Financial Education, Disclosure Policy and Credit Market Outcomes.[*]

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Abstract

We study the interaction between the policy of mandatory disclosure of annual percentage rate (APR) and the level of financial education of the borrowers. We use a detailed measure of financial education based on the economic content covered in the higher education programs enrolled by the borrowers. We combine our individual-level data of financial literacy with data on the universe of loans in Chile. We estimate difference-in-differences regressions to study the impact of the policy on interest rates, loan amounts and loan term of the financially educated consumer relative to uneducated consumers. Our findings suggest that the disclosure policy triggered a sizable gap in interest rates between the financially educated and uneducated of 90 basis points, that is about 5 percent of the average interest rate of the population.

Keywords: financial education   financial literacy   credit market   information regulation disclosure policy

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1 Introduction

The ability of consumers to assess the costs and benefits of their credit market options is crucial for achieving efficiency and stability in the financial sector. Nowadays, typical households are expected to make a wide range of credit decisions such as credit card usage, short-term loans, mortgages, and student loans.

Despite the frequency and importance of their financial choices, households still struggle with credit decisions and display a poor understanding of their financial options (Lusardi and Mitchell (2014)). The evidence shows that most households are quite financially illiterate and that lack of knowledge correlates with suboptimal financial decisions (Hastings et al. (2013)).[1] Moreover, lender institutions have incentives to obfuscate borrowers in order to soften competition (Carlin (2009)).[2]

Given the sub-optimal decisions from households, many authorities and researchers have urged regulations to simplify the financial information provided to prospective borrowers (Campbell et al. (2011)).[3] The underlying assumption is that the salient disclosure of more transparent information should improve the financial decisions of households. Starting with the Truth in Lending Act (TILA 1968), the typical regulation is to force lenders to disclose the actual yearly cost of funds over the term of a loan as an annual percentage rate (APR) that includes any fees or additional costs associated with the transaction. As loans or credit agreements can vary in terms of interest-rate structure, transaction fees, late penalties and other factors, this standardized APR computation provides borrowers with a bottom-line number they can easily compare to rates charged by other lenders.

We study the effects of the typical APR disclosure policy on individual credit outcomes using detailed information about the financial education of the borrowers. In 2012, the Chilean authorities required to all lending institutions to display the APR in a salient and standardized format. We use this exogenous improvement in the quality of the information to assess the impacts on the credit features of borrowers with different levels of financial education.

Our paper is unique because of the detailed information on the educational background of the borrowers we have. In effect, we have the borrower educational records that allow us to compute the financial content of each higher-education program they attended. This accurate and detailed measure of their financial literacy allows us to study the heterogeneous effects of this type of disclosure policies worldwide implemented.

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[1] Also see Lusardi (2015); Calvet et al. (2007, 2009); Stango and Zinman (2009).

[2] Among others see Wilson (2010); Piccione and Spiegler (2012); Chioveanu and Zhou (2013).

[3] See also Woodward and Hall (2012) and Campbell (2016).

We also have a rich individual-level data on banking loans for the entire market. The administrative records on credit outcomes contain the interest rate, amount, term, and allow us to control for borrower's characteristics such as income (from the regulator records), credit default (as ex-ante evaluated by the bank), the prior repayment behavior (as recorded by the regulator), and the usual demographics.

Our differences-in-differences estimates show that the gap in interest rates between the financially literate and illiterate borrowers increased by at least 90 basis points after the mandatory APR information was available. Consistent with the relatively lower interest rates for the financially educated borrowers, we find a significant increase in the loan amounts taken by those financially educated consumers relative to their uneducated counterpart. Also, the gap in the loan term between the two groups tends to disappear after the regulation was in place. Our results are robust to several specifications, pre-trend analysis, and falsification tests. We rule out a significant change in the pool of borrowers and suggest that most effects of the new policy are triggered by the more competitive environment in the credit market only for those consumers who can use the simplified information.

The main contribution of this paper is to provide solid evidence on the sizable effectiveness of disclosure regulations when borrowers have some financial knowledge. Moreover, we estimate the expected impacts on interest rates and other credit outcomes, shedding light on the financial education that makes the disclosure of APRs very effective in helping consumers.

Importantly for public policy, we conclude that the disclosure of simpler information does not close the gap in interest rates between the financial illiterate relative to the financially educated population. Thus, enhanced information may be necessary but not sufficient to level the field for the less financially educated borrowers.

We think our results are relevant to a vast number of markets with complex contracts and non-sophisticated consumers possibly choosing sub-optimal decisions. For instance, choices of health insurance, savings for retirement and investment decisions are typical markets that require not only information but also the capabilities to translate the financial information into a meaningful data that allows the consumer to improve her choices.

In general, our paper is related to a vast literature on how information affects economic decisions. For instance, the information effect on the choices on retirement plans (Duflo and Saez (2003)), payday loans (Bertrand and Morse (2011)), health-insurance plans (Kling et al. (2012)), and educational choices (Hastings and Weinstein (2008); Jensen (2010)). In particular, we contribute to the study of the interplay between information and financial education in credit markets. As surveyed by Hastings et al. (2013), how to improve household decision making in credit markets remains a crucial open question.

Our paper is also related to the literature on the effects of disclosure policies in credit markets

using transactional data. The closest work is Stango and Zinman (2011), who study the effect on credit outcomes of a reduction in the enforcement of TILA regulations in 1981. Using mostly car loans from 3,094 households, the authors find that the legal change implies a 400 basis-point interest rate increase to borrowers with more substantial payment/interest bias relative to the less biased consumers.[4] Similarly, Agarwal et al. (2015) and, Stango and Zinman (2011) study different regulations that decreased the borrowers' payments in a small but significant amount. For the Chilean case, Kulkarni et al. (2018) study the effects of standardization and disclosure policies on repayment behavior. They use county level educational attainment to assess the impact of the policy on delinquency rates.

Unlike our paper, other authors have studied different information manipulations by implementing field experiments in financial markets (Bertrand and Morse (2011); Ferman (2015); Seira et al. (2017)). Although this approach allows for arbitrary changes in the information sets, the sample selection is an issue if the subjects are required to consent their participation in the study or whether the financial institution was choosing the treated subjects based on risk, income or other characteristics. Our transactional data contain the entire market, although we only have educational records for the borrowers who took the college admission test after 2007. Having a younger than average cohort of borrowers might be considered a limitation, but it also eliminates the concerns about the unobservable initial credit history of the subjects.

The paper is organized as follows. Section 2 presents the regulation we study, institutional details and descriptive statistics of our data. Section 3 presents a model of firms competing in framing complexity with confused consumers. Section 4 presents our empirical strategy, results and robustness checks. Section 5 concludes.

2 Disclosure Policy and Data

2.1 Disclosure Policy: the *CAE* Regulation

As in the rest of the world, Chilean households show poor records of financial literacy (Ormazábal et al., 2016) and authorities seek for disclosure polices that can improve the credit outcomes for the less advantaged population.

On March 5th, 2012, the Chilean authorities introduced the so-called *CAE* regulation that requests lenders to compulsory disclose standardized information to prospectus borrowers.[5] Similar to most disclosure regulations implemented worldwide, the Chilean law demands that the

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[4] The authors measure the payment/interest bias as the gap between the actual and perceived interest rates using two hypothetical questions in the Survey of Consumer Finances. See Stango and Zinman (2009).

[5] CAE is an acronym that refers to "Carga Anual Equivalente", that translates as Annual Equivalent Amount similar to the APR definition.

lender must provide the APR and other standardized information to financial consumers. The mandatory APRs is a yearly measure of the interest rate using the total amount of the credit (including the principal and any other fee involved). Also, the Chilean regulation required the lender to disclose the total amount of repayments (with no discount) and the number of the installments.

The compliance by the Chilean financial institutions was satisfactory, and prospectus borrowers obtained the new standardized information. Given the active marketing campaign and the media coverage of this new regulation, we believe consumers were aware of the salient information, and hence, discard inattention that has been the concern in some of the literature (Chetty et al. (2009)).

Importantly for our identification strategy, the date of implementation of the disclosure policy is not straightforward. The first legal step of the regulation was to make standard APR information available upon request for a subset of credit products enacted on October 24, 2011. In particular, the first law allows to consumers to request specific loans (called "Creditos Universales") under the simplified benchmark that would be mandatory a few months later. The data does not identify whether the credit corresponded to the products with the enhanced information or not. The excellent reception of the policy by the public called to make the standardized information compulsory to all financial products in a law established in March 2012 (Congress, 2012). However, some final details on the implementation of the legal body were finished just in July 2012 (Kulkarni et al. (2018)). Besides the legal obligations, we found evidence that the private sector was gradually implementing the disclosure policy from early 2012 as the consumers were aware of the popularity the information and the financial institutions were able to provide the information established in 2011 by the first regulation.

We use the date of March 5, 2012, as a conservative measure of when the regulation was in place, with the authorities offering noticeable public campaigns about the benefits for consumers of the APR information. Since this regulation was an extension of the law passed in 2011, the lenders could provide the standardized information before all the details of the statute were official. However, if the disclosure policy was not entirely in force in March 2012, the estimates that we find can be seen as a lower bound of the actual effects because more substantial impacts should be observed in subsequent weeks as more financial institutions fulfilled the regulation.

2.2   Data on Loans

Our analysis uses microdata requested and recorded by the Chilean regulator of banks and financial institutions (hereafter *SBIF*[6]). The *SBIF* is an autonomous regulatory institution aiming at protecting the financial stability in Chile.

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[6]SBIF is an acronym that refers to "Superintendencia de Bancos e Instituciones Financieras", that translates as Superintendence of Banks and Financial Institutions.

We use individual-level data for the universe of new credits extended by commercial banks between 2010-2014. The data contain the credit characteristics (amount, annual interest rate, credit term, lending bank), and the consumer characteristics (age, gender, income, financial and historical repayment records). More details about the data can be found in Montoya et al. (2017).

2.3 Data on Education

We combine different sources of administrative data to build an individual-level information with rich educational background of the borrowers.

First, our data contain the records from the admission test to the higher education institutions such as university colleges and other technical or vocational schools. The admission test, PSU, is a multiple choice test taken once a year at a national level by a centralized institution and resembles the American SAT in various dimensions. The test outcomes are provided to the universities and other higher education institutions, who construct different weighted averages of the scores to rank and select their applicants. We have the individual records of the standardized scores in Math and Language tests, besides the average grade in High school. We have access to the universe of test takers graduating from high school from 2006 to 2012.

Second, we also have administrative data on the enrollment in higher education. We identify the specific program and educational institution that each PSU taker enrolled in a given year. We do not know whether the student passed or not each year of instruction but we know whether the student is enrolled in a different program the next year.[7] Our data indicates whether the student graduated, i.e., finished successfully her program. We do not know whether the student did not finish her or his studies and entered the labor market.

Third, we collect about 10,000 program curricula from all higher education institutions in Chile to quantify the amount of financial education they provide. For example, Figure 1 shows the curriculum for one program in bio-engineering from the University of Concepcion. The figure lists the name of the subject that students should take each semester, following the official time schedule. For instance, Algebra should be taken in the first semester. We have marked in red those subjects that contain financial tools useful for future credit decisions. In this particular example, the subjects "Economic Evaluation of Investment projects (7th semester) and "Preparation and Assessment of Projects" (8th semester) are thought to teach financial contents that should develop better consumers in the credit market.

We use the information on financial content of the borrower's enrollment to build three different individual-level measures of financial education. The first measure is a dummy variable that takes the value one if borrowers enrolled in a program that has at least one program from the fol-

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[7]For tractability reasons, we drop the few students that were enrolled in three or more programs in our data.

lowing list of topics: finance, accounting, cost analysis, project evaluation, capital management, investments, financial management, tax management, budget analysis, business valuation, and financial mathematics. The first program-specific measure is denoted "Fin-Lit-Yes".

The second measure considers whether the number of semesters enrolled by the student implies some exposure to the financial instruction identified in her correspondent curriculum. In our example of Figure 1, the student is exposed to financial instruction only if she was enrolled at least seven semesters in that program. Note that we know the admission year but we have no information on the actual progress or performance of students. Thus, if the student lies behind schedule, this measure might overestimate the financial education of the borrowers. This individual-specific measure is denoted "Fin-Lit-Sem".

Third, to explore the intensive margin, we compute the number of courses on finance education received by the students according to their enrollment data. This measure is a refinement of the second measure and allows us to capture whether the amount of courses in financial education are relevant for actual credit outcomes of the students. This individual-specific measure is denoted "Fin-Lit-Num".

Finally, we also compute a fourth measure of financial education that is dummy variable based on the financial content of each college degree as classified by the OECD. This program-specific measure is denoted "Fin-Lit-OECD".

Based on our financial education measure, 67.3 percent of our sample enrolled in a higher education program with no financial education, 6.9 and 6.6 enrolled in a program with one and two classes respectively with economic content. The remaining 19.2 percent of our sample had more than 2 financial classes in their higher education program.

Tables 1 and 2 present the summary statistics of the credit data before and after the introduction of the CAE regulation. The tables present the statistics for the two groups of financial literacy as recorded by the measure "Fin-Lit-Yes".

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Table 1: Borrower and Loan Characteristics before CAE Regulation by Level of Financial Education

Financially Educated	Mean	sd	p25	p50	p75	cv	N
Yearly Interest Rate	18,9%	11,7%	9,9%	16,8%	24,8%	0,6	26.959
Loan Amount (USD)	3.828,3	4.563,3	1482,9	2.338,3	4.772,6	1,2	26.959
Yearly Income (USD)	972,7	902,3	531,7	851,0	1.287,7	0,9	26.959
Female Dummy	44,9%	49,7%	0	0	1	1,1	26.959
Age	25,8	3,1	23,7	25,8	27,7	0,11	26.959
Historical Default Rate	9,5%	29,4%	0%	0%	0%	3,1	26.959

Financially Non-Educated	Mean	sd	p25	p50	p75	cv	N
Yearly Interest Rate	19,2%	12,4%	8,0%	17,2%	25,4%	0,64	118.347
Loan Amount (USD)	3.730,4	4.167,3	1.479,3	2.352,8	4.706,3	1,12	118.347
Yearly Income (USD)	921,2	740,6	407,0	773,5	1264,2	0,8	118.347
Female Dummy	44,1%	49,6%	0	0	1	1,1	118.347
Age	26,0	3,4	23,7	26,0	27,9	0,1	118.347
Historical Default Rate	8,4%	27,8%	0%	0%	0%	3,3	118.347

Table 2: Borrower and Loan Characteristics after CAE Regulation by Level of Financial Education

Financially Educated Group	Mean	sd	p25	p50	p75	cv	N
Yearly Interest Rate	22,1%	10,5%	14,3%	20,1%	26,7%	0,5	54.636
Loan Amount (USD)	5.938,8	6.792,1	1.627,0	3.970,4	7.649,9	1,1	54.636
Yearly Income (USD)	1.439,3	754,4	879,9	1.284,3	1.855,9	0,5	54.636
Female Dummy	44,2%	49,6%	0	0	1	1,1	54.636
Age	27,5	3,0	25,4	27,3	29,4	0,11	54.636
Historical Default Rate	11,5%	31,9%	0%	0%	0%	2,77	54.636

Financially Non-Educated	Mean	sd	p25	p50	p75	cv	N
Yearly Interest Rate	24,1%	11,3%	16,1%	21,8%	29,2%	0,47	214.728
Loan Amount (USD)	5.516,2	6.395,0	1569,1	3.556,6	7.263,8	1,2	214.728
Yearly Income (USD)	1.359,3	789,3	777,3	1.117,7	1.784,4	0,6	214.728
Female Dummy	41,0%	49,1%	0	0	1	1,2	214.728
Age	28,0	3,3	25,8	27,9	29,7	0,12	214.728
Historical Default Rate	11,3%	31,7%	0%	0%	0%	2,8	214.728

3 Theoretical Framework

In this section, we present some theoretical arguments to expect benefits from disclosure policies on the credit outcomes of the financially educated borrowers. Recall that the disclosure policy did not reveal new information that was not available before. Instead, the regulation forces lenders to provide simpler and enhanced information.

Perhaps not surprisingly, we have evidence that more complex informational frames are positively correlated with higher prices. For instance, Woodward and Hall (2012) show that borrowers in the mortgage market who choose to roll all settlement costs into a single rate obtain, on average, lower interest rates than those on deals with separate fees. The idea is that the informational advantage of the broker is less severe when borrowers can shop using a single rate alone.

Mandatory disclosure policies can have a role in credit outcomes, especially among those consumers with a better understanding of economic concepts (Stahl II (1989); Ippolito (1988)). Indeed, we use a model of non-standard but rational consumers in which consumers can benefit from a mandatory simpler informational regulation like the disclosure policy imposed by the *CAE* regulation in Chile. We use the model of Chioveanu and Zhou (2013) to draw policy implications.[8]

Suppose two banks choose simultaneously the information frame and interest rates of the otherwise homogeneous loans. The information frame can be simple or complex. A fraction of consumers cannot compare the two products satisfactorily when facing different information frames. Also, a fraction of the consumers cannot choose her best option whenever both banks choose the complex information frame. Of course, lenders may have incentives to unilaterally deviate by offering the simple format to boost her profits.

However, Chioveanu and Zhou (2013) show that there is a unique symmetric mixed-strategy equilibrium where both banks randomize over the simple and complex informational frame. Moreover, banks will randomize lower interest rates when selecting the simpler frame or higher rates otherwise.

The implications of this equilibrium are straightforward for the authorities. If the simple frame is the mandatory frame in the credit market, the share of confused customers will fall, and we should expect a decrease in the interest rate for those consumers who typically are not confused by the framing and who will benefit the most from the disclosure policy.

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[8]See Appendix section for the model details.

4 Empirical Strategy

Our econometric approach seeks to estimate the heterogeneous treatment effect of the disclosure policy among the borrowers with different levels of financial literacy. Thus, we implement the following difference-in-difference estimation:

$$Y_{it} = \alpha\, FinLit_i + \beta\, CAE_t + \gamma\, FinLit_i \times CAE_t + \delta' X_{it} + \varepsilon_{it} \tag{1}$$

where Y_{it} is the credit outcome of consumer i at time t; $FinLit_i$ is a measure of financial education; CAE_t is a dummy variable equal to one after March 5th 2012, and zero otherwise; and X_{it} is a vector of covariates; and ε_{it} is the standard mean zero stochastic term that is assumed to be uncorrelated with the explanatory variables.

The credit outcomes we study, Y_{it}, are the interest rates, the loan amounts and the loan terms. The four measures of financial literacy we use, $FinLit_i$, are based on the educational background of the borrowers and were introduced and discussed in Section 2.3.

The vector of covariates includes demographics (gender, age), educational background (high-school GPA, College admission test scores, number of years in higher education), and economic characteristics (income and default risk from SBIF records.).[9] The controls also include bank, county, and month fixed effects.

Our main parameter of interest is γ that captures the differentiated effect of the disclosure policy among borrowers with different levels of financial education. In addition, to explore whether there are gender differences in the effects of the CAE regulation we also include the female dummy in the regression as follows:

$$Y_{it} = \alpha\, FinLit_i + \beta\, CAE_t + \gamma_1\, FinLit_i \times CAE_t + \gamma_2\, FinLit_i \times CAE_t \times Female_i + \delta' X_{it} + \varepsilon_{it} \tag{2}$$

The parameter γ_2 will capture gender differences in the informational treatment among the financially literates.

4.1 Identification

Difference-in-differences (DiD) estimators provide unbiased treatment effect estimates when, in the absence of treatment, the average outcomes for the treated and control groups would have followed parallel trends over time.

The key identifying assumption is that the trend of the interest rates, loan amounts and loan

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[9]Default risk is given by the ratio of the unpaid overdue debt total relative to the total amount and lagged two periods

terms would be unaffected in the absence of the disclosure policy, which is our treatment, for both, the financially educated and uneducated groups of consumers. We use the pre-treatment data to test the likelihood of the parallel trend assumption.

Figure 2 shows the weekly average of the interest rate for educated and non-educated borrowers in the period 2010 to 2014. We see no differential trends between both groups of consumers.

Similarly, Figure 3 and 4 replicate the previous time series plot showing weekly average of loan amounts and terms for the same period, respectively. We find no apparent trend differences between both groups before the implementation of the CAE regulation.

Another relevant issue is to analyze if the observable characteristics of both groups have similar trends in all the period of analysis. We need that the composition of the both group does not change in different way as a result of the treatment.

Although difference-in-differences allows us to take care of differences between the treatment and the comparison group that are constant over time, it will not help us eliminate the differences between the treatment and comparison groups that change over time (Cattaneo et al., 2009).

If the trend of both groups turn out to be different in terms of these observable variables, then it is likely that they would also have displayed differences in terms of interest rate, amount of loan and term of credit in the absence of treatment, thereby invalidate our identification strategy.

In Figures 5(a), 5(b), 5(c), 5(d), 5(e) and 5(d) we present weekly time series for the period 2010 to 2014 for the following average variables: age of borrowers, monthly earnings, the human capital of individuals measure as result of high school GPA and admission test to the secondary studies (PSU) ; share of females, default rate $t - 2$ and years of study on higher education . We report the average level for each variable by educated an non educated consumer. As can be seen from these figures, all the observable variables have similar trends in both groups in all the period.

4.2   Results

We present the results of estimating Equation 1 for interest rates, loan amount and loan terms. We explore the effects of the disclosure policy when considering the three alternative financial education measures.

4.3   Interest Rates

Figure 6 shows the average interest rates of financially educated and non-educated borrowers over time. We see a gap in interest rates between both groups after the implementation of the

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disclosure policy (CAE regulation).[10] The figures are consistent with the hypothesis of financially educated consumer taking more advantage of the simpler information in the credit market.

Table 3 presents the estimates of Equation (1) using the interest rate as the outcome variable. Panel A and B show the estimates using different measures of financial education. The results are similar and statistically significant using clustered standard errors.

Table 3.A shows the results using the enrollment in a program with financial education to classify financial literacy. The estimates suggest a sizable gap on interest rates of the financially educated borrowers relative to the uneducated group after the regulation was implemented. The financially educated borrowers obtain about 95 basis point lower interest rates than the uneducated, equivalent to 5 percent of the mean interest rate of the pre-treatment educated consumer (about 20 percent).

Regarding the marginal effect of an extra course with financial content, we analyze the results using the numbers of financial courses as the measure of financial literacy. Table 3.B presents the results using the total number of economic classes and shows that the additional course decrease, on average, the interest rate in 13,9 basis point of the financially educated borrowers relative to the control group. Furthermore, in an alternative specification, we include one dummy per number of courses to allow for different impacts of the additional course on interest rates. As shown in Table 4.A, we find that marginal effect on interest rates is decreasing with the number of classes with financial content.

We have weak evidence of financially educated borrowers obtaining lower interest rates before the CAE regulation, since the coefficients on financial literacy are negative but statistically insignificant.

4.4   Loan Amounts

We replicate the analysis done for interest rates to investigate the effects on the loan amounts of the disclosure policies for the different levels of financial education in the population.

Figure 7 shows the average loan amount for the financially educated and non-educated borrowers over time. Consistent with the financially educated borrowers obtaining lower interest rates after the implemented disclosure policy, we observe financially educated consumers increasing their credit amount relative to the uneducated group.

Table 5 shows the estimates of Equation (1) using loan amount as the dependent variable. Consistent with the sizable gap in interest rates triggered by the disclosure policy, we observe an increase in the loan amounts for the financially educated borrowers relative to the uneducated

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[10] We use the admission in a program with financial education as a measure of financial literacy in the figure at the top, and the enrollment in an economic class in the figure at the bottom.

ones. The amount increase of the educated groups is about 185 USD that represents a 4,8 percent of the average amount requested by the financially educated consumers previous to the reform.

The changes in amount are consistent, and probably, caused by the changes in interest rates shown above. The findings are robust when using different alternative financial education. In particular, the effect of the marginal economic class is decreasing with the extra class and perhaps may have a U shape. Our estimates in Table 4.B imply a significant impact on loan amounts of the first class, a statistically insignificant impact for a medium range of courses and a substantial effect for the additional class among the consumers with four or more financial courses.

4.5   Loan Terms

We also study the effect of the interaction between disclosure policy and financial literacy on loan terms. Figure 8 shows that the average loan term converges between the two groups once the CAE regulation comes into force. In effect, we see that the financially educated group tended to borrow for a shorter term than the non-educated group before the CAE regulation, but those loan terms are very close after March 2012.

Table 6 shows the estimates of Equation (1) using loan term as the outcome variable. We find a positive and significant effect of the CAE regulation on the term of the loans borrowed by educated consumers narrowing the gap with the financially uneducated group (but not closing the gap completely). Based on Table 6.A, the term of loans increase on average in 3,9 months for educated consumers, that represents about 12% of the term requested by financially educated consumers previous to the reform. Using the second measure of financial education shown in Table 6.B, we obtain that the number of finance courses studies by borrowers increase the term of loans in one month on average. In Table 4.C we can appreciate the intensity effect of courses in the loan terms is positive but it decreases with the number of courses.

4.6   Heterogeneous Effect

We also study whether the interaction between financial literacy and the CAE regulation have heterogeneous effects based on the gender of the borrower.

We find significant differences in the effects of the CAE regulation on the credit outcomes of financially educated consumers by gender. In Table 7.A we appreciate that the within the financially educated group, female borrowers benefit less from the CAE regulation. The interest rate reduction is about 30 percent less for financially educate female borrowers than their male counterpart. Table 7.B and C show that for financially educated female consumers the average loan amount is lower, and the loan terms are shorter than those of male counterpart after the CAE regulation.

Two reasons can explain gender differences. First, women could have used better their financial knowledge before the law came into force than men. Thus the effect of the disclosure policy in the credit market is lower. Another potential explanation considering the supply side may suggest possible gender discrimination in the credit market.

4.7 Robustness Check

In this section, we run some robustness checks in our empirical findings.

First, we examine whether the covariates show similar trends between both groups over time. Figures 5 and Table 9 suggest that there are no differences regarding the socioeconomic outcomes over time.

Second, following the suggestions of Bertrand et al. (2004), we rerun our main specification of Equation (1) using the averaged data before and after the treatment date to address the potential serial correlation that may underestimate the standard errors of the treatment effect.

Table 8 shows the estimates of the effect of the CAE regulation in financially educated consumers using the averaged data. Different columns present the impact on the interest rate, loan amounts and loan term of loans. Panel A use the dummy for programs with financial content and Panel B use the number of economic classes the borrower took. Our main conclusions remain in place at any standard level of confidence.

5 Conclusions

In March 2012, the Chilean government introduced a common worldwide policy, requesting the mandatory disclosure of APRs and other simple information on loans aiming at improving the financial choices of households in the credit market.

We assess whether the impact of this informational change is different across the population with different levels of financial education. We have access to a unique individual-level data on loans and financial background of the borrowers for the universe of loans approved between 2010 and 2014 in Chile.

We estimate difference-in-differences regressions to study the effect of this financial regulation on interest rates, loan amounts and loan term of financially educated consumer relative to uneducated consumers.

Our findings suggest that the gap in interest rates between the financially literate and illiterate borrowers increased by 95 basis points, once the mandatory APR information was in force. Consistent with relatively lower interest rates for the financially educated borrowers, we find a

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significant increase in the loan amounts taken by those financially educated consumers relative to their uneducated counterpart. Also, the gap in the loan term between the two groups tends to narrow after the regulation is in place. Our results are robust to pre-trend analysis and robustness tests.

We think our results suggest that information disclosure seems necessary but not sufficient to improve consumer choices. These results are relevant to a vast number of markets with complex contracts and non-sophisticated consumers possibly choosing suboptimal decisions. For instance, choices of health insurance, savings for retirement and investment decisions are typical markets that require not only information but also the capabilities to translate the financial information into a meaningful data that allows the consumer to improve her choices.

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Figure 1: Example of Educational Content

BIO-ENGINEERING - UNIVERSITY OF CONCEPCION

TIME →

1st YEAR		2nd YEAR		3rd YEAR		4th YEAR		5th YEAR	
sem 1	sem 2	sem 3	sem 4	sem 5	sem 6	sem 7	sem 8	sem 9	sem 10
Algebra	Calculus	Vectorial Calculus	Numerical Calculus	Biochemistry	Intro to bioprocesses	Bioengineering operations I	bioengineering operations II	Thesis	
General Chemistry I	General Chemistry II	Evolution and biology of microorganisms	Instrumental Analysis	Biosecurity	Molecular of the cell and the molecules	Molecular Genetic and genetic engineering	Topics on Molecular Physiopathology	Elective course	Elective course
Cell Biology	Physics I	Physics II	Bioethics workshop	Biometrics	Genomic Bio-informatics and molecular evolution	Cell biology prokaryotic and virology	Preparation and Assessment of Projects		
Introduction to biotechnology	Bioengineering	Organic Chemistry I	Organic Chemistry II	Macromolecular Physics-chemistry	Bio-informatics workshop	Fiosology of systems	Science, technology and society		
	Intro to biology of populations			Complement course	Elective course	Economic Evaluation of Investments	Elective course		

Figure 2: Interest Rate
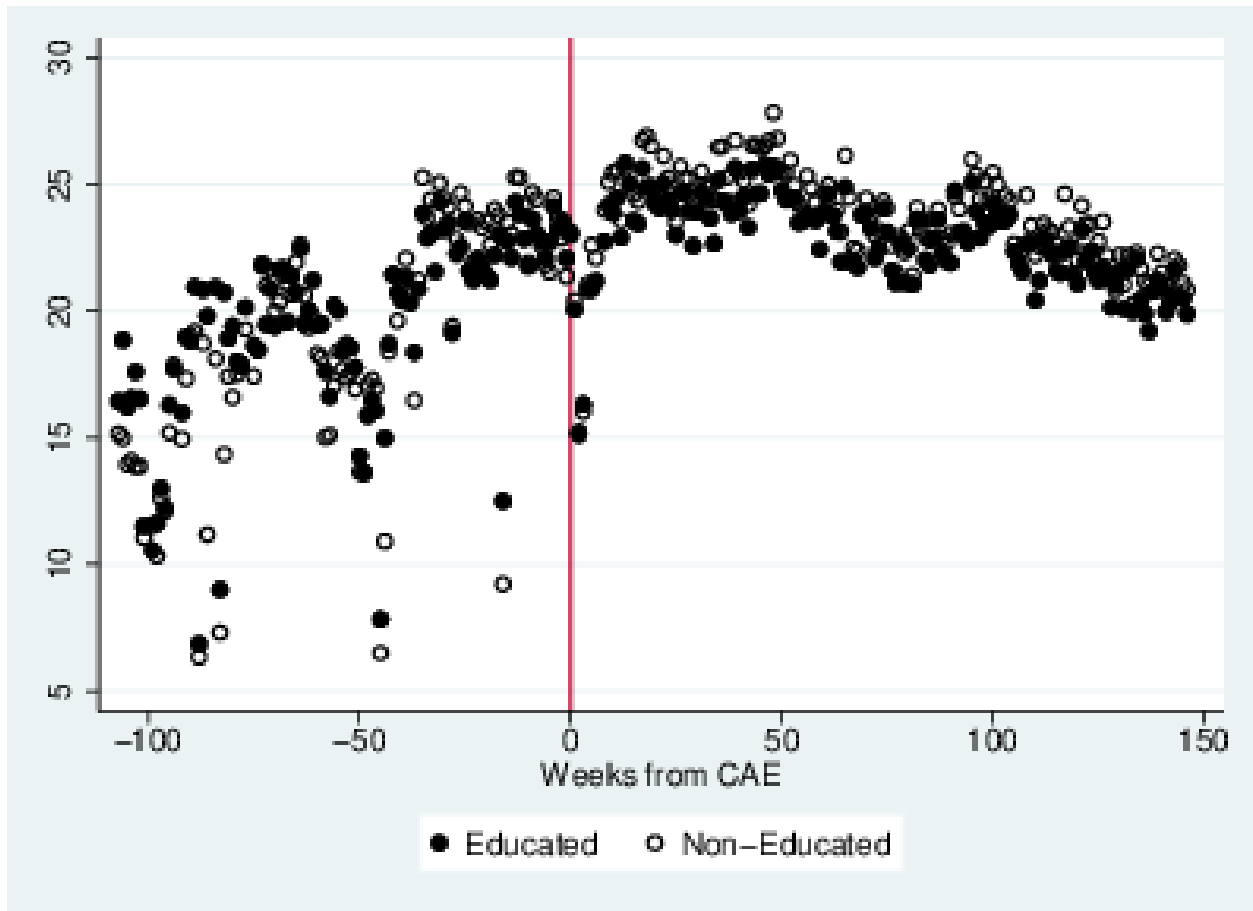
Notes: Dots represent weekly means for Educated and Non-Educated Groups. Red line represents 2012/03/05, date on which CAE policy was implemented. Interval 0 to -100 represent 100 weeks before the implementation and interval 0 to 100 represent those weeks after. Interest Rate is expressed in %.

Figure 3: Loan Amounts
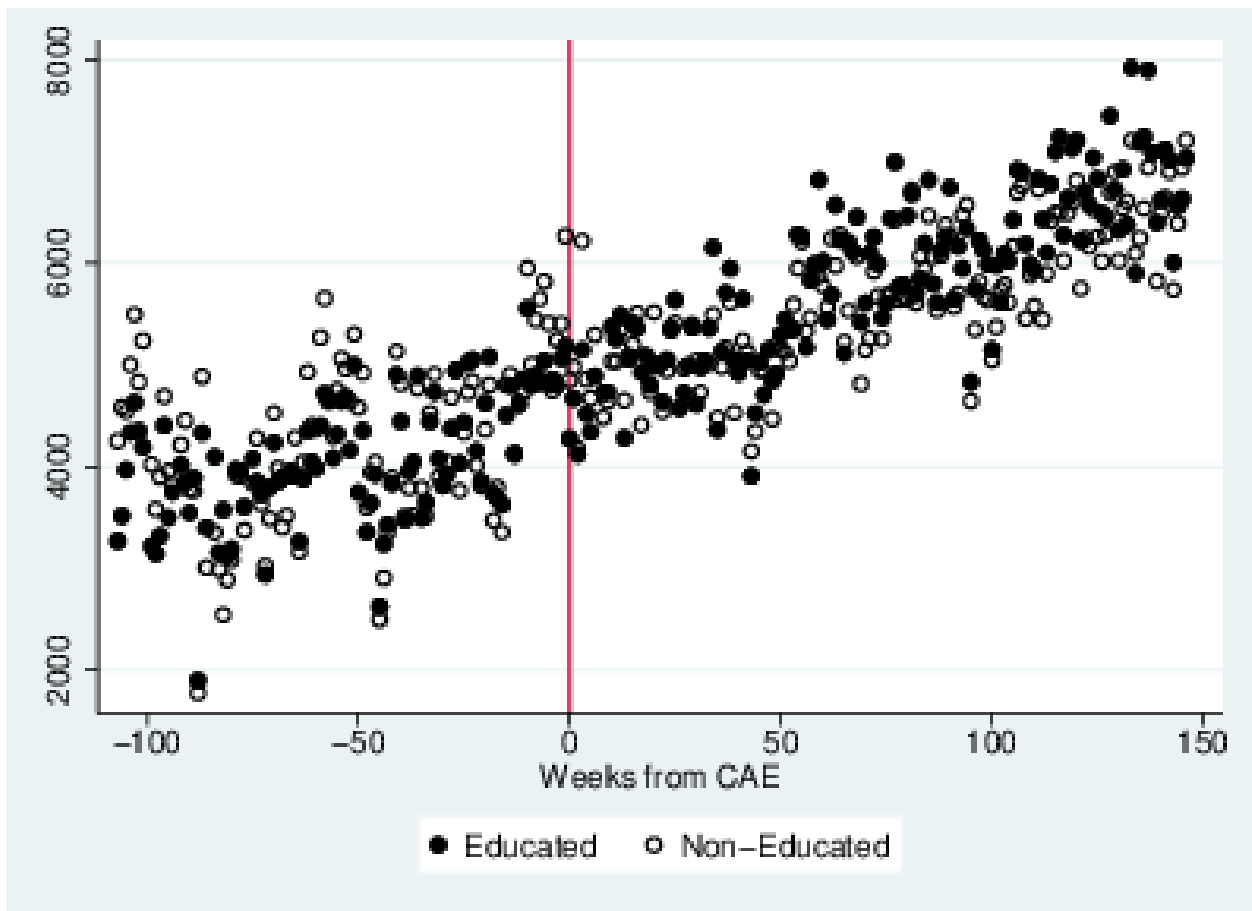
Notes: Dots represent weekly means for Educated and Non-Educated Groups. Red line represents 2012/03/05, date on which CAE policy was implemented. Interval 0 to -100 represent 100 weeks before the implementation and interval 0 to 100 represent those weeks after. Loan Amount is expressed in US Dollars.

Figure 4: Loan Terms

Notes: Dots represent weekly means for Educated and Non-Educated Groups. Red line represents 2012/03/05, date on which CAE policy was implemented. Interval 0 to -100 represent 100 weeks before the implementation and interval 0 to 100 represent those weeks after. Loan Amount is expressed in US Dollars.

Figure 5: Covariates

(a) Age

(b) Earnings

(c) High School GPA

(d) PSU

(e) Female

(f) Default Rate
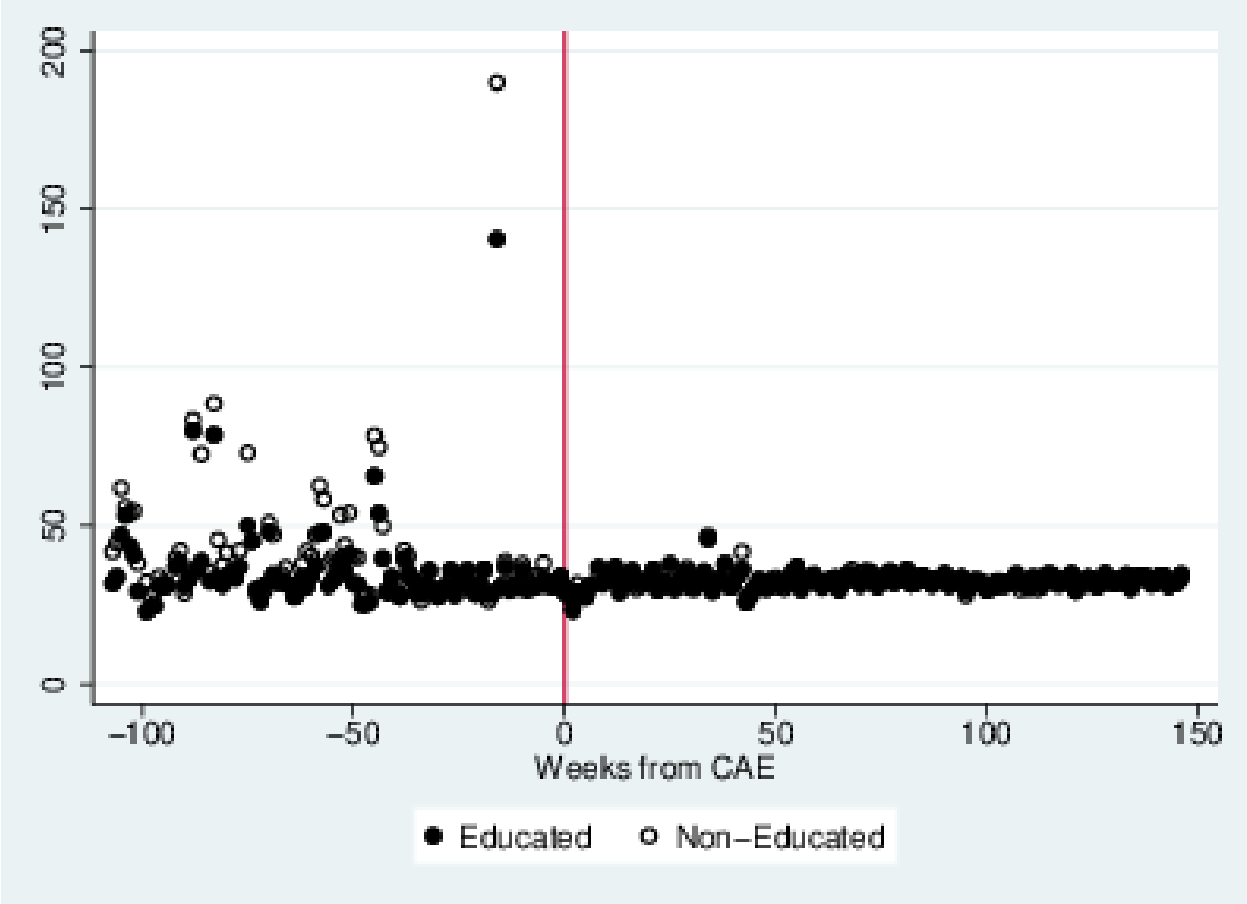
(g) Years Higher Education

Notes: Dots represent weekly means for Educated and Non-Educated Groups. Red line represents 2012/03/05, date on which CAE policy was implemented. Interval 0 to -100 represent 100 weeks before the implementation and interval 0 to 100 represent those weeks after.

Figure 6: Dif-Dif Rates

(a) Curso Yes

(b) Semestre Total

Notes: Regressions results. Confidence intervals represented by external lines. Dots represent weekly means of Interest Rates for Educated and Non-Educated Groups. Red line represents 2012/03/05, date on which CAE policy was implemented. Interval 0 to -100 represent 100 weeks before the implementation and interval 0 to 150 represent those weeks after.

Figure 7: Dif-Dif Amount
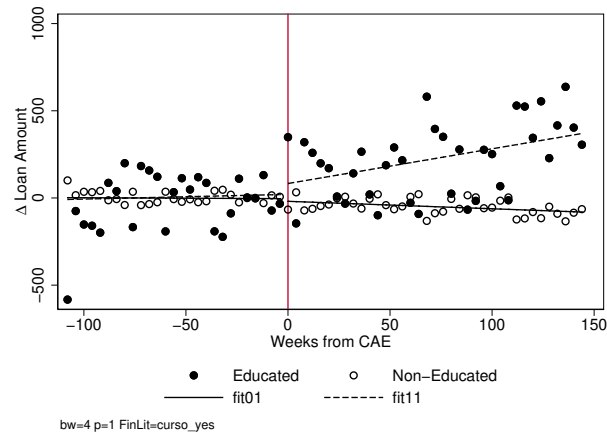
bw=4 p=1 FinLit=curso_yes

(a) Curso Yes

(b) Semestre Total

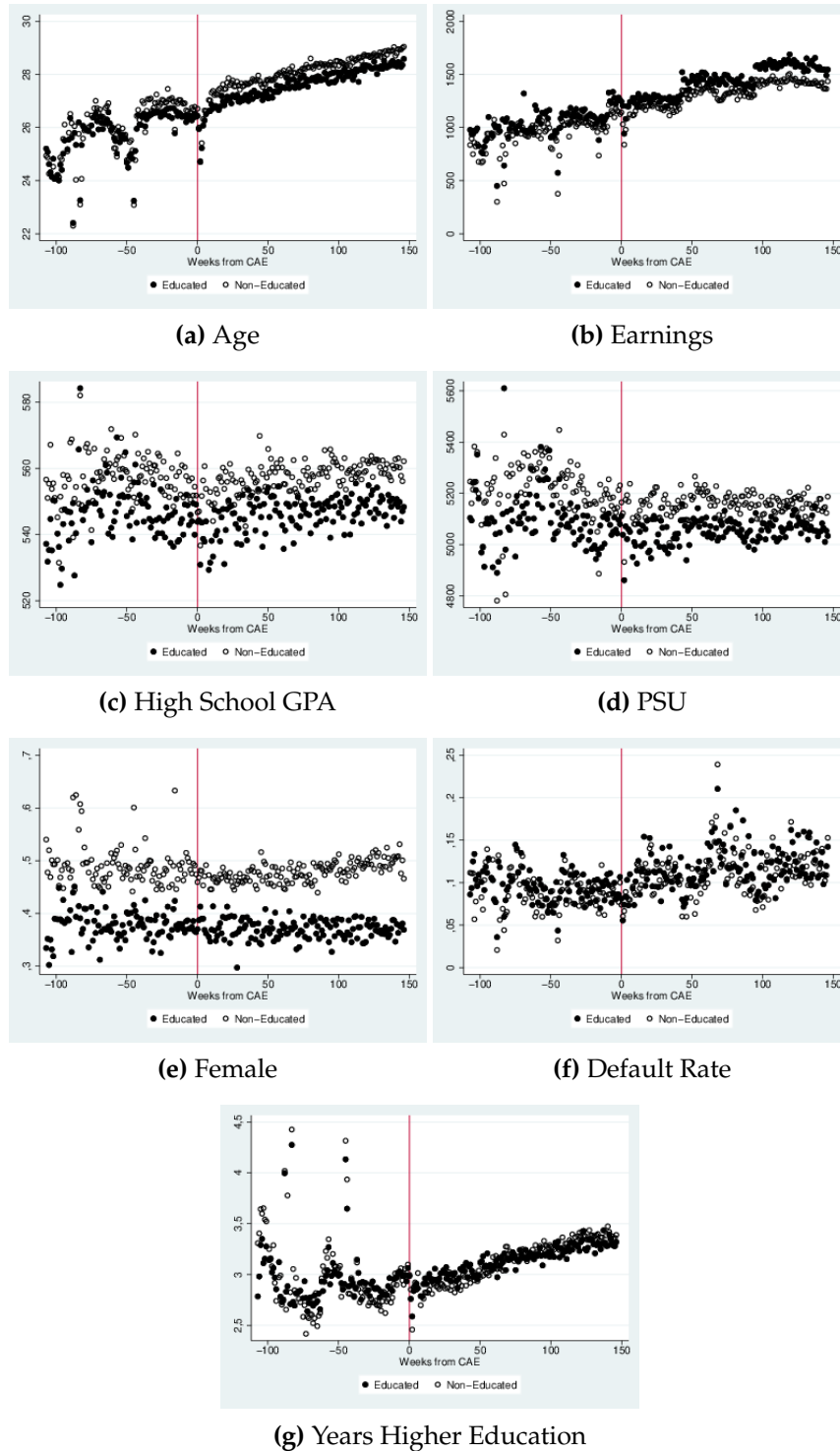*Notes:* Regressions results. Confidence intervals represented by external lines. Dots represent weekly means of Loan Amount for Educated and Non-Educated Groups. Red line represents 2012/03/05, date on which CAE policy was implemented. Interval 0 to -100 represent 100 weeks before the implementation and interval 0 to 150 represent those weeks after.

Figure 8: Dif-Dif loan terms

(a) Curso Yes

(b) Semestre Total

Notes: Regressions results. Confidence intervals represented by external lines. Dots represent weekly means of Loan Amount for Educated and Non-Educated Groups. Red line represents 2012/03/05, date on which CAE policy was implemented. Interval 0 to -100 represent 100 weeks before the implementation and interval 0 to 150 represent those weeks after.
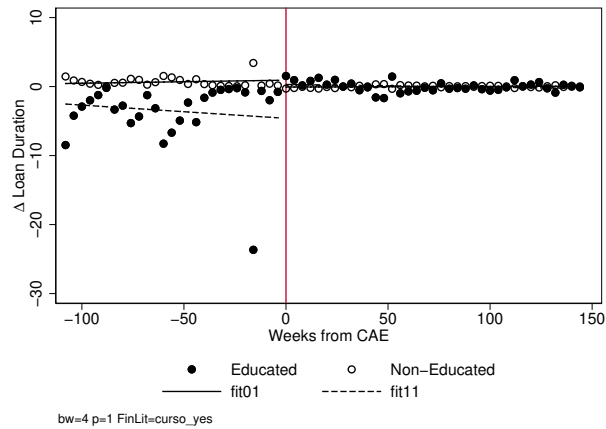
Table 3: Interest Rate Effects after CAE regulation on Financially Educated Borrowers

Panel A

	r-rfe	r-cfe	clreg	clcom	clmy	clmxr	clmxc
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FinLit-curso-yes	-.137	-.116	-.137	-.116	-.137	-.137	-.116
	(.070)**	(.070)*	(.178)	(.108)	(.288)	(.184)	(.079)
CAExFinLit-curso-yes	-.918	-.945	-.918	-.945	-.918	-.918	-.945
	(.080)***	(.081)***	(.154)***	(.113)***	(.233)***	(.161)***	(.087)***
Obs.	414090	414090	414090	414090	414090	414090	414090
R^2	.194	.2	.194	.2	.194	.194	.2

Panel B

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FinLit-sem-totalR	-.012	-.006	-.012	-.006	-.012	-.012	-.006
	(.015)	(.015)	(.053)	(.024)	(.057)	(.039)	(.017)
CAExFinLit-sem-totalR	-.131	-.139	-.131	-.139	-.131	-.131	-.139
	(.016)***	(.016)***	(.030)***	(.022)***	(.041)***	(.031)***	(.017)***
Obs.	414090	414090	414090	414090	414090	414090	414090
R^2	.194	.199	.194	.199	.194	.194	.199

Notes: Regressions computed using all the same covariates (gender, age, yearly income, financial and default history) and the same fixed effects (per month, year and bank). Model 1: Robust OLS with fixed effects per region. Model 2: Robust OLS with fixed effects per county. Model 3: Clusters at regional level. Model 4: Clusters at county level. Model 5: cluster at monthly and yearly level. Model 6: Cluster at regional, monthly and yearly level. Model 7: Cluster at county, monthly and yearly level. Interest Rate is annual and expressed in %. *** p<0.01, ** p<0.05, * p<0.1

Table 4: Marginal Effect of Financial courses after CAE regulation

Panel A: Interest Rates	c1	c2	c3	c4
	(1)	(2)	(3)	(4)
FinLit-sem-totalR	-.465	-.270	-.267	.011
	(.112)***	(.074)***	(.063)***	(.038)
CAExFinLit-sem-totalR	-.233	-.206	-.141	-.115
	(.075)***	(.050)***	(.050)***	(.031)***
Obs.	327623	326715	312381	338698
R^2	.201	.196	.201	.199

Panel B: Loan Amounts	c1	c2	c3	c4
	(1)	(2)	(3)	(4)
FinLit-sem-totalR	95.423	73.941	102.793	-15.741
	(43.379)**	(21.692)***	(22.638)***	(6.579)**
CAExFinLit-sem-totalR	40.398	-5.501	6.605	24.234
	(18.987)**	(15.614)	(16.037)	(7.093)***
Obs.	327623	326715	312381	338698
R^2	.184	.172	.178	.177

Panel C: Loan Terms	c1	c2	c3	c4
	(1)	(2)	(3)	(4)
FinLit-sem-totalR	-2.665	-1.441	-.870	-.916
	(.628)***	(.454)***	(.348)**	(.245)***
CAExFinLit-sem-totalR	.711	.794	.546	.625
	(.227)***	(.248)***	(.212)***	(.217)***
Obs.	327623	326715	312381	338698
R^2	.178	.179	.185	.18

Notes: Regressions computed using all the same covariates (gender, age, yearly income, financial and default history). Model 1: Contrast those who do not have a course with those who have one course of financial education. Model 2: Contrast those who do not have a course with those who have two courses. Model 3: Contrast those who do not have a course with those who have three courses. Model 4: Contrast those who do not have a course with those who have more than three courses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 5: Loan Amount Effects after CAE regulation on Financially Educated Borrowers

Panel A

	r-rfe	r-cfe	clreg	clcom	clmy	clmxr	clmxc
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FinLit-curso-yes	.200	-13.845	.200	-13.845	.200	.200	-13.845
	(28.498)	(28.213)	(49.442)	(41.015)	(45.370)	(35.375)	(28.984)
CAExFinLit-curso-yes	176.966	184.534	176.966	184.534	176.966	176.966	184.534
	(37.370)***	(37.683)***	(42.296)***	(50.062)***	(45.474)***	(38.802)***	(38.542)***
Obs.	414090	414090	414090	414090	414090	414090	414090
R^2	.177	.181	.177	.181	.177	.177	.181

Panel B

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FinLit-sem-totalR	-3.548	-6.123	-3.548	-6.123	-3.548	-3.548	-6.123
	(5.919)	(5.775)	(9.583)	(7.911)	(9.717)	(7.650)	(5.988)
CAExFinLit-sem-totalR	23.163	25.541	23.163	25.541	23.163	23.163	25.541
	(6.216)***	(6.165)***	(5.729)***	(7.935)***	(8.012)***	(7.012)***	(6.393)***
Obs.	414090	414090	414090	414090	414090	414090	414090
R^2	.177	.181	.177	.181	.177	.177	.181

Notes: Regressions computed using all the same covariates (gender, age, yearly income, financial and default history) and the same fixed effects (per month, year and bank). Model 1: Robust OLS with fixed effects per region. Model 2: Robust OLS with fixed effects per county. Model 3: Clusters at regional level. Model 4: Clusters at county level. Model 5: cluster at monthly and yearly level. Model 6: Cluster at regional, monthly and yearly level. Model 7: Cluster at county, monthly and yearly level. Loan Amount is expressed in USD. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 6: Loan Term Effects after CAE regulation on Financially Educated Borrowers

Panel A	r-rfe	r-cfe	clreg	clcom	clmy	clmxr	clmxc
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FinLit-curso-yes	-4.643	-4.570	-4.643	-4.570	-4.643	-4.643	-4.570
	(.213)***	(.213)***	(.372)***	(.312)***	(2.156)**	(1.282)***	(.315)***
CAExFinLit-curso-yes	3.918	3.847	3.918	3.847	3.918	3.918	3.847
	(.224)***	(.224)***	(.392)***	(.281)***	(1.971)**	(1.190)***	(.310)***
Obs.	414090	414090	414090	414090	414090	414090	414090
R^2	.155	.158	.155	.158	.155	.155	.158

Panel B

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FinLit-sem-totalR	-1.014	-1.000	-1.014	-1.000	-1.014	-1.014	-1.000
	(.042)***	(.042)***	(.057)***	(.067)***	(.435)**	(.269)***	(.064)***
CAExFinLit-sem-totalR	.726	.713	.726	.713	.726	.726	.713
	(.042)***	(.042)***	(.045)***	(.053)***	(.368)**	(.233)***	(.058)***
Obs.	414090	414090	414090	414090	414090	414090	414090
R^2	.156	.159	.156	.159	.156	.156	.159

Notes: Regressions computed using all the same covariates (gender, age, yearly income, financial and default history) and the same fixed effects (per month, year and bank). Model 1: Robust OLS with fixed effects per region. Model 2: Robust OLS with fixed effects per county. Model 3: Clusters at regional level. Model 4: Clusters at county level. Model 5: cluster at monthly and yearly level. Model 6: Cluster at regional, monthly and yearly level. Model 7: Cluster at county, monthly and yearly level. Loan term is expressed in month %. *** p<0.01, ** p<0.05, * p<0.1

Table 7: Effects after CAE regulation on Financially Educated Borrowers by Gender

Panel A: Interest Rates	r-rfe	r-cfe	clreg	clcom	clmy	clmxr	clmxc
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FinLit-curso-yes	-.139	-.117	-.139	-.117	-.139	-.139	-.117
	(.070)**	(.070)*	(.177)	(.108)	(.287)	(.184)	(.079)
CAExFinLit-curso-yes	-1.092	-1.070	-1.092	-1.070	-1.092	-1.092	-1.070
	(.088)***	(.088)***	(.160)***	(.122)***	(.279)***	(.179)***	(.095)***
CAExFinLit-curso-yesxfemale	.399	.288	.399	.288	.399	.399	.288
	(.091)***	(.092)***	(.086)***	(.114)**	(.148)***	(.111)***	(.093)***
Obs.	414090	414090	414090	414090	414090	414090	414090
R^2	.194	.2	.194	.2	.194	.194	.2

Panel B: Loan Amounts							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FinLit-curso-yes	1.729	-12.540	1.729	-12.540	1.729	1.729	-12.540
	(28.499)	(28.212)	(49.066)	(40.970)	(45.327)	(35.364)	(28.980)
CAExFinLit-curso-yes	316.081	302.362	316.081	302.362	316.081	316.081	302.362
	(46.698)***	(46.700)***	(46.598)***	(58.643)***	(61.291)***	(51.524)***	(47.767)***
CAExFinLit-curso-yesxfemale	-320.162	-271.238	-320.162	-271.238	-320.162	-320.162	-271.238
	(53.014)***	(53.286)***	(56.267)***	(60.250)***	(66.819)***	(60.810)***	(53.445)***
Obs.	414090	414090	414090	414090	414090	414090	414090
R^2	.177	.181	.177	.181	.177	.177	.181

Panel C: Loan Terms							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FinLit-curso-yes	-4.632	-4.559	-4.632	-4.559	-4.632	-4.632	-4.559
	(.213)***	(.213)***	(.369)***	(.311)***	(2.151)**	(1.280)***	(.315)***
CAExFinLit-curso-yes	4.906	4.846	4.906	4.846	4.906	4.906	4.846
	(.243)***	(.243)***	(.415)***	(.321)***	(2.416)**	(1.374)***	(.347)***
CAExFinLit-curso-yesxfemale	-2.273	-2.300	-2.273	-2.300	-2.273	-2.273	-2.300
	(.221)***	(.222)***	(.157)***	(.272)***	(1.085)**	(.524)***	(.251)***
Obs.	414090	414090	414090	414090	414090	414090	414090
R^2	.156	.159	.156	.159	.156	.156	.159

Notes: Regressions computed using all the same covariates (gender, age, yearly income, financial and default history) and the same fixed effects (per month, year and bank). Model 1: Robust OLS with fixed effects per region. Model 2: Robust OLS with fixed effects per county. Model 3: Clusters at regional level. Model 4: Clusters at county level. Model 5: cluster at monthly and yearly level. Model 6: Cluster at regional, monthly and yearly level. Model 7: Cluster at county, monthly and yearly level. Loan term is expressed in month %. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 8: Estimates with Averaged Data following Bertrand et al. (2004)

	r-tasa	clr-tasa	r-plazo	clr-plazo	r-monto	clr-monto
	(1)	(2)	(3)	(4)	(5)	(6)
FinLit-curso-yes	1.940	1.940	-13.169	-13.169	-172.135	-172.135
	(.312)***	(.368)***	(.892)***	(1.039)***	(84.162)**	(98.396)*
CAExFinLit-curso-yes	-1.833	-1.833	10.778	10.778	301.448	301.448
	(.346)***	(.338)***	(1.071)***	(1.112)***	(115.897)***	(124.629)**
Obs.	2529	2529	2529	2529	2529	2529
R^2	.596	.596	.559	.559	.666	.666

	r-tasa	clr-tasa	r-plazo	clr-plazo	r-monto	clr-monto
	(1)	(2)	(3)	(4)	(5)	(6)
FinLit-sem-totalR	.327	.327	-1.420	-1.420	-39.865	-39.865
	(.052)***	(.055)***	(.146)***	(.150)***	(13.751)***	(14.736)***
CAExFinLit-sem-totalR	-.160	-.160	.850	.850	1.360	1.360
	(.055)***	(.055)***	(.152)***	(.158)***	(17.043)	(16.705)
Obs.	7755	7755	7755	7755	7755	7755
R^2	.281	.281	.236	.236	.394	.394

Notes: This regressions average the data before and after the CAE regulation between Educated and Non-Educated Groups. Model 1, 3 & 5: Robust OLS with fixed effects per region. Model 2, 4 & 6: Robust OLS with fixed effects per county. Robust standar errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 9: Regression of Observable Variables Measures differences in Trend and Mean between Financial Educated Borrowers

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	mora2	femaleSBIF	prom_lm	ptje_em	salario_mes_promedio	edad_real	year_highe
Trend	0,000259***	-0,000223*	-0,171	0,00480	3,561***	0,0199***	-0,0000222
	(6,09)	(-2,51)	(-0,71)	(0,42)	(9,25)	(9,82)	(-0,02)
Trend_Finlit-curso-yes	-0,0000807	0,000207*	0,355	0,0394**	0,154	-0,00330	0,00124
	(-1,45)	(2,06)	(1,22)	(2,73)	(0,33)	(-1,31)	(1,13)
FinLit-curso-yes	0,229	-0,582*	-916,7	-99,89*	-343,3	8,735	-2,934
	(1,49)	(-2,07)	(-1,13)	(-2,49)	(-0,26)	(1,24)	(-0,95)
_cons	-0,611***	1,069***	5587,1***	539,0***	-8594,5***	-27,67***	3,142
	(-5,15)	(4,30)	(8,36)	(17,10)	(-7,98)	(-4,87)	(1,22)
N	498	498	498	498	498	498	498

Note: Weekly average variable of the sample. *t* statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

A Model

The model is based on Chioveanu and Zhou (2013). Consider a credit market with two financial institutions, bank 1 and 2, whose constant marginal costs of capital are normalized to zero. There is a unit mass of consumers, each borrowing at most one unit of credit and willing to pay at most 1.

There are two alternative information frames for interest rates, referred to as frames A and B. We assume that frame A is a simple frame (in which the two interest rates are easily comparable) and that frame B is a a more complex frame, in which not every consumer is able to perfectly compare alternative options. Each bank i will choose frame $z_i = \{A, B\}$, so the vector of frames will be $Z=(z_1, z_2)$ and the share of the population that gets confused is denoted by $\alpha(Z) \in [0,1)$.

The banks simultaneously and non cooperatively choose frames and interest rates r_1 and r_2; the demand function is given by $q_i(r_i, r_j)$. If firm i is the cheapest option ($r_i < r_j$), then firm i captures the entire demand ($q_i = 1$) and firm j has no customers ($q_j = 0$). When both banks set identical prices, $r_i = r_j$, each bank serves half of the demand: $q_i = q_j = \frac{1}{2}$.

If both banks choose the same simple frame, $Z = (A, A)$, then almost nobody gets confused, $\alpha(A, A) = \alpha_0 \geq 0$, and most consumers buy the cheaper product with a positive net surplus.

If the two banks adopt different frames, $Z = (A, B)$ or $Z = (B, A)$, then a larger fraction $\alpha(A, B) = \alpha(B, A) = \alpha_1 > \alpha_0 \geq 0$ of consumers gets confused and they are unable to compare the two alternative options. The remaining $(1 - \alpha_1)$ fraction of consumers can still accurately compare interest rates. In this duopoly example, for simplicity, we assume that confused consumers shop at random: half of them buy from bank 1 and the other half buy from bank 2.[11]

If both firms choose the same complex frame B, ie $Z = (B, B)$, then a larger fraction $\alpha(B, B) = \alpha_2 > \alpha_1 > \alpha_0 \geq 0$ of consumers get confused and shop randomly. In this setting frame complexity leads to a larger share of confused consumers than does frame differentiation.

Notice that the simple frame A can cause confusion only when it is combined with a different frame B, whereas frame B is confusing by itself and can obfuscate price comparisons even if both firms adopt it. Also, in this setting consumers have limited cognitive capabilities that prevent them to infer prices from the information frames.

Firm i's profit is

$$\pi_i(r_i, r_j, z_i, z_j) \;=\; r_i \times \left(\frac{1}{2} \times \underbrace{\alpha(Z)}_{\text{confused-share}} + q_i(r_i, r_j) \times \underbrace{(1 - \alpha(Z))}_{\text{non-confused-share}} \right)$$

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[11]Similar results can be obtained if consumers favor the bank with the simpler frame whenever facing two different frames. See Chioveanu and Zhou (2013).

Proposition 2 in Chioveanu and Zhou (2013) shows that there is a unique symmetric mixed-strategy equilibrium where each bank adopts frame A with probability $\lambda = \lambda(\alpha_0, \alpha_1, \alpha_2)$ and frame B with probability $(1 - \lambda)$. When a bank uses frame A, it chooses its price randomly according to the cdf F_A defined on the support given by prices in the $[\underline{p}, \hat{p}]$ interval and when a firm uses frame B, it chooses its price randomly according to the cdf F_B defined on support $[\hat{p}, \bar{p}]$, which contains more expensive prices.

The implications for the authorities are straightforward: 1) the market equilibrium involves mixing simple and complex frames that exploits the share of confused customers; 2) if the regulators establish the simple frame A as the mandatory frame in the credit market, the share of confused customers will fall.