Journal of Economic Psychology 94 (2023) 102575

Contents lists available at ScienceDirect

Journal of Economic Psychology

journal homepage: www.elsevier.com/locate/joep

Investor preferences for positive social externalities and state-owned enterprises' facilitated access to capital ☆

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ARTICLE INFO

Dataset link: https://osf.io/m6kst/

Keywords:
Public goods game
State-owned enterprise
Capital costs
Social preferences
Investment decisions

ABSTRACT

State-ownership of commercial companies exists around the world, and it is important to understand its effect on financing and investment decisions. Empirically, firms that are partially state-owned (SOE) usually profit from easier access to capital. We propose a novel explanation for this: investors' social preferences can affect capital allocation if SOEs are perceived as socially beneficial. In support of this we found that people attribute social benefits more to SOEs than to private firms, and their propensity to invest depends on this attitude. Further, in an incentivized modified stochastic public goods game, participants invested in risky options with positive externalities even when the aggregate of private return and externality was lower than the return of an investment option with only private returns. For the case of the EU, we discuss alternative explanations such as state guarantees and political lending in the light of regulations of state aid. We conclude that even if these regulations prohibit direct or indirect state aid for SOEs, state-ownership can affect capital allocation through investors' social preferences.

1. Introduction

In 2017 firms with full or partial state-ownership summed up to 2.4 trillion in firm value and employed over 9.2 million people, excluding China (OECD, 2017). Given its economic relevance, state-ownership shapes economic decisions around the world (Bruton et al., 2015). EU and OECD countries are no exceptions and feature many fully or partially state-owned companies (Christiansen, 2011). These companies in OECD countries acquire capital also in commercial marketplaces (OECD, 2014). In this paper, we define state-owned companies (SOEs) as commercially active companies where the state owns at least 10% of their capital. From the point of view of regulation, financial market research, and investors' behavior, it is important to understand how (partial) state-ownership affects investments in these firms. In particular, investors with social preferences might make their investment decisions not only based on expected performance (e.g., Bauer et al., 2021). Rather, they take positive social externalities of their investments into account, and they might associate state-ownership with these externalities. That way, the ownership structure could affect investment decisions and in turn financing conditions for companies. In principle, there are two opposing views to explain the existence of state-ownership of companies.

☆ Acknowledgements: We thank Thore Petersen for programming and conducting the experiment. We thank Jan Schmitz for helpful comments. All data as well as Supplemental Online Material (SOM) including the survey questions and experimental tasks are available at OSF: https://osf.io/m6kst/.

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https://doi.org/10.1016/j.joep.2022.102575
Received 20 September 2021; Received in revised form 21 October 2022; Accepted 6 November 2022
Available online 18 November 2022

The first view postulates that SOEs are a means to achieve the goals of politicians (Shleifer & Vishny, 1994). Such goals may range from maximizing employment, securing voters' happiness, transferring resources to their supporters, or achieving geopolitical agendas. As these goals are not necessarily profit maximizing, this can result in inefficiencies and lower profits (Cox & McCubbins, 1986; John et al., 2008; Shleifer, 1998). In accordance with this view, some research has shown that SOEs are less profitable and suffer from worse corporate governance than private firms (Borisova et al., 2012; Dewenter & Malatesta, 2001; Estrin et al., 2009; Megginson & Netter, 2001). A possible example for this view is German state bank *Kreditanstalt für Wiederaufbau*'s intervention (on behalf of the German government) to keep the insolvent carrier Air Berlin flying during the pre-election summer holidays in 2017.

In contrast, the second view suggests that SOEs exist to mitigate market failures and increase overall welfare (Atkinson & Stiglitz, 2015). For example, private postal operators have no incentive to service remote areas because the profit generated by a few parcels does not cover the costs of delivery. Similar arguments arise for other network industries such as railways and electricity. In such cases, the profit of the company may be lower, but there are positive externalities for the society in which the company operates. Hence, a local investor is not only compensated with the interest or dividend from the SOE, but also with some form of benefit that is distributed among all citizens. In accordance with this view, 37% of private sector CEOs in a recent PwC survey agreed that SOEs are beneficial to society in some sectors of the economy.[1]

1.1. Financing conditions and state-ownership

Empirically, state ownership affects profitability, governance, investment as well as financing strategies (Borisova et al., 2012; Estrin et al., 2009; Jaslowitzer et al., 2016; Megginson & Netter, 2001). State ownership also influences the market perceptions of firm value and risk (Beuselinck et al., 2017; Borisova et al., 2015). Importantly for our research question, SOEs seem to benefit from facilitated access to capital (Brandt & Li, 2003; Chen, Jiang et al., 2016; Megginson & Netter, 2001; Megginson et al., 2014; OECD, 2012, 2014, but see Borisova et al., 2015). This is evident, for example, in higher leverage ratios for SOEs than private firms (Dewenter & Malatesta, 2001; Li et al., 2009). Similarly, SOEs have more dispersed debt; that is, they have a higher number of different lenders (Boubakri et al., 2021). In the EU, state-ownership decreased the costs of debt on average (Borisova & Megginson, 2011). In line with this, in another recent large EU data set, including many non-listed firms, SOEs paid less for their debt than private firms (Olschewski et al., 2020). Moreover, risk proxies, such as firm profitability (Altman, 1968), were important determinants of debt costs only for private firms, but not for SOEs in this analysis. This is surprising as worse corporate performance should, ceteris paribus, increase individual company risk and therefore a firm's cost of external finance for both SOEs and private companies.

The most common explanation for the effect of state ownership on financing conditions is that state guarantees for SOEs induce a soft budget constraint (Kornai, 1979, 1980, 1986). As a time inconsistency problem, a soft budget constraint generalizes to all situations in which a financing entity cannot credibly commit itself not to bail out a company with positive expected profit and sunk cost (Dewatripont & Maskin, 1995; Kornai et al., 2003). That way, the risk of an investment for other investors decreases. Consequently, if SOEs have state guarantees through a soft budget constraint, this could explain their lower capital costs.

We argue that state guarantees are an insufficient explanation for SOEs' facilitated access to lending, at least in the EU. According to EU law, explicit guarantees to commercial ventures constitute state aid and are thus prohibited.[2] This law is also enforced as, for example, Germany was obliged to abolish explicit guarantees for its savings banks in 2001 (Gropp et al., 2014). Additionally, the regulatory framework of competitive neutrality bans preferential treatments (such as explicit debt guarantees) based on specific ownership types for commercial enterprises.[3] Consistent with this law, a study on competitive neutrality within the OECD (2012) found that member states subject their SOEs to the same regulatory framework; for example, no significant exemptions from bankruptcy law exist. It might, however, sometimes be difficult for governments to convince investors that they will not help a specific SOE against default (OECD, 2016). Yet, these are at most implicit and imperfect guarantees. Consequently, defaults of SOEs in the EU are possible, and rational investors should take this possibility into account.

1.2. The societal benefits explanation

Here, we propose the *societal benefits explanation* as an additional behavioral explanation for SOEs' facilitated access to capital: Investors perceive SOEs as having positive social externalities consistent with the second view on state-ownership described above. In addition, investors are willing to trade off private returns of an investment against positive social externalities. Consequently, these investors are willing to invest in SOEs with lower expected private returns.

The societal benefits explanation could be a driving force not only in determining financing conditions of SOEs but also in explaining recent increases in equity ownership by governments and tolerance towards persistently worse SOE book performance. This explanation assumes investors do not only maximize their expected individual utility, but also take the utilities of other stakeholders into consideration. Empirically this seems to be the case as investors are willing to forgo individual expected returns of an investment to pursue social or ethical objectives (Barber et al., 2021; Bauer et al., 2021; Heinkel et al., 2001; Renneboog

[1] PricewaterhouseCoopers. SOEs – What role should they play according to CEOs? www.pwc.com/gx/en/ceo-agenda/pulse/state-owned-enterprises.html (accessed on 9 September 2018).

[2] Article 90 of the Treaty on the European Community explicitly subjects public undertakings of "general economic interest" to EU competition law. Articles 107–109 in the Treaty on the Functioning of the EU define the concept of state aid and when it applies to SOEs (at arm's-length).

[3] Generally, Article 107 of the Treaty on the Functioning of the EU prohibits state-aid for commercially active SOEs because it could undermine the functioning of the single market.

et al., 2008; Riedl & Smeets, 2017). These preferences affect financial markets to the extent that socially responsible US companies pay less for their debt (Goss & Roberts, 2011) and that newly introduced sustainability ratings led to a net outflow of capital from poorly rated companies (Hartzmark & Sussman, 2019).

To understand whether these investor preferences can affect financing conditions of SOEs, we first examine how state-ownership is perceived in the general population. As reviewed above, in the scientific literature there are two opposing views with respect to SOEs: Either, they are established to pursue personal political goals with zero or potentially even negative consequences for societal welfare, or they are established to combat market failures with a positive effect on societal welfare. To examine which view is more prevalent in the general population, we conducted an online survey to elicit people's attitudes towards SOEs in comparison to private firms. In particular, in line with the second view of state-ownership as a means to combat market failure we state Hypothesis 1:

Hypothesis 1. People attribute positive externalities for society more to SOEs than to private firms.

If investors have pro-social preferences, they should prefer otherwise equal investments that provide positive externalities over those that provide no positive externalities. Thus, investors attributing positive externalities to SOEs should also be more willing to invest in them. To see whether the attitudes in the survey affect investment behavior, we asked people how to distribute a hypothetical endowment in SOEs and private firms and formulate Hypothesis 2:

Hypothesis 2. People attributing more societal benefits to SOEs compared to private firms invest more in SOEs.

To examine how externalities affect investment choices with real monetary incentives in a controlled environment, we conducted a laboratory experiment. Experiments are useful tools to understand how externalities affect behavior in consumer (Bartling et al., 2015) as well as investment contexts (Berg et al., 1995). Most recently, Heeb et al. (2022) showed that participants in an incentivized experiment preferred investments in a sustainable fund over investments in a regular fund matched in past performance and risk ratings. Moreover, risk preferences in experiments can change when outcomes affect other participants instead of just the decider (Charness & Jackson, 2009; Reynolds et al., 2009).

To experimentally examine investors' behavior under positive externalities, we developed a modified version of the public good game. This game is originally a strategic interaction between two or more players, where each player can decide to invest money in a public good. A production function then transforms the money invested in the public good and – irrespective of their contributions – redistributes it equally across all participants. A trade-off between narrow self-interest and group-interest is created when the public good's production function yields an individual return below 100% and an aggregated return across all group members above 100%. Narrow self-interest predicts zero contributions for the public good, whereas prosocial preferences predict some amount of contribution depending on the specified functional form.

Past experimental evidence showed that people contributed substantially to the public good. In a meta-analysis comprising of 27 studies, the average contribution was 37.7% (Zelmer, 2003) for an average of 10.4 repetitions per study. Looking at one-shot studies or first rounds only, an earlier meta-analysis estimated contribution rates to range between 30% and 70%, with an approximated median of 50% (Ledyard, 1995). Finally, the more profitable an investment in the public good, the more participants invest (Zelmer, 2003).

For our research question, the incentive structure of the public good game is well-suited as it captures a societal benefit that depends on individual contributions, but from which all members of a society profit equally. From the point of view of an investor, the societal benefit hypothesis conceptualizes the option to invest in an SOE as an investment where parts of the individual return are not transferred to the investor directly, but rather are redistributed to benefit all members of a society equally. This redistribution can happen in different dimensions, such as an additional benefit for consumers, employees, or the environment. To better mimic real-world investment situations, including SOEs and private firms, we modified the public good game in the following three ways.

First, most production functions in public good experiments are deterministic.[4] In contrast, in a real-world investment context, returns of both private firms and SOEs are stochastic. Thus, we implemented a stochastic individual investment and a stochastic public good production function. We expected that the inclusion of risk or ambiguity through the stochastic production functions crowds out prosocial preferences and thus decreases investment in the public good compared to the deterministic production function (Dana et al., 2007; Haisley & Weber, 2010; Mazar et al., 2008; Olschewski et al., 2019, but see Vesely & Wengström, 2017). To the extent that risk and uncertainty affect prosocial behavior, it is important to examine stochastic social production functions. Only if investments in the social investment option are observed in such an environment, can this channel be a viable explanation for SOEs' facilitated access to capital.

Second, in most previous public good games, investing in the public good is socially efficient, thus creating a dilemma between narrow self-interest and efficient social behavior. In contrast, SOEs often seemed to be less efficient than private firms when comparing market performance indicators (Dewenter & Malatesta, 2001; Estrin et al., 2009; Megginson & Netter, 2001). To incorporate this empirical regularity, we implemented a stochastic public good game that is socially inefficient in the sense that investing in the public good has a lower expected return than the group aggregate of investing individually. To be fair, in real-world scenarios, SOEs could be efficient when taking positive societal externalities into account. However, this is difficult to measure empirically. Therefore, we implemented an inefficient public good into our experimental scenario as the stronger test of our hypothesis.

[4] Notable exceptions are: Artinger et al. (2012), Vesely and Wengström (2017), Zhang (2019), and partly Gangadharan and Nemes (2009).

Third, the public good game is usually framed as a social interaction in which one chooses between keeping the money for oneself or transferring it to a public good. In contrast, we framed the choice problem as an investment task with two investments, where one investment option had a positive externality (the public good) and the other did not. One could argue that the investment framework makes the goal of maximizing one's private returns more salient and thus reduces contributions to the public good compared to contributions in a social interaction framework. Possibly, participants invested in the public good in the original frame partly because keeping the money for themselves was perceived as a passive or boring choice compared to choosing the active option of transferring to the public good. Ultimately, contributions to a public good must be significant in the experimental design presented here to be a viable explanation for SOEs' facilitated access to capital. Irrespective of the current research questions, this experimental design is also an extension of the public good paradigm to a stochastic investment framework.

We summarize the above reasoning of the societal benefits explanation for SOEs' facilitated access to capital as Hypothesis 3:

Hypothesis 3. In an incentivized experiment, participants in an investment framework invest a significant amount in a socially inefficient stochastic public good.

To test Hypotheses 1 and 2, we conducted an online survey about attitudes towards SOEs and private firms and hypothetical investment shares in these two firm types. To test Hypothesis 3, we conducted a laboratory experiment in which participants decided whether to invest in a company that pays a return only to them (mimicking a private firm) or to a company that pays a return to them, and, additionally, to other participants of the experiment (imitating an SOE). Our experimental design is a stochastic public good game with four players, in which any investment in the company with the externality (the SOE) has a lower (overall) expected return than an investment in the company with only individual returns.

2. Study 1: Attitude survey

2.1. Method

2.1.1. Material & procedure

The survey started with a minimal explanation of SOEs as companies that are completely or by a majority owned by the state or some local entities like counties or municipalities, and private companies that are completely or by a majority owned by private persons or entities. For the survey, we deviated from the less strict definition of SOEs used in the Introduction and applied in many empirical studies. This was done so that participants, who might not be familiar with ownership structures, can unambiguously understand which actor (state or private) has the power to determine a firm's behavior. We then queried participants to write down up to five reasons for why they would invest in a certain asset class, in a free response format. Participants were randomly assigned to either SOEs or private companies as the asset class in a between-subject design.

After this, all participants answered eight questions that elicited the attitude of participants towards private firms and SOEs. Three questions examined attitudes towards efficiency and five questions attitudes towards societal benefits, like environmental impact or employer–employee relations. All questions can be found in the SOM. Participants were given a 7-point Likert scale, with private firms on one end and SOEs on the other, to indicate which firm type suited the statement better. The orientation of the scale alternated between participants. Equal suitability to both firm types could be indicated by using the middle point of the scale. As the last task of the survey, a hypothetical investment question asked how much of 100 euro the participant wanted to invest in a fund consisting of SOEs and in a fund consisting of private firms.

2.1.2. Participants

We collected responses from 387 participants online with the platform Clickworker. Sample size was determined prior to data analysis and gave us an approximated power of 99% to detect a medium effect (Cohen's $d = 0.5$) at a significance level of 5% with a two-sided two-sample t-test. Participants were recruited from the general German population. The survey took about 10–15 min to complete, and participants earned 2.50 euro as compensation.

2.2. Results

The stated reasons to invest in a certain asset class were coded by a research assistant who did not know the significance of the variable coding, nor the research hypotheses. Each of the five answers were coded as either being best described as mentioning positive societal benefits, high expected individual return, or any other reason. Finally, empty entries or entries that consisted of random letters or unintelligible word combinations were coded as missing. We excluded participants who did not give any sensible reason according to this categorization (15), so we ended up with 189 participants stating at least one sensible reason to invest in SOEs and 183 participants stating at least one sensible reason to invest in private firms. For each participant, we divided the number of reasons belonging to a category by the total number of sensible reasons stated, and the results are summarized in Table 1. In line with Hypothesis 1, participants in the SOE condition gave a higher percentage of reasons classified as mentioning societal benefits than participants in the private condition ($t(329.02) = 3.79$, $p < .001$). Furthermore, as expected, participants in the SOE condition gave a lower percentage of reasons classified as high expected individual return than participants in the private condition ($t(301.83) = -8.86$, $p < .001$). Thus, in a free answer format participants were more likely to state reasons related to societal benefits for investments in SOEs than for investments in private firms.

Table 1
Results Study 1.

	SOE *Mean* [95% *CI*]	Private firm *Mean* [95% *CI*]
Societal benefit	22.57% [18.02%; 27.12%]	11.95%, [8.86%; 15.04%]
Private return	8.05% [5.40%; 10.70%]	31.10%, [26.75%; 35.46%]

The table presents the results of the classification of reasons given for investing in either an SOE or a private firm from the attitude survey in Study 1.

For the attitude questions we used data from all participants. We pooled the three questions about efficiency and the five questions about societal benefits each to a respective average score and coded low numbers (1–3) as representing that the respective statement suited private firms more and high numbers (5–7) SOEs. Participants attributed more efficiency to private companies ($M = 3.11$, $95\% CI = [2.99; 3.22]$ as indicated by a t-test against the indifference score of 4: $t(386) = -15.20$, $p < .001$. Crucially, and in line with Hypothesis 1 people attributed societal benefits more to SOEs than private firms: $M = 4.31$, $95\% CI = [4.22; 4.39]$, $t(386) = 7.03$, $p < .001$.

In the investment task, participants invested on average 46.08% ($95\% CI = [43.68\%, 48.48\%]$) in the SOE. The amount invested in the SOE was correlated with the attributed efficiency of the SOE, $r = .32$, $t(354) = 6.44$, $p < .001$. Most importantly and in line with Hypothesis 2, the amount invested was also correlated with the attributed societal benefit of the SOE, $r = .22$, $t(354) = 4.33$, $p < .001$.[5]

3. Study 2: Modified public good experiment

3.1. Method

3.1.1. Decision problems

We designed 26 choice problems, and their main characteristics are summarized in Table 2.[6] In 24 of these (Q1–Q24), participants could split an investment amount of 100 ECU into any integer distribution between the two possible investment options, and in the remaining two they made all-or-nothing investment choices (QI & QII). All investment options consisted of four different states that could occur with equal probability.

In social decision problems (Q1–Q18), there was always one option that distributed parts of the realized return to a public good while the other part was distributed directly to the decider. For the public good, participants formed groups of four players. Each player of a group received an equal share of the group return on the public good irrespective of his or her own contribution. The distribution of total returns for the investment option with the public good share was the same in all trials: In the four possible random states, the returns were 3%, 3.5%, 4.5%, and 5%, respectively, with a mean of 4%. The risk composition varied across trials: In one trial type, the riskiness of the individual and the public good part of the return was the same (Q13–Q18). This means that in every random state, half of the realized return went into the public good and the other half to the decider, that is 1.5%, 1.75%, 2.25%, and 2.5% for both return types each, respectively. In another trial type (Q1–Q6), only the individual part of the return was risky, while the public part remained a constant 2% across all random states. This means that the individual return in the four states was 1%, 1.5%, 2.5%, and 3%, respectively. The third trial type (Q7–Q12) was risky only for the public part of the return, while the individual part stayed constant at 2% across all random states.

The other investment option of the social decision problems consisted of only individual returns for the decider. The distribution of returns for the individual investment option was always superior to the investment with the public goods share in terms of the expected value (5% compared to 4%). But the standard deviation (SD) and skewness varied in six ways: In one type of trials (Q2, Q8, & Q14) the SD was the same as in the public good investment option (0.91%), and the returns were always one percentage point higher in each random state in the individual option compared to the public good option. Thus, the individual investment option dominated the public good investment option stochastically. In the other trials, the individual investment option had a higher SD than the public good investment. In two other trial types, the SDs were 4.16% (Q1, Q7, & Q13) and 4.76% (Q3, Q9, & Q15). In trial types where the individual investment option had an SD of 5.77% (Q4, Q10, & Q16), the return distribution included a negative return in one random state. Finally, in the trial types where the individual investment option had an SD of 6.22%, the

[5] To control for potential spill-over effects from the between-subject manipulation (private vs. SOE) of the free answer task, we also report correlation results for both conditions separately: Both in the condition where participants stated reasons to invest in a private firm in the first task ($r = .20$, $t(172) = 2.70$, $p = .008$), as well as in the conditions where participants stated reasons to invest in an SOE in the first task ($r = .19$, $t(180) = 2.63$, $p = .009$), participants attributing more societal benefits to SOEs also invested a higher share in them in the investment task.

[6] See SOM for the translated choice problems as presented to the participants of the study.

Table 2
Overview choice problems in Study 2.

Condition	Answer format	Stochasticity social	SD private	Skew private	Question id
Social	All or nothing	Private return only	4.16	0	QI
Social	0–100	Private return only	4.16	0	Q1
Social	0–100	Private return only	0.91	0	Q2
Social	0–100	Private return only	4.76	0	Q3
Social	0–100	Private return only	5.77	0	Q4
Social	0–100	Private return only	6.22	0.92	Q5
Social	0–100	Private return only	6.22	−0.92	Q6
Social	0–100	Social return only	4.16	0	Q7
Social	0–100	Social return only	0.91	0	Q8
Social	0–100	Social return only	4.76	0	Q9
Social	0–100	Social return only	5.77	0	Q10
Social	0–100	Social return only	6.22	0.92	Q11
Social	0–100	Social return only	6.22	−0.92	Q12
Social	0–100	Private & social return	4.16	0	Q13
Social	0–100	Private & social return	0.91	0	Q14
Social	0–100	Private & social return	4.76	0	Q15
Social	0–100	Private & social return	5.77	0	Q16
Social	0–100	Private & social return	6.22	0.92	Q17
Social	0–100	Private & social return	6.22	−0.92	Q18
Individual	0–100	–	4.16	0	Q19
Individual	0–100	–	0.91	0	Q20
Individual	0–100	–	4.76	0	Q21
Individual	0–100	–	5.77	0	Q22
Individual	0–100	–	6.22	0.92	Q23
Individual	0–100	–	6.22	−0.92	Q24
Individual + donation	All or nothing	–	0.91	0	QII

The table presents an overview of stimuli used in the modified public good game in Study 2. Question id refers to the id used in the description in the text and in the material of the SOM. SD (standard deviation) private and Skew (third centralized moment) private refer to the respective statistics for the option without externalities. The option with externalities (social) always consisted of the same four equally probable (aggregated) returns, namely 3%, 3.5%, 4.5%, and 5% ($SD = 0.91$, $Skew = 0$). Stochasticity social refers to whether the private, the social, or both parts of the return distribution of the social option were stochastic. In the individual condition the same returns are used for one option, yet without any externality.

return distribution was either right-skewed (0.92; Q5, Q11, & Q17) or left-skewed (−0.92; Q6, Q12, & Q18). In these trials the left-skewed distribution again included a negative return in one random state.

In contrast, in the individual decision problems (Q19–Q24), there was no public good, and both investment options yielded only individual returns for the decider. This means that one option always provided individual returns of 3%, 3.5%, 4.5%, and 5%. The other option varied in SD and skewness, and the expected value (EV) was always one percentage point higher, just as the individual option of the social decision problems described in the previous paragraph.

In two additional choice problems, participants faced a binary investment decision of 100 ECU in one of the two options. The first choice problem consisted of a public good and individual investment option (QI). The second problem consisted only of the individual investment. The choice was whether participants wanted to give 2% of the realized return to the public good or not (QII). In this choice people could express pro-social attitudes without investing in an option with lower average (total) return.

Finally, we implemented two slightly different frames in a randomized between-subject manipulation: In the minimal frame, the two choice options were called investment A and B, and in the instructions, only the term investment appeared. In the SOE frame, the two choice options were named company A and B. The instructions stressed that participants can invest in two companies and that one company is a private firm, whereas the other company is an SOE owned by a local community with a positive externality to that community. The instructions further clarified that both companies offer a service that is equal in any other aspect besides the positive externality.

3.1.2. Participants

A total of 76 economics students from the University of Kiel participated in two groups of 36 and 40 participants, respectively. The sample size was determined prior to data collection. With 76 participants, we have a power of 99% to find an effect of medium size (Cohen's $d = 0.5$) at a significance level of 5% in a two-sided paired t-test. Participants had an average age of 25 (range from 18 to 37), and 44 were female (32 male). The experiment took about 40 min in total, and participants earned a show-up fee of 4 euro and an average of 4.02 euro choice-dependent bonus (range from -.65 to 10 euro).

3.1.3. Procedure & incentives

The experiment took place at the Kiel Economics Laboratory, which has forty individual computer work stations. Participants were randomly assigned to a computer, where they received all instructions on the screen. The whole software environment was programmed in OTree (Chen, Schonger et al., 2016). An overview of the experimental procedure is depicted in Fig. 1.

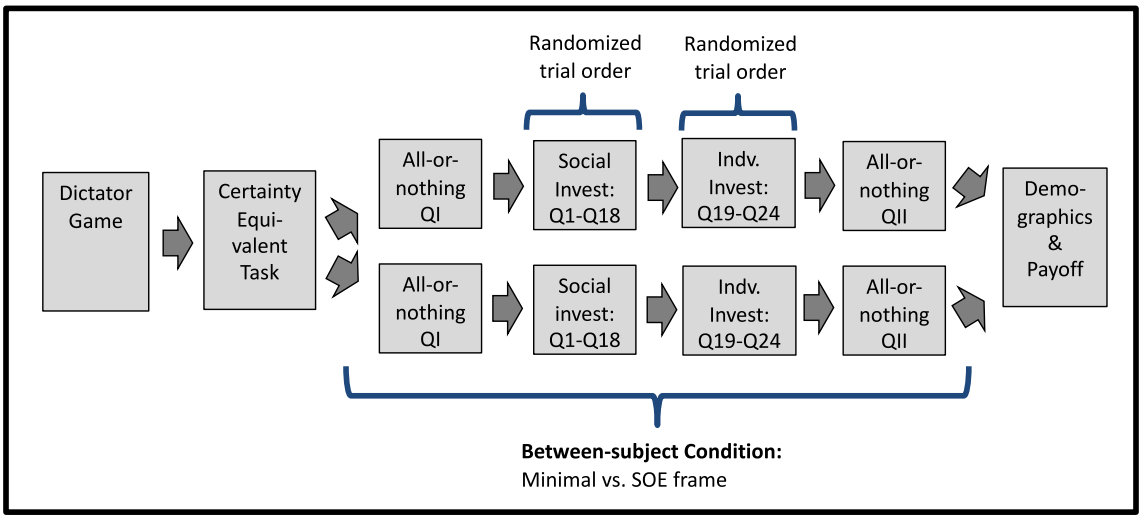

Fig. 1. Overview of the experimental procedure and the manipulations and randomizations involved in Study 2.

The first part of the experiment consisted of four tasks of which we describe the two tasks that are important for our analyses:[7] The first task was a dictator game, in which participants decided how much of 10 euros they wanted to keep and how much they wanted to give to another randomly matched participant of the experiment. Participants could insert an amount between 0 and 10. This task measured social preferences. Second, we asked for the certainty equivalent for a gamble, in which participants could win zero or 10 euro determined by a virtual coin flip. The certainty equivalent was elicited through a multiple-price list with 10 sure amounts ranging from 1 to 10 euro. For each sure amount, the participants decided whether they preferred the gamble or the sure amount. This task measured risk preferences. Both measures were used to better understand the participants' motives behind their investment choices.

The second part was devoted to the investment decisions: Participants in one group did the stochastic public good investment task in the minimal frame, whereas the other group in the SOE frame. Participants read the instruction at their own pace and could ask questions to the instructor at any time. The choice problems were presented in two blocks: In the first, participants saw the 18 social choice problems and in the second, the six individual choice problems. The order of choice problems within each block was random. Additionally, the all-or-nothing choice problem between the individual investment and the public good option was the first trial. The choice problem with a 2% voluntary return donation to the public good was the last trial. Finally, demographic information was collected.

No time restriction applied to decisions, which were made either by clicking at radio buttons (all-or-nothing questions) or writing numbers between 0 and 100 in answer boxes. To qualify as a valid response, the sum of both answer boxes had to add up to 100. Choices once confirmed could not be revised. There was no decision feedback during the task. Only after participants had answered all choice problems, would the payoff screen show the randomly chosen choice problem, the randomly chosen state, and the payoff.

The payoff was determined as follows: First, one choice problem was chosen randomly. If the choice problem was the gambling task, then one row of the multiple-price list was randomly selected, and dependent on the choice the participant either received the certain amount or the randomly determined payoff of the gamble. If the choice problem was the dictator game, participants were randomly assigned the role of dictator or receiver in random pairs of two participants, and the dictator's distribution was implemented.

If the second part of the experiment was chosen for payoff, participants formed random groups of four. Each group received the returns of a randomly selected choice problem for payout. Within choice problems, one of the four states was randomly selected, and participants received the corresponding return from their investment distribution in this state. For individual investment options, participants received the invested part of the return of this state for themselves. For the public good option, they received the share of the individual return for themselves and transferred the public part of returns to the public good. Finally, the public share of the return of the investment from all four participants in one group were added up and transferred back to the group members equally. With this incentive mechanism, no risk pooling was possible since the same state materialized for both investment options and all four team members.

[7] One other task was a coupled lottery game in which participants decided whether to determine the outcome of a 50–50 lottery for themselves and another player either by one coin flip or by two independent coin flips. The other task was a multiple-price list of ten choices between a 50–50 lottery and a varying sure amount in the loss domain. For details of these tasks see Koch et al. (2021).

3.2. Results

In the social decision problems, participants invested on average 48.18% ($SD = 28.13\%$) of their budget in the private option with higher EV. Consequently, the amount of 51.82% invested on average in the public good option is significantly different from zero ($t(75) = 24.24$, $p < .001$). In addition, participants invested more in the higher-EV option in the individual decision problems without any externalities ($M = 50.45\%$, $SD = 30.68\%$) than in the social ones. Crucially, in trials where the higher-EV option stochastically dominated the other (social) option, investments in the efficient option were 64.24% ($SD = 27.47\%$) in the social and 82.00% ($SD = 23.47\%$) in the individual choice problems on average. This difference is significant by means of a paired t-test ($t(75) = 5.29$, $p < .001$). This shows that the positive externality made people invest more (35.76%) in an otherwise inferior investment option compared to the individual choice problem (18.00%).

Our main regression model (see Model 1 Table 3) included random participant intercepts and slopes to account for repeated measurements per participant (Singmann & Kellen, 2019). The dummy predictor condition (social vs. individual) was significant, $b = -11.50$, $SE = 2.56$, $p < .001$, meaning that participants invested less in the higher EV option when the inferior option had social externalities. The table further shows that both a higher SD and a left-skew (compared to a right-skew) of the return distribution of the higher EV option led to a lower share of investments. Thus, we can conclude that SD and skewness affected investment decisions overall. A positive and significant interaction term between the condition and SD supports the conjecture that the SD was less important in social compared to individual choice problems.

In our second model, again with random intercepts and slopes, we added the behavioral measure of risk (the certainty equivalent for a risky lottery in the gain domain) and social preferences (the amount kept in a dictator game) as predictors. Risk preference did not significantly affect investments. Yet, the amount kept in a dictator game predicted more investments in the efficient option, especially when the inefficient investment option contained positive externalities. This aligns with the interpretation that social preferences motivated people to invest in inefficient investments with positive externalities. All previously reported findings were robust to the addition of these individual preference measures.

We checked for effects of the manipulation of the decision frame (minimal or SOE) and the distribution of risk across the individual and social part of the return in the social choice problems only (see Table 4). Controlling for SD and skewness and including random participant intercepts and slopes, we conclude that neither the frame nor the risk distribution influenced the investment choices.

For robustness, we compare the results from the free distribution of investments with the results from the binary choice problems. In the all-or-nothing choice, participants invested on average 44.74% in the higher-EV individual investment option, compared to 54.93% in the comparable choice problem with the non-binary answer format. Hence, even in a situation where individual risk pooling was obviously impossible,[8] participants invested a comparable amount in the public good, although it had a lower total EV. This analysis of the all-or-nothing choices also excludes the possibility that participants made use of a 50–50 heuristic to solve the problem, as in this task, participants frequently invested 100% in the inefficient social investment option. Finally, in the all-or-nothing choice where participants could donate 2% of the realized return in the public good, they chose to keep the full return for themselves in 46.05% of the cases. Again, this is similar to the continuous choice situation where the public good option's EV was one unit lower than that of the individual choice option. This suggests that when social benefits were present the effect of individual expected returns on investment choices was diminished.

The results presented in this section support Hypothesis 3. They indicate that participants were willing to forgo private returns in exchange for a social benefit to other participants. While risk measured as the return's standard deviation remained an important factor in determining investment allocations, a preference for group (i.e., social) compared to individual benefits mattered as well. Thus, pro-social investor preferences are a viable explanation for why SOEs have easier access to capital than private firms.

4. Discussion

We found support for the new societal benefits explanation for SOEs' facilitated access to capital compared to private firms. In an online survey, participants attributed more societal benefits to SOEs compared to private firms both in a free answer format as well as in Likert-scale questions. Further, people who attributed more societal benefits to SOEs were also willing to invest more in SOEs. Similarly, participants in our laboratory experiment invested a considerable share of their endowment in an investment option with a lower expected return and a positive externality. In addition, participants invested more in the inefficient option when it offered this positive externality compared to an investment option which was equivalent in mean, SD, and skewness, but where all return went to the individual investor. Consequently, the social externality of an investment option increased its attractiveness to our participants. This is consistent with other studies finding that investors are willing to pay for or forgo expected returns for positive externalities in their investments (Barber et al., 2021; Bauer et al., 2021; Riedl & Smeets, 2017). Applied to SOE financing, this finding can explain why SOEs, when perceived as socially beneficial, have easier access to capital. According to the proposed explanation, this is the case because investors are more willing to invest in an otherwise inferior investment option when it offers a positive externality.

Our experiment further demonstrated that investors took SD and skewness of the returns into account also when positive externalities were present. In particular, investors preferred options with positively skewed return distributions consistent with

[8] Note, that no risk pooling was possible in the free distribution choices by design of our payouts as well.

Table 3
Regression analysis.

	Model 1 *Coeff.* *(S.E.)*	Model 2 *Coeff.* *(S.E.)*
Intercept	71.42***	53.06***
	(2.03)	(6.18)
Social	−11.50***	−26.26**
	(2.56)	(7.86)
SD	−8.99***	−8.99***
	(0.76)	(0.76)
Skewness	7.91***	7.91***
	(1.72)	(1.72)
Social × *SD*	3.95***	3.95***
	(0.70)	(0.70)
Social × *skewness*	2.05	2.05
	(2.05)	(1.80)
Dictator		1.97*
		(0.82)
Risk preference		0.55
		(0.35)
Social × *dictator*		2.66*
		(1.04)
Social × *risk preference*		−0.22
		(0.44)
Num. observations	1824	1824
Participants	76	76
AIC	16 383	16 368

The table presents the results of a mixed-effects regression with share of investment in the efficient option as dependent variable: *Social* is a dummy with 1 referring to the public good game and 0 for the individual choice tasks, *Risk preference* is the certainty equivalent of a risky lottery, *Dictator* is the share of the amount kept for oneself. ***Significant at the 0.001-level; **at the 0.01-level; *at the 0.05-level.

Table 4
Regression analysis 2.

	Model 1 *Coeff.* *(S.E.)*
Intercept	55.75***
	(3.04)
Frame	7.16
	(4.38)
Risky_individual	1.48
	(1.21)
Risky_group	0.87
	(1.21)
SD	−5.03***
	(0.57)
Skewness	9.96***
	(1.02)
Num. observations	1368
Participants	76
AIC	12 160

The table presents results of a mixed-effect regression of the subset of trials in the public good game. The dependent variable is the share of endowment invested in the individual investment option. ***Significant at the 0.001-level; **at the 0.01-level; *at the 0.05-level.

recent experimental findings in a purely individual context (Dertwinkel-Kalt & Köster, 2020; Olschewski et al., 2021). Interestingly, the effect of SD was smaller when externalities were present compared to investment choices about personal returns only. Further, compared to one-shot deterministic public good games, the contribution rate in our experiment was similar (around 50%). Hence, the inclusion of risk did not crowd out social preferences in this investment task. However, it is important to note that the risk for the individual investment option was higher in most trials. When the SD for the individual and the public goods investment options were identical, contributions were slightly lower, but still substantial (36%). Together, the reduced sensitivity to expected returns and SD is in line with the idea that investment with social externalities is less based on consequentialist expected utility maximization (Heeb et al., 2022; Metzger & Günther, 2019).

We can rule out that participants in our experiment adhered to the social insurance hypothesis (Suleiman et al., 2015) and invested in the inefficient social option only to pool risk or diversify. First, we made clear in the instructions that no diversification was possible in our setting since the same random state materialized for the whole group and both investment options. Second, in an all-or-nothing investment choice at the beginning of the experiment, contributions to the inefficient social investment were statistically indistinguishable from contribution rates in the continuous investment task. This behavior in an all-or-nothing choice problem also speaks against the alternative explanation that participants simply adhered to a 50–50 heuristic over the two available options when investing their endowment continuously (Andreoni & Bernheim, 2009). Third, Vesely and Wengström (2017) explicitly manipulated the possibility of risk sharing in their experiment and concluded that contributions to the public good were also substantial when risk sharing was logically impossible. Fourth, we demonstrated that behavior in a dictator game, an established measure of social preferences, correlated with contribution rates to the public good (Murphy et al., 2011). This result also informs the debate about how social preferences generalize from decisions under certainty to decisions under risk or uncertainty (Olschewski et al., 2019).

As a limitation, the survey result in Study 1, that people invested more in SOEs compared to private firms when they attributed more societal benefits to SOEs, was hypothetical. However, the investment task in the survey was matched to the experimental investment task in Study 2, where we observed similar behavior and had full control of the payoff structure with real monetary incentives. Consequently, the structural similarity between investment behavior in the online survey and the laboratory experiment seems to indicate a stable effect of (attributed) positive externalities on investment choices. We also deem it unlikely that our survey results can be explained by experimenter demand effects. In particular in the free answer format, which always appeared first in the survey, participants were in a between-subject design and were only asked about investment reasons for SOEs or private firms. Together with the minimal description of SOEs and private firms, this design feature should make it implausible that participants could guess our research question at this stage of the survey.

A limitation of the experiment in Study 2 is that it examined only individual investment choices, whereas SOEs as well as private firms also use bank loans and institutional investors for financing. To attenuate this concern, we argue that especially for medium sized firms, bank loan decisions can be subject to banker preferences just as investments are subject to investor preferences. As an example, several studies have found an impact of environmentally friendly behavior of firms on bank loan decisions (Nandy & Lodh, 2012; Thompson & Cowton, 2004). Future research could examine the similarities and differences in investment and lending decisions to SOEs to better distinguish between these two sources of financing.

With our survey and experimental data we focused on the societal benefit explanation for SOEs' facilitated capital access. However, future studies could examine the quantitative impact of the proposed behavioral explanation in comparison to other explanations such as implicit state guarantees discussed in the Introduction. Another channel potentially affecting capital costs of SOEs is lending or investing based on a political agenda (Brandt & Li, 2003; Zhang & Zhang, 2016). Furthermore, in some countries SOEs are partially financed by state-owned banks directly (Dinc, 2005; Sapienza, 2004). Adding to the complexity, the importance of the different explanations is likely to vary between sectors. State-ownership might most readily be seen as providing societal benefits in sectors with a network economy, such as energy or transportation. In other sectors, state-ownership might be perceived as less beneficial. More empirical studies are needed to determine to what extent SOEs' financing is influenced by investors' social preferences compared to self-serving political agendas and how this differs between sectors.

We started by reviewing how state-ownership affects access to capital. We then introduced a new explanation through which state-ownership could affect financing conditions: if investors assume that SOEs are of societal value and have prosocial preferences, they will finance them at lower expected returns. Large multinational organizations like the OECD usually focus on regulations of how to limit distortions in competition caused by state-ownership. Whereas regulations are important, these reports should also consider whether in a society state-ownership is perceived as creating social benefits. If this is the case, then social preferences of investors can impede ownership neutrality.

Data availability

All data can be found at OSF: https://osf.io/m6kst/.

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