Annals of Operations Research
https://doi.org/10.1007/s10479-023-05683-x

ORIGINAL RESEARCH

Corporate social responsibility, industry competition and firm productive efficiency: evidence from semi-parametric and non-parametric analysis

Taher Hamza[1] · **Hamza Nizar**[2] · **Faten Lakhal**[3]

Received: 26 December 2022 / Accepted: 26 October 2023

Abstract
This study examines whether corporate social responsibility (CSR) improves firm productive efficiency and highlights the role of product market competition in addressing agency conflicts associated with CSR. Using a sample of French firms from 2008 to 2018, we estimate firm productive efficiency through a semi-parametric and non-parametric methods (Data Envelopment Analysis—DEA). The results show that CSR positively affects firm productive efficiency supporting the instrumental stakeholder theory. We also find that the positive effect of CSR on firm productive efficiency is more prevalent among firms operating in highly competitive environments and standing out high governance quality. These findings suggest that agency problems related to CSR are less likely in firms subject to high external and internal control. These findings have several practical implications and may provide valuable insights in particular to the French National Productivity Council, which has been actively investigating the primary catalysts of firm productivity in France.

Keywords Corporate social responsibility · Firm productive efficiency · Product market competition · Stakeholder theory · Corporate Governance

1 Introduction

Corporate social responsibility (CSR) refers to firms' engagement in pro-social activities that go above and beyond the pursuit of shareholders' financial interests (McWilliams & Siegel, 2001). The firm's engagement in CSR activities has become increasingly widespread. In France, companies have made efforts in recent years to report their CSR investments either in standalone reports or as part of their annual financial reports (Ajina et al., 2019). A 2015 survey by Ecovadis showed that 47% of French companies have a performing CSR management system. According to Novotic, in 2020, there was an increase in sustainable funds, both in

✉ Taher Hamza
taher.hamza.ihec@gmail.com

1 EM Normandie Business School, Metis Lab, Paris, France

2 PRESTIGE Lab, IHEC-University of Carthage, Carthage, Tunisia

3 Léonard de Vinci Pôle Universitaire, Research Center, 92916 Paris, La Défense, France

Published online: 06 December 2023

terms of the assets under management and the number of funds. There are currently 1186 funds in the French market, with nearly EUR 900 billion invested. The increasing focus on CSR has sparked debate among academics over its legitimacy.

The existing literature has mostly debated shareholders' preferences for CSR investment. The theoretical and empirical evidence regarding CSR is controversial. On the one hand, the agency theory suggests that CSR is embedded with high agency costs (Friedman, 1970; Jensen & Meckling, 1976). Specifically, managers and controlling shareholders may use firm resources to draw on the benefits of control (e.g., personal reputation) through CSR activities (Barnea & Rubin, 2010; Masulis & Reza, 2015). On the other hand, the stakeholder theory (Freeman, 1984) shows that CSR is value constructive for financial and non-financial stakeholders. CSR contributes to enhancing a firm's value and competitiveness (Flammer, 2015; Renneboog et al., 2008). It can benefit companies by offering strategic product market differentiation (Lins et al., 2017), higher financial performance (Hasan et al., 2018), and eventually, insurance against event risks (Godfrey et al., 2009).

The primary objective of this study is to investigate the effect of CSR on firm value, as reflected by its total factor of productivity (TFP). According to Tian and Twite (2011), TFP is the most appropriate proxy of firm value, as it is less subject to managerial manipulation than other financial metrics (e.g., return on assets and Tobin's Q). The instrumental stakeholder theory introduces CSR as an instrument that creates and maximizes shareholders' value, as proxied by productivity (Donaldson & Preston, 1995). Specifically, addressing various CSR issues (i.e., waste of energy, recycling, and employee welfare) and developing lasting productive relationships with key stakeholders can effectively enhance firm productivity (Hasan et al., 2018).

Hasan et al. (2018) showed that investment in CSR helps enhance the efficient allocation of production input factors (labor and capital) and thus firms' TFP. For instance, firms engaging in CSR activities increase stakeholders' (e.g., employees) willingness to participate in the production process in a more efficient way (Jones, 1995). For instance, green innovation by socially responsible firms helps achieve economic benefits (e.g., economies of scale and better economic performance) and environmental protection in the long term (Hao & He, 2022). Vilanova et al. (2009) found a positive relationship between CSR and the dimension of firm productivity, suggesting that CSR has a positive impact on employees' motivation.

We also examine the moderating effect of product market competition on the relationship between CSR and firm productivity. Product market competition may be considered a strong channel through which CSR affects firm productivity. The role of external market discipline is to ensure that corporate strategies, including CSR, are implemented effectively and in the interests of all stakeholders (Dupire & M'Zali, 2018). In the presence of external market discipline, CSR is well monitored and likely to have a value maximization purpose (Flammer, 2015; Kemper et al., 2013). External market discipline is likely to mitigate managerial discretion to use CSR investments to gain private benefits at the expense of other stakeholders (Lee et al., 2018). Under a strong external market discipline mechanism, CSR is viewed as a strategic investment consistent with stakeholders' interests, including those of employees (Sheikh, 2018).

Based on a sample of French listed firms over the period 2008–2018, we use the semi-parametric method proposed by Olley and Pakes (1996) to estimate firm-level TFP. The results show that CSR positively affects firm productivity, supporting the instrumental stakeholder theory. This finding suggests that CSR helps enhance the efficient allocation of production input factors (labor and capital) and thus, the firms' TFP. We also find that the positive effect of CSR on firm productive efficiency is more prevalent among firms operating in highly competitive environments. These findings also reveal that agency problems associated

with CSR are less prevalent in firms facing external market discipline, which can encourage managers to favor productive projects over personal interests. We conduct additional analysis to explore the impact of CSR in firms based on governance quality. In the presence of sound corporate governance, CSR is well-monitored and is more effective in achieving the value maximization goal. These results reveal a positive impact of CSR on strongly governed firms and suggest the importance of good governance in monitoring CSR activities in French firms.

This paper makes several contributions to the literature. First, this study complements the literature on the determinants of firm productive efficiency, such as managerial ownership (Palia & Lichtenberg, 1999), family ownership (Barbera & Moores, 2013), corporate governance (Köke & Renneboog, 2005), institutional investors (Allaya et al., 2022) and CSR (Hasan et al., 2018). Specifically, we provide new evidence on how CSR affects firm productive efficiency in the French context. To this end, we used semi-parametric and non-parametric methods (Data Envelopment Analysis—DEA)- to estimate firm productive efficiency. We document that CSR strategy is creating value, via higher firm productive efficiency, and therefore meets financial and non-financial stakeholders' interests. Second, this study contributes to the literature that highlights the role of product market competition (Boubaker et al., 2022; Flammer, 2015), and governance quality (Aguilera et al., 2006; Castañer & Kavadis, 2013) in curbing shareholders' wealth expropriation, such as overinvestment in CSR. Third, France serves as a suitable laboratory for investigating the role of industry competition on the relationship between CSR and firm productive efficiency. The implementation of many laws such as the New Economic Regulations (NER law, 2001), the Grenelle Environment Forum (2010), and the Energy Transition Act (2015), puts France at the forefront of CSR regulations. Additionally, in France, the AFEP-MEDEF code (2013) recommended the creation of a sustainable development committee to promote the integration of environmental, social and governance criteria to the company's strategy. Besides, France is a civil law country where investor protection is weak.[1] According to Barnea and Rubin (2010), corporate managers and controlling shareholders may have incentives to overinvest in CSR to satisfy their own needs (e.g., public image, job security, and respect). External market discipline, and in particular industry competitive pressure, can be essential in reducing shareholders' wealth expropriation risk in a weakly protected environment.

The remainder of this paper is organized as follows: In Sect. 2, we present the literature review and develop the hypotheses. In Sect. 4, we describe the sample selection procedure, provide variable definitions, and introduce the model specifications. In Sect. 4.2, we present the results. In Sect. 4.4, we conclude the paper.

2 Literature review and hypotheses development

2.1 CSR and productive efficiency

Productivity is the portion of output not explained by the number of inputs used in production (Tian & Twite, 2011). We applied instrumental stakeholder theory to develop a conceptual framework regarding the influence of CSR on firm productivity. Drawing on the instrumental stakeholder theory, firms are likely to manage the interests of shareholders and all stakeholders. This theory focuses on the relationship between satisfying stakeholders' interests and the fulfillment of traditional corporate objectives which is consistent with firm value

[1] https://www.worldbank.org/content/dam/doingBusiness/media/Annual-Reports/English/DB2019-report_web-version.pdf).

maximization (Donaldson & Preston, 1995, p. 71; Jones, 1995). The fundamental premise of instrumental stakeholder theory asserts that companies conduct their operations in an ethical way. The ethical behavior helps firms develop lasting productivity relationships with key stakeholders, engage in recycling, save costs, and generate gains in productivity (Hasan et al., 2018).

Previous studies have investigated the link between CSR and a variety of firm outcomes, including firm productivity (Sun & Stuebs, 2013; Vilanova et al., 2009) and financial performance (Hasan et al., 2018). For instance, Liang et al. (2022) examines the relationship between CSR and firm-level TFP in China. The study shows that CSR significantly promotes TFP in family firms, firms releasing CSR reports voluntarily, and privately held firms. Newman et al. (2020) show also a positive relationship between CSR adoption and firm efficiency, with a stronger impact for firms in non-competitive industries. However, a potentially important channel through which CSR can impact firm productivity has received little research. In this study, we provide arguments regarding how CSR can affect firm productivity. Edmans (2011) showed that firms invest in CSR to enhance employee welfare. For instance, firms can provide their employees with stock ownership that motivates them to be more involved in the production process. In addition, when firms invest in CSR, they also seek to attract talented employees who are likely to improve firm efficiency (Jones et al., 2014). Investment in CSR is not limited to attracting a skilled workforce; it also helps improve firms' ability to retain their workforce (Bode et al., 2015). Third, CSR enables firms to develop lasting productive relationships with key stakeholders, gain easy access to diverse resources, and use them efficiently (Hambrick, 1983). Overall, firms can benefit economically and financially by undertaking productive CSR projects. This is possible through several channels, such as improving employee morale, having easier access to financing, or preventing costly regulatory actions (Fernández-Kranz & Santaló, 2010).

Conversely, considering the agency perspective (Jensen & Meckling, 1976), CSR initiatives may lead to a decrease in firm productivity. The resource diversion and the increased operating costs are two mechanisms through which CSR can potentially decrease firm productivity. First, managers might prioritize CSR projects that align with their personal values or enhance their reputation, even if these projects do not directly benefit shareholders (Barnea & Rubin, 2010). This diversion of resources away from core business activities can hinder firm value and efficiency (Crisóstomo et al., 2011). Second, CSR projects require significant investments in terms of both financial and human resources (Renneboog et al., 2008). While these investments may yield long-term benefits, such as improved reputation and access to capital, the short-term increase in operating costs can challenge a company's profitability and efficiency (El Ghoul et al., 2011).

The preceding discussion shows that CSR may boost or reduce the firm's productive efficiency. Following the instrumental stakeholder theory, the company's commitment to ethical conduct, at the heart of its CSR initiative, will enable them to operate efficiently and drive better firm productivity. Following the agency theory, however, CSR projects can divert firm resources away from core business activities as managers prioritize projects aligned with personal interests or reputation enhancement. Allocating resources to CSR initiatives instead of profit generating projects can potentially lead to missed growth opportunities and diminished productivity.

Taking the arguments above together, we propose the following hypotheses:

H1a. CSR positively affects firm productivity.
H1b. CSR negatively affects firm productivity.

2.2 The moderating role of product market competition

Drawing on the agency theory, managers pursue their own interests rather than the interests of shareholders (Jensen & Meckling, 1976). While the instrumental stakeholder theory provides a more positive and holistic view of the benefits of CSR practices (Donaldson & Preston, 1995, p. 71; Jones, 1995), the agency theory may be more relevant in situations where managers have greater discretion in decision-making (Jensen & Meckling, 1976; Jo & Harjoto, 2011). We argue that these contradictory theories can be reconciled by considering the specific context in which CSR is engaged by managers. On the one hand, in highly competitive product markets, CSR may serve as a way for firms to differentiate themselves from their competitors and attract customers (Flammer, 2015). On the other hand, in less competitive product markets, managers may engage in CSR for personal gains (Sheikh, 2018). Indeed, in a low competitive environment, managers may seek to overinvest in CSR activities because the financial outcomes of such intangible investments are difficult to predict (Lee et al., 2018).

Existing studies show that product market competition is an important corporate governance device that alleviates managers' potential opportunistic behavior (Boubaker et al., 2022; Tian & Twite, 2011). Firms that experience external market discipline have lower agency costs (Köke & Renneboog, 2005; Tian & Twite, 2011). Firms operating in highly competitive environments are exposed to greater threats of liquidation; thus, they have few incentives to engage in wasteful and extravagant expenditures (Schmidt, 1997). The increased threat of liquidation pushes managers to work more diligently (Raith, 2003).

Considering the disciplinary power of product market competition, Lee et al. (2018) showed that the positive effect of CSR on firm value is more likely in a highly competitive environment. The commitment to CSR in a highly competitive environment would indicate managerial efforts to boost firm value rather than overinvestment (Sheikh, 2018). In the presence of external market discipline, CSR is well monitored and is likely to have a value maximization purpose (Flammer, 2015; Kemper et al., 2013).

The influence of competition on firm productivity has been well debated among economists and business scholars. Shleifer and Vishny (1997, p. 738) stipulated that "competition is the most powerful tool toward economic efficiency in the whole world entire." Existing studies support a positive effect of competition on firm productivity (Köke & Renneboog, 2005; Tang & Wang, 2005; Tian & Twite, 2011) and that competition may lead to two sources of productive efficiency: static and dynamic efficiency. According to Comanor and Leibenstein (1969), static efficiency stems from a better reallocation of scarce resources and/or an improvement in the use of the factors of production of companies. However, dynamic efficiency stems from greater incentives for firms to innovate and converge toward the technological frontier (Wu et al., 2021).

Considering the regulatory role of product market competition, CSR activities in highly competitive markets should not indicate an overinvestment problem; instead, they should be considered as strategic investments designed to enhance shareholder value and meet stakeholders' demands. CSR activities in a highly competitive environment are well monitored and will lead investee firms toward productivity maximization. Thus, we propose the following hypothesis:

H_2: The positive (negative) effect of CSR on firm productivity is more (less) prevalent in competitive environments.

3 Research design

3.1 Data sources

We obtained data on CSR from the Thomson Reuters Asset4 database. This database is ranked among the most reliable sources for conducting research in the CSR field (El Ghoul et al., 2017). The database contains scores on a wide range of CSR-related pillars. The environmental pillar (E) includes resource use, emissions, and innovation. The social pillar (S) includes the workforce, human rights, community, and product responsibility. The governance pillar (G) includes the management, shareholders, and CSR strategy. The environmental, social, and governance (CSR) scores are collected annually and compiled from global media publications, firms' sustainability reports, and other public sources. The data related to financial characteristics and the data needed to estimate firm-level productive efficiency are extracted from Compustat.

3.2 Sample

Panel A of Table 1 describes the sample selection procedure. We begin with a sample of 250 firms included in the CAC all tradable index (Former SBF250) from 2008 to 2018. Then we remove companies with missing data (107). Following previous studies on productivity (e.g., Hasan et al., 2018; Palia & Lichtenberg, 1999), we also exclude from our sample 20 financial companies because of their specific financial characteristics (those with SIC code (6000-6999)). These restrictions leave us with a sample of 1353 firm year observations (covering 123 firms). After matching the databases (Compustat and Thomson Reuters Asset 4), we ended up with a final sample of 729 firm year observations (covering 104 firms). Panel B of Table 1 provides the sample industry classification according to Campbell (1996). The highest productive efficiency score was in the textile and trade sector, the score stood at 1.988. The least represented sector group in terms of firm productive efficiency was transportation, with 0.94.

3.3 Variables definitions

3.3.1 Dependent variable

TFP is a measure of the overall effectiveness with which capital and labor are in a production process. This measure provides a broader gauge of firm-level performance than some of the more conventional measures, such as profitability. We estimated the following production function:

$$Y_{it} = \alpha + \beta_1 k_{it} + \beta_2 l_{it} + a_{it} + u_{it}, \tag{1}$$

where Y is the output, l is the cost of labor, and k is the cost of the physical capital input. Lower-case letters represent the logarithm of these variables; a_{it} (technology or efficiency) is TFP. Specifically, the output is the value added measured using the total operating revenue less the intermediate input, labor input using the number of employees, and capital input using net property, plant, and equipment (PP&E), and U_{it} is the error term. Following Boubaker et al. (2021), we proxy for firm investment using capital expenditures.

In this study, we adopt Olley and Pakes's (1996) semi-parametric method to estimate TFP. Specifically, to obtain estimates of the input coefficients and firm-level TFP, we use the

Table 1 Sample Selection Procedure and Industry distribution (SIC, total factor of productivity)

Panel A: Sample Selection Procedure

	Number of firms
Before matching dataset	
Initial sample	250
Financial and insurance companies (−)	20
Firm with missing data (−)	107
Total number of firms	123
After matching dataset	
Total number of firms	104

Panel B: Sample per Industry

	SIC	TFP_{OP}
Petroleum	13;29	1.913
Consumer durable	25, 30, 36, 37, 50, 55, 57	1.280
Basic industry	10, 12, 14, 24, 26, 28, 33	1.666
Food and tobacco	1, 2, 9, 20, 21, 54	1.699
Construction	15, 16, 17, 32, 52	1.908
Capital goods	34, 35, 38,39	1.524
Transportation	40, 41, 42, 44, 45, 47	0.949
Utilities	46,48,49	2.227
Textile and trade	22, 23, 31, 51, 53, 56, 59	1.988
Services	72, 73, 75, 76, 80, 82, 87, 89	1.685
Leisure	27, 58, 70, 78, 79	1.642

This table reports the sample selection procedure and the mean of the key regression variable per industry and per year. TFP_{OP} is total factor productivity computed using Olley and Pakes's (1996) method

Stata prodest, a new Stata module for production function estimation, based on the preceding log-linear Cobb–Douglas production function (Eq. 1). The Stata prodest basic usage is quite similar to that of existing modules like opreg, but has the advantage of adding many features to control the optimization procedures and address estimation issues, such as gross output (sales or revenue from production) vs. value added (defined as total operating revenue less intermediate input), endogenous variables, and attrition in the data. The major advantage of Olley and Pakes' (1996) approach over traditional estimation techniques, such as ordinary least squares (OLS),[2] is its ability to control for selection and simultaneity biases. Once the production function is estimated using Olley and Pakes' (1996) approach, we obtain a logged measure of firm productivity (TFP).

[2] TFP is often estimated as the residual from the OLS regression of observed output on the production inputs, assuming a Cobb–Douglas production function (Palia & Lichtenberg, 1999; Tian & Twite, 2011). However, this approach to estimating TFP suffers from two major endogeneity issues: simultaneity and selection bias (Hasan et al., 2018; Olley & Pakes, 1996).

3.3.2 Independent variable

The CSR variable is proxied by the composite CSR score and its three components: the environmental (ENV), social (SOC), and governance (GOV) scores (Govindan et al., 2021). They were all retrieved from the Thomson Reuters Asset4 database, and the scores ranged from 0 to 100 (highest).

3.3.3 Moderating variable

Product market competition was measured using the Herfindahl–Hirschman index (HHI). A high value of HHI indicates low product market competition. The HHI was calculated as follows:

$$\mathrm{HHI_{jt}} = \sum_{i=1}^{N} \mathrm{MS_{ijt}^2},$$

where MS_{ijt} refers to the market share of firm i in industry j in year t, and N refers to the number of the same industry firms. Based on the HHI, we construct a binary variable (*HHI_bin*) that takes the value of 1 if the value of the HHI is lower than the sample median, and 0 otherwise. We expect that external market discipline will positively affect CSR (Flammer, 2015).

3.3.4 Control variables

Consistent with previous literature (Boubaker et al., 2021; Hasan et al., 2018; Tian & Twite, 2011), we used a set of control variables to account for other possible determinants of firm productivity: (1) *Size*, computed as the natural logarithm of total assets; (2) the market-to-book ratio (*MTB*), defined as the ratio of the firm's market value of equity to its book value of equity; (3) firm leverage (*Leverage*), measured by the firm's total debt to total assets; and (4) return on assets (*ROA*), defined as firm income before interest and taxes divided by total assets. The definitions of all variables used in this paper are given in the appendix.

3.4 Model specification

We tested the relation between CSR and firm productivity by estimating the following panel data regression (generalized least squares) with robust standard errors clustered at the firm level to correct for heteroscedasticity and/or autocorrelation. To this end, we used a complete integrated statistical software package (Stata software) to analyze and manage our database. We estimated the following model:

$$\begin{aligned} TFP_{it} = {} & \beta 1 CSR_{it} + \beta 2 Size_{it} + \beta 3 MTB_{it} + \beta 4 Leverage_{it} + \beta 5\, ROA_{it} \\ & + Year\ Fixed\ Effects + Industry\ Fixed\ Effects + \varepsilon_{it}, \end{aligned} \tag{2}$$

where the dependent variable is TFP. To capture CSR, we used the CSR score and its three components (ENV, SOC, and GOV). The control variables are *Size*, *MTB*, *Leverage*, and *ROA* (see the appendix for the variable definitions), *Year Fixed Effects* is a set of year dummies, *Industry Fixed Effects* is a set of industry dummies, and ε is an error term.

To examine the moderating role of product market competition, we first computed the sales-based HHI using two-digit SIC code industry groupings. Then, we classified firms into two groups depending on whether they operated in a low-competition (above-median HHI)

or a high-competition (below-median HHI) industry. Finally, we tested whether productivity was significantly different between the low- and high-competition groups by running a joint seemingly unrelated regression estimation.

4 Empirical results

4.1 Descriptive statistics and correlation matrix

Table 2 presents descriptive statistics for all variables used in the analysis to investigate the impact of institutional investors on firm-level productive efficiency. The average TFP is 1.704, which is quite similar to the one reported by Tian and Twite (2011) in Australian firms. The average CSR score was 54.2% and ranged between 6.3% and 84.5%. This proportion is very similar to the one reported by Dyck et al. (2019) when referring to the French context. This suggests that French firms engage substantially in socially responsible activities, especially after the adoption of the Grenelle (II) act on CSR mandatory disclosures in 2010. Focusing on product market competition variable, we notice that over the entire period, 70.6% of French firms operated in a fairly competitive environment. This statistic implies that the sample firms appear to be vulnerable to effective monitoring activities by external market discipline. This proportion is quite distinct from the one presented by Flammer (2015) within the United States, and almost identical to the proportion displayed by Tian and Twite (2011) in the Australian context.

Table 3 provides the Pearson correlation matrix between the dependent, independent, and control variables to assess any potential problem of bilateral correlation that might cause the

Table 2 Summary statistics

	Mean	SD	Min	P25	Median	P75	Max
TFP_{OP}	1.704	0.594	0.602	1.268	1.703	2.151	2.796
CSR	0.542	0.223	0.063	0.423	0.578	0.718	0.845
ENV	0.590	0.260	0.068	0.435	0.638	0.795	0.935
SOC	0.586	0.255	0.066	0.411	0.628	0.797	0.929
GOV	0.434	0.241	0.048	0.236	0.441	0.641	0.826
MTB	1.954	1.163	0.460	1.110	1.640	2.530	4.900
Size (Assets Million Euros)	12,869.597	19,546.091	174.156	906.758	3717.1	15,186.4	72,762
ROA	0.804	0.424	0.157	0.499	0.723	1.083	1.766
Leverage	0.621	0.158	0.335	0.504	0.625	0.743	0.905

		Proportion	SE	[95%_Conf. Interval]	
HHI_bin	0	0.294	0.012	0.270	0.319
	1	0.706	0.012	0.681	0.730

This table reports summary statistics of the regression variables. The sample comprises 729 firm-year observations over the period 2008–2018. See the Appendix for variables' definitions

Table 3 Pearson correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) TFP_OP	1.000									
(2) CSR	0.149***	1.000								
(3) ENV	0.089*	0.403***	1.000							
(4) SOC	0.137***	0.520***	0.333***	1.000						
(5) GOV	0.195***	0.440***	0.149***	0.187***	1.000					
(6) HHI_bin	0.072**	0.125***	0.156***	0.071**	0.056***	1.000				
(7) MTB	0.307***	− 0.074**	− 0.067*	− 0.018	− 0.077**	0.120***	1.000			
(8) SIZE	0.601***	0.450***	0.400***	0.371***	0.278***	− 0.300***	− 0.081***	1.000		
(9) ROA	− 0.459***	− 0.091**	− 0.112***	0.000	− 0.139***	0.018	− 0.116***	− 0.199***	1.000	
(10) LEVERAGE	− 0.024	0.121***	0.063*	0.078**	0.042	− 0.292***	− 0.073***	0.204***	0.089***	1.000
VIF	1.38	1.96	1.39	1.48	1.26	1.18	1.07	1.74	1.17	1.19

This table reports the correlations of the regression variables. The sample comprises 729 firm-year observations over the period 2008–2018. See the Appendix for variables' definitions. ***, ** and * denotes the statistical significance at the 1, 5 and 10% levels, respectively

Table 4 CSR and firm productive efficiency

	TFP_{OP}	TFP_{OP}	TFP_{OP}	TFP_{OP}
CSR	0.263***			
	(0.048)			
ENV		0.110***		
		(0.038)		
SOC			0.162***	
			(0.039)	
GOV				0.315***
				(0.047)
MTB	0.100***	0.102***	0.103***	0.096***
	(0.007)	(0.007)	(0.007)	(0.008)
Size	0.163***	0.189***	0.177***	0.160***
	(0.009)	(0.008)	(0.008)	(0.008)
ROA	− 0.314***	− 0.319***	− 0.311***	− 0.306***
	(0.025)	(0.025)	(0.024)	(0.026)
Leverage	− 0.140*	− 0.199***	− 0.184**	− 0.101
	(0.073)	(0.073)	(0.074)	(0.075)
Constant	0.374***	0.238***	0.312***	0.362***
	(0.083)	(0.081)	(0.080)	(0.083)
Observations	729	729	729	729
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
WALD CHI2	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)

This table reports the panel data regression results regarding the impact of CSR on firm productivity. The sample comprises 729 firm-year observations over the period 2008–2018. See the Appendix for variables' definitions ***, ** and * denotes the statistical significance at the 1, 5 and 10% levels, respectively

estimated coefficient to be unstable and increase the standard deviation. We did not find high correlations between the explanatory variables, which suggests that variable correlation was not a serious concern in the regressions. All correlations were below the critical value of 0.8 (Gujarati, 2004) where the VIF (Variance inflation factor) range between 1.12 and 1.96 far below the critical value of 10.

4.2 Results and discussion

Table 4 shows the results using TFP_OP as the dependent variable. The CSR score and its three components (ENV, SOC, and GOV) have a positive and highly significant coefficient at the 1% level. Moreover, the effect of CSR on productive efficiency is not only statistically significant but also economically meaningful. A one-standard-deviation increase in CSR is associated with an increase in TFP of 3.44%, ceteris paribus.[3] This result supports our first hypothesis (H1a) and is consistent with the instrumental stakeholder theory (Donaldson &

[3] The economic significance is computed as the standard deviation of CSR, multiplied by its coefficient, all divided by the average *TFP_OP*.

Preston, 1995) and the existing literature investigating the effect of CSR on firm productivity (Hasan et al., 2018; Sun & Stuebs, 2013). This result suggests that investment in CSR helps enhancing the efficient allocation of production input factors (labor and capital) and thus, the firms' TFP. The CSR social dimension considers the managerial human and economic transactions with employees, customers, suppliers, and communities. Specifically, socially responsible firms seek to enhance employee welfare (safe and healthy work environment, training and development, competitive compensation and benefits, respect of the rights of its workers) which, in turn, increases their motivation and willingness to participate in the production process with increased efficiency (Edmans, 2011). In addition, by considering issues related to product safety, marketing practices, and customer privacy, this leads to increased trust and loyalty and better commercial productivity (Flammer, 2015; Servaes & Tamayo, 2013).

Regarding the environmental pillar, firms that place a high priority on environmental sustainability are likely to build stakeholders' trust and may benefit from a range of productivity-enhancing factors such as improved brand reputation, innovation and new technologies, products and services, operational cost savings, etc. (Lins et al., 2017; Masulis & Reza, 2015). Additionally, socially responsible firms seek to invest in green innovation (capital) to achieve economic benefits (e.g., better firm productive efficiency) and environmental protection in the long run (Hao & He, 2022; Hasan et al., 2018; Sun & Stuebs, 2013). These results offer valuable insights to French policymakers and regulators into the potential productivity advantages derived from adopting firm sustainable practices.

Table 5 shows the results of the subsample analysis regarding the influence of product market competition on the relationship between CSR and firm productivity. Table 5 shows that the coefficients of the CSR score and its three components (ENV, SOC, and GOV) are significant only for high product market competition groups. These findings provide support for our second hypothesis (H2), suggesting that the influence of CSR on firm productivity is more pronounced in firms that experience external market discipline. Firms that face intense competition are often forced to innovate in order to maintain or gain market share (Raith, 2003; Schmidt, 1997). Indeed, industry competition can spur firms to innovate, improve their products and services, and adopt more efficient business practices to gain a competitive advantage (Köke & Renneboog, 2005; Tang & Wang, 2005).

This finding also suggests that agency problems related to CSR are less likely in firms operating in highly competitive environments. In firms facing competitive pressure, CSR activities are well monitored, leading investee firms toward productive efficiency maximization (Flammer, 2015; Kemper et al., 2013; Lee et al., 2018; Sheikh, 2018). Indeed, companies that give high priority to CSR considerations may be better positioned to respond to changes in the competitive environment and to satisfy stakeholders' needs, which can help achieving a long-term performance. Overall, this finding implies that product market competition plays a significant moderating role in leveraging environmental and social performance for firm productivity, and then its value.

4.3 Additional analyses

4.3.1 The moderating role of governance quality

Following the conflict resolution hypothesis, CSR firms with effective governance and monitoring mechanisms are likely to reduce conflicts of interests among various stakeholders (Freeman, 1984; Jensen, 2002). Specifically, in presence of good corporate governance, CSR

Table 5 CSR and firm productive efficiency: the moderating role of external market discipline

	Low competiton	High competiton	Low competiton	High competiton	Low competiton	High competiton	Low competiton	High competiton
CSR	0.106	0.298***						
	(0.087)	(0.069)						
ENV			0.064	0.166***				
			(0.072)	(0.052)				
SOC					0.007	0.244***		
					(0.069)	(0.052)		
GOV							0.105	0.379***
							(0.066)	(0.085)
MTB	0.118***	0.094***	0.132***	0.095***	0.128***	0.095***	0.094***	0.101***
	(0.021)	(0.008)	(0.020)	(0.008)	(0.020)	(0.008)	(0.009)	(0.022)
Size	0.151***	0.187***	0.168***	0.208***	0.164***	0.201***	0.210***	0.136***
	(0.014)	(0.013)	(0.015)	(0.011)	(0.013)	(0.011)	(0.013)	(0.012)
ROA	− 0.462***	− 0.221***	− 0.446***	− 0.214***	− 0.447***	− 0.236***	− 0.236***	− 0.472***
	(0.042)	(0.035)	(0.042)	(0.036)	(0.043)	(0.035)	(0.035)	(0.040)
Leverage	− 0.556***	− 0.109	− 0.564***	− 0.144	− 0.540***	− 0.136	− 0.051	− 0.540***
	(0.168)	(0.088)	(0.172)	(0.090)	(0.167)	(0.087)	(0.088)	(0.180)
Constsant	0.828***	0.035	0.737***	− 0.086	0.724***	− 0.014	− 0.151	0.931***
	(0.142)	(0.118)	(0.138)	(0.114)	(0.136)	(0.114)	(0.120)	(0.138)
Observations	215	514	215	514	215	514	215	514
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 5 (continued)

	Low competiton	High competiton	Low competiton	High competiton	Low competiton	High competiton	Low competiton	High competiton
Industry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WALD CHI2	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)

This table reports the panel data regression results of the moderating effect of product market competition on the relationship of institutional ownership on firm productivity. The sample comprises 729 firm-year observations over the period 2008–2018. See the Appendix for variables' definitions ***, ** and * denotes the statistical significance at the 1, 5 and 10% levels, respectively

is well controlled and has a value maximization purpose (Aguilera et al., 2006; Castañer & Kavadis, 2013; Daily et al., 2003). We tested the effect of corporate governance quality on the relationship between CSR and productive efficiency. We distinguished between two subsamples, depending on whether the companies' governance scores were high or low (over or below the median, respectively). The results in Table 6 show that the CSR score and its two components (ENV and SOC) have a positive and significant impact on productive efficiency for companies with high-quality governance, confirming the importance of good governance quality within investee firms. For companies with poor governance, the effect of the ES score and its two components on productivity is not significant. Indeed, corporate governance practices, in particular through the quality of the board of directors, can improve the efficiency and effectiveness of a company's decision-making process. Hence, our results support the fact that corporate governance and sustainable behavior are tightly linked, because efficient corporate governance can help promoting the firm sustainable behavior (Aguilera et al., 2006;

Table 6 CSR and firm productive efficiency: does governance quality matter?

	Low governance	High Governance	Low governance	High Governance	Low governance	High governance
ES	0.069	0.475***				
	(0.052)	(0.076)				
ENV			0.042	0.187***		
			(0.040)	(0.069)		
SOC					0.045	0.304***
					(0.041)	(0.049)
MTB	0.078***	0.083***	0.077***	0.079***	0.077***	0.081***
	(0.008)	(0.010)	(0.008)	(0.010)	(0.008)	(0.009)
Size	0.243***	0.056***	0.262***	0.075***	0.247***	0.063***
	(0.010)	(0.012)	(0.009)	(0.013)	(0.008)	(0.012)
ROA	− 0.195***	− 0.532***	− 0.197***	− 0.500***	− 0.189***	− 0.560***
	(0.026)	(0.045)	(0.024)	(0.046)	(0.026)	(0.044)
Leberage	− 0.185**	− 0.719***	− 0.178***	− 0.718***	− 0.198***	− 0.705**
	(0.074)	(0.056)	(0.068)	(0.054)	(0.073)	(0.055)
Constant	0.376***	0.838***	0.258***	0.776***	0.352***	0.868***
	(0.095)	(0.159)	(0.085)	(0.167)	(0.089)	(0.054)
Observations	235	494	235	494	235	494
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
WALD CHI2	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)

This table reports the panel data regression results of the moderating effect of Governance quality on the relationship of institutional ownership on firm productivity. The sample comprises 723 firm-year observations over the period 2008–2018. See the Appendix for variables' definitions ***, ** and * denotes the statistical significance at the 1, 5 and 10% levels, respectively

Jo & Harjoto, 2011). In a stakeholder-oriented setting, good governance quality mitigates agency problems and contributes to build trust with investors and other stakeholders.

4.3.2 The impact of CSR on firm value

Previous literature has shown that CSR significantly increases firms' value (Renneboog et al., 2008; Servaes & Tamayo, 2013). In this subsection, we empirically test whether socially responsible firms exhibit improved value from better productive efficiency using the Tobin's Q to measure firm value. Table 7 reports the results regarding the impact of CSR on firm value. The coefficients of the CSR score and its three components (ENV, SOC, and GOV) are positive and significant. These results suggest that CSR is value-enhancing. Indeed, productivity (capital and labor) is an endogenous source of performance and runs through the entire value chain (core and support activities). The positive and significant impact of CSR is achieved through the social channel where employee welfare creates motivation for employees which in turn leads to enhancing productivity. In addition, customer satisfaction leads to an increase

Table 7 CSR and firm value

	TOBIN'S Q	TOBIN'S Q	TOBIN'S Q	TOBIN'S Q
CSR	0.073*			
	(0.040)			
ENV		0.036***		
		(0.013)		
SOC			0.050*	
			(0.029)	
GOV				0.107***
				(0.033)
MTB	0.086***	0.034***	0.070***	0.083***
	(0.002)	(0.004)	(0.005)	(0.002)
Size	0.917***	0.127***	0.923***	0.913***
	(0.005)	(0.019)	(0.005)	(0.005)
ROA	0.197***	0.313***	0.223***	0.216***
	(0.012)	(0.052)	(0.018)	(0.009)
Leverage	0.057	0.089**	0.098**	0.065
	(0.045)	(0.044)	(0.042)	(0.044)
Constant	0.874***	0.443**	0.130***	0.848***
	(0.052)	(0.191)	(0.045)	(0.051)
Observations	729	729	729	729
Year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
WALD CHI2	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)

This table reports the panel data regression results regarding the impact of CSR on firm productivity. The sample comprises 729 firm-year observations over the period 2008–2018. See the Appendix for variables' definitions ***, ** and * denotes the statistical significance at the 1, 5 and 10% levels, respectively

in sales and market share, which leads to higher productivity. The environmental channel is about productivity-enhancing factors related to environmental sustainability.

4.4 Robustness checks

4.4.1 Alternative metrics of firm productive efficiency

First, we estimated firm-level productivity using Levinsohn and Petrin's (2003) model that controls for simultaneity and selection biases. The results in Table 8 show that the CSR score and its three components (ENV, SOC, and GOV) still positively affect firm productivity. Second, we measured firm-level productivity using data envelopment analysis (DEA). DEA is a linear programming technique rooted in the work of Farrell (1957). Since then, it has become one of the most popular non-parametric techniques for measuring efficiency (e.g., Angulo-Meza & Lins, 2002; Vidal-García et al., 2018). Table 8 shows the regression results for estimating Eq. (2) using as the productive efficiency measure obtained from DEA as a dependent variable. The results show that the CSR score and its three components (ENV, SOC, and GOV) still have a significantly positive effect on firm productivity. These results corroborate our previous findings using TFP_{OP} and provide additional support for the first hypothesis.

4.4.2 Endogeneity

Instrumental variable approach (2SLS) To ensure the robustness of the results to endogeneity and reverse causality concerns, we relied on the instrumental variables estimation method. The results of the second stage regressions are reported in columns (1)-(4) of Table 9. We used the industry average of the CSR score and its three components (ENV, SOC, and GOV) as instruments. The validity and relevance of this instrument are confirmed by statistical results of endogeneity (Hausman, 1978; Wu, 1974) and over-identification (Basmann, 1960) test. We obtained consistent results across all these model specifications. The results remained robust and showed that CSR (CSR, ENV, SOC, and GOV) still positively affects firm productivity, which reinforces our primary result of a positive association between CSR and productive efficiency.

Generalized method of moment (GMM) Consistent with Köke and Reneeboog (2005), we also used the generalized method of moments (GMM) developed by Arellano and Bond (1991) as an estimation method. GMM modeling can avoid endogeneity problems related to reverse causality. This approach controls not only for individual-specific effects but also for time-specific effects. The results reported in Table 9 show that reverse causality is unlikely to drive the main evidence and that the CSR score and its three components (ENV, SOC, and GOV) positively affect firm productivity. The Arrelano–Bond model results were supported by two specification tests. (1) The Sargan test, which checks for the effectiveness and validity of the lagged dependent variable as an instrumental variable, showed that the instrument throughout the estimation was proper and valid. (2) The Arrelano–Bond AR test did not reveal any serial correlation in the first differenced errors in the second order, and therefore, the model is not subject to misspecification.

Propensity score matching (PSM) We use the propensity score matching (PSM) approach to allow a comparison between firms with similar features, with the only exception of CSR.

Table 8 CSR and firm productivity: estimating TFP using semi-parametric (Levinshon-Petrin) and non-parametric (Data Envelopment Analysis)

	TFP_{LP}	TFP_{LP}	TFP_{LP}	TFP_{LP}	DEA	DEA	DEA	DEA
CSR	0.224***				0.058***			
	(0.053)				(0.013)			
ENV		0.091**				0.030***		
		(0.040)				(0.010)		
SOC			0.149***				0.033***	
			(0.040)				(0.011)	
GOV				0.275***				0.074***
				(0.054)				(0.012)
MTB	0.094***	0.095***	0.096***	0.095***	0.010***	0.011***	0.011***	0.010***
	(0.007)	(0.007)	(0.007)	(0.008)	(0.002)	(0.002)	(0.002)	(0.002)
Size	0.065***	0.087***	0.077***	0.064***	0.032***	0.035***	0.035***	0.033***
	(0.010)	(0.009)	(0.008)	(0.010)	(0.002)	(0.002)	(0.002)	(0.001)
ROA	− 0.345***	− 0.341***	− 0.349***	− 0.349***	− 0.018**	− 0.020***	− 0.021***	− 0.020***
	(0.030)	(0.030)	(0.030)	(0.031)	(0.007)	(0.007)	(0.007)	(0.007)
Leverage	− 0.167**	− 0.202**	− 0.202**	− 0.143*	0.007	0.010	0.008	0.011
	(0.082)	(0.082)	(0.082)	(0.085)	(0.015)	(0.015)	(0.015)	(0.015)
Constant	0.795***	0.661***	0.746***	0.800***	0.477***	0.457***	0.463***	0.469***
	(0.093)	(0.087)	(0.088)	(0.094)	(0.026)	(0.025)	(0.026)	(0.024)
Observations	729	729	729	729	729	729	729	729
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 8 (continued)

	TFP_{LP}	TFP_{LP}	TFP_{LP}	TFP_{LP}	DEA	DEA	DEA	DEA
Iidustry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
WALD CHI2	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)	Prob > χ (0.000)

This table reports the panel data regression regarding the impact of CSR on alternative firm productivity estimation. The sample comprises 729 firm-year observations over the period 2008–2018. See the Appendix for variables' definitions ***, ** and * denotes the statistical significance at the 1, 5 and 10% levels, respectively

Table 9 CSR and firm productive efficiency: robustness to endogeneity

	IV TFP_{OP}	IV TFP_{OP}	IV TFP_{OP}	IV TFP_{OP}	GMM TFP_{OP}	GMM TFP_{OP}	GMM TFP_{OP}	GMM TFP_{OP}	PSM TFP_{OP}	PSM TFP_{OP}	PSM TFP_{OP}	PSM TFP_{OP}
CSR	0.520***				0.008***				0.202***			
	(0.051)				(0.003)				(0.012)			
ENV		0.519***				0.039***				0.380***	0.179***	0.133***
		(0.050)				(0.004)				(0.072)	(0.067)	(0.049)
SOC			0.109***				0.047***					
			(0.035)				(0.002)					
GOV				0.106**				0.009***				
				(0.524)				(0.003)				
MTB	0.112***	0.104***	0.107***	0.108***	0.024***	0.023***	0.024***	0.023***	0.175***	0.179***	0.101***	0.154***
	(0.016)	(0.015)	(0.015)	(0.017)	(0.001)	(0.001)	(0.001)	(0.001)	(0.021)	(0.023)	(0.018)	(0.022)
Size	0.403***	0.426***	0.353***	0.312***	0.397***	0.425***	0.364***	0.410***	0.249***	0.313***	0.209***	0.200***
	(0.074)	(0.080)	(0.055)	(0.060)	(0.051)	(0.052)	(0.048)	(0.052)	(0.027)	(0.025)	(0.020)	(0.023)
ROA	− 0.338***	− 0.352***	− 0.305***	− 0.340***	− 0.814***	− 0.840***	− 0.802***	0.817***	− 0.585***	− 0.496***	− 0.543***	− 0.629***
	(0.050)	(0.052)	(0.045)	(0.051)	(0.065)	(0.065)	(0.065)	(0.066)	(0.055)	(0.072)	(0.053)	(0.081)
Leverage	− 0.341***	− 0.309***	− 0.367***	− 0.290***	− 0.206***	− 0.184***	− 0.205***	− 0.222***	− 1.202***	− 0.943***	− 1.298***	− 0.832***
	(0.095)	(0.096)	(0.093)	(0.090)	(0.012)	(0.013)	(0.012)	(0.013)	(0.144)	(0.155)	(0.139)	(0.157)
LAG_TFPOP					0.056***	0.010***	0.070***	0.010***				

Table 9 (continued)

	IV TFP_{OP}	IV TFP_{OP}	IV TFP_{OP}	IV TFP_{OP}	GMM TFP_{OP}	GMM TFP_{OP}	GMM TFP_{OP}	GMM TFP_{OP}	PSM TFP_{OP}	PSM TFP_{OP}	PSM TFP_{OP}	PSM TFP_{OP}
					(0.002)	(0.003)	(0.002)	(0.003)				
Constant	0.267	0.360	0.110	0.685*	0.315	0.582	0.460	0.416	0.524*	0.454**	1.017***	0.868***
	(0.462)	(0.483)	(0.364)	(0.367)	(0.475)	(0.481)	(0.450)	(0.478)	(0.307)	(0.181)	(0.242)	(0.267)
Observations	729	729	729	729	474	474	474	474	230	230	230	230
Year	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes
R-squared	0.14	0.13	0.21	0.19					0.64	0.57	0.67	0.56
Basmannoverid (*p*-value)	0.628	0.535	0.367	0.423								
WU-HAUSMAN (*P*-value)	0.004	0.002	0.009	0.007								
AR 1					0.003	0.001	0.007	0.008				
AR2					0.331	0.336	0.337	0.341				
SARGAN					0.179	0.236	0.162	0.219				

This table reports the robustness of the impact of CSR on firm productivity to endogeneity concerns. The sample comprises 729 firm-year observations over the period 2008–2018. See the Appendix for variables' definitions ***, ** and * denotes the statistical significance at the 1, 5 and 10% levels, respectively

Following previous literature (e.g., Ongsakul et al., 2021), we divide the sample into four quartiles based on CSR. We classify firms with the level of CSR in the top quartile as the treatment group (HIGH_CSR_DUMMY). In the first stage, we estimate the propensity scores in a Probit model, where the dependent variable is a dummy variable (HIGH_CSR_DUMMY), and the explanatory variables are all control variables. Subsequently, we matched treatment firms to control firms with the closest propensity score estimated from the first stage. In the second stage, we estimate the regressions based on the matched sample. The results reported in columns (9–12) of Table 9 show that CSR is still positively associated with firm productivity even after controlling for differences in other observable firm characteristics.

5 Conclusion

This paper investigates whether a firm's productive efficiency is affected by CSR. We used semi-parametric (the Olley and Pakes method) and non-parametric (DEA) approaches to measure TFP. Using a sample of French listed firms operating in the manufacturing sector over 2008–2018, we found that CSR has a positive and significant impact on productive efficiency. This finding is consistent with the instrumental stakeholder theory suggesting that CSR is a value-constructive approach that enhances firm productivity and aligns with the interests of both financial and non-financial stakeholders (Donaldson & Preston, 1995; Hasan et al., 2018; Sun & Stuebs, 2013). This result is robust to a battery of tests, including endogeneity and alternative measures of TFP. Additionally, we found that the presence of external market discipline through product market competition drives the positive effect of CSR on firm productivity. This finding implies that product market competition can mitigate agency problems that could result from CSR investments (Dupire & M'Zali, 2018; Flammer, 2015; Lee et al., 2018). Further analyses showed that the positive effect of CSR on productivity is more likely for strongly governed firms. We conclude that CSR activities are well monitored when firms have strong governance structures, which is consistent with previous literature (Aguilera et al., 2006; Castañer & Kavadis, 2013; Daily et al., 2003).

These results are important for managers, boards of directors, investors, and regulators. First, managers may better understand the different mechanisms by which CSR influences productivity. Corporate boards are likely to accept CSR as part of their firms' strategy, given its positive impact on firm productivity. Second, investors should be aware that socially responsible firms are less vulnerable to productivity problems and should regard CSR as a strategy for alleviating agency problems among various stakeholders. Investors may also find reassurance that it is possible to pursue social and environmental objectives while maximizing shareholders' profits. Third, these findings have implications for regulators operating in civil law countries, such as France. In particular, regulators in these countries should set policies that prioritize CSR and create a rulebook to ensure that firms incorporate sustainability into their operations. Considering the disciplinary role of external market discipline, a regulatory review (e.g., notably removing entry barriers in specific industries) is expected to foster a fair competitive environment within the French context. Fourth, boards of directors' efforts should be directed toward best-in-class and authentic CSR strategies. To end with the practical implications, our findings may provide valuable insights to the French National Productivity Council, which has been actively investigating the primary catalysts of firm productivity in France.

Similar to existing research, this study is subject to some limitations. Our research is based on a sample of French companies and can open a direction for future studies to extend

our investigation internationally. While our findings suggest that CSR can help increasing firm productive efficiency, future research can contribute to this important area of study by examining the impact of various dimensions of CSR, such as human resources, environment, community Involvement, business ethics, and human rights scores, on firm productive efficiency.

Declarations

Ethical approval All applicable international, national, and/or institutional guidelines for the care and use of animals were followed.

Human and animal participants All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with human participants or animals performed by any of the authors.

Informed consent Informed consent was obtained from all individual participants included in the study.

Appendix

See Table 10.

Table 10 Variables definitions

Variable	Symbol	Description	Data sources
Dependent variables			
Value added	Y	Natural logarithm of total operating revenue less intermediate input	Compustat
Capital	K	Natural logarithm of capital input using net property, plant and equipment	As above
Labor	L	Natural logarithm of labor input using number of employees	As above
Total factor of productivity	TFP_{OP}	Total factor productivity computed using Olley and Pakes's (1996) method	Author calculation
Total factor of productivity	TFP_{lP}	Total factor productivity computed using Levinsohn and Petrin's (2003) method	Author calculation
Independent variables			
CSR performance	CSR	The average of environmental social and governance performance	Thomson Reuters Asset 4
Environmental and Social performance	ES	The average of environmental and social performance	As above
Environmental	ENV	The environmental pillar consists of three category groupings: emission reduction, product innovation, and resource reduction	As above

Table 10 (continued)

Variable	Symbol	Description	Data sources
Social	SOC	The social pillar is the most complex with seven categories: community, diversity, employment quality, health-and-safety, human rights, product responsibility, and training-and-development	As above
Governance	GOV	The governance pillar has five categories: board functions, board structure, compensation policy, shareholders policy, and vision-and-strategy	As above
Moderator			
Product market competition	HHI_bin	Takes the value of 1 if the value of the Herfindahl Hirschman index of the firm is lower than the sample median and 0 otherwise	Author calculation
Control variables			Compustat
Market to book	MTB	Market equity to book equity	As above
Return on asset	ROA	Net income to total asset	As above
Firm size	Size	Natural logarithm of total asset	As above
Firm leverage	Leverage	Liability to total asset	As above

References

Aguilera, R. V., Williams, C. A., Conley, J. M., & Rupp, D. E. (2006). Corporate governance and social responsibility: A comparative analysis of the UK and the US. *Corporate Governance: An International Review, 14*(3), 147–158.

Ajina, A., Lakhal, F., & Ayed, S. (2019). Does corporate social responsibility reduce earnings management? The moderating role of corporate governance and ownership. *Management International, 23*(2), 45–55.

Allaya, M., Hamza, T., & Nizar, H. (2022). Institutional ownership and firm productive efficiency: is it all about time? Evidence from France. *Gestion, 2000*(39), 17–44.

Angulo-Meza, L., & Lins, M. P. E. (2002). Review of methods for increasing discrimination in data envelopment analysis. *Annals of Operations Research, 116*(1), 225–242.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies, 58*(2), 277–297.

Barbera, F., & Moores, K. (2013). Firm ownership and productivity: A study of family and non-family SMEs. *Small Business Economics, 40*(4), 953–976.

Barnea, A., & Rubin, A. (2010). Corporate social responsibility as a conflict between shareholders. *Journal of Business Ethics, 97*(1), 71–86.

Basmann, R. L. (1960a). On finite sample distributions of generalized classical linear identifiability test statistics. *Journal of the American Statistical Association, 55*(292), 650–659.

Bode, C., Singh, J., & Rogan, M. (2015). Corporate social initiatives and employee retention. *Organization Science, 26*(6), 1702–1720.

Boubaker, S., Manita, R., & Rouatbi, W. (2021). Large shareholders, control contestability and firm productive efficiency. *Annals of Operations Research, 296*(1), 591–614.

Boubaker, S., Dang, V. A., & Sassi, S. (2022). Competitive pressure and firm investment efficiency: Evidence from corporate employment decisions. *European Financial Management, 28*(1), 113–161.

Campbell, J. Y. (1996). Understanding risk and return. *Journal of Political Economy, 104*(2), 298–345.

Castañer, X., & Kavadis, N. (2013). Does good governance prevent bad strategy? A study of corporate governance, financial diversification, and value creation by French corporations, 2000–2006. *Strategic Management Journal, 34*(7), 863–876.

Comanor, W. S., & Leibenstein, H. (1969). Allocative efficiency, X-efficiency and the measurement of welfare losses. *Economica, 36*(143), 304–309.

Crisóstomo, V. L., de Souza Freire, F., & De Vasconcellos, F. C. (2011). Corporate social responsibility, firm value and financial performance in Brazil. *Social Responsibility Journal, 7*(2), 295–309.

Daily, C. M., Dalton, D. R., & Cannella, A. A., Jr. (2003). Corporate governance: Decades of dialogue and data. *Academy of Management Review, 28*, 371–382.

Donaldson, T., & Preston, L. E. (1995). The stakeholder theory of the corporation: Concepts, evidence, and implications. *Academy of Management Review, 20*(1), 65–91.

Dupire, M., & M'Zali, B. (2018). CSR strategies in response to competitive pressures. *Journal of Business Ethics, 148*(3), 603–623.

Dyck, A., Lins, K. V., Roth, L., & Wagner, H. F. (2019). Do institutional investors drive corporate social responsibility? International Evidence. *Journal of Financial Economics, 131*(3), 693–714.

Edmans, A. (2011). The link between job satisfaction and firm value, with implications for corporate social responsibility. *Academy of Management Perspectives, 26*(4), 1–19.

El Ghoul, S., Guedhami, O., Kwok, C. C., & Mishra, D. R. (2011). Does corporate social responsibility affect the cost of capital? *Journal of Banking & Finance, 35*(9), 2388–2406.

El Ghoul, S. E., Guedhami, O., & Kim, Y. (2017). Country-level institutions, firm value, and the role of corporate social responsibility initiatives. *Journal of International Business Studies, 48*(3), 360–385.

Farrell, M. J. (1957). The measurement of productive efficiency. *Journal of the Royal Statistical Society: Series A (general), 120*(3), 253–281.

Fernández-Kranz, D., & Santaló, J. (2010). When necessity becomes a virtue: The effect of product market competition on corporate social responsibility. *Journal of Economics & Management Strategy, 19*(2), 453–487.

Flammer, C. (2015). Does corporate social responsibility lead to superior financial performance? *A Regression Discontinuity Approach. Management Science, 61*(11), 2549–2568.

Freeman, R. (1984). *Strategic management: A stakeholder approach*. Pitman Publishing.

Friedman, M. (1970). A theoretical framework for monetary analysis.*Journal of Political Economy, 78*(2), 193–238.

Godfrey, P. C., Merrill, C. B., & Hansen, J. M. (2009). The relationship between corporate social responsibility and shareholder value: An empirical test of the risk management hypothesis. *Strategic Management Journal, 30*(4), 425–445.

Govindan, K., Kilic, M., Uyar, A., & Karaman, A. S. (2021). Drivers and value-relevance of CSR performance in the logistics sector: A cross-country firm-level investigation. *International Journal of Production Economics, 231*, 107–835.

Gujarati, D. N. (2004). Basic econometrics. (4th edition). The McGraw-Hill Companies.

Hambrick, D. C. (1983). High profit strategies in mature capital goods industries: A contingency approach. *Academy of Management Journal, 26*(4), 687–707.

Hao, J., & He, F. (2022). Corporate social responsibility (CSR) performance and green innovation: Evidence from China. *Finance Research Letters, 48*, 102889.

Hasan, I., Kobeissi, N., Liu, L., & Wang, H. (2018). Corporate social responsibility and firm financial performance: The mediating role of productivity. *Journal of Business Ethics, 149*(3), 671–688.

Hausman, J. A. (1978). Specification tests in econometrics.*Econometrica: Journal of the Econometric Society*, 1251–1271.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics, 3*(4), 305–360.

Jensen, M. C. (2002). Value maximization, stakeholder theory, and the corporate objective function. *Business Ethics Quarterly*, 235–256.

Jo, H., & Harjoto, M. A. (2011). Corporate governance and firm value: The impact of corporate social responsibility. *Journal of Business Ethics, 103*, 351–383.

Jones, T. M. (1995). Instrumental stakeholder theory: A synthesis of ethics and economics. *Academy of Management Review, 20*(2), 404–437.

Jones, D. A., Willness, C. R., & Madey, S. (2014). Why are job seekers attracted by corporate social performance? Experimental and field tests of three signal-based mechanisms. *Academy of Management Journal, 57*(2), 383–404.

Kemper, J., Schilke, O., Reimann, M., Wang, X., & Brettel, M. (2013). Competition-motivated corporate social responsibility. *Journal of Business Research, 66*(10), 1954–1963.

Köke, J., & Renneboog, L. (2005). Do corporate control and product market competition lead to stronger productivity growth? Evidence from market-oriented and blockholder-based governance regimes. *The Journal of Law and Economics, 48*(2), 475–516.
Lee, J. H., Byun, H. S., & Park, K. S. (2018). Product market competition and corporate social responsibility activities: Perspectives from an emerging economy. *Pacific-Basin Finance Journal, 49*, 60–80.
Levinsohn, J., & Petrin, A. (2003). Estimating production functions using inputs to control for unobservables. *The Review of Economic Studies, 70*(2), 317–341.
Liang, Y., Cai, C., & Huang, Y. (2022). The effect of corporate social responsibility on productivity: Firm-level evidence from Chinese listed companies. *Emerging Markets Finance and Trade, 58*(12), 3589–3607.
Lins, K. V., Servaes, H., & Tamayo, A. (2017). Social capital, trust, and firm performance: The value of corporate social responsibility during the financial crisis.*The Journal of Finance, 72*(4), 1785–1824.
Masulis, R. W., & Reza, S. W. (2015). Agency problems of corporate philanthropy. *The Review of Financial Studies, 28*(2), 592–636.
McWilliams, A., & Siegel, D. (2001). Corporate social responsibility: A theory of the firm perspective. *Academy of Management Review, 26*(1), 117–127.
Newman, C., Rand, J., Tarp, F., & Trifkovic, N. (2020). Corporate social responsibility in a competitive business environment. *The Journal of Development Studies, 56*(8), 1455–1472.
Olley, S., & Pakes, A. (1996). The dynamics of productivity in the telecommunication equipment industry. *Econometrica, 64*, 1263–1297.
Ongsakul, V., Jiraporn, P., & Treepongkaruna, S. (2021). Does managerial ownership influence corporate social responsibility (CSR)? The role of economic policy uncertainty. *Accounting & Finance, 61*(1), 763–779.
Palia, D., & Lichtenberg, F. (1999). Managerial ownership and firm performance: A re-examination using productivity measurement. *Journal of Corporate Finance, 5*(4), 323–339.
Raith, M. (2003). Competition, risk, and managerial incentives. *American Economic Review, 93*(4), 1425–1436.
Renneboog, L., Ter Horst, J., & Zhang, C. (2008). Socially responsible investments: Institutional aspects, performance, and investor behavior. *Journal of Banking & Finance, 32*(9), 1723–1742.
Schmidt, K. M. (1997). Managerial incentives and product market competition. *The Review of Economic Studies, 64*(2), 191–213.
Servaes, H., & Tamayo, A. (2013). The impact of corporate social responsibility on firm value: The role of customer awareness. *Management Science, 59*(5), 1045–1061.
Sheikh, S. (2018). Corporate social responsibility, product market competition, and firm value. *Journal of Economics and Business, 98*, 40–55.
Shleifer, A., & Vishny, R. (1997). A survey of corporate governance. *Journal of Finance, 52*(2), 737–783.
Sun, L., & Stuebs, M. (2013). Corporate social responsibility and firm productivity: Evidence from the chemical industry in the United States. *Journal of Business Ethics, 118*(2), 251–263.
Tang, J., & Wang, W. (2005). Product market competition, skill shortages and productivity: Evidence from canadian manufacturing firms. *Journal of Productivity Analysis, 23*(3), 317–339.
Tian, G. Y., & Twite, G. (2011). Corporate governance, external market discipline and firm productivity. *Journal of Corporate Finance, 17*(3), 403–417.
Vidal-García, J., Vidal, M., Boubaker, S., & Hassan, M. (2018). The efficiency of mutual funds. *Annals of Operations Research, 267*(1), 555–584.
Vilanova, M., Lozano, J. M., & Arenas, D. (2009). Exploring the nature of the relationship between CSR and competitiveness. *Journal of Business Ethics, 87*(1), 57–69.
Wu, W., Sheng, L., Tang, F., Zhang, A., & Liu, J. (2021). A system dynamics model of green innovation and policy simulation with an application in Chinese manufacturing industry. *Sustainable Production and Consumption, 28*, 987–1005.
Wu, D. M. (1974). Alternative tests of independence between stochastic regressors and disturbances: Finite sample results.*Econometrica: Journal of the Econometric Society,* 529–546.