it was sold. Region is defined as NUTS2. Lender-time controls are ROA, Equity as a fraction of total assets and the logarithm of total assets. Borrowers controls are income, employment status dummy and and dummy for verified income. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table A6: Standalone Lender

	Loan Terms					Risk-taking				
	Rate (%)	Maturity (log)	LTV (%)	Car value (log)	Loan Size (log)	Income (log)	Unemployed (dummy)	Self-Employed (dummy)	Verified (dummy)	Arrears (dummy)
Lender CDS	0.042	0.048***	1.024	0.024**	0.038*	-0.064***	-0.006***	-0.075***	0.000	-0.156***
	[0.070]	[0.009]	[0.789]	[0.012]	[0.020]	[0.015]	[0.002]	[0.011]	[0.000]	[0.024]
BrandModel-Region-YearMonth FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Lender FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Lender-time Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Borrower Controls	YES	YES	YES	YES	YES	NO	NO	NO	YES	YES
Avg Dep Var	5.261	3.958	85.125	9.294	9.074	10.295	.001	.098	1	.054
R-squared	0.645	0.111	0.133	0.438	0.280	0.356	0.033	0.292	0.041	0.325
Adj. R-squared	0.633	0.0805	0.104	0.419	0.256	0.334	0	0.268	0.00885	0.228
Observations	321,281	321,281	321,281	321,281	321,281	321,281	321,281	321,281	321,281	35,216

Note: The Table shows the results from equation (4) on the sample of old cars. The dependent variables are the interest rate in percentage points, maturity in log, loan-to-value in percentage points, car value in log, loan size in log, income in logs, two dummy variables denoting the employment situation (unemployed and self-employed), a dummy variable denoting if the income is verified and an indicator of whether loan has been every in arrears. Lender. CDS is the CDS of the lender financing the car. Brand-model, region and year-month fixed effect are interacted fixed effects for the brand-model, the region where the car was sold and the month and year in which it was sold. Region is defined as NUTS2. Lender-time controls are ROA, Equity as a fraction of total assets and the logarithm of total assets. Borrowers controls are income, employment status dummy and and dummy for verified income. Standard errors are double clustered at brand-model and region-lender levels. *, **, and *** denote significance at the 10%, 5% and 1% levels, respectively.



(a) CDS level

(b) CDS normalized

Figure A1: Volkswagen Emissions Scandal: CDS car manufacturers

Note: The figure shows the CDS for Volkswagen and an average of all other manufacturers during our sample period (December 2013 - December 2017). The figures plots the monthly averages of daily CDS. The CDS value are in basis points in panel (a) and normalized to 100 in September 2015 in panel (b).