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SOCIAL BONDS AND THE "SOCIAL PREMIUM"

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Abstract

Although Social bonds (SB) have witnessed an unprecedented increase especially since the outburst of the Covid-19 pandemics, their performance vs. conventional bonds (CB) has not attracted much attention. The aim of this paper is to test the existence, the sign and the determinants of a "social premium", defined as the yield differential between a SB and an otherwise identical CB. To this end we set up a sample of 64 SB aligned with ICMA (International Capital Market Association) principles and 64 matched CB, from October 2020 to October 2021 so as to focus on the peak of SB issuances. We run regressions based on the idea that daily yield differential between SB and CB may be determined by differences in un-matched characteristics. Based on the FE specification, which turns out to be preferred vs. OLS and RE, a few main results emerge. First, as for the determinants, the difference in liquidity and in volatility turn out to be significant: they are, respectively, negatively and positively correlated with the yield differential. Second, on the whole sample the analysis of the fixed effects, which represent the social premium, proves the existence of a significantly positive social premium (1.242 bps). This result is robust to outliers, but differences emerge on subsamples. Overall, the small magnitude of the social premium emerging from our analysis over the latter two years would point to a (perhaps more mature) phase of the SB market, whereby the social feature does not make otherwise comparable bonds any different in terms of yield.

Keywords: social bonds, sustainable finance, yield to maturity, social premium

J.E.L. classification: C22, G11, G12.

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1. Introduction

Sustainable finance has become a mainstream field of finance in the latest years, and within it the ESG (Environmental, Social and Governance) investments are playing a relevant role.[1] However, the ESG trend is often focused solely on the "E" label, with Green finance and its instruments – in particular green bonds – becoming the main focus of attention and research. This trend is due to a particular sensibility towards environmental issues, also supported by non-financial movements (e.g. Friday for Futures), and by the attention of public institutions and financial organizations to a more ecological economic system (e.g. Cop26 in November 2021) accompanied by regulatory requirements for the financial industry and worries for financial stability (e.g. BCBS (2021a,b), ECB, 2021).

However, the recent Covid-19 pandemic put to the forefront the need for funds to support the economic and health recovery with attention to both firms and households. This has in turn boosted the issuances of Social Bonds (SB), which are traditional fixed-income securities whose proceeds are allocated to social initiatives. According to Amundi (2021), social bonds represent 14% of the total sustainable investments.

In comparison with the growing literature on green bonds, the academic literature on social bonds is still very scant, and little is known about the financially performance of social bonds with respect to conventional ones. In order to fill this gap, the aim of this paper is to test the existence and the sign of yield difference between social and comparable conventional bonds, which we will define as a "social premium" in the social bond market. Using a methodology already developed in Zerbib (2019) and Bachelet (2019) on the green bond market, we analysis the existence of a social premium and the determinants by means of regression analysis.

The paper is organised as follows. After defining in Section 2 SB features and investment drivers, in Section 3 we illustrate the empirical methodology and the sample with a focus on the matching process between SB and their conventional counterpart. The investigation of the determinants of the spread differential between social and conventional bonds is provided in Section 4, while Section 5 discusses the existence and the sign of the social premia. Final Section concludes.

2. Social bonds and investment drivers

According to the guidelines set by the International Capital Market Association (ICMA), SBs are defined as "*any type of bond instrument where the proceeds, or an equivalent amount, will be exclusively applied to finance or re-finance in part or in full new and/or existing eligible Social*

[1] The Global Sustainable Investment Alliance (2021) reports that in 2020 sustainable investments reached $35.3 trillion, growing by $13 trillion from 2016.

Projects and which are aligned with the four core components of the Social Bond Principle " (ICMA, 2021).

In 2009, the International Finance Facility for Immunisation issued a vaccine bond for increasing vaccinations in developing countries. Even though the emission is not aligned with ICMA principles, it may be considered a first attempt of SB. Some years later, in 2013, the International Finance Corporate (IFC) issued the "Banking on Women" bond in order to support female entrepreneurship, followed by another social initiative called "Inclusive Business" programme in 2014 (Peeters et al., 2020). Before the Social Bond Principles (SBP) publication in 2017 by ICMA, the emission of social bonds was sporadic. [2] This new voluntary framework provided the market tools for issuing these innovative debt instruments (Peeters et al., 2020). Danone was the first corporation to issue a social bond in 2018 with the aim to finance food security development and social integration in the supply chain ($355 million of proceeds), and it was followed in 2019 by Bank of America with a SB with proceeds (around $500 million) to be invested in affordable housing projects. The turning point came in 2020 with the Covid-19 pandemic, which hit directly firms and households with a sudden reduction in economic activities, a drop in consumer demand and disruption in global supply chain reflected on employments and salaries. To face these economic challenges arising from the Covid-19 pandemic, social bonds appear a powerful instrument with issuances increased up to 420% between 2019 and 2020 (Dax, 2020).

The recent development of the SB market has not yet fostered the academic literature as much as the growth of green bonds, although both belong to the category of thematic bonds and are connected to two main related research-questions that have been investigated in the field of sustainable finance: why do investors include in their portfolios assets whose characteristics go beyond the financial return and, accordingly, what is the profile of this type of investors? How do these assets perform in comparison to conventional ones?

As for the first question, Rossi et al. (2019) underscore that the answers rest on a theoretical framework, i.e. whether the utility function upon which the investment decision is taken depends on both wealth and non-wealth returns, whereby the latter capturing the socially responsible dimensions of the decision and essentially. In particular, Beal et al. (2005) provide three non-exhaustive and non-exclusive motivations for ethical investments: superior financial returns (consistently with traditional finance theory), non-wealth returns, and social change. In general, investors in the field of sustainable finance are driven by responsible and environmental considerations (e.g. Bauer and Smeets, 2015;

[2] The Social Bond Principles (SBP) are "*voluntary process guidelines that recommend transparency and disclosure and promote integrity in the development of the Social Bond market by clarifying the approach for issuance of a Social Bond*" (ICMA, 2021a) developed by the International Capital Market Association (ICMA), a non-for-profit association based in Switzerland.

Gutsche and Ziegler, 2019; Rossi et al., 2019), but assets such as green and social bonds may also help investors to realize diversification objectives. Following the traditional paradigm, retail and institutional investors may prefer social bonds with respect to traditional instruments because their expected financial returns are higher. Otherwise, investors may prefer social bonds because of their social commitment, and they are willing to sacrifice part of their return to obtain social impacts. Basiglio et al. (2020) point out how the traditional theory of finance is not able to explain the investments rationale in this field.

As for the second question, the answer requires a comparison of the performance of sustainable asset w.r.t. conventional ones. The issue has received much attention in relation to green bonds, where a vast empirical literature has tested is the existence of a green premium, defined as the yield difference between a green bond and a similar conventional bond (generally called "greenium" when negative). The literature provides disparate results, since the sign and the existence of the greenium depends on the market (primary vs. secondary), the issuer (e.g. Government, municipal, corporate), the time horizon of the analysis (short vs. long). For instance Zerbib (2019) analyses 110 green bonds on the secondary market between 2013 and 2017 and, based on matching pairs of a green and a conventional bond, finds an average green bond yield premium of -2 bps, while Bertelli et al. (2021) based on a sample of 92 Euro denominated bonds over the period October 2014 - December 2019 compare a green and a synthetic conventional portfolio finding a very low but negative green premium, which is however increasing to positive over time together with the number of bonds in both the green and the conventional portfolio.

As far as we know, no research has evaluated the presence, the sign and the determinants of a yield differential between social and conventional and this represent the aim of the present paper. Specifically, we aim to test the existence, the sign and the determinants of a "social premium", which we define as the yield differential between a social bond and an otherwise identical conventional bond.

3. Methodology and sample construction

We define "social premium" the yield differential between a social bond and an identical equivalent conventional bond:

$$\Delta y_{i,t} = y_{i,t}^{SB} - y_{i,t}^{CB} \tag{1}$$

Where:

$\Delta y_{i,t}$ = Social premium at date t = 1,2…T for each comparable pair of bonds

$y_{i,t}^{SB}$ = Yield to maturity of the social bond i =1,2…N at time t=1,2…T

$y_{i,t}^{CB}$ = Yield to maturity of the conventional bond i =1,2…N at time t=1,2…T

To investigate whether there is a "social" premium in the social bond market, we follow the matching method approach mostly used in the empirical literature on the green bond premium (e.g. Zerbib, 2019, Bachelet et al., 2019). It is a model-free approach that requires matching pair of securities with the same characteristics except for the one property to be investigated, which for the present analysis is the "social" label. For implementing a matching method, a crucial point is defining "closeness", i.e. different measures and thresholds to evaluate whether a security is a good match for another (Stuart, 2010), as detailed below.

In order to set up the dataset, we start by identifying 580 social bonds aligned with ICMA principles at the date of 23rd September 2021. SBs are retrieved from Bloomberg Platform and this set encompasses different kind of bonds: corporate, government, sovereign as well as financials.[3] We consider only fixed-rate bullet bonds with no optionality features and we exclude SBs with missing characteristics such as ID Bloomberg, maturity, amount issued and coupon rate.[4] Within the 459 SBs left, in order to control for liquidity only those with an amount issued higher or equal to $100 million enter the final set. The final sample consists of 252 SBs which represent 43,45% of initial social bond universe aligned with ICMA principles.

3.1 The matching process

In order to match each social bond with a comparable traditional one, while Zerbib (2019) and Bertelli et.al. (2021) build up synthetic bonds, we follow an exact matching method as in Bachelet et al. (2019). For each social bond in the dataset, we select a conventional bond, whereby "closeness" is defined by the measures and the thresholds in Table 1. In particular, the two bonds must be issued by the same institution, in the same currency, with the same bond structure (bullet bond), the same payment rank and same coupon type (fixed rate with a difference in coupon +/- 70 bps), the maximum mismatch in maturity dates is two-year lead/lag whereas the maximum mismatch in issuance dates is six-year lead/lag (as in Bachelet e al., 2019; Zerbib, 2019; Bertelli e al., 2021), and the issue amount between 1/4 and 4 times the social bond's issued amount. We cannot place restriction on the rating since very few SBs have one, but given other restrictions (same issuers and extremely similar bond structure) we can be assume that creditworthiness of both bonds is the same. When more than one conventional bond meets the criteria, we select the bond with the closest maturity date. When no conventional bond respects the properties, we exclude the social bond from the final set.

[3] No municipal bonds are included in our analysis since they have specific characteristics as also in the literature about greenium, where municipal bonds are generally considered separately (i.e., Karpf and Mandel, 2017; Baker et al., 2018).

[4] Callable and puttable bonds present multiple yield measures such as yield to call and yield to worst which complicate comparison between SB and conventional bonds.

Table 1 - Matching method thresholds

Social Bond characteristic	One closest traditional bond characteristic
Issuer	The same
Coupon Type	The same (Fixed rate)
Maturity Type	The same (Bullet)
Amount Issued	>= 100 millions
Currency	The same
Payment Rank	The same
Issuance Date	+/- 6 years
Maturity Date	+/- 2 years
Coupon	+/- 70 bps
Amount Issued	Between ¼ and 4 times the social bonds' issued amount

The matching process provides 64 pairs of bonds, namely 64 social bonds and their respective matched conventional bonds. The final set counts for 25.39% of the initial sample of 252 SBs and for 11.03% of the SBs aligned with ICMA principles retrieved from Bloomberg. The loss in data is mainly due to the liquidity requirement, since it leads to exclude many issues below $100 million, which highlights that the SB market is in a different stage with respect to the green bond market. With respect to the latest research on *greenium*, the dataset appears less representative, but it is in line with the earliest studies about green premium (Preclaw and Bakshi, 2015), when the green bond market was in its early stage.

The analysis is performed based on bid daily yields from October 16, 2020 to October 18, 2021. The choice of the period is motivated by the high number of SB issuances has occurred between 2020 and 2021, during the Covid-19 pandemic, which also implies a less unbalanced panel.

3.2 The final sample: descriptive statistics

The main features of the final sample of social bonds are represented in Figure 1. Bonds are issued by 30 different issuers from 11 countries. South Korea counts for 35.94%, followed by Japan and Supernational authorities (SNAT), while other countries count for lower quotes.[5] They are issued in 7 different currencies: Euro (26), South Korean won (16), Yen (10), US dollar (7), Australian dollar (3), New Zealand dollar (1) and Chilean peso (1). All amounts are expressed in US dollar.

[5] The reason for absence of United States in the set is due to the optionality features of SBs issued on the US market.

Figure 1 – Bond sample by sectors, countries, and currency

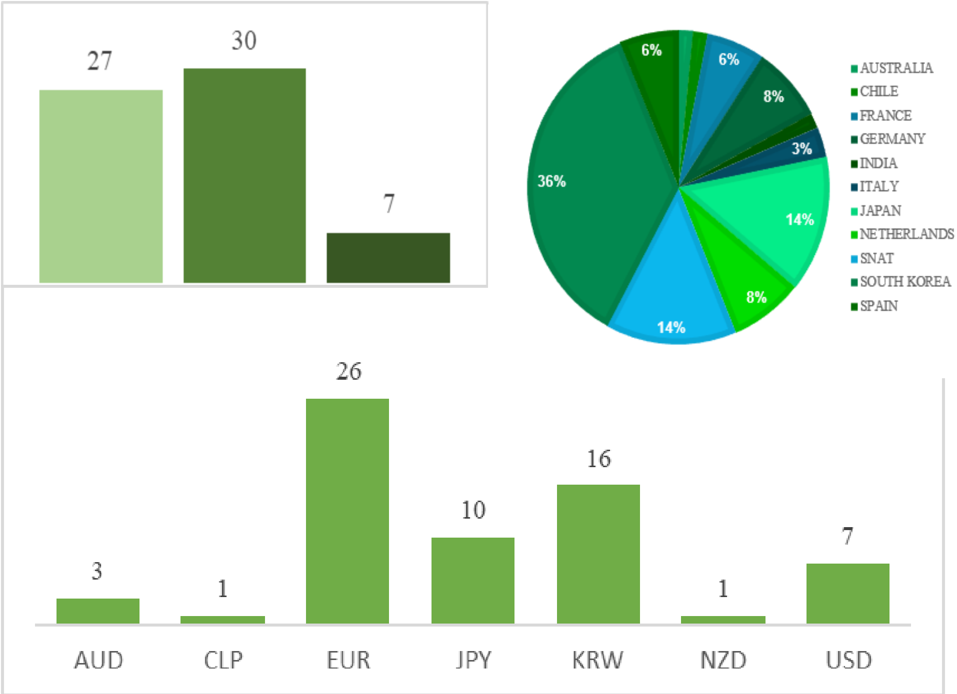


Table 2 reports descriptive statistics of social bonds sample. On average, SBs have 4.72 years to maturity although the range of value is quite wide, from 0.43 to 18.98 years, the average issue amount is $795.8 million, and the average bid yield to maturity is 0.42. Breakdown by sector (Industrials, Financials and Government) highlights bonds issued by the industrial sector have a higher maturity on average (5.78 years), while those issued by financials and government sectors present have more variation around the average values. Concerning the amount issued, as predictable, issuances from government entities have a higher average amount ($831.70 million) with more variation (from a minimum of $100 million to a maximum of $10 billion).

Table 2: Social Bonds statistics with breakdown by sector

Sector		Min	1st Quart.	Mean	Median	3rd Quart.	Max	SD
Total								
	Amount	$100.0	$274.2	$795.8	$541.1	$905.3	$10,710.0	$1,242.5
	Yield	-0.62	-0.19	0.42	0.16	0.57	7.20	0.13
	Maturity	0.43	2.15	4.72	3.56	5.67	18.98	4.06
	N° Bonds	64						
Industrials								
	Amount	$186.1	$274.2	$339.0	$332.9	$368.4	$651.4	$153.6
	Yield	0.02	0.08	0.12	0.11	0.16	0.31	0.06
	Maturity	3.18	3.18	5.78	5.67	7.79	8.75	2.28
	N° Bonds	7						
Financials								
	Amount	$112.8	$451.9	$885.2	$564.5	$1,090.0	$4,490.0	$1,018.7
	Yield	-0.43	-0.15	0.66	0.18	1.20	7.20	1.28
	Maturity	0.43	2.33	3.94	3.72	5.10	14.43	2.19
	N° Bonds	27						
Government								
	Amount	$100.0	$177.8	$831.7	$541.1	$1,080.0	$10,710.0	$1,460.6
	Yield	-0.62	-0.37	0.33	0.24	0.80	6.74	0.85
	Maturity	0.51	2.03	5.06	2.64	5.61	18.98	5.06
	N° Bonds	30						

Note: Average maturity is expressed in years (365 days) with reference to October 18, 2021. Information about sectors is retrieved from Bloomberg. Prices are expressed in US dollar. Prices are expressed in $ million.

Descriptive statistics of the social bonds, conventional bonds and their main differences are presented in Table 3, where liquidity is measured by the bid-ask spread ($\Delta L_{i,t}$), defined as:

$$\Delta L_{i,t} = \frac{(Ask\ price_{i,t} - Bid\ price_{i,t})}{Ask\ price_{i,t}} \quad (2)$$

The panel is unbalanced: the average number of days for each bond is 171. However, for some bonds there are only 21 days of data available and a maximum of 258. SBs have an average time to maturity higher than the conventional bonds (4.72 versus 4.63 years). The amount of coupon is almost the same in the two groups: average coupon for social bonds is 0.89 while for conventional is 0.93. Conventional bonds have a larger amount issued than SBs on average ($865.1 versus $$795.8 million) and smaller standard deviation. SBs appear to have a slightly higher yield with respect to CBs: on average 0.421 vs. 0.4057 of conventional bonds pointing to a positive social premium. Since CBs register a broader amount issued on average, it is possible that the higher yield required for SBs is due to illiquidity, as confirmed by the bid-ask spread liquidity measure.

Table 3 - Social Bonds and Conventional Bonds: statistics and differences

	Min	1st Quart.	Mean	Median	3rd Quart.	Max	SD
SBs							
N° of days	21	80	200	171	258	258	
Coupon	0.01	0.14	0.89	0.625	1.21	5.1	1.04
Amount	$100.0	$274.2	$795.8	$541.1	$905.3	$10,710	$1,242.5
Maturity	0.43	2.15	4.72	3.56	5.67	18.98	4.06
Yield	-0.62	-0.19	0.42	0.16	0.57	7.20	0.13
Liq	0.00%	0.00%	0.13%	0.15%	0.21%	1.18%	0.15%
CBs							
N° of days	21	80	171	200	258	258	
Coupon	0.01	0.25	0.93	0.5	1.13	5.7	1.08
Amount	$100.0	$221.3	$865.1	$531.8	$1,200.0	$11,780	$1,242.1
Maturity	0.36	1.94	4.63	2.79	6.10	19.72	4.37
Yield	-0.63	-0.23	0.41	0.17	0.61	7.34	0.96
Liq	0.00%	0.00%	0.09%	0.13%	0.20%	1.21%	0.13%
Δ							
Δ Coupon	-0.63	-0.1	-0.04	0	0.08	0.47	0.26
Δ Amount	-$3,500.0	-$170.0	-$69.3	$0.0	$50.7	$4,210.0	$702.7
Δ Maturity	-2.28	-0.37	0.09	0.01	0.88	2.00	0.97
Δ Yield	-0.85	-0.03	0.01	0.00	0.05	1.50	0.13
Δ Liq	-0.77%	-0.02%	0.02%	0.00%	0.02%	1.12%	0.00%
Δσ	-0.43	0.00	0.00	0.00	0.00	0.26	0.01

Note: Descriptive analysis are conducted separately between the two groups. Liquidity is calculated as the bid-ask spread. Prices are expressed in US dollar. Prices are expressed in $ million. Differences between bonds are calculated as SB characteristic – CB characteristic. Variable Δσ is the difference between variance of SB yield and variance of CB yield calculated in a 10-day rolling window.

In order to derive information on the distribution of main variables, Table 4 reports information about skewness and kurtosis, whereby the two measures point to a rejection of normality.

Table 4 - Variable skewness and kurtosis

	Skewness	Kurtosis
Δ Coupon	-0.57	3.2
Δ Amount	0.62	19.11
Δ Maturity	-0.12	2.48
Δ Yield	2.21	20.65
Δ Liq	4.61	31.49
Δσ	-10.83	353.84

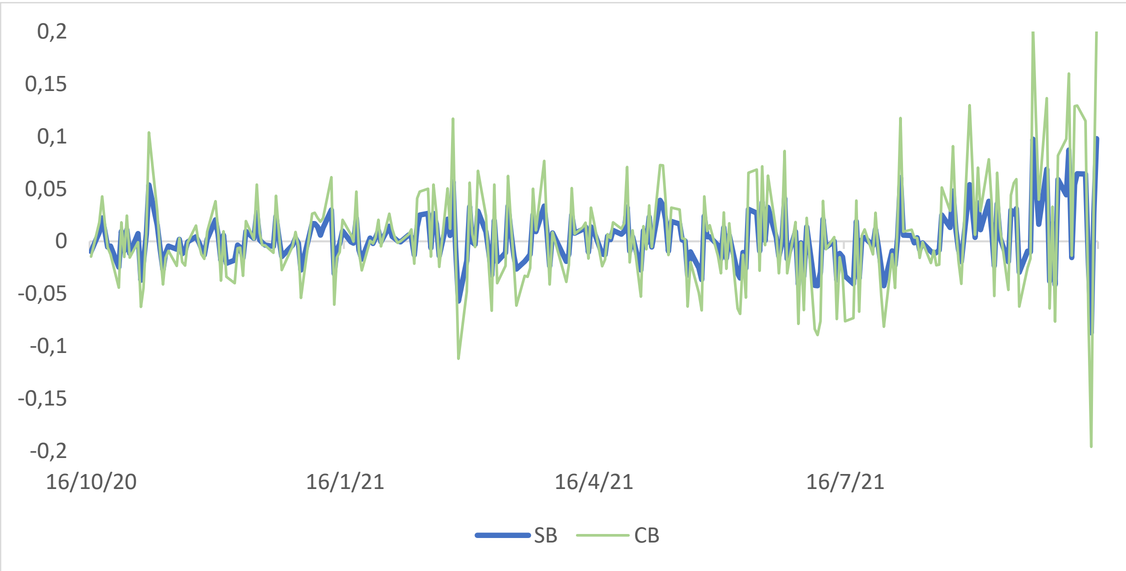
Finally, Table 5 shows the correlation coefficients, which appear in general low thus excluding multicollinearity. The highest values are registered between yield and liquidity (0.542) and yield and maturity (0.630). Other coefficients range from 0.371 to -0.379. Furthermore, the higher correlation values between yield and maturity and yield and liquidity point to the relevance of these two regressors in determining the spread yield.

Table 5 - Correlation matrix

	Δ Amount	Δ Coupon	Δ Liq	Δ Maturity	Δσ	Δ Yield
Δ Amount	1					
Δ Coupon	-0.105	1				
Δ Liq	0.022	-0.370	1			
Δ Maturity	0.114	-0.371	0.352	1		
Δσ	0.022	0.051	-0.176	-0.019	1	
Δ Yield	0.113	-0.379	0.542	0.630	-0.019	1

A comprehensive glance at the comparison between YTM of SB and CB is given by Figure 2. The two returns follow a common trend during the period under analysis, but SB appear to be more volatile with peaks between September and October 2021.

Figure 2 - Daily YTM: SBs and CBs



To sum up, the descriptive analysis of our sample of SB and CB highlights differences in yields and in some of the matched characteristics, and this call for the next multivariate analysis of the determinants of the yield spreads.

4. The determinants of the yield spread in social bonds

The regression model is based on the idea that differences in yields may be determined by differences in un-matched characteristics, which is not possible to control for in the matching method phase. To test this hypothesis, in line with the study by Bachelet et al. (2019) on green bonds, we assume the following specification:[6]

$$\Delta y_{i,t} = \alpha_{0\,+}\ \beta_1 \Delta Liq_{i,t} + \beta_2 \Delta\sigma_{i,t}\ \sum_j \beta_j \Delta\, B_{ji}\ +\ \eta_i\ +\ \varepsilon_{i,t} \qquad (3)$$

Where:

$\Delta y_{i,t}$: is the daily yield to maturity spread between the *i*th pair of matched bonds at time *t*=1,2…T, namely the difference between the *i*th social bond yield and its equivalent comparable conventional one

α_0 : is the intercept of the regression and the main parameter we want to investigate. It captures the social effect on the yield spread, namely the sign, value, and relevance of social effect

$\Delta Liq_{i,t}$: is the daily bid-ask spread between the *i*th pair of bonds at time *t*=1,2…T, namely the difference between the *i*th social bond bid- ask and its equivalent comparable conventional one.

$\Delta\sigma_{i,t}$: is the difference in bond yield variance computed ex post in a 10-day moving window.

ΔB_{ji}: are the three bond features not perfectly matched during the matching method, namely coupon, maturity and amount issued. The differences in the *i*th pair of bonds at time *t*=1,2…T, always calculated as difference between social bond characteristic and conventional bond ones

η_i: fixed effects to control for unobservable time invariant characteristic in FE regression

In order to choose the best specification, the equation is estimated with ordinary least squares (OLS), with Random Effects (RE) and with fixed effects (FE) (η_i) in order to control for any bond couple unobservable time invariant characteristic. In this latter case, ΔB_{ij} variables disappear as the considered differences in bond characteristics are time invariant for each bond couple.

To test for the existence of a social premium the variable of interest is the intercept of OLS and RE regression and the estimated Fixed Effects from FE regression, which can be interpreted as a social premium. Regression findings are reported in Table 6: the first column reports results of a

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[6] A few changes are made with respect to Bachelet et al. (2019): first, to control for liquidity, for parsimony only bid ask spreads are used, whereby Bachelet et al. (2019) uses also the difference in number of trading days; second, since several bonds employed in the present analysis have a short time series, variances are here calculated in a 10-days rolling window, whereby in the original econometric model $\Delta\sigma$ is calculated in a 20-days rolling window.

Pooled OLS regression, in the second column liquidity and variance controls are included, the third and the fourth columns reports results from FE regression and RE regression, respectively.

Results of the OLS regressions prove the importance of all differentials in explaining yield spread. However, before interpreting these results and their sensibility, we test for the the preferred specification (Tables in the Appendix). First, we confront OLS with FE and, in line with the analysis by Zerbib (2019) on green bonds, we conducted an F-test, a Honda test, and a Lagrange Multiplier test (Breusch-Pagan test). The null hypothesis of no individual effect is rejected in all three tests at the 1% significance level (see Table A1) hence FE estimation is preferred. Second in order to confront FE with RE, after running the Hausman-Test, the null hypothesis is rejected at 1% significance level and therefore FE regression is preferable (Table A2).

Table 6 – OLS, FE, RE results

	Dependent Variable			
	ΔY			
	OLS	*OLS*	*Fixed Effects*	*Random Effects*
Δ Amount	0.00001***	0.00001***		0
	(0.0000)	(0.0000)		(0.00001)
Δ Coupon	-0.074***	-0.034***		0.04
	(0.004)	(0.004)		(0.035)
Δ Maturity	0.081***	0.065***		0.112***
	(0.001)	(0.001)		(0.01)
Δ σ		0.504***	0.507***	0.511***
		(0.064)	(0.042)	(0.042)
Δ Liq		32.225***	-7.366***	-5.652***
		(0.709)	(1.335)	(1.317)
Costant	0.002**	-0.003***		0.011
	(0.001)	(0.001)		(0.009)
Observations	10938	9792	9792	9792
R2	0.413	0.523	0.02	0.031
Adjusted R2	0.413	0.523	0.013	0.03
F Statistics	2561.551***(df =3; 10934)	2148,706***(df=5; 9786)	97,604***(df=2; 9726)	311,701***

*p<0.1; **p<0.05; ***p<0.01

In sum, the FE specification is preferred in this research because it allows to identify the social premium as the unobserved effect in the fixed effect panel regression. Furthermore, the use of this model does not require that the unobserved effect is uncorrelated with the regressors.

Since Breusch-Godfrey/Wooldridge test signals serial correlation in the panel and, a Breusch-Pagan test assesses the presence of heteroscedasticity (Table 7), to account for them, regression is corrected with Beck Katz robust estimations of the standard errors (Table 8) in line with Zerbib (2019).[7]

Table 7 - Homoscedasticity and Serial Correlation tests

	Breusch-Godfrey	**Breusch-Pagan Test**
p-value	< 2.2e-16	< 2.2e-16
Conclusion	Serial Correlation	Eteroschedasticity

Table 8 - FE regression with robust errors

	Dependent Variable	
	Δ Y	
	Fixed Effects	Beck-Katz Coefficient Test
Δ Liq	-7.366***	-7.366*
	(1.335)	(4.377)
Δ σ	0.507***	0.507***
	(0.042)	(0.054)
Observations	9792	
R2	0.02	
Adjusted R2	0.013	
F Statistics	97.604***(df=2; 9726)	

*p<0.1; **p<0.05; ***p<0.01

The model has a very small adjusted R^2 (0.013), which is however in line with Zerbib (2019) and slightly lower than Bachelet et al. (2019). The difference in liquidity turns out to be significant at 10% level and negatively correlated with the yield difference. Specifically, if the percentage price bid-ask spread increases by 1 bp, $\Delta y_{i,t}$ decrease by 7.366 bps which is comparable with Zerbib (2019), where a 1-bp rise determines 9.88-bps decrease in $\Delta y_{i,t}$ in the green premium. As suggested by Antonelli et al. (2021), this result may demonstrate that investors are not concerned about illiquidity of social bonds and that there is a group of investors more interested in the social label. Volatility $\Delta\sigma_{i,t}$ is highly significant: a 1bp increase in $\Delta\sigma_{i,t}$ determines 0.507bp increase in $\Delta y_{i,t}$ suggesting that investors required higher yields when SBs are more volatile, in line from with expectations. Although both $\Delta Liq_{i,t}$ and $\Delta\sigma_{i,t}$ provide useful information regarding $\Delta y_{i,t}$, for our purpose the estimated fixed effects play a key role.

[7] Since our sample is relatively small, Beck Katz robust estimator should be more efficient (Beck & Katz, 1995).

5. Analysis of the social premia

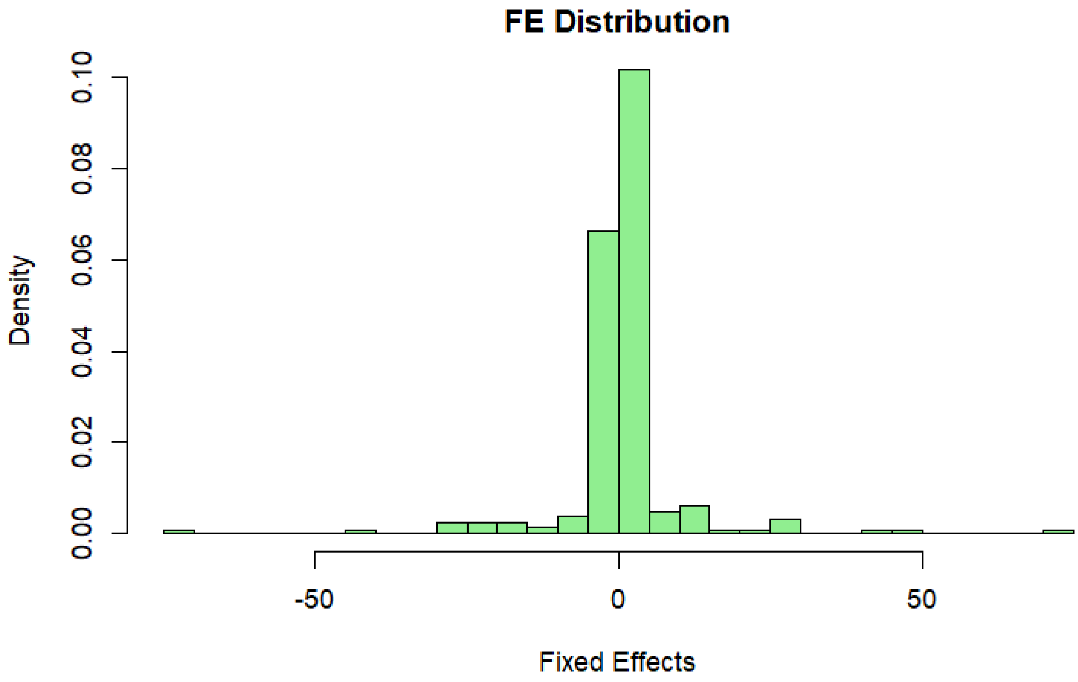
The main interest of this research is represented by values of 64 time-invariant fixed effects, which represent estimates of the social premium for each pair of bonds in the sample. Table 9 shows the distribution of the 64 social premia retrieved from the FE regression. The values range from -0.4897 to 0.4968. Both average and median values are positive.

Table 9 - Social premia distribution

Min	1st Quart.	Mean	Median	3rd Quart.	Max
-0.4896601	-0.379945	-0.0004846	0.0124189	0.0472494	0.4968425

Figure 3 reports the distribution of these 64 social premia and Shapiro-Wilk normality test confirms non normality at 1% confidence level and a t-test for differences in mean cannot be applied.

Figure 3 - Social premia distribution



As an alternative, following Zerbib (2019), a Wilcoxon signed-rank test can be implemented. Wilcoxon signed-rank test is a non-parametric test which has the same function of a t test, but it does not require a gaussian distribution of data. The null hypothesis of no differences in the mean is rejected at one percent significance level and therefore we can affirm that the average 0.01242 social premium is statistically significant (Table 10). The positive significant, albeit small, social premium of 1.242 bps suggests that CBs on average require a lower yield.

Table 10 - Social premium significance

	Shapiro Wilk-Test	Wilcoxon signed-rank
p-value	< 2.2e-16	1.13E-02
Conclusion	No normality	$\mu \neq 0$

5.1 Subsamples and outliers

In order to investigate whether different characteristics of issuers and issuance may determine higher/lower yield spread, the analysis is repeated on a few relevant subsamples.

Specifically, we break down the dataset in two main subsamples by sector and currency. For each subsample which consists of at least 10 bonds (a minimum consistent with Zerbib, 2019), equation (6) is re-estimated, and the fixed effects are analysed. Through a Shapiro-Wilk normality test, the normality assumption is tested for all subsamples and according to the result, either a t test or a Wilcoxon signed-rank test is applied to investigate their statistical significance. Results are presented in Table 11. Concerning issuer's sector, only government and financial subsamples are considered since only 7 social bonds belong to the industrial sector and the time series would be too limited for the regression analysis.

An interesting result emerges from the comparison between Government and Financials yield spreads: while average and median yield spread of financial issuances is always positive, yield spread of government issuances is negative. In particular, financial subsample presents an average premium of about 1bp while government subsample has an average social premium amounting to -1 bp. For both subsamples, premia are not normally distributed, and a Wilcoxon signed-rank test for the null of zero social premia is applied. Whereas for financials the social premium is statistically different (at the confidence level 95% or above), the social premium in Government bonds is not statistically different from zero.

As regards currencies, only Euro, Japanese Yen and South Korean Won subsamples are considered, with 26, 10 and 16 couple of bonds, respectively. Social premia from all subsamples are not normally distributed. However, Euro-denominated pairs of bonds have a negative premium of about 0.8 bp that is statistically different from zero, whereas South Korean won-denominated ones have on average a social premium of 1.5 bp statistically different from zero at 99% level. By contrast, Japanese Yen-denominated bonds do not have a statistically relevant social premium.

Table 11: Subsampling by sector and currency

		Mean	Median	Shapiro Wilk-test	Wilcoxon signed-rank
Sector					
	Financials	0.0113	0.0419	***	**
	Government	-0.0111	-0.0039	***	
Currency					
	EURO	-0.0081	0.0184	***	***
	KRW	0.0155	0.0014	***	***
	JPY	-0.0125	-0.0106	***	

*p<0.1; **p<0.05; ***p<0.01

As a final robustness check, to test whether our result regarding social premium is influenced by possible outliers in the dataset since $\Delta y_{i,t}$ presents a right-skewed distribution which indicates possible extreme values. For this reason, $\Delta y_{i,t}$ is winsorized above 99% percentile in line with Zerbib (2019), keeping in mind that it is an invasive method, and it is applied only for the robustness check and not on the main study. Table 12 shows the results from the FE regression, also with robust error correction. $\Delta\sigma_{i,t}$ remains highly significant in both determinations and perfectly in line with previous results. $\Delta Liq_{i,t}$ slightly decrease, from -7 to -9.1. However, the analysis of the fixed effects, representing social premia are unchanged. The average social premium is 1-bp and it is statistically significant at 99% level (Table 13).

Table 12 – FE: sample winsorized for outliers

	Dependent Variable	
	Δ Y	
	Fixed Effects	Beck-Katz Coefficient Test
Δ Liq	-9.100***	-9.100**
	(0.961)	(4.316)
Δ σ	0.566***	0.566***
	(0.030)	(0.053)
Observations	9792	
R2	0.048	
Adjusted R2	0.042	
F Statistics	245.151***(df=2;9726)	

*p<0.1; **p<0.05; ***p<0.01

Table 13 – Social premium significance: sample winsorized for outliers

Mean	Median	Shapiro Wilk-Test	Wilcoxon signed-rank
0.011	0	< 2.2e-16	0.0292

6. Conclusions

Social bonds have witnessed an unprecedented increase especially since the outburst of the Covid-19 pandemics. However, their performance vs. conventional bonds has not yet attracted much attention, in contrast to green finance where a vast empirical literature has tested the existence of a green premium although with disparate results.

As far as we know, no research has yet evaluated the presence, the sign and the determinants of a yield differential between social and conventional and this represent the scope of the present paper. Specifically, we aim to test the existence, the sign and the determinants of a “social premium”, which we define as the yield differential between a social bond and an otherwise identical conventional bond.

To this end we set up a sample of 64 SB aligned with ICMA principles and 64 matched CB, for the period October 16, 2020 - October 18, 2021 so as to focus on the peak of SB issuances occurred after the outburst of Covid-19. In line with Bachelet et al. (2019), we then run a regression based on the idea that differences in daily yields between SB and CB may be determined by differences in un-matched characteristics, which is not possible to control for with the matching method.

Based on the FE specification, which turns out to be preferred vs. OLS and RE, a few main results emerge. First, as for the determinants, the difference in liquidity turns out to be significant and negatively correlated with the yield differential. Specifically, if the percentage bid-ask spread increases by 1 bp, the yield differential decreases by 7.366 bps, a result comparable with Zerbib (2019), where a 1 bp rise determines 9.88 bps decrease in the green premium. Volatility is highly significant: a 1 bp volatility increase determines 0.507 bp increase in the yield differential suggesting, in line with expectations, that investors require higher yields when SBs are more volatile. Second, on the whole sample the analysis of the fixed effects, which represent the social premium, prove the existence of a significant social premium, which is positive, although small and amounting to 1.242 bps. This result, which is robust to outliers, is consistent with the market attaching higher riskiness to SB with respect to CBs. However, differences emerge on subsamples. The two main ones are Financials and Government: Financial SB present an average significant social premium of about 1bp, while the social premium of Government bonds is not statistically different from zero. Across currencies, the social premium remains very small, but it is significant only for Euro-denominated SB (about -0.8 bp) and South Korean won-denominated SB (1.5 bp).

Overall, the small magnitude of the social premium emerging from our analysis over the latter two years would point to a (perhaps more mature) phase of the SB market, whereby the Social feature does not make otherwise comparable bonds any different in terms of yield. However, more research is needed especially because SB may differ broadly not only in terms of issuers but also in terms of use of proceeds (ranging from e.g. social housing or social benefit to loans for SMEs), and hence they may attract very different investor profiles. Moreover, as well as green washing, also the risk of "social washing" is there and the need of developing regulations to avoid it should be high on the agenda. A step in the right direction is the EU initiative of developing a Social Taxonomy as illustrated in the Final Report on Social Taxonomy by the Platform for Sustainable Finance in February 2022.

Appendix - Regression specification Tests

Table A 1- Ftest, Honda test and Breusch-Pagan test

	Ftest	**Honda Test**	**Lagrange/Breusch-Pagan Test**
p-value	< 2.2e-16	< 2.2e-16	< 2.2e-16
Conclusion	Individual Effects	Individual Effects	Individual Effects

Table A 2 - Hausmann Test

	Hausmann Test
p-value	3.78E-11
Conclusion	FE

REFERENCES

Amundi. (2020). Social Bonds: finanziare la ripresa e la crescita inclusiva a lungo termine. Investment insights blue paper. November 2020.

Antonelli, S., Doronzo, R., Siracusa, V. (2021). Green Bonds: the Sovereign Issuers' Perspective. Research paper Banca d'Italia N.3. March 2021.

Bachelet, M. J., Becchetti, L., & Manfredonia, S. (2019). The green bonds premium puzzle: The role of issuer characteristics and third-party verification. *Sustainability*, 11(4), 1-22.

Baker, M., Bergstresser, D., Serafeim, G., & Wurgler, J. (2018). Financing the response to climate change: The pricing and ownership of US green bonds. N. 25194. *National Bureau of Economic Research*.

BCBS (Basel Committee on Banking Supervision), (2021a), "Climate related financial risks – measurement methodologies", report, April.

BCBS (Basel Committee on Banking Supervision), (2021b), "Climate related risk drivers and their transmission channels", report, April.

Basiglio S., Rossi M.., Salomone, R., Torricelli C. 2020. Saving with social impact: evidence from Trento province, *Sustainability*, 12, 8363.

Bauer, R., & Smeets, P. (2015). Social identification and investment decisions. *Journal of Economic Behavior & Organization*, 117(C), 121-134.

Beal DJ., Goyen, M., Philips, P. (2005). Why do we invest ethcally?. J. Invest. 14(3),66-78.

Beck N., Katz, J., 1995. What to do (and not to do) with time-series cross-section data in comparative politics. *American Political Science Review*, 89 (3), 634–647.

Bertelli, B., Boero, G., Torricelli, C. (2021). The market price of greenness: A factor pricing approach for Green Bonds. Working Paper Cefin N.83, June, Università di Modena e Reggio Emilia.

Dax, M. (2020). ESG – a comprehensive guide to a growing asset class. *Unicredit Report*, September 2020.

ECB (European Central Bank), (2021), "Climate related risk and financial stability", ECB/ESRB project team on climate risk monitoring, July.

Global Sustainable Investment Alliance. (2019). Global Sustainable Investment Review, Report N.4.

Global Sustainable Investment Alliance. (2021). Global Sustainable Investment Review, Report N.5.

Gutsche, G., & Ziegler, A. (2019). Which private investors are willing to pay for sustainable investments? Empirical evidence from stated choice experiments. Journal of Banking & Finance, 102(C), 193-214.

ICMA. (2021). Social Bond Principles: Voluntary Process Guidelines for Issuing Social Bonds. ICMA Paris Representative Office. Paris. Retrieved from ICMA: www.icmagroup.org.

Karpf, A., & Mandel, A. (2018). The changing value of the 'green' label on the US municipal bond market. *Nature Climate Change*, 8(2), 161-165.

Peeters S., Schmitt M., Volk, A. (2020). Social Bonds can help mitigate the economic and social effects of the COVID-19 Crisis. *EMCompass*, 89. Retrieved from IFC: www.ifc.org/ThoughtLeadership.

Preclaw, R., & Bakshi, A. (2015). The cost of being green. Report, Barclays Credit Research.

Rossi M.C., Sansone D., van Soest A., Torricelli, C. (2019). Household preferences for Socially Responsible Investments, *Journal of Banking and Finance*, 105, 107-120.

Stuart, E. A. (2010). Matching methods for causal inference: A review and a look forward. *Statistical science: a review journal of the Institute of Mathematical Statistics*, 25(1), 1.

Zerbib, O. D. (2019). The effect of pro-environmental preferences on bond prices: Evidence from green bonds. *Journal of Banking & Finance*, 98(C), 39-60.

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