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Opportunism in a Library[i]

Oportunismo em uma Biblioteca

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ABSTRACT

In this paper, I present novel evidence related to opportunism in a common-pool resource. I study the behavior of users in a university library (an information commons) during a three-year period, with an emphasis on their borrowing patterns. In doing so, I want to answer the following questions: (i) Does opportunism rise in specific times of the academic year? (ii) How do different types of punishment affect opportunism? Based on panel data count models, I uncover two main results. First, the frequency of opportunistic behaviors increases during recover exams' weeks, which suggests that users take advantage of the library's rivalry property. Second, the instauration of a monetary fee at a specific moment of time – an "institutional change", in this context – exerts a negative effect on opportunistic behavior, a result consistent with theories based on monetary incentives. The results reported in this paper are important not only for providing a better understanding of the determinants of opportunism and the impacts of institutional change over common-pool resources' management, but also for shedding light on issues such as economic incentives, social norms, and corruption in real-world settings.

KEYWORDS: Common-pool resources; Corruption; Information commons; Libraries; Opportunism.

RESUMO

Neste artigo, são apresentadas novas evidências relacionadas ao oportunismo em um recurso comum. Especificamente, estuda-se o comportamento dos usuários de uma biblioteca universitária (um *information commons*) durante um período de três anos, com ênfase sobre atrasos de usuários. No caso, busca-se responder às seguintes questões: (i) comportamentos oportunistas aumentam durante períodos específicos do ano letivo? (ii) como diferentes tipos de sanções afetam comportamentos oportunistas? Baseando-se em modelos de contagem para dados em painel, são reportados dois resultados principais. Primeiro, a frequência de comportamentos oportunistas aumenta durante semanas de provas de reavaliação, o que sugere que os usuários tendem a tirar vantagem da propriedade de rivalidade da biblioteca. Segundo, a instauração de uma multa monetária em um dado momento - uma "mudança institucional", neste contexto – exerce um efeito negativo sobre comportamentos oportunistas, um resultado consistente com teorias baseadas em incentivos monetários. Os resultados reportados neste artigo são importantes não apenas no sentido de proporcionar uma melhor compreensão dos determinantes de comportamentos oportunistas e impactos da mudança institucional em ambientes envolvendo recursos comuns, mas também para esclarecer questões relacionadas a incentivos econômicos, normas sociais e corrupção em ambientes reais.

PALAVRAS-CHAVE: Recursos comuns; Corrupção; *Information commons*; Bibliotecas; Oportunismo.

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1 INTRODUCTION

Which factors drive opportunistic behavior in real-world settings? Does opportunism vary through time? In this paper, I present novel evidence related to opportunism in a common-pool resource. Specifically, I study the behavior of users in a university library during a three-year period, with an emphasis on borrowing patterns. In doing so, I want to answer the following questions: (i) Does opportunism rise in specific times of the academic year? (ii) How do different types of punishment affect opportunism?

I exploit the fact that libraries are an example of a common-pool resource (non-exclusive, but rival). The non-exclusive property means that libraries cannot easily exclude specific users from the benefits generated by its services. On the other hand, the rivalry property means that different users cannot simultaneously borrow the same library item. In this case, users who do not return items on predicted dates might generate a negative externality for the population of library users. In fact, the latter property (rivalry) might induce competition among distinct users for library resources, especially during specific times of the academic year, such as final exams' week, for instance (when congestion rises). Given this possibility, I conjecture that opportunistic behavior may emerge in such situations.

If confirmed, this hypothesis has important implications for the areas of organizational economics and public policy analysis. For instance, several theories in management, accounting and economics rely on opportunistic behavior, such as principal-agent theory and team theory, just to cite a few examples. By providing additional empirical evidence related to these theories, this paper contributes to different literatures on the subject of social dilemmas inside and outside organizations.

This paper dialogues with several literatures. Originally, opportunism came as an important behavioral assumption in previous research, over the last decades. When associated to other hypotheses – such as bounded rationality (Simon, 1955) and asset specificity (Williamson, 1985) – opportunism had important implications for areas such as transaction cost economics (Williamson, 1985, 1996, 2010). On the other hand, the literature on common-pool resources, although extremely rich and insightful, has not relied on opportunism as one of its main ingredients (Cárdenas, 2003; Fehr & Leibbrandt, 2011; Ostrom, 1990, 1999). The present paper attempts to bridge the gap between these two areas, while providing related empirical evidence[1].

The results described in this paper also add to the growing evidence related to behaviors observed in a field setting (Cárdenas & Ostrom, 2004; Fehr & Leibbrandt, 2011). Specifically, this paper contributes to a growing body of research related to observed behavior in field settings involving common-pool resources (Cárdenas & Ostrom, 2004; Cárdenas, 2003). Although I do not perform a field experiment *per se*, I present results related to behavior in the field, along the lines suggested by other authors (Apesteguia, Funk, & Iriberri, 2013; Haselhuhn, Pope, Schweitzer, & Fishman, 2012; Levitt & List, 2009; Levitt, 2006; List, 2011). Additionally, these results emphasize the importance of culture for economic outcomes (Alesina & Giuliano, 2015), as well as social norms (Coleman, 1990; Gneezy, Leibbrandt, & List, 2013; Ostrom, 2000), and corruption (Fisman & Miguel, 2007; Glaeser & Goldin, 2006; Mauro, 1995; Svensson, 2005).

Finally, while most of the previous contributions in the literature related to common-pool resources emphasized examples related to themes such as forests, fisheries, and wildlife in general (Cárdenas, 2003; Dietz, Ostrom, & Stern, 2003; Ostrom, 2007; Zylbersztajn, 2010), I present an example of application related to an information commons (libraries). The simplicity of this unique setting constitutes a major strength of the present paper. I study an everyday situation where I can observe the way the library creates its rules and enforcements, which allows me to focus my analysis on specific aspects of users' behaviors. In fact, similar to a few recent studies, the main advantage of this

[1] For examples of studies aimed at testing different aspects of transaction-cost theory, see Joskow (1987), Poppo and Zenger (1998), and Zylbersztajn and Lazzarini (2005). Macher and Richman (2008), Masten (1996), and Ruester (2010) correspond to surveys related to empirical studies in transaction-cost economics.

dataset is the possibility, for the researcher, to perfectly observe rule compliance in a real world setting (Apesteguia et al., 2013; Haselhuhn et al., 2012)[2].

This paper has four additional sections. In the next section, I present definitions related to public goods, club goods and common-pool resources, as well as the main testable hypotheses used in the empirical analysis below. The third section describes details related to data construction and the econometric models employed in the analysis. The fourth section presents the main results of the empirical analysis, as well as robustness' tests. Finally, the fifth section concludes and discusses future directions of research.

2 BACKGROUND AND HYPOTHESES

Public goods have two distinct characteristics: they are non-rival (one individual's consumption of the good does not reduce other individuals' consumption) and non-exclusive (no individual can be excluded from consuming it). Examples of such goods are national defense, public education and organizational knowledge, just to cite a few (Samuelson, 1954; Stiglitz, 2000). On the other hand, common-pool resources are defined as non-exclusive, but rival (one individual's consumption of the good may reduce other individuals' consumption). Examples of this kind of good are fisheries, forests and irrigation systems (Dietz et al., 2003; Murphy & Cárdenas, 2004; Vollan & Ostrom, 2010).

Both public goods and common-pool resources are important mainly for the social benefits they generate. For instance, although it may be expensive for a private firm to supply transportation services for a city's population (by building a subway; for instance), its aggregate (societal) benefits might be quite large (thousands of people use the subway on a daily basis). However, since benefits diffuse across society, private firms may not have sufficient incentives to supply such services. In these situations, one may observe an undersupply of public goods (Olson, 1965).

There are two important questions related to public goods and common-pool resources. The first is the following: will people take part in collective actions involving public goods if they notice that government provision may happen regardless of individual contributions? According to some authors, rational individuals who seek to maximize their private gains would probably not contribute to public goods provision, since they expect that the government perform such a task. This situation is also known as the "zero contribution thesis" (Olson, 1965; Ostrom, 2000).

The second question asks if the nature of common-pool resources may lead to its overexploitation. In this case, Hardin (1968) predicted that such a situation would almost inevitably happen, given that individualistic attitudes might prevail both in the short and in long run. For instance, forest degradation would be a natural result in a setting where individuals and firms try to maximize their own private gains, the so-called "Tragedy of the Commons" (Hardin, 1968)[3]. In both cases, there is a situation named "social dilemma": society may gain by having public goods and common-pool resources, but individuals do not have incentives to provide the former nor to preserve the latter. In this context, some individuals might even try to obtain benefits from public actions, even when not contributing for them. This type of behavior is known as "free-riding" (Olson, 1965)[4]. Given the

[2] Haselhuhn, Pope, Schweitzer, and Fishman (2012) follow a similar approach when analyzing the impacts of personal experience with fees faced by video-rental users. The authors employ a dataset on video store transactions from 10,000 customers during a two-year period (2003/2004). On the other hand, Apesteguia, Funk, and Iriberri ((2013) report the results of a randomized field experiment in public libraries located in Barcelona during the 2009 year. Although there are similarities between these contributions and the present paper, their focus is not on opportunistic behavior.

[3] Coase (1960) represents a seminal contribution to social dilemmas, with an emphasis on situations involving what the author calls "social cost problems". See Libecap (2016) for a recent discussion on related themes. When analyzing the emergence of property rights, Demsetz (1967) also provides a discussion related to common property situations.

[4] Critical appraisals on traditional results related to public goods' provision and common-pool resources' management are contained in Dietz, Ostrom, and Stern (2003), Ostrom (1990, 1999, 2000, 2005), Vollan and Ostrom (2010), Wilson, Ostrom, and Cox (2013), and Zylbersztajn (2010). Coleman (1990) provides an extensive discussion of several related themes, with an emphasis on collective action and interpersonal comparisons of well-being among individuals.

rivalry property of a common-pool resource and/or information commons, I conjecture the following hypothesis:

H_1: devolution delays (lateness) will be higher during exam weeks.

Specifically, since the rivalry property means that different users cannot simultaneously borrow the same library item, I propose that it might induce competition among distinct users for library resources, especially during final exams' week, for instance. Additionally, because the library implemented a monetary fee for delayed items in 2006, I consider it a proxy for "institutional change" in this context (institutions as "rules of the game")[5]. Prior to that year, users with overdue loans received a non-monetary penalty (three-day suspension). Based on this information, I propose two additional hypotheses:

H_2: types of punishment based on non-monetary factors (such as suspension days) will decrease devolution delays (lateness).

H_3: the instauration of a monetary fee for library items will also decrease devolution delays (lateness), but by a larger volume.

3 STUDY: METHODS

3.1 Sample

I have access to confidential daily data related to library users of a private university in São Paulo, Brazil, during the 2004-2006 period. The dataset corresponds to an unbalanced panel of 3,303 individual users, covering 12,918 observations (this is an unbalanced panel because each user may borrow different quantities of specific library items). It contains information on users' socioeconomic characteristics – such as gender and date of birth – as well as library's confidential information, such as each user's identification number and his or her university category (undergraduate student, master's student, professor, employee, etc.). The data covers distinct undergraduate and graduate courses (Master's Programs), as well as MBA courses. This dataset also contains the dates when each user borrowed specific items from the library, as well each item's code (books, theses, CDs, DVDs, etc.). In this case, when a user borrows an item, the library's electronic system automatically generates a devolution date based on the user's university category and the item he or she borrows.

Besides these dates, I also have access to the dates when each user actually returned each item, which allows me to build a measure of delayed returns, named "lateness" (more details below). I complement this data with information related to exams' weeks occurred in the university in the sample period. In the latter case, official exams occurr during a two-week period every six months (named "exames", in Portuguese). If a student does not pass these exams, he or she has the chance to take a "recover exam" ("reaval"), which takes place one week after official exams.

Additionally, based on internal reports from the library, I build an indicator variable, named "D2006"; in order to capture the change occurred in the type of penalty for late delays, when users started paying a monetary fee of R$ 1.00 for each delayed item. This penalty started in 1/1/2006 (in previous years, users with late items faced a non-monetary fee: the library would suspend them for a specific number of days). As described above, I consider the instauration of this monetary fee as a proxy for "institutional change" in the inner workings of the library (where institutions are seen as "rules of the game"). Table 1 contains a description of the dataset's main variables.

[5] Although I adopt North's (1990, 1991) definition, I am aware that this is a very specific definition of institutions. See Eggertsson (1990) and Hodgson (2006) for alternative definitions and related discussions on this theme. Commons (1931) correspond to a seminal contribution related to Institutional Economics, while Williamson (2000) describes some of the main concepts related to the New Institutional Economics.

Table 1 - Main variables used in econometric analysis

Variable	Description
Academic number	Users' library identification number (three to nine digits).
Gender	Users' gender (male or female).
Birth date	Users' birth date (available in the format MM/DD/YYYY).
User Category	Users' university category (undergraduate, graduate, Master's student, university employee, professor, outside user).
Item Code	Library items' identification code (three to five digits).
Item Title	Library items' titles and subtitles.
Borrow Date	Date and time when each user borrowed a specific item from the library (MM/DD/YYYY, HH:MM:SS).
Devolution Date (Predicted)	Estimated date of devolution (electronically generated by the library system) (MM/DD/YYYY).
Devolution Date (Effective)	Actual date and time of devolution of each library's item (MM/DD/YYYY, HH:MM:SS).
Penalty	Penalty imposed by the library for individual items' delays (suspension days between 11/10/2004 and 12/31/2005; monetary fee between 1/1/2006 and 9/21/2006).
Exam Week	University's official exam week (two-week period).
Recover Exam Week	University's official recover exam week (one-week period).
D2006	Indicator variable that assumes value 1 for the period between 1/1/2006 and 9/21/2006 (when the monetary fee was instituted), and 0, otherwise.

Source: Author's own calculations. Data collected from the library's electronic system and covers the period between 11/10/2004 and 9/21/2006.

3.2 Variables

3.2.1 Dependent variable

Since I am interested in obtaining correlations among delayed items in the library and specific regressors, I build a measure related to the time patterns of devolutions of specific library items (books, CDs, DVDs, etc.) for all users in the sample. Specifically, I build the following index:

Lateness = item loans' effective duration (days) – item loans' predicted duration (days) (1)

Basically, "lateness" corresponds to the number of days that a user takes to return specific items to the library. This is a discrete, non-negative variable, which makes it suitable for the use of count-based models (more details below) (Blevins, Tsang, & Spain, 2015; Cameron & Trivedi, 2009)[6].

3.2.2 Independent variables

Here I describe the main specification employed in the econometric estimations below (this specification might be subject to minor modifications, according to the econometric method considered). I do this in order to describe each regressor, as well as its expected sign on the dependent variable (lateness). My main specification is the following:

$$Lateness_{it} = \alpha_i + \beta_1*(\text{'Punishment Days}_{it}\text{'}) + \beta_2*(\text{'Exam Week}_t\text{'}) + \beta_3*(\text{'Recover Exam Week}_t\text{'}) + \beta_4*(\text{'D2006'}) + \beta_5*Controls_{it} + \varepsilon_{it} \quad (2)$$

In the above specification, the dependent variable is "lateness", while the term "Punishment Days" describes the number of days that each user was forbidden to use the library's services for previous items' delays. On the other hand, the terms "Exam Week" and "Recover Exam Week" denote the

[6] When analyzing corruption practices among United Nations' diplomats, Fisman and Miguel (2007) also employ models of this kind. See Blevins, Tsang, and Spain (2015) for an extended treatment on the estimation of count models.

university's official dates for exams. In the case of the first variable, it corresponds to an indicator variable that assumes a unit value for days corresponding to official exams. In the case of the second variable, it corresponds to an indicator variable that assumes a unit value for days corresponding to official recover exams.

In the latter case, the university policy allows students to retake exams if they do not meet the minimum standards for approval in their first attempt. The term "D2006" corresponds to an indicator variable that assumes the unit value for the period between January 1st, 2006 and September 21st, 2006, when a monetary fee was implemented in the library for delayed items[7]. I control for users' characteristics in the regressions described above by including some of their personal information, such as age, age squared and gender. In doing so, I want to verify if there are significant differences among users based on gender and life-cycle characteristics[8].

The above specification relates each user's lateness measures – which may vary in time and according to each item considered – to specific points in time, such as exams' and recover exams' weeks, as well as a "post enforcement" period, when monetary payments were implemented.

4 STUDY: RESULTS

In this section, I describe the main results of the empirical analysis conducted. The section contains two subsections: one related to descriptive statistics, and another related to the estimation of econometric models.

4.1 Descriptive statistics

Table 2 contains descriptive statistics related to the main variables of interest.

Table 2 - Main variables' descriptive statistics

Variables	Observations	Mean	Std. Deviation	Minimum	Maximum
Lateness	12,918	9.486	19.77	0	386
Age	12,918	26.46	7.984	14	67
Gender	12,618	0.4452	--	0	1
Exam Week	12,918	0.0725	--	0	1
Recover Exam Week	12,918	0.0284	--	0	1
Predicted Duration	12,918	8.337	4.792	-1	122
Effective Duration	12,918	17.77	20.39	1	393
Penalty Days	12,918	19.36	52.59	0	762
D2006	12,918	0.355	--	0	1

Source: Author's calculations, based on library data. Notes: (a) "Gender" and "Age" corresponds to each user's gender and age, while "$(Age)^2$" is the squared value of users' ages. "Exam Week" corresponds to an indicator variable that assumes value 1 for exams' weeks ("exame") and 0, otherwise, and "Recover Exam Week" corresponds to an indicator variable that assumes value 1 for recover exams' weeks ("reaval") and 0, otherwise. "D2006" is an indicator variable that assumes value 1 for the period between 1/1/2006 and 9/21/2006, when the library instituted a monetary fee.

A few interesting patterns emerge from a first look at the data. First, these descriptive statistics reveal that exams' weeks cover 7.25% of the total sample period, while recover exams' cover 2.84%, only. This result makes sense given the time allocated for the former type of exam by the university, when compared to the latter.

[7] When surveying part of the literature related to the economics of libraries in the 1980s, Van House (1984) cites that the evidence related to the introduction of user fees in libraries was still inconclusive at the time. See Haselhuhn et al. (2012) for an analysis of the impact of fines on the behavior of users of a video rental store.

[8] The main motivation for including these users' characteristics is to analyze behavioral differences in terms of gender and age, as suggested by previous experimental and field research (Antonovics, Arcidiacono, & Walsh, 2005; Apesteguia et al., 2013; Levitt, 2004; Niederle & Vesterlund, 2007).

Second, when comparing the predicted and effective duration of the library's items that users borrow, the statistics show a clear pattern of delays over time: while the predicted duration is, on average, around 8.34 days, the effective duration is more than two times larger (17.77 days). Additionally, one notes the disparity between maximum durations in this case, since the maximum predicted duration is 122 days (around four months), while the maximum effective duration is longer than a year (393 days). At first, these results suggest the occurrence of delay patterns over time. In fact, the main variable of interest ("lateness") presents a mean value of 9.49 days, as well as a maximum value of 386 days, which is also longer than a calendar year.

Third, when the type of penalty imposed by the library to delayed items by specific users is measured in days (for the 2004/2005 years), the average penalty is around a month (30.01 days), although there is a lot of dispersion in this kind of punishment (standard deviation of 63 days). During the total sample period, it ranged from two days to more than two years (762 days).

4.2 Econometric results

In this subsection, I report the results of econometric models' estimations, namely the results of panel count models. As cited above, the main advantage of these models is that they consider the dependent variable ("lateness") as a discrete and non-negative variable. Additionally, it is important to emphasize that estimations which do not consider the count-based nature of the dependent variable (such as ordinary least squares, for instance) may generate biased estimates. Table 3 contains the results of estimations based on Poisson models.

Table 3 - Count Models' Estimates, Poisson distribution (Dependent Variable: Lateness)

Variables	Poisson	Panel Poisson	Fixed-Effects Poisson	Random-Effects Poisson
Gender	-0.18***	-0.17***		-0.10***
	(0.052)	(0.059)		(0.026)
Age	-0.05**	-0.06***	0.16***	-0.02**
	(0.019)	(0.020)	(0.029)	(0.009)
$(Age)^2$	0.00**	0.00***	-0.00**	0.00*
	(0.000)	(0.000)	(0.000)	(0.000)
Penalty Days	0.01***	0.01***	0.01***	0.01***
	(0.000)	(0.000)	(0.000)	(0.000)
Exam Week	-0.19***	-0.16***	-0.17***	-0.16***
	(0.063)	(0.053)	(0.019)	(0.018)
Recover Exam Week	0.39***	0.40***	0.47***	0.45***
	(0.129)	(0.121)	(0.024)	(0.023)
D2006	-0.32***	-0.29***	-0.19***	-0.09***
	(0.046)	(0.045)	(0.018)	(0.012)
Observations	12,618	12,618	11,669	12,618
Log likelihood	-67324.62	--	-26646.55	-39761.28
Number of Users' ID		3,303	2,355	3,303

Source: Author's calculations based on library data. Notes: (a) "Gender" and "Age" corresponds to each user's gender and age, while "$(Age)^2$" is the squared value of users' ages. "Exam Week" corresponds to an indicator variable that assumes value 1 for exams' weeks ("exame") and 0, otherwise, and "Recover Exam Week" corresponds to an indicator variable that assumes value 1 for recover exams' weeks ("reaval") and 0, otherwise. "D2006" is an indicator variable that assumes value 1 for the period between 1/1/2006 and 9/21/2006, when the library instituted a monetary fee. (b) Estimates' standard errors reported in parentheses. (c) The terms (*), (**) and (***) denote statistical significance at the 10%, 5%, and 1% levels, respectively.

A few interesting results emerge from the results displayed in the table. First, users' gender is statistically significant and presents a negative sign, suggesting that, in the case of this dataset, male users have lower expected counts of delayed items when compared to female users. Similarly, both age and age squared are statistically significant, although the estimates are not robust in terms of sign. While most specifications suggest a negative impact of age on counts of delayed items (coefficients

in the -.06/-.02 range), the estimated coefficients for age squared suggest the inexistence of non-linear effects of life-cycle characteristics over behavior in the current setting.

The Table 3 also displays two interesting results regarding exams' and recover exams' weeks. In the case of the first variable, it reduces the expected number of delay counts (estimates in the -.19/-.16 range), while it raises the expected number of delay counts (.39/.47 range), with all estimates being significant at the 1% significance level. Taken together, these results suggest the existence of significant differences among users in terms of observed behavior in the library during specific periods. Specifically, while there is no evidence of opportunistic behavior during exams' weeks, the same does not happen during recover exams' weeks.

In terms of distinct punishment forms, two results emerge. First, the variable "penalty days" presents a robust and statistically significant positive coefficient over the expected count of library delays; second, the indicator variable "d2006" exerts a negative (and statistically significant) effect over such delays (in the -.32/-.09 range). These results suggest that different forms of punishment might have different impacts over users' lateness.

While these results are certainly informative, they can present biases if the dependent variable displays overdispersion patterns. Because of this possibility, I present below overdispersion tests. In doing so, I want to verify if alternative estimation methods – such as negative binomial count models – can be more appropriate for the problem studied in this paper. Table 4 reports the results of several tests aimed at testing for overdispersion.

Table 4 - Overdispersion Tests (Dependent Variable: Lateness)

Variable	Mean	Variance
Lateness	9.49	390.84
Deviance goodness-of-fit	.000***	
Pearson goodness-of-fit	.000***	
Cameron and Trivedi's (1990) test (p-value)	.000***	

Source: Authors' calculations. Notes: (a) "Lateness" corresponds to the number of days of delayed items in the library. (b) The terms (*), (**) and (***) denote rejection of each test's null hypothesis at the 10%, 5%, and 1% significance levels, respectively.

A first inspection of the statistics in the Table 4 suggest the occurrence of overdispersion in the variable, since its variance is more than forty times higher than its mean (values of 390.84 and 9.49, respectively). Additionally, table 4 contains the result of goodness-of-fit, as well as Cameron and Trivedi's (1990) overdispersion tests.

As the table suggests, the reported results concerning overdispersion favor the use of negative binomial count models over Poisson models. Table 5 contains estimates obtained from negative binomial models.

Table 5 - Count Models' Estimates, Negative Binomial distribution (Dependent Variable: Lateness)

Variables	Negative Binomial	Panel Negative Binomial	Fixed-Effects Negative Binomial	Random-Effects Negative Binomial
Gender	-0.09**	-0.09*	0.13***	-0.02
	(0.042)	(0.047)	(0.049)	(0.021)
Age	-0.02	-0.03	0.05***	0.01*
	(0.016)	(0.021)	(0.016)	(0.008)
$(Age)^2$	0.00	0.00	-0.00**	-0.00*
	(0.000)	(0.000)	(0.000)	(0.000)
Penalty Days	0.01***	0.01***	0.01***	0.01***
	(0.001)	(0.000)	(0.000)	(0.000)
Exam Week	-0.12**	-0.11**	-0.07**	-0.08***
	(0.048)	(0.049)	(0.027)	(0.024)
Recover Exam Week	0.31	0.34	0.23***	0.24***
	(0.217)	(0.209)	(0.038)	(0.034)

D2006	0.09	0.07	-0.08***	-0.10***
	(0.055)	(0.054)	(0.018)	(0.015)
Observations	12,618	12,618	11,669	12,618
Log likelihood	-36341.43	--	-21939.63	-34526.28
Number of Users' ID		3,303	2,355	3,303

Source: Author's calculations based on library data. Notes: (a) "Gender" and "Age" corresponds to each user's gender and age, while "$(Age)^2$" is the squared value of users' ages. "Exam Week" corresponds to an indicator variable that assumes value 1 for exams' weeks ("exame") and 0, otherwise, and "Recover Exam Week" corresponds to an indicator variable that assumes value 1 for recover exams' weeks ("reaval") and 0, otherwise. "D2006" is an indicator variable that assumes value 1 for the period between 1/1/2006 and 9/21/2006, when the library instituted a monetary fee. (b) Estimates' standard errors reported in parentheses. (c) The terms (*), (**) and (***) denote statistical significance at the 10%, 5%, and 1% levels, respectively.

In general, the results obtained from negative binomial models confirm the magnitudes and signs previously reported for Poisson models. That is, these results suggest that male users have fewer delayed items, when compared to female users. Additionally, age and age squared are not statistically significant predictors of lateness.

Again, the expected number of delayed items reduces during exams' week, but it raises during recover exams', although the latter variable is not always statistically significant in all specifications. At first, the latter result is consistent with a game theory argument: in a repeated game with finite duration, players would have an incentive to defect in the game's last stage (Gibbons, 1992). Although this is an exploratory theoretical argument, it is certainly consonant with the evidence presented.

In terms of penalties, the variable "penalty days" displays a robust (and statistically significant) positive impact over lateness (estimated coefficients around .01). On the other hand, in the case of the instauration of a monetary fee, one notices that this variable is not statistically significant in the case of the first two specifications (a simple negative binomial model and its panel-data version). However, once fixed and random effects are included in estimations, this variable has the predicted sign (negative), with magnitudes in the -.1/-.08 range. Although fixed-effects models have the disadvantage of eliminating part of the sample during estimation, they have the advantage of considering individual heterogeneity, which may be a major driver of my results. Overall, I see the results from fixed-effects' models as the most suggestive, given the importance of individual effects, as well as the non-random nature of the data.

5 GENERAL DISCUSSION

Below, I discuss the main implications of these results in terms of research and practice in organizations.

5.1 Implications for research

One important consequence of the results presented in this paper relates to the process of institutional change. While most contributions to the literature focused on aggregate effects of institutional change (Aoki, 2007; Greif & Laitin, 2004; North, 1990), this paper's results relate directly to research efforts focused on applied examples of institutional change taking place at the micro level (Ostrom, 2007). Although I do not discuss the detailed implications of institutional change in an information commons' setting, the main results described in this paper add to the growing evidence related to the theme.

Additionally, this paper is probably one of the first attempts to analyze individual behavior in an information commons. While most of the literature on the theme concentrated on determining precise definitions of related terms, and tried to analyze some of its main implications for relevant situations – such as the diffusion of the internet and the new role of libraries in the digital age – there were few efforts aimed at empirically testing its main insights (Hess & Ostrom, 2007). By providing results

related to the hypotheses tested above, I hope to stimulate more research on empirical topics related to information commons.

The results related to the instauration of a monetary fee at a specific point in time (2006) also dialogue with previous studies related to the importance of economic incentives (Becker, 1968). For instance, when analyzing the behavior of customers of a video-rental store, Haselhuhn et al. (2012) conclude that a personal experience with monetary fees significantly boosts users' future compliance. Additionally, according to these authors, larger fines have a stronger effect over compliance than smaller fines. In this sense, the results presented in this paper confirm the authors' previous results, since the instauration of a monetary fee in the library studied generated, on average, a decrease in the expected count of delayed items[9].

5.2 Implications for practice

The results reported in this paper have direct implications for organizational behavior such as team management, hold up issues, and incentive schemes. In terms of team management, an old question related to the impossibility of measuring distinct members' contributions in teamwork, some authors argue that it could lead to free-riding behavior (Alchian & Demsetz, 1972; Croson, 2008). While this paper is focused on a very specific setting (a university library), it does shed light on differences in opportunistic behavior over time. In this regard, managers and decision makers could benefit from understanding the main determinants of such behaviors in their own organizational settings. For instance, a manager inspecting the performance of employees located at different plants could try to elicit differences in behavior during specific times of the day as a means to understand the determinants of cooperation in team arrangements.

On the other hand, given the importance of holdup issues for contract design and vertical integration (Klein, Crawford, & Alchian, 1978; Klein, 1990; Mesquita, Saes, & Lazzarini, 2011), one current challenge in organizations would be to understand which factors undermine such behavior. In this regard, the results reported in this paper could extend to other real-world settings involving the possibility of holdup behavior. A particularly promising direction would be to run field experiments inside organizations, as originally proposed by Bandiera, Barankay, and Rasul (2011). In this case, managers could gather valuable insights from observing situations involving social dilemmas in a real-world setting[10].

Finally, the result where an instauration of a monetary fee induced a reduction in opportunistic behavior calls attention to the importance of this kind of incentive in social dilemma situations in organizations. While I recognize the importance of non-monetary factors for observed behavior in organizations (Ellingsen & Johannesson, 2007), the reported results suggest that monetary incentives may still bring desired outcomes in certain occasions, as suggested by the literature on economic incentives (Becker, 1968; Haselhuhn et al., 2012). Other than that, the application of some of the principles related to successful reports of common-pool resources' management throughout time and space might provide an innovative approach in these cases (Ostrom, 1990, 2010; Wilson, Ostrom, & Cox, 2013). For instance, when dealing with situations similar to common-pool resources' management, decision makers could think about using gradual monetary sanctions as a means to induce behaviors that could benefit the organization as a whole[11].

[9] For a counter-example related to monetary incentives, see Gneezy and Rustichini (2000), who study the effects of instituting a fee in daycare centers in Israel. In this specific case, the introduction of monetary fees actually increased the number of late-incoming parents in the daycare centers (instead of decreasing it). According to the authors, such results might be a consequence of contracts' incompleteness.

[10] For examples of experimental studies related to holdup issues, see Antiqueira, Lazzarini, and Saes (2007), Mesquita et al. (2011) and Morita and Servátka (2013).

[11] Masten (2000) discusses alternative theories of contract choice and design, with a special emphasis on the interaction between contract design and contract enforcement, as well as the explanatory power of alternative theories.

6 CONCLUSION

Opportunism is an important theoretical hypothesis employed in several areas (Williamson, 1985, 1996), with growing empirical validation over the last years (Fisman & Miguel, 2006; Levitt, 2006). Using a unique field setting and a longitudinal dataset covering more than 12,000 item transactions by library users during a three-year period, I test the emergence of opportunistic behavior in a very specific setting: an information commons (Hess & Ostrom, 2007).

After conducting an econometric analysis relating a library's delayed items as a measure of opportunistic behavior, I uncover two main results. First, the frequency of opportunistic behaviors increases during recover exams' weeks, which suggests that users take advantage of the library's rivalry property during specific moments of time. Second, the instauration of a monetary fee in the 2006-year – an "institutional change", in this context – exerts a negative effect on opportunistic behaviors, a result consistent with theories based on monetary incentives (Becker, 1968).

These results have important implications, both in theoretical and applied terms. Specifically, they not only provide a better understanding of the impacts of institutional change over common-pool resources' management, but also shed light on issues such as economic incentives, social norms, and corruption in real-world settings.

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