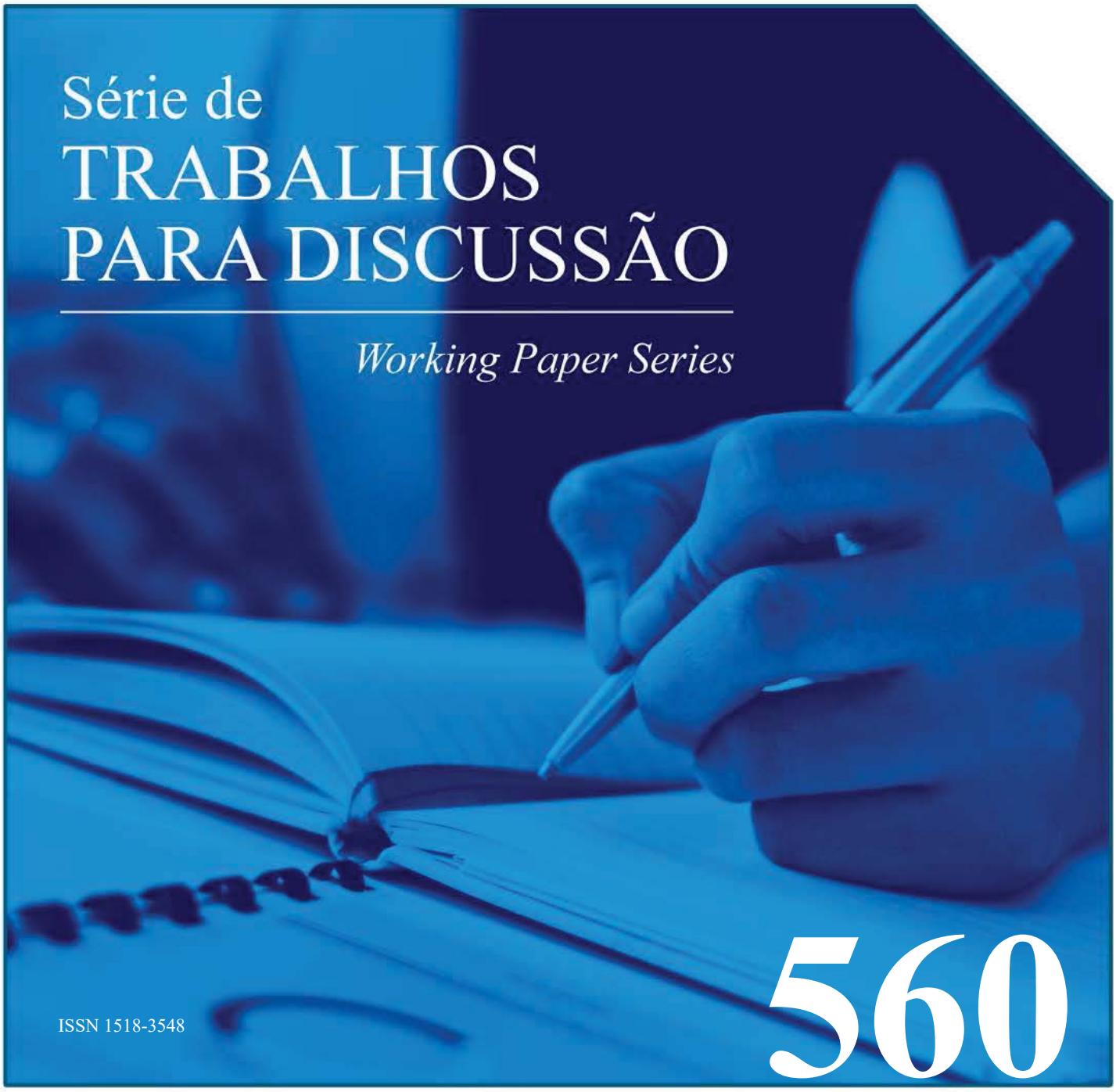

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Evaluation of the Protective Varnish on Brazilian Real Banknotes

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Non-technical Summary

Climatic conditions and handling habits cause the impregnation of dirt in the banknotes, increasing their wear speed, and, therefore, leading to the need for replacement in a short period of time.

In order to protect the banknotes from dirt and prolong their useful life, several issuers have applied a protective varnish. In Brazil, this protective varnish coats the R$2.00 and R$5.00 bills of the second series of the real.

The use of protective varnish is currently common practice in banknote production. According to studies carried out by other issuers, the increase of the banknotes lifespan provided by this protective varnish is highly variable, reflecting each country's climatic conditions and handling habits, as well as characteristics of the varnish. In general, these studies indicate increases of around 20% to 70% in the banknotes lifespan.

The objective of this work was to evaluate the effectiveness of the protective varnish cover on the R$2.00 and R$5.00 banknotes of the second series of the Brazilian real in terms of protection against dirt and life extension.

Unlike previous studies carried out by other issuers, this work evaluated a representative sample of the banknotes in circulation throughout the country and not in a controlled experiment with limited samples and regions.

The varnish proved to be a protective factor, reducing by 38% the risk of wear when the banknotes begin to circulate. However, it was found that the effectiveness of the varnish is limited: the protection reduces over time, and in about two years there is no longer any difference between banknotes with and without varnish.

Sumário Não Técnico

As condições climáticas e os hábitos de manuseio provocam a impregnação de sujeira nas cédulas de dinheiro, aumentando a sua velocidade de desgaste e, por conseguinte, levando à necessidade de substituição em curto espaço de tempo.

Com o objetivo de proteger as notas de dinheiro contra sujeira e prolongar sua vida útil, vários emissores têm aplicado um verniz protetor. No Brasil, esse verniz protetor reveste as notas de R$2,00 e R$5,00 da segunda série do real.

O uso de verniz protetor é atualmente uma prática comum na produção de notas. De acordo com estudos realizados por outros emissores, o aumento da vida útil das notas proporcionado por esse verniz protetor é muito variável, refletindo as condições climáticas e hábitos de manuseio de cada país, bem como as características do verniz. Em geral, esses estudos indicam aumentos de cerca de 20% a 70% na vida útil das notas.

Este trabalho teve como objetivo avaliar a eficácia da capa protetora de verniz nas notas de R$2,00 e R$5,00 da segunda série do real quanto à proteção contra sujeira e extensão de vida.

Ao contrário de estudos anteriores realizados por outros emissores, este trabalho avaliou uma amostra representativa das notas em circulação em todo o país e não em um experimento controlado com amostras e regiões limitadas.

O verniz se mostrou como um fator de proteção, reduzindo em 38% o risco de desgaste quando as notas começam a circular. Entretanto, verificou-se que a eficácia do verniz é limitada: a proteção diminui com o tempo, e em cerca de dois anos não há mais diferença entre as notas com e sem verniz.

Evaluation of the Protective Varnish on Brazilian Real Banknotes[1]

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Abstract

The present article assesses the effectiveness of the protective varnish that coats the R$2 and R$5 bills of the second Brazilian real series based on representative sample of banknotes in circulation throughout the country. Two comparative evaluations were carried out involving: (i) banknotes with and without varnish (R$5 x R$10); and (ii) banknotes with two different types of varnish (used in different productions of the R$2 banknote). Unlike previous studies carried out by other issuers, this work evaluated a representative sample of the banknotes in circulation throughout the country and not in a controlled experiment with limited samples and regions. For the calculation of the useful life, the sample banknotes were classified according to wear levels and those classified as level 4 to 6 should be withdrawn from circulation. The time in circulation was calculated based on the dates of issue and withdrawal from circulation. Survival analysis allowed the comparison between banknotes with and without application of varnish, considering both banknotes that had already reached this level of wear, as well as those that were in better situations. The study showed the adoption of varnish increased protection against dirt and wear. However, it was found the effectiveness of the varnish is limited: the protection reduces over time, and in about two years there is no longer any difference between banknotes with and without varnish.

Keywords: protective varnish, banknotes useful life, currency management, Brazil

JEL Code: C93, E42, E51.

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1. INTRODUCTION

Climatic conditions and handling habits entail to the Brazilian low-denomination banknotes a high dirt level and a fast pace of wear and tear, leading to the need for replacement in a short period.

Since July 2013, the Banco Central do Brasil (BCB) has been issuing low-denomination banknotes coated with a protective varnish aimed at protecting them against dirt and extending their lifespan. This protective varnish coats the R$2 and R$5 bills of the second Brazilian *real* series.

The usage of protective varnish is currently a widespread practice in the production of banknotes. According to studies carried out by other issuers, the increase of the banknotes lifespan provided by this protective varnish is highly variable, reflecting each country's climatic conditions and handling habits, as well as characteristics of the varnish. In general, these studies indicate increases of around 20% to 70% in the banknotes lifespan.

This paper aims to evaluate the efficacy of the protective varnish coat in the R$2 and R$5 bills of the second series of the Brazilian *real* concerning dirt protection and lifespan extension.

However, since all the notes are uniformly available, it is not possible to compare R$5 notes with and without the application of varnish. Thus, due to the similarity of lifespan and usage, it was decided to evaluate whether the lifespan and protection against dirt increase in varnished banknotes (R$5) when compared with unvarnished banknotes (R$10).

Additionally, in order to assess the quality of the varnish applied to the R$ 2 banknote, in view of the existence of a period of simultaneous circulation of these two types of banknotes, an assessment was carried out of the differences concerning dirt protection and lifespan extension between two types of protective varnishes used in R$2 bills of the second series: varnish 'type 1', for banknotes produced by the national supplier (banknotes with serial numbers not initiated by the DZ letters), and varnish 'type 2', for banknotes produced in 2016 by a foreign supplier (banknotes with serial numbers initiated with DZ letters).

2. SAMPLING PLAN

In Brazil, banknote sorting is currently made by the custodian institution Banco do Brasil (BB) in a decentralized manner in more than 140 processing centers. Equipment of different sizes and generations are used for this purpose. With point exceptions, the BCB processes in its premises only banknotes already classified by the custodian as unfit and destined to destruction. Besides, both the BCB and the BB outsource the currency processing operation. Thus, carrying out a study which includes the adoption of specific procedures for banknotes processing and storage and the remittance of data of

processed samples would be unfeasible, since it implies services not foreseen in contracts of custody and processing.

Thus, the option for this study was to measure and compare the banknotes lifespan by sampling. A sampling plan was outlined to guarantee a representative fragment of the currency circulating in the country. Sample banknotes were visually classified according to their wear level, following a 6-level rank being level 4 the cut-off level, i.e., when the banknote should ideally be withdrawn from circulation.

The statistical analysis of the sample data allowed to estimate an average time for a banknote to reach wear level 4, thus permitting to build a lifespan curve for each group studied, in order to guide future decision making in the framework of banknote design project.

2.1. Calculating the sample size

For calculating the sample size, the variable of interest considered was the lifespan[8] of the R$2 type 1, R$2 type 2, R$5, and R$10 bills (groups of interest).

The sample size is a function of the *expected* difference between the lifespan of groups of varnished and unvarnished banknotes.

To build this estimate we used the results of the lifespan survey conducted in 2012[9] with banknotes from the first series. For each denomination, the estimates are presented in Table 1.

Table 1 – Banknotes lifespan according to the wear level - First Brazilian *real* series

Lifespan (months)

First Brazilian *real* series						
Denomination	Wear level					
	Fit			Unfit		
	1	2	3	4	5	6
R$2	4.6	8.0	11.1	14.8	19.2	25.3
R$5	5.0	7.8	10.5	12.4	14.6	20.9
R$10	3.9	7.6	11.3	13.9	19.1	22.9

As the banknotes of the first series were unvarnished, the estimation of the lifespan of the second series' R$2 and R$5 bills needed to incorporate a factor of improved durability, depending on the type of varnish they were coated with. The BCB verified in the experience of different countries that, by the time these bills were issued, the estimates of extra lifespan due to the varnish application varied between 20% and 74%. Thus, on the conservative side, the lifespan of the R$2 and R$5 bills revealed in the

[8] Time until the banknote reaches a wear level equal or superior to 4.

[9] Research conducted by CP2 Pesquisas (2012) for the BCB, from December 5, 2011 to January 12, 2012. The study was conducted for the banknotes of the first series but offers a basis for the lifespan expectancy for the same denomination banknotes of the second series.

research of 2012 was increased by 20% to obtain a closer estimate of the durability of the varnished banknotes. The estimated lifespan is presented in Table 2.

Table 2 – Estimated banknotes lifespan according to wear level - Second Brazilian *real* series

Lifespan (months)

Second Brazilian *real* family (estimation)						
	Wear level					
	Fit			Unfit		
Denomination	1	2	3	4	5	6
R$2	5.5	9.6	13.3	17.7	23.0	30.3
R$5	6.0	9.4	12.6	14.9	17.5	25.1
R$10	3.9	7.6	11.3	13.9	19.1	22.9
difference t(R$5) - t(R$10)	2.0	1.8	1.3	1.0	-1.6	2.2

The row "difference t(R$5) - t(R$10)" compares the estimated lifespan between the R$5 and R$10 bills for different wear levels. Considering that the smallest difference between the expected lifespan of the R$5 and R$10 bills was 1 month in rating 4, and using a power[10] of 95%, the sample size necessary to detect a difference at the 5% significance level[11] was of 750 banknotes for each of the four groups of banknotes and each of the six levels of wear classification.[12]

Regarding possible observable and controllable variables that could influence the banknotes lifespan, geographic regions of Brazil and location types (capital or inland cities) were listed as control variables in the sampling.

The estimation domains allowed:

a) comparison among only 3 wear levels[13], grouped as follows:

[10] The power of a test is the probability of rejecting the test null hypothesis (in this case, that the average time until the varnished banknote reaches a wear level greater than or equal to 4 is different from the time of the unvarnished banknote) when this fact is true. Thus, the power is the probability of the test to identify differences between the varnished and unvarnished banknotes in the sample, when this difference actually exists in the population of banknotes.

[11] The level of significance is the probability of error characterized by the rejection of the null hypothesis (in this case, we conclude that there is a difference between the average time of the varnished and unvarnished banknotes), when it is true (in this case, that there is no such difference in the population). The level of significance, commonly referred to as alpha, corresponds to the probability of committing this error (called type I error), whose value is desirably kept under control.

[12] For further details, see Machin et all (1997) and Malden Zar and Jerrold (1984).
In sampling by conglomerate (branches) sample errors are expected to be greater than simple random samples. Thus, a Design Effect (DEFF) of 1.2 and a standard deviation of 4.5 months was applied. DEFF consists of the ratio between the inaccuracies (variances) associated with the estimation of a parameter under two sample designs. In this study, it would correspond to the variance ratio of the estimate obtained via simple random and by conglomerates sampling.

[13] The grouping of wear levels was made only to calculate the sample size, being maintained the original classification of the sampled banknotes in the 6-wear levels.

- levels 1 + 2 + 3 (fit banknotes);
- level 4 (banknotes at the cut-off level, i.e., that had just become unfit);
- levels 5 + 6 (banknotes that have passed the cut-off level, i.e., that should be withdrawn from circulation in ideal sorting conditions);

b) analysis only at the national level, not stratifying by regions or by location type (capital or inland cities).

Therefore, the sample size was calculated in 2,250 banknotes for each of the studied groups, totaling 9,000 banknotes.

2.2. Sample distribution

The custodian bank was requested to collect the samples at its branches, taking them from the cashiers' drawers, so that the samples contained banknotes of different wear levels. Therefore, the effective state of the banknotes in circulation was portrayed, besides remaining representative of the whole country. One sample per branch (considered as a conglomerate) was adopted. In order to choose which BB's branches would participate in the study, the 4,225 active branches in September 2018 were grouped according to size (quartiles related to average cash movement), geographic region, and location type to assure the representativeness of the sample in terms of distribution across the country[14].

The number of branches drawn from each group was proportional to the participation in the cash movement of each stratum. A total of 751 branches were drawn (Table 3) Each one collected one hundred of the R$5 and R$10 denominations, and three hundred of the R$2 denomination. This higher amount of the R$2 denomination is because the number of R$2 type 2 bills in circulation is small (100 million banknotes were put into circulation during 2017). Three bills were randomly drawn from each group of banknotes of interest (R$2 type 1, R$2 type 2, R$5, and R$10), totaling 12 bills from each branch. Thus, the final sample size reached 9,012 bills.

[14] Due to a logistic limitation, the study covered only BCB's regional offices in Belém, Brasília, Curitiba, Fortaleza, Recife, Rio de Janeiro, and São Paulo. Thus, only the BB branches in the respective jurisdictions were considered.

Table 3 – Distribution of branches and banknotes by region and size, according to location type

	Number of branches			Number of banknotes			
	Capital cities	Inland cities	Total	R$2	R$5	R$10	Total
North	**27**	**55**	**82**	**492**	**246**	**246**	**984**
1st Quartile	1	1	2	12	6	6	24
2nd Quartile	1	5	6	36	18	18	72
3rd Quartile	4	10	14	84	42	42	168
4th Quartile	21	39	60	360	180	180	720
Northeast	**50**	**136**	**186**	**1116**	**558**	**558**	**2232**
1st Quartile	1	2	3	18	9	9	36
2nd Quartile	2	9	11	66	33	33	132
3rd Quartile	7	24	31	186	93	93	372
4th Quartile	40	101	141	846	423	423	1692
Southeast	**71**	**170**	**241**	**1446**	**723**	**723**	**2892**
1st Quartile	5	8	13	78	39	39	156
2nd Quartile	14	27	41	246	123	123	492
3rd Quartile	20	54	74	444	222	222	888
4th Quartile	32	81	113	678	339	339	1356
South	**16**	**131**	**147**	**882**	**441**	**441**	**1764**
1st Quartile	1	8	9	54	27	27	108
2nd Quartile	4	25	29	174	87	87	348
3rd Quartile	5	39	44	264	132	132	528
4th Quartile	6	59	65	390	195	195	780
Central-West	**34**	**61**	**95**	**570**	**285**	**285**	**1140**
1st Quartile	2	1	3	18	9	9	36
2nd Quartile	2	8	10	60	30	30	120
3rd Quartile	7	16	23	138	69	69	276
4th Quartile	23	36	59	354	177	177	708
Brazil	**198**	**553**	**751**	**4506**	**2253**	**2253**	**9012**
1st Quartile	10	20	30	180	90	90	360
2nd Quartile	23	74	97	582	291	291	1164
3rd Quartile	43	143	186	1116	558	558	2232
4th Quartile	122	316	438	2628	1314	1314	5256

3. DATA COLLECTION AND DATA ANALYSIS

The BCB was responsible for selecting three banknotes of each group from the banknotes sent by the BB branches. To ensure random and unbiased samples (choice of banknotes with a certain wear level), the following procedure for separation was adopted:

- for the R$5 and R$10 bills, the 11th, 12th and 13th of every lot of hundred banknotes were withdrawn;
- for the R$2 type 1 bills, the same procedure was adopted. However, if a R$2 type 2 bill was among the three bills selected, the process would continue until obtaining three R$2 type 1 bills;
- for the R$2 type 2 bills, the first three found were withdrawn and, if necessary, the three hundred sent were verified.

The collection of the banknotes by the BB's participating branches took a longer time than initially estimated, and some operational problems were observed (for example, looted branches, branches that did not send any banknotes because they did not have a regular cash transportation flow, among others).

Ten branches (1.33% of the total number of selected branches) were replaced by the BB, maintaining the original grouping of region, size and location type, in addition to the municipality.

For 24 branches, the three R$2 type 2 banknotes could not be found in the hundreds of bills sent, resulting in an incomplete sample. Overall, 46 missing banknotes produced incomplete samples in 30 branches (including the 24 reported above).

The overall final sample of the study was then composed of:

- 2,235 R$10 bills;
- 2,232 R$5 bills;
- 2,233 R$2 type 1 bills;
- 2,182 R$2 type 2 bills;
- Total 8,882 bills (98.6% of the planned sample).

The comparative distribution according to the sample strata is presented in Table II.1 of Appendix II.

It is worth mentioning that the sample size and distribution allowed the analysis of each region and each wear level, although this was not provided in the initial planning.

3.1. Sample classification

After separation, the samples were visually classified into six wear levels, adopting the following pattern as standard:

Level 1: new banknotes;
Level 2: banknotes in excellent condition, without folds, stains, or tears, and with intact edges and legible characters and symbols;
Level 3: banknotes in good condition, with folds but paper still rigid;
Level 4: dirty banknotes, with well-marked folds and less rigid substrate. This would be the level where, ideally, the banknotes are withdrawn from circulation;
Level 5: very dirty and stained banknotes, with faded ink and weakened substrate. The latent image and the tactile mark are no longer perceived;
Level 6: an exacerbation of the previous level: very dirty and stained, with substrate very flaccid, worn-out ink, and tears.

3.2. Registration of samples and assessment of the issuance date

All sample banknotes data were registered in an Excel spreadsheet: branch of origin (including size, geographic region, and location), collection date, serial number, and wear level.

Based on the serial number, the Sismecir database was used to obtain the issuance date of each banknote.

The issuance date considered for this study was:

- for the R$5 and R$10 bills: the date when the custodian delivered the bill to a financial institution or to its branches;

- for the R$2 bills (types 1 and 2): the date when the BCB sent the bills to the BB. This procedure was necessary because when the R$2 bills produced by the foreign supplier were distributed, the system had to be adapted such that the delivery date of banknotes to the financial institutions is not available. It is noteworthy that with this definition the result obtained for the R$2 bills – regardless of the supplier – do not represent only the lifespan of the banknotes in circulation, but a longer time starting when they were distributed to the custodian. However, this solution allowed the comparison of the R$5 and R$10 bills, and of the two types of varnish of the R$2 bills, which is the aim of this study.

3.3. Statistical methodology

Initially, the sample profile (absolute and relative frequencies of each variable) and its associations with the wear levels assigned to the banknotes are presented. From the issuance and withdrawal dates, each banknote lifespan was calculated according to its wear level. Finally, a survival analysis was performed to study the time until the occurrence of an event, which in this case was the achievement of a wear level greater than or equal to 4.

For all statistical tests a significance level of 5% was used. The analyses were performed using the statistical programs SPSS 20.0 and STATA 12. Appendix I presents the details of the methodology used.

4. RESULTS

4.1. General descriptive analysis

Currently 55.9% of the R$2 bills in circulation are in stages 4, 5, and 6 (Table 4). This percentage is higher for the R$5 and R$10 bills, respectively, 62.2% and 66.1%.

Concerning the distribution of wear level by regions, the South region presents a better profile, with 46.6% of R$5 bills and 44.5% of R$10 bills on levels 4, 5, and 6. In other regions, the percentage of R$10 bills in this situation is 71.2%.

Comparing the percentage of unfit of R$5 and R$10 bills, this difference within regions ranged between -3.4 p.p. and 1.2 p.p., except for the Southeast region, where this difference was 15.4 p.p.

Among the R$2 denomination, despite the percentage of type 2 bills with a wear level greater or equal to 4 is similar to the type 1 bill in the national aggregate (Type 1 - 56.2% vs. Type 2 - 55.6%), the same does not occur when comparing different regions. While North and Northeast regions present 80.7% and 58.1% of unfit R$2 type 2 and R$2 type 1 bills, respectively, in the South and Central-West regions these percentages invert to 30.1% of type 2 and 46.8% of type 1.[15]

This heterogeneous behavior can also be verified among the different Federated Units (UF) in Table II.2 of Appendix II. It is noteworthy that São Paulo has the greatest wear level in banknotes of all denominations.

The analysis of the wear level between the capital and the inland cities did not show significant differences in the denominations of R$5, R$10, and R$2 type 2 (Tables II.4, II.5, and II.6 of Appendix II, respectively). As for the R$2 type 1 (Table II.7 of Appendix II), despite significant differences in the North, Southeast, and Central-West regions, these results are due to some sparse classifications. Regarding the percentage of classifications 4, 5, and 6, in all regions but the South, the percentage of worn R$2 type 1 bills is higher in the inland cities than in the capital cities.

Analyzing the lifespan according to the wear level (Figure 1 and Table II.8 of Appendix II), the average time interval for the R$5 bill to change levels (continuing) presents a linear relationship throughout the 6-level wear classification, while for the R$10 bills, from the level of wear 4 on, there is a discontinuity in the trend observed in previous levels. As for the varnished R$5 bills, the time variation between one level and the next is approximately 5 months, while the R$10 bills present a very heterogeneous variation, with time intervals of only 2.9 months between levels 1 and 2 and 10 months between levels 3 and 4. Contrastingly, the average time until wear level 4 was reached by the R$5 and R$10 bills was quite similar (22.2 and 22.9 months, respectively).

[15] This distinct behavior across different regions of the country possibly indicates a problem with the Cox's model assumption of proportional risks.

Table 4 – Distribution of denominations by wear level among regions

	Region										Total		p
	North		Northeast		Southeast		South		Central-West				
	N	%	N	%	N	%	N	%	N	%	N	%	
R$5	**246**	**100.0%**	**549**	**100.0%**	**723**	**100.0%**	**429**	**100.0%**	**285**	**100.0%**	**2232**	**100.0%**	<0.001
1	13	5.3%	55	10.0%	44	6.1%	63	14.7%	19	6.7%	194	8.7%	
2	19	7.7%	55	10.0%	74	10.2%	74	17.2%	45	15.8%	267	12.0%	
3	40	16.3%	84	15.3%	110	15.2%	92	21.4%	57	20.0%	383	17.2%	
4	55	22.4%	131	23.9%	183	25.3%	116	27.0%	58	20.4%	543	24.3%	
5	53	21.5%	118	21.5%	165	22.8%	63	14.7%	58	20.4%	457	20.5%	
6	66	26.8%	106	19.3%	147	20.3%	21	4.9%	48	16.8%	388	17.4%	
R$10	**246**	**100.0%**	**552**	**100.0%**	**723**	**100.0%**	**429**	**100.0%**	**285**	**100.0%**	**2235**	**100.0%**	<0.001
1	12	4.9%	29	5.3%	19	2.6%	76	17.7%	27	9.5%	163	7.3%	
2	22	8.9%	79	14.3%	30	4.1%	74	17.2%	43	15.1%	248	11.1%	
3	35	14.2%	106	19.2%	68	9.4%	88	20.5%	50	17.5%	347	15.5%	
4	61	24.8%	116	21.0%	131	18.1%	93	21.7%	74	26.0%	475	21.3%	
5	56	22.8%	107	19.4%	240	33.2%	64	14.9%	53	18.6%	520	23.3%	
6	60	24.4%	115	20.8%	235	32.5%	34	7.9%	38	13.3%	482	21.6%	
R$2 type 2	**242**	**100.0%**	**520**	**100.0%**	**708**	**100.0%**	**427**	**100.0%**	**285**	**100.0%**	**2182**	**100.0%**	<0.001
1	3	1.2%	12	2.3%	26	3.7%	33	7.7%	50	17.5%	124	5.7%	
2	9	3.7%	24	4.6%	104	14.7%	104	24.4%	71	24.9%	312	14.3%	
3	35	14.5%	64	12.3%	181	25.6%	167	39.1%	73	25.6%	520	23.8%	
4	61	25.2%	158	30.4%	226	31.9%	103	24.1%	67	23.5%	615	28.2%	
5	57	23.6%	140	26.9%	127	17.9%	16	3.7%	17	6.0%	357	16.4%	
6	77	31.8%	122	23.5%	44	6.2%	4	0.9%	7	2.5%	254	11.6%	
R$2 type 1	**245**	**100.0%**	**552**	**100.0%**	**723**	**100.0%**	**428**	**100.0%**	**285**	**100.0%**	**2233**	**100.0%**	<0.001
1	7	2.9%	62	11.2%	64	8.9%	42	9.8%	29	10.2%	204	9.1%	
2	26	10.6%	74	13.4%	80	11.1%	90	21.0%	62	21.8%	332	14.9%	
3	49	20.0%	116	21.0%	134	18.5%	107	25.0%	49	17.2%	455	20.4%	
4	63	25.7%	124	22.5%	140	19.4%	95	22.2%	54	18.9%	476	21.3%	
5	33	13.5%	81	14.7%	147	20.3%	61	14.3%	39	13.7%	361	16.2%	
6	67	27.3%	95	17.2%	158	21.9%	33	7.7%	52	18.2%	405	18.1%	

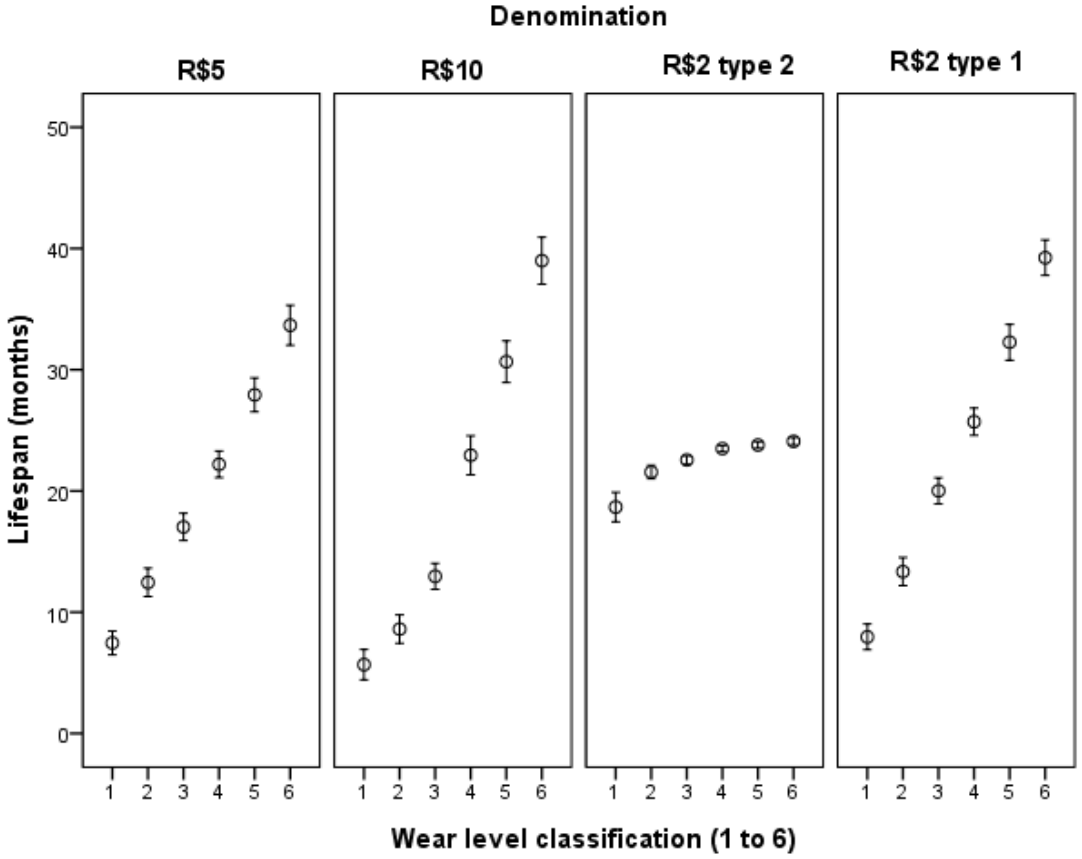
p - descriptive level of the Chi-square test.

Regarding the R$2 bills, the same linear trend can be observed for the R$2 type 1 bills, but with a slightly longer interval between levels (6.3 months). The time until the R$2 type 2 bills reach each wear level shows very different behavior in relation to the other groups. In addition to presenting an average interval between one level and another of only 1.1 month, the maximum lifespan does not exceed 2 years, much less than the R$2 type 1 bills (up to approximately 40 months). This behavior is due to the issuance of banknotes with this type of varnish being almost entirely carried out only in 2017[16]. Thus, given that the average time for this type of banknote to reach wear level 4 is approximately 2 years, a portion of this type of banknote should have already been withdrawn from circulation.

The average time for the R$2 bills to reach wear level 4 was 25.7 months (type 1) and 23.5 months (type 2).

[16]Only 8.6% of the sample of R$2 type 2 bills were issued in 2018 (February to September).

Figure 1 – Average lifespan of denominations by wear level classification



4.2. Wear survival time for the R$5 (varnished) and R$10 (unvarnished) denominations

The accumulated survival function shows the probability, at each instant in time, of a banknote showing a wear level below 4 (survival)[17]. Thus, a function with a slower decay indicates a longer "duration" of the banknote.

The nationwide comparison of the accumulated survival functions of the varnished R$5 bills and unvarnished R$10 bills, estimated by Kaplan-Meier (Figure 2), presents a different curve behavior ($p < 0.001$). Although having a quite similar survival time, of approximately 2 years, the R$5 bills last a bit longer than the R$10 bills. Subsequently to

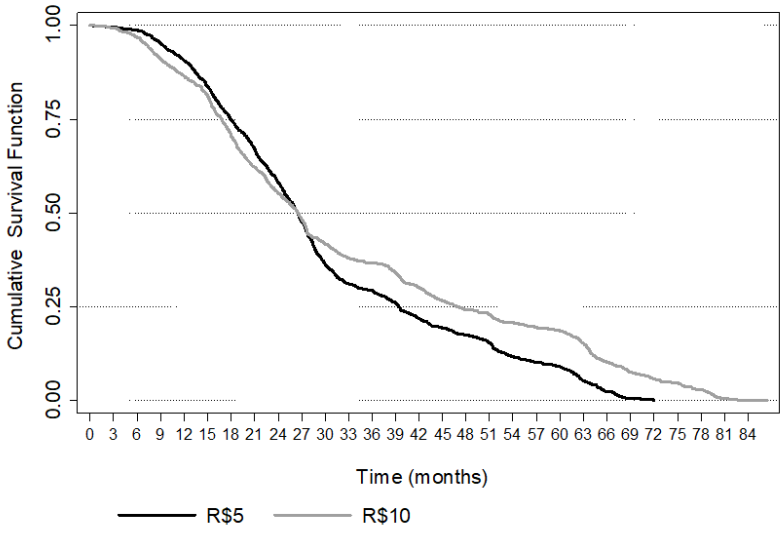
[17]That is, P (T> t), where T is the time for a banknote to reach the wear level 4. Thus, the survival function measures the probability that the time for circulation withdrawal is greater than a certain time t. For this calculation, both the grades with a rating greater than or equal to 4 (wear level) and those with a lower rating (censorship) were considered. Table II.9 of Annex II shows the number of observations in each of these conditions according to the controlling characteristics.

this period, there is a rapid drop in the survival function of varnished banknotes, inverting the pattern previously observed.

However, this behavior is not homogeneous across the different regions of the country (Figure 3). While the curves of the Southeast and South behave similarly to what is observed nationally, it is not possible, in the Northeast and Central-West, to identify differences between the curves of the R$5 and R$10 bills (p = 0.583 and p = 0.260, respectively – Table II.10 of Appendix II). In the North, although the curves are uneven (p = 0.043), the survival of the R$5 bills remains higher than the R$10 bills until, approximately, 3 years.

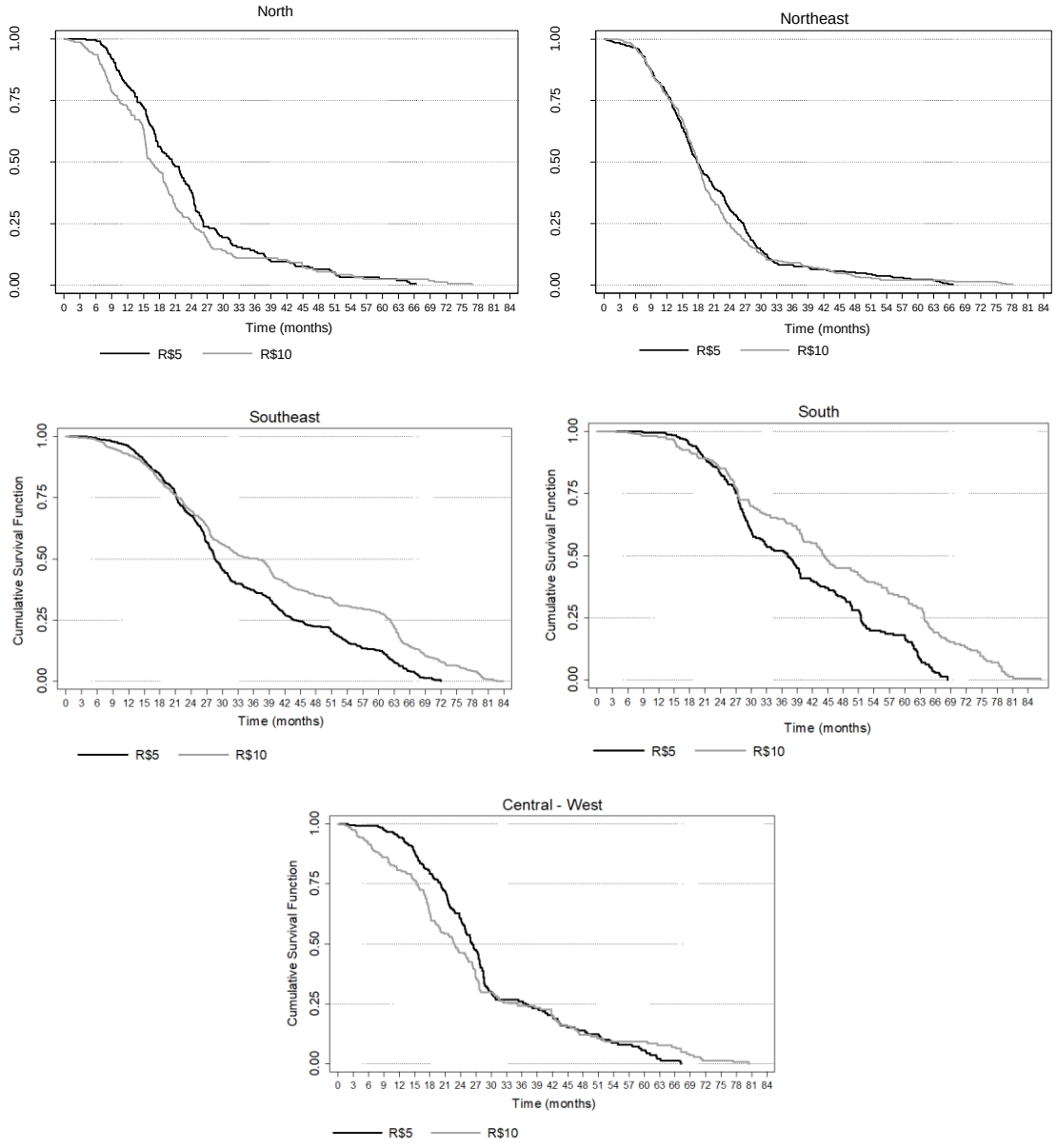
The comparison of survival curves by location type (capital x inland cities) did not capture differences between curves, except in the Northeast.[18] In this region, the capital cities and branches of the 2nd quartile presented a slightly higher survival rate.

Figure 2 – Cumulative survival function of Kaplan-Meier



[18]Additionally, using the Kaplan-Meier model, it is possible to estimate the mean, median, and the 25th and 75th percentiles of the wear level. These estimates are presented in Table II.11 of Annex II. Except for the Southeast and South, where the average time of the R$10 bills is greater than that of the R$5 bills, there was no difference in average survival times by region. There were also no differences between location types and branch size for all regions, except in the Northeast.

Figure 3 – Cumulative survival function of Kaplan-Meier by regions



To assess the total effect of the various variables, a Cox regression model was adapted. In the Cox model, the survival function is expressed in terms of the risk function (hazard function) and it is interpreted in terms of a ratio of the risk functions (HR – hazard ratio). In this study, this ratio is the chance that a banknote will reach wear levels 4, 5 or 6.

Initially, univariate models were adjusted with each of the variables separately (Table 5, column "Univariate"), as well as a joint model with all variables simultaneously (Table 5, columns "Multivariate 1" and "Multivariate 2"). As for the Cox model's proportional risk

assumption[19], it was invalid, which required the inclusion of a set of interactions to make it acceptable. The model presented in the column "Multivariate 3" in Table 5 presents the results of this analysis.

The varnish proved to be a protective factor, reducing by 38% the risk of wear when the banknotes begin to circulate. However, as this effect decreases over time (interaction between varnish and time), varnished and unvarnished banknotes show no difference after 24 months[20].

At the time that banknotes begin to circulate, the North and Northeast presented the greatest risks of wear compared to the Southeast (approximately 5 times greater). However, this difference is reduced at a rate of 3% per month (p.m.). The Central-West presented a higher risk than the Southeast (2.09 times), with an approximation rate of only 1% p.m. By contrast, the South presented a wear risk 57% lower than that of the Southeast and a reduction of this advantage of 2% p.m.

The location type and branch size, used as control variables, had no significant effect on the final model.

[19]The assumption of proportional risks imposes that the effect of a variable is constant over time, that is, regardless of the moment in which the assessment is being made, the ratio of the risk functions (effect) between the level of the analyzed variable to the basal class is constant over time.

[20] This value was obtained based on the following calculation: $(1-0.38)(1+0.02)^n = 1 \rightarrow n = -\ln(1-0.38)/\ln(1+0.02) \approx 24$.

Table 5 – Cox model – Varnish effect

	Univariate		Multivariate 1		Multivariate 2		Multivariate 3 (variable varying over time)	
	Crude HR (IC95%)	**p**	**Adjusted HR (IC95%)**	**P**	**Adjusted HR (IC95%)**	**p**	**Adjusted HR (IC95%)**	**p**
R$5 (ref.= R$10)	1.22 [1.13 - 1.32]	<0.001	1.15 [1.07 - 1.24]	<0.001	1.15 [1.07 - 1.24]	<0.001	0.62 [0.54 - 0.72]	<0.001
Region (ref.= Southeast)		<0.001		<0.001		<0.001		<0.001
North	2.67 [2.36 - 3.02]	<0.001	2.60 [2.30 - 2.94]	<0.001	2.59 [2.29 - 2.94]	<0.001	4.99 [3.88 - 6.41]	<0.001
Northeast	2.96 [2.68 - 3.27]	<0.001	2.88 [2.60 - 3.19]	<0.001	2.87 [2.59 - 3.17]	<0.001	5.17 [4.20 - 6.37]	<0.001
South	0.75 [0.67 - 0.85]	<0.001	0.74 [0.66 - 0.84]	<0.001	0.75 [0.67 - 0.85]	<0.001	0.43 [0.33 - 0.55]	<0.001
Central-West	1.63 [1.44 - 1.85]	<0.001	1.59 [1.40 - 1.80]	<0.001	1.58 [1.40 - 1.79]	<0.001	2.09 [1.63 - 2.69]	<0.001
Capital (ref.=Inland)	0.92 [0.85 - 1.00]	0.053	1.07 [0.98 - 1.17]	0.111	-	-	-	-
Size (ref.= 1st Quartile		<0.001		0.056		0.048		0.137
2nd Quartile	1.12 [0.90 - 1.38]	0.306	1.07 [0.87 - 1.33]	0.523	1.08 [0.88 - 1.34]	0.457	1.06 [0.86 - 1.31]	0.588
3rd Quartile	1.29 [1.06 - 1.58]	0.012	1.19 [0.98 - 1.46]	0.084	1.21 [0.99 - 1.47]	0.068	1.16 [0.95 - 1.42]	0.150
4th Quartile	1.59 [1.31 - 1.93]	<0.001	1.21 [0.001 - 1.48]	0.051	1.23 [1.01 - 1.49]	0.039	1.18 [0.97 - 1.44]	0.094
Interaction region x time								
North							0.97 [0.96 - 0.98]	<0.001
Northeast							0.97 [0.97 - 0.98]	<0.001
South							1.02 [1.01 - 1.02]	<0.001
Central-West							0.991 [0.983 - 0.998]	0.017
Interaction varnish x time							1.02 [1.02 - 1.03]	<0.001

4.3. Wear survival time for the R$2 denomination – comparison between varnish types

The survival functions of the R$2 bills were calculated to compare types 1 and 2 bills. As noted in the descriptive analysis, the lifespan of the R$2 type 2 bills showed a very different behavior in relation to the type 1 due to the short period in which this type of varnish was applied. To eliminate a possible bias resulting from this distinct circulation period of the two varnish types, only the R$2 bills with issuance dates between January 18, 2017 and September 28, 2018 were analyzed (the period when R$2 type 2 bills were put into circulation).[21]

[21]Annex III presents the results of the survival analysis considering the complete sample (Tables II.12.a to II.15 and Figures II.1 and II.2 of Annex II). Table II.16 shows the number of observations subjected to wear that were withdrawn from the restricted sample of R$2 bills.

Comparing the survival function of types 1 and 2 bills (Figure 4), type 2 bills show a higher survival rate than type 1, both nationwide and across the different regions, except for the Central-West (Figure 5 and Table II.17 of Appendix II). Additionally, longer survival rates were observed in the inland cities of the Northeast (p = 0.025) and South (p = 0.046) regions.

Figure 4 – Cumulative survival function of Kaplan-Meier – comparison of varnish types

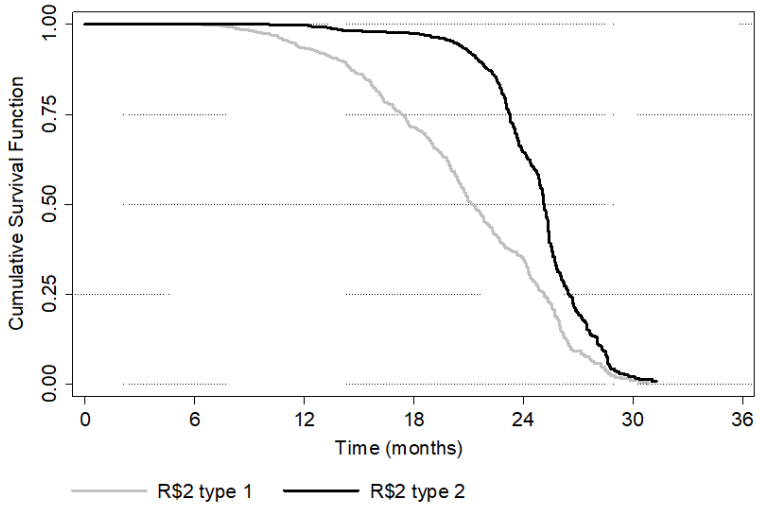
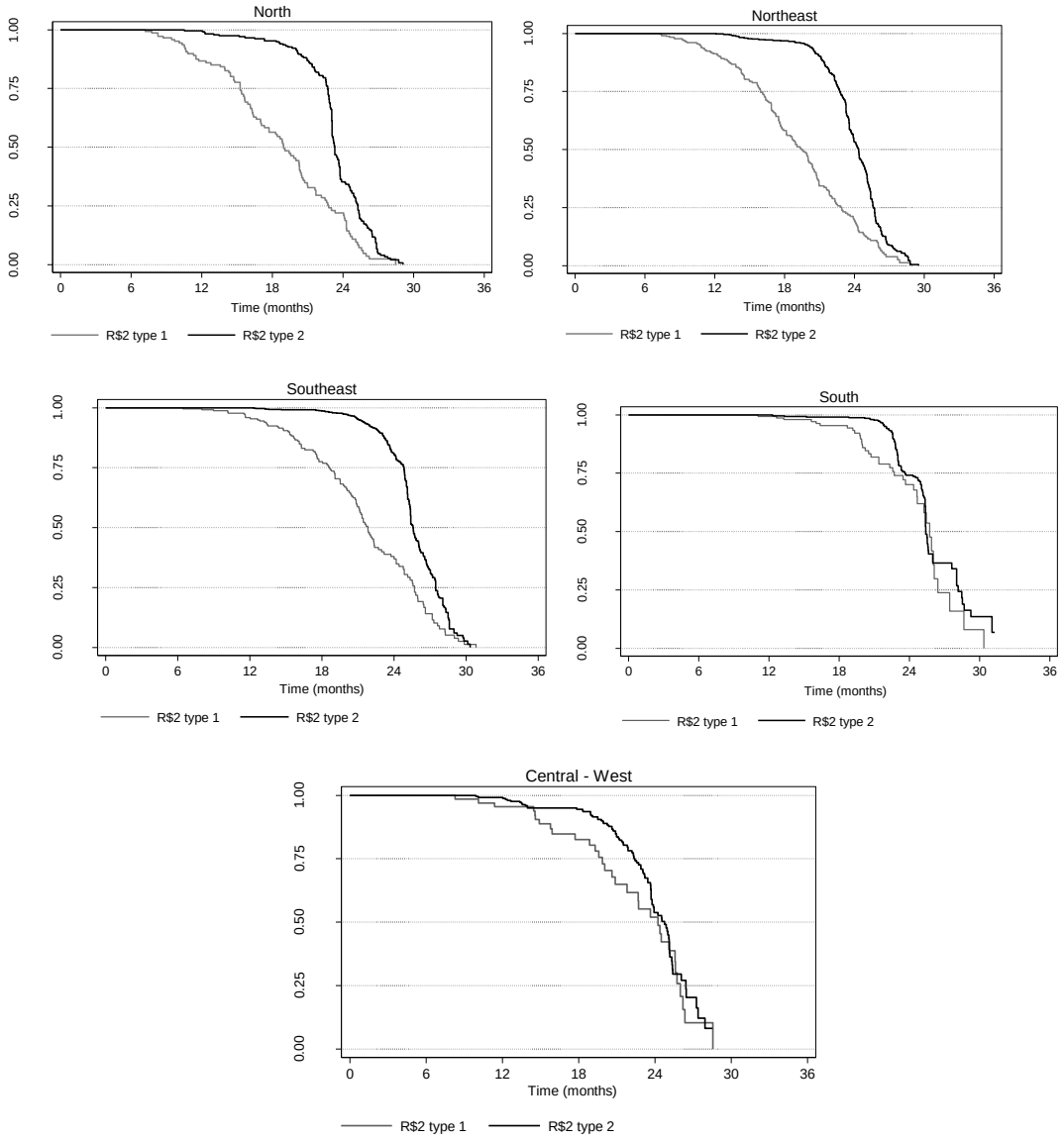


Figure 5 – Cumulative survival function of Kaplan-Meier – comparison of varnish types by regions



The Cox model with all variables (Table 6, columns “Multivariate 1” and “Multivariate 2”), similarly to the evaluation of the varnish effect, indicated problems in the assumption of proportional risks. The model was then adjusted to include the interaction between type 2 bills and time, as well as between region and time (Table 7 – column “Multivariate 3”). According to this model, type 2 bills present a risk of wear 99.7% lower than type 1, but with loss of efficiency rate, so that, after 26 months, both types of varnish present similar risks. Regarding regional differences, it seems the North, Northeast and Central-West regions present a higher risk of wear compared to the Southeast, regardless of time. On the other hand, the South, despite showing a risk of wear 82% lower than the Southeast, presents an increase of this risk type by 6% p.m. There was no effect due to the location type or branch size.

Table 6 – Cox model estimate

	Univariate		Multivariate 1		Multivariate 2		Multivariate 3 (variable varying over time)	
	Crude HR (IC95%)	**p**	**Adjusted HR (IC95%)**	**P**	**Adjusted HR (IC95%)**	**p**	**Adjusted HR (IC95%)**	**p**
R$2 type 2 (ref.= R$2 type 1)	0.41 (0.37 - 0.45)	<0.001	0.42 (0.38 - 0.47)	<0.001	0.42 (0.38 - 0.47)	<0.001	0.003 (0.002 - 0.007)	<0.001
Region (ref.= Southeast)		<0.001		<0.001		<0.001		<0.001
North	2.58 (2.23 - 2.97)	<0.001	2.30 (1.99 - 2.67)	<0.001	2.30 (1.99 - 2.66)	<0.001	2.28 (1.97 - 2.64)	<0.001
Northeast	2.06 (1.83 - 2.32)	<0.001	1.87 (1.65 - 2.11)	<0.001	1.87 (1.65 - 2.11)	<0.001	1.85 (1.64 - 2.09)	<0.001
South	0.75 (0.63 - 0.9)	0.002	0.69 (0.58 - 0.83)	<0.001	0.70 (0.59 - 0.84)	<0.001	0.19 (0.07 - 0.52)	0.001
Central-West	1.5 (1.23 - 1.83)	<0.001	1.31 (1.07 - 1.59)	0.009	1.29 (1.06 - 1.58)	0.011	1.42 (1.17 - 1.74)	0.001
Capital (ref.=Inland)	0.95 (0.85 - 1.06)	0.377	0.88 (0.79 - 0.98)	0.019	-	-	-	-
Size (ref.= 1st Quartile				<0.001		<0.001		
2nd Quartile	1.01 (0.72 - 1.41)	0.953	0.91 (0.65 - 1.28)	0.591	0.92 (0.66 - 1.29)	0.635	0.29 (0.06 - 1.49)	0.139
3rd Quartile	1.52 2 (1.11 - 2.08)	0.009	1.29 (0.94 - 1.77)	0.110	1.30 (0.95 - 1.78)	0.104	0.34 (0.08 - 1.47)	0.149
4th Quartile	1.90 (1.40 - 2.58)	<0.001	1.38 (1.02 - 1.88)	0.038	1.38 (1.02 - 1.88)	0.039	0.51 (0.13 - 2.04)	0.337
Interaction R$ 2 type 2 x Time							1.25 (1.21 - 1.29)	<0.001
Interaction Region x Time								
South							1.06 (1.02 - 1.11)	0.007
Interaction Size x Time								
2nd Quartile							1.06 (0.98 - 1.13)	0.140
3rd Quartile							1.06 (1.00 - 1.14)	0.059
4th Quartile							1.05 (0.99 - 1.12)	0.135

5. CONCLUSIONS

This study aimed at evaluating the efficacy of the protective varnish coat in the R$2 and R$5 bills of the second family of the Brazilian real, identifying possible differences in the level of dirt and lifespan between varnished and unvarnished banknotes.

Varnished R$5 bills were compared with unvarnished R$10 bills. The study also compared two different types of varnish applied to R$2 bills (the first used in banknotes produced in Brazil and the second in banknotes produced in 2016 by a foreign producer).

Regarding banknotes lifespan – understood as the average time for reaching the wear level 4 – data analysis indicated a period of 22.2 months for R$5 bills and 22.9 months for R$10 bills.

Considering their different values, both banknotes have a distinct but close circulation profile. The lifespan survey carried out in 2011, with banknotes of the first series of the Brazilian real (entirely unvarnished), indicated the lifespan of R$5 bills was equivalent to 89% of the lifespan of the R$10 bills (12.4 and 13.9 months, respectively).

The result presented in this study indicates the lifespan of R$5 bills of the second series of the Brazilian real is equivalent to 96% of the R$10 bills lifespan. Despite the different methodologies employed in both studies, results suggest the varnish applied to R$5 bills of the second series was somehow protective, lengthening their lifespan.

The survival analysis highlighted the varnish effectively protects banknotes, reducing the wear risk. However, the protection provided by the varnish loses efficiency over time and after 24 months there is no longer protective difference between varnished and unvarnished banknotes.

In relation to the Southeast region, the North, Northeast, and Central-West regions showed a banknote wear risk up to five times higher, while the South region showed a lower wear risk. These results suggest the Brazilian territory presents quite uneven circulation conditions, likely related to differences in climate, handling habits, and access to electronic means of payment. However, the study reveals that regional differences related to the wear risk tend to reduce throughout the period of circulation of banknotes.

Regarding the comparison between R$2 bills produced with different types of varnish, the lifespan reached 23.5 months for the R$2 type 2 bills and 25.7 months for the R$2 type 1 bills. It is noteworthy that R$2 type 2 bills were only put into circulation as of 2017 and, therefore, their circulation time reaches, at maximum, around 2 years, while R$2 bills type 1 bills are circulating since 2013, which might have interfered in this comparison.

The survival analysis of the sample of banknotes issued in the same period indicated the wear risk is lower for R$2 type 2 bills, but this advantage reduces over time, disappearing after 26 months.

This study revealed, for the analyzed banknotes, the adoption of the varnish coat increased the protection against dirt and wear. This result points to the relevance of persisting in the usage of this input in the production of low-denomination banknotes, which are more subject to wear and tear given their intense circulation.

However, the study also highlighted the varnish efficiency is limited: the protection is higher at the beginning of the circulation period and reduces over time; in nearly two years, there are no longer differences between varnished and unvarnished banknotes. This is a relevant issue to be considered, especially in the scenario of limited public expenditures, which has led to the reduction in the pace of banknotes replacement, extending their circulation time.

Bibliography

Machin, D., Campbell, M., Fayers, P., and Pinol, A. (1997) Sample Size Tables for Clinical Studies, 2nd Edition. Blackwell Science.

Malden, MA. Zar, Jerrold H. (1984) Biostatistical Analysis (Second Edition). Prentice-Hall. Englewood Cliffs, New Jersey

CP2 Pesquisas (2012) Qualidade de Cédulas e Entesouramento de Moedas Metálicas (Quality of banknotes and Coin Hoarding).

APPENDIX I – STATISTICAL METHODOLOGY

To evaluate the sample profile, the absolute and relative frequencies of each variable, as well as measures of associations between wear levels and the sample profile variables (Chi-Square test, or, alternatively, in cases of small samples[22], Fisher's exact test) are herein presented. When local differences are observed in distributions, the standardized adjusted residue was used to identify them[23].

Subsequently, based on information on the date of issuance and circulation withdrawal, the lifespan of each banknote was calculated according to its wear level, with a set of summary measures (mean, quartiles, minimum, maximum, and standard deviation).

The survival analysis studies the time until the occurrence of an event (in this case, wear level greater than or equal to 4), considering censored data (cases that did not experience the event during the analysis period). In this analysis, the survival function, i.e., the probability of a banknote surviving (remaining at a wear level below 4) after a certain period, is estimated.

Initially, survival functions were analyzed separately for each predictor variable (univariate analysis). Kaplan-Meier models of survival analysis were used for categorical variables. Survival functions were estimated for each level of these variables and then compared by using the Log Rank test (Mantel-Cox). For the numerical variables, Cox regression models were adjusted.

Then, to simultaneously evaluate the effects of all predictor variables on the survival time, the Cox model (multivariate) was once again adjusted. Initially, all selected variables were included in the model; after, those not significant at 5% were eliminated one by one in order of significance (backward method).

Cox's model assumes the existence of proportional risks, which were verified via a test based on Schoenfeld residues.

[22]More than 20% of the cells in a contingency table with expected values lower than 5 cases.
[23]Cells with absolute values above 1.96 indicate evidence of (local) associations between the categories related to these crossings.

APPENDIX II - DESCRIPTIVE TABLES AND FIGURES

Table II.1 – Comparison between planned and actual sample

	Expected sample				Actual Sample				Actual/expected Sample			
	R$2	R$5	R$10	Total	R$2	R$5	R$10	Total	R$2	R$5	R$10	Total
North	**492**	**246**	**246**	**984**	**487**	**246**	**246**	**979**	**99.0%**	**100.0%**	**100.0%**	**99.5%**
1st Quartile	12	6	6	24	12	6	6	24	100.0%	100.0%	100.0%	100.0%
2nd Quartile	36	18	18	72	36	18	18	72	100.0%	100.0%	100.0%	100.0%
3rd Quartile	84	42	42	168	83	42	42	167	98.8%	100.0%	100.0%	99.4%
4th Quartile	360	180	180	720	356	180	180	716	98.9%	100.0%	100.0%	99.4%
Northeast	**1,116**	**558**	**558**	**2,232**	**1,072**	**549**	**552**	**2,173**	**96.1%**	**98.4%**	**98.9%**	**97.4%**
1st Quartile	18	9	9	36	23	9	12	44	127.8%	100.0%	133.3%	122.2%
2nd Quartile	66	33	33	132	66	33	33	132	100.0%	100.0%	100.0%	100.0%
3rd Quartile	186	93	93	372	185	96	96	377	99.5%	103.2%	103.2%	101.3%
4th Quartile	846	423	423	1,692	798	411	411	1,620	94.3%	97.2%	97.2%	95.7%
Southeast	**1,446**	**723**	**723**	**2,892**	**1,431**	**723**	**723**	**2,877**	**99.0%**	**100.0%**	**100.0%**	**99.5%**
1st Quartile	78	39	39	156	75	39	39	153	96.2%	100.0%	100.0%	98.1%
2nd Quartile	246	123	123	492	242	123	123	488	98.4%	100.0%	100.0%	99.2%
3rd Quartile	444	222	222	888	444	222	222	888	100.0%	100.0%	100.0%	100.0%
4th Quartile	678	339	339	1,356	670	339	339	1,348	98.8%	100.0%	100.0%	99.4%
South	**882**	**441**	**441**	**1,764**	**855**	**429**	**429**	**1,713**	**96.9%**	**97.3%**	**97.3%**	**97.1%**
1st Quartile	54	27	27	108	54	27	27	108	100.0%	100.0%	100.0%	100.0%
2nd Quartile	174	87	87	348	161	81	81	323	92.5%	93.1%	93.1%	92.8%
3rd Quartile	264	132	132	528	263	132	132	527	99.6%	100.0%	100.0%	99.8%
4th Quartile	390	195	195	780	377	189	189	755	96.7%	96.9%	96.9%	96.8%
Central-West	**570**	**285**	**285**	**1,140**	**570**	**285**	**285**	**1,140**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
1st Quartile	18	9	9	36	18	9	9	36	100.0%	100.0%	100.0%	100.0%
2nd Quartile	60	30	30	120	60	30	30	120	100.0%	100.0%	100.0%	100.0%
3rd Quartile	138	69	69	276	138	69	69	276	100.0%	100.0%	100.0%	100.0%
4th Quartile	354	177	177	708	354	177	177	708	100.0%	100.0%	100.0%	100.0%
Brazil	**4,506**	**2,253**	**2,253**	**9,012**	**4,415**	**2,232**	**2,235**	**8,882**	**98.0%**	**99.1%**	**99.2%**	**98.6%**
1st Quartile	180	90	90	360	182	90	93	365	101.1%	100.0%	103.3%	101.4%
2nd Quartile	582	291	291	1,164	565	285	285	1135	97.1%	97.9%	97.9%	97.5%
3rd Quartile	1,116	558	558	2,232	1,113	561	561	2,235	99.7%	100.5%	100.5%	100.1%
4th Quartile	2,628	1,314	1,314	5,256	2,555	1,296	1,296	5,147	97.2%	98.6%	98.6%	97.9%

Table II.2 – Distribution of denominations by wear level according to Federated Unit

	Banknote wear level (1 to 6)												Total		p
	1		2		3		4		5		6				
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
R$5	**194**	**8.7%**	**267**	**12.0%**	**383**	**17.2%**	**543**	**24.3%**	**457**	**20.5%**	**388**	**17.4%**	**2,232**	**100.0%**	<0.001
AC	2	8.3%	2	8.3%	7	29.2%	4	16.7%	1	4.2%	8	33.3%	24	100.0%	
AM	2	4.2%	3	6.3%	6	12.5%	9	18.8%	8	16.7%	20	41.7%	48	100.0%	
AP	1	6.7%	2	13.3%	4	26.7%	2	13.3%	6	40.0%	0	0.0%	15	100.0%	
PA	3	3.6%	7	8.3%	11	13.1%	21	25.0%	22	26.2%	20	23.8%	84	100.0%	
RO	3	7.7%	2	5.1%	8	20.5%	10	25.6%	9	23.1%	7	17.9%	39	100.0%	
RR	0	0.0%	0	0.0%	2	22.2%	0	0.0%	3	33.3%	4	44.4%	9	100.0%	
TO	2	7.4%	3	11.1%	2	7.4%	9	33.3%	4	14.8%	7	25.9%	27	100.0%	
AL	2	9.5%	2	9.5%	3	14.3%	4	19.0%	5	23.8%	5	23.8%	21	100.0%	
CE	13	9.0%	19	13.2%	29	20.1%	35	24.3%	24	16.7%	24	16.7%	144	100.0%	
MA	7	7.1%	9	9.1%	10	10.1%	28	28.3%	21	21.2%	24	24.2%	99	100.0%	
PB	4	8.3%	3	6.3%	5	10.4%	16	33.3%	15	31.3%	5	10.4%	48	100.0%	
PE	14	11.7%	12	10.0%	20	16.7%	26	21.7%	22	18.3%	26	21.7%	120	100.0%	
PI	10	17.5%	7	12.3%	7	12.3%	11	19.3%	14	24.6%	8	14.0%	57	100.0%	
RN	5	8.3%	3	5.0%	10	16.7%	11	18.3%	17	28.3%	14	23.3%	60	100.0%	
ES	4	7.8%	10	19.6%	6	11.8%	16	31.4%	6	11.8%	9	17.6%	51	100.0%	
PR	21	15.6%	23	17.0%	24	17.8%	38	28.1%	21	15.6%	8	5.9%	135	100.0%	
RJ	11	6.7%	17	10.3%	23	13.9%	40	24.2%	37	22.4%	37	22.4%	165	100.0%	
SP	29	5.7%	47	9.3%	81	16.0%	127	25.0%	122	24.1%	101	19.9%	507	100.0%	
RS	22	13.6%	27	16.7%	38	23.5%	43	26.5%	22	13.6%	10	6.2%	162	100.0%	
SC	20	15.2%	24	18.2%	30	22.7%	35	26.5%	20	15.2%	3	2.3%	132	100.0%	
DF	8	19.0%	12	28.6%	8	19.0%	7	16.7%	5	11.9%	2	4.8%	42	100.0%	
GO	3	2.9%	16	15.7%	18	17.6%	26	25.5%	23	22.5%	16	15.7%	102	100.0%	
MS	4	7.0%	4	7.0%	12	21.1%	15	26.3%	12	21.1%	10	17.5%	57	100.0%	
MT	4	4.8%	13	15.5%	19	22.6%	10	11.9%	18	21.4%	20	23.8%	84	100.0%	
R$10	**163**	**7.3%**	**248**	**11.1%**	**347**	**15.5%**	**475**	**21.3%**	**520**	**23.3%**	**482**	**21.6%**	**2,235**	**100.0%**	<0.001
AC	0	0.0%	1	4.2%	0	0.0%	11	45.8%	7	29.2%	5	20.8%	24	100.0%	
AM	2	4.2%	5	10.4%	8	16.7%	6	12.5%	14	29.2%	13	27.1%	48	100.0%	
AP	0	.0%	0	.0%	3	20.0%	6	40.0%	3	20.0%	3	20.0%	15	100.0%	
PA	6	7.1%	8	9.5%	12	14.3%	19	22.6%	16	19.0%	23	27.4%	84	100.0%	
RO	3	7.7%	3	7.7%	5	12.8%	10	25.6%	8	20.5%	10	25.6%	39	100.0%	
RR	0	0.0%	0	0.0%	3	33.3%	0	0.0%	2	22.2%	4	44.4%	9	100.0%	
TO	1	3.7%	5	18.5%	4	14.8%	9	33.3%	6	22.2%	2	7.4%	27	100.0%	
AL	0	0.0%	1	4.8%	3	14.3%	3	14.3%	7	33.3%	7	33.3%	21	100.0%	
CE	9	6.3%	31	21.5%	32	22.2%	26	18.1%	15	10.4%	31	21.5%	144	100.0%	
MA	3	3.0%	11	11.1%	17	17.2%	22	22.2%	19	19.2%	27	27.3%	99	100.0%	
PB	5	10.4%	4	8.3%	6	12.5%	17	35.4%	13	27.1%	3	6.3%	48	100.0%	
PE	6	4.9%	19	15.4%	23	18.7%	31	25.2%	30	24.4%	14	11.4%	123	100.0%	
PI	6	10.5%	8	14.0%	15	26.3%	5	8.8%	6	10.5%	17	29.8%	57	100.0%	
RN	0	0.0%	5	8.3%	10	16.7%	12	20.0%	17	28.3%	16	26.7%	60	100.0%	
ES	1	2.0%	2	3.9%	11	21.6%	7	13.7%	18	35.3%	12	23.5%	51	100.0%	
PR	30	22.2%	18	13.3%	25	18.5%	30	22.2%	19	14.1%	13	9.6%	135	100.0%	
RJ	7	4.2%	17	10.3%	31	18.8%	33	20.0%	39	23.6%	38	23.0%	165	100.0%	
SP	11	2.2%	11	2.2%	26	5.1%	91	17.9%	183	36.1%	185	36.5%	507	100.0%	
RS	30	18.5%	31	19.1%	38	23.5%	31	19.1%	21	13.0%	11	6.8%	162	100.0%	
SC	16	12.1%	25	18.9%	25	18.9%	32	24.2%	24	18.2%	10	7.6%	132	100.0%	
DF	5	11.9%	13	31.0%	3	7.1%	9	21.4%	10	23.8%	2	4.8%	42	100.0%	
GO	6	5.9%	11	10.8%	16	15.7%	24	23.5%	21	20.6%	24	23.5%	102	100.0%	

	Banknote wear level (1 to 6)												Total		p
	1		2		3		4		5		6				
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
MS	7	12.3%	9	15.8%	9	15.8%	15	26.3%	12	21.1%	5	8.8%	57	100.0%	
MT	9	10.7%	10	11.9%	22	26.2%	26	31.0%	10	11.9%	7	8.3%	84	100.0%	
R$2 type 2	**124**	**5.7%**	**312**	**14.3%**	**520**	**23.8%**	**615**	**28.2%**	**357**	**16.4%**	**254**	**11.6%**	**2,182**	**100.0%**	<0.001
AC	0	0.0%	1	4.2%	1	4.2%	10	41.7%	7	29.2%	5	20.8%	24	100.0%	
AM	1	2.3%	1	2.3%	1	2.3%	5	11.4%	7	15.9%	29	65.9%	44	100.0%	
AP	0	.0%	0	.0%	3	20.0%	5	33.3%	4	26.7%	3	20.0%	15	100.0%	
PA	0	0.0%	2	2.4%	11	13.1%	25	29.8%	24	28.6%	22	26.2%	84	100.0%	
RO	0	0.0%	1	2.6%	13	33.3%	8	20.5%	9	23.1%	8	20.5%	39	100.0%	
RR	0	0.0%	0	0.0%	1	11.1%	0	0.0%	2	22.2%	6	66.7%	9	100.0%	
TO	2	7.4%	4	14.8%	5	18.5%	8	29.6%	4	14.8%	4	14.8%	27	100.0%	
AL	1	4.8%	0	.0%	2	9.5%	7	33.3%	3	14.3%	8	38.1%	21	100.0%	
CE	2	1.7%	2	1.7%	21	17.9%	32	27.4%	33	28.2%	27	23.1%	117	100.0%	
MA	1	1.0%	3	3.0%	10	10.1%	31	31.3%	29	29.3%	25	25.3%	99	100.0%	
PB	1	2.1%	6	12.5%	1	2.1%	15	31.3%	13	27.1%	12	25.0%	48	100.0%	
PE	6	4.9%	7	5.7%	15	12.3%	39	32.0%	24	19.7%	31	25.4%	122	100.0%	
PI	0	0.0%	3	5.5%	8	14.5%	19	34.5%	19	34.5%	6	10.9%	55	100.0%	
RN	1	1.7%	3	5.2%	7	12.1%	15	25.9%	19	32.8%	13	22.4%	58	100.0%	
ES	0	0.0%	3	5.9%	12	23.5%	19	37.3%	13	25.5%	4	7.8%	51	100.0%	
PR	6	4.5%	23	17.2%	61	45.5%	34	25.4%	9	6.7%	1	0.7%	134	100.0%	
RJ	0	0.0%	16	10.5%	30	19.7%	44	28.9%	36	23.7%	26	17.1%	152	100.0%	
SP	26	5.1%	85	16.8%	139	27.5%	163	32.3%	78	15.4%	14	2.8%	505	100.0%	
RS	15	9.3%	42	26.1%	61	37.9%	34	21.1%	6	3.7%	3	1.9%	161	100.0%	
SC	12	9.1%	39	29.5%	45	34.1%	35	26.5%	1	0.8%	0	.0%	132	100.0%	
DF	6	14.3%	7	16.7%	17	40.5%	10	23.8%	2	4.8%	0	.0%	42	100.0%	
GO	19	18.6%	27	26.5%	24	23.5%	26	25.5%	4	3.9%	2	2.0%	102	100.0%	
MS	14	24.6%	12	21.1%	11	19.3%	11	19.3%	6	10.5%	3	5.3%	57	100.0%	
MT	11	13.1%	25	29.8%	21	25.0%	20	23.8%	5	6.0%	2	2.4%	84	100.0%	
R$2 type 1	**204**	**9.1%**	**332**	**14.9%**	**455**	**20.4%**	**476**	**21.3%**	**361**	**16.2%**	**405**	**18.1%**	**2,233**	**100.0%**	<0.001
AC	1	4.2%	4	16.7%	6	25.0%	8	33.3%	2	8.3%	3	12.5%	24	100.0%	
AM	1	2.1%	0	0.0%	9	19.1%	12	25.5%	5	10.6%	20	42.6%	47	100.0%	
AP	1	6.7%	2	13.3%	0	0.0%	8	53.3%	2	13.3%	2	13.3%	15	100.0%	
PA	2	2.4%	7	8.3%	23	27.4%	23	27.4%	10	11.9%	19	22.6%	84	100.0%	
RO	1	2.6%	8	20.5%	8	20.5%	5	12.8%	7	17.9%	10	25.6%	39	100.0%	
RR	0	0.0%	0	0.0%	2	22.2%	3	33.3%	0	.0%	4	44.4%	9	100.0%	
TO	1	3.7%	5	18.5%	1	3.7%	4	14.8%	7	25.9%	9	33.3%	27	100.0%	
AL	3	14.3%	3	14.3%	3	14.3%	2	9.5%	1	4.8%	9	42.9%	21	100.0%	
CE	17	11.8%	17	11.8%	40	27.8%	32	22.2%	19	13.2%	19	13.2%	144	100.0%	
MA	1	1.0%	10	10.1%	15	15.2%	36	36.4%	18	18.2%	19	19.2%	99	100.0%	
PB	5	10.4%	7	14.6%	11	22.9%	8	16.7%	9	18.8%	8	16.7%	48	100.0%	
PE	24	19.5%	19	15.4%	18	14.6%	24	19.5%	18	14.6%	20	16.3%	123	100.0%	
PI	5	8.8%	9	15.8%	15	26.3%	8	14.0%	7	12.3%	13	22.8%	57	100.0%	
RN	7	11.7%	9	15.0%	14	23.3%	14	23.3%	9	15.0%	7	11.7%	60	100.0%	
ES	5	9.8%	7	13.7%	9	17.6%	14	27.5%	10	19.6%	6	11.8%	51	100.0%	
PR	13	9.7%	24	17.9%	30	22.4%	33	24.6%	23	17.2%	11	8.2%	134	100.0%	
RJ	13	7.9%	26	15.8%	36	21.8%	33	20.0%	20	12.1%	37	22.4%	165	100.0%	
SP	46	9.1%	47	9.3%	89	17.6%	93	18.3%	117	23.1%	115	22.7%	507	100.0%	
RS	16	9.9%	34	21.0%	43	26.5%	35	21.6%	21	13.0%	13	8.0%	162	100.0%	
SC	13	9.8%	32	24.2%	34	25.8%	27	20.5%	17	12.9%	9	6.8%	132	100.0%	
DF	6	14.3%	12	28.6%	7	16.7%	9	21.4%	2	4.8%	6	14.3%	42	100.0%	

	Banknote wear level (1 to 6)												Total		p
	1		2		3		4		5		6				
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	
GO	7	6.9%	17	16.7%	24	23.5%	22	21.6%	13	12.7%	19	18.6%	102	100.0%	
MS	3	5.3%	10	17.5%	11	19.3%	8	14.0%	12	21.1%	13	22.8%	57	100.0%	
MT	13	15.5%	23	27.4%	7	8.3%	15	17.9%	12	14.3%	14	16.7%	84	100.0%	

p - descriptive level of the test.
Fisher's exact test.

Table II.3 – Distribution of denominations by wear level according to branch size

	Branch size according to cash movement in Sep/2018								Total		p
	1st. Quartile (≤ R$ 1,117,647)		2nd Quartile (1,117,647 --| 2,641,871)		3rd Quartile (2,641,871 --| 5,043,931)		4th Quartile (> 5,043,931)				
	N	%	N	%	N	%	N	%	N	%	
R$5	**90**	**100.0%**	**285**	**100.0%**	**561**	**100.0%**	**1296**	**100.0%**	**2,232**	**100.0%**	0.318
1	11	12.2%	24	8.4%	41	7.3%	118	9.1%	194	8.7%	
2	12	13.3%	33	11.6%	64	11.4%	158	12.2%	267	12.0%	
3	16	17.8%	52	18.2%	98	17.5%	217	16.7%	383	17.2%	
4	18	20.0%	77	27.0%	145	25.8%	303	23.4%	543	24.3%	
5	21	23.3%	54	18.9%	132	23.5%	250	19.3%	457	20.5%	
6	12	13.3%	45	15.8%	81	14.4%	250	19.3%	388	17.4%	
R$10	**93**	**100.0%**	**285**	**100.0%**	**561**	**100.0%**	**1,296**	**100.0%**	**2,235**	**100.0%**	0.371
1	9	9.7%	26	9.1%	44	7.8%	84	6.5%	163	7.3%	
2	10	10.8%	29	10.2%	54	9.6%	155	12.0%	248	11.1%	
3	15	16.1%	37	13.0%	74	13.2%	221	17.1%	347	15.5%	
4	18	19.4%	58	20.4%	118	21.0%	281	21.7%	475	21.3%	
5	21	22.6%	72	25.3%	149	26.6%	278	21.5%	520	23.3%	
6	20	21.5%	63	22.1%	122	21.7%	277	21.4%	482	21.6%	
R$2 type 2	**89**	**100.0%**	**281**	**100.0%**	**552**	**100.0%**	**1260**	**100.0%**	**2,182**	**100.0%**	<0.001
1	9	10.1%	21	7.5%	37	6.7%	57	4.5%	124	5.7%	
2	13	14.6%	58	20.6%	69	12.5%	172	13.7%	312	14.3%	
3	31	34.8%	77	27.4%	140	25.4%	272	21.6%	520	23.8%	
4	23	25.8%	73	26.0%	167	30.3%	352	27.9%	615	28.2%	
5	8	9.0%	31	11.0%	84	15.2%	234	18.6%	357	16.4%	
6	5	5.6%	21	7.5%	55	10.0%	173	13.7%	254	11.6%	
R$2 type 1	**93**	**100.0%**	**284**	**100.0%**	**561**	**100.0%**	**1,295**	**100.0%**	**2,233**	**100.0%**	0.112
1	8	8.6%	34	12.0%	53	9.4%	109	8.4%	204	9.1%	
2	18	19.4%	44	15.5%	75	13.4%	195	15.1%	332	14.9%	
3	23	24.7%	58	20.4%	115	20.5%	259	20.0%	455	20.4%	
4	15	16.1%	51	18.0%	116	20.7%	294	22.7%	476	21.3%	
5	18	19.4%	51	18.0%	107	19.1%	185	14.3%	361	16.2%	
6	11	11.8%	46	16.2%	95	16.9%	253	19.5%	405	18.1%	

p - descriptive level of the Chi-square test.

Table II.4 – Distribution of the R$5 wear level by region and location type

	Location type						p
	Capital cities		Inland cities		Total		
	N	%	N	%	N	%	
North	**81**	**100.0%**	**165**	**100.0%**	**246**	**100.0%**	0.247
1	8	9.9%	5	3.0%	13	5.3%	
2	6	7.4%	13	7.9%	19	7.7%	
3	15	18.5%	25	15.2%	40	16.3%	
4	14	17.3%	41	24.8%	55	22.4%	
5	17	21.0%	36	21.8%	53	21.5%	
6	21	25.9%	45	27.3%	66	26.8%	
Northeast	**144**	**100.0%**	**405**	**100.0%**	**549**	**100.0%**	0.997
1	15	10.4%	40	9.9%	55	10.0%	
2	15	10.4%	40	9.9%	55	10.0%	
3	21	14.6%	63	15.6%	84	15.3%	
4	35	24.3%	96	23.7%	131	23.9%	
5	32	22.2%	86	21.2%	118	21.5%	
6	26	18.1%	80	19.8%	106	19.3%	
Southeast	**213**	**100.0%**	**510**	**100.0%**	**723**	**100.0%**	0.072
1	14	6.6%	30	5.9%	44	6.1%	
2	30	14.1%	44	8.6%	74	10.2%	
3	31	14.6%	79	15.5%	110	15.2%	
4	48	22.5%	135	26.5%	183	25.3%	
5	39	18.3%	126	24.7%	165	22.8%	
6	51	23.9%	96	18.8%	147	20.3%	
South	**33**	**100.0%**	**396**	**100.0%**	**429**	**100.0%**	0.933[a]
1	4	12.1%	59	14.9%	63	14.7%	
2	5	15.2%	69	17.4%	74	17.2%	
3	7	21.2%	85	21.5%	92	21.4%	
4	12	36.4%	104	26.3%	116	27.0%	
5	4	12.1%	59	14.9%	63	14.7%	
6	1	3.0%	20	5.1%	21	4.9%	
Central-West	**102**	**100.0%**	**183**	**100.0%**	**285**	**100.0%**	0.294
1	11	10.8%	8	4.4%	19	6.7%	
2	17	16.7%	28	15.3%	45	15.8%	
3	19	18.6%	38	20.8%	57	20.0%	
4	23	22.5%	35	19.1%	58	20.4%	
5	18	17.6%	40	21.9%	58	20.4%	
6	14	13.7%	34	18.6%	48	16.8%	

p - descriptive level of the Chi-square test or Fischer's exact test([a]).

Table II.5 – Distribution of the R$10 wear level by region and location type

	Location type						p
	Capital cities		Inland cities		Total		
	N	%	N	%	N	%	
North	**81**	**100.0%**	**165**	**100.0%**	**246**	**100.0%**	0.660
1	3	3.7%	9	5.5%	12	4.9%	
2	8	9.9%	14	8.5%	22	8.9%	
3	14	17.3%	21	12.7%	35	14.2%	
4	22	27.2%	39	23.6%	61	24.8%	
5	19	23.5%	37	22.4%	56	22.8%	
6	15	18.5%	45	27.3%	60	24.4%	
Northeast	**147**	**100.0%**	**405**	**100.0%**	**552**	**100.0%**	0.106
1	7	4.8%	22	5.4%	29	5.3%	
2	27	18.4%	52	12.8%	79	14.3%	
3	19	12.9%	87	21.5%	106	19 .2%	
4	35	23.8%	81	20.0%	116	21.0%	
5	24	16.3%	83	20.5%	107	19.4%	
6	35	23.8%	80	19.8%	115	20.8%	
Southeast	**213**	**100.0%**	**510**	**100.0%**	**723**	**100.0%**	0.233
1	8	3.8%	11	2.2%	19	2.6%	
2	12	5.6%	18	3.5%	30	4.1%	
3	26	12.2%	42	8.2%	68	9.4%	
4	36	16.9%	95	18.6%	131	18.1%	
5	64	30.0%	176	34.5%	240	33.2%	
6	67	31.5%	168	32.9%	235	32.5%	
South	**33**	**100.0%**	**396**	**100.0%**	**429**	**100.0%**	0.366
1	9	27.3%	67	16.9%	76	17.7%	
2	2	6.1%	72	18.2%	74	17.2%	
3	7	21.2%	81	20.5%	88	20.5%	
4	7	21.2%	86	21.7%	93	21.7%	
5	4	12.1%	60	15.2%	64	14.9%	
6	4	12.1%	30	7.6%	34	7.9%	
Central-West	**102**	**100.0%**	**183**	**100.0%**	**285**	**100.0%**	0.301
1	9	8.8%	18	9.8%	27	9.5%	
2	19	18.6%	24	13.1%	43	15.1%	
3	13	12.7%	37	20.2%	50	17.5%	
4	24	23.5%	50	27.3%	74	26.0%	
5	19	18.6%	34	18.6%	53	18.6%	
6	18	17.6%	20	10.9%	38	13.3%	

p - descriptive level of the Chi-square test.

Table II.6 – Distribution of the R$2 type 2 wear level by region and location type

	Location type						p
	Capital cities		Inland cities		Total		
	N	%	N	%	N	%	
North	**80**	**100.0%**	**162**	**100.0%**	**242**	**100.0%**	0.161[a]
1	1	1.3%	2	1.2%	3	1.2%	
2	1	1.3%	8	4.9%	9	3.7%	
3	18	22.5%	17	10.5%	35	14.5%	
4	20	25.0%	41	25.3%	61	25.2%	
5	16	20.0%	41	25.3%	57	23.6%	
6	24	30.0%	53	32.7%	77	31.8%	
Northeast	**134**	**100.0%**	**386**	**100.0%**	**520**	**100.0%**	0.567
1	5	3.7%	7	1.8%	12	2.3%	
2	8	6.0%	16	4.1%	24	4.6%	
3	18	13.4%	46	11.9%	64	12.3%	
4	43	32.1%	115	29.8%	158	30.4%	
5	31	23.1%	109	28.2%	140	26.9%	
6	29	21.6%	93	24.1%	122	23.5%	
Southeast	**201**	**100.0%**	**507**	**100.0%**	**708**	**100.0%**	0.089
1	3	1.5%	23	4.5%	26	3.7%	
2	30	14.9%	74	14.6%	104	14.7%	
3	60	29.9%	121	23.9%	181	25.6%	
4	64	31.8%	162	32.0%	226	31.9%	
5	28	13.9%	99	19.5%	127	17.9%	
6	16	8.0%	28	5.5%	44	6.2%	
South	**33**	**100.0%**	**394**	**100.0%**	**427**	**100.0%**	0.478[a]
1	2	6.1%	31	7.9%	33	7.7%	
2	7	21.2%	97	24.6%	104	24.4%	
3	10	30.3%	157	39.8%	167	39.1%	
4	13	39.4%	90	22.8%	103	24.1%	
5	1	3.0%	15	3.8%	16	3.7%	
6	0	0.0%	4	1.0%	4	0.9%	
Central-West	**102**	**100.0%**	**183**	**100.0%**	**285**	**100.0%**	0.617
1	18	17.6%	32	17.5%	50	17.5%	
2	22	21.6%	49	26.8%	71	24.9%	
3	31	30.4%	42	23.0%	73	25.6%	
4	24	23.5%	43	23.5%	67	23.5%	
5	6	5.9%	11	6.0%	17	6.0%	
6	1	1.0%	6	3.3%	7	2.5%	

p - descriptive level of the Chi-square test or Fischer's exact test([a]).

Table II.7 – Distribution of the R$2 type 1 wear level by region and location

	Location						p
	Capital cities		Inland cities		Total		
	N	%	N	%	N	%	
North	**81**	**100.0%**	**164**	**100.0%**	**245**	**100.0%**	0.003
1	6	7.4%	1	0.6%	7	2.9%	
2	7	8.6%	19	11.6%	26	10.6%	
3	15	18.5%	34	20.7%	49	20.0%	
4	29	35.8%	34	20.7%	63	25.7%	
5	7	8.6%	26	15.9%	33	13.5%	
6	17	21.0%	50	30.5%	67	27.3%	
Northeast	**146**	**100.0%**	**406**	**100.0%**	**552**	**100.0%**	0.765
1	15	10.3%	47	11.6%	62	11.2%	
2	22	15.1%	52	12.8%	74	13.4%	
3	36	24.7%	80	19.7%	116	21.0%	
4	31	21.2%	93	22.9%	124	22.5%	
5	19	13.0%	62	15.3%	81	14.7%	
6	23	15.8%	72	17.7%	95	17.2%	
Southeast	**213**	**100.0%**	**510**	**100.0%**	**723**	**100.0%**	0.017
1	25	11.7%	39	7.6%	64	8.9%	
2	33	15.5%	47	9.2%	80	11.1%	
3	43	20.2%	91	17.8%	134	18.5%	
4	39	18.3%	101	19.8%	140	19.4%	
5	38	17.8%	109	21.4%	147	20.3%	
6	35	16.4%	123	24.1%	158	21.9%	
South	**33**	**100.0%**	**395**	**100.0%**	**428**	**100.0%**	0.310[a]
1	4	12.1%	38	9.6%	42	9.8%	
2	4	12.1%	86	21.8%	90	21.0%	
3	6	18.2%	101	25.6%	107	25.0%	
4	7	21.2%	88	22.3%	95	22.2%	
5	8	24.2%	53	13.4%	61	14.3%	
6	4	12.1%	29	7.3%	33	7.7%	
Central-West	**102**	**100.0%**	**183**	**100.0%**	**285**	**100.0%**	0.010
1	10	9.8%	19	10.4%	29	10.2%	
2	28	27.5%	34	18.6%	62	21.8%	
3	26	25.5%	23	12.6%	49	17.2%	
4	16	15.7%	38	20.8%	54	18.9%	
5	9	8.8%	30	16.4%	39	13.7%	
6	13	12.7%	39	21.3%	52	18.2%	

p - descriptive level of the Chi-square test or Fischer's exact test([a]).

Table II.8 – Summary measures of lifespan (in months) of denominations by wear level

	Average	SD	Minimum	Maximum	1st Quartile	Median	3rd Quartile	N
R$5								
1	7.5	6.9	0.3	41.8	3.0	5.1	9.2	191
2	12.5	9.7	0.1	69.1	5.7	9.8	16.9	266
3	17.0	11.1	0.9	71.5	9.7	15.1	22.0	379
4	22.2	13.0	0.8	70.7	13.3	19.9	27.6	542
5	27.9	15.3	0.5	68.8	16.4	24.8	36.2	457
6	33.7	16.5	0.5	72.0	21.4	28.6	46.3	388
R$10								
1	5.7	8.1	0.2	77.3	2.5	3.6	6.0	160
2	8.6	9.3	0.0	71.4	3.4	5.4	10.4	248
3	13.0	10.1	0.3	67.8	5.9	10.2	17.6	344
4	22.9	17.8	0.2	82.7	11.0	18.0	27.2	474
5	30.7	19.9	0.6	84.0	16.0	25.2	41.0	520
6	39.0	21.6	0.7	86.4	19.5	37.7	60.8	482
R$2 type 2								
1	18.7	6.9	5.2	28.3	12.6	21.7	24.8	124
2	21.6	5.0	5.9	29.0	20.0	23.0	25.2	312
3	22.6	3.9	6.2	31.3	21.6	23.3	25.2	520
4	23.5	3.3	9.9	31.1	22.3	23.9	25.4	613
5	23.8	2.7	12.4	30.1	22.6	24.0	25.4	357
6	24.1	2.6	12.2	29.8	23.2	24.1	25.6	254
R$2 type 1								
1	8.0	7.6	0.6	52.1	3.2	5.6	9.3	202
2	13.3	10.8	0.7	69.5	6.0	9.2	18.7	332
3	20.0	11.6	2.3	64.8	11.1	18.4	27.6	454
4	25.7	12.5	4.4	68.2	16.3	24.1	30.3	476
5	32.3	14.3	7.4	69.3	21.2	29.8	41.9	361
6	39.2	14.9	3.6	70.9	27.6	39.3	51.8	405

Table II.9 – Number of events and censored data – R$5 and R$10 denominations

Factors	N	Wear level	Censored	
			N	%
Total	4,451	2,863	1,588	35.7%
Denomination				
R$5	2,223	1,387	836	37.6%
R$10	2,228	1,476	752	33.8%
Region				
North	491	351	140	28.5%
Northeast	1089	692	397	36.5%
Southeast	1,445	1,101	344	23.8%
South	857	390	467	54.5%
Central-West	569	329	240	42.2%
Region - North				
R$5	246	174	72	29.3%
R$10	245	177	68	27.8%
Region - Northeast				
R$5	541	354	187	34.6%
R$10	548	338	210	38.3%
Region - Southeast				
R$5	722	495	227	31.4%

Factors	N	Wear level	Censored	
			N	%
R$10	723	606	117	16.2%
Region - South				
R$5	429	200	229	53.4%
R$10	428	190	238	55.6%
Region - Central-West				
R$5	285	164	121	42.5%
R$10	284	165	119	41.9%
Region - North				
Capital cities	162	108	54	33.3%
Inland cities	329	243	86	26.1%
Region - Northeast				
Capital cities	290	186	104	35.9%
Inland cities	799	506	293	36.7%
Region - Southeast				
Capital cities	426	305	121	28.4%
Inland cities	1,019	796	223	21.9%
Region - South				
Capital cities	66	32	34	51.5%
Inland cities	791	358	433	54.7%
Region - Central-West				
Capital cities	204	116	88	43.1%
Inland cities	365	213	152	41.6%
Region - North				
1st Quartile	12	7	5	41.7%
2nd Quartile	36	30	6	16.7%
3rd Quartile	84	58	26	31.0%
4th Quartile	359	256	103	28.7%
Region - Northeast				
1st Quartile	15	8	7	46.7%
2nd Quartile	66	37	29	43.9%
3rd Quartile	192	126	66	34.4%
4th Quartile	816	521	295	36.2%
Region - Southeast				
1st Quartile	78	62	16	20.5%
2nd Quartile	246	194	52	21.1%
3rd Quartile	444	357	87	19.6%
4th Quartile	677	488	189	27.9%
Region - South				
1st Quartile	54	23	31	57.4%
2nd Quartile	162	77	85	52.5%
3rd Quartile	264	128	136	51.5%
4th Quartile	377	162	215	57.0%
Region - Central-West				
1st Quartile	18	10	8	44.4%
2nd Quartile	60	31	29	48.3%
3rd Quartile	138	78	60	43.5%
4th Quartile	353	210	143	40.5%

Table II.10 – Accumulated survival function of the Kaplan-Meier model (total and featured) – R$5 and R$10 denominations

	% Accumulated survival										p
	3 months	6 months	12 months	18 months	24 months	30 months	36 months	48 months	60 months	72 months	
Total	99.47 ± 0.11	97.81 ± 0.23	88.61 ± 0.52	72.81 ± 0.76	56.71 ± 0.88	39.12 ± 0.9	33.22 ± 0.88	21.00 ± 0.78	14.22 ± 0.69	3.31 ± 0.37	-
Denomination											<0.001
R$5	99.59 ± 0.14	98.72 ± 0.24	90.65 ± 0.67	74.86 ± 1.05	58.04 ± 1.25	36.30 ± 1.28	29.34 ± 1.23	17.50 ± 1.07	9.13 ± 0.84	(1)	
R$10	99.35 ± 0.17	96.85 ± 0.39	86.47 ± 0.81	70.68 ± 1.11	55.3 ± 1.25	41.67 ± 1.27	36.72 ± 1.26	24.13 ± 1.14	18.59 ± 1.04	5.87 ± 0.65	
Region											<0.001
North	99.38 ± 0.36	96.66 ± 0.85	76.5 ± 2.13	51.32 ± 2.60	31.38 ± 2.48	16.74 ± 2.05	12.32 ± 1.82	6.00 ± 1.32	2.53 ± 0.88	0.79 ± 0.53	
Northeast	99.15 ± 0.28	96.39 ± 0.6	77.42 ± 1.46	49.45 ± 1.84	28.05 ± 1.72	13.44 ± 1.36	8.73 ± 1.15	4.29 ± 0.84	2.14 ± 0.61	0.71 ± 0.36	
Southeast	99.79 ± 0.12	98.77 ± 0.30	94.22 ± 0.64	83.25 ± 1.06	68.79 ± 1.35	51.28 ± 1.48	44.52 ± 1.48	29.37 ± 1.38	21.43 ± 1.25	4.84 ± 0.67	
South	100.00	99.87 ± 0.13	98.59 ± 0.44	93.54 ± 0.99	84.06 ± 1.58	64.91 ± 2.23	58.21 ± 2.35	38.94 ± 2.45	25.34 ± 2.28	6.80 ± 1.42	
Central-West	98.55 ± 0.51	95.67 ± 0.91	88.05 ± 1.54	71.35 ± 2.30	53.85 ± 2.65	30.03 ± 2.57	25.11 ± 2.46	12.93 ± 1.96	7.54 ± 1.56	0.72 ± 0.51	
Region x Denomination											<0.001
Region - North											0.043
R$5	100.00	99.55 ± 0.45	81.12 ± 2.77	56.33 ± 3.61	37.44 ± 3.63	19.31 ± 3.07	13.52 ± 2.69	6.44 ± 1.95	2.58 ± 1.27	(1)	
R$10	98.75 ± 0.72	93.65 ± 1.65	71.60 ± 3.24	46.04 ± 3.71	25.05 ± 3.31	14.05 ± 2.69	11.00 ± 2.43	5.50 ± 1.77	2.44 ± 1.20	1.22 ± 0.86	
Region - Northeast											0.583
R$5	98.5 ± 0.53	96.45 ± 0.82	77.65 ± 2.01	49.48 ± 2.55	30.77 ± 2.45	13.99 ± 1.95	8.25 ± 1.59	5.27 ± 1.32	2.26 ± 0.90	(1)	
R$10	99.8 ± 0.20	96.28 ± 0.89	77.13 ± 2.11	49.43 ± 2.66	25.12 ± 2.41	12.76 ± 1.90	9.06 ± 1.64	3.36 ± 1.04	2.01 ± 0.81	1.34 ± 0.67	
Region - Southeast											<0.001
R$5	100.00	99.13 ± 0.35	95.85 ± 0.78	84.5 ± 1.48	67.77 ± 1.98	45.55 ± 2.19	37.38 ± 2.15	22.35 ± 1.90	12.52 ± 1.55	(1)	
R$10	99.58 ± 0.24	98.42 ± 0.47	92.58 ± 1.02	82.02 ± 1.52	69.55 ± 1.84	55.96 ± 2.00	50.30 ± 2.02	34.95 ± 1.94	28.26 ± 1.83	8.09 ± 1.12	
Region - South											<0.001
R$5	100.00	100.00	99.45 ± 0.39	94.86 ± 1.26	83.17 ± 2.26	60.25 ± 3.2	52.11 ± 3.35	33.12 ± 3.33	17.91 ± 2.89	(1)	
R$10	100.00	99.74 ± 0.26	97.64 ± 0.83	92.09 ± 1.56	85.04 ± 2.19	70.02 ± 3.05	64.78 ± 3.24	45.09 ± 3.55	32.87 ± 3.45	13.12 ± 2.62	
Region - Central-West											0.260
R$5	99.64 ± 0.36	99.27 ± 0.51	94.35 ± 1.53	79.18 ± 2.89	60.55 ± 3.63	30.15 ± 3.6	26.02 ± 3.48	13.79 ± 2.84	5.81 ± 1.97	(1)	
R$10	97.41 ± 0.97	91.66 ± 1.80	80.79 ± 2.74	62.63 ± 3.54	46.43 ± 3.80	29.79 ± 3.66	24.12 ± 3.47	12.06 ± 2.70	9.22 ± 2.41	1.42 ± 0.99	

	% Accumulated survival										p
	3 months	6 months	12 months	18 months	24 months	30 months	36 months	48 months	60 months	72 months	
Region x Location											
Region - North											0.517
Capital cities	99.35 ± 0.64	97.22 ± 1.37	70.18 ± 4.14	44.92 ± 4.66	30.13 ± 4.43	16.8 ± 3.71	11.55 ± 3.21	8.40 ± 2.80	3.15 ± 1.78	2.10 ± 1.46	
Inland cities	99.39 ± 0.43	96.38 ± 1.07	79.34 ± 2.45	54.17 ± 3.11	31.95 ± 3.00	16.75 ± 2.46	12.67 ± 2.20	4.98 ± 1.46	2.26 ± 1.00	0.45 ± 0.45	
Region - Northeast											0.004
Capital cities	99.63 ± 0.37	96.42 ± 1.17	78.61 ± 2.78	52.73 ± 3.52	35.53 ± 3.47	19.34 ± 2.99	12.89 ± 2.60	7.09 ± 2.02	4.51 ± 1.65	1.29 ± 0.90	
Inland cities	98.97 ± 0.36	96.38 ± 0.70	76.99 ± 1.71	48.22 ± 2.16	25.18 ± 1.96	11.19 ± 1.48	7.14 ± 1.23	3.23 ± 0.86	1.24 ± 0.55	0.50 ± 0.35	
Region - Southeast											0.916
Capital cities	99.77 ± 0.23	99.26 ± 0.42	92.77 ± 1.34	82.8 ± 2.01	67.31 ± 2.58	51.96 ± 2.8	44.94 ± 2.81	31.72 ± 2.66	23.84 ± 2.46	3.91 ± 1.16	
Inland cities	99.80 ± 0.14	98.57 ± 0.38	94.79 ± 0.73	83.43 ± 1.25	69.36 ± 1.58	51.02 ± 1.75	44.36 ± 1.75	28.46 ± 1.61	20.50 ± 1.45	5.19 ± 0.81	
Region - South											0.626
Capital cities	100.00	100.00	100.00	95.74 ± 2.94	85.98 ± 5.33	67.6 ± 7.88	54.36 ± 8.69	30.58 ± 8.33	20.39 ± 7.34	10.19 ± 5.55	
Inland cities	100.00	99.86 ± 0.14	98.47 ± 0.48	93.36 ± 1.05	83.92 ± 1.65	64.7 ± 2.32	58.55 ± 2.44	39.65 ± 2.56	25.76 ± 2.39	6.43 ± 1.45	
Region - Central-West											0.823
Capital cities	99.01 ± 0.70	94.74 ± 1.72	85.85 ± 2.82	69.49 ± 4.01	50.27 ± 4.54	34.69 ± 4.44	27.95 ± 4.25	12.01 ± 3.19	8.01 ± 2.68	(1)	
Inland cities	98.29 ± 0.69	96.13 ± 1.05	89.18 ± 1.82	72.29 ± 2.80	55.71 ± 3.25	27.33 ± 3.13	23.46 ± 3.01	13.4 ± 2.48	7.26 ± 1.92	1.12 ± 0.78	
Region x Size											
Region - North											0.171
1st Quartile	100.00	100.00	100.00	75.00 ± 15.31	50.00 ± 17.68	33.33 ± 18.00	16.67 ± 14.83	16.67 ± 14.83	16.67 ± 14.83	16.67 ± 14.83	
2nd Quartile	100.00	97.06 ± 2.90	83.77 ± 6.66	56.96 ± 9.03	40.21 ± 8.96	26.81 ± 8.10	23.46 ± 7.75	6.70 ± 4.58	3.35 ± 3.29	(1)	
3rd Quartile	98.75 ± 1.24	94.78 ± 2.54	74.90 ± 5.31	59.19 ± 6.28	39.38 ± 6.42	16.88 ± 5.07	13.13 ± 4.58	5.63 ± 3.14	(1)	(1)	
4th Quartile	99.44 ± 0.40	96.94 ± 0.95	75.35 ± 2.53	48.20 ± 3.04	27.91 ± 2.83	14.93 ± 2.30	10.54 ± 2.00	5.71 ± 1.52	2.64 ± 1.06	0.59 ± 0.56	
Region - Northeast											0.047
1st Quartile	100.00	100.00	68.57 ± 15.15	57.14 ± 16.38	28.57 ± 16.47	14.29 ± 13.03	14.29 ± 13.03	14.29 ± 13.03	14.29 ± 13.03	14.29 ± 13.03	
2nd Quartile	98.44 ± 1.55	96.54 ± 2.41	86.17 ± 4.89	55.36 ± 7.6	41.74 ± 7.81	28.91 ± 7.64	18.07 ± 6.88	14.46 ± 6.38	7.23 ± 4.82	(1)	
3rd Quartile	99.47 ± 0.52	95.93 ± 1.51	77.84 ± 3.43	56.98 ± 4.21	30.65 ± 4.1	13.41 ± 3.19	8.62 ± 2.68	3.83 ± 1.86	2.87 ± 1.62	0.96 ± 0.95	

	% Accumulated survival										p
	3 months	**6 months**	**12 months**	**18 months**	**24 months**	**30 months**	**36 months**	**48 months**	**60 months**	**72 months**	
4th Quartile	99.11 ± 0.33	96.42 ± 0.69	76.77 ± 1.70	46.93 ± 2.14	26.3 ± 1.96	12.31 ± 1.51	7.98 ± 1.27	3.54 ± 0.88	1.42 ± 0.57	0.47 ± 0.33	
Region - Southeast											0.919
1st Quartile	100.00	100.00	0 ± 0	90.06 ± 3.57	70.05 ± 5.63	58.94 ± 6.11	50.97 ± 6.24	32.44 ± 5.97	20.49 ± 5.21	5.12 ± 2.87	
2nd Quartile	100.00	100.00	95.62 ± 1.35	84.46 ± 2.45	70.26 ± 3.16	50.30 ± 3.53	42.9 ± 3.52	29.06 ± 3.27	23.14 ± 3.05	6.46 ± 1.80	
3rd Quartile	99.55 ± 0.32	98.61 ± 0.56	93.9 ± 1.18	83.49 ± 1.88	68.67 ± 2.39	50.76 ± 2.62	44.17 ± 2.61	29.74 ± 2.43	20.45 ± 2.16	4.17 ± 1.09	
4th Quartile	99.85 ± 0.15	98.27 ± 0.52	93.68 ± 0.99	81.76 ± 1.63	68.17 ± 2.02	51.10 ± 2.22	44.62 ± 2.22	28.84 ± 2.06	21.60 ± 1.89	4.64 ± 1.00	
Region - South											0.274
1st Quartile	100.00	100.00	100.00	95.09 ± 3.4	85.25 ± 6.18	66.25 ± 8.92	62.35 ± 9.21	54.56 ± 9.56	42.87 ± 9.61	18.75 ± 8.59	
2nd Quartile	100.00	100.00	99.22 ± 0.77	94.84 ± 2.06	83.94 ± 3.59	69.6 ± 4.81	64.56 ± 5.08	39.28 ± 5.51	25.49 ± 5.16	6.37 ± 3.05	
3rd Quartile	100.00	100.00	98.16 ± 0.91	91.85 ± 1.96	82.27 ± 2.87	64.52 ± 3.88	56.43 ± 4.15	34.20 ± 4.22	21.36 ± 3.80	8.63 ± 2.73	
4th Quartile	100.00	99.7 ± 0.3	98.39 ± 0.72	93.96 ± 1.48	85.24 ± 2.38	62.56 ± 3.55	55.62 ± 3.72	39.67 ± 3.82	25.2 ± 3.55	3.88 ± 1.68	
Region - Central-West											0.457
1st Quartile	94.44 ± 5.40	87.70 ± 8.21	79.73 ± 10.65	60.74 ± 14.32	36.45 ± 15.84	24.3 ± 14.49	24.3 ± 14.49	(1)	(1)	(1)	
2nd Quartile	100.00	98.08 ± 1.90	91.60 ± 4.04	78.04 ± 6.59	56.55 ± 8.42	41.96 ± 8.89	34.33 ± 8.76	11.44 ± 6.13	7.63 ± 5.14	(1)	
3rd Quartile	99.28 ± 0.72	97.52 ± 1.42	91.55 ± 2.71	68.97 ± 4.85	49.69 ± 5.50	29.63 ± 5.29	25.18 ± 5.08	7.41 ± 3.16	4.44 ± 2.50	(1)	
4th Quartile	98.23 ± 0.72	94.93 ± 1.24	86.51 ± 2.05	71.71 ± 2.87	55.69 ± 3.30	28.72 ± 3.17	23.79 ± 3.02	15.90 ± 2.66	9.09 ± 2.12	1.14 ± 0.80	

p - descriptive level of the Long Rank test
(1) Absence of cases.

Table II.11 – Average time, median time, wear level 25 and 75 percentiles via Kaplan-Meier model – R$5 and R$10 denominations

Factors	Mean ± SE	P25 ± SE	Median ± SE	P75 ± SE
Total	31.67 ± 0.35	42.97 ± 0.93	26.53 ± 0.27	17.33 ± 0.24
Denomination				
R$5	30.03 ± 0.42	39.39 ± 1.10	26.50 ± 0.35	17.92 ± 0.42
R$10	33.01 ± 0.54	46.98 ± 1.56	26.53 ± 0.44	16.80 ± 0.30
Region				
North	21.48 ± 0.72	25.81 ± 0.70	18.44 ± 0.68	12.56 ± 0.85
Northeast	20.44 ± 0.47	25.32 ± 0.63	17.88 ± 0.35	12.76 ± 0.43
Southeast	37.11 ± 0.59	53.13 ± 1.90	30.94 ± 0.94	21.37 ± 0.48
South	42.66 ± 0.88	60.07 ± 2.08	39.65 ± 1.31	27.39 ± 0.50
Central-West	28.20 ± 0.88	36.23 ± 2.97	25.08 ± 0.73	17.36 ± 0.54
Region - North				
R$5	22.80 ± 0.96	26.24 ± 1.46	20.48 ± 1.3	13.81 ± 0.98
R$10	20.03 ± 1.06	24.36 ± 1.59	16.60 ± 1.05	10.42 ± 1.15
Region - Northeast				
R$5	20.64 ± 0.65	26.63 ± 0.78	17.79 ± 0.65	12.82 ± 0.47
R$10	20.18 ± 0.67	24.13 ± 0.86	17.95 ± 0.41	12.56 ± 0.65
Region - Southeast				
R$5	33.80 ± 0.73	44.28 ± 2.07	28.54 ± 0.61	21.21 ± 0.50
R$10	39.64 ± 0.87	62.27 ± 1.49	36.82 ± 1.73	21.44 ± 0.86
Region - South				
R$5	39.17 ± 1.03	51.48 ± 1.13	37.08 ± 2.08	27.39 ± 0.72
R$10	46.15 ± 1.38	63.78 ± 1.41	44.28 ± 2.62	27.39 ± 1.07
Region - Central-West				
R$5	29.31 ± 1.10	36.76 ± 4.05	26.30 ± 0.91	20.09 ± 1.04
R$10	26.90 ± 1.40	35.11 ± 4.69	22.75 ± 1.71	15.39 ± 1.36
Region - North				
Capital cities	20.92 ± 1.41	24.85 ± 0.97	17.10 ± 1.11	11.05 ± 0.79
Inland cities	21.75 ± 0.84	26.01 ± 0.89	18.97 ± 0.91	14.30 ± 1.09
Region - Northeast				
Capital cities	22.73 ± 1.08	27.45 ± 1.10	18.64 ± 0.82	13.18 ± 0.90
Inland cities	19.57 ± 0.49	24.13 ± 0.65	17.69 ± 0.41	12.56 ± 0.48
Region - Southeast				
Capital cities	37.37 ± 1.13	58.55 ± 2.48	30.94 ± 1.86	20.94 ± 0.84
Inland cities	37.01 ± 0.69	52.04 ± 2.32	31.00 ± 1.02	21.40 ± 0.58
Region - South				
Capital cities	41.59 ± 3.40	52.57 ± 9.55	36.69 ± 2.97	27.39 ± 1.61
Inland cities	42.72 ± 0.91	60.20 ± 2.10	39.98 ± 1.35	27.39 ± 0.56
Region - Central-West				
Capital cities	28.19 ± 1.49	40.64 ± 4.03	24.20 ± 1.51	17.29 ± 0.75
Inland cities	28.17 ± 1.10	31.46 ± 3.90	25.28 ± 0.81	17.36 ± 1.06
Region - North				
1st Quartile	31.27 ± 7.92	30.71 ± 3.86	23.77 ± 3.39	17.62 ± 3.22
2nd Quartile	24.46 ± 2.72	31.46 ± 8.92	19.33 ± 2.37	14.73 ± 1.37
3rd Quartile	21.94 ± 1.61	26.83 ± 1.45	20.25 ± 1.84	10.62 ± 2.55
4th Quartile	20.73 ± 0.83	24.56 ± 0.72	17.42 ± 0.84	12.07 ± 0.74
Region - Northeast				
1st Quartile	25.30 ± 8.70	27.98 ± 4.29	18.58 ± 3.13	10.95 ± 3.88
2nd Quartile	25.06 ± 2.66	33.11 ± 2.78	21.04 ± 3.52	13.38 ± 1.40
3rd Quartile	21.33 ± 1.11	25.64 ± 1.31	19.50 ± 1.01	13.55 ± 1.04
4th Quartile	19.79 ± 0.51	24.33 ± 0.68	17.52 ± 0.37	12.53 ± 0.49
Region - Southeast				
1st Quartile	38.70 ± 2.40	55.86 ± 4.56	36.03 ± 3.91	22.49 ± 1.81
2nd Quartile	37.49 ± 1.41	56.58 ± 4.93	30.28 ± 1.60	21.86 ± 1.14
3rd Quartile	36.82 ± 1.01	52.11 ± 2.87	30.35 ± 1.51	21.70 ± 0.80

Factors	Mean ± SE	P25 ± SE	Median ± SE	P75 ± SE
4th Quartile	36.98 ± 0.89	53.13 ± 2.95	30.9 ± 1.43	21.11 ± 0.77
Region - South				
1st Quartile	48.48 ± 4.15	68.68 ± 6.20	50.20 ± 9.69	27.39 ± 2.30
2nd Quartile	43.47 ± 1.91	60.07 ± 4.22	43.17 ± 2.24	29.06 ± 1.44
3rd Quartile	41.13 ± 1.56	55.50 ± 4.19	38.43 ± 1.22	26.93 ± 0.95
4th Quartile	42.45 ± 1.36	60.72 ± 2.94	39.72 ± 3.02	27.29 ± 0.57
Region - Central-West				
1st Quartile	23.16 ± 4.47	24.2 ± 10.78	22.92 ± 3.91	12.89 ± 6.67
2nd Quartile	30.42 ± 2.78	42.74 ± 4.82	27.52 ± 2.83	18.48 ± 1.47
3rd Quartile	27.19 ± 1.63	37.32 ± 5.52	23.77 ± 1.32	16.73 ± 0.90
4th Quartile	28.49 ± 1.16	31.46 ± 3.53	25.84 ± 0.87	17.29 ± 0.79

Table II.12 – Number of events and censored data – R$2 denomination – total sample

Factors	N	Wear level	Censored	
			N	%
Total	4,410	2,466	1,944	44.1%
Type				
R$2 type 1	2,230	1,242	988	44.3%
R$2 type 2	2,180	1,224	956	43.9%
Region				
North	487	358	129	26.5%
Northeast	1,067	718	349	32.7%
Southeast	1,431	842	589	41.2%
South	855	312	543	63.5%
Central-West	570	236	334	58.6%
Region - North				
R$2 type 1	245	163	82	33.5%
R$2 type 2	242	195	47	19.4%
Region - Northeast				
R$2 type 1	549	300	249	45.4%
R$2 type 2	518	418	100	19.3%
Region - Southeast				
R$2 type 1	723	445	278	38.5%
R$2 type 2	708	397	311	43.9%
Region - South				
R$2 type 1	428	189	239	55.8%
R$2 type 2	427	123	304	71.2%
Region - Central-West				
R$2 type 1	285	145	140	49.1%
R$2 type 2	285	91	194	68.1%
Region - North				
Capital cities	161	113	48	29.8%
Inland cities	326	245	81	24.8%
Region - Northeast				
Capital cities	280	176	104	37.1%
Inland cities	787	542	245	31.1%
Region - Southeast				
Capital cities	414	220	194	46.9%
Inland cities	1,017	622	395	38.8%
Region - South				
Capital cities	66	33	33	50.0%
Inland cities	789	279	510	64.6%
Region - Central-West				
Capital cities	204	69	135	66.2%
Inland cities	366	167	199	54.4%

Factors	N	Wear level	Censored	
			N	%
Region - North				
1st Quartile	12	3	9	75.0%
2nd Quartile	36	25	11	30.6%
3rd Quartile	83	65	18	21.7%
4th Quartile	356	265	91	25.6%
Region - Northeast				
1st Quartile	18	13	5	27.8%
2nd Quartile	66	37	29	43.9%
3rd Quartile	185	127	58	31.4%
4th Quartile	798	541	257	32.2%
Region - Southeast				
1st Quartile	75	41	34	45.3%
2nd Quartile	242	134	108	44.6%
3rd Quartile	444	273	171	38.5%
4th Quartile	670	394	276	41.2%
Region - South				
1st Quartile	54	17	37	68.5%
2nd Quartile	161	50	111	68.9%
3rd Quartile	263	102	161	61.2%
4th Quartile	377	143	234	62.1%
Region - Central-West				
1st Quartile	18	4	14	77.8%
2nd Quartile	60	27	33	55.0%
3rd Quartile	138	57	81	58.7%
4th Quartile	354	148	206	58.2%

Table II.13 – Accumulated survival function of the Kaplan-Meier model (total and featured) – R$2 denomination – total sample

	% Accumulated survival										p
	3 months	6 months	12 months	18 months	24 months	30 months	36 months	48 months	60 months	72 months	
Total	100.00	99.84 ± 0.06	98.09 ± 0.22	92.65 ± 0.43	69.34 ± 0.81	33.62 ± 0.95	25.29 ± 0.92	13.1 ± 0.77	6.03 ± 0.58	(1)	-
Denomination											<0.001
R$2 type 1	100.00	99.66 ± 0.13	96.03 ± 0.46	86.77 ± 0.83	74.57 ± 1.10	54.17 ± 1.33	40.99 ± 1.37	21.24 ± 1.21	9.77 ± 0.92	(1)	
R$2 type 2	100.00	100.00	99.86 ± 0.08	97.44 ± 0.35	64.43 ± 1.16	2.01 ± 0.69	(1)	(1)	(1)	(1)	
Region											<0.001
North	100.00	99.15 ± 0.43	94.15 ± 1.11	83.19 ± 1.83	40.61 ± 2.55	12.57 ± 1.82	10.03 ± 1.66	4.61 ± 1.20	0.71 ± 0.50	(1)	
Northeast	100.00	100.00	96.66 ± 0.59	86.34 ± 1.17	51.52 ± 1.79	14.04 ± 1.36	6.9 ± 1.03	0.92 ± 0.41	0.37 ± 0.26	(1)	
Southeast	100.00	99.86 ± 0.1	99.1 ± 0.26	95.75 ± 0.57	81.32 ± 1.13	38.99 ± 1.65	30.44 ± 1.63	16.67 ± 1.41	8.17 ± 1.08	(1)	
South	100.00	99.88 ± 0.12	99.76 ± 0.17	98.59 ± 0.42	83.7 ± 1.52	61.35 ± 2.47	51.45 ± 2.71	31.01 ± 2.79	16.05 ± 2.46	(1)	
Central-West	100.00	100.00	98.93 ± 0.47	94.76 ± 1.07	74.61 ± 2.38	46.35 ± 3.14	33.58 ± 3.15	17.57 ± 2.72	6.26 ± 1.92	(1)	
Region x type											
Region - North											0.003
R$2 type 1	100.00	0.88 ± 95.36	2.32 ± 82.26	3.46 ± 60.5	3.85 ± 39.48	3.46 ± 19.39	3.22 ± 14.74	2.41 ± 5.45	1.02 ± 0.29	(1)	

	% Accumulated survival										p
	3 months	6 months	12 months	18 months	24 months	30 months	36 months	48 months	60 months	72 months	
R$2 type 2	100.00	100.00	0.41 ± 97.09	1.38 ± 91.69	3.36 ± 28.73	(1)	(1)	(1)	(1)	(1)	
Region - Northeast											<0.001
R$2 type 1	100.00	100.00	92.46 ± 1.31	71.38 ± 2.43	49.4 ± 2.81	30.44 ± 2.68	14.95 ± 2.15	1.99 ± 0.88	0.80 ± 0.56	(1)	
R$2 type 2	100.00	100.00	100.00	96.82 ± 0.78	53.38 ± 2.32	(1)	(1)	(1)	(1)	(1)	
Region - Southeast											<0.001
R$2 type 1	100.00	99.71 ± 0.2	98.08 ± 0.55	92.27 ± 1.11	82.41 ± 1.63	60.47 ± 2.18	47.55 ± 2.3	26.03 ± 2.13	12.77 ± 1.66	(1)	
R$2 type 2	100.00	100.00	100.00	98.69 ± 0.43	80.48 ± 1.57	2.66 ± 1.57	(1)	(1)	(1)	(1)	
Region - South											<0.001
R$2 type 1	100.00	99.76 ± 0.24	99.5 ± 0.36	98.08 ± 0.72	92.1 ± 1.53	78.84 ± 2.54	66.86 ± 3.09	40.31 ± 3.48	20.86 ± 3.15	(1)	
R$2 type 2	100.00	100.00	100.00	99.04 ± 0.48	74.2 ± 2.69	13.53 ± 5.09	(1)	(1)	(1)	(1)	
Region - Central-West											<0.001
R$2 type 1	100.00	100.00	98.58 ± 0.82	95.07 ± 1.52	89.08 ± 2.26	62.46 ± 3.74	45.25 ± 3.99	23.67 ± 3.59	8.44 ± 2.57	(1)	
R$2 type 2	100.00	100.00	99.23 ± 0.54	94.53 ± 1.48	53.77 ± 4.49	(1)	(1)	(1)	(1)	(1)	
Region x Location											
Region - North											0.946
Capital cities	100.00	98.72 ± 0.9	91.77 ± 2.28	81.36 ± 3.31	39.38 ± 4.52	11.78 ± 3.24	9.64 ± 2.99	4.28 ± 2.08	(1)	(1)	
Inland cities	100.00	99.36 ± 0.45	95.31 ± 1.22	84.1 ± 2.18	41.05 ± 3.09	12.86 ± 2.19	10.17 ± 1.99	4.73 ± 1.46	1.05 ± 0.73	(1)	
Region - Northeast											0.387
Capital cities	100.00	100.00	97.04 ± 1.1	85.71 ± 2.38	59.24 ± 3.48	14.39 ± 2.81	7.20 ± 2.14	(1)	(1)	(1)	
Inland cities	100.00	100.00	96.54 ± 0.69	86.54 ± 1.35	48.91 ± 2.07	13.89 ± 1.55	6.79 ± 1.17	1.23 ± 0.54	0.49 ± 0.35	(1)	
Region - Southeast											0.023
Capital cities	100.00	99.50 ± 0.35	98.39 ± 0.65	94.27 ± 1.25	81.34 ± 2.21	31.26 ± 3.14	24.88 ± 3.04	12.64 ± 2.54	5.12 ± 1.78	(1)	
Inland cities	100.00	100.00	99.37 ± 0.26	96.31 ± 0.62	81.37 ± 1.32	41.71 ± 1.93	32.41 ± 1.92	18.06 ± 1.68	9.17 ± 1.31	(1)	
Region - South											0.675
Capital cities	100.00	100.00	100.00	100.00	84.53 ± 5.47	58.87 ± 8.12	43.37 ± 8.47	25.47 ± 7.91	18.20 ± 7.13	(1)	
Inland cities	100.00	99.87 ± 0.13	99.74 ± 0.19	98.47 ± 0.46	83.64 ± 1.59	61.68 ± 2.59	52.56 ± 2.84	31.79 ± 2.98	15.68 ± 2.63	(1)	
Region - Central-West											0.569
Capital cities	100.00	100.00	100.00	95.74 ± 1.70	75.28 ± 4.16	42.16 ± 5.92	34.83 ± 5.92	18.58 ± 5.26	10.61 ± 4.6	(1)	
Inland cities	100.00	100.00	98.4 ± 0.71	94.27 ± 1.35	74.31 ± 2.90	47.98 ± 3.70	33.10 ± 3.72	17.23 ± 3.18	4.80 ± 2.00	(1)	
Region x Size											
Region - North											0.083

	% Accumulated survival										p
	3 months	**6 months**	**12 months**	**18 months**	**24 months**	**30 months**	**36 months**	**48 months**	**60 months**	**72 months**	
1st Quartile	100.00	100.00	90.91 ± 8.67	90.91 ± 8.67	68.18 ± 20.73	(1)	(1)	(1)	(1)	(1)	
2nd Quartile	100.00	100.00	97.06 ± 2.90	93.71 ± 4.32	76.06 ± 7.94	20.01 ± 7.96	15.01 ± 7.38	10.01 ± 6.39	(1)	(1)	
3rd Quartile	100.00	100.00	97.37 ± 1.84	79.61 ± 4.7	35.95 ± 5.87	8.28 ± 3.51	8.28 ± 3.51	6.21 ± 3.18	2.07 ± 2.00	(1)	
4th Quartile	100.00	98.83 ± 0.58	93.24 ± 1.39	82.9 ± 2.15	37.71 ± 2.94	12.88 ± 2.14	9.88 ± 1.92	3.70 ± 1.25	0.46 ± 0.46	(1)	
Region - Northeast											0.469
1st Quartile	100.00	100.00	93.75 ± 6.05	79.33 ± 10.69	64.9 ± 12.71	16.83 ± 10.69	(1)	(1)	(1)	(1)	
2nd Quartile	100.00	100.00	100.00	91.66 ± 4.00	55.65 ± 7.69	19.99 ± 6.87	13.33 ± 5.98	(1)	(1)	(1)	
3rd Quartile	100.00	100.00	96.09 ± 1.57	86.77 ± 2.83	52.98 ± 4.31	10.59 ± 2.84	6.18 ± 2.24	0.88 ± 0.88	(1)	(1)	
4th Quartile	100.00	100.00	96.60 ± 0.68	85.99 ± 1.36	50.52 ± 2.06	14.39 ± 1.58	6.3 ± 1.15	1.03 ± 0.51	0.26 ± 0.26	(1)	
Region - Southeast											0.102
1st Quartile	100.00	100.00	100.00	95.67 ± 2.44	77.48 ± 5.32	51.18 ± 7.26	39.14 ± 7.65	23.18 ± 7.15	16.56 ± 6.46	(1)	
2nd Quartile	100.00	100.00	99.11 ± 0.63	95.37 ± 1.43	84.98 ± 2.49	45.59 ± 4.13	34.32 ± 4.2	19.36 ± 3.83	10.76 ± 3.11	(1)	
3rd Quartile	100.00	99.77 ± 0.23	99.29 ± 0.41	96.74 ± 0.89	82.24 ± 1.99	38.03 ± 2.9	28.71 ± 2.82	16.01 ± 2.41	6.79 ± 1.72	(1)	
4th Quartile	100.00	99.85 ± 0.15	98.86 ± 0.43	95.24 ± 0.88	79.76 ± 1.72	35.84 ± 2.4	29.15 ± 2.36	15.41 ± 2.00	7.41 ± 1.51	(1)	
Region - South											0.845
1st Quartile	100.00	100.00	100.00	97.92 ± 2.06	87.20 ± 5.48	75.12 ± 9.24	61.46 ± 11.55	27.32 ± 11.4	(1)	(1)	
2nd Quartile	100.00	100.00	100.00	100.00	88.19 ± 2.99	68.7 ± 5.56	51.44 ± 6.74	25.08 ± 6.5	13.54 ± 6.23	(1)	
3rd Quartile	100.00	100.00	100.00	98.36 ± 0.81	81.9 ± 2.81	56.11 ± 4.41	50.46 ± 4.64	30.29 ± 4.94	19.05 ± 4.59	(1)	
4th Quartile	100.00	99.73 ± 0.27	99.44 ± 0.39	98.25 ± 0.71	82.61 ± 2.4	60.58 ± 3.71	50.92 ± 4.03	34.23 ± 4.17	17.01 ± 3.62	(1)	
Region - Central-West											0.212
1st Quartile	100.00	100.00	100.00	100.00	87.5 ± 11.69	65.63 ± 20.88	65.63 ± 20.88	65.63 ± 20.88	32.81 ± 25.44	(1)	
2nd Quartile	100.00	100.00	97.96 ± 2.02	93.5 ± 3.63	73.13 ± 7.44	51.81 ± 9.1	28.26 ± 9.23	(1)	(1)	(1)	
3rd Quartile	100.00	100.00	98.37 ± 1.15	95.81 ± 1.84	75.29 ± 4.84	46.98 ± 6.3	32.68 ± 6.29	24.51 ± 5.9	9.34 ± 4.78	(1)	
4th Quartile	100.00	100.00	99.28 ± 0.5	94.24 ± 1.44	73.95 ± 3.03	44.15 ± 4	33.64 ± 3.97	16.77 ± 3.39	5.48 ± 2.26	(1)	

p - descriptive level of the Long Rank test
(1) Absence of cases.

Figure II.1 – Cumulative survival function of the Kaplan-Meier model – Country – R$2 denomination – total sample

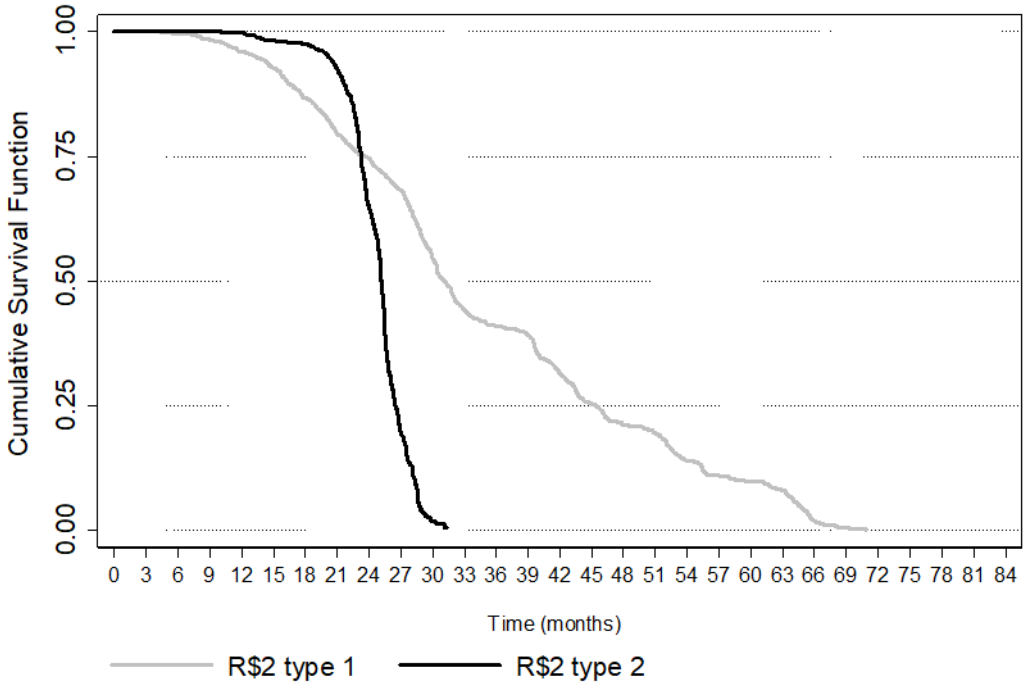


Figure II.2 – Cumulative survival function of the Kaplan-Meier model by region – R$2 denomination – total sample

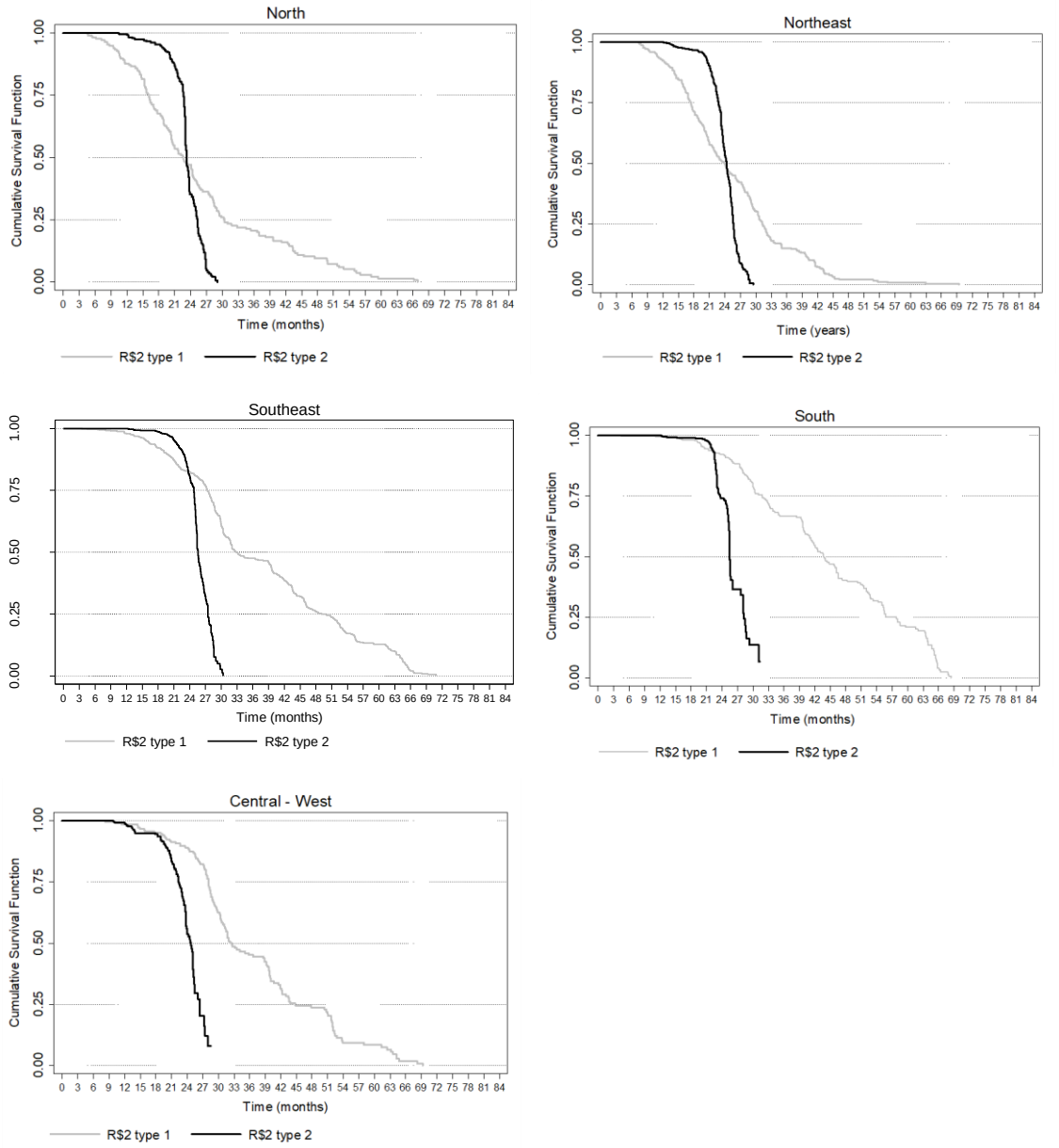


Table II.14 – Average time, median time, wear level 25 and 75 percentiles via Kaplan-Meier model – R$2 denomination – total sample

Factors	Mean ± SE	P25 ± SE	Median ± SE	P75 ± SE
Total	31.13 ± 0.27	36.95 ± 0.9	26.33 ± 0.17	23.28 ± 0.09
Type				
R$2 type 1	35.01 ± 0.42	45.30 ± 1.00	31.13 ± 0.37	23.64 ± 0.56
R$2 type 2	24.78 ± 0.07	26.5 ± 0.11	25.15 ± 0.05	23.24 ± 0.06
Region				
North	24.62 ± 0.51	26.24 ± 0.37	23.24 ± 0.15	20.45 ± 0.52
Northeast	24.68 ± 0.27	26.66 ± 0.33	24.23 ± 0.19	21.44 ± 0.25
Southeast	33.44 ± 0.47	41.88 ± 1.38	28.04 ± 0.22	24.95 ± 0.13

Factors	Mean ± SE	P25 ± SE	Median ± SE	P75 ± SE
South	40.00 ± 0.84	52.87 ± 1.43	39.48 ± 2.05	25.51 ± 0.46
Central-West	33.38 ± 0.85	40.70 ± 1.21	28.96 ± 0.7	23.93 ± 0.43
Region - North				
R$2 type 1	25.73 ± 1.04	30.44 ± 2.63	22.62 ± 1.17	16.11 ± 0.6
R$2 type 2	23.37 ± 0.20	25.28 ± 0.19	23.31 ± 0.1	22.72 ± 0.15
Region - Northeast				
R$2 type 1	25.31 ± 0.59	31.27 ± 0.6	23.93 ± 1.1	17.49 ± 0.49
R$2 type 2	24.02 ± 0.13	25.64 ± 0.07	24.36 ± 0.16	22.75 ± 0.16
Region - Southeast				
R$2 type 1	37.86 ± 0.69	50.01 ± 1.41	32.91 ± 1.73	27.32 ± 0.52
R$2 type 2	25.70 ± 0.11	27.48 ± 0.17	25.61 ± 0.10	24.82 ± 0.15
Region - South				
R$2 type 1	44.56 ± 0.98	57.83 ± 2.08	43.73 ± 1.31	31.82 ± 0.92
R$2 type 2	26.05 ± 0.27	28.18 ± 0.34	25.41 ± 0.05	23.64 ± 0.44
Region - Central-West				
R$2 type 1	37.12 ± 1.06	44.84 ± 3.06	32.61 ± 1.91	28.04 ± 0.37
R$2 type 2	23.92 ± 0.29	26.43 ± 0.69	24.76 ± 0.49	22.42 ± 0.47
Region - North				
Capital cities	24.32 ± 0.87	26.24 ± 0.8	23.31 ± 0.19	20.32 ± 1.34
Inland cities	24.75 ± 0.63	26.24 ± 0.43	23.18 ± 0.18	20.48 ± 0.54
Region - Northeast				
Capital cities	24.79 ± 0.51	26.99 ± 0.66	24.62 ± 0.24	22.29 ± 0.64
Inland cities	24.64 ± 0.32	26.33 ± 0.34	23.93 ± 0.17	21.37 ± 0.25
Region - Southeast				
Capital cities	31.50 ± 0.84	33.63 ± 3.47	27.48 ± 0.48	25.08 ± 0.14
Inland cities	34.12 ± 0.55	43.4 ± 1.17	28.11 ± 0.34	24.92 ± 0.15
Region - South				
Capital cities	38.95 ± 2.64	55.36 ± 7.51	33.83 ± 3.05	25.91 ± 1.73
Inland cities	40.16 ± 0.88	52.87 ± 1.29	39.65 ± 2.27	25.45 ± 0.45
Region - Central-West				
Capital cities	34.08 ± 1.76	41.59 ± 2.03	28.77 ± 0.82	24.23 ± 0.85
Inland cities	33.14 ± 0.97	40.14 ± 1.41	29.23 ± 1.07	23.77 ± 0.50
Region - North				
1st Quartile	23.64 ± 1.50	25.41 (1)	25.41 (1)	23.08 ± 10.34
2nd Quartile	28.59 ± 2.13	28.47 ± 3.9	25.28 ± 0.54	24.33 ± 1.35
3rd Quartile	24.08 ± 1.27	25.41 ± 0.29	22.98 ± 0.26	19.07 ± 2.00
4th Quartile	24.32 ± 0.57	26.24 ± 0.62	23.18 ± 0.09	20.32 ± 0.60
Region - Northeast				
1st Quartile	25.21 ± 2.52	28.8 ± 1.27	26.33 ± 1.58	18.94 ± 5.57
2nd Quartile	26.46 ± 1.20	27.19 ± 1.35	25.35 ± 1.02	23.24 ± 1.21
3rd Quartile	24.44 ± 0.68	26.04 ± 0.36	24.33 ± 0.40	21.47 ± 0.51
4th Quartile	24.59 ± 0.31	26.7 ± 0.46	24.13 ± 0.18	21.40 ± 0.30
Region - Southeast				
1st Quartile	36.47 ± 2.42	47.84 ± 5.84	30.38 ± 1.49	25.15 ± 0.98
2nd Quartile	34.94 ± 1.25	43.69 ± 2.87	29.29 ± 0.70	25.15 ± 0.14
3rd Quartile	33.07 ± 0.78	41.65 ± 2.79	27.78 ± 0.36	25.05 ± 0.16
4th Quartile	32.80 ± 0.67	40.57 ± 2.59	27.48 ± 0.34	24.82 ± 0.23
Region - South				
1st Quartile	40.71 ± 2.73	55.00 ± 5.09	39.91 ± 5.13	34.16 ± 4.96
2nd Quartile	39.46 ± 1.98	48.30 ± 3.46	38.47 ± 3.98	28.04 ± 1.63
3rd Quartile	39.75 ± 1.52	55.36 ± 5.27	39.55 ± 4.68	25.38 ± 0.39
4th Quartile	40.30 ± 1.27	52.70 ± 1.50	39.48 ± 3.07	25.38 ± 0.29
Region - Central-West				
1st Quartile	47.1 ± 8.27	64.24 (1)	52.11 ± 18.33	28.47 ± 6.62
2nd Quartile	30.13 ± 1.50	38.96 ± 4.26	30.31 ± 1.52	23.87 ± 1.79
3rd Quartile	34.35 ± 1.89	40.01 ± 6.43	29.69 ± 2.66	24.23 ± 0.47

Factors	Mean ± SE	P25 ± SE	Median ± SE	P75 ± SE
4th Quartile	33.13 ± 1.06	41.88 ± 1.33	28.57 ± 0.61	23.93 ± 0.66

(1) The SE estimation was not possible.

Table II.15 – Cox model – Varnish type effect – R$2 denomination – total sample

	Univariate		Multivariate 1		Multivariate 2		Multivariate 3 (variable varying over time)	
	Crude HR (IC95%)	p	Adjusted HR (IC95%)	p	Adjusted HR (IC95%)	p	Adjusted HR (IC95%)	p
Type 2 (ref.= Type 1)	3.13 (2.81 - 3.48)	<0.001	2.81 (2.52 - 3.13)	<0.001	2.81 (2.52 - 3.13)	<0.001	0.002 (0.001 - 0.003)	<0.001
Region (ref.= Southeast)		<0.001		<0.001		<0.001		<0.001
North	2.46 (2.17 - 2.79)	<0.001	2.33 (2.05 - 2.64)	<0.001	2.33 (2.05 - 2.64)	<0.001	6.60 (4.51 - 9.66)	<0.001
Northeast	2.41 (2.18 - 2.67)	<0.001	2.16 (1.94 - 2.40)	<0.001	2.16 (1.94 - 2.40)	<0.001	3.44 (2.44 - 4.85)	<0.001
South	0.66 (0.58 - 0.75)	<0.001	0.7 (0.61 - 0.8)	<0.001	0.70 (0.61 - 0.80)	<0.001	0.57 (0.41 - 0.80)	0.001
Central-West	1.02 (0.89 - 1.18)	0.747	1.14 (0.98 - 1.31)	0.089	1.14 (0.98 - 1.31)	0.089	1.42 (0.98 - 2.07)	0.066
Capital (ref.=Inland)	0.85 (0.77 - 0.93)	<0.001	1.00 (0.91 - 1.10)	0.956	-	-	-	-
Size (ref.= 1st Quartile		<0.001		0.002		0.002		<0.001
2nd Quartile	1.12 (0.87 - 1.45)	0.360	1.09 (0.84 - 1.40)	0.518	1.09 (0.84 - 1.40)	0.518	1.08 (0.84 - 1.39)	0.539
3rd Quartile	1.36 (1.08 - 1.72)	0.010	1.30 (1.02 - 1.64)	0.032	1.30 (1.02 - 1.64)	0.032	1.35 (1.07 - 1.71)	0.012
4th Quartile	1.69 (1.35 - 2.12)	<0.001	1.35 (1.07 - 1.69)	0.011	1.35 (1.07 - 1.69)	0.011	1.41 (1.12 - 1.77)	0.003
GDP	-	-	-	-	-	-	-	-
Interaction Region x Time								
North							0.96 (0.95 - 0.98)	<0.001
Northeast							0.98 (0.97 - 0.99)	0.006
South							1.01 (1.00 - 1.02)	0.146
Central-West							1.00 (0.98 - 1.01)	0.509
Interaction varnish x time							1.39 (1.35 - 1.42)	<0.001

Table II.16 – Number of events and censored data – R$2 denomination – selected sample

Factors	N	Wear level	Censored	
			N	%
Total	3,196	1,708	1,488	46.6%
Type				
R$2 type 1	1,016	484	532	52.4%

Factors	N	Wear level	Censored	
			N	%
R$2 type 2	2,180	1,224	956	43.9%
Region				
North	395	300	95	24.1%
Northeast	852	604	248	29.1%
Southeast	968	521	447	46.2%
South	605	160	445	73.6%
Central-West	376	123	253	67.3%
Region - North				
R$2 type 1	153	105	48	31.4%
R$2 type 2	242	195	47	19.4%
Region - Northeast				
R$2 type 1	334	186	148	44.3%
R$2 type 2	518	418	100	19.3%
Region - Southeast				
R$2 type 1	260	124	136	52.3%
R$2 type 2	708	397	311	43.9%
Region - South				
R$2 type 1	178	37	141	79.2%
R$2 type 2	427	123	304	71.2%
Region - Central-West				
R$2 type 1	91	32	59	64.8%
R$2 type 2	285	91	194	68.1%
Region - North				
Capital cities	130	93	37	28.5%
Inland cities	265	207	58	21.9%
Region - Northeast				
Capital cities	214	148	66	30.8%
Inland cities	638	456	182	28.5%
Region - Southeast				
Capital cities	286	149	137	47.9%
Inland cities	682	372	310	45.5%
Region - South				
Capital cities	47	18	29	61.7%
Inland cities	558	142	416	74.6%
Region - Central-West				
Capital cities	140	40	100	71.4%
Inland cities	236	83	153	64.8%
Region - North				
1st Quartile	12	3	9	75.0%
2nd Quartile	27	19	8	29.6%
3rd Quartile	71	60	11	15.5%
4th Quartile	285	218	67	23.5%
Region - Northeast				
1st Quartile	14	11	3	21.4%
2nd Quartile	50	31	19	38.0%
3rd Quartile	144	110	34	23.6%
4th Quartile	644	452	192	29.8%
Region - Southeast				
1st Quartile	51	23	28	54.9%
2nd Quartile	163	83	80	49.1%
3rd Quartile	292	163	129	44.2%
4th Quartile	462	252	210	45.5%
Region - South				
1st Quartile	37	5	32	86.5%
2nd Quartile	118	26	92	78.0%

Factors	N	Wear level	Censored	
			N	%
3rd Quartile	182	56	126	69.2%
4th Quartile	268	73	195	72.8%
Region - Central-West				
1st Quartile	13	1	12	92.3%
2nd Quartile	38	14	24	63.2%
3rd Quartile	94	32	62	66.0%
4th Quartile	231	76	155	67.1%

Table II.17 – Cumulative survival function of the Kaplan-Meier model (total and featured) – R$2 denomination – total sample

	% Cumulative survival													p
	3 months	6 months	9 months	12 months	15 months	18 months	21 months	24 months	30 months	36 months	48 months	60 months	72 months	
Total	100.00	100.00	99.48 ± 0.13	98.04 ± 0.25	94.83 ± 0.41	90.75 ± 0.55	82.5 ± 0.74	57.41 ± 1.04	1.74 ± 0.54	(1)	(1)	(1)	(1)	-
Denomination														<0.001
R$2 type 1	100.00	100.00	98.29 ± 0.42	93.51 ± 0.84	86.07 ± 1.23	71.43 ± 1.71	50.89 ± 2.07	34.64 ± 2.13	0.97 ± 0.67	(1)	(1)	(1)	(1)	
R$2 type 2	100.00	100.00	100.00	99.86 ± 0.08	98.18 ± 0.29	97.44 ± 0.35	92.38 ± 0.60	64.43 ± 1.16	2.01 ± 0.69	(1)	(1)	(1)	(1)	
Region														<0.001
North	100.00	100.00	98.71 ± 0.57	94.96 ± 1.13	90.49 ± 1.53	82.11 ± 2.03	69.60 ± 2.49	30.90 ± 2.65	(1)	(1)	(1)	(1)	(1)	
Northeast	100.00	100.00	99.16 ± 0.32	96.89 ± 0.61	91.64 ± 1.00	84.85 ± 1.32	73.96 ± 1.65	43.48 ± 1.94	(1)	(1)	(1)	(1)	(1)	
Southeast	100.00	100.00	99.68 ± 0.18	99.02 ± 0.32	97.12 ± 0.56	94.18 ± 0.79	88.05 ± 1.12	72.51 ± 1.59	2.35 ± 1.20	(1)	(1)	(1)	(1)	
South	100.00	100.00	100.00	99.83 ± 0.17	98.94 ± 0.43	98.18 ± 0.57	94.82 ± 0.99	73.40 ± 2.41	11.95 ± 4.20	(1)	(1)	(1)	(1)	
Central-West	100.00	100.00	99.71 ± 0.29	98.46 ± 0.68	93.69 ± 1.40	92.18 ± 1.57	80.07 ± 2.58	53.85 ± 3.92	(1)	(1)	(1)	(1)	(1)	
Region x type														
Region - North														<0.001
R$2 type 1	100.00	100.00	96.58 ± 1.50	86.73 ± 2.92	77.62 ± 3.69	56.43 ± 4.57	33.79 ± 4.64	22.00 ± 4.17	(1)	(1)	(1)	(1)	(1)	
R$2 type 2	100.00	100.00	100.00	99.59 ± 0.41	97.48 ± 1.01	95.31 ± 1.38	86.85 ± 2.24	35.26 ± 3.36	(1)	(1)	(1)	(1)	(1)	
Region - Northeast														<0.001
R$2 type 1	100.00	100.00	97.76 ± 0.84	91.24 ± 1.68	79.33 ± 2.56	58.16 ± 3.35	34.30 ± 3.46	19.26 ± 3.02	(1)	(1)	(1)	(1)	(1)	
R$2 type 2	100.00	100.00	100.00	100.00	97.82 ± 0.78	96.82 ± 0.78	90.28 ± 1.33	53.38 ± 2.32	(1)	(1)	(1)	(1)	(1)	
Region - Southeast														<0.001
R$2 type 1	100.00	100.00	98.74 ± 0.73	95.91 ± 1.34	90.46 ± 2.04	77.47 ± 3.11	58.66 ± 3.95	36.95 ± 4.28	1.28 ± 1.27	(1)	(1)	(1)	(1)	
R$2 type 2	100.00	100.00	100.00	100.00	99.13 ± 0.35	98.69 ± 0.43	95.22 ± 0.82	80.48 ± 1.57	2.66 ± 1.57	(1)	(1)	(1)	(1)	
Region - South														0.032
R$2 type 1	100.00	100.00	100.00	99.34 ± 0.66	97.95 ± 1.17	95.45 ± 1.83	81.98 ± 4.10	70.19 ± 5.44	7.95 ± 7.23	(1)	(1)	(1)	(1)	
R$2 type 2	100.00	100.00	100.00	100.00	99.28 ± 0.41	99.04 ± 0.48	97.76 ± 0.74	74.20 ± 2.69	13.53 ± 5.09	(1)	(1)	(1)	(1)	

	% Cumulative survival													p
	3 months	6 months	9 months	12 months	15 months	18 months	21 months	24 months	30 months	36 months	48 months	60 months	72 months	
Region - Central-West														0.165
R$2 type 1	100.00	100.00	98.57 ± 1.42	95.49 ± 2.55	88.79 ± 4.01	82.63 ± 5.07	64.96 ± 7.17	51.97 ± 8.17	(1)	(1)	(1)	(1)	(1)	
R$2 type 2	100.00	100.00	100.00	99.23 ± 0.54	95.00 ± 1.41	94.53 ± 1.48	83.59 ± 2.66	53.77 ± 4.49	(1)	(1)	(1)	(1)	(1)	
Region x Location														
Region - North														0.615
Capital cities	100.00	100.00	98.43 ± 1.10	92.72 ± 2.34	89.31 ± 2.81	80.52 ± 3.66	70.24 ± 4.31	29.51 ± 4.71	(1)	(1)	(1)	(1)	(1)	
Inland cities	100.00	100.00	98.85 ± 0.66	96.05 ± 1.22	91.06 ± 1.82	82.91 ± 2.44	69.30 ± 3.05	31.35 ± 3.21	(1)	(1)	(1)	(1)	(1)	
Region - Northeast														0.025
Capital cities	100.00	100.00	98.57 ± 0.82	97.59 ± 1.07	90.59 ± 2.12	84.54 ± 2.65	77.17 ± 3.11	53.61 ± 3.82	(1)	(1)	(1)	(1)	(1)	
Inland cities	100.00	100.00	99.36 ± 0.32	96.65 ± 0.74	91.98 ± 1.14	84.95 ± 1.53	72.84 ± 1.94	39.98 ± 2.23	(1)	(1)	(1)	(1)	(1)	
Region - Southeast														0.962
Capital cities	100.00	100.00	99.65 ± 0.35	98.52 ± 0.73	95.83 ± 1.23	92.96 ± 1.60	86.76 ± 2.19	74.63 ± 2.94	2.37 ± 2.01	(1)	(1)	(1)	(1)	
Inland cities	100.00	100.00	99.70 ± 0.21	99.23 ± 0.34	97.65 ± 0.60	94.69 ± 0.90	88.58 ± 1.30	71.78 ± 1.89	2.56 ± 1.55	(1)	(1)	(1)	(1)	
Region - South														0.046
Capital cities	100.00	100.00	100.00	100.00	100.00	100.00	94.71 ± 3.65	74.29 ± 8.79	29.27 ± 10.69	(1)	(1)	(1)	(1)	
Inland cities	100.00	100.00	100.00	99.81 ± 0.19	98.84 ± 0.47	98.02 ± 0.62	94.83 ± 1.03	73.34 ± 2.51	(1)	(1)	(1)	(1)	(1)	
Region - Central-West														0.406
Capital cities	100.00	100.00	100.00	100.00	95.18 ± 2.11	94.11 ± 2.34	80.74 ± 4.25	60.39 ± 6.28	(1)	(1)	(1)	(1)	(1)	
Inland cities	100.00	100.00	99.54 ± 0.46	97.60 ± 1.06	92.86 ± 1.84	91.09 ± 2.07	79.58 ± 3.26	50.28 ± 4.94	(1)	(1)	(1)	(1)	(1)	
Region x Size														
Region - North														0.011
1st Quartile	100.00	100.00	100.00	90.91 ± 8.67	90.91 ± 8.67	90.91 ± 8.67	90.91 ± 8.67	68.18 ± 20.73	(1)	(1)	(1)	(1)	(1)	
2nd Quartile	100.00	100.00	100.00	100.00	100.00	95.65 ± 4.25	91.10 ± 6.01	72.34 ± 9.64	(1)	(1)	(1)	(1)	(1)	
3rd Quartile	100.00	100.00	100.00	97.14 ± 1.99	91.26 ± 3.41	77.80 ± 5.06	61.52 ± 6.09	29.61 ± 5.88	(1)	(1)	(1)	(1)	(1)	
4th Quartile	100.00	100.00	98.20 ± 0.80	94.13 ± 1.42	89.47 ± 1.88	81.85 ± 2.40	69.22 ± 2.94	26.71 ± 2.99	(1)	(1)	(1)	(1)	(1)	
Region - Northeast														0.110
1st Quartile	100.00	100.00	92.86 ± 6.88	92.86 ± 6.88	75.97 ± 12.18	75.97 ± 12.18	67.53 ± 13.44	59.09 ± 14.16	(1)	(1)	(1)	(1)	(1)	
2nd Quartile	100.00	100.00	100.00	100.00	95.35 ± 3.21	90.46 ± 4.54	79.82 ± 6.41	48.16 ± 8.41	(1)	(1)	(1)	(1)	(1)	
3rd Quartile	100.00	100.00	99.30 ± 0.70	96.99 ± 1.48	92.18 ± 2.38	86.41 ± 3.07	76.38 ± 3.84	47.69 ± 4.63	(1)	(1)	(1)	(1)	(1)	
4th Quartile	100.00	100.00	99.20 ± 0.36	96.71 ± 0.72	91.55 ± 1.16	84.25 ± 1.55	73.07 ± 1.92	41.69 ± 2.23	(1)	(1)	(1)	(1)	(1)	

	% Cumulative survival													p
	3 months	6 months	9 months	12 months	15 months	18 months	21 months	24 months	30 months	36 months	48 months	60 months	72 months	
Region - Southeast														0.006
1st Quartile	100.00	100.00	100.00	100.00	95.79 ± 2.92	93.66 ± 3.54	83.32 ± 5.81	64.89 ± 7.64	(1)	(1)	(1)	(1)	(1)	
2nd Quartile	100.00	100.00	100.00	98.74 ± 0.88	97.42 ± 1.28	93.34 ± 2.04	87.63 ± 2.74	77.85 ± 3.53	9.42 ± 5.53	(1)	(1)	(1)	(1)	
3rd Quartile	100.00	100.00	99.65 ± 0.35	99.29 ± 0.50	97.44 ± 0.95	95.50 ± 1.27	90.68 ± 1.82	73.12 ± 2.87	1.41 ± 1.37	(1)	(1)	(1)	(1)	
4th Quartile	100.00	100.00	99.55 ± 0.32	98.85 ± 0.51	96.95 ± 0.83	93.72 ± 1.19	87.00 ± 1.69	70.94 ± 2.37	(1)	(1)	(1)	(1)	(1)	
Region - South														0.118
1st Quartile	100.00	100.00	100.00	100.00	100.00	96.88 ± 3.08	96.88 ± 3.08	76.54 ± 10.21	(1)	(1)	(1)	(1)	(1)	
2nd Quartile	100.00	100.00	100.00	100.00	100.00	100.00	94.74 ± 2.29	82.14 ± 4.42	24.97 ± 11.49	(1)	(1)	(1)	(1)	
3rd Quartile	100.00	100.00	100.00	100.00	98.28 ± 0.99	97.67 ± 1.15	92.16 ± 2.18	70.21 ± 4.42	5.37 ± 5.05	(1)	(1)	(1)	(1)	
4th Quartile	100.00	100.00	100.00	99.60 ± 0.40	98.78 ± 0.70	97.91 ± 0.92	96.44 ± 1.24	71.41 ± 3.81	10.39 ± 6.05	(1)	(1)	(1)	(1)	
Region - Central-West														0.603
1st Quartile	100.00	100.00	100.00	100.00	100.00	100.00	100.00	75.00 ± 21.65	(1)	(1)	(1)	(1)	(1)	
2nd Quartile	100.00	100.00	100.00	96.88 ± 3.08	93.42 ± 4.51	89.68 ± 5.67	80.46 ± 8.00	45.98 ± 12.79	(1)	(1)	(1)	(1)	(1)	
3rd Quartile	100.00	100.00	98.86 ± 1.13	97.71 ± 1.60	94.06 ± 2.58	94.06 ± 2.58	82.94 ± 4.87	53.93 ± 8.22	(1)	(1)	(1)	(1)	(1)	
4th Quartile	100.00	100.00	100.00	98.96 ± 0.74	93.20 ± 1.90	91.29 ± 2.16	77.84 ± 3.40	53.90 ± 4.84	(1)	(1)	(1)	(1)	(1)	

p - descriptive level of the Long Rank test
(1) Absence of cases.

Table II.18 – Average time, median time, wear level percentiles 25 and 75 via Kaplan-Meier model – Denomination R$2 – total sample

Factors	Mean ± SE	P25 ± SE	Median ± SE	P75 ± SE
Total	23.82 ± 0.08	26.2 ± 0.1	24.85 ± 0.08	22.52 ± 0.12
Type				
R$2 type 1	20.89 ± 0.20	25.15 ± 0.27	21.24 ± 0.28	17.42 ± 0.35
R$2 type 2	24.78 ± 0.07	26.50 ± 0.11	25.15 ± 0.05	23.24 ± 0.06
Region				
North	21.80 ± 0.24	24.76 ± 0.28	23.05 ± 0.07	20.15 ± 0.49
Northeast	22.54 ± 0.16	25.41 ± 0.10	23.54 ± 0.12	20.91 ± 0.26
Southeast	24.91 ± 0.13	27.39 ± 0.17	25.41 ± 0.07	23.67 ± 0.20
South	25.74 ± 0.24	28.04 ± 0.44	25.45 ± 0.06	23.61 ± 0.38
Central-West	23.64 ± 0.27	26.2 ± 0.32	24.53 ± 0.44	22.19 ± 0.48
Region - North				
R$2 type 1	18.70 ± 0.46	22.78 ± 0.89	18.97 ± 0.72	15.25 ± 0.44
R$2 type 2	23.37 ± 0.20	25.28 ± 0.19	23.31 ± 0.1	22.72 ± 0.15
Region - Northeast				
R$2 type 1	19.18 ± 0.33	22.92 ± 0.64	19.53 ± 0.51	15.95 ± 0.61
R$2 type 2	24.02 ± 0.13	25.64 ± 0.07	24.36 ± 0.16	22.75 ± 0.16
Region - Southeast				
R$2 type 1	21.65 ± 0.39	25.71 ± 0.43	21.83 ± 0.40	18.61 ± 0.60
R$2 type 2	25.70 ± 0.11	27.48 ± 0.17	25.61 ± 0.10	24.82 ± 0.15
Region - South				
R$2 type 1	24.76 ± 0.49	26.43 ± 0.68	25.74 ± 0.36	22.72 ± 1.29
R$2 type 2	26.05 ± 0.27	28.18 ± 0.34	25.41 ± 0.05	23.64 ± 0.44
Region - Central-West				
R$2 type 1	22.49 ± 0.69	26.01 ± 0.33	24.23 ± 1.13	19.86 ± 0.89
R$2 type 2	23.92 ± 0.29	26.43 ± 0.69	24.76 ± 0.49	22.42 ± 0.47
Region - North				
Capital cities	21.75 ± 0.44	24.95 ± 0.57	23.08 ± 0.13	20.15 ± 1.33
Inland cities	21.82 ± 0.28	24.62 ± 0.26	22.98 ± 0.09	20.15 ± 0.52
Region - Northeast				
Capital cities	22.87 ± 0.33	25.74 ± 0.23	24.33 ± 0.32	21.83 ± 0.71
Inland cities	22.42 ± 0.18	25.35 ± 0.11	23.47 ± 0.10	20.78 ± 0.26
Region - Southeast				
Capital cities	24.79 ± 0.26	27.19 ± 0.29	25.38 ± 0.02	23.93 ± 0.47
Inland cities	24.97 ± 0.15	27.45 ± 0.24	25.41 ± 0.10	23.67 ± 0.20
Region - South				
Capital cities	26.93 ± 0.71	30.38 ± 1.08	27.62 ± 1.99	23.61 ± 1.19
Inland cities	25.32 ± 0.20	27.45 ± 0.67	25.41 ± 0.05	23.47 ± 0.38
Region - Central-West				
Capital cities	23.91 ± 0.42	26.47 ± 0.48	25.08 ± 0.49	22.29 ± 0.72
Inland cities	23.47 ± 0.34	26.01 ± 0.37	24.39 ± 0.43	21.90 ± 0.60
Region - North				
1st Quartile	23.64 ± 1.50	25.41 (1)	25.41 (1)	23.08 ± 10.34
2nd Quartile	24.68 ± 0.64	26.86 ± 1.00	25.12 ± 0.04	23.15 ± 1.08
3rd Quartile	21.40 ± 0.53	25.08 ± 0.74	22.59 ± 0.77	18.94 ± 1.88
4th Quartile	21.60 ± 0.28	24.20 ± 0.25	23.05 ± 0.08	20.09 ± 0.52
Region - Northeast				
1st Quartile	22.33 ± 1.87	26.79 ± 1.39	24.36 ± 0.58	18.94 ± 4.29
2nd Quartile	23.68 ± 0.55	25.87 ± 0.34	23.93 ± 0.69	21.83 ± 1.31
3rd Quartile	22.76 ± 0.38	25.58 ± 0.16	23.93 ± 0.35	21.14 ± 0.66
4th Quartile	22.40 ± 0.18	25.25 ± 0.11	23.41 ± 0.12	20.71 ± 0.29
Region - Southeast				
1st Quartile	24.89 ± 0.62	28.50 ± 0.60	25.41 ± 0.40	22.85 ± 1.08
2nd Quartile	25.54 ± 0.35	28.60 ± 0.58	25.55 ± 0.34	24.30 ± 0.43
3rd Quartile	24.99 ± 0.23	27.22 ± 0.25	25.41 ± 0.12	23.84 ± 0.43

Factors	Mean ± SE	P25 ± SE	Median ± SE	P75 ± SE
4th Quartile	24.61 ± 0.19	26.93 ± 0.27	25.32 ± 0.08	23.47 ± 0.28
Region - South				
1st Quartile	25.61 ± 0.49	-	-	-
2nd Quartile	26.95 ± 0.60	29.26 ± 0.90	26.14 ± 1.82	25.38 ± 1.26
3rd Quartile	25.11 ± 0.37	26.43 ± 0.68	25.38 ± 0.08	23.11 ± 0.48
4th Quartile	25.55 ± 0.34	28.04 ± 1.17	25.38 ± 0.1	23.31 ± 0.53
Region - Central-West				
1st Quartile	24.44 ± 0.84	-	-	21.53 (1)
2nd Quartile	23.4 ± 0.91	26.37 ± 0.85	23.87 ± 0.73	21.8 ± 1.70
3rd Quartile	23.46 ± 0.45	25.32 ± 0.27	24.49 ± 0.50	23.21 ± 1.03
4th Quartile	23.62 ± 0.35	26.47 ± 0.6	24.56 ± 0.54	21.83 ± 0.66

(1) The SE estimation was not possible.
(-) it was not possible to perform the estimation.