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Introduction

Corruption – the use of public office for private gain – undermines good governance. According to U.N. secretary-general António Guterres "Corruption is present in all countries, rich and poor, North and South, developed and developing", it "robs schools, hospitals and others of vitally needed funds", and "rots institutions, as public officials enrich themselves" (U.N. 2018). Klitgaard (1988: xv) succinctly puts it as "corruption is the great disease of government". The true costs of corruption are no doubt very large but difficult to estimate (see Gründler and Potrafke 2019, Fisman and Golden 2017, Dimant and Tosato 2017).

Civic engagement is a potential constraint to corruption.[1] According to the United Nations (UNODC 2023, p. 12), the role of civic engagement in curbing corruption can be "understood in terms of social accountability, where the citizens oppose corruption by keeping it in check, critically assessing the conduct and decisions of office holders, reporting corruption misdoings and crimes, and asking for appropriate countermeasures." Civic engagement can therefore help to "overcome the collective action problem in monitoring officials" (Knack 2002, p. 273) and to increase the probability to detect illicit rent extraction (e.g., Shleifer and Vishny 1993).

This paper studies civic engagement (CE) as a constraint on corruption. In our novel laboratory experiment, corruption takes the form of diversion of public funds, which is a public bad because it imposes a cost on all citizens. Civic engagement curbs corruption and, hence, CE is a public good. An advantage of our experimental approach is that the individual costs and benefits of civic engagement, and the social cost of corruption, are controlled. We set these benefits and costs such that incentives are stacked against providing CE. The private costs of CE are high enough that self-interested agents do not want to civically engage, and the (private and social) benefits of CE are decreasing in other agents' CE. This decrease generates a built-in strategic substitutability which discourages individual CE as others increase CE (as has been shown to be the case of street protests in Hong Kong, Cantoni *et al.* 2019).

We test whether social approval improves civic engagement. In treatments with social approval, subjects are assigned to fixed "social circles". Subjects can observe how much civic engagement others in their social circle provide and can send each other messages of encouragement. We test whether social approval promotes civic engagement by generating a "positive feedback loop": Civic engagement meets with social approval, and higher social approval motivates subjects to sustain high levels of CE. The feedback loop generates strategic complementarity among prosocial subjects: subjects wanting to contribute more CE if others contribute more CE. If this strategic complementarity is sufficiently strong to

[1] Klitgaard (1988) discusses a range of policies to curb corruption including "increasing the likelihood that corrupt actions will be detected and punished" and "altering the agents' attitudes toward corruption" which can both be shaped by civic engagement. He also discusses measures such as selecting agents for incorruptibility as well as technical competence, and changing the organization's mission or administrative system so that the agent's discretion is reduced. See also Fisman and Golden (2017, Ch. 9).

overcome the built-in strategic substitutability, social approval improves civic engagement and thus curbs corruption.

We find that social approval increases civic engagement by about 40 percent and significantly reduces corruption. We find support for the existence of a positive feedback loop driven by social approval, and the resulting strategic complementarity seems to overcompensate the strategic substitutability in our sample. We also find that the effect of social approval is surprisingly robust to framing in neutral vs. natural terms. In the naturally framed treatments, we describe the experiment in terms of a "public sector" overseen by a "government" which is subject to "corruption" that can be reduced by "civic engagement" which involves completing "civic tasks". Neutrally framed treatments avoid such loaded expressions and instead speak of a "loss that can be reduced" by completing "type A tasks" etc. While we find that civic engagement in the field is correlated with CE in the lab in the natural (but not the neutral) framing, neutral framing was not found to demotivate CE or reduce social approval. The observed treatment effects thus primarily seem to be driven by the interaction of prosocial preferences and controlled material incentives and are not an artefact of framing or experimenter demand.

Our experimental investigation of civic engagement and corruption builds on a rich literature of public goods games but investigates corruption in a novel framework. We build on and adapt Kamei *et al*. (2023) (see section 2 for positioning our approach in the literature).

Our setting models a public good problem with two layers. Subjects not only decide on how much CE to provide but also how much to contribute to the Funding of the Public Sector (henceforth FPS choices). Thus, FPS choices endogenously generate the funds that may be diverted through corruption. Corruption is socially costly because it directly reduces public sector effectiveness and indirectly reduces private sector productivity. This rich setting provides subjects with two ways to improve good governance: to provide more funds (FPS) at a given level of corruption, or to curb corruption at a given level of funding. We find that subjects succeed in sustaining efficiency above levels predicted by standard theory, and prefer to do so by increasing CE rather than by increasing FPS. We explain this preference for CE over FPS by the larger "leverage" (i.e., ratio of average benefit to average cost) in CE compared to FPS.

We proceed as follows. Section 2 discusses related literature. Section 3 explains the experimental design and Section 4 lays out predictions and hypotheses. Section 5 presents the experimental results, and Section 6 provides concluding remarks.

2. Related literature

This paper contributes to the experimental literature investigating civic engagement as a constraint on corruption. The literature on the causes, consequences, and remedies of corruption is vast. For overviews see, e.g., Rose-Ackerman and Palifka (2016), Fisman and Golden (2017), or the research summaries of the international anti-corruption academy

IACA. However, the empirical literature in economics on civic engagement as a constraint on corruption is rather limited (see the survey of Costa and Kahn 2003 for an economics perspective). A notable recent exception is Besley (2020) who discusses the role of civic culture in explaining state capacity to tax and provide public goods.

Civic participation has often been claimed to be a key factor in promoting government accountability and reducing corruption. The idea is that when citizens are actively engaged in the political process — whether through voting, attending rallies, joining protest movements or civic associations — they are better able to monitor the actions of public officials and pressure them to act in the public interest. However, most of the literature claiming that civic engagement acts as a constraint on corruption is correlational in nature, which makes identification of causal effects of civic engagement on corruption difficult. For example, Treisman (2007) reviews correlational cross-country evidence suggesting that a broad range of factors, including a lively democracy with a free and widely read press, can constrain corruption, but he also points out that causality is difficult to establish because of the complex interplay of many variables. Some of the correlational studies emphasize the role of social interaction among citizens (which is captured in our design by treatments with social approval in social circles) in constraining corruption. Various studies have indeed found that control of corruption is related to the number of civil society associations, freedom of the press, and availability of internet connection (Mungiu-Pippidi 2013, Campante and Do 2014, Gao *et al*. 2020). Putnam (1993) shows that regions in Italy where social interaction of citizens is intense (in voluntary associations, local clubs etc.) have lower levels of corruption.

A strength of experimental studies lies in the ability to provide causal evidence. A small number of natural field experiments have studied various aspects of corruption in randomized controlled trials but most of these are not related to civic engagement (e.g., Bertrand *et al*. 2006 study bribery in a natural field experiment to obtain a driver license in India; Beekman *et al*. (2014) study how corruption by community leaders in Liberian villages undermines investment in private and public goods in these villages). Notable exceptions are Olken (2007) who studies the effect of encouraging grassroot monitoring by villagers to reduce corruption in road construction projects in Indonesia, and Banerjee *et al*. (2010) who use randomized interventions to encourage beneficiaries' participation in reducing corruption in education in India.

Corruption is notoriously difficult to study in the field as it is an illicit activity often concealed from observers, similar to tax evasion or the shadow economy. Laboratory experiments often use controlled games in which corruption can be unambiguously measured and its cost is known. The literature prioritizing tight control at the expense of a more stylized approach includes Lab-in-the-field experiments (e.g., Armand *et al*. 2023 in Mozambique) and laboratory studies which have focused on bribing games and embezzlement games. Examples of bilateral bribery games are Abbink *et al.* (2012) in which officials extort money for services that citizens are entitled to, and Drugov *et al*. (2014) in which officials provide access to services that citizens are not entitled to. Embezzlement experiments involve the appropriation of public funds for private gains (e.g., Attanasi *et al*. 2019). The experimental studies of this type typically focus on bilateral relations that cause an externality on third parties. Our approach is related to this line of research as we also model corruption as generating a negative externality but we study corruption in the context of public goods games and, crucially, relate the prevention of corruption to civic engagement which we also model as provision of a public good.

This paper provides a novel framework in that it uses a two-layered public goods problem to study civic engagement as a constraint on corruption. The first layer is the funding of a public sector that benefits citizens by providing public goods. A deterrent sanction scheme is put in place to alleviate the standard problem of free riding on contributions, but up to half of the funding citizens direct to the sector will be diverted from public good provision into corruption and will thus fail to benefit the society's members unless the corruption is checked. The second layer models civic engagement as a privately costly contribution to a public good that constrains the public bad of corruption. The framework builds on and adapts that of Kamei, Putterman and Tyran (henceforth KPT, 2023), which developed the two-layered public good framework to study civic engagement in the creation of a functioning state that provides essential public goods (like clean air, infrastructure, or law and order) at efficient levels. The design in KPT focuses on polar cases in which there is either fully efficient provision of essential public goods or none at all, depending on the level of civic engagement and the realization of a randomization device. To study the more gradual corrosive effect of corruption on public good provision, we introduce several changes into the KPT framework, the most important of which is a corruption fighting function marked by smoothly diminishing returns. As a by-product, the corruption function lets us model civic engagement as a social dilemma without recourse to KPT's random draw feature.

Building on the paradigm developed by KPT ties our paper to two lines of literatures related to good government as potential solution to providing vital public goods. First, our framework allows us to study civic engagement as a constraint on corruption in a substantially richer environment than the one provided by the standard linear public goods games. Standard linear public goods games maximize the tension between the private optimum (at zero contribution) and social optimum (at full contribution). In contrast, our framework has an interior (private and social) optimum and is richer in that the funding of the public sector has both a direct effect on all members in society but also an indirect effect making private business activity more productive.

Second, our framework contributes to a line of thinking developed in Acemoglu and Robinson (2019) which emphasizes that collective action remains crucial to the solution of the public goods provision problem even in the presence of a state with coercive power. This is so because the main way that such coercion can be prevented from turning against the interest of common citizens is through inclusive institutions involving their continued readiness to mobilize and hold an extractive or malfeasant state accountable.

Adapting KPT allows us to study questions that could not be studied in KPT (and have not been studied experimentally, to the best of our knowledge, elsewhere in the literature): the interplay of (exogenous) strategic substitutability and (endogenously arising) strategic complementarity in the provision of public goods. The main adaptation of KPT we implement is a built-in relation of how civic engagement limits the losses from corruption. We model this relation as a convex function (see figure 2) which implies that civic engagement is a strategic substitute. That is, civically engaged subjects find it less attractive to provide civic engagement as others provide more civic engagement. This built-in strategic substitutability stacks incentives against civic engagement for pro-social subjects (self-interested subjects do not have incentives to provide CE independent of how much CE others provide due to the public good nature of CE).

Our treatment variations serve to isolate the causal effects of social approval and of contextualization on the effect of civic engagement as a constraint on corruption. These variations provide novel insights on the role of civic engagement in constraining corruption, and add to the two lines of research in the provision of public goods discussed above.

Our first treatment variation concerns whether subjects can express approval for civic engagement within their social group (called social circle below). This treatment variation serves to test whether a feedback loop emerges (civic engagement meets with social approval which, in turn, motivates more civic engagement), and whether this feedback loop generates strategic complements for prosocial agents. We indeed find evidence supporting the emergence of such a feedback loop (see section 5.2), and that endogenously emerging strategic complementarity compensates for the built-in strategic substitutability of the corruption function. This aspect ties our paper to a rather small literature that has studied the role of strategic complements vs. substitutes in the provision of public goods (e.g., Potters and Suetens 2009). Various economics experiments including Masclet *et al*. (2003) and Dugar (2010) have found that social approval is associated with significantly higher contributions in public good games, and vice versa for disapproval.

Our second treatment variation concerns the contextualization or framing of the game. The main purpose of this treatment variation is to test whether the feedback-loop effect discussed above is robust to presenting material incentives in a non-contextualized manner. We indeed find that the feedback loop effect is robust to "neutral" framing. We also find that contextualization has no effect when social approval cannot be expressed. This aspect ties our paper to a large literature studying framing in public goods games more generally. Examples are Andreoni (1995), Sonnemans *et al*. (1998), Böhm and Theelen (2016), and Liberman *et al*. (2004). Overall, the evidence on framing on the provision of public goods is mixed. Some studies suggest that normative expressions shape norm perception and norm compliance (Kuang and Bicchieri 2024, Chang *et al*. 2019) while other studies find weak or culture-sensitive effects (e.g., Rege and Telle 2004, Dufwenberg *et al*. 2011). One reason why mixed results have obtained is that omitting explicit wording does not rule out spontaneous associations that might have similar behavioral effects (see Eriksson and Strimling 2023).

Our treatment variation using "neutral" vs. "natural" wording is also interesting from the perspective of a methodological discussion on the merits of contextual vs. neutral instructions in experiments (e.g., Alekseev *et al*. 2017). The fact that we do not find effects of framing can also be seen as linked to a fundamental problem in corruption research: Corruption might be underestimated due to social desirability bias in field studies which, by its very nature, use a “natural” framing. One way to address the relevance of this concern is to use framing in experimental instructions that highlight that a decision is socially undesirable (e.g., Abbink and Hennig-Schmidt 2006 in a bribing game).

3. Experimental design

3.1. General description

In the main part of the experiment, subjects make two types of decisions. They decide how much to contribute to the Funding of the Public Sector (henceforth FPS decision) and how much Civic Engagement to exert (CE decision). The FPS decision provides tax revenues that are potentially available to fund a public good with value to all subjects (think of roads, public safety, a clean environment). However, corruption reduces the amount of tax revenues available for this purpose (think of taxpayer money diverted by corrupt officials). The CE decision curbs corruption (think of holding corrupt officials in check through political competition, increased monitoring of public officials by the media etc.) and thus magnifies the benefits obtained by all from the public sector.

We focus on a situation in which subjects have incentives to pay taxes as requested. This is the case because a stiff sanction is meted out to those who fail to pay the requested amount of taxes (8 out of an endowment of 20 tokens). The sanction for contributing less than 8 tokens is so high (35 points per token short) that it deters a rational and self-interested player from free riding.[2] Requested taxes are set at the social optimum, meaning that subjects as a group earn most at that level absent corruption. Our design thus allows us to focus on the efficiency losses from corruption rather than inefficient provision of public goods for other reasons.

In the absence of civic engagement (CE = 0), corruption reduces tax revenues available to fund the public sector by 50%. However, civic engagement curbs corruption, and thus increases the funding available for the public sector. Providing civic engagement is moderately costly to participants (think of voting in elections, participating in a campaign or rally, or signing a petition).

Incentives are stacked against providing CE in two ways. First, it is never (regardless of how much CE others provide) rational for a strictly self-interested subject to provide CE because the cost of providing CE always exceeds its private benefits. Second, contributing to CE is a strategic substitute which means that incentives of any prosocial subjects present to provide CE fall with the level of CE provision by others (see detailed discussion below).

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[2] We model a situation in which corruption reduces the public goods effectively provided. This reduction can be thought of as a reduction in the quantity or quality of public goods provided (think of bumpy roads or a polluted environment) since quantity and quality effects of corruption are theoretically equivalent in the case modeled here. We model a situation in which corruption does not undermine the effectiveness of tax collection (think of tax evasion) to be able to focus on specific cause of inefficiency. However, our design could easily be adapted to also have corruption reduce incentives for tax payment.

In Table 1, treatments labelled “natural” describe the experiment in terms of a “government” which provides “public goods”, with a public sector that is subject to “corruption,” and “corruption [that] can be reduced” by “civic engagement”, which involves completing “civic tasks”. In contrast, treatments labelled “neutral” use neutral language and speak of a “penalty,” a “loss that can be reduced” by completing “type A tasks” etc.

In treatments “with social approval” subjects observe civic task completion by other individuals in a subgroup (4 out of 12 subjects), called their “social circle”, can express their approval (by sending a smiley face) to other circle members, and learn how many “smileys” they received from others in their social circle. Social circle members have permanent identifiers (think of friends, relatives, co-workers) which enables subjects to keep track of one anothers’ actions. We hypothesize that social approval transforms strategic substitutes into strategic complements, for conditional co-operators (see section 4 for explanations). In “natural description” we speak of sharing information about registering to vote, going to the polls, “or take part in some other civic activity”, while this description is absent in “neutral” treatments.[3]

Table 1: Treatments

		Framing	
		Natural	Neutral
Social Approval	Yes	With Approval-Natural	With Approval-Neutral
	No	No Approval-Natural	No Approval-Neutral

Notes: Social Approval Yes: Subjects are allocated to a “social circle” and can send each other stylized messages of social approval. Neutral framing uses terms such as “penalty scheme,” “loss,” and “type A task,” whereas natural framing uses terms such as “government,” “corruption,” and “civic task”.

We hypothesize that the belief that reducing corruption through civic engagement is the “morally right thing to do” is fostered when the environment is described in “natural” terms. Such a description may evoke a norm of “pulling one’s weight” in a desirable group effort. Natural description may also induce more extensive use of social approval. To test for this hypothesis, we compare treatments with a “natural” vs. “neutral” description of the environment that is otherwise identical.

[3] Natural instructions say: “In the real world, you might wish to share with others the fact that you registered to vote, went to the polls, read up on candidates’ positions, or took part in some other civic activity. Sharing with others information about your completion of civic tasks is also possible in the experiment. … information about the number of civic tasks that you and 3 other randomly chosen participants have completed will be displayed … and (these participants) will be referred to as your ‘social circle’.” In neutral treatments the paragraph reads: “… information about the number of Type A tasks that you and 3 other randomly chosen participants have completed will be displayed, … and (these participants) will be referred to as your ‘subgroup’.”

3.2. Procedures and parameters

This section provides explanations for the choice of parameters and procedures.

FPS decision: In all periods of the experiment, subjects make decisions to fund the public good. Subjects are assigned to groups of n = 12 (an "economy") and endowed with 20 tokens each. Each individual i divides these tokens between a private business activity, b_i, and funding of the public sector, p_i ($b_i + p_i = 20$). Absent corruption, aggregate public funding ($P = \Sigma p_i$) determines the earnings that i obtains from the private activity, $b_i * V(P)$, reflecting the fact that businesses are more productive in an environment in which roads, law and order, a secure currency, etc., are provided. The factor V increases with aggregate public funding P within bounds.[4] Aggregate public funding P also directly benefits all n members of the economy. This direct benefit D from the public sector is equal for all subjects and increases in P (see appendix A for details). In combination, $b_i * V(P)) + D(P)$ induces a socially optimal allocation of $p_i = 8$ tokens per group member ($P = 8 \text{ x } 12 = 96$), so that a proportion of resources consistent with taxation and public spending in advanced economies is captured. Our modelling of the public good adapts KPT (2023)[5] whose subjects appeared to have no difficulties with understanding this incentive structure (see appendix D for instructions). Subjects make FPS decisions in the 15 periods of the main phase (hereafter, Part 2).

Part 1 is a simplified introductory phase that serves to familiarize the participants with making FPS decisions as described above. Part 1 has 4 periods. Part 1 is simplified in that there is no sanction for failing to fund the public sector at the requested level, no corruption, no opportunity to provide social approval, no opportunity to exert civic engagement, all of which are introduced at the beginning of the main part (Part 2).

Part 2 is the main part of the experiment. Subjects remain in their group and play 15 periods in one of the treatments described in Table 1. Each period begins with a CE decision (see below) and is followed by a modified FPS decision facing the corruption level induced by the CE choices. The FPS decision in the main part includes the possibility of corruption losses and a deterrent sanction for failing to contribute to FPS as required.

Deterrent sanction: Subjects have incentives to contribute a required amount of FPS ($p_i = 8$) because failure to do so entails a deterrent sanction. The sanction is about twice the income that is gained by free riding at $p_i = 8$, which means that a rational and self-interested player never under-contributes. We set the required contribution at $p_i = 8$ because it is the socially optimal level of public sector funding when corruption is absent. It is privately unprofitable

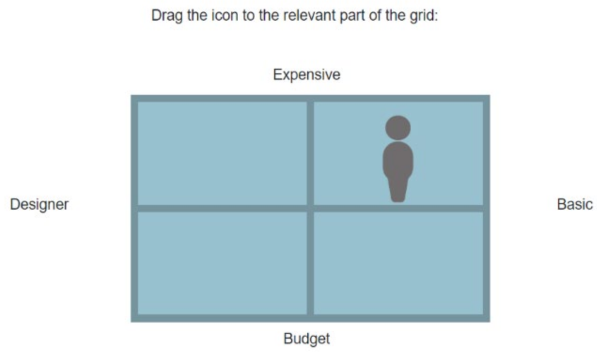
[4] Specifically, we set $V = 6$ when there are no tokens in the public sector, and V rises by 1/8 for each additional token in the public sector, up to a threshold of 96, past which V retains a fixed level of 18.

[5] Precise values differ because KPT study economies with 24 participants, whereas the present experiment has n = 12. Note that 8 of 20 tokens is 40% of subjects' endowments, and that about 40% of resources go the public sector in advanced economies (see OECD data at https://data.oecd.org/gga/general-government-revenue.htm#indicator-chart).

to contribute $p_i > 8$, but socially-minded subjects may want to do so if CE is low due to the public-goods nature of FPS.[6]

CE decision: Subjects are presented with simple puzzles which involve recognizing two dimensions of a sentence. Figure 1 shows an example in which the sentence reads "As Max needs his clothing to be robust for outdoor activities, even his simple t-shirts are expensive." Subjects get 10 points for solving a puzzle correctly (in this example, dragging the icon to the upper-right quadrant) and choose whether it should count as a private or civic task (see appendix B for details). Subjects can work for 40 seconds on tasks. Private vs. civic tasks do not differ in their content or difficulty.[7] A subject simply designates each task as private (Type B) or civic (Type A). The more "private tasks" subjects complete, the more they privately earn, the more "civic tasks" they complete, the more the amount of corruption is reduced. Hence, completing private tasks generates private income (is a private good) and completing CE tasks is a public good. Note that both FPS and CE decisions are contributions to public goods, but they differ qualitatively by whether tokens vs. real effort is allocated. Using a real effort task in the CE decision has the advantage that real effort resembles more closely the "engagement" aspect of civic engagement, while contributing tokens in FPS resembles paying a tax.

Figure 1: Example of a real effort task



Incentives are stacked against civic engagement (CE) in two ways. First, the private cost of CE-provision exceeds the private benefit at any level of CE. Subjects earn 10 points of private income for completing a private task. The opportunity cost of performing a CE task is to forego completing a private task, i.e., 10 points. The private benefit of the very first unit of CE in terms of corruption reduction is just below that (9.6 points) but falls rapidly if at least a few others are also expected to complete a first task [8] Second, incentives are stacked against

6 The private optimum remains at $p_i = 8$ at all levels of CE, but socially optimal FPS decision rises to 9, 10 or 11 tokens per person at intermediate levels of CE to compensate for the cost of high corruption. Subjects' instructions indicate socially optimal FPS as a function of CE, using a table. The contribution requirement is kept at 8 tokens for the sake of simplicity.

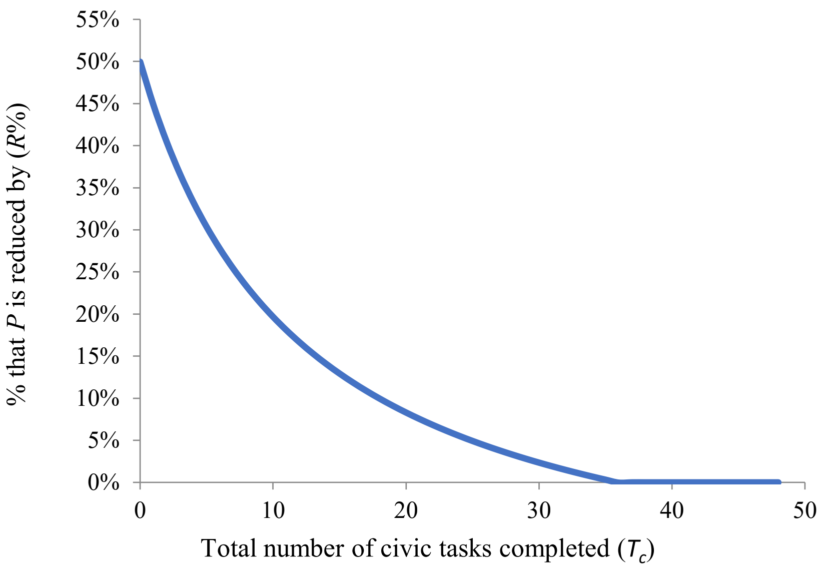
7 Using the same sentences for both types of tasks allows us to use the same quizzes in both natural and neutral treatments. It also precludes subjects to complete more civic tasks because they perceive them to be more "relevant" or more private tasks because they are more "entertaining".

8 Suppose 11 group members each complete one civic task. If subject *i* also provides 1 CE (instead of 0 CE), her private gain is 3.1 points, her private costs is 10 points, resulting in a net private loss of 6.7. This corresponds to familiar values of MPCR in public goods experiments (MPCR = 0.31). However, she

providing CE because CE are strategic substitutes for cooperative players (see Potters and Suetens 2009 showing that cooperation is more difficult with strategic substitutes than with strategic complements). This means that pro-social players, i.e., ones who are willing to provide CE when the social benefit on the margin is high enough, have an incentive to reduce their CE when others increase CE choices.

Cost of corruption: Figure 2 shows the cost of corruption, i.e., the share of tokens allocated to FPS, *P*, that is lost for effective public sector funding as a function of the total number of CE tasks completed (T_c) by all 12 group members. The cost of corruption falls from 50% to 0% at an initially steep and then a gradually diminishing rate as T_c rises. The socially optimal level of CE provision is reached when the loss from corruption approaches zero, at $T_c = 36$, i.e., at $T_c / n =$ CE* = 3 per capita.

Figure 2: Losses from corruption fall with total civic tasks completed



Notes: Figure shows the loss from corruption, i.e., the share of tokens allocated to the public sector *P* that is lost in a period for effective public sector funding. The loss is $R\% = [(800/(T_c + 12)) – 16.7]\%$. T_c is total number of CE tasks completed by all n =12 members.

The falling marginal returns from civic engagement (i.e., the convexity of the loss function in figure 2) imply that the CE of each cooperative player (as defined above) is a strategic substitute for that of each other cooperative player in our experiment (self-interested players never find it optimal to provide CE > 0). However, whether civic engagement is a strategic complement or substitute in the field is likely to depend on the context. For example, diminishing marginal returns to CE, giving rise to strategic substitution, seem plausible when investigative efforts by the press or by civil society groups first focus on large-scale, egregious, and perhaps easier-to-detect misbehavior, then move on to smaller and costlier-to-uncover transgressions (see, e.g., the monitoring cost function in Jensen and Meckling 1976).

generates 3.1 x 12 = 37.2 points of earnings for the group as a whole, a net social gain of 37.2 – 10 = 27.2 points.

Strategic substitutes may also prevail when citizens have some social target value in mind for overall provision of CE (as Cantoni *et al*. 2019 argue for street protests in Hong Kong).

Social approval: In all treatments, subjects learn about aggregate civic engagement (T_c) and the resulting corruption losses (R%) before making their FPS decisions. In treatments with social approval, they in addition observe the CE choices of others in their social circle of 4 subjects (who are identified by a fixed letter A, B, C, D) and can assign a stylized message of approval (an icon of a "smiley face") to others. They also learn how many smiley faces they got from others, and the average number others in their circle received, at the end of a period (see appendix C for screenshots). Giving and receiving social approval has no monetary cost.

Participants and payments: A total of 384 subjects participated in 16 experimental sessions, with 24 subjects each.[9] Two sessions of each treatment were conducted at Newcastle University and an equal number at York University. Subjects were randomly assigned to groups, social circles, and treatments. A session took about 90 minutes with an average payment of £21.4 including a £3 show-up fee (conversion rate was 260 points = £1).

4. Predictions and hypotheses

Standard theory in which rationality and self-interest are common knowledge predicts free riding on civic engagement (CE = 0) and the provision of the minimum required amount to fund the public sector (FPS_i = 8 tokens) to avoid the stiff sanction for non-compliance in all periods in the main part. As a consequence of CE = 0, corruption looms large and only half of the total funding is effectively used to fund the public sector (P = 8 tokens x 12 group members ÷ 2 = 48 tokens). The resulting per-period equilibrium earnings are about 194 points (154 points from the FPS stage plus about 40 points from completing private tasks in the CE decision).

The social optimum is efficient. It obtains when each subject funds the public sector as requested (FPS_i^* = 8 tokens) and they collectively drive corruption to zero. This is the case at a total of 36 civic tasks (see figure 2), i.e., at CE_i^* = 3 civic tasks per subject.[10] Since subjects can complete about 4 tasks per period on average, this means that they do about 1 private task per period in the social optimum. The income that can be obtained by eliminating corruption (i.e., in the social optimum) is thus about 273 points (= 263 points from the FPS + about 10 points from completing private tasks). The potential income gain from eliminating corruption is therefore about 41% (≈ (273 – 194)/194).

[9] A session thus had two groups of 12, without subject knowledge of which were in their own group. All subjects were students (67% undergraduate, 33% graduate). We have an even gender distribution (49% female, 51% male or other). 27% have some knowledge of economics, the remaining ones studied a wide range of majors. 55% of subjects reported themselves to be British. Subjects were recruited using the recruiting software *hroot* (Bock et al. 2014). Experiments were programmed in *oTree* (Chen et al. 2016).

[10] Accounting for the social opportunity cost, the social optimum has CE = 35 and $CE_i \approx 2.92$. Since CE_i must be an integer and since there is no realistic way to coordinate on which of twelve participants will choose $CE_i = 2$ in each period, we refer to $CE_i = 3$ as the social optimum, for simplicity.

Our main behavioural hypotheses are as follows.

Hypothesis 1 (civic engagement): *Average civic task completion is positive in all treatments.*

From previous experiments (especially KPT 2023), we expect FPS choices close to the private optimum of $FPS_i = 8$ tokens and civic engagement at intermediate levels between the private (CE = 0) and the social ($CE_i = 3$) optimum. Although FPS_i of 8 tokens will be close to the social optimum if low corruption losses obtain, the prediction flows from the binding sanction for $FPS_i < 8$, and few will voluntarily raise their FPS to compensate for corruption losses. The reason for predicting little voluntary FPS versus considerable voluntary CE, even in the base case environments that lack social interaction, is the tendency of subjects to compare average benefit to average cost of cooperation when that ratio is particularly high and subjects can boost earnings in the higher-stakes FPS dilemma at relatively low cost by group action, as found by KPT (2023) (see section 5.3 for further discussion). The benefit to cost ratio or "leverage" is substantially lower in FPS.

Hypothesis 2 (social approval mechanism increases civic engagement): *Average civic task completion is higher in treatments with social approval than in those without approval.*

We hypothesize that civic engagement is promoted by a social feedback loop as follows. Subjects are likely to reward civic engagement by others with social approval. This is likely to be the case for subjects who see civic engagement as desirable but also for strictly self-interested subjects who benefit from the provision of public goods by others (sending messages of social approval is costless). Civic engagement thus meets with social approval which, in turn, motivates prosocial subjects to civically engage. This positive feedback loop generates a strategic complementarity among conditionally cooperative subjects (i.e., they find it optimal to civically engage if others also civically engage) despite the built-in strategic substitutability, i.e., incentives to reduce civic engagement when others provide more civic engagement. We thus speculate that the strategic complementarity triggered by the feedback loop compensates or even overcomes the strategic substitutability (note that these strategic properties apply to prosocial subjects. Strictly self-interested subjects find zero civic engagement optimal, independent of whether there is social approval or how much others contribute).

Hypothesis 3 relates to the effects of framing and comes in two sub-hypotheses. Hypothesis H3a postulates that natural framing is positively related to civic engagement while the (Null-) hypothesis H3b postulates that framing makes no difference.

One reason why a positive relation may prevail (H3a) is that natural framing may evoke social norms while neutral framing may not do so. Civic engagement may thus be higher with natural than with neutral framing, independent of social approval. In addition, natural framing may engender a stronger positive feedback loop of social approval which means that civic engagement is expected to be higher with natural than with neutral framing in treatments with social approval.

Another potential explanation for H3a is experimenter demand. Subjects may think that they ought to civically engage because they want to please the experimenters whom they may believe to favour civic engagement, given the language in the instructions. Thus, framing may evoke social desirability independent of the social approval loop.

In contrast, H3b postulates that framing makes no difference with or without social approval. In particular, H3b takes the perspective that the feedback loop operates in overcoming strategic substitutability independent of framing because neutral framing does not reduce social approval and, thus, cooperation.

Hypothesis 3a (natural framing increases civic engagement): *Average civic task completion is higher in treatments with natural than with neutral framing.*

Hypothesis 3b (no effect of framing): *Average civic task completion is not different in treatments with natural than with neutral framing.*

We formulate no explicit hypotheses regarding Part 1 periods because they are not the focus of this paper. Part 1 has no corruption and CE elements, and mainly serves to familiarize subjects with the FPS structure. We expect subjects to display there the decline of voluntary contributions that is one of the most widely reconfirmed results in experimental economics, seen in conventional finitely repeated public goods games (Zelmer 2003), and also observed by Kamei *et al*. (2023) for the specific structure used in our experiment.

5. Results

Before stating the main results, we note that our experimental setting provides an excellent environment to study the effect of civic engagement on corruption. Despite the complexity added when moving from Part 1 to 2, we find that subjects react clearly and strongly to the change in material incentives from Part 1 to 2, and their FPS choices are close to the private optimum given the penalty scheme in Part 2.

In particular, we find that subjects react to free-rider incentives by strongly decreasing cooperation when no sanctions for non-contribution are present (in Part 1) and respond rationally to the introduction of the deterrent sanction by bringing FPS choices to the private optimum or slightly above (in Part 2). In Part 1, average FPS choices start out at positive levels (81% of social optimum) in period 1 and decline (to 34%) by period 4 (the end of Part 1; see Figure A1 in the appendix).[11] In Part 2, when deterrent sanctions for under-provision of FPS are in place, FPS choices immediately jump close to the privately optimal level of $FPS_i = 8$, and remain at that level throughout the main phase in all treatments (average over

[11] Note that subjects were allocated to treatment conditions at the beginning of the experiment (in Part 1) but the treatments differed from each other only in whether the instructions had neutral or natural language. Most differences, including differences in language describing corruption and civic engagement, existed only in Part 2, for which instructions were read upon completing Part 1 only. Figure A.1 shows that FPS choices do not differ across treatments in Part 1. This demonstrates that randomization of subjects into treatments was effective. FPS choices jump in all treatments to close to privately payoff-maximizing values (see table 2 for labels). Treatment averages are A: 8.06, B: 8.13, C: 8.05, D: 8.08 (all significantly different from phase 1 averages at 5%-level, Mann-Whitney tests).

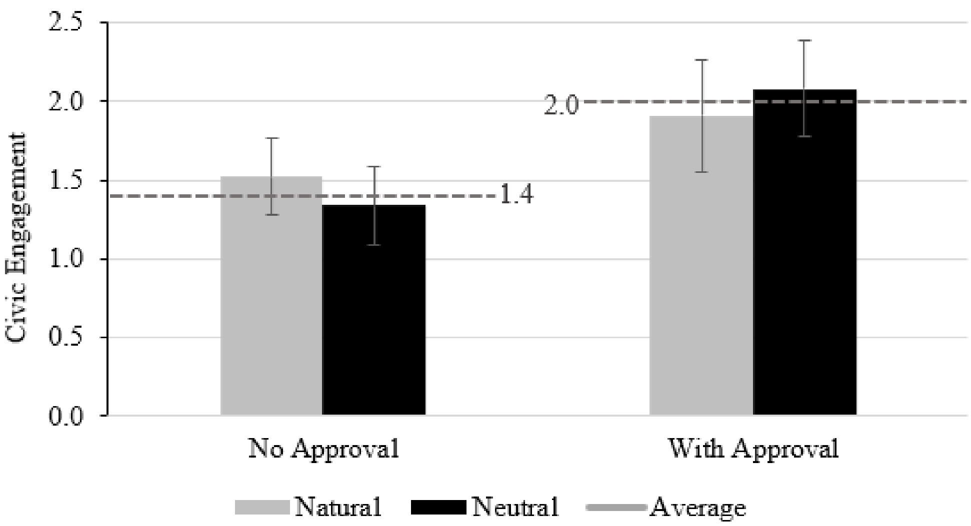
all treatments and periods of Part 2 is 8.08 tokens). Both of these findings are well in line with our expectations and the literature. The decline in response to free rider-incentives we observe in Part 1 has been documented in hundreds of voluntary contribution games, and the compliance with deterrent sanctions we see in the main part is also well documented (e.g., Markussen *et al*. 2014).

FPS choices close to theoretical predictions in the main part provide an ideal setting for studying under what conditions the damage done by corruption can be constrained by civic engagement because the driving source of inefficiency is corruption, rather than low FPS.

5.1 Treatment effects on civic engagement and corruption

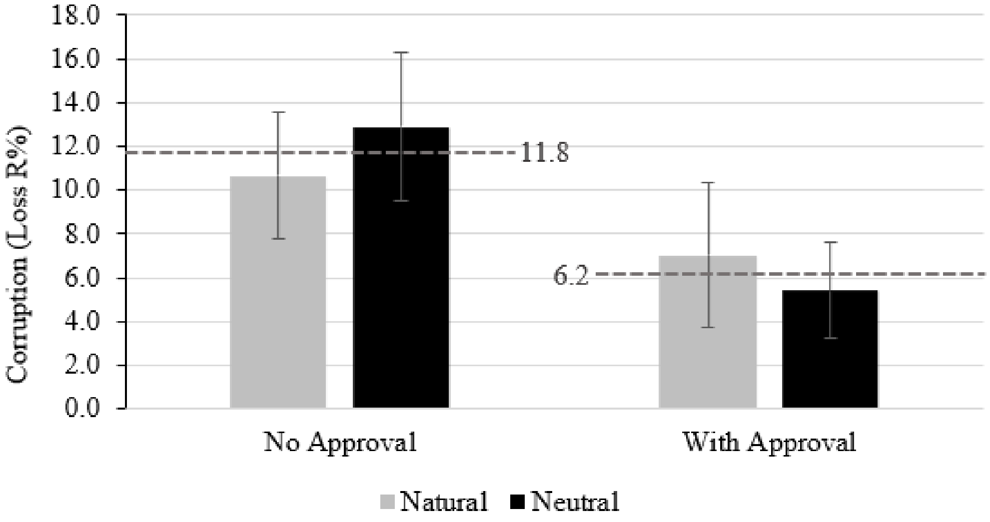
Figure 3 shows that civic engagement was positive in all treatments (H1 is supported). We find that adding the social approval mechanism causally increases CE relative to treatments lacking it by about 40% (from 1.4 to 2.0), an effect that is highly significant ($p < 0.001$, Mann-Whitney (MW) test). Hence, H2 is supported. In contrast, the presentation of the game in neutral vs. natural language has no effect on CE choices overall (average is 1.7 in both cases, $p = 0.889$, MW test, group level observations). We also note that neutral framing does not have a directional effect: CE(neutral) - CE(natural) is positive with approval but negative without (neither difference is statistically significant). We conclude that H3a receives no support, while H3b is supported.

Figure 3: Social approval increases civic engagement (CE)



Notes: Civic engagement is the average number of CE choices (civic tasks completed) over all periods (periods 5 – 19). Neutrally-framed treatments use terms such as "penalty scheme," "loss," and "type A task," whereas naturally-framed treatments use terms such as "government," "corruption loss," "civic task". "With approval" vs. "No approval" indicates whether subjects were in treatments in which they were able to send each other simple messages of social approval. Average over all treatments is CE = 1.71.

Figure 4: Social approval reduces corruption



Notes: Figure shows corruption as measured by the loss of funding for public sector (FPS) in percent of total FPS (see notes to Figure 2 for explanations).

Figure 4 shows that presence of the social approval mechanism reduced the loss from corruption by about 47% (the average loss falls from 11.8 to 6.2 with approval), an effect that is highly significant ($p < 0.001$, Mann-Whitney (MW) test). In contrast, the presentation of the game in natural vs. neutral language had no effect on average corruption (9.2 vs. 8.8 in natural, $p = 0.956$, MW test). In summary, the evidence clearly indicates that social feedback increased civic engagement and reduced corruption, while neutral framing did not affect either. The effect of the treatment variations on overall income are more modest, since we model CE's impact on corruption losses as having diminishing returns (see figure 2). Total incomes with approval are 8.3 points higher with than without approval which corresponds to about 11 percent of the potential gain from cooperation (see section 4 calculations).

Table 2 summarizes the tests for treatment effects. The top part of the table explains the labelling of treatments in the lower part. The first row of the lower part of the table shows that CE choices, losses from corruption, and efficiency (measured as realized total income gain relative to potential gain) are higher in treatments with the social approval mechanism. In contrast FPS remain unaffected by social approval (determinants of FPS choices are discussed in section 5.3). The second row shows that framing had no effects in any of the four dimensions. The next two rows show that the social approval mechanism has significant effects in either framing for CE choices and corruption, and the last two rows show that framing has no effect either with or without the social approval mechanism. Accordingly, the presence of social approval significantly reduces the loss from corruption (column 2) and increases efficiency (column 4), while framing has no significant effects on corruption or efficiency.

Table 2: Treatment effects

		Framing	
		Natural	Neutral
Social Approval	Yes	A	B
	No	C	D

Δ social approval	Treatment comparison	(1) CE choices	(2) Corruption	(3) FPS choices	(4) Efficiency
Yes	A&B vs. C&D	0.001***	0.001***	1.000	0.037**
No	A&C vs. B&D	0.941	0.941	0.941	0.941
Yes	A vs. C	0.088*	0.088*	0.627	0.270
Yes	B vs. D	0.022**	0.004***	0.627	0.088*
No	A vs. B	0.964	0.627	0.964	0.270
No	C vs. D	0.627	0.627	0.270	0.627

Notes: Table shows *p*-values for Mann Whitney (MW) tests (1) civic tasks completed, (2) Loss from corruption, R%, see figure 2, (3) tokens assigned to funding the public sector, (4) efficiency, measured by realized gain in average earnings / potential gain. Potential gain = sum of incomes at the socially optimal level - predicted level assuming strictly self-interested and rational choices.

The treatment effects of approval vs. no approval are impressively large given the limited potential for improvement. The potential is limited because most of the loss from corruption was eliminated already in the baseline, i.e., the treatments without social approval (in line with H1). This, in turn, means that the scope for incentives created through the social approval mechanism to provide additional effort to reduce corruption was small for prosocial subjects. The reasons why this is the case are as follows. The parameters in the experiment were chosen to induce civic engagement at an intermediate level between full free riding (CE_i = 0) and socially optimal contribution (CE_i = 3.0) such that positive and negative treatment effects can in principle be observed. We find that average civic task completion over all treatments was CE_i = 1.71 (i.e. at 58% of the efficient contribution), implying that most (about 90%) of the potential loss from corruption was eliminated. Thus, civic engagement constrained corruption losses remarkably well despite the fact that incentives were doubly stacked against providing CE in our design, in the sense that (i) engaging in CE never increases private payoff, and (ii) even cooperative players are discouraged from doing more CE by its strategic substitutability with the CE of other group members.

We note that, as common in such settings, subjects learn to complete tasks more rapidly as they gain experience. Averaged over the 15 Part 2 periods, subjects complete about 4 tasks in total (i.e., civic plus private) per period. Regression analysis shows that the total task number rises by about 1.6, from about 3.2 at the outset to about 4.8 at the end. In contrast, the number of tasks subjects designate as CE is fairly constant around the average of 1.71 tasks with very little decline (see appendix, figure A2). This means that civic tasks per person remained roughly constant, their share of total tasks declined over time. We focus on the absolute number of civic tasks completed, rather than their share of total task completions, since it is the absolute number of civic tasks that determines the extent to which corruption is reduced. Note that the opportunity cost of a civic task is fixed at 10 points, and this cost was unaffected by enhanced speed at doing tasks of either designation.

5.2 Social approval shapes civic engagement

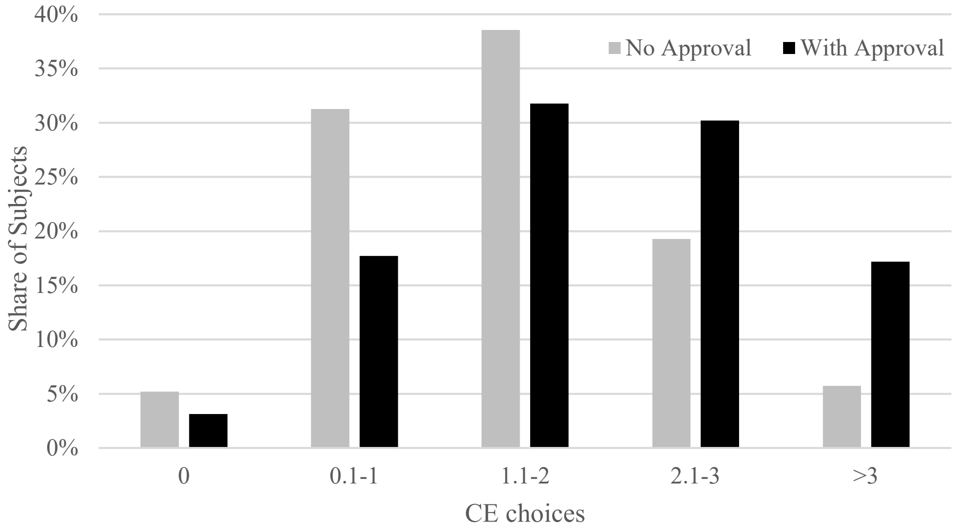
The previous section has shown that the social approval mechanism causally increases civic engagement and thus reduces corruption overall. We have done so by demonstrating that otherwise identical subjects assigned to treatments that include a social approval opportunity complete significantly more civic tasks than do counterparts in treatments without it. We now provide a detailed account of the behavioral drivers behind this causal effect. We show that a) presence of social approval causes both low and high contributors to provide more CE, and that there is a strong correlation between CE and social approval within social circles. In particular, we show that b) those who exert more civic engagement receive more social approval in comparison to others in their social circle, and c) that individuals who have received more social approval in one period exert more civic engagement in the next period.

These correlations suggest that two processes operate simultaneously: providing high CE is rewarded by social approval, and social approval motivates civic engagement. These two effects reinforce each other and induce a "positive feedback loop" which generates cooperation-promoting strategic complementarity: high CE choices meet with approval by others, and social approval tends to trigger high CE choices. The thus endogenously arising strategic complementarity counteracts the exogenously built-in strategic substitutability which discourages cooperation. Because the two processes are intertwined and occur simultaneously, we cannot empirically disentangle which precedes the other or which is stronger than the other. But whatever the exact structure of the feedback loop may be, we find empirically that the resulting strategic complementarity was strong enough to at least partly compensate the negative effects of built-in strategic substitutability (the impact of which will be detailed below).

a) Social approval shifts the CE distribution up

Figure 5 shows that social approval has effects on low and high contributors as it shifts the entire distribution of CE choices up. The distribution with approval first-order stochastically dominates the distribution without approval ($p < 0.001$, MW). In treatments with social approval, a much larger share of subjects (18% vs. 6%) civically engage above the socially optimal level (see rightmost bars), and a much smaller share makes low CE choices (21% vs. 36% are at or below 1 civic task per period).

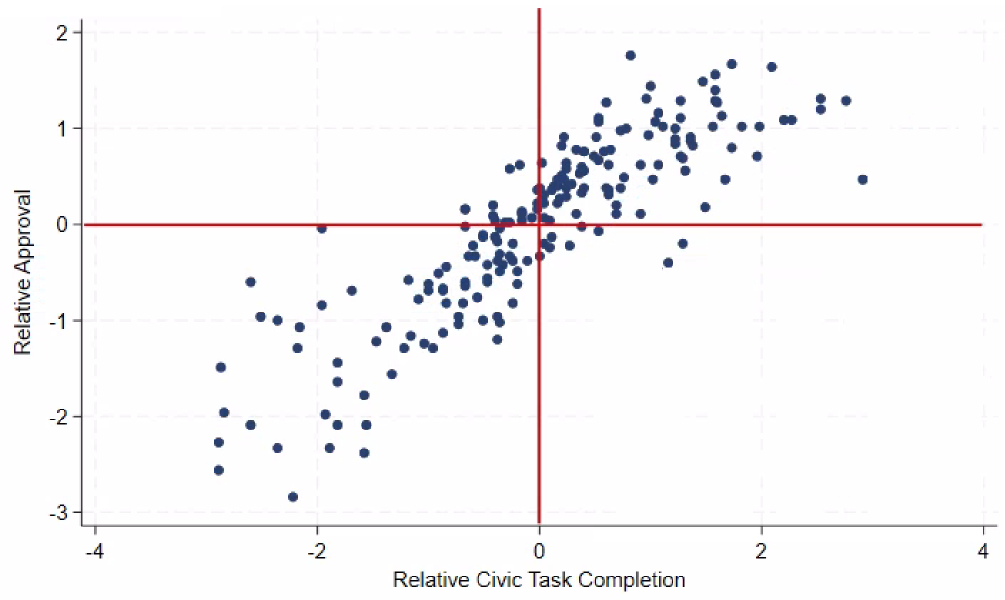
Figure 5: Distribution of civic engagement (CE choices)



Notes: Figure shows share of subjects by their CE choices (i.e., civic tasks completed) in treatments with vs. without social approval (n = 192 per treatment). Average CE is 1.4 without, 2.0 with the approval mechanism.

b) The feedback loop, part 1: Civic engagement meets with social approval

Figure 6: Relative approval received vs. relative task completion in one's social circle



Notes: Relative approval received is defined as "approval to subject i in social circle k *in period t*" - "average approval per subject $j \neq i$ in social circle k *in period t*". Relative civic task completion is "civic tasks completed by subject i in social circle k *in period t*" - "average number of civic tasks completed by subjects $j \neq i$ in social circle k *in period t*". Location on vertical and horizontal mid-lines indicate that subject i completes the average number of CE and receives the average approval, respectively. Linear regression of relative approval received (with individual-level fixed effects and a constant) shows a highly significant coefficient of 0.72 on relative task completion. Subjects were in social circles of 4 in which subjects could send each other up to one stylized message of social approval per dyad (n = 192).

Figure 6 shows that high civic engagement tends to be rewarded by high social approval, where "high" means that a subject has provided relatively more CE than other members of their social circle. A dot on the vertical mid-line bisecting the x-axis indicates that a subject exerted civic engagement exactly at the average CE in their social circle in a given period, dots to the right of that line indicate that a subject provided above-average CE, and vice versa for dots to the left. Dots on the horizontal mid-line bisecting the y-axis indicate that a subject received the average approval given in their social group in that period. Subjects on average made 1.71 CE choices, and sent 1.74 approval messages per period to their three fellow circle members.[12] Relative CE choices and relative social approval received are highly correlated overall (Pearson correlation $r = 0.70$, $p < 0.001$), and the correlations are about equally strong for positive and negative deviations from social-circle averages ($r = 0.53$, $p < 0.001$, and $r = -0.58$, $p < 0.001$, respectively). Figure 6 thus shows that high civic engagement comes with high social approval within a social circle, and can be interpreted as showing that high CE triggers high approval.

c) The feedback loop, part 2: Civic engagement is high after receiving social approval

Table 3 shows that CE choices are higher in period $t + 1$ when social approval received was high in period t, controlling for subject characteristics and other variables. Table 3 uses GLS regressions with clustering by groups, but the results are robust to using other models and specifications. For example, Tobit regressions yield very similar results. The models displayed vary in their controls (see table notes for details).

Column (1) shows that receiving higher approval in period t is correlated with CE in $t + 1$ in the sense that subjects who received (absolute) higher approval in one period tend to exert more civic engagement in the next period (row (a)). The insignificant coefficient in row (f) confirms our earlier conclusion that natural vs. neutral framing has no effect on CE choices, indicating that the beneficial effect of social approval is robust to framing in this specification.

Columns (2) and (3) show that own civic engagement and civic engagement by group members outside one's social circle are on average strategic substitutes, while own CE and civic engagement by those inside one's social circle are strategic complements. That is, subjects tend to contribute less when group members outside their social circle provide more CE (see row (e)), but tend to contribute more when those within their social circle provide more civic engagement. While the property of strategic substitutes is induced by the convex curvature of the loss function from corruption (see Figure 2), the property of strategic complementarity arises endogenously through the feedback loop. Remarkably, strategic complementarity between CE_i and CE_{-i} only arises within the subgroups of subjects that can socially interact and not between members belonging to other subgroups of the overall economy (of $n = 12$). This finding provides support for our claim that strategic

[12] A regression with individual-level fixed effects and a constant, shows that relative CE performance is a highly significant predictor of receiving above-average approval (coefficient value 0.54, $p < 0.01$). CE choices is defined as civic tasks completed.

complementarity arises because of social approval within one's group. The endogenously arising strategic complementarity seems to at least neutralize the strategic substitutability on average (the coefficients in rows (d) and (e) of column 3 are of similar absolute size).

Columns (4) to (6) repeat the analysis above but decompose the overall effect of social approval (row (a)) into whether a subject has received relatively high vs. low approval in comparison to their fellow social circle members, see rows (b) and (c). The regularities discussed in the previous paragraph are robust to this decomposition, i.e., the other coefficients remain essentially unaffected by the decomposition. The decomposition suggests that receiving relatively high approval is motivating (see positive coefficients in row (b)) and receiving low approval is demotivating (negative coefficients in row (c)).

Table 3: Civic engagement is predicted by approval received

	(1)	(2)	(3)	(4)	(5)	(6)
(a) Approval received by subject *i* (lagged)	0.21*** (0.03)	0.22*** (0.03)	0.22*** (0.03)	---	---	---
(b) High approval received by subject *i*	---	---	---	0.23*** (0.06)	0.35*** (0.05)	0.36*** (0.05)
(c) Low approval received by subject *i*	---	---	---	-0.20*** (0.05)	-0.21** (0.05)	-0.20** (0.05)
(d) CE_{-i} in social circle (lagged)	---	0.15*** (0.03)	0.15*** (0.03)	---	0.23*** (0.04)	0.24*** (0.04)
(e) CE_{-i} outside social circle (lagged)	---	---	-0.14** (0.05)	---	---	-0.13** (0.05)
(f) Natural framing	-0.09 (0.15)	-0.07 (0.13)	-0.09 (0.15)	-0.12 (0.15)	-0.09 (0.12)	-0.10 (0.15)
Constant	0.88*** (0.24)	0.62*** (0.23)	0.87*** (0.21)	1.20*** (0.24)	0.76*** (0.22)	1.00*** (0.27)
Control	Yes	Yes	Yes	Yes	Yes	Yes
Wald $\chi 2$	215.3	256.5	292.6	369.5	407.8	440.7
Prob > Wald $\chi 2$	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Dependent variable is CE_i in period $t + 1$. GLS regressions, clustering by groups ($N = 2{,}492$, treatments with social approval only). (a) is total approval received by *i* from other subjects in *i*'s social circle in period *t*, (b) = 1 if *i* received more social approval than other subjects in *i*`s social circle on average in period *t*, (c) = 1 if *i* received less social approval than other subjects in *i*`s social circle on average in period *t*, (d) average CE by the other 3 subjects in *i*'s social circle in period *t*, (e) average CE by the other 8 subjects not in *i*'s social circle in period *t*, and (f) is a dummy for treatment With Approval-Natural. All specifications include controls for laboratory location, gender, economics degree, British nationality, and cooperativeness (as measured by FPS choices in the first period of the experiment). *, **, and *** indicate significance at 10%, 5%, 1%, respectively.

5.3 “Leverage” can explain why subjects cooperate more in CE than in FPS

The analysis above has demonstrated the strong impact of social feedback. We now turn to explaining why considerable levels of CE appear and are relatively sustained in the treatments without feedback.

Both CE and FPS choices are contributions to a public good. However, we find that “excess” contributions (contributions above the level a rational and self-interested subject would make if believing all are of that type) are much higher for civic engagement than in the funding of the public sector: average CE is 1.71, more than half way to the social optimum of 3 from a selfish payoff maximizing level of 0.0, whereas average FPS is 8.08, less than a tenth of the way from the 8.00 expected of strictly selfish players to the 9.00 that is socially optimal due to corruption loss in the large majority of periods.[13] Why do subjects cooperate more in the provision of CE than in FPS in the main part of the experiment? The concept of “leverage” proposed by KPT (2023) offers an explanation.

KPT suggest that whereas strictly rational, self-interested agents gravitate towards their privately payoff maximizing choices in multi-person social dilemma situations because they come to see that their private marginal cost of cooperating exceeds their private marginal benefit, many real world individuals may adopt a less rational or selfish heuristic of comparing average rather than marginal benefit and cost, when considering a collective action problem in which the ratio of the two is high. They suggest that this is more likely to be the case when the cooperation problem under consideration stands in a “second order” relationship to a first-order social dilemma having higher stakes. In the present case, the first-order dilemma is funding the public sector, which can more than double the main source of earnings, and where a binding penalty scheme sharply reduces most free riding but its success is threatened by loss of up to half of the funding subjects make available, unless they engage in CE. CE, then, offers a relatively low-cost solution to the problem of corruption that threatens the larger portion of earnings available in the FPS stage.

Applying KPT’s hypothesis to our context, many subjects may approach the second-order problem of CE taming the FPS stage’s corruption losses by asking themselves what it would cost each group member to do their part to achieve a better outcome. They then compare the cost to themselves, calculated under the *ex ante* conditions, to the average benefit they (like other members) would privately experience. A group member may, for example, compare the 30 points cost to each member from foregoing private tasks, which eliminates corruption in the FPS stage, to the 109 points of earnings gained by each in the latter stage when corruption losses fall from 50% to 0%. The 109 ÷ 30 ratio implies a 3.6-fold benefit per unit of cost, and

[13] Subjects were provided with a table showing that when fewer than 26 and more than 12 tokens were allocated to CE, the socially optimal allocation to FPS is 9, rather than the 8 required to avoid the monetary penalty. $12 < CE < 26$ held in about 94% of periods in the treatments without feedback. FPS choices are not only very close to the mandated and private payoff maximizing level, they also exhibit little time trend (see figure A1 in the appendix), are invariant to treatment variations (see column (3) of Table 3), and are not correlated with CE contributions. CE choices also show little time trend; see Figure A.2 of the Online Appendix.

may strike them as a return justifying joining with others to achieve. In contrast, if group members acted cooperatively to raise FPS from 96 to 108, or from the private payoff maximizing 8 to the socially optimal 9 per person, each would consider themselves to be foregoing private sector earnings of about 17.3 in the FPS stage to increase earnings in that stage from 249 to 251, a benefit to cost ratio far below unity. KPT (2023)'s experimental data are consistent with their hypothesis and our finding can be explained by the same phenomenon.[14]

While Kamei *et al.*'s leverage concept assumes that comparisons of average benefit to average cost of coalitional action is adopted by individuals as a mental short-cut to which they are drawn mainly by cognitive convenience, the attraction of such thinking may also be stronger for those who bring more cooperative or pro-social dispositions into the environment studied. The force of cognitive convenience and that of cooperative disposition could, logically speaking, operate as independent motivators of engagement in CE, but attraction to the cognitive short-cut of leverage may well be strengthened by cooperative preferences. The heterogeneity we observed in CE, across subjects, may thus be explained by the stronger attraction to the average benefit-to-cost heuristic among the more cooperatively disposed than among others.[15]

Finally, we note the possibility that the role of leverage in explaining substantial CE even in the absence of social feedback can provide an additional explanation of why such feedback raises the CE of many participants. Specifically, the leverage hypothesis proposes that individuals weigh the value of acting as a coalition with others by comparing the benefit per person to the cost per person. Assurance that others are also committed to such collective action can reinforce this way of thinking. While such assurance is present in the treatments without feedback in the form of the information subjects receive about aggregate CE each period, seeing group sentiment for cooperation in the form of positive feedback disproportionately directed at high co-operators may further strengthen confidence that many are thinking of their decisions with a coalitional mindset.

[14] KPT (2023) use the term leverage for the idea that low cost cooperation in a second-order dilemma like that of civic engagement can yield a high return when cooperating in it solves a problem in a high-stakes domain, like putting in place a penalty scheme, in their paper, or reducing the corruption affecting FPS, in the present study. The mindset that being part of a cooperating coalition is a profitable and thus attractive choice appears to be sustainable despite not all cooperating to the same degree. Sustained cooperation presumably requires that there be overall success in group effort, and that earnings inequalities due to unequal participation are modest relative to overall earnings. The idea thus closely resembles the "minimum profitable coalition" idea of Isaac, Walker and Williams (1994), but permits the level of commitment to the coalition to vary somewhat from member to member (as Fig. 5 shows to be the case).

[15] Since the cognitive pull of the leverage effect can be thought of as an instance of bounded rationality, it might be wondered whether participants with stronger math abilities or training engaged in less CE. Our exit survey collected information on completion of pre-college math A-level exams and the GCSE (general certificate of secondary education) math score, as well as the number of university economics modules taken. The GCSE score turns out to be uncorrelated with average CE, while the A-level dummy has a marginally significant positive correlation with CE. Interestingly, number of economics modules taken is negatively correlated with CE, significant at the 5% level, although the partial correlation of 0.03 in a linear regression estimate implies an economically modest effect.

5.4 Civic engagement in the lab correlates with civic engagement in the field

Table 4 shows that civic engagement in the field is correlated with civic engagement in the lab (i.e., with CE choices), but only when CE choices are framed as such ("civic tasks", top part of table 4). Civic engagement in the field is not related to civic engagement in the lab when it is framed neutrally ("task A", bottom part). Since civic engagement is an empirically multi-faceted concept, we construct an index of civic engagement in the field from responses about engagement in six activities: contributing time or money to a political cause or candidate, signing a petition, attending a rally for a candidate, and joining a boycott, a peaceful demonstration, or a strike. The resulting index can take values from 1 to 3, and empirical averages are very similar (2.11 vs. 2.09) in the two framing conditions, as is to be expected by random assignment of subjects to treatments.

Table 4: Civic engagement in the lab vs. field

	Obs.	Mean	Variance	(1) Average CE	(2) Low CE	(3) Cooperativeness
				Naturally framed treatments		
Civic engagement index	170	2.11	0.16	0.55*** (0.004)	-0.21*** (0.002)	1.23 (0.112)
				Neutrally framed treatments		
Civic engagement index	171	2.09	0.27	0.10 (0.627)	-0.07 (0.366)	0.69* (0.052)

Notes: OLS for (1) average number of civic tasks (CE) completed per period, and (3) FPS choices in period 1 of Part 1, with standard errors clustered by group. *p*-values in parentheses. Marginal effects at the mean from Probit regressions for (2) with likelihood of CE < 1 on average. Civic engagement Index: average of 6 civic activities a person 3 = 'has done', 2 = 'might do', 1 = 'Would never do' (avg. 2.1, sd = 0.4). Activities are: Contributing time or money to a political cause or candidate, signing a petition, attending a rally for a political candidate, joining a boycott, joining a peaceful demonstration, joining a strike (see appendix E for details). All regressions control for laboratory location, gender, economics degree, and British nationality. *, **, and *** indicate significance at the 0.10 level, at the 0.05 level, and at the 0.01 level, respectively.

The top part of table 4 shows the result for the natural framing. The estimate in column (1) shows that subjects who are engaging civically in the field make significantly higher CE choices in the lab. Column (2) shows that the civically engaged in the field are less likely to make very low CE choices in the lab (i.e., contribute less than 1 civic task per period). Column (3) shows that the civically engaged in the field do not generally have higher cooperativeness (as measured by FPS choices in the very first period of Part 1, i.e., before they get any information about the behaviour of other subjects). This finding suggests that while CE and FPS choices are both contributions to a public good, they seem to be perceived differently by subjects. The bottom part of table 4 shows that there is no significant relationship between our measures of civic engagement in the lab and the field when choices are neutrally represented.

The finding that the civically engaged in the field contribute more (and the civically unengaged contribute less) to CE when CE choices are connected to civic engagement by the instructions provides some evidence of external validity of our laboratory setting (see, e.g., Cohn and Maréchal 2018, or Dai *et al*. 2018 on external validity of cheating in the lab and the field).

For the sake of completeness, we also note that those reporting themselves to hold more right-leaning political views make lower CE choices. This finding aligns with Cappelen *et al*. (2022) who find that universalism (as measured by sharing with strangers) is negatively correlated with right-wing political views, and is "strongly predictive of … civic engagement". Putterman *et al*. (2011) find that those who self-describe as more politically conservative are less inclined to vote for a measure (a deterrent sanction on free-riding) to improve cooperation.

6. Concluding remarks

This paper has shown that civic engagement can act as a constraint on corruption. Our experimental demonstration is set in a novel framework in two respects. First, we demonstrate this effect under controlled conditions when the costs and benefits of civic engagement, the benefits of public goods provision, and the social damage from corruption are known. This tight control allows us to investigate the role of incentives and strategic properties in much more detail than would be possible in the field. Second, we demonstrate the constraining effect of civic engagement on corruption in the context of public goods provision (and public bad prevention) in a much richer environment than most previous laboratory experimental studies on public goods. Our framework involves a relatively large economy, a public good that provides direct and indirect benefits, interior equilibria, and opportunities for social interaction.

We find that participants in the experiment are much more civically engaged than predicted by standard theory, that differences in civic engagement in the lab mirror differences in self-reported engagement in the field, and that civic engagement is importantly shaped by incentives. These incentives are partly built into our design, reflecting formal institutions like a sanctioning scheme for under-contribution and the technology relating civic engagement to preventing losses from corruption. But incentives also arise endogenously from informal institutions. Our design allows us to study the interaction of formal and informal institutions in the guise of social preferences and norms. For example, we find that the leverage effect (Kamei *et al*. 2023), wherein subjects respond behaviourally to a high average benefit to cost ratio in a second-order collective action problem that can unlock larger benefits in the main public goods domain, can explain why civic engagement is high whereas voluntarily funding of the public good itself is not. A particular focus is on incentives that arise from the interplay of formal and informal institutions in the presence of social approval.

The main finding from our treatment variations is that civic engagement is more effective in constraining corruption when social approval can be expressed, and that this effect is surprisingly robust to framing. In particular, we find that social approval engenders a self-reinforcing feedback loop effect in which civic engagement is rewarded by social approval which, in turn, encourages civic engagement. In the presence of such a feedback loop, civic engagement exhibits a strategic complementarity: subjects who value a good social image have incentives to provide more civic engagement as others provide more of it. This endogenously arising strategic complementarity at least partly offsets the built-in strategic substitutability (which stacks incentives against providing high levels of civic engagement). Perhaps surprisingly, we find the social feedback effect to be robust to framing the game "neutrally", i.e., when removing all reference to civic engagement, public goods, the state, etc. Contextualization also has no effect on its own, i.e., in the absence of the social approval mechanism.

Our framework provides a workhorse to study further aspects of civic engagement as a constraint on corruption. Below, we suggest modifications to our framework for further research.

First, our study exogenously imposes that civic engagement is subject to strategic substitutability for prosocial participants by means of our corruption reduction technology. However, the strength and even the nature of this relation is likely to depend on particular institutional settings in the field (e.g., Cantoni *et al*. 2019). The framework (in particular the shape of the function in figure 2) can easily be adapted to study a more or less pronounced degree of strategic substitutability, or even built-in strategic complementarity.

Second, our analysis has shown that leverage, i.e., the high ratio of per-capita gains to per-capita cost of cooperation in the modest cost CE dilemma linked to the higher stakes public good domain's struggle with corruption losses, can explain civic engagement. The specific amount of leverage is induced by the functional forms (in particular through the direct and indirect effects of the funding of the public services and the cost of civic engagement) in our experimental design. Kamei *et al*. (2023) have already made first steps in showing that high leverage induces more civic engagement by experimentally varying the cost of civic engagement. Further study of this question would be particularly relevant to learn more about alternative ways to promote civic engagement.

Third, we have studied a setting with symmetric agents (e.g., all participants have the same endowments and face the same technological constraints), and we have modelled civic engagement as preventing the public bad of corruption. In such a setting, civic engagement may be driven by some sort of general civic duty that increases the attraction to the coalitional benefit-to-cost heuristic. However, citizens are often asymmetric (e.g., some may benefit more from a public good than others, some are richer than others), and the public goods and bads may be group-specific rather than general, which may give rise to different opportunities and motives to be civically engaged. Our framework can be adapted to study asymmetry in endowments and technologies, and collective action can be studied in promoting partisan or special interests. This could be achieved by providing local public goods, or by promoting special policies that benefit only people with particular interests.

Fourth, our experiment was run in the U.K. which scores well in terms of corruption (the U.K. ranks 20, similar to the U.S. which ranks 24, in the corruption perception index CPI 2023 issued by Transparency International), and has relatively high levels of civic engagement. Since we find that civic engagement in the lab correlates with civic engagement in the field when we describe the experimental environment in socially realistic terms, it would be interesting to use our framework in countries where corruption is rampant (for example, Venezuela ranks 177, Somalia ranks 180 in the CPI 2023). Such a cross-cultural study could contribute to recent research suggesting that informal institutions are shaped by formal ones (e.g., Gächter and Schultz 2016, Henrich 2020, Cappelen *et al*. 2022).

Fifth, our study has focussed on a citizen-centered approach to fighting corruption. In our setting, corruption results in losses to citizens but does not benefit particular government officials. It would be interesting to adapt our framework to include officials who personally profit from corruption as is the case in bribing games (see section 2 for references) to investigate if such profiteering would entice outrage and additional civic engagement or, instead, result in resignation.

Finally, our citizen-centered approach has focused on civic engagement as a bottom-up mechanism to constrain corruption. An interesting direction for further research could be to compare the relative effectiveness and the interplay of bottom-up vs. top-down approaches. For example, Olken (2007) finds that increasing monitoring to reduce corruption in road projects was effective while more bottom-up approaches were ineffective, in Indonesia. However, bottom-up and top-down approaches may also interact. Indeed, civic engagement by ordinary citizens as modelled in our paper can be thought of as public demand to have top-down mechanisms in place and to keep pressure on those involved. In this sense, civic engagement remains essential as it provides the necessary “underpinning” of formal and top-down institutions preventing corruption.

References

Abbink, K., Hennig-Schmidt, H.,2006. Neutral versus loaded instructions in a bribery experiment. *Experimental Economics* 9: 103-121.

Abbink, K., Dasgupta, U., Gangadharan, L., and Jain, T. 2012. Letting the briber go free: an experiment on mitigating harassment bribes. Journal of Public Economics 111: 17-28.

Acemoglu, D. and Robinson, J. 2019. *The Narrow Corridor: States, Societies, and the Fate of Liberty*. Penguin Press.

Alekseev, A., Charness, G. and Gneezy, U. 2017. Experimental methods: when and why contextual instructions are important. *Journal of Economic Behavior and Organization* 134: 48-59.

Andreoni, J. 1995. Warm-glow versus cold-prickle: the effects of positive and negative framing on cooperation in experiments. *Quarterly Journal of Economics* 110(1): 1–21.

Armand, A., Coutts, A., Vicente, P. C. and Vilela, I. 2023. Measuring corruption in the field using behavioral games. *Journal of Public Economics* 218: 104799.

Attanasi, G., Rimbaud, C., and Villeval, M. C. 2019. Embezzlement and guilt aversion. *Journal of Economic Behavior and Organization* 167: 409-429.

Banerjee, A.V., Duflo, E., Glennerster, R. and Khemani, S. 2010. Pitfalls of participatory programs: Evidence from a randomized evaluation in education in India. *American Economic Journal: Economic Policy* 2(1): 1-30.

Beekman, G., Bulte, E. and Nillesen, E. 2014. Corruption, investments and contributions to public goods: Experimental evidence from rural Liberia. *Journal of Public Economics* 115: 37-47.

Besley, T. 2020. State capacity, reciprocity, and the social contract. *Econometrica* 88(4): 1307-1335.

Bock, O., Baetge, I. and Nicklisch, A. 2014. hroot: Hamburg registration and organization online tool. *European Economic Review* 71: 117-120.

Böhm, R. and Theelen, M. 2016. Outcome valence and externality valence framing in public good dilemmas. *Journal of Economic Psychology* 54: 151-163.

Campante, F. and Do, Q. 2014. Isolated capital cities, accountability, and corruption: Evidence from U.S. States. *American Economic Review* 104(8): 2456-2481.

Cantoni, D., Yang, D., Yuchtman, N. and Zhang, J. 2019. Protests as strategic games: Experimental evidence from Hong Kong's antiauthoritarian movement. *Quarterly Journal of Economics* 134 (2): 1021-1077.

Cappelen, A., Enke, B., Tungodden, B. 2022: Universalism: global evidence. NBER WP 30157. Forthcoming in *American Economic Review*.

Chang, D., Chen, R., and Krupka, E. 2019. Rhetoric matters: A social norms explanation for the anomaly of framing. *Games and Economic Behavior* 116: 158-178.

Chen, D., Schonger, M. and Wickens, C. 2016. oTree - An open-source platform for laboratory, online and field experiments. *Journal of Behavioral and Experimental Finance* 9: 88-97.

Cohn, A. and Maréchal, M. A. 2018. Laboratory measure of cheating predicts school misconduct. *Economic Journal* 128(615): 2743-2754.

Costa, D. L. and Kahn, M. E. 2003. Civic engagement and community heterogeneity: An economist's perspective. *Perspectives on Politics*, 1(1): 103-111.

Dai, Z., Galeotti, F. and Villeval, M. C. 2018. Cheating in the lab predicts fraud in the field: An experiment in public transportation. *Management Science* 64(3): 1081-1100.

DellaVigna, S., List, J., Malmendier, U. and Rao, G. 2017. Voting to tell others. *Review of Economic Studies* 84(1): 143-181.

Dimant, E. and Tosato, G. 2017. Causes and effects of corruption: What has past decade's empirical research taught us? *Journal of Economic Surveys* 32(2): 335-356.

Drugov, M., Hamman, J. and Serra, D. 2014. Intermediaries in corruption: an experiment. *Experimental Economics* 17: 78-99.

Dufwenberg, M., Gächter, S. and Hennig-Schmidt, H. 2011. The framing of games and the psychology of play. *Games and Economic Behavior* 7: 459-478.

Eriksson, K. and Strimling, P. 2023. Spontaneous associations and label framing have similar effects in the public goods game. *Judgment and Decision Making* 9(5): 360-372.

Fisman, R. and Golden, M. A. 2017. *Corruption. What Everyone Needs to Know*. Oxford University Press.

Gächter, S. and Schultz, J.F. 2016. Intrinsic honesty and the prevalence of rule violations across societies. *Nature* 531: 496-499.

Gao, P., Li, C. and Murphy, D. 2020. Financing dies in darkness? The impact of newspaper closures on public finance. *Journal of Financial Economics* 135(2): 445-467.

Gründler, K. and Potrafke, N. 2019. Corruption and economic growth: New empirical evidence. *European Journal of Political Economy* 60: 101810.

Henrich, J. 2020. *The WEIRDEST people in the world: how the West became psychologically peculiar and particularly prosperous*. Farrar, Straus and Giroux.

IACA, International Anti-Corruption Academy. https://www.iaca.int/online/

Isaac, M., Walker, J. and Williams, A. 1994. Group size and the voluntary provision of public goods: experimental evidence using large groups. *Journal of Public Economics* 54(1): 1-36.

Kamei, K., Putterman, L. and Tyran, J-R. 2023. Civic engagement, the leverage effect and the accountable State. *European Economic Review* 156: 104466.

Klitgaard, R. 1988. *Controlling Corruption*. University of California Press.

Knack, S. 2002. Social capital and the quality of government: Evidence from the States. *American Journal of Political Science* 46: 772-785.

Kuang, J. and Bicchieri, C. 2024. Language matters: How normative expressions shape norm perception and affect norm compliance. *Philosophical Transactions of the Royal Society B* 379, 20230037.

Liberman, V., Samuels, S. and Ross, L. 2004. The name of the game: predictive power of reputations versus situational labels in determining prisoner's dilemma game moves. *Personality and Social Psychology Bulletin* 30(9): 1175-1185.

Markussen, T., Putterman, L. and Tyran, J.-R. 2014. Self-organization for collective action: An experimental study of voting on formal, informal, and no sanction regimes. *Review of Economic Studies* 81(1): 301-324.

Masclet, D., Noussair, C., Tucker, S. and Villeval, M. 2003. Monetary and non-monetary punishment in the voluntary contributions mechanism. *American Economic Review* 93(1): 366-380.

Mungiu-Pippidi, A. 2013. Controlling corruption through collective action. *Journal of Democracy* 24(1): 101-115.

Potters, J. and Suetens, S. 2009. Cooperation in experimental games of strategic complements and substitutes. *Review of Economic Studies* 76(3): 1125-1147.

Putnam, R. D. 1993. *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton University Press.

Putterman, L., Tyran, J.-R. and Kamei, K. 2011. Public goods and voting on formal sanction schemes. *Journal of Public Economics* 96(9-10): 1213-1222.

Rege, M. and Telle, K. 2004. The impact of social approval and framing on cooperation in public good situations. *Journal of Public Economics* 88(7-8): 1626-1644.

Rose-Ackerman, S. and Palifka, B.J. 2016. *Corruption and Government. Causes, Consequences, and Reform*. 2nd edition. Cambridge Univ. Press.

Shleifer, A. and R. Vishny (1993): Corruption. *Quarterly Journal of Economics* 108(3): 599-617.

Sonnemans, J., Schram, A. and Offerman, T. 1998. Public good provision and public bad prevention: The effect of framing. *Journal of Economic Behavior and Organization* 34(1): 143-161.

Treisman, D. 2007. What have we learned about the causes of corruption from ten years of cross-national empirical research? *Annual Review of Political Science* 10(1): 211-244.

United Nations 2018. Secretary-General's remarks to the Security Council on Corruption in Conflict. *United Nations*, 10 September. Available at: https://www.un.org/sg/en/content/sg/statement/2018-09-10/secretary-generals-remarks-security-council-corruption-conflict (accessed on 29 February 2024).

United Nations Office on Drugs and Crime (UNODC) 2023: The role of citizens in fighting corruption, Module 10: Citizen Participation in Anti-Corruption Efforts, Vienna. Available at: https://grace.unodc.org/grace/uploads/documents/academics/Anti-Corruption_Module_10_Citizen_Participation_in_Anti-Corruption.pdf

Zelmer, J. 2003. Linear public goods experiments: a meta-analysis. *Experimental Economics* 6(3): 299-310.

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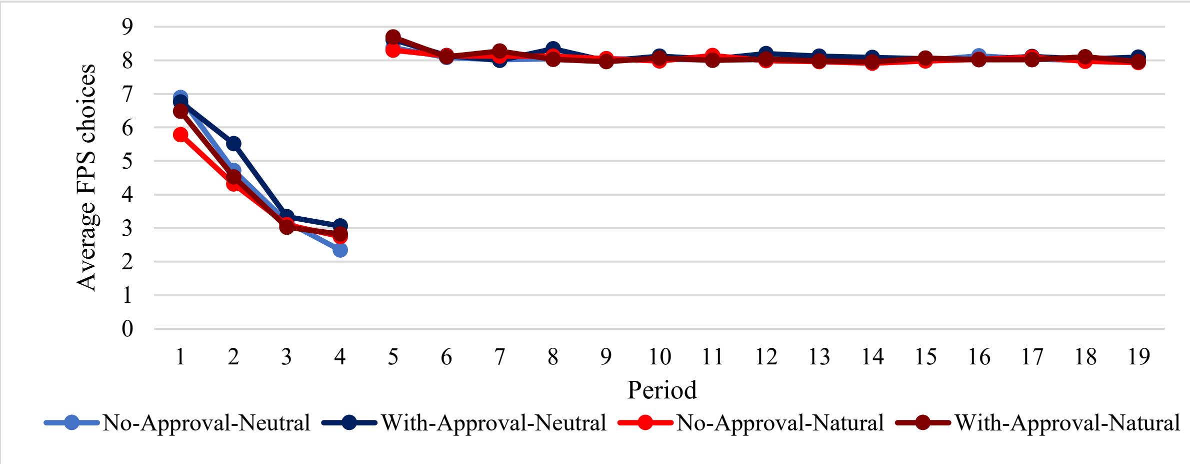
Appendix to Kamei, Putterman, Tabero and Tyran, "Civic Engagement as a Constraint to Corruption"

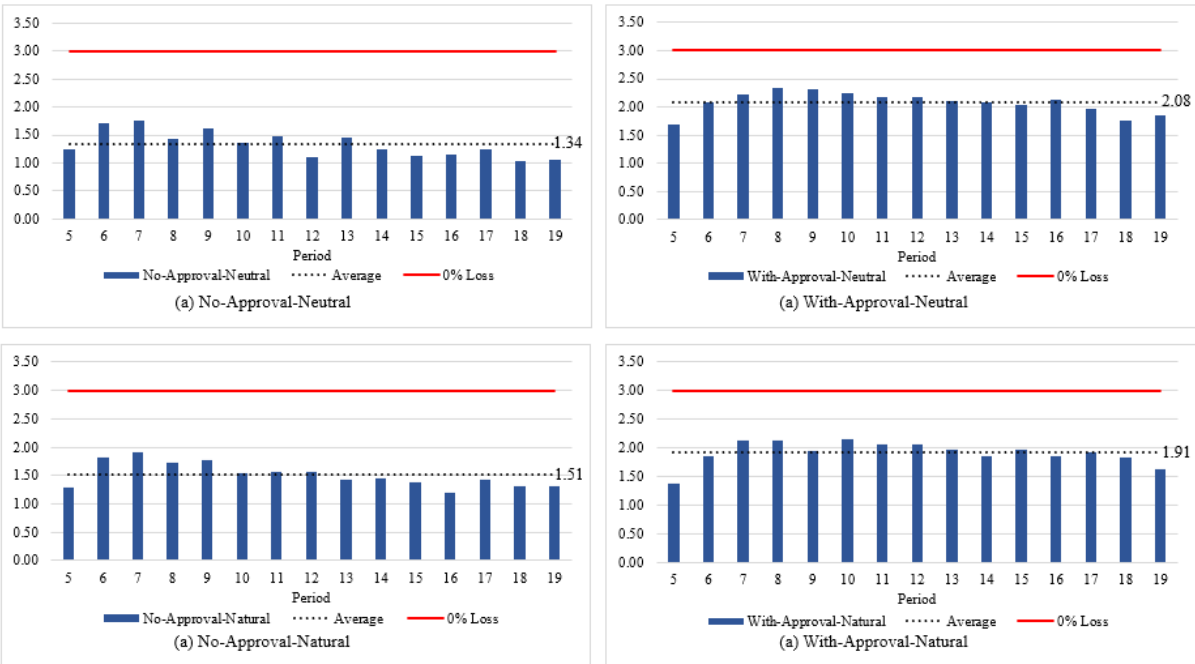
Appendix A: Additional Tables and Figures

Figure A1: Funding of the public sector (average FPS choices) by treatment



Note: Average contribution to the public sector by period and treatment. Periods 1-4, called Part 1, is a learning phase differentiated only by presence of neutral or natural language. There is no contribution requirement enforced by penalties, no tasks before FPS stage, and no corruption losses. Periods 5-19, called Part 2, are the main part of the experiment with minimum required contribution of 8, FPS following CE decisions, and corruption losses depending on aggregate CE each period.

Figure A2: Civic engagement (CE choices) over time



Notes: Average civic tasks completed by period and treatment. The solid line at 3 indicates the socially optimal level of average CE. At this level, the loss from corruption is eliminated (reduced to 0%). The dotted line shows the average number of civic tasks per person completed across all 15 periods in Part 2.

Table A1: Descriptive statistics

Variable	Treatment	*N*	Mean	Median	Std. Dev.
Part 1 FPS choices	All	384	4.29	4	3.97
Part 2 FPS choices	All	384	8.08	8	0.93
	No Approval-Neutral	96	8.06	8	0.53
	With Approval-Neutral	96	8.13	8	0.91
	No Approval-Natural	96	8.05	8	1.16
	With Approval-Natural	96	8.08	8	0.99
CE choices	All	384	1.71	2	1.40
	No Approval-Neutral	96	1.34	1	1.36
	With Approval-Neutral	96	2.08	2	1.39
	No Approval-Natural	96	1.51	1	1.30
	With Approval-Natural	96	1.91	2	1.43
Loss from corruption (R%)	All	384	9.0%	7.5%	5.7%
	No Approval-Neutral	96	12.9%	12.9%	5.8%
	With Approval-Neutral	96	5.4%	5.2%	3.3%
	No Approval-Natural	96	10.7%	9.6%	5.0%
	With Approval-Natural	96	7.0%	6.2%	4.9%
Private tasks completed	All	384	2.32	2	1.56
	No Approval-Neutral	96	2.74	3	1.59
	With Approval-Neutral	96	1.99	2	1.46
	No Approval-Natural	96	2.43	2	1.57
	With Approval-Natural	96	2.11	2	1.52
Earnings Part 1	All	384	204.7	205	55.46
Earnings Part 2	All	384	263.4	266	25.9
	No Approval-Neutral	96	259.8	262	20.5
	With Approval-Neutral	96	269.6	271	22.3
	No Approval-Natural	96	258.7	263	31.5
	With Approval-Natural	96	265.5	268	26.2

Notes: FPS choices: allocations of tokens to the Funding of the Public Sector (out of 20). CE Choices: real effort civic tasks completed. CE choices reduce the loss from corruption R%. Private tasks are private goods in that they generate income for the subject doing the real effort but not for other subjects. Earnings are indicated in points (exchanged at 1 GBP for 260 points).

Appendix B. Details of the experimental design

This appendix provides additional details on the experimental design and the calculation of earnings. In the main phase (Part 2) of the experiment, earnings are determined by direct and indirect earnings from FPS (funding of public sector) choices. These earnings are reduced if corruption looms. However, corruption is reduced by privately costly civic engagement (CE choices). Incomes are also reduced when subjects are sanctioned for failing to contribute the minimum required amount of FPS (of 8 out of 20 tokens). See sample instructions in Appendix C for how these details were communicated to subjects.

FPS choices. At the beginning of the experiment, subjects are assigned to groups of $n = 12$ (an "economy") and endowed with 20 tokens each. In all periods of the experiment, each individual i divides these tokens between a private business activity, b_i, and funding of the public sector, p_i ($b_i + p_i = 20$).

Aggregate public funding ($P = \Sigma p_i$) directly and indirectly increases incomes. The indirect effect on earnings that i obtains from the private activity is $b_i * V(P)$. It reflects the fact that businesses are more productive in an environment in which roads, law and order, a secure currency, etc., are provided. Aggregate public funding P also provides a direct benefit. This benefit D is equal for all n subjects and increases in P. An individual's earnings, in points (260 points convert to £1) is:

$$Y_i\,(p_i \mid p_{-i}) = b_i V(P) + D(P) \qquad \text{(B.1)}$$

where $p_{-i} = \sum_{j \neq i} p_j$. This design reflects that private activity is supported by a functioning state, and so underfunding of the state not only impacts public goods such as clean air and public health and safety but also the profitability of individual entrepreneurship or work. These elements are captured in the $V(P)$ and $D(P)$ functions below.

$$D(P) = \frac{101}{1+(49)\mathrm{Exp}[-0.04*\mathrm{P}]} - 2\,. \qquad \text{(B.2)}$$

$D(P)$ is a logistic function (see Figure B.1), reflecting that many public projects require a considerable level of funding before they can be implemented effectively, while returns start to diminish once they have become well-funded.[16] $V(P)$ is described by the piece-wise linear function:

$$V(P) = \alpha + \beta P\,. \qquad \text{(B.3)}$$

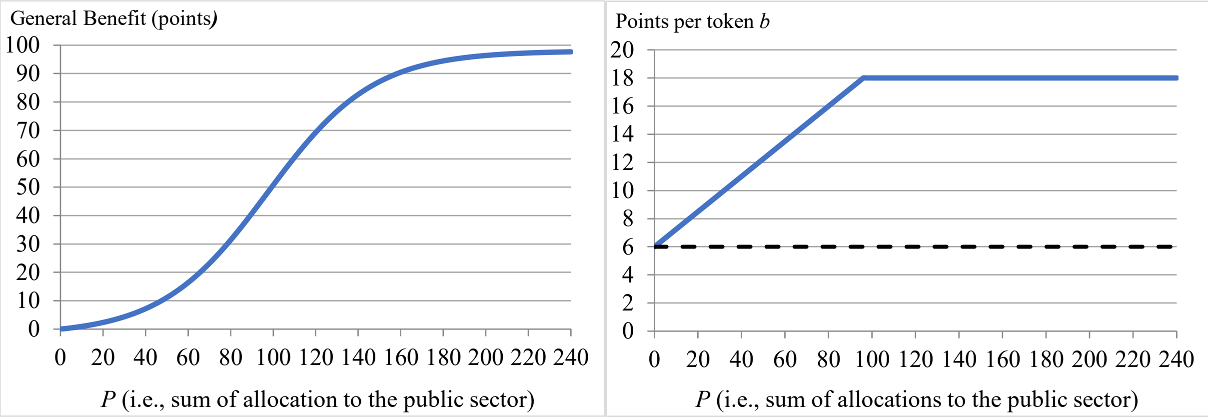
Specifically, for $P \leq P^* = 96$: $V(P) = 6 + (1/8)P$, for $P > P^*$: $V(P) = 6 + (1/8)96 = 18$, where $P^* = 96$ tokens is the socially optimal funding for the public sector, corresponding to an average of 8 tokens per subject. The shape of $V(P)$ (see Fig. B.1, right panel) reflects how funding to the public sector is beneficial to the private sector up to a point, for example, to ensure contract enforcement and infrastructure, but beyond the optimal level it offers no additional return.

Instructions present subjects with Figure 1b and a table showing total earnings from FPS choices. While our functional forms are more complex than those of standard linear public goods games, experience with closely parallel forms in Kamei *et al*. (2023) indicates that they cause little confusion to student subjects and generate qualitatively similar results to finitely repeated public goods games with more conventional specifications.[17]

[16] The functional form yields a clear interior optimum at 40% public (i.e., 8 tokens) and 60% private activity.

[17] The majority of public goods experiments use a linear allocation problem in which allocating the entire endowment to the public good is socially optimal. In contrast, the novel design of Kamei *et al*. (2023) gives subjects the sense of facing the problem of public goods provision in a more realistic mixed economy in which most resources go to private production. We adopt their design with minor modifications. We know of no experiments on public goods dilemmas that explicitly model a private sector, the productivity of which depends on synergies with the public one.

Figure B1: Functions $D(P)$ and $V(P)$ as shown in the experiment instructions



Part 1 has 4 periods with FPS as described above to gest subjects acquainted with making FPS choices. In the main part of the experiment (Part 2), subjects play 15 periods in one of the 4 treatments described in Table 1 of the main text. Each period begins with a CE decision (see below) and is followed by a modified FPS decision. The calculation of earnings from the FPS decision in the main part includes a) a deterrent sanction for failing to contribute to FPS as required, and b) potential corruption losses that can be reduced by civic engagement (CE choices, see below for details).

a) Deterrent sanction: Contributing less than the required amount of FPS ($p_i = 8$) entails a sanction of 35 points which is about twice the income gained by free riding at $p_i = 8$. Thus, a rational and self-interested player never under-contributes. The required FPS is set at $p_i = 8$ because it is the socially optimal level of public sector funding when corruption is absent. There are no private incentives to over-contribute due to free-rider incentives, but socially-minded subjects may want to over-contribute due to the public-goods nature of FPS when corruption looms large (see discussion of the leverage effect in section 5.3. in the main text).

b) Corruption is modelled as reducing the number of tokens effectively available to the public sector. This design choice reflects the fact that corruption (including embezzlement by officials) opens a gap between what citizens allocate to the public sector and what is actually spent on public good provision. Specifically, the loss from corruption is 50% in the absence of civic engagement, but can be fully eliminated by sufficient collective civic engagement (total CE = 36). Note that, while FPS = 8 tokens is the socially optimal symmetrical contribution to the public sector when corruption losses are sufficiently reduced, it is socially optimal to contribute more than 8 tokens at high levels of corruption (see section 5.3 of the main text). When losses can occur, equations (B.2) and (B.3) are modified by replacing P, the sum of subjects' public sector allocations, by P^L (with L signifying "net of losses").

CE choices. At the start of each period in Part 2, subjects are given 40 seconds to complete real-effort tasks. "Civic tasks" (called "Type A tasks" in neutral framing) reduce the loss from corruption and thus benefit all subjects. In contrast, completing a "private task" ("Type B task" in the neutral framing) only benefits the subject who completed the task. Subjects are given a description of a fictional person's preferences in two dimensions, such as travel destination and transport, and must drag and drop an icon of the person onto the respective area of a 2x2 matrix (see screen image 1b in instructions). For each private task they complete correctly, they receive 10 points. The total number of CE tasks completed (T_c) determines the **loss from corruption**:

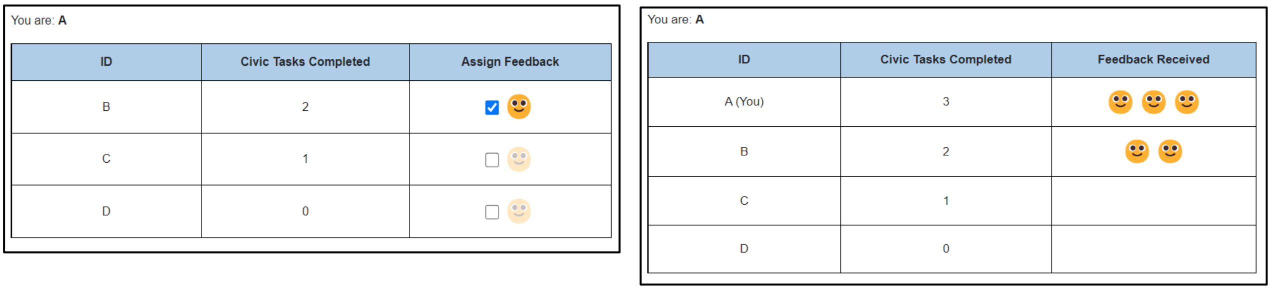
$$R\% = [(800/(T_c + 12)) - 16.7]\% \qquad \text{(B.4)}$$

The resulting convex reduction function (see figure 2 in the main text) starts at 50% and reaches 0% when subjects complete an average of 3 civic tasks each ($T_c = 36$), i.e., $P^L = [(100 - R\%)/100]P$.

While CE > 0 is socially beneficial it is privately so costly that it is never optimal for a self-interested agent to choose CE > 0. As a result, CE choices constitute a second-order social dilemma problem, in which self-interested subjects are predicted to complete only private tasks, and suffer a large loss form corruption. The design thus captures the idea that merely empowering the state to collect taxes does not fully resolve the free-riding problem for the funding of public goods, but rather pushes the problem back one step into the challenge of fostering the civic engagement needed to hold the state accountable, given that the material gains to an individual citizen are usually insufficient to render such engagement privately rational.

Treatment variation: Social approval. In treatments with social approval, subjects are given identifiers (letters) and are permanently assigned to a social circle ($n = 4$) within which they could express social approval. Social circles are designed to simulate the smaller social sphere of people within a large society whose activities — such as whether or not they vote (compare DellaVigna *et al*., 2017) or attend a political rally (Cantoni *et al*. 2019) — one might know of. In each period, subjects learn CE choices by others in their social circle, as well as the total CE choices by all 12 subjects in the economy.[18] They can express social approval (a smiley face) to as many of their fellow members as they like (see left screenshot in figure B2). All social circle members learn approval received by all subgroup members (see right screenshot). Social approval does not impact either the sender or receiver's earnings.

Figure B2: Approval assignment (left) and receipt (right). Naturally framed treatments



Treatment variation: Framing. To test the robustness of civic engagement as a constraint on corruption to framing effects, we remove or replace all wording suggestive of "civic tasks", "corruption" etc. in "neutrally" framed treatments. Both the instructions and decision screens replace or omit the words "public sector," "government," "citizen," "public affairs," "officials," and "corruption" for more neutral terms such as "group account," "minimum required allocation," and "reduction". "Civic task" and "private task" are replaced by "Type A task" and "Type B task."

We also remove the following two text portions:

"Although having a government to enforce a penalty scheme can increase the amounts citizens allocate to the public sector, potentially increasing earnings, real-world governments sometimes have leaders and officials that don't act fully in the public's interest. Indeed, some government revenue can be lost to lax oversight, negligence, or corruption by government officials."

"In what follows, we assume that governments exhibit less corruption when citizens engage more in public affairs. Examples of civic engagement in the real world include paying attention to the news, voting in elections, participating in a campaign or rally, signing a petition, or other actions that may hold a government to account."

Full sets of instructions are included in Appendix C.

[18] Experimental sessions had 24 subjects randomly and anonymously assigned to two groups of 12. It was therefore unknown to participants which other participants were in one's social circle or one's large group.

Appendix C: Instructions

This appendix contains instructions in the following sequence:
C1: Part 1, Naturally framed, C2: Part 1, Neutrally framed ;
C3: Part 2, Naturally framed with/without approval; C4: Part 2, Neutrally framed with/without approval.

C1: Instructions for Part 1, Naturally Framed

This experiment involves a set of decisions by 12 participants, yourself included, in which others' decisions can affect your earnings, and your decisions can affect their earnings. Whenever you are shown approval on the decisions of others, their real identities will be kept anonymous, but please be assured that reported decisions are those of the same actual participants (group composition does not change) and never fictitious participants simulated by a computer program or members of the experimenter team.

No communication between participants will be permitted during the experiment. You are also not permitted to use your phone, tablet computer, or programs other than the designated experiment software. Members of the experiment team will check that this rule is adhered to. You will have an opportunity to ask questions before the experiment begins. We ask that you devote your full attention to the experiment while it is in progress.

In the experiment, we'll be using two different currencies. The first currency, called **tokens**, is something you are given each period to allocate as you wish in order to earn the second currency, called **points**. Throughout the experiment, you can try to accumulate points. At the end of the experiment, your points will be converted to money (pounds) at a rate of 260 points to £1. You will receive your payment in cash at the end of the experiment. As you'll see below, while the value of a point is small, your total earnings can still be substantial. Please listen carefully to the instructions and ask questions if something is unclear.

Decisions and earnings

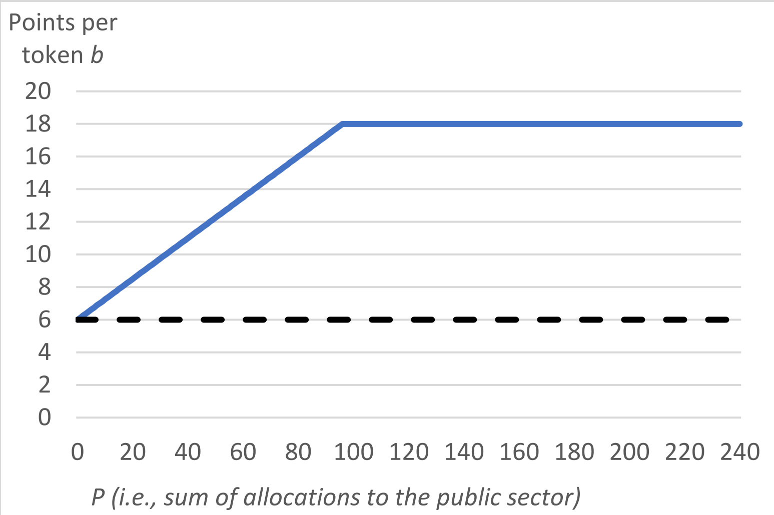
The main decision to be made, and the main way in which you can earn points, involves the allocation of your tokens between a private income-generating activity and a public sector. Allocating tokens to your private activity is always beneficial to you, but the size of the benefit is larger when the public sector is well funded. The amount jointly allocated to the public sector also determines a direct benefit evenly distributed across each participant, regardless of what they allocated to the public sector individually, similar to the benefits in everyday life from having safe roads, law and order, and clean air. Each participant has a private activity of their own, whereas there is only one public sector for the whole group. We will now provide further details about the allocation decision between the public sector and private activity.

More about the main allocation problem

In each period, you and every other participant will be endowed with 20 tokens that you must decide how to allocate between two accounts, your private activity, and the public sector. As mentioned above, each participant has their own private activity, while there is a single public sector for all 12 participants in a group. In a period, you can assign any integer number of tokens (including zero) to the public sector, assigning the rest of that period's 20 tokens to your private activity. Examples include 0 to the public sector and 20 to your private activity; 7 to the public sector and 13 to your private activity; 14 to the public sector and 6 to the private activity, and so on. These are among the twenty-one possible ways you can allocate your twenty tokens. Each of you makes an allocation decision with your own 20 tokens separately and simultaneously, learning of the others' decisions afterwards.

The number of points you earn from tokens allocated to your private activity depends on the number of tokens put into the public sector in that period by you and the other 11 participants. Call the number of tokens you put into the private activity *b* (for "business") and the number you allocate to the group account *p* (for "public"). Since you always start with 20 tokens, *b* + *p* = 20. We'll call the sum of *p*'s allocated to the public sector by all 12 participants *P*.

The points you get from each token you allocate to your private activity—i.e., *b* —depends on *P*. Each token of *b* increases your earnings by 6 points when *P* = 0, and by a larger number of points, rising to a maximum of 18 points per token when *P* = 96 or more. See Table 1 and Figure 1.

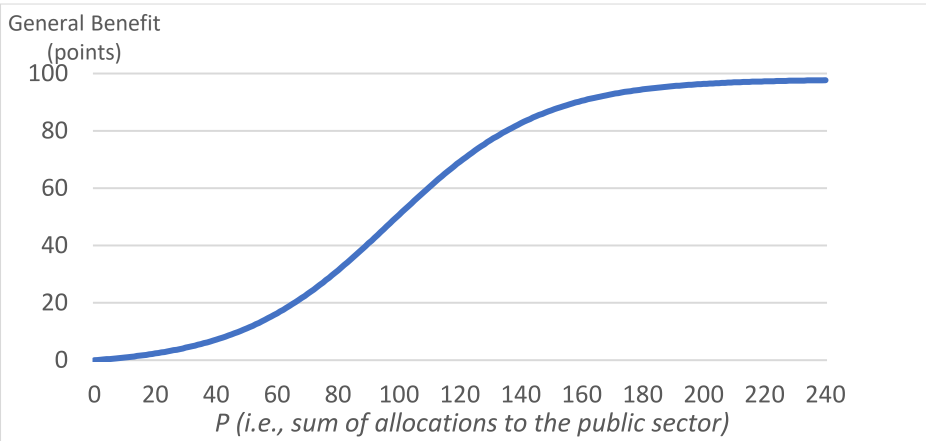


<u>Figure 1. Points earned per token of *b* as a function of *P*</u>

P	0	8	16	24	32	40	48	56	64	72	80	88	96	> 96
income from *b*	6	7	8	9	10	11	12	13	14	15	16	17	18	18

<u>Table 1: income per token of *b* as a function of *P*</u>

In addition to *P*'s effect on your earnings by influencing the income from tokens assigned to your private activity, *P* also affects your earnings in a direct way which is the same for all participants. Each participant in the experiment receives a number of points that rises as *P* does, and that goes equally to participants regardless of their individual choices of *b* and *p*. We will call this the "General Benefit". This general benefit of *P* rises as *P* increases, continuing to rise, although more slowly, even when *P* > 96, as shown in the figure below.



<u>Figure 2. shows the benefit from the public sector *P* that is given to each participant, regardless of their *b* and *p* token allocation</u>

The two ways in which allocations to the public account affect earnings—partly through increasing the returns to any token allocated to one's private activity, and partly by yielding an equal amount for all participants—are summarized in Table 2. The columns correspond to different allocations of tokens to the public sector by you, and the rows correspond to different average allocations of tokens to the public sector by the other 11 participants. To make the presentation more compact, the table shows only one's own and others' average allocations that are divisible by four.

Average allocation of 11 others	*Own allocation to the public sector (p)*					
	0	4	8	12	16	20
0	120	104	85	61	34	2
4	239	202	162	118	70	19
8	379	323	263	195	127	59
12	438	368	299	229	158	88
16	454	382	311	239	168	96
20	457	385	313	242	170	98

Table 2: Earnings as a function of your allocation to the public sector (*p*) and the average allocation *p* of the other 11 participants to the public sector

We've shaded the diagonal entries of the table, which represent situations in which you and the others in your group happen to allocate the same number of tokens (or for the others, the same number on average) to the public sector. For example, the entry *202* (second row from top, second column from left) is the total amount that you would earn if you allocated 4 of your 20 tokens to the public sector and 16 of your tokens to your private activity, while the other 11 participants allocate an average of 4 tokens each to the public sector. Notice that among these shaded diagonal cells, your earnings would be highest when you and the others on average allocate 8 tokens to the public sector, giving you 263 points. That's more than double your earnings if all participants put 0 into the public sector, and the fact that it occurs when all allocate 8 tokens to the public sector is consistent with the fact that the return from allocating a token to your private activity reaches its maximum value when P = 96 (= 12 x 8) (see Figure 1), and that the General Benefit of P (shown in Figure 2) increases at a slower rate after P = 96. Table 2 is available on your screen during the allocation stages of the experiment by double-clicking the 'Payment Table' button. You can also open (and close) an expanded table showing outcomes for all integer combinations of allocations by yourself and others by clicking the 'Full Table' button, which becomes available when the smaller table is open.

Two further things to note are the following. First, your earnings are not sensitive to *how* others' allocations add up to a given average; any combination of choices by others that generates a given average has the same impact on your earnings. Second, what you earn does change if your own allocation varies, taking the average allocation of the others as given. For example, suppose that the others allocate an average of 8 tokens to the public sector. You earn more by allocating less than 8 yourself, as shown by the cells to the left of the one with the shaded value of 260. The largest number in the table, 457, is what you would earn if others assigned all their tokens to the public sector, while you allocate all of yours to your private activity.

In summary, there will be four periods in Part 1 of the experiment followed by a break for further instructions. Operationally, each of the 4 periods in Part 1 will unfold as follows:

- You'll initially see a screen where you'll be asked to decide how many (if any) of the 20 tokens you wish to allocate to the public sector (the rest automatically go to your private activity).
- When everyone has submitted their decisions, you'll see a screen showing your overall results for the period.
- When you click "Next", you'll see a screen showing the amount that you and each of the other 11 participants assigned to the public sector in this period, plus the points that each of you earned. These results will be anonymous; you will only see the tokens allocated and the corresponding points earned.
- You can take a moment to absorb this information, then click "Next" to begin the next period.

C2: Instructions for Part 1, Neutrally Framed

This experiment involves a set of decisions by 12 participants, yourself included, in which others' decisions can affect your earnings, and your decisions can affect their earnings. Whenever you are shown approval on the decisions of others, their real identities will be kept anonymous, but please be assured that reported decisions are those of the same actual participants (group composition does not change) and never fictitious participants simulated by a computer program or members of the experimenter team.

No communication between participants will be permitted during the experiment. You are also not permitted to use your phone, tablet computer, or programs other than the designated experiment software. Members of the experiment team will check that this rule is adhered to. You will have an opportunity to ask questions before the experiment begins. We ask that you devote your full attention to the experiment while it is in progress.

In the experiment, we'll be using two different currencies. The first currency, called **tokens**, is something you are given each period to allocate as you wish in order to earn the second currency, called **points**. Throughout the experiment, you can try to accumulate points. At the end of the experiment, your points will be converted to money (pounds) at a rate of 260 points to £1. You will receive your payment in cash at the end of the experiment. As you'll see below, while the value of a point is small, your total earnings can still be substantial. Please listen carefully to the instructions and ask questions if something is unclear.

Decisions and earnings

The main decision to be made, and the main way in which you can earn points, involves the allocation of your tokens between your private account and a group account. Allocating tokens to your private account is always beneficial to you, but the size of the benefit is larger when the group account is well funded. The amount jointly allocated to the group account also determines a direct payment evenly distributed across each participant, regardless of what they allocated to the group account individually. Each participant has a private account of their own, whereas there is only one group account for the whole group. We will now provide further details about the allocation decision between the group and private account.

More about the main allocation problem

In each period, you and every other participant will be endowed with 20 tokens that you must decide how to allocate between two accounts, your private account, and the group account. As mentioned above, each participant has their own private account, while there is a single group account for all 12 participants in a group. In a period, you can assign any integer number of tokens (including zero) to the group account, assigning the rest of that period's 20 tokens to your private account. Examples include 0 to the group account and 20 to your private account; 7 to the group account and 13 to your private account; 14 to the group account and 6 to the private account, and so on. These are among the twenty-one possible ways you can allocate your twenty tokens. Each of you makes an allocation decision with your own 20 tokens separately and simultaneously, learning of the others' decisions afterwards.

The number of points you earn from tokens allocated to your private account depends on the number of tokens put into the group account in that period by you and the other 11 participants. Call the number of tokens you put into the private account p (for "private") and the number you allocate to the group account g (for "group"). Since you always start with 20 tokens, $p + g = 20$. We'll call the sum of g's allocated to the group account by all 12 participants G.

The points you get from each token you allocate to your private account—i.e., p —depends on G. Each token of p increases your earnings by 6 points when $G = 0$, and by a larger number of points, rising to a maximum of 18 points per token when $G = 96$ or more. See Table 1 and Figure 1.

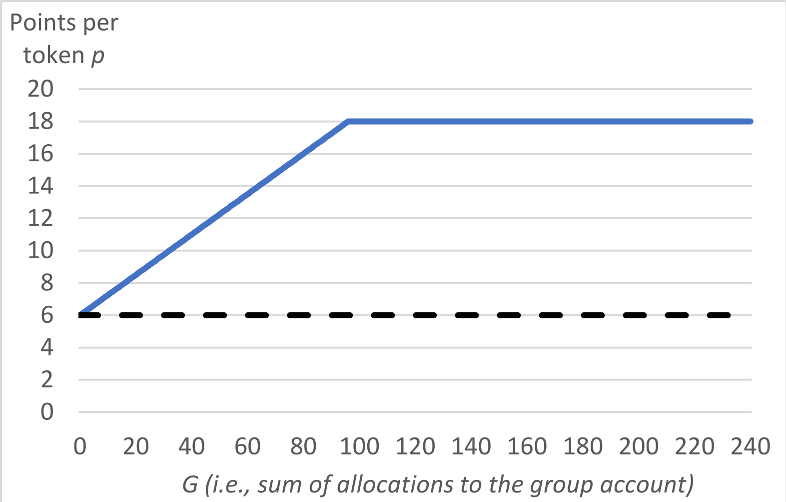
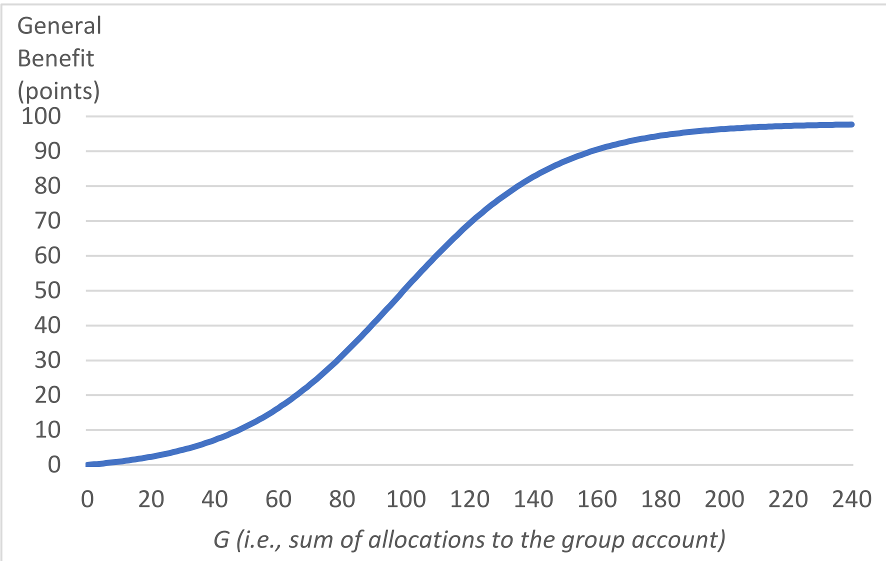


Figure 1. Points earned per token of *p* as a function of *G*

G	0	8	16	24	32	40	48	56	64	72	80	88	96	Above 96
income from *p*	6	7	8	9	10	11	12	13	14	15	16	17	18	18

<u>Table 1: income per token of *p* as a function of *G*</u>

In addition to *G*'s effect on your earnings by influencing the income from tokens assigned to your private account, *G* also affects your earnings in a direct way which is the same for all participants. Each participant in the experiment receives a number of points that rises as *G* does, and that goes equally to participants regardless of their individual choices of *p* and *g*. We will call this the "General Benefit". This general benefit of *G* rises as *G* increases, continuing to rise, although more slowly, even when $G > 96$, as shown in the figure below.



<u>Figure 2. shows the benefit from the group account (*G*) that is given to each participant, regardless of their *p* and *g* token allocation.</u>

The two ways in which allocations to the group account affect earnings—partly through increasing the returns to any token allocated to one's private account, and partly by yielding an equal amount for all participants—are summarized in Table 2. The columns correspond to different allocations of tokens to the group account by you, and the rows correspond to different average allocations of tokens to the group account by the other 11 participants. To make the presentation more compact, the table shows only one's own and others' average allocations that are divisible by four.

Average allocation of 11 others	*Own allocation to the group account (g)* 0	4	8	12	16	20
0	120	104	85	61	34	2
4	239	202	162	118	70	19
8	379	323	263	195	127	59
12	438	368	299	229	158	88
16	454	382	311	239	168	96
20	457	385	313	242	170	98

Table 2: Earnings as a function of your allocation to the group account (*g*) and the average allocation g of the other 11 participants to the group account

We've shaded the diagonal entries of the table, which represent situations in which you and the others in your group happen to allocate the same number of tokens (or for the others, the same number on average) to the group account. For example, the entry *202* (second row from top, second column from left) is the total amount that you would earn if you allocated 4 of your 20 tokens to the group account and 16 of your tokens to your private account, while the other 11 participants allocate an average of 4 tokens each to the group account. Notice that among these shaded diagonal cells, your earnings would be highest when you and the others on average allocate 8 tokens to the group account, giving you 263 points. That's more than double your earnings if all participants put 0 into the group account, and the fact that it occurs when all allocate 8 tokens to the group account is consistent with the fact that the return from allocating a token to your private account reaches its maximum value when $G = 96$ (= 12 x 8) (see Figure 1), and that the General Benefit of G (shown in Figure 2) increases at a slower rate after $G = 96$. Table 2 is available on your screen during the allocation stages of the experiment by double-clicking the 'Payment Table' button. You can also open (and close) an expanded table showing outcomes for all integer combinations of allocations by yourself and others by clicking the 'Full Table' button, which becomes available when the smaller table is open.

Two further things to note are the following. First, your earnings are not sensitive to *how* others' allocations add up to a given average; any combination of choices by others that generates a given average has the same impact on your earnings. Second, what you earn does change if your own allocation varies, taking the average allocation of the others as given. For example, suppose that the others allocate an average of 8 tokens to the group account. You earn more by allocating less than 8 yourself, as shown by the cells to the left of the one with the shaded value of 263. The largest number in the table, 457, is what you would earn if others assigned all their tokens to the group account, while you allocate all of yours to your private account.

In summary, there will be four periods in Part 1 of the experiment followed by a break for further instructions. Operationally, each of the 4 periods in Part 1 will unfold as follows:

- You'll initially see a screen where you'll be asked to decide how many (if any) of the 20 tokens you wish to allocate to the group account (the rest automatically go to your private account).
- When everyone has submitted their decisions, you'll see a screen showing your overall results for the period.
- When you click "Next", you'll see a screen showing the amount that you and each of the other 11 participants assigned to the group account in this period, plus the points that each of you earned. These results will be anonymous; you will only see the tokens allocated and the corresponding points earned.
- You can take a moment to absorb this information, then click "Next" to begin the next period.

C3: Instructions for Part 2, Naturally Framed

The remaining fifteen periods of the experiment have a core structure identical to those of the first four periods. In what we'll now call the "main stage" of each period, you and the other 11 participants each have 20 tokens to allocate between your private activity and the public sector. However, whereas the allocation decision was strictly voluntary in Part 1, there will now be **a government** that makes allocating a minimum number of tokens to the public sector a requirement, subject to a penalty if not fulfilled. The allocation to the public sector that is required to avoid a penalty will be 8 of your 20 tokens, which, as you will recall, was the allocation (among those in which all allocated equally) at which total earnings of participants were maximized in Part 1. For each token less than 8 that you allocate to the public sector, you will be penalized 35 points. The size of the penalty is large so you will definitely earn less if you allocate less than 8 tokens to the public sector (see Table 3 below, where the struck through amounts indicate points earned before the penalty has been applied).

Average *p* of 11 others	Own allocation to the public sector					
	0	4	8	12	16	20
0	~~120~~ -160	~~104~~ -36	85	61	34	2
4	~~239~~ -41	~~202~~ 62	162	118	70	19
8	~~379~~ 99	~~323~~ 183	263	195	127	59
12	~~438~~ 158	~~368~~ 228	299	229	158	88
16	~~454~~ 174	~~382~~ 242	311	239	168	96
20	~~457~~ 177	~~385~~ 245	313	242	170	98

Table 3: Earnings as a function of your allocation to the public sector (*p*) and the average allocation *p* of the other 11 participants to the public sector when there is a **minimum required allocation** of 8 tokens

In addition to having a minimum required allocation, a further change may also affect the total amount allocated to the public sector, *P*, in Part 2. Although having a government to enforce a penalty scheme can increase the amounts citizens allocate to the public sector, potentially increasing earnings, real-world governments sometimes have leaders and officials that don't act fully in the public's interest. Indeed, some government revenue can be lost to lax oversight, negligence, or corruption by government officials. To capture this point, the tokens in *P* may be reduced by a percentage, which we will call *R*%, that varies depending on your own and others' actions. Tokens that are removed from the public sector by this reduction process will not be used in the calculation of the general benefit received by everyone and won't help to increase your return from allocating tokens to your private activity. Given this, *P* can now be re-defined as the total amount of tokens allocated to the public sector minus any reductions due to corruption or waste by officials. We will explain how the percentage that *P* is reduced by is determined next.

In what follows, we assume that governments exhibit less corruption when citizens engage more in public affairs. Examples of **civic engagement** in the real world include paying attention to the news, voting in elections, participating in a campaign or rally, signing a petition, or other actions that may hold a government to account.

Each of the fifteen periods remaining will include an extra stage before the main stage—we'll call it the "pre-stage"—during which you'll have the opportunity to perform two types of tasks. The first type of task, called a **"Civic Task",** decreases the amount *P* is reduced by in the period's main stage. Put differently, the more civic tasks that are completed in a period's pre-stage, the smaller the percentage (*R*%) by which *P* gets reduced. The way in which *R*% decreases as you and others increase the number of civic tasks completed overall is shown in the graph below. *R*% starts at 50% when no civic tasks are completed; this means that the value of *P* is reduced by 50% before the general benefit and your private return are calculated in the main stage. Completing civic tasks reduces *R*%, for example, if an average of two civic tasks are completed by you and the other participants (a total of 24 civic tasks), then *R*% falls from 50% to 5.2%. This means that only 5.2% of tokens are removed from the total amount allocated to the public sector before your earnings are calculated. If 36 or more civic tasks are completed, no tokens are removed from the total put into the public sector —i.e., *R*% = 0.

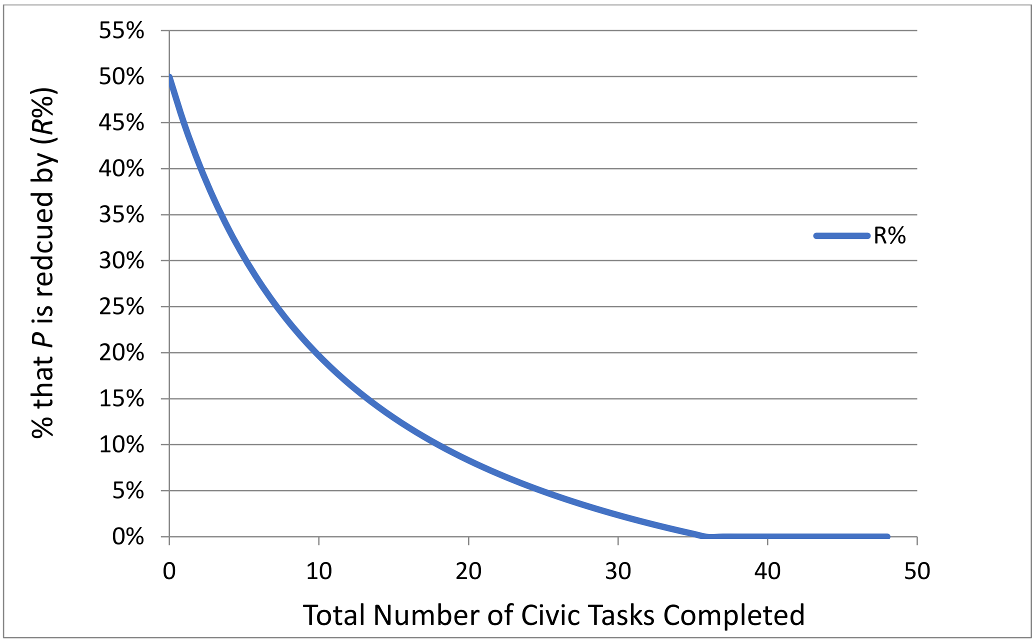


Figure 3. shows the percentage (*R*%) that *P* is reduced by, due to corruption or waste, for a given level of civic tasks completed in total.

To give you an idea how the percentage reduction (*R*%) affects your earnings, the payment table available on your screen has been updated with a slider. You can adjust the slider for hypothetical numbers of civic tasks completed by all 12 participants and see the corresponding *R*% and payment table (which is read in the same way as Table 2 in Part 1). The table also accounts for the penalty which is applied if fewer than 8 tokens are allocated to the public sector. As in Part 1, you can view an expanded table showing outcomes for all integer combinations of allocations by yourself and others by clicking the 'Full Table' button. Please take a moment to open the table and use the slider to see how *R*% affects the number of points you earn depending on the tokens you and the other 11 participants allocate to the public sector.

The second type of activity available during the pre-stage is **"Private Tasks"**. Completing a private task correctly adds 10 points directly to your earnings and has no effect on *R*%. Tasks of both types take about 10 - 15 seconds to complete, and a total of 40 seconds will be available each period for the task portion of the pre-stage. Any points you earn in the pre-stage are added to your overall accumulation and they convert to real money at the same rate as other points at the end of the experiment. The potential to earn points in a period's pre-stage does not affect what allocations you can make in its main stage. You will have 20 tokens available to allocate to the public sector and your private activity in the period's main stage, regardless of how many tasks you complete.

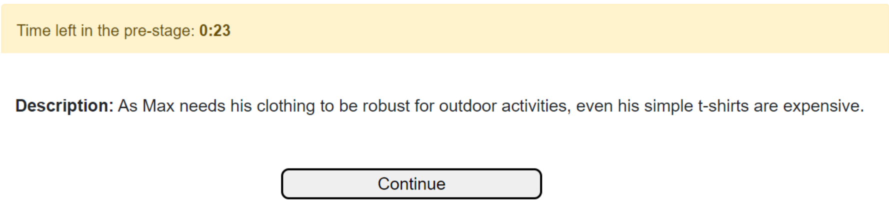
Information sharing and approval. {Treatments with Approval Only}

In the real world, you might wish to share with others the fact that you registered to vote, went to the polls, read up on candidates' positions, or took part in some other civic activity. Sharing with others information about your completion of civic tasks is also possible in the experiment. At the end of each period's pre-stage, information about the number of civic tasks that you and 3 other randomly chosen participants have completed will be displayed, along with their identification letter (A, B, C, or D). The composition of this set of four participants remains fixed for the remainder of Part 2, and will be referred to as your **'social circle'**. The pre-stage of each period will end with an opportunity to provide approval to the others in your social circle, and for them to do the same to you anonymously. Specifically, you can give a smiley face (☺) to any or none of them. On the final pre-stage screen, you'll be shown the approval other social circle members submitted about you (in total), as well as the approval that the other social circle members received. {/}

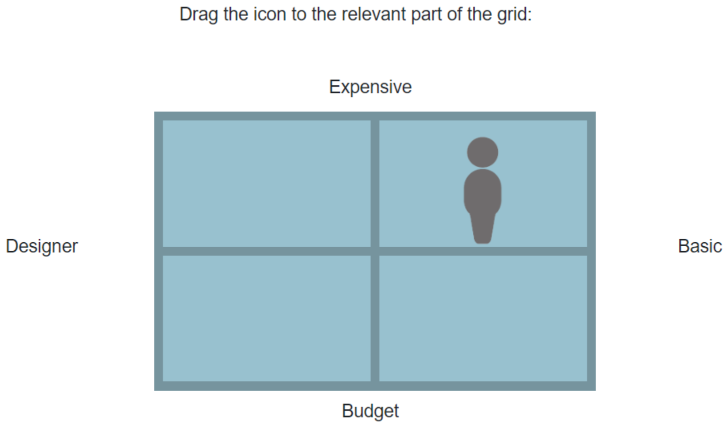
<u>More about pre-stage tasks</u>.

When a Part 2 period begins, always with its pre-stage, you'll see a screen on which you select whether the first task you want to do will be a civic or private task. Once you click on your choice, you'll begin that task. The tasks are identical in nature, only how they impact the main stage differs (as described above). Each task begins with a description of a person differing in two dimensions or characteristics (see screen image 1.a below), for example, what type of food they like and whether they prefer to cook or eat in a restaurant. After reading the description and clicking continue, you'll see a two-dimensional grid (screen image 1.b). There, you'll click and drag a person-shaped icon to whichever of the four quadrants corresponds to the description, drop it in place, and submit that answer by clicking the "Submit" button. Note that you cannot go back from the grid screen to view the description, although you are free to take notes to help you remember it. Once you have submitted an answer, you will be told whether it was correct or not, and then click 'Return' to select the next task type.

Screen image 1.a



Screen image 1.b



On the screen showing the description of the individual, the experiment software requires you to spend a minimum of 3 seconds before you can continue to the screen showing the four-quadrant grid, the screen with the grid further requires you to spend a minimum of 2 seconds before submitting your answer. This time requirement is to encourage you to pay attention to the tasks, rather than engage in random clicking.

<u>Summary:</u> As mentioned, the task part of the pre-stage will last for a total of 40 seconds. In that time, you may complete civic tasks, which reduce *R*% (representing loss from corruption or waste), or private tasks, which add to your personal earnings without reducing *R*%. When that time runs out, you'll be informed of the total number of civic tasks completed (from all 12 participants, combined)

and of the resulting percentage reduction (*R*%) that will exist in the main stage as a result of this, as well as any earnings from private tasks.

{Treatments with Approval Only} On the next screen, you will be shown the number of civic tasks completed by each of the other 3 members in your 4-person social circle, as well as their identification letters. You can then assign approval (or not) to each of the other members in your social circle by clicking the checkbox in their row. On the screen after, you will see your own approval from the other social circle members, as well as the approval each other member received. You will not see who you or the other members received approval from in your social circle. {/}

When you click continue, you'll go to the main stage (where you can allocate 20 tokens between the public sector or your private activity). The main stage will work as in Part 1 except that there is a penalty if you put less than 8 tokens into the public sector and the total amount allocated to the public sector may be reduced by R%, which varies depending on the number of civic tasks completed by all 12 participants in the pre-stage. The more civic tasks completed in the pre-stage, the less the amount in the public sector will be reduced.

C4: Instructions for Part 2, Neutrally Framed

The remaining fifteen periods of the experiment have a core structure identical to those of the first four periods. In what we'll now call the "main stage" of each period, you and the other 11 participants each have 20 tokens to allocate between your private account and the group account. However, whereas the allocation decision was strictly voluntary in Part 1, there will now be **a minimum required allocation** to the group account, subject to a penalty if not fulfilled. The allocation to the group account that is required to avoid a penalty will be 8 of your 20 tokens, which, as you will recall, was the allocation (among those in which all allocated equally) at which total earnings of participants were maximized in Part 1. For each token less than 8 that you allocate to the group account, you will be penalized 35 points. The size of the penalty is large so you will definitely earn less if you allocate less than 8 tokens to the group account (see Table 3 below, where the struck through amounts indicate points earned before the penalty has been applied).

Average *g* of 11 others	Own allocation to the group account					
	0	4	8	12	16	20
0	~~120~~ -160	~~104~~ -36	85	61	34	2
4	~~239~~ -41	~~202~~ 62	162	118	70	19
8	~~379~~ 99	~~323~~ 183	263	195	127	59
12	~~438~~ 158	~~368~~ 228	299	229	158	88
16	~~454~~ 174	~~382~~ 242	311	239	168	96
20	~~457~~ 177	~~385~~ 245	313	242	170	98

Table 3: Earnings as a function of your allocation to the group account (*g*) and the average allocation *g* of the other 11 participants to the group account when there is a **minimum required allocation** of 8 tokens

In addition to having a minimum required allocation, a further change may also affect the total amount allocated to the group account, *G*, in Part 2. Specifically, the tokens in *G* may be reduced by a percentage, which we will call *R*%, that varies depending on your own and others' actions. Tokens that are removed from the group account by this reduction process will not be used in the calculation of the general benefit received by everyone and won't help to increase your return from allocating tokens to your private account. Given this, *G* can now be re-defined as the total amount of tokens allocated to the group account minus any reductions. We will explain how the percentage that *G* is reduced by is determined next.

Each of the fifteen periods remaining will include an extra stage before the main stage—we'll call it the "pre-stage"—during which you'll have the opportunity to perform two types of tasks. The first type of task, called a **"Type A Task"**, decreases the amount *G* is reduced by in the period's main stage. Put differently, the more Type A tasks that are completed in a period's pre-stage, the smaller the percentage (*R*%) by which *G* gets reduced. The way in which *R*% decreases as you and others increase the number of Type A tasks completed overall is shown in the graph below. *R*% starts at 50% when no Type A tasks are completed; this means that the value of *G* is reduced by 50% before the general benefit and your private return are calculated in the main stage. Completing Type A tasks reduces *R*%, for example, if an average of two Type A tasks are completed by you and the other participants (a total of 24 Type A tasks), then *R*% falls from 50% to 5.5%. This means that only 5.5% of tokens are removed from the total amount allocated to the group account before your earnings are calculated. If 36 or more Type A tasks are completed, no tokens are removed from the total put into the group account—i.e., *R*% = 0.

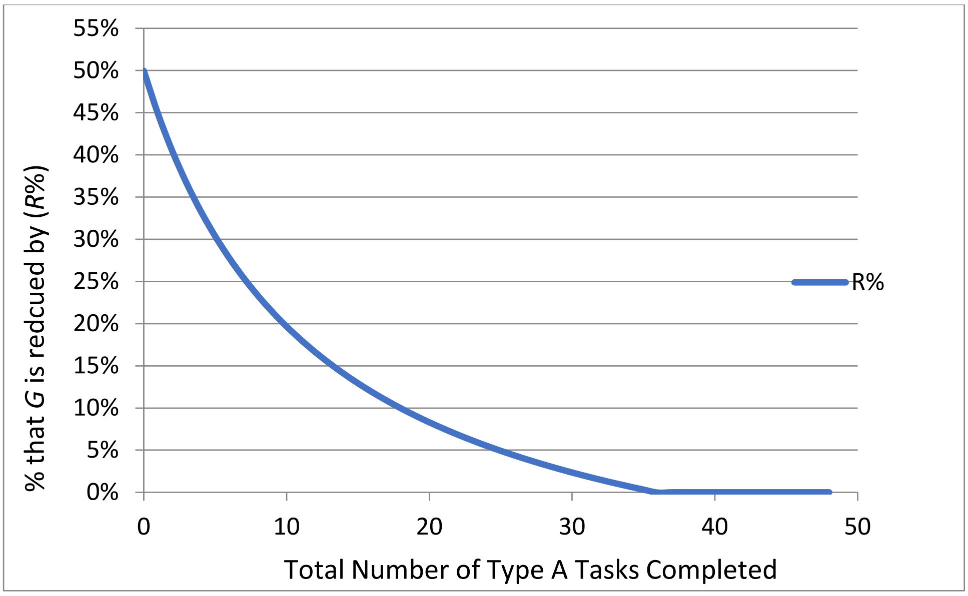


Figure 3 shows the percentage (*R*%) that *G* is reduced by for a given level of Type A tasks completed in total.

To give you an idea of how the percentage reduction (*R*%) affects your earnings, the payment table available on your screen has been updated with a slider. You can adjust the slider for hypothetical numbers of Type A tasks completed by all 12 participants and see the corresponding *R*% and payment table (which is read in the same way as Table 3). The table also accounts for the penalty which is applied if fewer than 8 tokens are allocated to the group account. As in Part 1, you can view an expanded table showing outcomes for all integer combinations of allocations by yourself and others by clicking the 'Full Table' button. Please take a moment to open the table and use the slider to see how *R*% affects the number of points you earn depending on the tokens you and the other 11 participants allocate to the group account.

The second type of activity available during the pre-stage is **"Type B Tasks"**. Completing a Type B task correctly adds 10 points directly to your earnings and has no effect on *R*%. Tasks of both types take about 10 - 15 seconds to complete, and a total of 40 seconds will be available each period for the task portion of the pre-stage. Any points you earn in the pre-stage are added to your overall accumulation and they convert to real money at the same rate as other points at the end of the experiment. The potential to earn points in a period's pre-stage does not affect what allocations you can make in its main stage. You will have 20 tokens available to allocate to the group account and your private account in the period's main stage, regardless of how many tasks you complete.

<u>Information sharing and approval</u>. {Treatments with Approval Only}

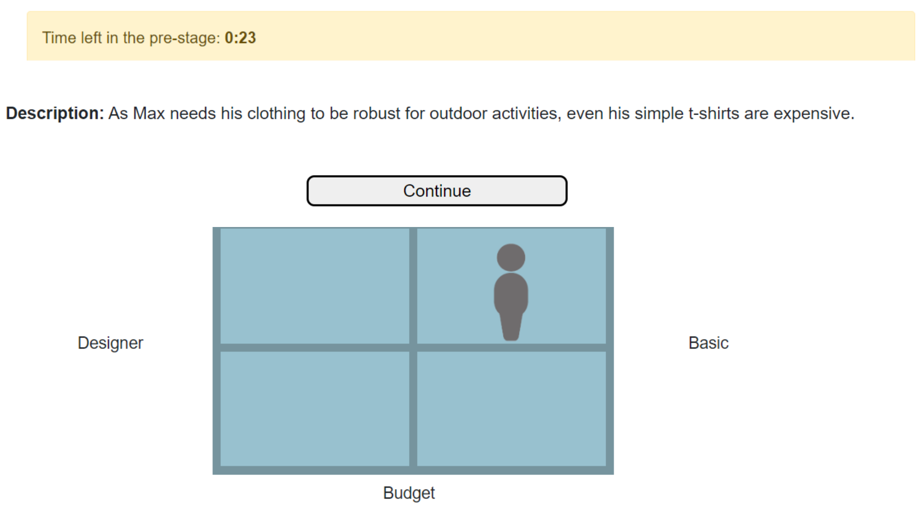
At the end of each period's pre-stage, information about the number of Type A tasks that you and 3 other randomly chosen participants have completed will be displayed, along with their identification letter (A, B, C, or D). The composition of this set of four participants remains fixed for the remainder of Part 2, and will be referred to as your **'subgroup'**. The pre-stage of each period will end with an opportunity to provide approval to the others in your subgroup, and for them to do the same to you anonymously. Specifically, you can give a smiley face (☺) to any or none of them. On the final pre-stage screen, you'll be shown the approval other subgroup members submitted about you (in total), as well as the approval that the other subgroup members received. {/}

<u>More about pre-stage tasks</u>.

When a Part 2 period begins, always with its pre-stage, you'll see a screen on which you select whether the first task you want to do will be a Type A or Type B task. Once you click on your choice, you'll begin that task. The tasks are identical in nature, only how they impact the main stage differs (as described above). Each task begins with a description of a person differing in two dimensions or characteristics (see screen image 1.a below), for example, what type of food they like and whether they prefer to cook or eat in a restaurant. After reading the description and clicking continue, you'll see a two-dimensional grid (screen image 1.b). There, you'll click and drag a person-shaped icon to whichever of the four quadrants corresponds to the description, drop it in place, and submit that answer by clicking the "Submit" button. Note that you cannot go back from the grid screen to view the description, although you are free to take notes to help you remember it. Once you have submitted an answer, you will be told whether it was correct or not, and then click 'Return' to select the next task type.

On the screen showing the description of the individual, the experiment software requires you to spend a minimum of 3 seconds before you can continue to the screen showing the four-quadrant grid, the screen with the grid further requires you to spend a minimum of 2 seconds before submitting your answer. This time requirement is to encourage you to pay attention to the tasks, rather than engage in random clicking.

Screen image 1.a



Summary

As mentioned, the task part of the pre-stage will last for a total of 40 seconds. In that time, you may complete Type A tasks, which reduce *R*%, or Type B tasks, which add to your personal earnings without reducing *R*%. When that time runs out, you'll be informed of the total number of Type A tasks completed (from all 12 participants, combined) and of the resulting percentage reduction (*R*%) that will exist in the main stage as a result of this, as well as any earnings from Type B tasks.

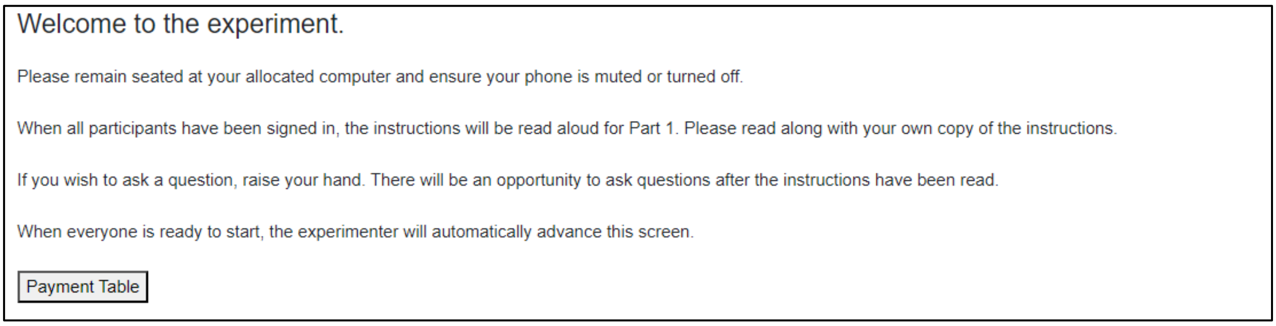
{Treatments with Approval Only} On the next screen, you will be shown the number of Type A tasks completed by each of the other 3 members in your 4-person subgroup, as well as their identification letters. You can then assign approval (or not) to each of the other members in your subgroup by clicking the checkbox in their row. On the screen after, you will see your own approval from the other subgroup members, as well as the approval each other member received. You will not see who you or the other members received approval from in your subgroup. {/}

When you click continue, you'll go to the main stage (where you can allocate 20 tokens between the group or private account). The main stage will work as in Part 1 except that there is a penalty if you put less than 8 tokens into the group account and the total amount allocated to the group account may be reduced by *R*%, which varies depending on the number of Type A tasks completed by all 12 participants in the pre-stage. The more Type A tasks completed in the pre-stage, the less the amount in the group account will be reduced.

Appendix D: On-screen information available during the Instructions and FPS choices

When the instructions were read aloud to participants, a button was available on-screen to view the payment schedule based on one's own allocationns and the allocations of the 11 other participants (the same as Table 2 in the instructions). The instruction screen is shown below (Image D.1). This Payment schedule could be expanded by clicking a 'Full Table' button to see a full 20x20 schedule (Image D.2). The same expandable schedule was available throughout the instructions, comprehension questions, and allocations pages in Part 1.

Image D.1: Payment Schedule (unexpanded version) in the Instruction screen



Average Allocation of 11 Others		Your Own Allocation					
		0	4	8	12	16	20
	0	120	104	85	61	34	2
	4	239	202	162	118	70	19
	8	379	323	263	195	127	59
	12	438	368	299	229	158	88
	16	454	382	311	239	168	96
	20	457	385	313	242	170	98

Full Table

Image D.2: Expanded version of the payment schedule

Average Allocation of 11 Others		Your Own Allocation																				
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	0	120	116	112	108	104	99	95	90	85	79	73	67	61	54	47	41	34	26	18	10	2
	1	149	143	138	133	128	122	116	109	102	96	89	82	74	66	58	49	42	32	23	14	5
	2	178	172	165	158	151	145	137	129	121	114	105	96	87	79	69	59	50	40	29	19	8
	3	207	200	193	184	176	168	159	150	142	132	122	113	102	91	81	70	59	48	37	24	13
	4	239	230	221	212	202	193	183	173	162	152	141	130	118	107	95	83	70	58	46	32	19
	5	272	261	251	240	230	218	208	197	184	173	161	148	136	124	110	97	84	70	55	41	27
	6	305	294	283	271	259	247	235	222	209	196	183	170	156	141	127	113	98	83	68	53	37
	7	341	329	316	303	290	277	263	249	236	221	207	192	177	162	146	131	114	98	82	65	48
	8	379	365	351	337	323	308	293	278	263	246	229	212	195	178	161	144	127	110	93	76	59
	9	410	393	376	359	342	325	308	291	274	257	239	222	205	188	171	154	137	120	103	86	68
	10	420	403	386	369	352	335	318	301	284	266	249	232	215	198	180	163	146	129	111	94	77
	11	430	413	396	378	361	344	327	309	292	275	257	240	223	205	188	170	153	136	118	101	83
	12	438	421	403	386	368	351	334	316	299	281	264	246	229	211	194	176	158	141	123	106	88
	13	444	427	409	392	374	356	339	321	304	286	268	251	233	215	198	180	162	144	127	109	91
	14	449	431	413	396	378	360	342	325	307	289	272	254	236	218	200	183	165	147	129	111	94
	15	452	434	416	398	381	363	345	327	309	292	274	256	238	220	202	184	167	149	131	113	95
	16	454	436	418	400	382	365	347	329	311	293	275	257	239	222	204	186	168	150	132	114	96
	17	455	437	420	402	384	366	348	330	312	294	276	258	240	222	204	187	169	151	133	115	97
	18	456	438	420	402	385	367	349	331	313	295	277	259	241	223	205	187	169	151	133	115	97
	19	457	439	421	403	385	367	349	331	313	295	277	259	241	223	205	187	169	151	133	115	97
	20	457	439	421	403	385	367	349	331	313	295	278	260	242	224	206	188	170	152	134	116	98

Full Table

In Part 2, the schedule in the instruction screen, comprehension questions, and allocation screens were updated to include an interactive slider that allowed a participant to see the schedule for different levels of corruption (R%). Images D.3 and D.4 show the expanded versions of the updated payment schedule when 0 and 48 civic tasks are completed by the group in total.

Image D.3: Expanded version of the payment schedule in Part 2 (*R*% = 50%)

Average Allocation of 11 Others \ Your Own Allocation	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0	-160	-130	-100	-70	-40	-10	19	49	78	72	66	60	55	49	42	36	29	22	15	8	1
1	-146	-116	-86	-57	-28	1	30	59	87	81	74	67	61	53	46	39	32	24	18	10	2
2	-131	-103	-74	-45	-17	11	39	69	96	89	82	75	67	59	52	44	36	27	19	11	3
3	-117	-89	-61	-33	-5	23	50	77	105	98	90	82	73	65	57	48	39	30	21	12	4
4	-102	-75	-47	-20	7	34	61	87	114	106	98	89	80	71	62	52	43	33	25	15	5
5	-87	-61	-34	-7	19	45	71	98	124	115	106	96	87	77	68	58	48	38	27	17	6
6	-73	-46	-21	6	32	58	83	108	134	124	115	104	94	84	73	62	52	42	30	19	8
7	-57	-31	-6	19	44	70	95	119	144	133	122	113	101	90	79	68	57	46	34	22	10
8	-41	-16	8	33	57	82	106	130	154	143	132	121	109	97	86	74	62	50	38	26	13
9	-25	-1	23	47	71	95	118	142	165	153	141	130	118	105	92	81	68	55	42	29	16
10	-8	15	38	61	85	108	131	153	176	164	151	139	126	113	100	87	74	61	47	33	20
11	8	31	53	77	99	121	144	166	188	175	162	148	135	122	108	94	80	66	52	38	24
12	25	48	70	91	114	135	157	179	200	187	173	158	145	130	116	102	87	73	58	42	28
13	43	65	86	107	129	150	171	192	212	198	184	170	155	140	125	109	95	79	64	48	33
14	61	82	104	124	144	165	185	206	226	211	195	181	165	150	134	118	102	86	71	54	38
15	80	100	121	140	160	180	200	220	239	224	207	192	175	160	143	127	110	94	77	61	43
16	99	118	138	157	177	196	215	234	253	236	220	203	187	170	153	136	119	101	84	66	49
17	118	137	156	175	193	212	229	247	264	247	229	212	194	177	159	142	124	107	89	72	54
18	130	147	165	182	200	217	235	252	270	252	235	217	200	182	165	147	130	112	95	77	59
19	135	153	170	188	205	223	240	258	275	257	240	222	205	187	170	152	135	117	100	82	65
20	140	158	175	193	210	228	245	263	280	263	245	227	210	192	175	157	140	122	104	87	69

Full Table

Total Type A Tasks Completed by all 12 Participants (between 0 and 48): 0

Percentage reduction (R%) applied to the total allocations to the Group Account based on this number of Type A tasks: 5

Image D.4: Expanded version of the payment schedule in Part 2 ($R\%$ = 0%)

Average Allocation of 11 Others	Your Own Allocation																				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0	-160	-129	-98	-67	-36	-6	25	55	85	79	73	67	61	54	47	41	34	26	18	10	2
1	-131	-102	-72	-42	-12	17	46	74	102	96	89	82	74	66	58	49	42	32	23	14	5
2	-102	-73	-45	-17	11	40	67	94	121	114	105	96	87	79	69	59	50	40	29	19	8
3	-73	-45	-17	9	36	63	89	115	142	132	122	113	102	91	81	70	59	48	37	24	13
4	-41	-15	11	37	62	88	113	138	162	152	141	130	118	107	95	83	70	58	46	32	19
5	-8	16	41	65	90	113	138	162	184	173	161	148	136	124	110	97	84	70	55	41	27
6	25	49	73	96	119	142	165	187	209	196	183	170	156	141	127	113	98	83	68	53	37
7	61	84	106	128	150	172	193	214	236	221	207	192	177	162	146	131	114	98	82	65	48
8	99	120	141	162	183	203	223	243	263	246	229	212	195	178	161	144	127	110	93	76	59
9	130	148	166	184	202	220	238	256	274	257	239	222	205	188	171	154	137	120	103	86	68
10	140	158	176	194	212	230	248	266	284	266	249	232	215	198	180	163	146	129	111	94	77
11	150	168	186	203	221	239	257	274	292	275	257	240	223	205	188	170	153	136	118	101	83
12	158	176	193	211	228	246	264	281	299	281	264	246	229	211	194	176	158	141	123	106	88
13	164	182	199	217	234	251	269	286	304	286	268	251	233	215	198	180	162	144	127	109	91
14	169	186	203	221	238	255	272	290	307	289	272	254	236	218	200	183	165	147	129	111	94
15	172	189	206	223	241	258	275	292	309	292	274	256	238	220	202	184	167	149	131	113	95
16	174	191	208	225	242	260	277	294	311	293	275	257	239	222	204	186	168	150	132	114	96
17	175	192	210	227	244	261	278	295	312	294	276	258	240	222	204	187	169	151	133	115	97
18	176	193	210	227	245	262	279	296	313	295	277	259	241	223	205	187	169	151	133	115	97
19	177	194	211	228	245	262	279	296	313	295	277	259	241	223	205	187	169	151	133	115	97
20	177	194	211	228	245	262	279	296	313	295	278	260	242	224	206	188	170	152	134	116	98

Full Table

Total Type A Tasks Completed by all 12 Participants (between 0 and 48): 48

Percentage reduction (R%) applied to the total allocations to the Group Account based on this number of Type A tasks:**0%**

Appendix E: Survey questions

1. What gender do you identify as?

   [1, Male],
   [2, Female],
   [3, Other],
   [4, Prefer not to say]

2. What is your nationality? If you do not wish to answer, please type N/A. [Free text entry]

3. What is your degree subject (e.g., biology, political science)? If you do not wish to answer, please type N/A. [Free text entry]

4. What is your degree level? [Free text entry]

5. If you are an undergraduate student, what is the current year of your degree programme?

   [1, Year 1 (undergraduate)],
   [2, Year 2 (undergraduate)],
   [3, Year 3 (undergraduate)],
   [4, Year 4 (undergraduate)],
   [5, N/A or Prefer not to say]

6. How many Economics modules have you completed (not including the current academic year)? Please enter a number or, if you do not wish to answer, please type N/A. [Free text entry]

7. How many political science modules have you completed (not including the current academic year)? Please enter a number or, if you do not wish to answer, please type N/A. [Free text entry]

8. Have you completed A-Level Mathematics or equivalent, such as IB Higher Level Mathematics, AP Calculus BC?

   [1, Yes],
   [2, No],
   [3, Not sure/Prefer not to say]

9. If you answered "Yes" to having completed an A-Level in Mathematics or equivalent, please select your final grade. If you do not remember, answered "No", or would prefer not to say, please select 'N/A or Prefer not to say'.

   [1, A* or equivalent],
   [2, A or equivalent],
   [3, B or equivalent],
   [4, C or equivalent],
   [5, D or equivalent],
   [6, E or equivalent],
   [7, U (Did not pass the qualification)],
   [8, N/A or Prefer not to say]

10. What was your final grade in GCSE English Language? If you do not remember, did not sit GCSE exams, or would prefer not to say, please select 'N/A or Prefer not to say'.

    [1, A*/9 or 8],
    [2, A/7],
    [3, B/6 or 5],
    [4, C/4],
    [5, D or E/3],
    [6, F/2],
    [7, G/1],
    [8, U (Did not pass the qualification)],
    [9, N/A or Prefer not to say]

11. What was your final grade in GCSE Mathematics? If you do not remember, did not sit GCSE exams, or would prefer not to say, please select 'N/A or Prefer not to say'.

    [1, A*/9 or 8],
    [2, A/7],
    [3, B/6 or 5],
    [4, C/4],
    [5, D or E/3],
    [6, F/2],
    [7, G/1],
    [8, U (Did not pass the qualification)],
    [9, N/A or Prefer not to say]

12. Are you currently employed (outside of your studies)?

    [1, Yes],
    [2, No],
    [3, Not sure/Prefer not to say]

13. How interested would you say you are in politics? Please answer on a 4-point scale."

    (1 = very interested, 4 = not very interested)

14. How often do you watch or listen to broadcasts or read media (including online) about world, national, or local news, including coverage of the positions of political candidates?

    [1, Multiple times per day],
    [2, About once a day],
    [3, Less than once a day but more than once per week],
    [4, Weekly],
    [5, Less than weekly],
    [6, Never or almost never],
    [7, Prefer not to say]

15. Some people believe that a substantial government role is required to achieve a healthy economy for a country's people, while others feel that the smaller the government role, the greater is overall prosperity. Please place your view along or at the appropriate end of the spectrum between these. Leave the item blank if you have no view or prefer not to answer.

    [A lesser government role is beneficial, A substantial government role is beneficial]

16. In politics, people talk of a spectrum of views from 'left' to 'right'. Please characterize where your own views fall by selecting a point among those below, where further towards the Left or Right end indicates the strongest leaning in one or the other direction, and nearer the center means less or no strong leaning. Leave this item blank if you prefer not to answer.
    [Left, Right]

17. Please indicate how likely you are to vote in the next UK General Election?

    [1, Very Likely],
    [2, Likely],
    [3, Unsure],
    [4, Unlikely],
    [5, Very Unlikely],
    [6, I am not/will not be eligible to vote],
    [7, Prefer not to say]

18. For each of the following actions or activities, please indicate whether you think that it can always be justified, never be justified, or something in between. You may use any response from 1 to 10 to reflect the strength of your feeling, or leave all responses blank if you would prefer not to answer.

    [Never justifiable, always justifiable]

    a: claiming government benefits to which you are not entitled.
    b: Avoiding paying a fare on public transport.
    c: Cheating on taxes.

19. Some forms of political action that people can take are listed below. For each activity, please indicate whether you have done this activity, whether you might do it in the future, or would never do it under any circumstances.

    [Have done, Might do, Would never do, Prefer not to say]

    a. Contributing time or money to a political cause or candidate
    b. Signing a petition
    c. Attending a rally for a political candidate
    d. Joining a boycott
    e. Joining a peaceful demonstration
    f. Joining a strike

20. Do you think that most people would try to take advantage of you if they got a chance, or would they try to be fair? Please show your response on this scale, where 1 means that "people would try to take advantage of you" and 10 means that "people would try to be fair"

    [Take advantage, Try to be fair]

21. Do you consider yourself to be religious?

    [Yes, No, Prefer not to say]

22. If you answered "Yes" to being religious, please indicate your religion. If you answered "No" to being religious, or would prefer not to say, please select 'N/A or Prefer not to say'

    [1, Christianity],
    [2, Islam],
    [3, Hinduism],
    [4, Sikhism],
    [5, Judaism],
    [6, Buddhism],
    [7, Other],
    [8, N/A or Prefer not to say]