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ARTIGO

ASSOCIATIONS BETWEEN PRISON RECIDIVISM AND WORKING AND EDUCATIONAL EXPERIENCES DURING DEPRIVATION OF LIBERTY

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ABSTRACT

This essay investigates the impact of inmates' work and educational programs on recidivism rates over nearly five years for prisoners released from Santa Catarina prisons. Three methods were used to analyze recidivism and to control for self-selection bias and non-observable heterogeneity: propensity score matching, Cox, and frailty models. The frailty model showed that participation in work and educational programs reduced the odds of recidivism by 14% and 32%, respectively. This study suggests that programs are being carried out in Santa Catarina that may effectively impact prisoners' rehabilitation.
Keywords: Recidivism. Rehabilitation. Santa Catarina. Propensity Score Matching. Frailty Model.

RESUMO

ASSOCIAÇÕES ENTRE REINCIDÊNCIA PRISIONAL E EXPERIÊNCIAS LABORAIS E EDUCACIONAIS DURANTE A PRIVAÇÃO DE LIBERDADE

Este ensaio investiga o impacto de programas laborais e educativos nas taxas de reincidência de detentos ao longo de um período de quase cinco anos para os presos libertados de prisões de Santa Catarina. Três

métodos foram usados para analisar a reincidência e para controlar o viés de auto seleção e a heterogeneidade não observável: propensity score matching, modelos Cox e modelos de fragilidade. O modelo de fragilidade mostrou que a participação em programas de laborais e educacionais reduziu as chances de reincidência em 14% e 32%, respectivamente. Este estudo sugere que existem programas em andamento em Santa Catarina que podem impactar efetivamente na reabilitação de presos.
Palavras-chave: *Reincidência. Reabilitação. Santa Catarina. Propensity Score Matching. Modelos de Fragilidade.*

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1. INTRODUCTION

The population deprived of liberty in Brazil reached more than 750 thousand individuals in 2019, with an imprisonment rate of over 350 prisoners per 100,000 inhabitants, and these numbers have increased in recent decades[1]. On the one hand, the policy of mass incarceration reassures society that criminals are being incapacitated and/or crime is being deterred, though evidence suggests that the actual results do not meet this common-sense expectation (Chalfin; McCrary, 2017; Pratt, 2019). On the other hand, the social cost of this policy affects various spheres of society, with negative impacts on public health, the economy, and public safety (Massoglia; Pridemore, 2015; Schnittker; John, 2007; Wildeman; Wang, 2017).

The prisoner's rehabilitation or resocialization is believed to increase if he/she works and/or studies while in prison (Davis *et al.*, 2013; Hui Kim; Clark, 2013; Sedgley *et al.*, 2010). However, only a small minority of Brazilian prisoners work or study in prison (Brasil, 2018). Moreover, there are very few evaluations of the effectiveness of these programs.

This paper addresses this topic by evaluating the effectiveness of programs promoting the participation of prisoners in work and study activities. Following Cullen (2013), there are gaps in the literature that evaluate the effects of public policies in the process of prisoners´ resocialization, especially as a contraposition of the Nothing Works doctrine. This is particularly true in developing-country settings, and we hope to contribute to understanding how criminal recidivism is impacted by prison work and study activities. We used an extremely rich database from Santa Catarina (SC), a Brazilian state, and robust statistical analysis based on propensity score matching (PSM) and a frailty model. The results and inferences of this paper may contribute to more effective planning in the public sphere about how to promote enhanced rehabilitation and resocialization through these types of activities.

In addition to this introduction, the paper is divided into four sections. The next section discusses the theoretical background of the paper. Section 3 describes the methodology. Section 4 presents the empirical results. The last section concludes the paper.

1 *https://www.gov.br/depen/pt-br/sisdepen.*

2. ASSOCIATIONS BETWEEN WORK AND EDUCATIONAL ACTIVITIES IN PRISONS AND RECIDIVISM

This paper evaluates the effectiveness of work and study activities in prisons in decreasing the probability of recidivism of former prisoners. The idea is founded on the belief that deprivation of liberty associated with specific programs can potentially promote the individual's resocialization. Thus, depriving individuals of liberty would have the potential to deter the individuals from becoming criminals from an *ex-ante* perspective, and there would also be a positive *a posteriori* effect due to the resocialization process (Liszt, 2006).

This theory posits that individuals who work and/or study while in prison may have an opportunity to qualify themselves and acquire abilities and competencies, increasing their human capital levels or slowing the process of human capital loss (Carvalho, 2002). Besides, there may be psychological and social effects of these types of activity, such as the increase of critical reasoning and a greater connection to life in society, that may also positively affect the reintegration of prisoners after their release (Julião, 2009; Cullen; Jonson, 2011).

However, this assertion that work and study activities by individuals deprived of liberty are effective in rehabilitation has been subjected to strong criticism and skepticism (Baqueiro, 2017; Bitencourt, 2017; Brant, 1994). These authors argue that prisons are not able to promote any form of resocialization; on the contrary, they assert that prisons are more likely to be schools of crime, places where careers in crime may be forged, increasing the prisoner's propensity to continue to act in the illicit labor market after being released. Besides, stigmatization may deter the prisoner's process of reintegration into society (Becker, 2008).

While we acknowledge that most prisons in Brazil have limited ability to implement resocialization policies, this paper's hypotheses are based on the idea that penitentiary policies may effectively reduce recidivism if well implemented. Moreover, although the paper focuses on work and study activities, a large set of policies is designed to promote the resocialization of the individual either in prison or after release (Aos *et al.*, 2009; Cullen, 2013).

Many authors empirically analyzed the association between the prisoner´s participation in work and educational activities while in prison and the prisoner's recidivism after release. Examining different studies, Wilson et al. (2000) concluded that prisoners who participated in work programs had a lower rate of recidivism. Nonetheless, the authors observed that self-selection bias was poorly controlled for in the studies and the results may have been overestimated. Similarly, Aos *et al.* (2009) found slight positive impacts from this program. Duwe and McNeeley (2017) concluded that prisoners who had worked while in prison were much more employable after their release and had a lower recidivism rate. In conclusion, most studies determined that prison work programs showed a positive, although sometimes small, impact on recidivism.

Concerning study programs, Wilson et al. (2000) concluded that participation in educational activities had a positive effect, reducing recidivism, and MacKenzie (2006) and Davis et al. (2013) observed similar results. More recently, Fogarty and Giles (2018) reanalyzed the Davis et al. (2013) study and verified that educational programs reduced recidivism rates by 30%. Similarly, Pompoco et al. (2017) and Ellison et al. (2017) observed positive impacts of educational activities. In general, educational programs had a positive

effect on reducing recidivism, especially in the U.S. However, there are different educational programs, and many showed little or no impact.

Two studies applied survival analysis to U.S. data and addressed self-selection bias while discussing the above associations. Hui Kim and Clark (2013) analyzed the effects on recidivism of tertiary education programs lasting at least one year. The authors observed that those who graduated from such programs had a 50% lower recidivism rate. Sedgley et al. (2010) investigated the effects of work and educational programs. 88.8% of the individuals in this study had jobs while in prison, and 45.2% participated in educational programs. Both programs had remarkable impacts, reducing recidivism. In the context of Latin America, Baeza and Grau (2017) studied whether work programs in Chilean prisons had any effect on recidivism. They observed that the programs had no significant effect after addressing bias due to self-selection.

Very few empirical quantitative studies analyzed the Brazilian reality and the association of work and/or educational programs with recidivism in Brazil. Among the first, Adorno and Bordini (1989, 1991) analyzed individuals released from the State Penitentiary of São Paulo in 1974, 1975, and 1976. They concluded that those who recidivated had a similar profile to those who did not recidivate. Brant (1994) examined prisoners in the Carandiru Complex in São Paulo. He verified that prisoners' main motivation for participating in any program while in prison was to avoid idleness and to receive a small stipend to help their families. The author emphasized that the programs might not positively affect recidivism. Similarly, Coelho (2005) and Salla (2006) showed that the conditions in prisons in Rio de Janeiro State were extremely harsh, and the availability of work or educational programs was highly limited. Shikida and Brogliatto (2008) studied prisoners from the State Penitentiary of Foz do Iguaçu. They observed that convicts' main motivation for participating in programs was to reduce their penalties, avoid idleness, and increase their qualifications in technical skills. On the other hand, convicts complained that the number of jobs and the learning possibilities were too limited. Ipea (2015) emphasized that policies associated with the resocialization of prisoners were poorly implemented in Brazilian establishments in part due to the prison's environment and the implicit culture, rules, and roles of daily penitentiary management. These cited studies concluded that the possibilities of rehabilitation through work and/or educational programs are small, partly due to the limited availability of such programs.

However, two of the few studies addressing realities in Brazil showed a greater resemblance to this study. Julião (2009) analyzed data from the state of Rio de Janeiro for the period between 1996 and 2006 and concluded that educational activities decreased the probability of recidivism by 39%, while work programs decreased the probability of recidivism by 48%. However, these studies did not quantitatively account for the self-selection bias and the non-observable heterogeneity that plague such analysis, although the author was aware of these problems and discussed them qualitatively. The author points out that the positive effects observed by his analysis were probably mostly caused by the greater propensity of particular prisoners to participate in educational or work programs.

This brief theoretical section has presented some studies that addressed questions similar to those considered in this paper. Most analyses investigated the reality in developed countries, rather different settings than the one examined here. Moreover, the only paper that addressed an analysis similar to the one described in this paper did not tackle the problems related to self-selection bias and non-observable heterogeneity. Thus, this study focuses on the possibility that work and/or educational activities while in prison may have positive influences promoting lower levels of recidivism in a developing country and taking into account that individuals show different propensities to engage in such activities. We used a

rich database from Santa Catarina state in Brazil. We based our methodology on the explicit treatment of non-observable heterogeneities described in Vaupel et al. (1979) and Sedgley et al. (2010) and the methodology of propensity score matching portrayed in Hui Kim and Clark (2013) while dealing with the Brazilian reality. By doing so, we believe we are filling a gap in the literature.

3. METHODOLOGICAL SECTION

3.1 DATABASE

All individuals who become prisoners have their information collected by the prison´s administration; a database for all jails in the state of SC has been built using this information. The State Secretary of Penitentiary and Socioeducative Administration of SC kindly provided part of this database for research purposes.

We used the data of individuals released from the prison system between January 1st, 2013, and December 31st, 2014. They were followed until November 11th, 2018. Many returned to the prison system during this period, while others continued at liberty. This paper analyzes the first such occurrence of individuals released and imprisoned more than once. Thus, the database shows the release date and the recidivism date, if any, for each individual released over two years.

Besides the dates of release and recidivism, the database contains the following information, among others: the establishment of the prison system in which the prisoner was incarcerated; skin color/race (self-declared); sex; civil status (self-declared); date of birth; level of formal education (self-declared); type of crime committed; and time spent working and/or studying while in prison. Table 3 details the variables used in the empirical analysis.

Two establishments with particular characteristics (Hospital de Custódia e Tratamento Psiquiátrico and Casas do Albergado) were dropped from the sample as they do not represent the prison system. Finally, those imprisoned for less than one complete day were also dropped from the sample. The final number of observations is 21,274.

3.2 VARIABLES OF INTEREST

Besides whether or not the individual returned to the prison system, the variables of main interest to the paper are the amount of time spent working or studying while in prison. The mean time spent on work activities was 12 days, with a standard deviation of 65. For educational activities, these numbers were 1.2 and 12 days, respectively. These numbers corroborate the findings of other authors concerning the limited opportunities for work or study in Brazilian prisons.

Given that few prisoners work and/or study, we created a dummy indicating who had done each activity, using the same procedure described in Julião (2009) and Baeza and Grau (2017). Table 1 presents some of the details for these dummy variables. Only 8% of those released had worked one day or more while in prison, and only 2% had studied one day or more, numbers much lower than those verified in most studies with U.S. or European data.

TABLE 1

Recidivism rates associated with participation in work and/or educational activities

	Number of individuals	Individuals who recidivated	Recidivism rate
Working activities			
Did not work	19,479 (92%)	6,034	31%
Worked	1,795 (8%)	830	46%
Educational activities			
Did not study	20,891 (98%)	6,690	32%
Studied	383 (2%)	174	45%

Source: *Own elaboration.*

Given that the effect of work and educational programs might depend on the time the prisoner spent in them (Duwe & Mcneeley, 2017; Steiner & Wooldredge, 2014), another analysis is performed for those who spent at least 90 days in the activity, as done by Sedgley *et al.* (2010). However, the number of released individuals who spent 90 days or more in work and/or educational activities is small. Only 4% worked for 90 days or more, and only 0.5% studied for 90 days or more, as shown in Table 2.

Tables 1 and 2 also show that the rates of recidivism are higher for prisoners who worked and/or studied, a result different from what was initially expected. Work and educational programs may have no effect, or they may have a negative effect, or problems related to self-selection bias and non-observable heterogeneity might be plaguing the analysis.

TABLE 2

Recidivism rates associated with participation in work and/or educational activities for 90 days or more

	Number of individuals	Individuals who recidivated	Recidivism rate
Working activities			
Did not work 90 days or more	20,401 (96%)	6,482	32%
Worked 90 days or more	873 (4%)	382	44%
Educational activities			
Did not study for 90 days or more	21,157 (99.5%)	6,817	32%
Studied 90 days or more	117 (0.5%)	47	40%

Source: *Own elaboration.*

3.3 OTHER EXPLANATORY VARIABLES USED AS CONTROLS

Table 3 details the explanatory variables used as controls, including how they were categorized and the recidivism rate for each category. Note at the bottom of the table that the global recidivism rate in the state of Santa Catarina was 32.3%, much smaller than the national figure, which was between 70 and 85% (DEPEN, 2001, 2009).

The recidivism rates for the different categories of the explanatory variables used as a control corroborate most known facts already described in the literature. Higher rates were observed for males (Stolzenberg;

D'Alessio, 2004; Zanon; Barros, 2018); Pardos and Blacks (Jung *et al.*, 2010; Souza *et al.*, 2016); bachelors (Andersen *et al.*, 2015); atheists (Deuchar *et al.*, 2016); younger individuals (Sapori *et al.*, 2017; Souza *et al.*, 2016; Zanon; Barros, 2018); individuals with lower levels of formal education (Hui Kim; Clark, 2013; Souza *et al.*, 2016); less visited individuals (Duwe; Clark, 2011); for those who had a conviction compared to those who were awaiting trial or who tried to escape, successfully or not (Sullivan; Piquero, 2016); and for those who had committed property crimes instead of against individuals (Sapori *et al.*, 2017; Shikida *et al.*, 2014). Finally, those who stayed in prison longer had higher rates of recidivism. On the one hand, this may indicate a longer career in crime and a more serious criminal charge. On the other hand, this might suggest that most prisons function as schools of crime (Bitencourt, 2017) instead of places of resocialization.

TABLE 3

Explanatory variables used as controls

Covariate	Total of released individuals	Total who recidivated	Recidivism rate
1 – Sex			
0 – Female	1,677	305	18.2%
1 - Male	19,597	1,940	33.5%
2 – Skin color/race			
1 – Black	1,537	584	38.0%
2 – Pardo	5,834	6,167	33.3%
3 – White	13,418	4,227	31.5%
4 – Asian	485	113	23.3%
3 – Civil status			
1 – Bachelor	8,491	3,134	36.9%
2 – Married	2,417	600	24.8%
3 – Others	7,877	2,817	35.8%
4 – Did not inform	2,489	313	12.6%
4 – Religion			
1 – Atheist	234	101	43.2%
2 – Other	15,533	5,397	34.7%
3 - Did not inform	5,507	1,366	24.8%
5 – Age at incarceration			
1 – 18 to 29	10,435	3,985	38.2%
2 - 30 to 40	6,503	1,996	30.7%
3 - 41 or more	4,336	883	20.4%
6 – Age when released			
1 - 18 to 29	9,625	3,611	37.5%
2 - 30 to 40	7,007	2,258	32.2%
3 - 41 or more	4,642	995	21.4%
7 – Level of formal education			
1 – Less than High School	14,608	4,995	34.2%
2 – High School	5,767	1,696	29.4%
3 – Tertiary Education	899	173	19.2%
8 – Time in prison			
1 - 10 days or less	7,207	1,135	15.7%
2 - 11 to 100 days	5,048	1,613	32.0%
3 - 101 days or more	9,019	4,116	45.6%

Continua

9 – Number of visits per day in prison			
1 – Zero visits and time in prison of less than 10 days	6,509	1,029	15.8%
2 - Zero visits and time in prison of 10 days or more	9,407	3,970	42.0%
3 – Zero to 0.04 visits per day	2,321	1,000	43.1%
4 – 0.04 to 0.37 visits per day	2,617	781	29.8%
5 – More than 0.37 visits per day	420	84	20.0%
10 – Tried to escape or escaped			
0 – No	20,247	6,224	30.7%
1 - Yes	1,027	640	62.3%
11 – With conviction			
0 - No	14,968	4,044	27.0%
1 - Yes	6,306	2,820	44.7%
12 – Type of crime			
1 – Against property	1,399	683	48.8%
2 – Others	2,698	863	32.0%
3 – Did not inform	17,177	5,318	31.0%
Total	21,274	6,864	32.3%

Source: *Own elaboration.*

3.4 SELF-SELECTION BIAS AND NON-OBSERVABLE HETEROGENEITY

Self-selection bias while analyzing treatments occurs when the treated and non-treated samples are not similar. In particular, for this study, individuals who work or study while in prison may not be a random sample of all prisoners. They might tend to be different in many aspects, which may be correlated with treatment outcomes (Colosimo; Giolo, 2006).

Another problem plaguing this paper's data type is the presence of non-observable heterogeneities. In particular, for this study, individuals with the same set of observable variables might show a very different profile regarding recidivism. Moreover, important factors associated with recidivism may not be present in the database, potentially causing estimation biases (Sharmin; Khan, 2017).

We used two methodologies in order to overcome these estimation difficulties. Initially, Propensity Score Matching (PSM) was used, as in Hui Kim and Clark (2013) and Sedgley et al. (2010). After this, a frailty model was used, adapted by Sedgley *et al.* (2010) for a similar empirical study.

3.5 PROPENSITY SCORE MATCHING

PSM was used to decrease the potential bias caused by self-selection (Guo; Fraser, 2014). In this paper, the propensity scores were estimated using individuals' attributes prior to becoming a prisoner. Thus, the variables "age when released," "time in prison," and "number of visits," all described in Table 3, were not used in the matching process. Similarly to Hui Kim and Clark (2013) and Sedgley et al. (2010), in order to build the counterfactual group, we matched the treated individuals with their nearest individual among the non-treated (Olmos; Govindasamy, 2015). By doing so, we obtained counterfactual groups with the same number of observations as the treated groups: individuals who had worked in prison and individuals

who had studied in prison. After the matching, the treatment groups and the counterfactual groups were analyzed, and they were similar in the explanatory variables, indicating that the matching was successful.

3.6 THE KAPLAN-MEIER ESTIMATOR AND THE COX SEMIPARAMETRIC MODEL

The dependent variable in this paper is the recidivism time. However, released individuals might not recidivate either because they may not commit another crime or because the analysis period was too short for them to become prisoners again. Thus, the data is censored, and survival analyses are recommended (Colosimo; Giolo, 2006).

Among the non-parametric techniques related to survival functions, the Kaplan-Meier estimator (KM) is extremely popular and can be used to compare different categories of explanatory variables while verifying whether the differences are statistically significant (Kaplan; Meier, 1958). Thus, the KM estimator can be used as a first step to analyze differences in the survival rates of different population groups, and we used this technique as a first step of the analysis.

Another widely used technique in survival analysis is the semiparametric model of Cox. In this model, it is analyzed the associations of a set of covariates with survival time (Cox, 1972). Initially, we verified whether the hypotheses of proportional failures of the model were satisfied using the residuals test of Schoenfeld (Schoenfeld, 1982). If the hypothesis is rejected, an alternative analysis technique is to employ a stratified Cox model (Colosimo; Giolo, 2006). Another possibility, as in Hui Kim and Clark (2013), is to use a reduced sample using the PSM to estimate the Cox model with a dummy variable indicating whether the individual belonged to the control or treatment groups for the non-stratified or stratified model. This was the procedure employed here.

3.7 THE FRAILTY MODEL

Given the small set of explanatory variables, there is a large probability that relevant variables may be omitted in studies similar to the one presented in this paper. Moreover, these variables might be related to self-selection bias, and the assumption of independence of survival times may not be valid. In order to overcome these limitations, the frailty model with non-observable heterogeneity between observations can be employed (Colosimo; Giolo, 2006; Wienke, 2011). This technique can also be used to minimize the effect of self-selection bias, as described in Sedgley et al. (2010). This model has been applied at least since Vaupel et al. (1979), and different authors have demonstrated that it is effective in dealing with estimation bias (Wienke, 2011).

Sedgley et al. (2008) analyzed the impact of work and educational programs on recidivism using the frailty model. Here, we used this model, having as its initial specification a Cox model (Colosimo; Giolo, 2006; Munda *et al.*, 2017). Like the Cox model, the frailty model can be stratified, and we used this last model, as Bowles and Florackis (2007) did. These authors studied the determinants of recidivism in Great Britain and grouped the individuals according to the types of crimes they committed. Here, we grouped the individuals who had been incarcerated in particular prisons, as there are remarkable differences between establishments.

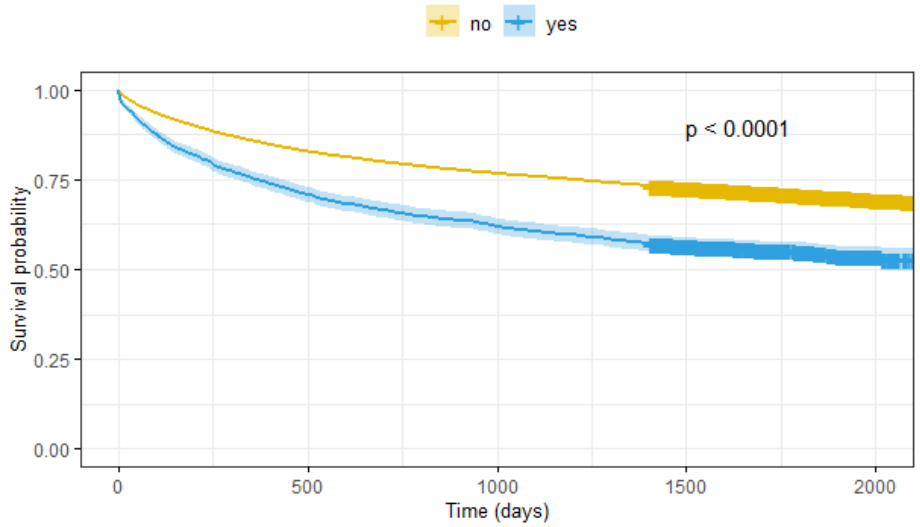
4. RESULTS

4.1 DESCRIPTIVE ANALYSIS WITH THE KAPLAN-MEIER ESTIMATOR

We used the KM estimator to compare the categories of our variables of interest: whether or not the prisoner had worked while in prison and whether or not he/she had studied. Graph 1 shows the results for the survival curves comparing those who had participated in work activities with those who had not. The survival curve of those who had worked before release is below that of those who did not. That is, the survival times of the first were smaller than those of the latter, indicating a higher recidivism rate for those who had worked. Differences are statistically significant, and the results corroborate the findings of Tables 1 and 2 and go against the initial expectations proposed in the hypothesis of this paper.

GRAPH 1

Kaplan-Meier estimator for the dummy variable whether the prisoner had worked or not before his/her release

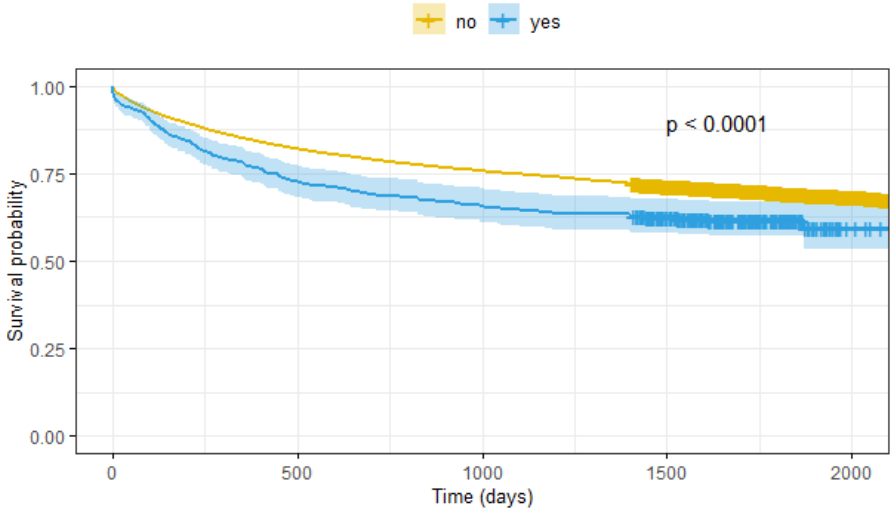


Source: *Own elaboration.*

A similar analysis was done with the dummy whether the prisoner had studied before his/her release, and the results are shown in Graph 2. Again, contrary to the initial expectations but in line with the findings of Tables 1 and 2, those who had studied showed higher recidivism rates. The differences between groups were also statistically significant.

GRAPH 2

Kaplan-Meier estimator for the dummy variable whether the prisoner had studied or not before his/her release



Source: *Own elaboration.*

Thus, the KM estimator did not corroborate our working hypothesis but contradicted it. However, this analysis did not control for covariates, self-selection bias, or non-observable heterogeneity problems.

4.2 COX MODELS WITH REDUCED SAMPLES OBTAINED BY PROPENSITY SCORE MATCHING

This section presents the results of the Cox models that used the reduced sample after matching. The models for work and educational activities were estimated separately. In each model, a dummy indicated whether the prisoner had participated in the specific activity. The Shoenfeld test for residuals showed a significant result for the work program model but did not for the educational activity model, indicating that the stratified model by the establishments of the prison system should be used only for the first type of program. However, the results did not differ from those produced by the non-stratified model, and therefore, table 4 shows the results for the non-stratified models for both types of activities.

As defined in Table 1, both variables of interest showed non-significant results. Hence, work and educational activities did not seem effective in reducing recidivism.

Concerning the other variables, we noticed that some factors were associated with an increase in the recidivism rates, such as: being male, being Black, being atheist, being younger, having spent a longer time in prison, having attempted successfully or unsuccessfully to escape from prison, and having committed crimes against property. Most of these results corroborate the stigmatized profile previously described. Other factors were associated with lower recidivism rates, such as not providing information about marital status and being convicted. This last result was contrary to what was observed in Table 3. Other variables showed non-significant results, such as the variables for marital status, educational level, and number of visits. In a more controlled analysis, these variables were not significantly associated with recidivism rates.

TABLE 4

Results for the Cox model applied to a reduced sample obtained with PSM

Type of activity	Work				Study			
Covariate	**Coef.**	**OD**	**SD**	**Sign.**	**Coef.**	**OR**	**SD**	**Sign.**
Work (Reference: No)	0.01	1.01	0.06		-	-	-	-
Study (Reference: No)	-	-	-	-	-0.14	0.87	0.14	
Male (Reference: Female)	0.62	1.87	0.10	***	0.51	1.67	0.20	**
White	-0.29	0.75	0.10	***	-0.17	0.84	0.27	
Pardo	-0.21	0.81	0.09	**	0.02	1.02	0.25	
Asian	-0.96	0.38	0.39	**	-0.33	0.72	0.48	
Reference: Black								
Married	-0.11	0.90	0.11		0.31	1.36	0,.5	
Other	0.01	1.01	0.06		0.11	1.12	0.14	
Did not inform	-0.51	0.60	0.14	***	-0.10	0.90	0.29	
Reference: Bachelor								
Had a religion	-0.34	0.71	0.23		-1.25	0.29	0.60	**
Did not inform	-0.59	0.56	0.24	**	-1.52	0.22	0.62	**
Reference: Atheist								
Age between 30 and 40	-0.22	0.80	0.06	***	-0.24	0.79	0.14	*
Age above 40	-0.48	0.62	0.09	***	-0.46	0.63	0.24	**
Reference: 18 to 29								
Secondary level of education	0.02	1.02	0.06		-0.09	0.91	0.15	
Tertiary level of education	-0.33	0.72	0.21		-0.70	0.50	0.51	
Reference: Elementary level								
Time in prison: 11 to 100 days	0.82	2.26	0.39	**	1.39	4.00	1.09	
Time in prison: more than 100 days	0.86	2.36	0.39	**	1.83	6.26	1.10	*
Reference: 0 to 10								
0 visits and time in prison more than 10 days	0.06	1.06	0.41		-0.50	0.60	1.12	
More than 0 to 0.04 visits per day	0.03	1.03	0.41		-0.57	0.57	1.13	
More than 0.04 to 0.37	-0.10	0.90	0.40		-0.55	0.58	1.12	
More than 0.37 visits per day	0.10	1.10	0.37		-0.70	0.49	1.10	
Ref.: 0 visits/time in prison less than 10 days								
Prison escape (Reference: No)	0.47	1.59	0,.7	***	0.38	1.47	0.18	**
Conviction (Reference: No)	-0.14	0.87	0.06	**	-0.16	0.85	0.14	
Other types of crime	-0.39	0.68	0.11	***	-0.71	0,49	0.30	**
No information about the type of crime given	-0.62	0.54	0.09	***	-0.82	0.44	0.23	***
Reference: Crimes against property								

Source: *Own elaboration.*

**** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10*

OD: Odds ratio. Sd: Standard deviation. Sign: significance

Coefficient of determination (Working activity): 0.641

Coefficient of determination (Educational activity): 0.657

Similar analyses were done with the variables of interest defined in Table 2 to verify the robustness of the results. The results obtained were very similar to the ones presented in Table 4 and are not shown, including the non-significance of the variables of interest.

4.3 SURVIVAL ANALYSIS WITH FRAILTY MODELS

Table 5 shows the results for the Cox models with frailty. The results for the controls were very similar to those presented in Table 4 and are not shown. Six models show the results for each variable of interest. The models were estimated for non-stratified data and stratified data. For both these models, three models with different data and variables were estimated: with all observations and reduced samples obtained with PSM and the dummies of interest defined as in Table 1 or Table 2.

The preliminary results indicated that frailty models should be used instead of previous ones. Moreover, the variance was decreased in the stratified models, indicating that the heterogeneity of the prison system's establishments should be included in the model.

The results for the work activity dummy for the non-stratified model with all variables were positive and significant, contrary to the initial expectations, but corroborating the descriptive findings. The results differed for the stratified model with all observations and the non-stratified and stratified models with the reduced sample with a dummy for work defined as those who had worked at least one day. That is, partial correction for self-selection changed the results, indicating the importance of a more careful estimation of the effects of work programs on recidivism. Besides, as prisons differ in their capacity to promote meaningful working experiences for the prisoner, controlling the natural idiosyncrasies of the establishments in the prison system also appeared relevant in determining the results.

However, to define those who worked as those who engaged at least one day in the activity might undermine one's capacity to observe any influence of the activity on recidivism. Thus, the last models incorporate the more restricted definition of working for at least 90 days. Using this definition, the non-stratified models showed a non-significant result and the stratified one showed a negative and significant coefficient. This last result corroborates our hypothesis that those who worked were 14% less likely to recidivate, indicating the possibility of positive impacts of this type of program on the propensity to return to prison.

A similar analysis was done for those who studied while in prison. Most coefficients were non-significant. The only exception was the non-stratified frailty model with the reduced sample with a more restricted definition for those who had studied. The coefficient was negative and significant at 10%. These results corroborate our hypothesis; however, notice that the results depended on the applied model, and careful estimations should be employed.

TABLE 5

Cox models with frailty

	Individual				Stratified			
Covariate	**Coef.**	**OR**	**Sd**	**Sign.**	**Coef.**	**OR**	**Sd**	**Sign.**
All observations								
Work (Reference: No)	0.12	1.12	0.05	**	0.01	1.01	0.04	
Study (Reference: No)	-0.07	0.93	0.11		-0.04	0.96	0.09	
Reduced sample using PSM with dummies defined as in Table 1								
Work (Reference: No)	0.01	1.01	0.06		0.02	1.02	0.07	
Study (Reference: No)	-0.14	0.87	0.14		-0.00	0.99	0.16	
Reduced sample using PSM with dummies defined as in Table 2								
Work (Reference: No)	-0.02	0.98	0.07		-0.15	0.86	0.06	**
Study (Reference: No)	-0.39	0.68	0.21	*	-0.26	0.77	0.17	

Source: *Own elaboration.*

**** p-value < 0.01, ** p-value < 0.05, * p-value < 0.10*

OD: Odds ratio. Sd: Standard deviation. Sign: significance

5. FINAL DISCUSSION AND CONCLUSION

This paper evaluated the effectiveness of work or study activities on the resocialization of jail/prison inmates. The initial hypothesis of this study was that while engaging in these types of activities, the prisoner could gain knowledge, competencies, and experiences that might contribute to his/her reintegration into society, increasing the chance that the individual might take part in licit pursuits after being released.

We employed two sets of observations, two estimation techniques, and two criteria to define who had participated in an activity, as suggested by the literature, to overcome the limitations imposed by our data. Concerning the different sets of observations, initially, we used propensity score matching to overcome some of the limitations of self-selection bias while applying a Cox model. After this, a Cox model with frailty was employed, as it showed greater flexibility to address the limitations imposed by the data. Regarding the criteria for participating in an activity, first, we used a less restricted definition: whether or not the prisoner had participated. However, some individuals had participated in work or educational activities briefly. Thus, we also used other criteria and established that individuals had to participate in an activity for at least 90 days to be considered as having participated.

The results of the estimations showed non-significant results for the first criterion. However, as emphasized by Duwe and Mcneeley (2017) and by Steiner and Wooldredge (2014), the effectiveness of resocialization programs in prison may be linked to the amount of time prisoners spend in them. We observed significant associations with recidivism when we estimated the effects of work and educational programs using the more restricted definition of who had engaged in the activity. Those who had studied or worked for at least 90 days while in prison had lower recidivism rates. These results suggest that longer-term activities might effectively decrease the ex-prisoners propensity to engage again in illicit activities.

Given this perspective, it is fundamental to evaluate public policies *ex-ante*, *ex-dure,* and *ex-post*, even though the results might not be what was initially expected, to design cost-effective procedures rationally (IPEA, 2018). Tilley (2000) emphasized the necessity not only of verifying the effectiveness of a program, but also of apprehending the actual context and mechanisms of the program. Similarly to other analyses cited here, this study indicates that work and educational programs may be effective if well-designed and implemented. Moreover, rehabilitation programs based on work and study have been shown to have good cost-benefit relations, as observed by Aos *et al.* (2009), Sedgley et al. (2010), and Davis et al. (2013). These studies verified that well-implemented programs generate intertemporal surpluses, as costs are lower than benefits in the long run.

Brazil's number of individuals deprived of liberty is already extremely large and increasing; it may reach 1.5 million in 2025 (Brasil, 2018). In this scenario, policies that will reduce recidivism and help convicts break free of the habit of criminal activities are needed, and the findings of this paper may provide information on which to base specific policies with this purpose.

Besides, other programs that could also be implemented in prisons may effectively reduce recidivism, as discussed by Aos et al. (2009) and Duwe and Clark (2017). For instance, policies that support and assist the ex-prisoner might complement the positive effects of work and educational activities in prison (Aos *et al.*, 2009; Skardhamar; Telle, 2012; Travis; Petersil, 2001). In addition to their statistical effectiveness, the programs in this paper have another fundamental value: the respect for prisoners' rights and the warranty of support and assistance for ex-prisoners envisaged in the Criminal Enforcement Law (LEP) (Brasil, 1984).

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