UNDERSTANDING SOCIAL IMPACT BONDS IN A FIRST-BEST WORLD:
AN EXPERIMENTAL INVESTIGATION

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B. Commerce/ B. Economics
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DECLARATION

I hereby declare that this submission is my own original work and that the contributions of other authors have been appropriately acknowledged. I also declare that this thesis has not been submitted to any other university or institution as part of the requirements for a degree or other award.

Jade Wong

4 June 2012
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:-D :-D :-D
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ABSTRACT

Policy-makers have proposed a new contract – the “social impact bond” (SIB) – which they claim can allay the underperformance problem afflicting the not-for-profit sector (Tierney & Fleishman, 2011), by tying the private returns of (social) investors to the success of social programs (Von Glahn & Whistler, 2011). In this thesis, we experimentally test whether SIBs work in a first-best world – where investors are rational and able to obtain hard monitoring information about not-for-profits’ performance. To this end, we use a principal-agent multi-tasking experiment to compare SIBs to inputs-based (IBs) and performance-based (PBs) contracts, which represent current government not-for-profit contracts. IBs contain a piece-rate mechanism, PBs contain a non-binding bonus mechanism, and SIBs contain a full enforceability mechanism due to the presence of an investor. Though SIBs can perfectly enforce good behaviour, they also require the principal (i.e. government) to relinquish control over the agent’s (i.e. not-for-profit’s) payoff to a self-maximising investor. In spite of this drawback, SIBs outperformed IBs and PBs. We therefore conclude that, at least in our experimental test-bed, SIBs can allay the underperformance problem in a first-best world.
CHAPTER 1: INTRODUCTION

The not-for-profit sector is plagued with problems of underperformance (Tierney & Fleishman, 2011). Stories about not-for-profits that mismanage funds, overspend on administration costs, and even engage in fraud abound (e.g. see BDO, 2012). The Three Cups of Tea story offers a damning illustration of a not-for-profit behaving badly. Greg Mortenson, ex-CEO of the Central Asian Institute, claimed he used donations to build more than 170 schools in Afghanistan and Pakistan. In reality, he seems to have used the Institute as his own “private ATM”, spending only 41 percent of donations on schools (Kristof, 2011; Rusche and Burke, 2011). Even after the scandal was exposed on 60 minutes, charity watchdog Charity Navigator maintained the Institute’s four-star rating (Bernholtz, 2011). This is one of many stories that question the moral high ground not-for-profits claim to have, and illustrates the severe problems that arise when regulatory oversight and evaluation systems do not achieve their desired aims (Krishnan, Yetman, & Yetman, 2011a; 2011b). Against this backdrop, policy-makers created “social impact bonds”, which promises to allay the widely documented underperformance problem plaguing the not-for-profit sector (Tierney & Fleishman, 2011).

A social impact bond (SIB) is a contract that ties private returns to the success of social programs (Von Glahn & Whistler, 2011). It contains three components (Mulgan et al, 2010). First, (social) investors enter a contractual relationship with the government, where they agree to fully fund a not-for-profit to deliver a program that aims to improve the prospects of a target group. Second, the not-for-profit uses investors’ funds to implement the program, which is eventually evaluated. Lastly, the government repays the investors the cost of funding the program plus interest, where repayments are tied to levels of improvement in the target group.

It is routinely claimed that not-for-profits will perform well under SIBs, lest they incur reputational damage and/or are denied funding in the future (Centre for Social Impact, 2011; henceforth CSI; Liebman, 2011). However for this threat to be credible, investors must properly
monitor and evaluate the not-for-profit’s performance. Indeed policy-makers argue that investors will properly monitor not-for-profits, since their financial returns are tied to the performance of the program (CSI, 2011; Liebman, 2011). Furthermore, since investors have explicit monetary incentives to monitor the not-for-profit, they will monitor better than governments who do not have such incentives, and who often do not own adequate monitoring technology (Productivity Commission, henceforth PC, 2010; Liebman, 2011).

In a first-best world, investors are rational and able to obtain “hard” monitoring information about the not-for-profit’s performance. Hard monitoring renders the information credible in a court of law, as it truthfully reveals the not-for-profit’s performance (Tirole, 1986). If these assumptions hold, SIBs offer “perfect enforceability” – it allows investors to perfectly write a contract on the not-for-profit’s performance. However the advantage of perfect enforceability is countered by the government’s loss of control. Specifically, by delegating the contracting task to the investor, the government is no longer able to influence the not-for-profit’s payoff.

With this trade-off in mind, we test the efficacy of SIBs in a laboratory setting. We conduct a multi-task principal-agent experiment to reflect the type of goods not-for-profits typically provide (Holmstrom & Milgrom, 1991). In the experiment, the government (neutral) offers the not-for-profit (masculine) a contract, which he accepts or rejects. If he accepts the contract, he engages in a chosen-effort task. He chooses effort on task 1 (a quantitative task) and task 2 (a qualitative task), which is costly for the not-for-profit but increases the government’s payoff. We assume the government can perfectly observe the not-for-profit’s effort on both tasks, but can only verify effort on task 1 in a court of law. This set-up thus reflects the government’s inability to properly monitor in real life (e.g. see PC, 2010).

To explore the pitfalls of current not-for-profit contracts, in Treatment IP (i.e. inputs-based versus performance-based contracts), governments offer either inputs-based (henceforth, IBs) or performance-based contracts (henceforth, PBs) to not-for-profits. IBs contain a wage and a
piece-rate which is paid for every unit of effort the not-for-profit exerts on task 1. PBs contain a wage and the promise of a bonus. The bonus is paid once the government observes the not-for-profit’s chosen effort levels, but is not enforceable due to the unverifiable nature of task 2. If governments and not-for-profits are material maximisers and interactions are one-shot, PBs are theoretically predicted to fail. Governments are theoretically predicted to never pay the promised bonus, and so not-for-profits will exert minimum effort on tasks 1 and 2. In contrast, in IBs, governments can induce not-for-profits to exert effort on task 1 through the piece-rate component.

In our experiment, both contracts performed poorly. In PBs, governments often reneged on the promised bonus while not-for-profits often exerted less effort than what governments desired. In IBs, not-for-profits focussed their effort on the quantitative and contractible task 1 to the detriment of the qualitative and non-contractible task 2. However in contrast to theoretical predictions, PBs outperformed IBs. The clear majority of offered contracts were PBs. Moreover, many governments paid large bonuses, which induced not-for-profits to exert more than minimum effort on tasks 1 and 2. Effort levels were consequently higher and more efficient in PBs than in IBs, which suggests the non-binding promise of a bonus was a better incentive tool than the partial enforceability of the piece-rate. We argue that the mechanism that caused the success of PBs was “reciprocity”. Specifically, not-for-profits attempted to elicit large bonuses from governments by exerting high effort, and a fair portion of governments reciprocated high effort with large bonuses.

Treatment PS (i.e. performance-based contracts versus social impact bonds) was thus conducted to explore behaviour in PBs and SIBs. In SIBs, the government specifies its desired effort on tasks 1 and 2 and makes a bond offer to the investor (feminine). If the investor accepts, she subcontracts the tasks to the not-for-profit and makes a wage offer. As in our conceptualisation of a first-best world, the investor is able to obtain hard monitoring information about the not-for-profit’s performance. She can therefore perfectly verify and write a contract on the not-for-
profit’s effort on tasks 1 and 2. As such, in SIBs the investor pays the not-for-profit’s wage only if he complies with the government’s desired effort levels. If not, he does not receive a wage. The perfect enforceability offered by SIBs thus implies SIBs should outperform PBs.

However the perfect enforceability of SIBs comes at a cost – the government has to relinquish control over the not-for-profit’s payoff to the investor. In the literature and in real life (e.g. see Mookherjee, 2006; Plott, 1986), the investor (i.e. “middleman”) is portrayed as the paragon selfish actor who is without social preferences. She is driven solely by profit-maximization, and so extracts the entirety of the agent’s surplus each time they transact.¹ To preserve the assumption that the investor is purely self-interested, we use a computerized investor whose objective is to maximize profits. There is consequently no opportunity for the investor to reciprocate high effort with high wages, and so the mechanism that rendered PBs powerful is absent in SIBs.

The government’s loss of control may render SIBs less effective than what theory predicts. However in the experiment, SIBs were preferred to and unambiguously yielded higher social surplus than PBs. Hence, the full enforceability offered by SIBs worked very well. It compensated for the government’s loss of control, and was preferred to PBs’ “mechanism” of reciprocity. Treatment IP thus highlights the problems associated with prevailing not-for-profit contracts, while Treatment PS highlights the promise of SIBs to allay these problems. Our results therefore suggest that, at least in our experimental test-bed, SIBs can allay the underperformance problem afflicting not-for-profits in a first-best world.

The rest of the thesis proceeds as follows: Chapter 2 contains a literature review. Chapter 3 describes the principal-agent model with three contractual alternatives. Chapter 4 contains the experimental design and implementation, and Chapter 5 presents the results. Chapter 6

¹ Though one can question whether this portrayal is appropriate for social investors, it is a useful baseline to explore the consequences of delegation.
discusses the main results and Chapter 7 contains concluding remarks and future research avenues.
CHAPTER 2: LITERATURE REVIEW

In this chapter, we explain why it makes sense to portray not-for-profits as self-interested entities, and how the current not-for-profit landscape is conducive to underperformance. We then identify key arguments from the nascent SIB literature that motivate the belief that SIBs can allay the underperformance problem plaguing not-for-profits.

2.1 NOT-FOR-PROFITS

For some time, Hansmann’s (1980, 1987) “non-distribution constraint” informed policy-makers’ perception of not-for-profits. His basic idea is this: not-for-profits typically deliver experience goods – such as day-care, health, and education services – whose quality cannot be evaluated by inexperienced customers. When customers cannot assess the quality of the good delivered, opportunistic not-for-profits may exploit their information advantage by providing inferior goods. However by virtue of the non-distribution constraint, which reflects the law prohibiting not-for-profits from distributing surplus to its controlling members, Hansmann argues that not-for-profits have fewer and lesser incentives to behave opportunistically. This is because any revenue that accrues from short-changing customers cannot and do not benefit the owners of not-for-profits.

The non-distribution constraint cannot, however, guarantee or induce good behaviour (Ben-Ner & Gui, 2003). For instance, by removing financial incentives to perform tasks efficiently, the non-distribution constraint may cause not-for-profits to produce goods or services at a higher cost than their for-profit counterpart (Hansmann, 1987). Moreover, the non-distribution constraint cannot align the goals of those working within the not-for-profit to the overall mission of the organisation (Ortmann & Schlesinger, 2003). Workers can still behave badly by shirking on the job, indulging in office perquisites, or by pursuing goals other than the not-for-profit’s mission. In fact, low- and mid-level not-for-profit workers often face the same
incentives as their for-profit counterpart, as they have similar remuneration profiles (Erus & Weisbrod, 2003).  

In response to standard and then popular theory, Ortmann (1996) draws upon the seminal works of Klein and Leffler (1981) and Kreps (1990), and uses a simple reputation game to explain the inner dynamics of not-for-profits. He explains why not-for-profits face severe temptations to underperform (see Table 2.1.1 below).  

<table>
<thead>
<tr>
<th>Agent</th>
<th>Principal</th>
<th>Trust</th>
<th>Not</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Quality</td>
<td>1, 1</td>
<td>0, 0</td>
<td></td>
</tr>
<tr>
<td>Low Quality</td>
<td>2, -1</td>
<td>0, 0</td>
<td></td>
</tr>
</tbody>
</table>

In a one-shot game, rational not-for-profits (i.e. Agents) deliver low-quality goods, as it is less costly than the alternative. Hence, consumers (i.e. Principals) cannot trust workers to deliver high quality goods. Principals and Agents are thus stuck in a socially inefficient equilibrium, where not-for-profits deliver inferior goods and consumers do not trust them. The folk theorem posits, however, that if players are sufficiently patient, the shadow of the future is sufficiently long, and perfect information exists, providing high quality goods and trusting not-for-profits can be a sustainable equilibrium. This is because reputation enforcement – where not-for-profits with good track records attract more customers – will induce not-for-profits to provide high quality goods.

2 There are other theories that portray not-for-profits with less opportunistic motivations. For instance, Young’s entrepreneurial theory argues that a not-for-profit entrepreneur is the driver of change and innovation, who is attracted to the not-for-profit because they offer different goals and motivations from that of for-profit organisations. For instance, they might derive utility from shaping the goals of the organisation, as it allows them to align the organisation’s mission to their own (Bacchiega & Borzaga, 2003), or are motivated to fulfil the organisation’s mission because it gives them a sense of accomplishment (Young, 1981). Young thus argues that these entrepreneurs – who shape the objectives of not-for-profits – can explain why not-for-profits’ objectives are different to for-profits’. However the problem with this theory is that it makes the objectives of not-for-profits too nuanced to capture in a single objective function, as objective functions will vary across different entrepreneurs and thus different not-for-profits.

3 For an overview of empirical evidence that scrutinizes the alleged “trustworthy” status of not-for-profits, refer to Ortmann and Schlesinger (2003).
However the dearth of transparency in the not-for-profit sector, and the difficulties associated with verifying the quality of experience goods makes reputational enforcement difficult to achieve (e.g. see PC, 2010). Namely, the condition of perfect, or at least adequate, information is rarely satisfied. Therefore the dismal outcome where not-for-profits underperform by providing poor quality goods remains a real problem.

When not-for-profits deliver experience goods and mechanisms to induce good behaviour are absent, the temptation to shirk on quality is severe. Failure to recognize this is dangerous, particularly since the effect of shirking on quality is most acutely felt when relational effort determines quality, such as in the old-age care, health or education sectors, which is what not-for-profits typically engage in (Bacchiega & Borzaga, 2003; Ortmann & Schlesinger, 2003; Washington State for Public Policy, 2004). It is therefore a good first approximation to assume that not-for-profits do indeed self-maximise.

2.2 INSTITUTIONAL SETTINGS

Governments are increasingly reliant on not-for-profits to deliver human-related, experience goods such as housing, intervention programs and employment training (Boris et al, 2010; Erwin, 2011; 2011, PC, 2010). For instance, around 20,000 Australian not-for-profits relied heavily on government funding during the 2006-07 period (The Treasury, 2011). Also, almost 33,000 American not-for-profits received government funding in 2009, which was the largest source of revenue for 60% of them (Erwin, 2011). This reliance on public funds implies that not-for-profits have a special fiduciary duty to society to deliver services efficiently. However the ways in which not-for-profits actually use public funds to create value remains unknown.

The current state of monitoring and evaluation is underwhelming. PC (2010) surveyed 43 Australian not-for-profits about 109 of their programs. While 97% of programs employed performance reporting, the majority was conducted in-house rather than independently (refer to
D.13 of the PC, 2010). Similarly, American not-for-profits that earn revenue over US$25,000 are required to complete an IRS 990 form detailing their financial performance. However the information is self-reported and does not require external appraisal. Self-assessment is problematic on many levels. First, many not-for-profits do not possess the correct monitoring infrastructure to collect and evaluate performance data, which complicates monitoring and reduces the reliability of the information (PC, 2010). Second, even when proper monitoring infrastructure exists, not-for-profits can fabricate self-reported performance information (e.g. see Krishman et al, 2006; Yetman & Yetman 2011b; Friesen and Gangadharan, 2011). Lastly, government departments may not even be able to evaluate not-for-profits’ performance information adequately, since they typically have low-powered incentives and employ poor performance measures (PC, 2010; Liebman 2011).

In response to the problems associated with poor monitoring, government contracts are overly prescriptive, specifying how funds should be used and what services should be provided (PC, 2010). An example is the “purchase of services” contract, which is where not-for-profits deliver governments’ desired inputs and/or outputs in exchange for money. While the contract’s performance-based aspect is theoretically appealing, its effectiveness hinges on two conditions. First, governments must be able to measure the contracted inputs and/or outputs accurately and objectively. However this is difficult in light of the underwhelming state of monitoring already alluded to, and the experience nature of the goods not-for-profits typically provide. Second, the contracted inputs and/or outputs must correlate to social value. If it does not, not-for-profits might place most of their effort on increasing the contracted inputs/outputs rather than fulfilling their mission (Holmstrom & Milgrom, 1991).
2.3 SOCIAL IMPACT BONDS

In light of the current not-for-profit landscape, policy-makers catering for government bureaucrats designed a new contract form, “Social Impact Bonds” (SIBs). SIBs promise to “unlock new investments”, “transform incentives” and employ performance measures that are “highly correlated to program outcomes” (e.g. see Social Finance, 2009; 2011; Bolton, 2010; Liebman, 2011, to name a few). Armed with these properties, advocates hope SIBs will generate significant cost savings for the public sector (Liebman, 2011; CSI 2011).

Mulgan et al (2010a) generalize SIBs’ basic properties in three steps (refer to Figure 2.3.1 above). First, (social) investors enter a contract with the government, where they agree to fully fund a not-for-profit to deliver a program, which aims to improve the livelihood of a target group. Second, the not-for-profit uses investors’ funds to deliver the program, which is then assessed. Third, the government repays the investors the cost of funding the program in addition to interest, and concurrent with the level of improvement in the target group.

To provide context, consider the SIB that was piloted first, and is still underway at UK’s Peterborough Prison. The objective is to reduce the recidivism rate of 3000 short-sentence male prisoners by 7.5% or more over 6 years (Bolton, 2010). In 2010, the UK Justice Ministry contracted the social investment bank, Social Finance, to raise capital from outside investors to
fully fund the cost of a not-for-profit’s intervention program. If reoffending decreases by at least 7.5%, the government will repay Social Finance and thus the investors the cost of funding, in addition to interest. However if the 7.5% threshold is not reached, Social Finance and its investors lose their entire investment, which includes the principal and return (Liebman, 2011).

By virtue of SIB’s evaluation system, which contains “effective” and “agreed-upon” performance measures, the underperformance problem will be allayed (Liebman, 2011). Not-for-profits will scrutinize the efficacy of their program ex ante in order to convince investors and the government that their program can improve the livelihood of the target group, and is therefore worthy of financing. If the program goes awry during the implementation stage, investors may threaten to withdraw their financial support. Lastly, missing the performance objective ex post jeopardizes the opportunity for future funding, as the government may reduce funding and investors may withdraw their financial support in the future (CSI, 2010; Liebman, 2011).

In order for the underperformance problem to be mitigated, the performance measure must be credible and correlate to social outcomes. For instance, if investors believe the livelihood of the target group is too difficult to improve, that the monitor is incapable, or that the performance measure is too subjective and can therefore be manipulated (Liebman, 2011; CSI 2011), they may choose to invest their money elsewhere. Indeed though Mulgan et al (2010a:7) optimistically claims that “social impact bonds are generally likely to work best in situations where there are misaligned incentives to develop, fund and deliver preventative services that can save costs down the line and achieve a better result from the system as a whole”, SIBs will not work if the performance measure is poorly constructed and implemented, or if investors are not motivated to properly monitor the not-for-profit.

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4 Liebman (2011) argues that a potential pitfall of SIBs is if investors withdraw their financial support for poorly performing programs. As such, he emphasizes the importance of establishing “contingency” plans when programs do go awry.
CHAPTER 3: THEORY

In this chapter we theorize whether, and how exactly social impact bonds mitigate the underperformance problem plaguing not-for-profits. To this end, we construct three bare-bones models that reflect three contracts governments use to fund not-for-profits: inputs-based (IB), performance-based (PB), and social impact bond (SIB) contracts. We also construct a first-best contract for comparison purposes (see Table 3.0.1).

<table>
<thead>
<tr>
<th>First-Best Contract</th>
<th>Inputs-Based Contract (IB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The government perfectly writes a contract on outcomes.</td>
<td>The government pays the not-for-profit for every input placed in the program.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance-Based Contract (PB)</th>
<th>Social Impact Bond Contract (SIB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The government pays the not-for-profit once it achieves a pre-specified performance target. Payment is not legally enforceable.</td>
<td>An investor funds the not-for-profit. The government pays the investor if the not-for-profit achieves a pre-specified performance target. Payment is legally enforceable.</td>
</tr>
</tbody>
</table>

To motivate the models, consider the following story inspired by the Peterborough pilot. The government is concerned about the level of prisoner recidivism, as it is alarmingly high and costly to manage. It therefore seeks ways to rehabilitate prisoners in the cheapest way possible. In pursuing this objective, it contracts a not-for-profit to deliver rehabilitation services (henceforth “program”). Government cost savings depends on the number of prisoners that participate in the program and the quality of the program delivered. Although the government can verify the number of prisoners that participate in the program, it cannot verify the quality of the program because it lacks the proper monitoring technology and incentives to do so. In light of its limitations, the government asks: what contract should it implement?
3.1 BASIC SET-UP

There are two players: the government and the not-for-profit. Government cost savings, \( S_e_1 e_2 \), depends on the level of effort the not-for-profit exerts on tasks 1 and 2, \( e_1 \) and \( e_2 \). Task 1 entails increasing enrolments in the program (i.e. quantitative element) and task 2 entails tailoring the program to meet each prisoner’s needs (i.e. qualitative element). The functional form of cost savings reflects the assumption that for any given effort level, government cost saving is maximised when effort is equally exerted on task 1 and 2. The government’s budget is therefore its cost savings less the wage it pays the not-for-profit.\(^5\)

\[
B_{\text{government}} = S_e_1 e_2 - w
\]

The not-for-profit’s cost of delivering the service is \( c(e_1,e_2) \) and depends on the total amount of effort he exerts on tasks 1 and 2. Cost of effort is increasing and convex \((c' > 0, c'' > 0)\), and the lowest effort level he can exert on tasks 1 and 2 is 1, where \( c(1,1) \neq 0 \). Hence, the not-for-profit’s “utility” equals his wage minus the cost of effort.

\[
U_{\text{not-for-profit}} = w - c(e_1,e_2)
\]

Crucially, we assume the government is unable to monitor the not-for-profit’s performance, as it lacks the proper incentives and technology to do so. Hence, although the government can observe the level of effort the not-for-profit exerts on tasks 1 and 2, it can only verify effort on quantifiable task 1 in a court of law. It cannot verify effort on qualitative task 2.

\(^5\) The government's objective to maximise its cost savings is reasonable on two grounds. First, governments allegedly seek the “best value for money” when they offer contracts to not-for-profits (PC, 2010:297). Second, SIBs were conceived to generate “greater taxpayer’s value for money”, which implies governments are concerned about efficiency. Therefore it makes sense to portray governments as budget maximizing.
The timing of events is as follows: At date 0, the government offers a take-it-or-leave-it contract to the not-for-profit. If the contract is accepted, at date 1 the not-for-profit exerts effort on tasks 1 and 2. If the contract is rejected, both players receive their reservation utilities of zero. Lastly, payoffs are realised.

3.2 BENCHMARK CONTRACT (FIRST-BEST)

In the benchmark contract, the government is able to costlessly verify effort on tasks 1 and 2 in a court of law. It offers the not-for-profit a contract \(\{e_1^*, e_2^*, w\}\), which specifies its desired effort levels on tasks 1 and 2, \(e_1^*\) and \(e_2^*\) and wage \(w\). The not-for-profit receives \(w > 0\) if \(\{e_1, e_2\} = \{e_1^*, e_2^*\}\) and \(w = 0\) if otherwise. The government thus maximises its budget subject to the not-for-profit’s participation constraint\(^6\), which yields first-best effort levels:

\[
\{e_1^*, e_2^*\} = \arg \max_{e_1, e_2} Se_1 e_2 - c(e_1, e_2)
\]

First-best effort levels are achieved when the government’s marginal cost savings equals the not-for-profit’s marginal disutility of effort. The government also offers the not-for-profit a wage \(w^* = c(e_1^*, e_2^*)\) such that his participation constraint binds.

3.3 INPUTS-BASED CONTRACT (IB)

When the government cannot verify effort on task 2 in a court of law, it might offer an inputs-based contract \(\{w, s\}\), where \(s\) is the level of compensation the not-for-profit receives for every unit of effort he exerts on task 1. To solve the contract, the government ensures the not-for-profit’s participation constraint binds (1), and the contract is incentive compatible (2):

\[^6\text{Formally, Max}_{e_1, e_2} Se_1 e_2 - w \text{ subject to } w - c(e_1, e_2) \geq 0\]
\[
\begin{align*}
\text{Max}_{w, s} Se_1 e_2 - w - se_1 \\
\text{Subject to} \\
w + se_1 - c(e_1, e_2) & \geq 0 \quad (1) \\
\{e_1, e_2\} = \arg\max_{e_1, e_2} w + se_1 - c(e_1, e_2) \quad (2)
\end{align*}
\]

The not-for-profit focuses his effort on increasing enrolments (i.e. task 1) rather than on improving the quality of the program (i.e. task 2). He therefore exerts minimum effort on task 2, \(e_2 = 1\), but increases effort on quantifiable \(e_1\) until his marginal gain from receiving \(s\) equals his marginal disutility of effort \(c'(e_1, 1)\). Given the not-for-profit exerts \(e_2 = 1\) and \(e_1\) such that \(s = c'(e_1,1)\), the government implicitly sets optimal \(e_1^*\) such that it solves \(S = c'(e_1^*,1) + c''(e_1^*,1)e_1^*\). Thus, optimal effort levels are achieved when the government’s marginal gain from cost savings equals the marginal cost of funding the not-for-profit. Lastly, the government offers compensation \(s^* = c'(e_1^*,1)\) and wage \(w^* = c(e_1,1) - c(e_1,1)e_1\) such that the not-for-profit receives his reservation utility.

### 3.4 PERFORMANCE-BASED CONTRACT (PB)

In performance-based contracts, the government offers contract \(\{w, b^*\}\), where \(b^*\) is the promised bonus. The government also sets a performance target \(\{e_1^*, e_2^*\}\), which specifies its desired effort on tasks 1 and 2. The government announces the not-for-profit will receive \(b^* > 0\) if he satisfies the performance target \(\{e_1^*, e_2^*\}\), and \(b^* = 0\) if otherwise. However the non-verifiability of task 2 means the promise of a bonus \(b^*\) is not legally enforceable in a court of law\(^7\). The payoffs for PBs are thus:

\[
\begin{align*}
B_{\text{government}} &= Se_1 e_2 - w - b \\
U_{\text{not-for-profit}} &= w + b - c(e_1, e_2)
\end{align*}
\]

\(^7\) Poor monitoring makes verifying the performance of not-for-profits difficult. In such cases, governments may unwittingly (or intentionally) renege on their promise to pay not-for-profits for their services. For instance, in 2009 58% of American human-service not-for-profits experienced late payments, payment cancellations or payment cuts to their contracts (Boris et al, 2010), which arguably are forms of governments “reneging” on promised payments.
The government never fulfills its promise to pay $b^* > 0$ when \( \{e_1, e_2\} = \{e_1^*, e_2^*\} \), since it is budget maximising to set $b$ equal to zero. When $b = 0$, the not-for-profit maximises his utility by exerting the lowest possible effort on tasks 1 and 2, \( \{e_1, e_2\} = \{1, 1\} \). The government thus offers a wage $w^* = c(1,1)$ such that the not-for-profit’s participation constraint binds.

### 3.5 SOCIAL IMPACT BOND (SIB)

In social impact bonds, there is an investor (feminine) who is able to obtain hard monitoring information about the not-for-profit’s performance. Hard information prevents the investor from manipulating the monitoring report and the government from doubting it, as it credibly conveys the not-for-profit’s performance. The investor can thus verify and write a contract on the not-for-profit’s effort on tasks 1 and 2. Finally, monitoring costs $M$ and does not require effort.

In SIBs, the government offers the investor \( \{e_1^*, e_2^*, B, r\} \), which contains a performance target \( \{e_1^*, e_2^*\} \), the value of the bond $B$, and the bond’s interest rate $r$. If the performance target \( \{e_1^*, e_2^*\} \) is achieved, the government pays the investor $B$ at interest rate $r$, where $r \in [0, 1]$, and $B = 0$ if otherwise. The investor’s reservation interest rate ($r_o$) is normalized to zero. The investor does not possess the skills to deliver the program, but can outsource the tasks to a not-for-profit.

The investor offers the not-for-profit a contract \( \{w, e_1^*, e_2^*\} \), where he receives wage $w > 0$ if he achieves the government’s performance target \( \{e_1^*, e_2^*\} \), and $w = 0$ otherwise.\(^8\) By outsourcing the task, the investor’s financial return thus depends on the not-for-profit's performance. Namely, if the performance target is achieved, the investor receives $B(1 + r)$ from the government. If not, the investor receives 0 and incurs a monitoring cost of $M$.

---

\(^8\) This assumption reflects the fact that in SIBs, not-for-profits are paid in installments. Therefore if not-for-profits underperform, investors may stop making financial payments, or withdraw their support altogether.
The government therefore designs a contract that maximises its budget and ensures the investor’s and not-for-profit’s participation constraints binds:

\[
\begin{align*}
\text{Max}_{e_1, e_2} & \quad Se_1e_2 - B \\
\text{Subject to:} & \\
w - c(e_1, e_2) & \geq 0 \quad (3) \\
(1 + r)B & \geq (1 + r_0)B \quad (4) \\
(1 + r)B & \geq w + M \quad (5)
\end{align*}
\]

Optimality requires that all participations constraints bind, hence \( r^* = 0 \), \( w^* = c(e_1, e_2) \), and \( B^* = c(e_1, e_2) + M \). The optimal efforts are thus:

\[
\{e_1^*, e_2^*\} = \text{Max}\{\text{argmax}_{e_1, e_2} Se_1e_2 - c(e_1, e_2) - M, 0\}
\]

Note that there is no distortion on optimal effort levels since \( M \) is a constant. Therefore if the government’s participation constraint is satisfied \( i.e. \text{Se}_1e_2 - c(e_1, e_2) \geq M \) and the investor is able to obtain hard monitoring information about the not-for-profit’s performance, SIBs induce first-best effort levels.

### 3.6 Theoretic Predictions

The investor in SIBs is able to obtain hard monitoring information about the not-for-profit’s performance. Hence, she can perfectly write a contract on the not-for-profit’s effort levels, which drives SIBs ability to induce first-best effort levels. As such, SIBs will outperform IBs and PBs. Likewise, IBs will outperform PBs, since the piece-rate component can induce the not-for-profit to exert effort on task 1. Lastly, PBs will fare worst, since the bonus payment cannot enforce effort at all.
CHAPTER 4: EXPERIMENT

The experiment is based on the models developed in Chapter 3, and explores the interaction between governments and not-for-profits under various contractual alternatives. The experiment resembles in its structure Fehr and Schmidt (2004).

4.1 EXPERIMENTAL DESIGN

In the experiment, the government (neutral) offers the not-for-profit (masculine) a contract, which he accepts or rejects. If he accepts the contract, he engages in a chosen-effort task. He chooses effort on task 1 and task 2, which is costly for the not-for-profit but increases the government’s payoff. As in the theoretical framework, the government can perfectly observe the not-for-profit’s effort on both tasks, but can only verify effort on task 1 in a court of law.

In the experiment, government cost savings is \( S e_1 e_2 = 75e_1 e_2 \), where \( e_1 \in [1, 6] \) and \( e_2 \in [1, 6] \). The not-for-profit’s cost of effort is in Table 4.1.1. The marginal cost of effort is 30 when \( e_1 + e_2 \in [2, 6] \), and increases to 75 when \( e_1 + e_2 \in [7, 12] \) to reflect the convexity of the cost function.

TABLE 4.1.1: COST OF EFFORT

<table>
<thead>
<tr>
<th>( e = e_1 + e_2 )</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>( c(e_1, e_2) )</td>
<td>60</td>
<td>90</td>
<td>120</td>
<td>150</td>
<td>180</td>
<td>255</td>
<td>330</td>
<td>405</td>
<td>480</td>
<td>555</td>
<td>630</td>
</tr>
</tbody>
</table>

9 Governments and not-for-profits are clearly not individual decision makers. Hence, we need to be aware that the participants – whether they act knowingly or unknowingly in their role of organizational entities – may bring to the experiment social preferences like altruism or fairness that organizational entities may not be afflicted with. There is a literature which addresses the question whether individual or team decision making leads to significant differences (e.g. see Kugler et al, 2007; Kocher & Sutter, 2007; Luhan et al, 2009); our reading is that the answer to this question remains open and could in any case be tested if necessary.

10 The experimental parameters were calibrated on rehabilitation data on juvenile delinquents in NSW, which is the target of the proposed SIB pilot in New South Wales (CSI, 2011). For the calibration exercise, refer to Appendix 3.1. Our motivation to calibrate is twofold. First, experimentalists aim to increase the external validity of their experiments (e.g. see List 2006). Calibrating our parameters thus brings our experiment one step closer to the real world. This is an important step towards “parallelism”, or external validity, which is of importance in public-policy situations (e.g., Plott 1987). Second, the way in which experiments are parameterized can affect behaviour in the laboratory (e.g. see Engelmann & Ortmann, 2009; Ridgon, 2002).
In SIBs, the investor was computerized and programmed to behave in line with theory. This implies the following:

1. The investor’s monitoring cost is 50 points. The investor is therefore able to obtain hard monitoring information about the not-for-profit’s performance and perfectly enforce effort on tasks 1 and 2. Thus, if the not-for-profit complies with the government’s desired effort levels, the not-for-profit and investor receive their wage and bond payment respectively. If not, they both receive zero points.

2. The investor extracts maximum surplus from the not-for-profit each time they transact. Hence, the investor pays the not-for-profit a wage \( w = 200 + c(e_1^*, e_2^*) \) if he exerts the government’s desired effort levels on tasks 1 and 2. This means the not-for-profit only earns 200 points (= $2) when he complies with the government’s desired effort levels.

3. The investor always accepts the government’s SIB offer if her reservation utility of zero is satisfied (i.e., if \( B \geq 250 + c(e_1^*, e_2^*) \)).

This is common knowledge in the experiment.

Figure 4.1.2 contains the exact steps and payoffs in each contract, and follows the theoretical models developed in Chapter 3.

### TABLE 4.1.2: STEPS AND PAYOFFS

<table>
<thead>
<tr>
<th></th>
<th>IB</th>
<th>PB</th>
<th>SIB</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>G offers {w, s} and</td>
<td>G offers {w, b*}</td>
<td>G offers {e_1^<em>, e_2^</em>, B} to I</td>
</tr>
<tr>
<td></td>
<td>specifies {e_1^<em>, e_2^</em>}</td>
<td>and specifies {e_1^<em>, e_2^</em>}</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>N chooses ( e_1 ) and</td>
<td>N chooses ( e_1 ) and</td>
<td>I offers {e_1^<em>, e_2^</em>, w} to N,</td>
</tr>
<tr>
<td></td>
<td>( e_2 )</td>
<td>( e_2 )</td>
<td>where ( w = c(e_1^<em>, e_2^</em>) + 200 )</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>G chooses b</td>
<td>N chooses ( e_1 ) and ( e_2 ),</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>which I monitors for 50 points</td>
</tr>
</tbody>
</table>

**Payoffs**

|       | \( E_G = 75e_1e_2 - w - se_1 \) | \( E_G = 75e_1e_2 - w - b \) | If \( \{e_1, e_2\} = \{e_1^*, e_2^*\} \) |
|       | \( E_N = w + se_1 - c(e_1,e_2) \) | \( E_N = w + b - c(e_1,e_2) \) |                                      |
|       | \( E_I = B - 50 - w \)              | \( E_I = 200 \)             | If \( \{e_1, e_2\} \neq \{e_1^*, e_2^*\} \) |
|       |                                         | \( E_G = 75e_1e_2 \)         | \( E_G = 75e_1e_2 \)                   |
|       |                                         | \( E_I = -50 \)              | \( E_N = - c(e_1,e_2) \)               |

**Notes:**

* \( E = \) Experimental Points; \( G = \) Government; \( N = \) Not-for-profit; \( I = \) Investor

11 Since \( r^* = 0 \) in the theoretic framework, we remove it in the experiment.
Each experimental session lasted at least 8 periods.\textsuperscript{12} To mitigate reputation building, governments were randomly matched to not-for-profits. Moreover, subjects remained anonymous, could only observe the decisions in their own relationship, and could never observe the past actions of others. Following Fehr and Schmidt (2004), we used “loaded” language\textsuperscript{13}.

We conducted 2 treatments. In Treatment \textbf{IP}, governments could offer either IBs or PBs to not-for-profits. In Treatment \textbf{PS}, governments could offer either PBs or SIBs to not-for-profits.\textsuperscript{14}

\subsection*{4.2 PREDICTIONS}

Table 4.2.1 contains the predictions for the experiment, using the standard assumption of payoff-maximisation. In IBs, the not-for-profit exerts lowest possible effort on task 2, \(e_2 = 1\), and so the government’s marginal gain from increasing \(e_1\) by one unit is 75. Since the marginal cost of effort is 75 when \(e_1 + e_2 > 6\), the government sets \(e_1^* = 5, e_2^* = 1, s^* = 30\) and \(w^* = 30\) such that the not-for-profit’s participation constraint binds. In PBs, pre-empting the government not delivering its promised bonus (i.e. \(b = 0\)), the not-for-profit exerts the lowest possible effort on tasks 1 and 2, \(e_1 = e_2 = 1\). The government therefore offers wage \(w^* = 60\) such that the not-for-profit’s participation constraint binds. In SIBs, the government specifies first-best effort levels on tasks 1 and 2, \(e_1^* = e_2^* = 6\), to maximise its budget, and thus offers the investor a bond \(B^* = 630 + 200 + 50 = 880\). The investor therefore offers the not-for-profit a wage \(w^* = 200 + c(e_1^*, e_2^*) = 200 + 630 = 830\), which ensures the not-for-profit receives 200 points if he complies with the government’s desired effort levels. Finally, we predict that SIBs will outperform IBs, and IBs will outperform PBs in terms of social surplus (i.e. the sum of all payoffs).

\begin{table}
\caption{4.2.1 Predictions for the experiment, using the standard assumption of payoff-maximisation.}
\begin{tabular}{|l|l|}
\hline
\textbf{Task} & \textbf{Effort} \\
\hline
1 & \(e_1^* = 5\) \\
2 & \(e_2^* = 1\) \\
\hline
\end{tabular}
\end{table}

\textsuperscript{12} The length of the experiment depended on how long it took participants to make their decisions. We advertised that the experiment might last up to two hours. Once the targeted time was about to lapse, we stopped the experiment even if the targeted ten rounds were not reached; since that happened in a couple of cases, and to simplify our exposition, we report throughout only the results for the first 8 periods. None of our results are affected by this truncation.

\textsuperscript{13} Refer to Appendix 2.1 for the instructions.

\textsuperscript{14} We also conducted control Treatment \textbf{C} as a robustness check. Its details are contained in Appendix 1.
TABLE 4.2.1: SUMMARY OF PREDICTIONS

<table>
<thead>
<tr>
<th>(e₁, e₂)</th>
<th>IB</th>
<th>PB</th>
<th>SIB</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5,1)</td>
<td>(1,1)</td>
<td>(6, 6)</td>
<td></td>
</tr>
</tbody>
</table>

\[ E^G = 195 \]
\[ E^N = 15 \]
\[ E^I = 1820 \]

Social Surplus = \( E^G + E^N + E^I \)
\[ = 195 + 15 + 1820 \]
\[ = 195 \]
\[ = 15 \]
\[ = 1820 \]

4.3 EXPERIMENTAL IMPLEMENTATION

The experiments were programmed in Z-tree (Fischbacher, 2007) and were conducted in the Australian School of Business Experimental Lab. We recruited participants using ORSEE (Greiner, 2004). Table 4.3.1 contains the descriptive data of the participants.

TABLE 4.3.1: DEMOGRAPHICS

<table>
<thead>
<tr>
<th>Experiment</th>
<th>IP</th>
<th>PS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Session</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Date</td>
<td>24-11-11</td>
<td>24-11-11</td>
</tr>
<tr>
<td>Time</td>
<td>14:00-15:30</td>
<td>16:30-18:00</td>
</tr>
<tr>
<td>No. Periods</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>No. of participants</td>
<td>20</td>
<td>24</td>
</tr>
<tr>
<td>% Female</td>
<td>55</td>
<td>42</td>
</tr>
<tr>
<td>% Local</td>
<td>5</td>
<td>13</td>
</tr>
<tr>
<td>% Business Students</td>
<td>40</td>
<td>38</td>
</tr>
<tr>
<td>Age</td>
<td>19-34</td>
<td>19-28</td>
</tr>
<tr>
<td>Avg Earnings ($)</td>
<td>25.25</td>
<td>32.40</td>
</tr>
<tr>
<td>Min Earnings ($)</td>
<td>12</td>
<td>25</td>
</tr>
<tr>
<td>Max Earnings ($)</td>
<td>60*</td>
<td>44**</td>
</tr>
</tbody>
</table>

* Show-up fee = 10 ** Show-up fee = 25 *** Show-up fee = 15

The show-up fee varied across the three session, as average earnings varied across the three sessions. This behaviour across sessions provide evidence of so-called “session effects” (e.g. Frechette, 2011:4), which is “within correlation in the variable of interest (or residual) once the relevant factors are controlled for”. Frechette (2011) argues that if feedback participants received from other participants caused session effects, to test whether this had an appreciable effect on the experiment results, one should run clustered OLS regressions at the session-level. However this is not feasible in our case, as it means there would be at most 12 clusters per session. The sample size is too small to obtain truly meaningful statistical results.

The subsequent question the reader may ask is: how exactly did we pay the show-up fee? We had two concerns in mind: First, we had to ensure the average earnings would equal the promised $30, lest participants might believe we deceived them (e.g. see Ortmann & Hertwig, 2002). Second, we did not...
Due to the complexity of the experiment, it took one hour to go through the instructions. Before the experiment commenced, participants were given two documents: “Detailed Instructions” and “Information Fact Sheet”. Participants were given 25 minutes to read the two documents. Once the 25 minutes lapsed, participants were given 20 minutes to complete a quiz that tests their understanding. Once the 20 minutes lapsed, the experimenter used PowerPoint to go through the questions in the quiz. Participants were encouraged to ask the experimenter questions about the instructions.

In PS, governments and not-for-profits had different experimental conversion currency rates. We did this to ensure that those in the role of not-for-profits earned enough to induce them to return to the lab. At the beginning of the experiment, the experimenter announced that the experimental conversion currency rate was different depending on the roles they were randomly assigned to, and to ensure that governments and not-for-profits would not have hugely different expected earnings. Experimental conversion currency rates were private information (e.g. see Kagel, Kim and Moser 1996). Governments therefore did not know not-for-profits’ experimental currency conversion rate, nor did not-for-profits know governments’ experimental currency conversion rate.

want participants to know ex ante they would always receive the promised average earnings of $30, lest they behaved differently in the experiment. For this reason, once we knew the average earnings from the experiment, we increased the earnings of all participants by a lump-sum that ensured average earnings were in the $30 range.

16 See Appendix 2.1 and 2.2
17 See Appendix 2.3
CHAPTER 5: EXPERIMENTAL RESULTS

Our aim is to determine whether, and how exactly, the specific properties of each contract affect the underperformance problem plaguing not-for-profits, and to determine which contract (i.e. IB, PB or SIB) fares best. We thus consider governments’ behavior in each contract, including their contract offers and design choice idiosyncratic to each contract. We also examine whether, and how exactly, their choice and design of contract influence not-for-profits’ effort levels. Finally, we compare payoffs and social surplus across all contracts.

5.1 TREATMENT IP

A. GOVERNMENTS’ CONTRACT OFFER

FIGURE 5.1.1: PROPORTION OF CONTRACTS OFFERED

In Treatment IP, governments can offer one of two contracts: inputs-based contracts (IBs) and performance-based contracts (PBs). If governments behave in line with theory, they will offer IBs more frequently than PBs, as it allows them to write a contract on task 1. However in contrast to theoretical predictions but in line with the earlier findings in Fehr and Schmidt
(2004), governments offered PBs more frequently than IBs. This is shown in Figure 5.1.1, which graphically shows the proportion of contract type offered in every period of the experiment. It shows that their preference for PBs was pronounced from the start of the experiment, and was never offered less than 70 percent of the time. In total, 199 (75.4 percent) of offered contracts were PBs, whereas the remaining 65 (24.6 percent) were IBs.

**Result 1:** Governments preferred PBs to IBs, offering them at least 70 percent of the time in each period.

**B. GOVERNMENTS’ CONTRACT DESIGN CHOICE**

Table 5.1.1 contains governments’ piece-rate s, promised bonus b*, and actual bonus payment b, averaged over the first and second half of the experiment. It shows that on average, governments offered higher piece-rates, promised higher bonuses and paid higher actual bonuses in the second half of the experiment than in the first.

<table>
<thead>
<tr>
<th>TABLE 5.1.1: SUMMARY OF GOVERNMENTS’ DESIGN CHOICE</th>
<th>Periods 1-4</th>
<th>Periods 5-8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract</td>
<td>s</td>
<td>b*</td>
</tr>
<tr>
<td>IB</td>
<td>33</td>
<td>36.1</td>
</tr>
<tr>
<td>PB</td>
<td>99</td>
<td>579.6</td>
</tr>
</tbody>
</table>

In IBs, governments must offer a piece-rate greater than or equal to the marginal cost of effort to induce utility-maximising not-for-profits to exert effort on task 1. Recall that the marginal cost of effort is 30 when \( e_1+e_2 \in [1,6] \), and increases to 75 when \( e_1+e_2 \in [7,12] \). Table 5.1.1 shows that governments understood the power of the piece-rate to induce effort on task 1, as piece-rate offers were on average greater than 30.

Theory also posits that budget-maximising governments will reduce their piece-rate offer such that they just compensate not-for-profits’ marginal cost of effort, but the data in Table 5.1.1
shows that average piece-rate offers rose as the experiment progressed. However a greater proportion of governments offered piece-rates greater than or equal to 30 in the second half of the experiment than in the first, rising from 60.6 to 75.5 percent, which most likely drives this result.

In PBs, budget-maximising governments always renege on their promise to pay their bonus. We therefore expect governments to pay lower bonuses than what they promised. The data in Table 5.1.1 unambiguously confirms our prediction - governments’ actual bonus payments were systematically and significantly lower than their promised bonus (Mann-Whitney, p < 0.01). In total, governments’ actual bonuses were smaller than their promised bonuses 82.5 percent of the time. This could be driven by governments who discipline underperforming not-for-profits by reducing bonus payments. However this hypothesis is incorrect, as governments underpaid their promised bonus 58.2 percent of the time even when not-for-profits complied with their desired effort levels.

**Result 2:** Governments’ designed contracts qualitatively in line with theoretic predictions. Namely, they on average:

a) Offered piece-rates close to the marginal cost of effort 30 in IBs;

b) Did not pay their promised bonus in PBs, even when not-for-profits complied with their desired effort levels.

In spite of Result 2, governments exhibited behaviour in PBs that challenges the standard model of self-interest. In particular, actual bonus payments increased from an average of 148.40 points in the first half of the experiment to 214.37 points in the second (see Table 5.1.1). Moreover, governments increased bonus payments when not-for-profits complied with their desired effort levels. Specifically, average actual bonuses were 206.5 points, but increased to 530.1 points when not-for-profits complied with governments’ desired effort levels. Lastly, governments reciprocated high effort with high bonuses. This is formally shown by replicating Fehr and
Schmidt’s (2004) OLS regression (1), where dependent variable Actual Bonus was regressed on not-for-profits’ total effort \((e_1 + e_2)\), effort difference between tasks 1 and 2 \(|e_1 - e_2|\), and each component of the PB. We also conducted a clustered OLS regression, where each cluster represents the action of a single government.\(^{18}\)

\[
\text{Actual Bonus} = \beta_0 + \beta_1(e_1 + e_2) + \beta_2|e_1 - e_2| + \beta_3\text{Wage} + \beta_4e_1^* + \beta_5e_2^* + \beta_6b^* + \epsilon
\]  

(1)

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Robust standard errors</th>
<th>Clusters (31 Clusters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
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<td>-205.65**</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>((e_1 + e_2))</td>
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<td>63.94***</td>
</tr>
<tr>
<td></td>
<td>(8.12)</td>
<td>(13.92)</td>
</tr>
<tr>
<td>(</td>
<td>e_1 - e_2</td>
<td>)</td>
</tr>
<tr>
<td></td>
<td>(26.51)</td>
<td>(38.48)</td>
</tr>
<tr>
<td>Wage</td>
<td>-0.51***</td>
<td>-0.51***</td>
</tr>
<tr>
<td></td>
<td>(0.16)</td>
<td>(0.18)</td>
</tr>
<tr>
<td>(e_1^*)</td>
<td>11.62</td>
<td>11.62</td>
</tr>
<tr>
<td></td>
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<td>(23.61)</td>
</tr>
<tr>
<td>(e_2^*)</td>
<td>24.34</td>
<td>24.34</td>
</tr>
<tr>
<td></td>
<td>(21.80)</td>
<td>(27.68)</td>
</tr>
<tr>
<td>(b^*)</td>
<td>-0.14</td>
<td>-0.14</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.08)</td>
</tr>
<tr>
<td>Obs</td>
<td>175</td>
<td>175</td>
</tr>
<tr>
<td>Adjusted R(^2)</td>
<td>0.50</td>
<td>0.50</td>
</tr>
</tbody>
</table>

*Significance level = 10%; **Significance level = 5%; ***Significance level = 10%

Table 5.1.2 contains the regression results. It shows that a one-unit increase in total effort \((e_1 + e_2)\) led to a 64 point increase in Actual Bonus (p < 0.01), which suggests governments reciprocated high effort levels with high bonuses. Interestingly, effort difference \(|e_1 - e_2|\) had a significant (p < 0.05) and negative effect on Actual Bonus, which implies that governments punished not-for-profits by reducing Actual Bonus by 85 points when effort difference increased

\(^{18}\) We ran a clustered OLS regression since each observation in the normal OLS regression may not be truly independent of each other. Specifically, governments’ past experience with not-for-profits might have influenced their present decisions with not-for-profits, since each experimental session ran for at least eight rounds.

\(^{19}\) Refer to Appendix 4.1 for the regression results with demographics; which are very similar.
by one unit. Lastly, governments that offered high wages paid smaller bonuses (p < 0.01). However its impact on Actual Bonus was minimal.

**Result 3:** Governments rewarded compliant and high-effort levels with high bonuses.

**C. NOT-FOR-PROFITS’ EFFORT**

The analysis thus far suggests that most governments exploited the piece-rate component in IBs and failed to deliver their promised bonus in PBs – which is in line with theoretical predictions. However governments in PBs often reciprocated compliant and high effort levels with generous bonuses. The question we thus ask is: how did governments’ choice and design of contract influence not-for-profits’ performance? Table 5.1.3 summarises governments’ desired effort, not-for-profits’ actual effort, and the percentage of contracts that were rejected (R%) in both contracts, averaged over the first and second half of the experiment.

<table>
<thead>
<tr>
<th>TABLE 5.1.3: SUMMARY STATISTICS OF NOT-FOR-PROFITS’ BEHAVIOUR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Periods 1-4</strong></td>
</tr>
<tr>
<td>Contract</td>
</tr>
<tr>
<td>IB</td>
</tr>
<tr>
<td>PB</td>
</tr>
</tbody>
</table>

Theory predicts that when principals write a contract on one of several important tasks, opportunistic agents will focus their effort on the contractible task and neglect the others. The experimental results confirm this. Figure 5.1.2 shows that in every period of the experiment, not-for-profits on average exerted more effort on contractible task 1 than on non-contractible task 2 (Mann-Whitney p-value < 0.01). In particular, not-for-profits increased effort on task 1 from 3.4 to 4.0 and reduced effort on task 2 from 1.4 to 1.2 from the first to the second half of the experiment (Table 5.1.3). In total, not-for-profits exerted lowest possible effort on non-contractible task 2 (i.e. $e_2 = 1$) 87.3 percent of the time.
In PBs, the non-contractible nature of task 2 allows governments to renege on their promised bonus without fear of being disciplined by a court of law. Selfish governments will therefore pay an actual bonus of zero. If not-for-profits anticipate such opportunism, it is in their best interest to exert minimum effort on tasks 1 and 2. We therefore expect not-for-profits to underperform in the experiment. Underperformance was indeed prevalent, as not-for-profits systematically and significantly exerted less effort than what governments desired (Mann-Whitney, p-value < 0.01). Specifically, not-for-profits on average exerted a total of 3 units less effort than what governments desired (Table 5.1.3). This is evident in Figure 5.1.3, which compares governments’ desired effort on tasks 1 and 2 to not-for-profits’ actual effort on tasks 1 and 2, averaged over each period of the experiment. Lastly, 38.3 percent of not-for-profits exerted minimum effort on tasks 1 and 2, which was also the mode effort choice in the PB.

To quantify how the piece-rate component influenced not-for-profits’ effort on task 1, we conducted OLS regression (2). Dependent variable, effort on task 1 $e_1$, was regressed on each component of the IB and dummy variable $PR$. Dummy variable $PR$ equals 1 when the piece-rate component is greater than or equal to thirty, and zero if otherwise:

$$e_1 = \beta_0 + \beta_1 e_1 + \beta_2 e_2 + \beta_3 \text{Piece-rate} + \beta_4 \text{Wage} + \beta_5 PR + e$$  

(2)

Dummy variable $PR$ had a positive and highly statistically (p < 0.01) effect on not-for-profits’ effort on task 1, $e_1$. Specifically, when governments offer piece-rates greater than or equal to thirty, not-for-profits exerted approximately 2.1 additional units of effort on task 1. Not-for-profits therefore responded to the piece-rate mechanism in line with theory. Refer to Appendix 4.2 for regression results.
**Result 4:** Not-for-profits behaved qualitatively in line with theoretic predictions. Namely, on average:

a) Not-for-profits exerted more effort on contractible task 1 than on non-contractible task 2 in IBs,

b) Not-for-profits exerted less effort than what governments desired in PBs.

In spite of Result 4, many not-for-profits exhibited behaviour in PBs that challenges the assumption of payoff-maximisation. For instance, not-for-profits exerted on average a total of 5.7 units of effort on tasks 1 and 2, even though theory predicts they will only exert 2. Moreover not-for-profits average total effort increased from 5.3 units in the first half of the experiment to 6.3 in the second. To formally test the effect of bonus payments on effort levels, we conducted OLS regression (3). In the regression, dependent variable total effort \( (e_1 + e_2) \) was regressed on the specific components of PBs and dummy variable \( \text{Generous}^1 \). \( \text{Generous}^1 \) equals 1 if, in the previous PB offer, actual bonus payment was equal to or higher than the corresponding promised bonus, and 0 if otherwise:
\[(e_1 + e_2) = \beta_0 + \beta_1(e_1^* + e_2^*) + \beta_2Wage + \beta_3b^* + \beta_4Generous^l + \varepsilon \tag{3}\]

<table>
<thead>
<tr>
<th>Dependent Variable [(e_1 + e_2)]</th>
<th>Robust Standard Errors</th>
<th>Cluster (33 Clusters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
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<td>1.84</td>
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<tr>
<td></td>
<td>(1.11)</td>
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<td>(e_1^*)</td>
<td>0.43</td>
<td>0.43</td>
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<tr>
<td></td>
<td>(0.49)</td>
<td>(0.53)</td>
</tr>
<tr>
<td>(e_2^*)</td>
<td>0.02</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>(0.47)</td>
<td>(0.44)</td>
</tr>
<tr>
<td>Wage</td>
<td>-0.00</td>
<td>-0.00</td>
</tr>
<tr>
<td></td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>(b^*)</td>
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<td></td>
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<tr>
<td>Generous(^l)</td>
<td>3.01***</td>
<td>3.01***</td>
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<td>(0.60)</td>
<td>(0.70)</td>
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<td>Obs</td>
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<td>142</td>
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<tr>
<td>Adjusted R(^2)</td>
<td>0.26</td>
<td>0.26</td>
</tr>
</tbody>
</table>

* Significance level = 10%; ** Significance level = 5%; *** Significance level = 10%

Table 5.1.4 contains the regression results. Generous\(^l\) is highly statistically (p-value < 0.01) and economically significant in determining not-for-profits’ total effort \((e_1 + e_2)\). In particular, not-for-profits increased total effort by approximately 3 units when, in the previous PB, governments paid a bonus that was equal to or greater than their promised bonus. The result therefore suggests that even though the promise of a bonus is non-binding, it can be a powerful motivational tool.

Result 5: In PBs, not-for-profits exhibited behaviour that challenges the standard assumption of self-interest, as they increased total effort by approximately 3 units when they encountered a generous government in the previous PB.

\(^{21}\) Refer to Appendix 4.3 for the regression results with demographics; again the results are similar with and without demographics.
D. PAYOFFS AND SOCIAL SURPLUS

Finally, we calculate social surplus – which is the sum of governments’ budget and not-for-profits’ utility – from each contract to measure their relative strength. Table 5.1.5 contains governments’ and not-for-profits’ payoffs, and social surplus (W) in each contract in terms of experimental currency units (E), averaged over the first and second half of the experiment.

<table>
<thead>
<tr>
<th>Contract</th>
<th>Periods 1-4</th>
<th>Periods 5-8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>E\textsuperscript{G}</td>
</tr>
<tr>
<td>IB</td>
<td>33</td>
<td>102.2</td>
</tr>
<tr>
<td>PB</td>
<td>99</td>
<td>350.0</td>
</tr>
</tbody>
</table>

The data in Table 5.1.5 shows that on average, not-for-profits earned more than governments in IBs, but governments earned substantially more than not-for-profits in PBs. However the average earnings for governments and not-for-profits were higher in PBs than in IBs, and so both were better off in PBs than in IBs. Specifically, governments earned 444.2 points in PBs and 80.3 points in IBs, and not-for-profits earned 109.5 points in PBs and 95.1 points in IBs.

FIGURE 5.1.4 SOCIAL SURPLUS
Moreover, social surplus was unambiguously higher in PBs than in IBs, which is not surprising given effort levels were marginally higher and more efficiently allocated in PBs. This is evident in Figure 5.1.4, which shows that on average, PBs yielded higher social surplus than IBs in every period of the experiment (Mann-Whitney, p-value < 0.01). In total, average social surplus decreased in IBs (from 195.09 to 156.10 points) but increased in PBs (from 466.30 to 641.25 points) from the first half to the second half of the experiment (Table 5.1.5).

**Result 6:** Therefore in stark contrast to theoretic predictions, PBs outperformed IBs as

a) Not-for-profits and governments earned on average more in PBs than in IBs.

b) Average social surplus was higher in PBs than IBs in every period of the experiment.

The results from Treatment IP show that current not-for-profit contracts fail in serious ways – governments often do not pay their promised bonus in PBs, and not-for-profits often exert low effort in PBs and disproportionate effort on task 1 in IBs – which qualitatively aligns with theoretic predictions. The results in IP nevertheless present an interesting puzzle: consistent with the results in Fehr and Schmidt (2004) but in contrast to theoretic predictions, PBs outperformed IBs. Indeed why does a contract that offers no enforceability outperform a contract with partial enforceability? The results suggest that reciprocity drove the success of PBs. But if reciprocity – and particularly the government’s power to control not-for-profits’ payoffs through the bonus – outperformed the mechanism of partial enforceability in Treatment IP, is it powerful enough to outperform the mechanism of full enforceability in SIBs? Treatment PS answers this question.
5.2 TREATMENT PS

In Treatment PS, governments offer either performance-based contracts (PBs) or social impact bonds (SIBs) to not-for-profits.

A. GOVERNMENTS’ CONTRACT OFFER

Theory predicts governments will prefer SIBs to PBs, since SIBs offer perfect enforceability. This is confirmed in Figure 5.2.1, which shows that governments offered SIBs more often than PBs in every period but period 1 of the experiment, and increased SIB offers as the experiment progressed. In particular, governments offered SIBs 58.3 percent of the time in the first half of the experiment, and 75.0 percent in the second. In total, governments offered SIBs 64 times (66.7 percent) and PBs 32 times (33.3 percent). Note that if governments’ preferences are rational, then by strict transitivity they would prefer SIBs to IBs, since they preferred PBs to IBs in Treatment IP.

FIGURE 5.2.1: PROPORTION OF CONTRACTS OFFERS

Result 7: Governments offered more SIBs than PBs, and offered them 66.7 percent of the time.
B. GOVERNMENTS’ CONTRACT DESIGN CHOICE

Table 5.2.1 summarises governments’ design of PBs and SIBs, averaged over the first and second half of the experiment. It contains their promised bonus \( b^* \), actual bonus payment \( b \), bond offer \( B \) and the investor’s reservation bond \( B^O \).

<table>
<thead>
<tr>
<th>Contract</th>
<th>Periods 1-4</th>
<th>Periods 5-8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( # )</td>
<td>( b^* )</td>
</tr>
<tr>
<td>PB</td>
<td>32</td>
<td>356</td>
</tr>
<tr>
<td>SIB</td>
<td>64</td>
<td>642.5</td>
</tr>
</tbody>
</table>

In PBs, governments often reneged on their promise to pay the bonus. In particular, the data in Table 5.2.1 shows that governments’ actual bonuses were on average at least three times lower than their promised bonuses, where the difference is statistically significant (Mann-Whitney, p-value < 0.01). In total, governments reneged on their promised bonus 83.3 percent of the time. Even when not-for-profits exerted governments’ desired effort levels on tasks 1 and 2, governments did not deliver their promised bonus 80.0 percent of the time. At first glance, it appears that governments behaved in line with theoretical predictions.

Governments nevertheless exhibited behaviour in PBs that challenges payoff-maximisation, which is consistent with the results in Treatment IP. Table 5.2.1 reveals that the extent to which governments reneged on their promised bonus decreased in the second half of the experiment. In particular, governments underpaid their promised bonus by 74.4 percent in the first half of the experiment, which decreased to 57.0 percent in the second. This is driven by the increase in average bonus payments from 91 points in the first half of the experiment to 268.3 points in the second. Moreover, governments rewarded not-for-profits who exerted their desired effort levels on tasks 1 and 2. Namely, governments increased their average bonus payments from 168.0 to 347.0 points when not-for-profits complied with their desired effort levels.
To quantify the effect of total effort levels on actual bonus payments, we conducted OLS regression (1) from Chapter 5.1. Table 5.2.2 contains the regression results, and shows that a one-unit increase in total effort \((e_1 + e_2)\) led to a 35 point increase in Actual Bonus \((p < 0.1)\), which is consistent with the results from IP. Governments therefore rewarded high effort levels with high bonus payments in both treatments.

### TABLE 5.2.2: OLS REGRESSION ON ACTUAL BONUS

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Robust standard errors</th>
<th>Clusters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Bonus</td>
<td>IP</td>
<td>PS</td>
</tr>
<tr>
<td>Constant</td>
<td>-205.65***</td>
<td>-239.34*</td>
</tr>
<tr>
<td></td>
<td>(66.75)</td>
<td>(135.58)</td>
</tr>
<tr>
<td>((e_1 + e_2))</td>
<td>63.94***</td>
<td>35.36*</td>
</tr>
<tr>
<td></td>
<td>(8.12)</td>
<td>(17.95)</td>
</tr>
<tr>
<td>(</td>
<td>e_1 - e_2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(26.51)</td>
<td>(86.47)</td>
</tr>
<tr>
<td>Wage</td>
<td>-0.51***</td>
<td>-0.10</td>
</tr>
<tr>
<td></td>
<td>(0.16)</td>
<td>(0.95)</td>
</tr>
<tr>
<td>(e_1^*)</td>
<td>11.62</td>
<td>12.71</td>
</tr>
<tr>
<td></td>
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<td>(84.22)</td>
</tr>
<tr>
<td>(e_2^*)</td>
<td>24.34</td>
<td>44.28</td>
</tr>
<tr>
<td></td>
<td>(21.80)</td>
<td>(89.57)</td>
</tr>
<tr>
<td>(b^*)</td>
<td>-0.14</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.13)</td>
</tr>
<tr>
<td>Obs</td>
<td>175</td>
<td>30</td>
</tr>
</tbody>
</table>

\* Significance level = 10%; ** Significance level = 5%; *** Significance level = 10%

In SIBs, the presence of an investor who is able to obtain hard monitoring information about not-for-profits’ performance allows the investor (and thus governments) to perfectly enforce effort on tasks 1 and 2. Governments should thus desire the highest possible effort on tasks 1 and 2. Moreover, the presence of a rational, computerized investor allows governments to fully extract the investor’s surplus, since other factors such as social preferences or human error

---

22 Refer to Appendix 4.1 for regression results with demographics.
cannot interfere with the investor’s decision-making. We thus ask: did governments fully exploit the investor’s ability to obtain hard monitoring information and rationality?

The data in Table 5.2.1 shows that governments began desiring higher effort levels as the experiment progressed, as their average bond offer and investor’s reservation bond increased from 643 and 609 points respectively in the first half of the experiment, to 708.5 and 742 points respectively in the second. Recall that the theoretically predicted bond offer and reservation bond is 880 points. In addition, governments often exploited the investor’s rationality, as 76.3 percent of accepted bond offers were very close to the investor’s reservation bond (i.e. reservation bond ≤ bond + 50 < reservation bond). It therefore appears that governments behaved in line with theoretical predictions.

However governments did not fully exploit the perfect enforceability of SIBs, as they desired the theoretically predicted effort levels only 36 percent of the time. In particular, on average they desired a total of 9.4 units of effort, which is lower than the theoretically predicted 12, and the average bond offer was 710 points, which is lower than the theoretically predicted 880. Perhaps governments were motivated by concerns for fairness – they did not want to earn substantially more than not-for-profits (Fehr and Schmidt, 1999). Or perhaps they were being strategic – they did not desire high effort levels, lest their offers are rejected by fair-minded not-for-profits (Camerer, 2003). However if governments were inequity-averse, they would desire effort levels \((e_1^*, e_2^*) = (3, 3)\) such that their points and not-for-profits’ points roughly equalize at 200 each, but this only occurred in 5 out of the 64 SIB offers. Also, governments designed 53 out of the 64 SIB offers such that they would earn more than two times more points than not-for-profits. Thus, although governments did not fully exploit the perfect enforceability of SIBs, they designed SIBs to ensure that they would earn more experimental points than not-for-profits.
**Result 8:** Governments’ designed contracts that were qualitatively in line with theoretic predictions as:

a) In PBs, governments often did not pay their promised bonus, even when not-for-profits complied with their desired effort levels.

b) In SIBs, governments offered bonds that were close to the investor’s reservation bond, and demanded higher effort levels as the experiment progressed.

**Result 9:** Governments exhibited behaviour that contradicts theoretic predictions. Namely,

a) Governments often reciprocated high effort with generous bonuses in PBs.

b) Governments did not fully exploit the perfect enforceability of SIBs, as they desired the highest effort levels \((e_1^*, e_2^*) = (6, 6)\) only 36 percent of the time.

**C. NOT-FOR-PROFITS’ EFFORT**

Table 5.2.3 contains governments’ desired effort levels, not-for-profits’ actual effort levels, and not-for-profits’ rejection rate (R%), averaged over the first and second half of the experiment.

<table>
<thead>
<tr>
<th>Contract</th>
<th>Periods 1-4</th>
<th>Periods 5-8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>(e_1^*)</td>
</tr>
<tr>
<td>PB</td>
<td>30</td>
<td>3.6</td>
</tr>
<tr>
<td>SIB</td>
<td>27</td>
<td>4.3</td>
</tr>
</tbody>
</table>

Not-for-profits qualitatively behaved in line with theoretic predictions, as they exerted on average less than what governments desired in PBs, but often complied with governments’ desired effort levels in SIBs. Specifically, in PBs not-for-profits exerted significantly less effort than what governments desired in every period but period 4\(^{23}\) of the experiment (see Figure 5.2.2), where the difference in desired and actual effort level is statistically significant (Mann-

\(^{23}\) Note that there were only 3 observations for performance-based offers in period 4 of PS.
Whitney, p < 0.01). In contrast, in SIBs there was only one instance in Period 1 where a not-for-profit did not comply with a government’s desired effort levels (see Figure 5.2.2).

Result 10: Not-for-profits behaved qualitatively in line with theoretic predictions, as they on average:

a) Exerted less effort than what governments desired in PBs.

b) Complied with governments’ desired effort levels in SIBs.
Moreover, not-for-profits’ effort levels in PBs mirrored their effort levels in SIBs. Namely, the mode effort choice in PBs was the most inefficient one (i.e. \(e_1, e_2 = \{1,1\}\)) whereas the mode effort choice in SIBs was the most efficient one (i.e. \(e_1, e_2 = \{6,6\}\)). Specifically, in PBs 53.3 percent of not-for-profits exerted minimum effort levels on both tasks, whereas only 10 percent exerted the socially optimum effort levels on both tasks. In contrast, in SIBs 36.2 percent of not-for-profits exerted the socially optimum effort levels on both tasks, whereas only 2 percent exerted minimum effort levels on both tasks.

At first glance, these results may seem unsurprising in light of the investor’s ability to perfectly enforce effort on tasks 1 and 2 in SIBs, and governments’ inability to enforce effort in PBs. However recall that theory predicts all not-for-profits will exert minimum effort in PBs and all not-for-profits will exert maximum effort in SIBs. However on average, not-for-profits exerted a total of 4.7 units of effort in PBs\(^{24}\) and 9.4 units of effort in SIBs\(^{25}\). The behavior of not-for-profits thus contradicts theoretic predictions in the experiment.

**Result 11:** Not-for-profits behaviour diverged from theoretical predictions, as they on average:

a) Exerted more than what was theoretically predicted in PBs.

b) Exerted less than what was theoretically predicted in SIBs.

Lastly, not-for-profits only rejected 8 out of the 63 SIB offers. Though theory predicts not-for-profits will never reject SIB offers since receiving a wage is better than nothing, the rejection rate is lower than what is commonly observed in the literature, especially since governments often earned substantially more experimental points than not-for-profits (e.g., see Camerer, 2003; Fehr and Schmidt, 2006).

\(^{24}\) However when we regressed the not-for-profit’s total effort on the specific components of PBs and dummy variable *Reciprocate-1* using OLS regression (2), not-for-profits actually decreased their total effort when governments paid an actual bonus that was greater than their promised bonus in the previous PBs. For the results, refer to Appendix 4.3.

\(^{25}\) The lower than predicted effort levels in SIBs are due to governments who do not desire the socially optimum effort levels.
D. PAYOFFS AND SOCIAL SURPLUS

To determine which contract fared best, we compare payoffs and social surplus in PBs and SIBs. Table 5.2.4 contains governments’ budget, not-for-profits’ utility, the investor’s utility, and social surplus in both contracts in experimental points, averaged over the first and second half of the experiment.

<table>
<thead>
<tr>
<th>Contract</th>
<th>Periods 1-4</th>
<th></th>
<th>Periods 5-8</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>M$_{G}$</td>
<td>M$_{N}$</td>
<td>M$_{I}$</td>
</tr>
<tr>
<td>PB</td>
<td>20</td>
<td>238.2</td>
<td>212.6</td>
<td>450.8</td>
</tr>
<tr>
<td>SIB</td>
<td>28</td>
<td>808.0</td>
<td>152.5</td>
<td>10.2</td>
</tr>
</tbody>
</table>

Table 5.2.4 reveals that governments earned substantially higher payoffs in SIBs than not-for-profits, earning on average at least four times more points than not-for-profits. In contrast, not-for-profits earned substantially higher payoffs in PBs than governments, which is inconsistent with the results obtained in IP. However upon further scrutiny of the data, average wage offers in PBs were high. Namely, average wage offers were 334.2 in the first half of the experiment, which increased to 654.4 in the second. However not-for-profits’ average cost of effort was 150 points in the first half of the experiment, which decreased to 120 points in the second. It is therefore likely that the surprising earnings in PBs is driven by governments who attempted to elicit gift exchange from not-for-profits by offering high wages (Fehr, Kirchsteiger, & Riedl, 1993), but got burnt by underperforming not-for-profits.

Social surplus was higher in SIBs than in PBs, as the perfect enforceability offered by investors led to higher and more efficient effort levels in SIBs than in PBs. In particular, average social surplus in SIBs was greater than PBs by 155 percent in the first half of the experiment, which increased to 235 percent in the second. On average, social surplus in PBs was 415.8 points, and 1098.9 points in SIBs. Therefore SIBs unequivocally outperformed PBs on the basis of social surplus. Moreover, if behaviour is roughly consistent across treatments, it implies that SIBs will
outperform IBs, since PBs outperformed IBs in Treatment **IP**. Indeed Figure 5.2.4 compares the social surplus generated in each contract from Treatments **IP** and **PS**, and shows that SIBs unambiguously yielded the highest social surplus, followed by PBs and IPs.

**FIGURE 5.2.4: SOCIAL SURPLUS POOLED DATA**

![](image)

**Result 12:** SIBs unambiguously generated higher surplus than PBs, and therefore outperformed PBs. Moreover, if behaviour is consistent across treatments, the result implies that SIBs would also outperform IBs.
CHAPTER 6: DISCUSSION

6.1. DO SOCIAL IMPACT BONDS WORK?

The aim of this thesis is to explore whether, and how exactly, the incentive mechanism in each contract exacerbates (or allays) the underperformance problem afflicting not-for-profits. The results from Treatment IP show that governments’ inability to monitor not-for-profits exacerbates the underperformance problem. In particular, the piece-rate component in IBs induced not-for-profits to exert disproportionate effort on task 1 and neglect effort on task 2. The non-binding nature of the bonus in PBs induced many governments to renege on their promise to pay the bonus, which in turn caused not-for-profits to exert low effort levels. In spite of this, in the absence of an investor who can obtain hard monitoring information about not-for-profits’ performance, governments preferred PBs to IBs, as they induced higher effort than IBs. Specifically, a fair number of governments paid generous bonuses to reward hard working not-for-profits, which induced a fair number of not-for-profits to exert high effort in PBs. As a result of this reciprocity “mechanism”, PBs outperformed IBs.

In light of this result, in Treatment PS we determine how SIBs fare in comparison to PBs in a first-best environment. We thus transferred two assumptions from the models developed in Chapter 3 – that investors are rational and able to obtain hard monitoring information about not-for-profits’ performance – to the laboratory to test whether SIBs work when they possess the ingredients that induce first-best effort levels theoretically. The predictions of Treatment PS are clear – SIBs should outperform PBs since they offer perfect enforceability.

However the benefit of perfect enforceability comes at a cost – governments must relinquish control over not-for-profits’ payoffs to the investor. The theoretic and experimental literature often portrays the investor or “middleman” as the archetypal selfish economic actor (Mookherjee, 2006; Plott, 1986). The middleman’s sole objective is to profit-maximize, and so
extracts maximum surplus from agents each time they transact. To preserve this assumption and to truly highlight the consequence of delegation, we used a computerized investor who was programmed to profit maximize in the experiment. The investor pays the not-for-profit a wage of $200 + c(e_1^*, e_2^*)$ when he exerts the government’s desired effort on tasks 1 and 2, which yields him a net payoff of 200 points (= $2). Hence, our rational investor never reciprocates high effort with high wages. Therefore by using the perfect enforceability of SIBs, governments lose control over not-for-profits’ payoffs and the ability to motivate them through reciprocity, and so the mechanism that rendered PBs powerful is absent in SIBs.

In spite of these drawbacks, the results from Treatment PS suggest SIBs work well: they were preferred to and unambiguously yielded higher social surplus than PBs. Moreover, not-for-profits’ effort levels converged towards the social optimum effort levels as the experiment progressed. Our experiment therefore shows that SIBs work in a first-best world. In particular, the investor’s ability to perfectly enforce effort can overcome the drawback associated with governments’ loss of control and their inability to reciprocate good performance with generous wages.
6.2 BEHAVIOURAL IMPLICATIONS

While pursuing the main objective of the experiment, we observed behaviour that substantially deviated from the standard assumption of payoff-maximisation. As such, in this section we take a detour from our main research question and attempt to explain these anomalies.

The model of self-interest cannot explain why PBs were preferred to and induced higher effort than IBs. Theory predicts that selfish governments will never pay the voluntary bonus, and so not-for-profits will always exert the lowest possible effort on tasks 1 and 2. Governments should therefore offer IBs, since they offer partial enforceability through the piece-rate. However in the experiment, the promise of a bonus was a more powerful motivational tool than the piece-rate. Indeed, a fair number of governments did pay generous bonuses to reward hard working not-for-profits, which induced a fair number of not-for-profits to exert high effort levels in PBs. PBs thus outperformed IBs in every possible dimension: they were preferred by governments, induced higher and more efficient effort levels, and yielded higher payoffs and social surplus than IBs.

We therefore ask why the promise of the bonus was a better motivational tool than the partial enforceability of the piece-rate. In the experiment, we used complete anonymity and random matching to remove opportunities for reputation building and to decrease the probability of future interactions. We therefore attempted to remove all explicit incentives to behave prosocially (Burnham & Johnson, 2005). However a growing number of scholars have begun to question the self-interested man, claiming that experimental, anthropological and historical evidence lends support to the existence of homo reciprocans – an individual who behaves prosocially even at a personal cost. His actions are often motivated by concerns for fairness, inequity aversion or reciprocity (Charness & Rabin, 2002; Fehr & Schmidt, 1999; Bolton & Ockenfels, 2000; Rabin, 1993). His other-regarding preferences can even alter the incentive properties of some contracts (e.g., see Fehr, Kirchsteiger & Riedl, 1993; Fehr & Schmidt, 2004;
Fehr, Klein, & Schmidt, 2007). In our experiment, it appears that a fair portion of governments in PBs behaved in line with homo reciprocans. Namely, they were willing to pay generous bonuses to reward high performing not-for-profits, even though it was individually costly.\textsuperscript{26} As such, not-for-profits exerted high effort on the two tasks.\textsuperscript{27}

Our experimental results thus pose a puzzling question – why does the reciprocity “mechanism” in PBs outperform the partial enforceability of the piece-rate in IBs, but the full enforceability of the investor in SIBs outperform the reciprocity mechanism in PBs? In other words, why do governments display other-regarding preferences in Treatment IP but less so in Treatment PS? And why do not-for-profits accept SIB offers so readily? Indeed, at first sight it seems surprising (see, for example, Fehr & Schmidt 1999, 2006; Camerer, 2003) that not-for-profits rarely rejected SIB offers in spite of the great payoff inequality that often resulted. Namely, if governments specified a performance target \( \{e_1, e_2\} = \{6, 6\} \), they would earn 1820 points (=\$9) whereas not-for-profits would only earn 200 points (=\$2).

A key insight from experimental economics is that the results of the experiment are contingent on the experimental design (Camerer, 2003; Smith, 2002; Ortmann 2010). It is quite probably that the specific design of our experiment – which uses a rational and computerized investor and gives governments the choice of one of two contracts – may have driven governments away from the reciprocity “mechanism” in PBs to the safe but mechanical mechanism in SIBs. Specifically, governments offer either PBs or SIBs to not-for-profits in Treatment PS. Not-for-profits can burn governments in PBs by exerting low effort, whereas governments are protected from being burned in SIBs by virtue of the investor. By making this shift in power explicit,

\footnote{Though it is beyond the scope of this thesis to identify the exact cause of this reciprocity, Fehr & Schmidt (2004) and Fehr, Klein, & Schmidt (2007) attribute it to inequity aversion. For a detailed reading of inequity aversion, we refer the reader to their papers, and Fehr & Schmidt (1999).}

\footnote{Note that governments could also use reciprocity in IBs. Specifically, they could offer large wages to elicit high effort levels or “gift exchange” from not-for-profits (e.g. see Fehr, Kirchsteiger, & Riedl, 1993; List 2006; Gneezy & List, 2006). However such a contract would be tremendously risky for governments, since there is some probability they might encounter self-interested not-for-profits. It is therefore for this reason that PBs – where governments can reciprocate high effort with generous bonuses rather than eliciting reciprocity through paying large upfront wages – were most probably preferred to IBs.}
governments might justify making SIBs offers and not-for-profits might legitimize them – even though it means governments lose control over not-for-profits’ payoff and their ability to exercise reciprocity via the bonus (Schnedler & Vadovic, 2011). SIB offers may further be legitimized when governments “give up” earning higher points by desiring less than socially optimum effort levels. Therefore the specific design of our experiment may have, in part, driven the success of SIBs. In particular, it may explain why governments behaved more “prosocially” in PBs and less so in SIBs.

28 On the other hand, the results from Treatment PS might simply be evidence of governments who do not truly have the type of social preferences that the results from Treatment IP and certain behavioural theories posit (e.g. see Dana et al, 2007; Kagel et al, 1996).
CHAPTER 7: CONCLUDING REMARKS AND FUTURE RESEARCH

In this thesis, we have shown both theoretically and experimentally how current contracting mechanisms exacerbate the underperformance problem afflicting not-for-profits, and how social impact bonds can overcome the underperformance problem in a first-best world. Our results therefore suggest that, at least for our experimental test-bed, social impact bonds can allay the underperformance problem afflicting not-for-profits in a first-best world.

Indeed by testing social impact bonds in a first-best environment, we have provided a platform from which other insightful theories and/or experiments can evolve. In particular, we can now ask: how will SIBs fare both theoretically and experimentally in contrast to other contracts when the assumptions that make them first-best are relaxed? In particular, what if the investor is unable to obtain hard monitoring information about not-for-profits? What if we relax the assumption of self-interest by letting human subjects play the role of investor? We argued that the high offer and acceptance rate of SIBs was driven by the design of the experiment, since governments’ contract choice set legitimized SIB offers. Hence, would the offer and acceptance rate of SIBs change if SIBs were the only contract in the government's choice set? Would not-for-profits still legitimize “unfair” SIB offers when there is a computerized investor? Would this change if a human subject played the investor? Indeed by testing the efficacy of social impact bonds in a first-best world, we have provided the best platform from which further research on social impact bonds (and behavioural contract theory) can be conducted.
REFERENCES


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APPENDIX 1: THE CONTROL TREATMENT

A1.1 INTRODUCTION, EXPERIMENTAL DESIGN AND IMPLEMENTATION

Treatment IP closely follows Fehr and Schmidt’s (2004; henceforth FS) experiment. However in contrast to FS (2004), in IP we 1) removed a design feature that was in FS (2004) (henceforth “FS rule”) and 2) changed their parameters. Therefore for comparison purposes and as a robustness check, we replicated IP with the FS rule, but retained our parameters. Hence, the Control Treatment serves two purposes: first, to compare our results with FS (2004) in light of our different parameterizations; and second, to determine whether the FS rule changes the behaviour of participants across Treatments IP and C.

The FS rule stipulates that governments (i.e. principals) are required to pay not-for-profits (i.e. agents) fully for the costs associated with their desired effort levels on tasks 1 and 2. Governments therefore had to offer a total wage that satisfies wage + (piece-rate x e₁*) ≥ c(e₁*,e₂*) for IBs, and wage ≥ c(e₁*,e₂*) for PBs. However in reality, governments rarely fully and upfront pay not-for-profits’ cost of financing (e.g. see PC 2010). We therefore decided to remove the FS rule in our experiment.

The FS rule does not alter the theoretical predictions for IP and C. Hence, we expected participants to behave similarly in IP and C. Moreover, we expected participants to behave similarly in C and FS (2004), since there was no reason to assume that our parameters would alter subjects’ behaviour across these experiments.

Table A1.1.1 contains the demographics of the experiment. The show-up fee was $30. Lastly, the implementation details of C are identical to IP (refer to Chapter 4.3).
TABLE A1.1: DEMOGRAPHICS

<table>
<thead>
<tr>
<th>Date</th>
<th>28-02-12</th>
<th>29-02-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
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<td>15:00-16:45</td>
</tr>
<tr>
<td>No. Periods</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>No. of participants</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>% Female</td>
<td>54</td>
<td>50</td>
</tr>
<tr>
<td>% Local</td>
<td>33</td>
<td>21</td>
</tr>
<tr>
<td>% Business Students</td>
<td>58</td>
<td>58</td>
</tr>
<tr>
<td>Age</td>
<td>18-34</td>
<td>19-27</td>
</tr>
<tr>
<td>Avg Earnings ($)</td>
<td>33.33</td>
<td>32.17</td>
</tr>
<tr>
<td>Min Earnings ($)</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>Max Earnings ($)</td>
<td>45</td>
<td>42</td>
</tr>
</tbody>
</table>

A1.2 EXPERIMENTAL RESULTS

A. GOVERNMENT CONTRACT OFFER

Figure A1.2.1 shows that in all periods of C and IP, and therefore regardless of the FS rule, the number of PB offers was equal to or higher than IB offers. Namely, governments offered PBs 58.3 percent (112 out of 192) and 75.4 percent (199 out of 264) of the time in C and IP respectively.

Result 1: Regardless of the FS rule, governments preferred PBs to IBs.

FIGURE A1.2.1: PROPORTION OF CONTRACTS OFFERED IN C (Left Panel) and IP (Right Panel)
As is evident in Figure A1.2.1, governments’ preference for PBs was more pronounced in IP. To understand this result, consider Figure A1.2.2, which compares governments’ wage offer to the cost associated with their desired effort levels (i.e. $c(e_1^*, e_2^*)$), averaged over each period of the experiment. In IBs, governments’ wage payment (i.e. wage + piece-rate*e) was often higher than $c(e_1^*, e_2^*)$. However in PBs, average wage payment (i.e. wage) was often smaller than $c(e_1^*, e_2^*)$ in IP, but was always higher than $c(e_1^*, e_2^*)$ in C due to the FS rule. By choosing PBs in IP, governments thus could pay low upfront wages to protect their earnings against the risk of underperforming not-for-profits. This most likely drove their preference for PBs in IP.

**FIGURE A1.2.2: WAGE: IB (Left Panel) and PB (Right Panel)**

**Result 2:** The FS rule influenced wage payment in PBs. Namely, governments:

a) On average offered a wage $w < c(e_1^*, e_2^*)$ in Treatment IP.

b) Always offered a wage $w \geq c(e_1^*, e_2^*)$ in Treatment C.

**B. GOVERNMENTS’ CONTRACT DESIGN CHOICE**

Table A1.2.1 contains governments’ design choices in both treatments, including their piece-rate s, promised bonus $b^*$, and actual bonus payment b, averaged over the first and second half of the experiment.
The data in Table A1.2.1 shows that governments understood the power of the piece-rate to induce effort on task 1, as average piece-rates were close to not-for-profits’ marginal cost of effort of thirty in both treatments. Hence, governments’ behaviour in IBs was consistent in both treatments.

In contrast, governments’ behaviour in PBs differed across treatments. Namely, though governments reneged often on their promise to pay their bonus in both treatments, the extent to which they reneged on their bonus is more pronounced in C than in IP. In C, governments’ actual bonuses were on average lower than their promised bonuses 93.7 percent of the time. Even when not-for-profits complied with governments’ desired effort levels, governments underpaid the promised bonus 96.3 percent of the time. In contrast, in IP, governments’ actual bonuses were smaller than their promised bonuses 82.5 percent of the time. However this decreased to 58.2 percent when not-for-profits complied with their desired effort levels. Also, in C governments’ average bonus payment was 34.8 points in the first half of the experiment, but decreased to 6.0 points in the second. This strongly contrasts with the increase in the average bonus payment in IP from 148.4 points to 214.4 points. We therefore observe a shift towards the theoretically predicted outcome in C but not in IP.

**Result 3:** Governments’ design of IBs was similar in both Treatments. However their design of PBs was different across both treatments. Namely, it:

a) Diverged from what was theoretically predicted in IP.

b) Converged to what was theoretically predicted in C.
Moreover, governments’ level of reciprocity in PBs varied across treatments. We show this in regression (1), where dependent variable Actual Bonus was regressed on not-for-profits’ total effort \((e_1 + e_2)\), effort difference \(|e_1 - e_2|\), and each component of the PB.

\[
\text{Actual Bonus} = \beta_0 + \beta_1 (e_1 + e_2) + \beta_2 |e_1 - e_2| + \beta_3 \text{Wage} + \beta_4 e_1^* + \beta_5 e_2^* + \beta_6 b^* + \varepsilon
\]  

(1)

Table A1.2.2 contains the regression results from IP and C. It shows that a one unit increase in total effort corresponded to a 64 (p < 0.01) and 25 (p < 0.05) point increase in IP and C respectively. However the effect of total effort on Actual Bonus in C is statistically insignificant in clustered regression (2). Hence, reciprocity is less apparent in C.

<table>
<thead>
<tr>
<th>TABLE A1.2.2: OLS REGRESSION ON ACTUAL BONUS</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Robust standard errors</th>
<th>(2) Clusters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Bonus</td>
<td>IP</td>
<td>Control</td>
</tr>
<tr>
<td></td>
<td>(31 Clusters)</td>
<td>(24 Clusters)</td>
</tr>
<tr>
<td>Constant</td>
<td>-205.65***</td>
<td>-70.68*</td>
</tr>
<tr>
<td></td>
<td>(66.75)</td>
<td>(39.37)</td>
</tr>
<tr>
<td>((e_1 + e_2))</td>
<td>63.94***</td>
<td>25.08**</td>
</tr>
<tr>
<td></td>
<td>(8.12)</td>
<td>(12.50)</td>
</tr>
<tr>
<td>(</td>
<td>e_1 - e_2</td>
<td>)</td>
</tr>
<tr>
<td></td>
<td>(26.51)</td>
<td>(22.38)</td>
</tr>
<tr>
<td>Wage</td>
<td>-0.51***</td>
<td>0.12*</td>
</tr>
<tr>
<td></td>
<td>(0.16)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>(e_1^*)</td>
<td>11.62</td>
<td>-9.16</td>
</tr>
<tr>
<td></td>
<td>(22.12)</td>
<td>(9.96)</td>
</tr>
<tr>
<td>(e_2^*)</td>
<td>24.34</td>
<td>5.76</td>
</tr>
<tr>
<td></td>
<td>(21.80)</td>
<td>(9.13)</td>
</tr>
<tr>
<td>(b^*)</td>
<td>-0.14</td>
<td>-0.02</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.01)</td>
</tr>
<tr>
<td>Obs</td>
<td>175</td>
<td>95</td>
</tr>
<tr>
<td>Adjusted R(^2)</td>
<td>0.50</td>
<td>0.32</td>
</tr>
</tbody>
</table>

*Significance level = 10%; **Significance level = 5%; ***Significance level = 10%
C. NOT-FOR-PROFITS’ BEHAVIOUR

Table A1.2.3 summarises governments’ desired effort levels, not-for-profits’ actual effort levels and not-for-profits’ rejection rate (R%) in all contracts in IP and C, averaged over the first and second half of the experiment.

<table>
<thead>
<tr>
<th>Contract</th>
<th>Periods 1-4</th>
<th>Periods 5-8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>e₁* e₁ e₂* e₂ R%</td>
<td>e₁* e₁ e₂* e₂ R%</td>
</tr>
<tr>
<td>C IB</td>
<td>36 3.4 3.6 2.6 1.1 8 44 3.0 2.6 1.7 1.0 18</td>
<td></td>
</tr>
<tr>
<td>IP IB</td>
<td>33 3.6 3.4 3.0 1.4 15 32 4.5 4.0 2.7 1.2 16</td>
<td></td>
</tr>
<tr>
<td>C PB</td>
<td>60 3.3 1.8 3.4 1.8 7 52 2.8 1.3 6.1 1.2 25</td>
<td></td>
</tr>
<tr>
<td>IP PB</td>
<td>99 4.3 2.7 4.2 2.6 12 100 4.5 3.1 4.6 3.0 12</td>
<td></td>
</tr>
</tbody>
</table>

In IBs, not-for-profits exploited the contractible nature of task 1 and the non-contractible nature of task 2. Specifically, they exerted roughly 1.3 and 2.1 more units of effort on contractible task 1 in Treatment C and IP respectively when governments offered a piece-rate equal to or greater than their marginal cost of effort of 30 (see Table A1.2.4 below). In contrast, they exerted on average 1.0 and 1.3 units of effort on non-contractible task 2 in C and IP respectively.

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>(1) Robust standard errors</th>
<th>(2) Clusters</th>
</tr>
</thead>
<tbody>
<tr>
<td>e₁ IP</td>
<td>0.32 (0.46)</td>
<td>0.48 (0.67)</td>
</tr>
<tr>
<td></td>
<td>e₁ C</td>
<td>0.32 (0.33)</td>
</tr>
<tr>
<td></td>
<td>e₂ IP 0.62*** (0.25)</td>
<td>0.09 (0.09)</td>
</tr>
<tr>
<td></td>
<td>e₂ C 0.62*** (0.20)</td>
<td>0.11 (0.09)</td>
</tr>
<tr>
<td>Piece rate (0.13)</td>
<td>0.01*** (0.02)</td>
<td>0.00 (0.01)</td>
</tr>
<tr>
<td>Wage -0.00</td>
<td>-0.00 (0.00)</td>
<td>0.00* (0.00)</td>
</tr>
<tr>
<td>PR 1.19** (0.51)</td>
<td>1.19** 2.13*** (0.48)</td>
<td>2.13*** (0.73)</td>
</tr>
<tr>
<td>Obs 69</td>
<td>69 55 55 55</td>
<td></td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.39 0.39 0.36 0.36</td>
<td></td>
</tr>
</tbody>
</table>

*Significance level = 10%; **Significance level = 5%; ***Significance level = 10%
In PBs, not-for-profits on average exerted less effort than what governments desired. In total, 74.7 and 53.3 percent of not-for-profits in C and IP respectively exerted minimum effort on tasks 1 and 2. However as the experiment progressed, the behaviour of not-for-profits diverged from theoretical predictions in IP but converged to theoretical predictions in C (refer to Figure A1.2.3 below). Namely, not-for-profits on average increased their total effort from 5.3 to 6.1 in IP, but decreased their total effort from 3.6 to 2.5 in C from the first half to the second half of the experiment. Recall that the theoretically predicted total effort is 2.

**FIGURE A1.2.3: DESIRED AND ACTUAL EFFORT IN PB**
CONTROL (Left Panel) and IP (Right Panel)

**Result 4:** In both treatments, not-for-profits generally:

1) Exploited the contractible nature of task 1 and the non-contractible nature of task 2 in IBs.

2) Exerted less effort than what governments desired in PBs. However their behaviour converged to theoretic predictions in IP, but diverged from theoretic predictions in C.

**D. PAYOFFS AND SOCIAL SURPLUS**

Table A1.2.5 contains governments’ budget, not-for-profits’ utility and social surplus (W) in experimental points (E), averaged over the first and second half of the experiment.
<table>
<thead>
<tr>
<th>Contract</th>
<th>Periods 1-4</th>
<th>Periods 5-8</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>E^G</td>
</tr>
<tr>
<td>C</td>
<td>IB</td>
<td>36</td>
</tr>
<tr>
<td>IP</td>
<td>IB</td>
<td>33</td>
</tr>
<tr>
<td>C</td>
<td>PB</td>
<td>60</td>
</tr>
<tr>
<td>IP</td>
<td>PB</td>
<td>99</td>
</tr>
</tbody>
</table>

Governments earned substantially more points in IP than in C. In particular, they earned at least three times more in contracts without the FS rule (i.e. in IP) than in contracts with the FS rule (i.e. in C), and often made negative earnings in C. In contrast, not-for-profits on average earned more in C than in IP, and earned more than governments in C. Lastly social surplus was higher in IP than in C (refer to Figure A1.2.4 below), as average social surplus was 121.9 points in C and 461.0 points in IP.

**Result 5:** Contracts without the FS rule (IP) outperformed their counterpart with the FS rule (C), as they yielded significantly higher social surplus.

Therefore the seemingly innocuous FS rule had a pronounced effect on the outcome of the experiment, and particularly the payoffs of not-for-profits and governments, and social surplus.
A1.3 DISCUSSION AND CONCLUDING REMARKS

Treatment IP is based on FS’s (2004) multitasking experiment, where principals offer either bonus (i.e. performance-based) or piece-rate (i.e. inputs-based) contracts to the agent (i.e. not-for-profit.) However unlike our experiment, in FS (2004) principals were constrained by the FS rule. We therefore conducted Treatment C to test the robustness of FS’s (2004) results in light of removing the FS rule and our different parameterization.

This section is to some extent speculative since the experimental results discussed in the body of the text are a function of the FS rule and our calibrated parameterization. Ideally we would have two more treatments – one where we use FS’s (2004) parameterization but remove the FS rule, and another where we use FS’s (2004) parameterization but implement the FS rule.


In FS (2004), the principal’s revenue was $10e_1e_2$ whereas ours was $75e_1e_2$. Furthermore, agents had to choose effort levels $e_1 \ [1, 2, \ldots, 10]$ and $e_2 \ [1, 2, \ldots, 10]$, where $c(e_1,e_2) = 5(e_1+e_2)$ when $(e_1+e_2) \leq 10$ and $c(e_1,e_2) = 50 + 10(e_1+e_2)$ when $10 < (e_1+e_2) \leq 20$. In contrast, agents had to choose effort levels $e_1 \ [1, 2, \ldots, 6]$ and $e_2 \ [1, 2, \ldots, 6]$, where $c(e_1,e_2) = 30(e_1+e_2)$ when $(e_1+e_2) \leq 10$ and $c(e_1,e_2) = 180 + 75(e_1+e_2)$ in ours. Our parameterisation makes desiring high effort and hence offering high wages more costly for principals, if agents choose low effort. However it makes choosing low effort more advantageous for agents if principals offer high wages. To demonstrate this, consider the following example: suppose the principal specifies effort levels $e_1 = e_2 = 6$, and so offers a minimum wage of 70 in FS and 630 in ours. However the agent’s actual effort levels are $e_1 = e_2 = 1$. The principal’s payoff is thus -60 in FS and -555 in ours, but the agent’s payoff is 60 in FS and 570 in ours. Our parameterisation therefore makes trusting agents more risky for principals and shirking more attractive for agents. Indeed this may explain why agents on average exerted 60.3 percent (12.05 out of 20) of the maximum effort
level in FS (2004) and 25.6 percent (3.07 out of 12) of the maximum effort level in Treatment Control. Therefore the highly cooperative behaviour in FS’s (2004) experiment and the low level of cooperation in ours may be driven by our parameters.

B. C VERSUS IP

The behaviour of participants varied across treatments, even though theory predicts they would behave similarly. The FS rule is akin to governments who compensate not-for-profits’ cost of delivering a specified service fully and upfront. It applies to a customer who pays the car mechanic before he starts fixing the engine, to a patient who pays the doctor to perform surgery before the surgery commences, or more generally to a consumer who pays for an experience good before it is delivered. But how pervasive is full-cost-of-funding in real life? Can consumers really trust that providers of experience goods will deliver their services adequately? Common sense warns us to withhold payments until service providers have completed their task satisfactorily, as they might take the money and run.

The results of the experiment seem to make sense. When the FS rule was removed in IP, governments that offered PBs often paid wages that did not compensate the cost associated with their desired effort levels, but promised large bonuses to encourage hard work. In response, many not-for-profits exerted effort levels greater than what is theoretically predicted. Thus, even in the midst of low wage offers, the promised bonus was a powerful motivation tool. However when the FS rule was imposed in Control, 95.7 percent of not-for-profits exerted lowest effort levels $e_1 = e_2 = 1$. This shows that there are severe incentives to underperform when full and upfront financing is enforced. The results therefore cautions us against the use of full-cost-of-funding when the incentives to shirk are steep, and poses a challenge to gift exchange, which posits a positive relationship between wage and effort exist (Akerlof & Yellen, 1990; Fehr, Kirchsteiger, & Riedl, 1993).
C. CONCLUDING REMARKS

Theory predicts that 1) the parameters of the experiment and 2) the FS rule will not affect behaviour of participants in the experiment. However our results show that it does. Our results also suggest caution against the use of arbitrary parameters in experiments.
APPENDIX 2: THE EXPERIMENT

For the experiment, we used different titles for contracts. I.e. Inputs-based contract = Piece-rate contract; Performance-based contract = Bonus contract; Social Impact Bond = Performance-based contract.

A2.1: DETAILED INSTRUCTIONS

Introduction

Welcome!

The experiment that you have agreed to participate in today is used to analyse economic decision-making. Your earnings from this experiment consist of a show-up fee of $5 and the money you earn during the experiment. Your earnings during the experiment depend on the decisions you make and the decisions of others. Your earnings are calculated in points, which will be converted to dollars at the end of the experiment as follows:

{For C, IP or Employer in PS add: 200 points = $1}
{For Employee PS add: 100 points = $1}

Therefore your $5 show-up fee equals {For C, IP or Employer in PS add: 1000 points} {For Employee in PS add: 500 points}. If you make losses greater than {For C, IP or Employer in PS add: 1000 points} {For Employee in PS add: 500 points} during the experiment, we will have to exclude you from the experiment. **However you always have decisions in your choice set that prevent the risk of making losses during the experiment.**

At the end of the experiment, the points you have earned will be added up, converted into $AUS, and paid to you in cash before you leave.

Please read these instructions carefully, and then complete the quiz. Once the experimenter goes through the answers to the quiz, we will begin the experiment.

You are not allowed to talk to any of other participants. We will have to ask you to leave if you violate this rule. If you have questions, please raise your hand and wait for an experimenter to come and answer your questions.

Also, feel free to scribble on the instructions in any way you want.

___ Page Break ___
General Information

0. In the experiment, there are \{For C or IP add: Employers and Employees\} \{For SP add: Employers, Employees and Supervisors\}. In the experiment, \textit{you are always the} \{For Employee add: “Employee”\} \{For Employer add: “Employer”\}. \{For PS add: The computer is always the “Supervisor”. The computer is never the “Employer” or the “Employee”. Only participants are “Employers” or “Employees”\}.

The experiment lasts \{For C or IP add: 10\} \{For PS add: 8\} periods. In each period, Employees are randomly assigned a new Employer. Employees are therefore not likely to meet the same Employer more than once. In each period, Employers make an offer to their assigned Employee. The Employee can either accept or reject the offer.

The identities of Employees and Employers remain unknown throughout the experiment. The Employee’s decision is revealed to his/her assigned Employer, only within the period they interact. Similarly, the Employer’s decision is revealed to his/her assigned Employee, only within the period they interact. Therefore no other participants will know your decisions.

1. In the experiment, the \textbf{Employee performs two tasks: task 1 and task 2}. The \textbf{Employer desires the Employee to exert certain effort levels on the two tasks} – which we denote \textit{desired effort1} and \textit{desired effort2}.

The Employer must also decide whether s/he wants to make the Employee \{For C or IP add: a “Bonus Offer” or a “Piece-Rate Offer”\} \{For PS add: a “Bonus offer” or make the Supervisor a “Performance-Based offer”\}.

The \textbf{Bonus Offer} consists of three components:

- The two \textit{desired effort levels}, \textit{desired effort1} and \textit{desired effort2},
- The \textbf{Employee’s Wage}, \textit{Employee’s Wage}; and
- A \textbf{Bonus} that is promised to the Employee, \textit{Promised Bonus}.

\{For C or IP add: The \textbf{Piece-Rate Offer} consists of three components:

- The two \textit{desired effort levels}, \textit{desired effort1} and \textit{desired effort2},
- The \textbf{Employee’s Wage}, \textit{Employee’s Wage}; and
- A \textbf{Piece-rate} for each level of \textit{effort on task 1}, \textit{Piece-rate}.\}

\{For PS add: The \textbf{Performance-Based Offer} consists of two components:

- The two \textit{desired effort levels}, \textit{desired effort1} and \textit{desired effort2}; and
- The \textbf{Supervisor’s Wage}, \textit{Supervisor’s Wage}.

\}

In Bonus Offers, \{For C or IP add: the Employer is allowed to change his/her Promised Bonus.\} \{For PS add: the Employee makes an offer to the Supervisor.\}
For C or IP add: In Piece-Rate Offers, the Employer pays the Employee for every level of effort s/he exerts on task 1. Note that the Piece-rate is paid only for effort on task 1 and not for effort on task 2.

For PS add: In the Performance-Based Offer, the Employer makes an offer to the Supervisor (i.e. the computer).

Once Employers have chosen their offer, the first stage of the period ends.

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2. In the second stage of {For C or IP add: the Bonus Offer and the Piece-Rate Offer} {For PS add: the Bonus Offer}, the Employee must accept or reject the Employer’s offer.

For PS add: In the second stage of the Performance-Based Offer, the Supervisor (i.e. the computer) must accept or reject the Employer’s offer.

- If the Supervisor rejects the offer, the period ends for the Employer, Supervisor and Employee. They all earn nothing (i.e. 0 points).
- If the Supervisor accepts the offer, it makes a “Supervisor’s Performance-Based Offer” to the Employee. The Supervisor’s Performance-Based Offer consists of two components:
  - The two desired effort levels, desired effort1 and desired effort2, which the Employer specified in his/her Performance-Based offer; and
  - The Employee’s Wage, Employee’s Wage.

Once the Supervisor makes the Supervisor’s Performance-Based Offer, the Employee must accept or reject the Supervisor’s offer.

If the Employee rejects {For C or IP add: the Bonus Offer or the Piece-Rate Offer} {For PS add: the Bonus Offer or the Supervisor’s Performance-Based Offer}, the period ends for {For C or IP add: the Employer and Employee} {For PS add: the Employer, Supervisor and Employee}. {For C or IP add: Both} {For PS add: All} earn nothing (i.e. 0 points).

If the Employee accepts {For C or IP add: the Bonus Offer or the Piece-Rate Offer} {For PS add: the Bonus Offer or the Supervisor’s Performance-Based Offer}, the Employee chooses his/her actual effort levels, effort1 and effort2. His/her choice of actual effort levels, effort1 and effort2, can be equal to, higher than or lower than the effort levels desired by the Employer {for PS add: or Supervisor}, desired effort1 and desired effort2. Therefore the Employee can choose an effort level that is different to the Employer’s {for PS add: or Supervisor’s} desired effort levels, desired effort1 and desired effort2.

The actual effort level the Employee chooses is associated with a cost. The Employee’s Cost of Total Effort depends on the Employee’s total actual effort level (Total Effort = Effort1 + Effort2). Hence, cost does not depend on how the Employee allocates his/her effort between task 1 and task 2. It only depends on Total Effort.
3. In the third stage of the Bonus Offer, the Employer finds out the Employee’s actual effort levels, effort1 and effort2. The Employer then chooses and pays an Actual Bonus. The Actual Bonus can be higher than, equal to or lower than the Promised Bonus. The Employer can therefore choose an Actual Bonus that is different from his/her Promised Bonus.

{For C or IP add: In the third stage of the Piece-Rate Offer, the Employer finds out the Employee’s actual effort levels, effort1 and effort2.}

{For PS add: In the third stage of the (Supervisor’s) Performance-Based Offer, the Supervisor monitors the Employee’s actual effort levels, effort1 and effort at a cost of 50 points. Monitoring ensures that:

- If the Employee’s actual effort levels are different to the Employer’s desired effort levels (i.e. effort1 ≠ desired effort1 and/or effort2 ≠ desired effort2), the Supervisor and Employee receive no wage (i.e. 0 points).
- If the Employee’s actual effort levels are the same as the Employer’s desired effort levels (i.e. effort1 = desired effort1 and effort2 = desired effort2), the Supervisor and Employer receive the specified Supervisor’s Wage and Employee’s Wage respectively.}

The third stage of {For C or IP add: the Bonus Offer and the Piece-Rate Offer}{For PS add: the Bonus offer and the (Supervisor’s) Performance-Based Offer} ends when {For C or IP add: both} {For PS add: all} are informed of each other’s points.

The separate sheet on your desk labelled “INFORMATION FACT SHEET” contains a graph that summarises the sequence of decisions that must be made in each period. Please make yourself familiar with that graph. If you have questions, please raise your hand and an experimenter will come to you and answer it.

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{For Employers add: Detailed Information for Employers}

The following contains more detail about the procedures and rules:

1. At the beginning of each period, you must make {For C or IP add: a Bonus Offer or a Piece-Rate Offer} {For PS add: a Bonus Offer or a Performance-Based Offer} and specify the details of the offer.

2. Specifically, you must specify two desired effort levels for task 1 and task 2, desired effort1 and desired effort2. You can specify 6 possible effort levels for desired effort1 and desired effort2. For desired effort1, the lowest effort level you can specify is 1 and the highest is 6. For desired effort2, the lowest effort level you can specify is 1 and the highest is 6.

Your profit depends on the actual effort levels the Employee chooses, not your desired effort levels. It also depends on the Employee’s combination of effort on task 1 and task 2.

Your revenue is \((75 \times \text{effort1} \times \text{effort2})\)
If $effort1 = 4$ and $effort2 = 2$, you earn $75 \times 4 \times 2 = 600$ points. In contrast, if $effort1 = 3$ and $effort2 = 3$, you earn $75 \times 3 \times 3 = 675$ points.

In the first example, if $effort1$ increases from 4 to 5, you earn $75 \times 5 \times 2 = 750$ points. You earn an additional 150 points. In the second example, if $effort1$ increases from 3 to 4, you earn $75 \times 4 \times 3 = 900$ points. You earn an additional 225 points.

If actual effort levels on both tasks is minimal, i.e. $effort1 = 1$ and $effort2 = 1$, you earn 75 points. However if actual effort levels on both tasks are maximal, i.e. $effort1 = 6$ and $effort2 = 6$, you earn 2700 points.

The actual level of effort the Employee chooses is associated with a cost. The larger the total effort level ($Total\ Effort = effort1 + effort2$), the greater the Employee’s Cost of Total Effort is. See the Information Fact Sheet Table 1: Employee’s Cost of Total Effort, which contains the Employee’s possible effort levels and related costs. All Employee(s) have the same Cost of Effort table.

Note that the way the Employee allocates Total Effort levels between $effort1$ and $effort2$ does not influence his/her Cost of Total Effort. Only Total Effort counts. However, because it can influence the Employee’s earnings, your “Offer Type” (i.e. either [For C or IP add: a Bonus Offer or a Piece-Rate Offer] [For PS add: a Bonus Offer or a Performance-Based Offer]) can affect the way the Employee allocates his/her effort between $effort1$ and $effort2$.

3. “Bonus Offer” Rules:

- [For C add: The Employee’s Wage you offer must cover the Cost of Total Effort associated with your desired effort levels ($Total\ Desired\ Effort = desired\ effort1 + desired\ effort2$). For example, if you specify desired effort levels $desired\ effort1 = 4$ and $desired\ effort2 = 4$, you must offer at least an Employee’s Wage of 330, because the Cost of Total Desired Effort $4 + 4 = 8$ equals 330 points (see Table 1: Employee’s Cost of Total Effort on the Information Fact Sheet).]

- The sum of the Employee’s Wage and the Promised Bonus cannot exceed 2700 points.

- The sum of the Employee’s Wage and the Actual Bonus cannot exceed 2700 points.

4. [For C or IP add: “Piece-Rate Offer” Rules:

- The Employee’s Wage and Piece-rate you offer remain fixed for the entire period.

- The Piece-Rate is paid for the Employee’s actual effort level on task 1, $effort1$. It is not paid for the Employee’s actual effort level on task2, $effort2$. Hence, at the end of the period the Employee’s total wage consists of the Employee’s Wage plus the Piece-rate multiplied by actual effort level on task 1, $effort1$. Therefore the Employee’s total wage is calculated as (Employee’s Wage + Piece-Rate x $effort1$).
- **For C add:** The Employee’s Wage and Piece-rate payment offered must cover the Cost of Total Effort associated with your desired effort levels \( \text{Total Desired Effort} = \text{desired effort1} + \text{desired effort2} \). For example, if you specify efforts levels \( \text{desired effort1} = 4 \) and \( \text{desired effort2} = 4 \), you must offer at least a total wage (Employee’s Wage + Piece-Rate x effort1) of 330, because the Cost of Total Desired Effort \( 4 + 4 = 8 \) equals 330 points (see Table 1: Employee’s Cost of Total Effort on the Information Fact Sheet).

- Employee’s Wage cannot be negative.

- The combination (Employee’s Wage + Piece-Rate x effort1) cannot exceed **2700 points**.

5. **For PS add: “(Supervisor’s) Performance-Based Offer” Rules:**

- The Supervisor (i.e. the computer) specifies and pays the Employee’s Wage.

- The Supervisor pays the “Employee’s Wage” only if the Employee exerts your specified desired effort levels, \( \text{desired effort1} \) and \( \text{desired effort2} \), on tasks 1 and 2. In other words, the Employee receives his/her “Employee’s Wage” only if his/her actual effort level on task 1 equals your desired effort level on task 1 (i.e. \( \text{effort1} = \text{desired effort1} \)), and if his/her actual effort level on task 2 equals your desired effort level on task 2 (i.e. \( \text{effort2} = \text{desired effort2} \)). If not, the Employee does not receive the “Employee’s Wage” (i.e. s/he earns 0 points).

  o The Supervisor always offers an “Employee’s Wage” equal to the Cost of Total Effort associated with your specified total desired effort levels \( \text{desired effort1} + \text{desired effort2} \) plus 200. For example, if you desire effort levels \( \text{desired effort1} = 4 \) and \( \text{desired effort2} = 4 \), the Supervisor offers an Employee’s Wage of 530. This is because the Cost of Total Desired Effort \( 4 + 4 = 8 \) equals 330, plus 200, equals 530 (see Table 1: Employee’s Cost of Total Effort on the Information Fact Sheet).

- You specify and pay the Supervisor’s Wage (i.e. the computer’s wage).

- You pay the Supervisor its “Supervisor’s Wage” only if the Employee exerts your specified desired effort levels, \( \text{desired effort1} \) and \( \text{desired effort2} \), on tasks 1 and 2. If the Employee does not, you do not pay the Supervisor’s Wage (i.e. you pay 0 points).

- The Supervisor rejects your Performance-Based Offer if your “Supervisor’s Wage” offer is too low. Specifically:
  - The Supervisor’s Wage must cover the cost of the “Employee’s Wage” plus the Supervisor’s Cost of Monitoring (i.e. 50 points).
  - For example, if you desire effort levels \( \text{desired effort1} = 4 \) and \( \text{desired effort2} = 4 \), the Supervisor’s Wage must be at least 580. This is because the Supervisor offers an Employee’s Wage of 530 (i.e. the Cost of Total Desired Effort \( 4 + 4 = 8 \) equals 330, plus 200, equals 530) plus the Cost of Monitoring (i.e. 50 points) equals 580 (see Table 1: Employee’s Cost of Total Effort on the Information Fact Sheet).
  - Simply put, the Supervisor accepts your Performance-Based Offer if:
Supervisor’s Wage ≥ Employee’s Wage (Cost of Total Desired Effort + 200) + 50

Profit and Earnings calculation at the end of the period

At the end of the period, you will encounter one of these outcomes:

1. If the Employee rejects the Bonus Offer {For C or IP add: or the Piece-Rate Offer}, your Profit and the Employee’s Earnings for the period is 0 points.

2. {For PS add: If the Employee rejects the Supervisor’s Performance-Based Offer, your Profit, the Supervisor’s Earnings and the Employee’s Earnings for the period is 0 points.}

3. {For PS add: If the Supervisor rejects the Employer’s Performance-Based Offer, your Profit, the Supervisor’s Earnings and the Employee’s Earnings for the period is 0 points.}

4. If the Employee accepts your offer, your profit, {For PS add: the Supervisor’s Earnings} and the Employee’s Earnings depend on the Employee’s actual effort levels on task 1 and task 2, effort1 and effort2.

5. If the Bonus Offer is accepted, you and the Employee earn the following points:

| Your Profit = Revenue (75 x effort1 x effort2) – Employee’s Wage – Actual Bonus |
| Employee’s Earnings = Employee’s Wage + Actual Bonus – Cost of Total Effort* |

*See Table 1: Employee’s Cost of Total Effort on the Information Fact Sheet}

6. {For C or IP add: If the Piece-Rate Offer is accepted, you and the Employee earn the following points:

| Your Profit = Revenue (75 x effort1 x effort2) – Employee’s Wage – (Piece-Rate x Actual effort on task 1 (effort1)) |
| Employee’s Earnings = Employee’s Wage + (Piece-Rate x Actual effort on task 1 (effort1)) – Cost of Total Effort* |

*See Table 1: Employee’s Cost of Total Effort on the Information Fact Sheet}

7. {For PS add: If the (Supervisor’s) Performance-Based Offer is accepted, you, the Supervisor and the Employee earn the following points:

If effort1 = desired effort1 and effort2 = desired effort 2:
If \( \text{effort1} \neq \text{desired effort1} \) and/or \( \text{effort2} \neq \text{desired effort2} \), \textbf{Supervisor’s Wage} = \textbf{Employee’s Wage} = 0:

<table>
<thead>
<tr>
<th>Your Profit</th>
<th>( = \text{Revenue (75 x \text{effort1} x \text{effort2})} - 0 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisor’s Earnings</td>
<td>( = 0 – 0 – \text{Cost of Monitoring (50)} = -50 )</td>
</tr>
<tr>
<td>Employee’s Earnings</td>
<td>( = 0 – \text{Cost of Total Effort}* ) ( = 200 )</td>
</tr>
</tbody>
</table>

*See Table 1: Employee’s Cost of Total Effort on the Information Fact Sheet*

\{\textbf{For C or IP add}: In Piece-Rate offers, the Piece-Rate is only paid for the Employee’s \textit{actual} effort level on \textit{task 1}. It is not paid for the Employee’s \textit{actual} effort level on \textit{task 2}. Hence, the way the Employee allocates his/her effort, \textit{effort1} and \textit{effort2}, influences your Piece-rate payment (Piece-rate \( \times \text{effort1})\}\}

\{\textbf{For PS add}: In Performance-Based offers, you pay the Supervisor’s Wage only if the Employee’s \textit{actual} effort levels equals your desired effort levels. Therefore the way the Employee allocates his/her effort, \textit{effort1} and \textit{effort2}, influences your Supervisor’s Wage payment.\}

\textbf{All participants know how to calculate your Profit, \{For I/S or PS add: the Supervisor’s Earnings\} and the Employee’s Earnings.}

Do you have any questions?}

___ Page Break ___

\{\textbf{For Employees add: Detailed information for the Employees}

The following contains more detail about the procedures and rules:

1. At the beginning of each period, you are told your Employer’s “Offer Type” (i.e. whether s/he chose \{\textbf{For C or IP add}: a Bonus Offer or a Piece-Rate Offer\} \{\textbf{For PS add}: a Bonus Offer or a Performance-Based Offer\},) and the details of the offer. \{\textbf{For PS add}: If the Employer made a Performance-Based Offer and if the Supervisor accepted the offer, you will also be told the details of the Supervisor’s Performance-Based Offer.\}

2. You must accept or reject the offer. If you accept the offer, you must choose your actual effort levels. You can choose from \textbf{6 possible effort levels} for \textit{effort1} and \textit{effort2}. For \textit{effort1}, the lowest effort level you can choose is 1 and the highest is 6. For \textit{effort2} the lowest effort level you can choose is 1 and the highest is 6.

The Employer’s profit depends on your \textit{actual} effort levels, not the Employer’s \textit{desired} effort levels. It also depends on your combination of effort on \textit{task 1} and \textit{task 2}.

\[ \text{The Employer’s revenue is} \ (75 \times \text{effort1} \times \text{effort2}) \]
If effort1 = 4 and effort2 = 2, the Employer earns 75 x 4 x 2 = 600 points. In contrast, if effort1 = 3 and effort2 = 3, the Employer earns 75 x 3 x 3 = 675 points.

In the first example, if effort1 increases from 4 to 5, the Employer earns 75 x 5 x 2 = 750 points. The Employer earns an additional 150 points. In the second example, if effort1 increases from 3 to 4, the Employer earns 75 x 4 x 3 = 900 points. The Employer earns an additional 225 points.

If actual effort levels on both tasks is minimal, i.e. effort1 = 1 and effort2 = 1, the Employer earns 75 points. However if actual effort levels on both tasks are maximal, i.e. effort1 = 6 and effort2 = 6, the Employer earns 2700 points.

The actual level of effort you choose is associated with a cost. The larger the total effort level (Total Effort = effort1 + effort2), the greater your Cost of Total Effort is. See the Information Fact Sheet for Table 1: Employee’s Cost of Total Effort, which contains your possible effort levels and related costs. All Employee(s) have the same Cost of Effort table.

How you allocate your Total Effort levels between effort1 and effort2 has no influence on your Cost of Total Effort. Only Total Effort counts. However, depending on the Employer’s “Offer Type”, (i.e. either [For C or IP add: a Bonus Offer or a Piece-Rate Offer] [For PS add: a Bonus Offer or a Performance-Based Offer]), how you allocate your effort between effort1 and effort2 can affect your earnings.

“Bonus Offer” Rules:

- [For PS add: The Employer specifies and pays the Employee’s Wage.]

- [For C add: The Employee’s Wage must cover the Cost of Effort associated with the Employer’s desired effort levels (Total Desired Effort = desired effort1 + desired effort2). For example, if the Employer desires effort levels desired effort1 = 4 and desired effort2 = 4, s/he must offer at least an Employee’s Wage of 330, because the Cost of Total Desired Effort 4 + 4 = 8 equals 330 (see Table 1: Employee’s Cost of Total Effort on the Information Fact Sheet).]

3. [For C or IP add: “Piece-Rate Offer” Rules:

- The Piece-Rate is paid for your actual effort level on task 1, effort1. It is not paid for your actual effort level on task 2, effort2. Hence, at the end of the period, total wage consists of the Employee’s Wage plus the Piece-rate multiplied by actual effort level on task 1, effort1. Therefore your total wage is calculated as (Employee’s Wage + Piece-Rate x effort1).]

- [For C add: The Employee’s Wage and Piece-rate payment must cover the Employer’s desired effort levels (Total Desired Effort = desired effort1 + desired effort2). For example, if the Employer desires effort levels desired effort1 = 4 and desired effort2 = 4, s/he must offer at least a total wage (Employee’s Wage + Piece-Rate x effort1) of 330, because the
Cost of Total Desired Effort $4 + 4 = 8$ equals 330 (see Table 1: Employee’s Cost of Total Effort on the Information Fact Sheet).

- The Employee’s Wage must be positive.

4. {For PS add: “(Supervisor’s) Performance-Based Offer” Rules:}

- The Supervisor (i.e. the computer) specifies and pays the Employee’s Wage, not the Employer.

- You receive the “Employee’s Wage” only if you exert the Employer’s and Supervisor’s specified desired effort levels $\text{desired effort}_1$ and $\text{desired effort}_2$ on tasks 1 and 2. In other words, you receive the Employee’s Wage only if your actual effort level on task 1 equals the Employer’s desired effort level on task 1 (i.e. $\text{effort}_1 = \text{desired effort}_1$) and if your actual effort level on task 2 equals the Employer’s desired effort level on task 2 (i.e. $\text{effort}_2 = \text{desired effort}_2$). If not, you will not receive the Employee’s Wage (i.e. you earn 0 points).

- The Supervisor always offers you an Employee’s Wage equal to the Cost of Total Effort associated with the Employer’s specified desired effort levels ($\text{desired effort}_1 + \text{desired effort}_2$) plus 200. For example, if the Employer desires effort levels $\text{desired effort}_1 = 4$ and $\text{desired effort}_2 = 4$, the Supervisor offers an Employee’s Wage of 530. This is because the Cost of Total Desired Effort $4 + 4 = 8$ equals 330, plus 200, equals 530 (see Table 1: Employee’s Cost of Total Effort on the Information Fact Sheet).

- The Employer specifies and pays the Supervisor’s wage (i.e. the computer’s wage).

- The Supervisor receives the “Supervisor’s Wage” from the Employer only if you exert the Employer’s desired effort levels $\text{desired effort}_1$ and $\text{desired effort}_2$ on task 1 and task 2. If you do not, the Supervisor receives no wage (i.e. 0 points). Therefore the Supervisor’s Wage depends on your effort on task 1 and task 2.

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Profit and Earnings calculation at the end of the period

At the end of the period, you will encounter one of these outcomes:

1. If you reject {For C or IP add: the Bonus Offer or the Piece-Rate Offer} {For PS add: the Bonus Offer}, your Earnings and the Employer’s Profit in the period is 0 points.

2. {For PS add: If you reject the Supervisor’s Performance-Based Offer, your Earnings the Supervisor’s Earnings and the Employer’s Profit in the period is 0 points.}

3. {For PS add: If the Supervisor rejects the Performance-Based offer, your Earnings, the Supervisor’s Earnings and the Employer’s Profit in the period is 0 points.}
4. If you accept the Employer’s offer, your Earnings, {For PS add: the Supervisor’s Earnings} and the Employer’s Profit depend on your actual effort levels on task 1 and task 2, effort1 and effort2.

5. If you accept the Bonus Offer, you and the Employer earn the following points:

<table>
<thead>
<tr>
<th>Employer’s Profit</th>
<th>Your Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue (75 x effort1 x effort2) – Employee’s Wage – Actual Bonus</td>
<td>Employee’s Wage + Actual Bonus – Cost of Total Effort*</td>
</tr>
</tbody>
</table>

*See Table 1: Employee’s Cost of Total Effort on the Information Fact Sheet*

6. {For C or IP add: If you accept the Piece-Rate Offer, you and the Employer earn the following points:}

<table>
<thead>
<tr>
<th>Piece-Rate Offer</th>
<th>Employer’s Profit</th>
<th>Your Earnings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue (75 x effort1 x effort2) – Employee’s Wage – (Piece-Rate x Actual effort on task 1 (effort1))</td>
<td>Employee’s Wage + (Piece-Rate x Actual effort on task 1 (effort1)) – Cost of Total Effort*</td>
<td></td>
</tr>
</tbody>
</table>

*See Table 1: Employee’s Cost of Total Effort on the Information Fact Sheet*

7. {For PS add: If you and the Supervisor accept the (Supervisor’s) Performance-Based offer, you, the Supervisor and the Employer earn the following points}

If effort1 = desired effort1 and effort2 = desired effort2:

Income’s Profit = Revenue (75 x effort1 x effort2) – Supervisor’s Wage

Supervisor’s Earnings = Supervisor’s Wage – Employee’s Wage (Cost of Total Desired Effort* + 200) – Cost of Monitoring (50)

Your Earnings = Employee’s Wage (Cost of Total Desired Effort* + 200) – Cost of Total Effort*

If effort1 ≠ desired effort1 and/or effort2 ≠ desired effort 2, Supervisor’s Wage = Employee’s Wage = 0

Employer’s Profit = Revenue (75 x effort1 x effort2) – 0

Supervisor’s Earnings = 0 – 0 – Cost of Monitoring (50) = – 50

Your Earnings = 0 – Cost of Total Effort

*See Table 1: Employee’s Cost of Total Effort on the Information Fact Sheet*

{For C or IP add: In Piece-Rate Offers, the Piece-rate is only paid for your actual effort level on task 1. It is not paid for your actual effort level on task 2. Hence, the way you allocate your effort, effort1 and effort2, influences your Piece-rate payment (Piece-rate x effort1)}

{For PS add: In Performance-Based Offers, you receive the Employee’s Wage only if your actual effort levels equal the Employer’s desired effort levels. Therefore the way you allocate your effort, effort1 and effort2, influences whether you will receive the Employee’s Wage.}
All participants know how to calculate your Earnings, (For I/S or PS add: the Supervisor’s Earnings) and the Employer’s Profit.
Do you have any questions?}
A2.2.1: INFORMATION FACT SHEET

FIGURE 1: Summary of Steps

Start

The Employer specifies:
- Desired effort1
- Desired effort2
- Employee's Wage
- Promised Bonus

Requires

The Employer specifies:
- Desired effort1
- Desired effort2
- Employee's Wage
- Piece-rate

On decision

Employer makes an offer

Reject

Employer and Employee earn 0 points

Accept

Employer chooses Actual Bonus

Employer finds out the Employee's actual effort, effort1 and effort2

Points for the period are calculated:
Employer's Revenue = 75 x effort1 x effort2
Employer's Profit = 75 x effort1 x effort2 - Employee's Wage - Piece-rate x effort2
Employee's Earnings = Employee's Wage + Actual Bonus - Cost of Total Effort

End

Reject

Employee accepts or rejects the offer

Accept

Employee chooses Actual Bonus

Employee finds out the Employee's actual effort, effort1 and effort2

Points for the period are calculated:
Employer's Revenue = 75 x effort1 x effort2
Employer's Profit = 75 x effort1 x effort2 - Employee's Wage - Piece-rate x effort2 - Employee's Wage - Promised Bonus
Employee's Earnings = Employee's Wage + Actual Bonus - Cost of Total Effort

End

End
{Add for Employers in PS: IMPORTANT RULE:}

For the Supervisor to accept your Performance-based offer, you must offer a Supervisor’s Wage that fulfils this rule:

Supervisor’s Wage ≥ Employee’s Wage + 50 (Cost of Monitoring)
≥ Cost of Desired Total Effort + 200 + 50 (Cost of Monitoring)

{Add for Employees in PS: IMPORTANT RULE:}

In (Supervisor’s) Performance-based offers, if you do not exert the Employer’s/Supervisor’s desired effort on task 1 and task 2, you and the Supervisor do not receive your respective Employee’s Wage and Supervisor’s Wage. i.e. Employee’s Wage = Supervisor’s Wage = 0.

### TABLE 1: EMPLOYEE’S COST OF EFFORT

<table>
<thead>
<tr>
<th>Total Effort = Effort1 + Effort2</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of Total Effort</td>
<td>60</td>
<td>90</td>
<td>120</td>
<td>150</td>
<td>180</td>
<td>255</td>
<td>330</td>
<td>405</td>
<td>480</td>
<td>555</td>
<td>630</td>
</tr>
</tbody>
</table>

The Employee’s Cost of Total Effort is in Table 1 and means the following:

- The top row represents the Employee’s Total Effort, where Total Effort = effort1 + effort2
- The bottom row represents the Employee’s Cost of Total Effort.
- For example, if effort1 = 1 and effort2 = 3, Total Effort = 1 + 3 = 4. Therefore the Cost of Total Effort is 120.
A2.3: EXPERIMENTAL QUIZ

Employer’s Quiz

Please answer the following questions. You lose \{For C, IP or Employer in PS add: 50\} \{For Employee in PS add: 25\} points for every question that you do not answer. However you do not lose any points for incorrect answers. (Hint: See the Information Fact Sheet, under “Points for the period are calculated...”).

Once you have answered all the problems, please raise your hand and wait for the experimenter to collect your answer sheet. The experimenter will go through the answers once all the answer sheets are collected.

1. If the Employee rejects your \{For C or IP add: Bonus Offer or Piece-Rate Offer\} \{For PS add: Bonus Offer\}, what is your profit and the Employee’s earnings?

   Your Profit  
   Employee’s Earnings

\{For PS add:

2. If the Employee rejects the Supervisor’s Performance-Based Offer, what is your profit, the Supervisor’s earnings and the Employee’s earnings?

   Your Profit  
   Supervisor’s Earnings  
   Employee’s Earnings

3. If the Supervisor (i.e. the computer) rejects your Performance-Based Offer, what is your profit, the Supervisor’s earnings and the Employee’s earnings?

   Your Profit  
   Supervisor’s Earnings  
   Employee’s Earnings

4. In Bonus Offers, what is the maximum Promised Bonus plus Employee’s Wage that you can offer? (Hint: Look at page 5 of the “Employer Instructions”.)

\{For C add:

5. You desire the following effort levels: \textit{desired\_effort1} = 2 and \textit{desired\_effort2} = 3

   a) In Piece-Rate Offers, what is the minimum wage plus piece-rate payment (\textit{Piece-rate} \times \textit{desired effort1}) you can offer? (Hint: Employee’s Wage + (Piece-rate \times \textit{effort1}) \geq \text{Desired Cost of Total Effort}).
b) In Bonus Offers, what is the minimum wage that you can offer? (Hint: Employee’s Wage ≥ Desired Cost of Total Effort).

____ Page Break ____

6. You desire the following effort levels: Desired effort on task 1 (desired effort1) = 3 and desired effort on task 1 (desired effort2) = 2. What is your revenue if the Employee’s actual effort on task 1 and task 2 are the following:

- Your revenue when the Employee actual effort on task 1 (effort1) = 3 and actual effort on task 2 (effort2) = 2:

  \[
  \text{Your Revenue} = 75 \times \frac{\text{effort1}}{\text{effort2}} = \frac{75 \times 3}{2} = \frac{225}{2} = 112.5
  \]

- Your revenue when the Employee actual effort on task 1 (effort1) = 4 and actual effort on task 2 (effort2) = 1:

  \[
  \text{Your Revenue} = 75 \times \frac{\text{effort1}}{\text{effort2}} = \frac{75 \times 4}{1} = 300
  \]

- Your revenue when the Employee actual effort on task 1 (effort1) = 5 and actual effort on task 2 (effort2) = 1:

  \[
  \text{Your Revenue} = 75 \times \frac{\text{effort1}}{\text{effort2}} = \frac{75 \times 5}{1} = 375
  \]

7. (For PS add: You desire the following effort levels: Desired effort on task 1 (desired effort1) = 3 and desired effort on task 2 (desired effort2) = 2)

a) In Performance-Based Offers, what is the minimum “Supervisor’s Wage” you must offer in order for the Supervisor to accept your offer? (Hint: Look at page 5 of “Employer Instructions, and use the “Employee’s Wage” equation below to help you).

\[
\text{Minimum Supervisor’s Wage} = \frac{\text{Employee’s Wage}}{\text{Cost of Monitoring}} = \frac{\text{Employee’s Wage}}{\text{Cost of Total Desired Effort}} + 200 = \frac{\text{Employee’s Wage}}{\text{Cost of Total Desired Effort}} + 200
\]
8. You make the following Bonus Offer:

Desired effort on task 1 (desired effort1) = 3  
Desired effort on task 2 (desired effort2) = 3  
Employee’s Wage = 200  
Promised bonus = 150  

a) The Employee’s actual effort on task 1 (effort1) = 3 and actual effort on task 2 (effort2) = 3. The Employer’s Actual Bonus is 200.

• What is your Profit?

Your Profit = \( 75 \times \text{effort1} \times \text{effort2} - \text{Employee’s Wage} - \text{Actual Bonus} = \) \( \square \)

• What is the Employee’s Earnings?

Employee’s Earnings = \( \text{Employee’s Wage} + \text{Actual Bonus} - \text{Cost of Total Effort} = \) \( \square \)

b) The Employee’s actual effort on task 1 (effort1) = 1 and actual effort on task 2 (effort2) = 1. The Employer’s Actual Bonus is 0.

• What is your Profit?

Your Profit = \( 75 \times \text{effort1} \times \text{effort2} - \text{Employee’s Wage} - \text{Actual Bonus} = \) \( \square \)

• What is the Employee’s Earnings?

Employee’s Earnings = \( \text{Employee’s Wage} + \text{Actual Bonus} - \text{Cost of Total Effort} = \) \( \square \)

c) The Employee’s actual effort on task 1 (effort1) = 4 and actual effort on task 2 (effort2) = 1. The Employer’s Actual Bonus is 50.

• What is your Profit?
Your Profit = 75 x effort1 x effort2 - Employee’s Wage - Actual Bonus =

- What is the **Employee’s Earnings**?

Employee’s Earnings = Employee’s Wage + Actual Bonus - Cost of Total Effort =

d) The Employee’s actual effort on task 1 (effort1) = 5 and actual effort on task 2 (effort2) = 1. The Employer’s Actual Bonus is 100.

- What is your Profit?

Your Profit = 75 x effort1 x effort2 - Employee’s Wage - Actual Bonus =

- What is the **Employee's Earnings**?

Employee’s Earnings = Employee’s Wage + Actual Bonus - Cost of Total Effort =

___ Page Break ___

9. *For C or IP add:* You make the following Piece-Rate Offer:

Desired effort on task 1 (desired effort1) = 3  
Desired effort on task 2 (desired effort2) = 3  
Employee’s Wage = 100  
Piece-rate = 35

a) The Employee’s actual effort on task 1 (effort1) = 3 and actual effort on task 2 (effort2) = 3.

- What is Your Profit?

Your Profit = 75 x effort1 x effort2 - Employee’s Wage - Piece-rate x effort1 =
• What is the Employee’s Earnings?

\[
\text{Employee’s Earnings} = \frac{\text{Employee’s Wage}}{} + \frac{\text{Piece-rate} \times \text{effort1}}{} - \frac{\text{Cost of Total Effort}}{}
\]

b) The Employee’s actual effort on task 1 (effort1) = 1 and actual effort on task 2 (effort2) = 1.

• What is Your Profit?

\[
\text{Your Profit} = 75 \times \frac{\text{effort1}}{} \times \frac{\text{effort2}}{} - \frac{\text{Employee’s Wage}}{} - \frac{\text{Piece-rate} \times \text{effort1}}{}
\]

c) The Employee’s actual effort on task 1 (effort1) = 4 and actual effort on task 2 (effort2) = 1.

• What is the Employee’s Earnings?

\[
\text{Employee’s Earnings} = \frac{\text{Employee’s Wage}}{} + \frac{\text{Piece-rate} \times \text{effort1}}{} - \frac{\text{Cost of Total Effort}}{}
\]

d) The Employee’s actual effort on task 1 (effort1) = 5 and actual effort on task 2 (effort2) = 1.

• What is Your Profit?

\[
\text{Your Profit} = 75 \times \frac{\text{effort1}}{} \times \frac{\text{effort2}}{} - \frac{\text{Employee’s Wage}}{} - \frac{\text{Piece-rate} \times \text{effort1}}{}
\]
• What is the Employee’s Earnings?

Employee’s Earnings = \[ \text{Employee’s Wage} + (\text{Piece-rate} \times \text{effort1}) - \text{Cost of Total Effort} = \]

___ Page Break ___

10. (For PS add): You make the following Performance-Based Offer. (Remember that the Supervisor (i.e. the computer) accepts or rejects the Performance-Based Offer, not the Employee.)

Desired effort on task 1 (desired effort1) = 3
Desired effort on task 2 (desired effort2) = 3
Supervisor’s wage = 400

a) Why does the supervisor (i.e. the computer) accept your Performance-Based Offer? (Hint: The Supervisor accepts your Performance-Based Offer if you offer a Supervisor’s Wage that is greater than or equal to Employee’s Wage + Cost of Monitoring).

b) Because the Supervisor (i.e. the computer) accepts your Performance-Based Offer, the Supervisor makes the following Supervisor’s Performance-Based Offer to the Employee.

Employer’s desired effort levels: Desired effort1 = Desired effort2 =

Employee’s Wage = \[ \text{Cost of Total Desired Effort} + 200 = \]

c) The Employee’s actual effort on task 1 (effort1) = 3 and actual effort on task 2 (effort2) = 3.

• What is your Profit?

Your Profit = \[ 75 \times \text{effort1} \times \text{effort2} - \text{Supervisor’s Wage} = \]

• What is the Supervisor’s Earnings?

Supervisor’s Earnings = \[ \text{Supervisor’s Wage} - \text{Employee’s Wage} - \text{Cost of Monitoring} = \]
• What is the **Employee’s Earnings**?

  Employee’s Earnings = Employee’s Wage - Cost of Total Effort

**d)** The Employee’s **actual effort on task 1 (effort1) = 5 and actual effort on task 2 (effort2) = 1.** (Hint: Remember that if effort1 ≠ desired effort1 and/or effort2 ≠ desired effort 2, Supervisor’s Wage = Employee’s Wage = 0.)

• What is your **Profit**?

  Your Profit = 75 x effort1 x effort2 - Supervisor’s Wage =

• What is the **Supervisor’s Earnings**?

  Supervisor’s Earnings = Supervisor’s Wage - Employee’s Wage - Cost of Monitoring =

• What is the **Employee's Earnings**?

  Employee’s Earnings = Employee’s Wage - Cost of Total Effort =

}
Employee’s Quiz

Seat Number: ____

Please answer the following questions. You lose {For C, IP or Employer in PS add: 50} {For Employee in PS add: 25} points for every question that you do not answer. However you do not lose any points for incorrect answers. (Hint: See the Information Fact Sheet, under “Points for the period are calculated...”).

Once you have answered all the problems, please raise your hand and wait for the experimenter to collect your answer sheet. The experimenter will go through the answers once all the answer sheets are collected.

1. If you reject the Employer’s {For C or IP add: Bonus Offer or Piece-Rate Offer} {For PS add: Bonus Offer}, what is the Employer’s Profit and your Earnings?

Employer’s Profit

Your Earnings

{For PS add:}

2. If you reject the Supervisor’s Performance-Based Offer, what is the Employer’s Profit, the Supervisor’s Earnings and your Earnings?

Employer’s Profit

Supervisor’s Earnings

Your Earnings

3. If the Supervisor (i.e. the computer) rejects the Employer’s Performance-Based Offer, what is the Employer’s Profit, the Supervisor’s Earnings and your Earnings?

Employer’s Profit

Supervisor’s Earnings

Your Earnings

4. The Employer desires the following effort levels: Desired effort on task 1 (desired effort1) = 3 and desired effort on task 2 (desired effort2) = 2. What is the Employer’s revenue if your actual effort on task 1 and task 2 are the following:

- Employer’s revenue when your actual effort on task 1 (effort1) = 3 and actual effort on task 2 (effort2) = 2:

\[
\text{Employer’s Revenue} = 75 \times \frac{\text{effort1}}{x} \times \frac{\text{effort2}}{x} = \quad \square \quad \square
\]
• Employer’s Revenue when your actual effort on task 1 (effort1) = 4 and actual effort on task 2 (effort2) = 1:

Employer’s Revenue = 75 x effort1 x effort2 =

• Employer’s Revenue when your actual effort on task 1 (effort1) = 5 and actual effort on task 2 (effort2) = 1:

Employer’s Revenue = 75 x effort1 x effort2 =

___ Page Break ___

5. The Employer makes the following Bonus Offer:

Desired effort on task 1 (desired effort1) = 3
Desired effort on task 2 (desired effort2) = 3
Employee’s Wage = 200
Promised bonus = 150

a) Your actual effort on task 1 (effort1) = 3 and actual effort on task 2 (effort2) = 3. The Employer’s Actual Bonus is 200.

• What is the Employer’s Profit?

Employer’s Profit = 75 x effort1 x effort2 - Employee’s Wage - Actual Bonus =

• What are your Earnings?

Your Earnings = Employee’s Wage + Actual Bonus - Cost of Total Effort =

b) Your actual effort on task 1 (effort1) = 1 and actual effort on task 2 (effort2) = 1. The Employer’s Actual Bonus is 0.

• What is the Employer’s Profit?
Employer’s Profit = 75 \times \text{effort}_1 \times \text{effort}_2 - \text{Employee’s Wage} - \text{Actual Bonus} = \text{Employer’s Profit}

- What are your Earnings?

Your Earnings = \text{Employee’s Wage} + \text{Actual Bonus} - \text{Cost of Total Effort} = \text{Your Earnings}

c) Your actual effort on task 1 (effort1) = 4 and actual effort on task 2 (effort2) = 1. The Employer’s Actual Bonus is 50.

- What is the Employer’s Profit?

Employer’s Profit = 75 \times \text{effort}_1 \times \text{effort}_2 - \text{Employee’s Wage} - \text{Actual Bonus} = \text{Employer’s Profit}

- What are your Earnings?

Your Earnings = \text{Employee’s Wage} + \text{Actual Bonus} - \text{Cost of Total Effort} = \text{Your Earnings}

d) Your actual effort on task 1 (effort1) = 5 and actual effort on task 2 (effort2) = 1. The Employer’s Actual Bonus is 100.

- What is the Employer’s Profit?

Employer’s Profit = 75 \times \text{effort}_1 \times \text{effort}_2 - \text{Employee’s Wage} - \text{Actual Bonus} = \text{Employer’s Profit}

- What are your Earnings?

Your Earnings = \text{Employee’s Wage} + \text{Actual Bonus} - \text{Cost of Total Effort} = \text{Your Earnings}
6. **For C or IP add:** The Employer makes the following Piece-Rate Offer:

Desired effort on task 1 (desired effort1) = 3
Desired effort on task 2 (desired effort2) = 3
Employee’s Wage = 100
Piece-rate = 35

a) Your actual effort on task 1 (effort1) = 3 and actual effort on task 2 (effort2) = 3

- What is the Employer’s Profit?

Employer’s Profit = 75 \times \text{effort1} \times \text{effort2} - \text{Employee’s Wage} - ( \text{Piece-rate} \times \text{effort1} )

- What are Your Earnings?

Your Earnings = \text{Employee’s Wage} + ( \text{Piece-rate} \times \text{effort1} ) - \text{Cost of Total Effort}

b) Your actual effort on task 1 (effort1) = 1 and actual effort on task 2 (effort2) = 1.

- What is the Employer’s Profit?

Employer’s Profit = 75 \times \text{effort1} \times \text{effort2} - \text{Employee’s Wage} - ( \text{Piece-rate} \times \text{effort1} )

- What are Your Earnings?

Your Earnings = \text{Employee’s Wage} + ( \text{Piece-rate} \times \text{effort1} ) - \text{Cost of Total Effort}

c) Your actual effort on task 1 (effort1) = 4 and actual effort on task 2 (effort2) = 1.

- What is the Employer’s Profit?

Employer’s Profit = 75 \times \text{effort1} \times \text{effort2} - \text{Employee’s Wage} - ( \text{Piece-rate} \times \text{effort1} )
• What are Your Earnings?

Your Earnings = Employee’s Wage + \( \times \text{ Piece-rate x effort1} \) | Work Effort - Cost of Total Effort = 

- Your actual effort on task 1 (effort1) = 5 and actual effort on task 2 (effort2) = 1.

• What is the Employer's Profit?

Employer’s Profit = \( 75 \times \text{ effort1 x effort2} \) | Work Effort - Employee’s Wage \( \times \text{ Piece-rate x effort1} \) = 

- What are Your Earnings?

Your Earnings = Employee’s Wage + \( \times \text{ Piece-rate x effort1} \) | Work Effort - Cost of Total Effort = 

7. {For PS add: The Employer makes the following Performance-Based Offer to the Supervisor. (Remember that the Supervisor (i.e. the computer) accepts or rejects the Performance-Based Offer, not the Employee.)

Desired effort on task 1 (desired effort1) = 3
Desired effort on task 2 (desired effort2) = 3
Supervisor’s wage = 400

The Supervisor (i.e. the computer) accepts the Employer’s Performance-Based Offer.

a) Because the Supervisor (i.e. the computer) accepted the Employer’s Performance-Based Offer, the Supervisor makes you the following Supervisor’s Performance-Based Offer.

Employer’s desired effort levels: Desired effort1 = \( \text{ } \) Desired effort2 = 

Employee’s Wage = \( \text{ Cost of Total Desired Effort} + 200 \) = 

___ Page Break ___
b) Your actual effort on task 1 (effort1) = 3 and actual effort on task 2 (effort2) = 3

- What is the Employer's Profit?

Employer’s Profit = 75 x effort1 x effort2 - Supervisor’s Wage

- What is the Supervisor’s Earnings?

Supervisor’s Earnings = Supervisor’s Wage - Employee’s Wage - Cost of Monitoring

- What is the Employee's Earnings?

Your Earnings = Employee’s Wage - Cost of Total Effort

c) Your actual effort on task 1 (effort1) = 5 and actual effort on task 2 (effort2) = 1. (Hint: Remember that if effort1 ≠ desired effort1 and/or effort2 ≠ desired effort 2, Supervisor’s Wage = Employee’s Wage = 0.)

- What is the Employer's Profit?

Employer’s Profit = 75 x effort1 x effort2 - Supervisor’s Wage

- What is the Supervisor’s Earnings?

Supervisor’s Earnings = Supervisor’s Wage - Employee’s Wage - Cost of Monitoring

- What is the Employee's Earnings?

Your Earnings = Employee’s Wage - Cost of Total Effort


}
A2.4: QUESTIONNAIRE

Please answer the following questions. This questionnaire does not affect your earnings in this experiment.

Age: __________

Gender: Male / Female

Student Type: Local / International

Country of Origin: _______________________________________

Degree and Major: _______________________________________

Explain in your own words, what this experiment was about.

How did you reach the decisions you made in this experiment?
APPENDIX 2.5 EXPERIMENTER'S SCRIPT

0:01 – 0:05

Attention please. Welcome to the experiment! Today, we are running an experiment on decision-making, which will last approximately one and a half hours. The experiment will be conducted using the computer terminals. Please do not touch the computer until you are instructed to do so. From now until the end of the experiment, you cannot talk to the other participants. Also make sure your mobile phones are off or on silent.

Before we start the experiment, please make sure that you have read the participation information statement and signed the consent form. We will now collect the consent forms and distribute the instructions to the experiment.

Collect consent forms.

0:06-0:25

Please be aware that the instructions are very long. However it is important that you read and fully understand the instructions because the decisions you make during the experiment can earn you a considerable amount of money. {For PS add: Please also note that the experimental conversion rate is different depending on what role you have been assigned – that is, whether you were assigned the role of Employer or Employee. We applied different conversion rates to ensure that the earnings for the Employer would not be too different from the earnings of the Employee.}

We have given you two sets of paper. The thicker set of paper contains a detailed description of the experiment. The single piece(s) of paper provides an overview of the experiment. It would be useful if you placed the single piece of paper upright against the computer screen, because you will find that it will be very helpful throughout the experiment.

If you have any questions when you are reading the instructions, please raise your hand and an experimenter will come and assist you. You have 20 minutes to read the instructions. Once you have read the instructions, you will have to complete a quiz.

Please raise your hand if you need more time to read the instructions.
Now we will hand out the quiz. Hand out Quiz.

0:25 – 0:40

Now that you have read the instructions, please complete the quiz that was just handed out. Please note that if you do not complete the quiz, we will deduct points from your total earnings.

On the top left hand corner of your computer screen, there is a calculator icon. Please click the icon. You can use this calculator to help you answer the questions. You will also need to use the Information Fact Sheet to answer the quiz. Note that we have supplied you with working out
paper. You can use it during your quiz and the actual experiment. Once you have all completed the quiz, I will go through some of the answers with you.

\textit{0:40 – 0:50}

Thank you for completing the quiz. I will now go through (a few of) the answers with you. If you have any questions while I go through the answers, please raise your hand and ask your question in front of everyone. I will answer your question in front of everyone.

\textit{0:50 – 1:20}

We will begin the experiment shortly. Note that we have supplied you with working out paper, which you can use in the actual experiment. Please also note that if you do not make your decisions in a reasonable time, you will hold everyone up. I will ask you during the experiment to speed up your decision-making if any one participant takes too long. Please start the experiment as soon as the screen changes.

\textit{If participants on a stage for greater than two minutes:} Please remember that if you do not make your decisions in a reasonable time, you will hold everyone up.

\textit{1:20 – 1:30}

The experiment has now concluded. Thank you for your participation. We will now distribute the questionnaires. Please fill out the questionnaire and the receipt form.

\textit{Hand out questionnaire.}

This is how the payment procedure will work. When I call out your seat number, please go to Layla with your completed receipt form and your questionnaire. She will pay you your earnings from the experiment in addition to your show-up fee.

\textit{Privately pay the participants.}
APPENDIX 3: METHODOLOGY ISSUES

A3.1: CALIBRATIONS

The experiment’s parameters are calibrated, albeit crudely, using the costs associated with rehabilitating high-level reoffending juvenile delinquents in New South Wales over a 24-months period. In the following, we explain how we calibrate each parameter.

A. GOVERNMENT COST SAVINGS

Government cost savings concerns juvenile reoffending. It is determined by comparing the costs incurred by the New South Wales (NSW) government pre and post intervention (i.e. rehabilitation). We focus on high-level reoffending delinquents.

i. High-level Reoffending Delinquents

To define exactly the cohort we are interested in – high-level reoffenders – we draw upon Holme’s (2011) article. It contains information about the recidivism rates of those convicted in NSW since 1994 over a fifteen-year period. “High-level reoffending delinquents” refer to delinquents that engage in crimes that are associated with a high likelihood of reoffending. Note that Holmes (2011) contains the delinquent’s probability of reoffending within 15 years of his/her first conviction, rather than the 24 months that our calibrations are based on. We use the 15 years reoffending rate as a proxy for 24 months, as the marginal probability of reoffending is very high within the first two years of the first offence, and then dramatically decreases thereafter. Table A3.1.1 contains a summary of high-level reoffending crimes (see Figure 2 in Holmes, 2011). Using this data, we assume that the recidivism rate of high-level reoffending juveniles is 85% and is 78% for adults.

<table>
<thead>
<tr>
<th>TABLE A3.1.1: HIGH LEVEL REOFFENDING CRIMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juvenile</td>
</tr>
<tr>
<td>Break-in and enter</td>
</tr>
<tr>
<td>Robbery</td>
</tr>
<tr>
<td>Average</td>
</tr>
</tbody>
</table>

ii. Generating Government Cost Savings

Obtaining post-intervention recidivism rates can be achieved through two avenues: a randomised control trial or a quasi-experimental approach (CSI, 2011). In randomised control trials, participants are allocated to a treatment or non-treatment group. Those in treatment groups receive support from the program and those in non-treatment groups do not. The difference in recidivism rates across treatments reflects the program’s impact on recidivism. A quasi-experimental approach allows all participants to receive intervention. Researchers compare the recidivism rate of those who participate in the program to people that possess similar characteristic but do not participate in the program, Hence, the difference in recidivism in the two groups is attributed to the program.
We are unaware of any publicly available data that adequately demonstrates the effect of intervention on juvenile recidivism in NSW. For example, ARTD Consultants (2007) evaluated Mission Australia’s Pasifika’s Support Service for young Pacific Islanders in South West Sydney, and found that 11 out of 17 young people do not reoffend within a 12 month period after the program was first implemented. However the sample size is too small to be meaningful. Similarly, the Institute of Criminology (2006) assessed the Aboriginal over-representation strategic plan (AORSP), which aims to reduce the number Indigenous people under the care of Juvenile Justice in Australia. They found that 56% of indigenous people reoffend within 12 months pre-AORSP, whereas 49% of indigenous people reoffended post-AORSP. While they use a large sample size, the recidivism rates were not based on individual programs. Hence, the effects of an individual program on recidivism cannot be determined.

In light of these problems, we adopt CSI’s (2011) approach. To calculate government cost savings, we use a sensitivity analysis to determine the costs associated with different levels of recidivism. Like CSI’s economic model, we determine the costs associated with custodial sentences, community supervision, remand, Children’s Court and Youth Justice Conferencing. This is found in Table A3.1.2. Table A3.1.3 supplements Table A3.1.2, and contains the references and notes that describe our calculations. Also,

1. We define an offence as one that is finalised in the Children’s Court.
2. The second row of Table 2.1.2 contains the cohort size. We construct this variable such that we can determine the cost savings associated with having different cohort size.
<table>
<thead>
<tr>
<th>Cohort size</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>80</th>
<th>100</th>
<th>120</th>
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</thead>
<tbody>
<tr>
<td><strong>Children's Court</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assume all go to court</td>
<td>1.00</td>
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<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
<td>No. of offences per delinquent in Children's Court</td>
<td>3.13</td>
<td>3.13</td>
<td>3.13</td>
<td>3.13</td>
<td>3.13</td>
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<td>Total no. of children that go to Children's Court</td>
<td>62.50</td>
<td>125.00</td>
<td>187.50</td>
<td>250.00</td>
<td>312.50</td>
<td>375.00</td>
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<td>$409</td>
<td>$410</td>
<td>$411</td>
<td>$412</td>
<td>$413</td>
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<td><strong>Youth Justice</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number of finalisations in Children's Court in 2010/11</td>
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<td>8630</td>
<td>8630</td>
<td>8630</td>
<td>8630</td>
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<tr>
<td>Total number of YJC (2010/11 period)</td>
<td>1637</td>
<td>1637</td>
<td>1637</td>
<td>1637</td>
<td>1637</td>
<td>1637</td>
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<tr>
<td><strong>Conferencing (YJC)</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54% referred by court</td>
<td>883.98</td>
<td>883.98</td>
<td>883.98</td>
<td>883.98</td>
<td>883.98</td>
<td>883.98</td>
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<tr>
<td>46% referred by police</td>
<td>753.02</td>
<td>753.02</td>
<td>753.02</td>
<td>753.02</td>
<td>753.02</td>
<td>753.02</td>
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<td>% of finalisations in Children's Court that result in YJC</td>
<td>0.10</td>
<td>0.10</td>
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<td>Average length of YJC (day)</td>
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<td>Average daily cost per juvenile in YJC</td>
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<td>$6.00</td>
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<td>$6.00</td>
<td>$6.00</td>
<td>$6.00</td>
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<tr>
<td><strong>Number of admissions into juvenile justice centres on &quot;control&quot; orders</strong></td>
<td>805</td>
<td>805</td>
<td>805</td>
<td>805</td>
<td>805</td>
<td>805</td>
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<tr>
<td>Control (excluding remand)</td>
<td>% of finalisations in Children's Court that result in control orders</td>
<td>0.09</td>
<td>0.09</td>
<td>0.09</td>
<td>0.09</td>
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<tr>
<td>---------------------------</td>
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<td>------</td>
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<tr>
<td>Total number of juveniles that receive control orders</td>
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<td>11.66</td>
<td>17.49</td>
<td>23.32</td>
<td>29.15</td>
<td>34.98</td>
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<tr>
<td>Average length of stay for young people in custody on control orders</td>
<td>188</td>
<td>188</td>
<td>188</td>
<td>188</td>
<td>188</td>
<td>188</td>
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<tr>
<td>Average daily cost per juvenile in custody</td>
<td>$589.00</td>
<td>$589.00</td>
<td>$589.00</td>
<td>$589.00</td>
<td>$589.00</td>
<td>$589.00</td>
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<tr>
<td>Cost of Control order</td>
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<td>$1,291,124.86</td>
<td>$1,936,687.28</td>
<td>$2,582,249.71</td>
<td>$3,227,812.14</td>
<td>$3,873,374.57</td>
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<tr>
<td>Control on remand</td>
<td>% of finalisations in Children's Court that result in control on remand orders</td>
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<td>0.55</td>
<td>0.55</td>
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<td>0.55</td>
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<tr>
<td>Total number of children that receive control on remand orders</td>
<td>34.53</td>
<td>69.06</td>
<td>103.59</td>
<td>138.12</td>
<td>172.65</td>
<td>207.18</td>
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<td>Average length of stay for young people in control on remand orders</td>
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<td>9.50</td>
<td>9.50</td>
<td>9.50</td>
<td>9.50</td>
<td>9.50</td>
</tr>
<tr>
<td>Cost per day in custody</td>
<td>$589.00</td>
<td>$589.00</td>
<td>$589.00</td>
<td>$589.00</td>
<td>$589.00</td>
<td>$589.00</td>
</tr>
<tr>
<td>Cost of Control on remand orders</td>
<td>$193,216.57</td>
<td>$386,433.14</td>
<td>$579,649.71</td>
<td>$772,866.28</td>
<td>$966,082.85</td>
<td>$1,159,299.42</td>
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<tr>
<td>Total number of finalisations in Children's Court in 2010/11</td>
<td>8630</td>
<td>8630</td>
<td>8630</td>
<td>8630</td>
<td>8630</td>
<td>8630</td>
</tr>
<tr>
<td>Community supervision</td>
<td>Number of offences finalised in court that result in community supervision</td>
<td>1689</td>
<td>1689</td>
<td>1689</td>
<td>1689</td>
<td>1689</td>
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<tr>
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<td>------</td>
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<td>------</td>
<td>------</td>
</tr>
<tr>
<td></td>
<td>% of finalisations in Children's Court that result in community supervision</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td>Total number of children that enter community supervision</td>
<td>12.23</td>
<td>24.46</td>
<td>36.70</td>
<td>48.93</td>
<td>61.16</td>
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<td></td>
<td>Average length of community supervision</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Cost per diem of community supervision</td>
<td>13.00</td>
<td>13.00</td>
<td>13.00</td>
<td>13.00</td>
<td>13.00</td>
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<tr>
<td></td>
<td>Cost of community supervision</td>
<td>$159.02</td>
<td>$318.03</td>
<td>$477.05</td>
<td>$636.07</td>
<td>$795.08</td>
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<tr>
<td><strong>Total cost</strong></td>
<td>$864,476.43</td>
<td>$1,729,077.85</td>
<td>$2,593,804.28</td>
<td>$3,458,655.70</td>
<td>$4,323,632.13</td>
<td>$5,188,733.56</td>
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</table>
### TABLE A3.1.3 – ADDITIONAL INFORMATION

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>Notes</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Children’s Court</strong></td>
<td>Average number of offences</td>
<td>The recidivism rate of high-level reoffenders is 80-85% (Holmes, 2011), but the average reappearance in court over a 5 year period is 2.5 (Vignendra and Fitzgerald, 2006). Hence, we make “average number of offences” is 2.5/0.8 = 3.125 so that when we use the 85% reoffending rate in the sensitivity analysis, the average reoffending figure is 3.125*0.8 = 2.5.</td>
<td>Vignendra and Fitzgerald’s (2006:11)</td>
</tr>
<tr>
<td></td>
<td>Assume all go to court</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No of offences per delinquent in Children’s Court</td>
<td>No. of offences per delinquent in Children’s Court = Average number of offences*Assume all go to court</td>
<td>Calculation Based</td>
</tr>
<tr>
<td></td>
<td>Total no. of children that go to Children’s Court</td>
<td>Total no. of children that go to Children’s Court = No. of offences per delinquent in Children’s Court in 2010 * Cohort size</td>
<td>Calculation Based</td>
</tr>
<tr>
<td></td>
<td>Net expenditure of finalisation (criminal)</td>
<td>Cost of Children’s Court = no. of offences per delinquens in Children’s Court in 2010 * net expenditure of finalisation</td>
<td>Productivity Commission’s (2004:6.56) Report on Government Services</td>
</tr>
<tr>
<td></td>
<td>Cost of Children’s Court</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Youth Justice Conferencing (YJC)</strong></td>
<td>Average number of offences</td>
<td>Above</td>
<td>Vignendra and Fitzgerald’s (2006:11)</td>
</tr>
<tr>
<td></td>
<td>Total number of finalisations in Children’s Court in 2010/11</td>
<td>-</td>
<td>New South Wales Criminal Court Statistics (2010:66)</td>
</tr>
<tr>
<td></td>
<td>Total number of YJC (2010/11 period)</td>
<td>-</td>
<td>NSW Department of Attorney General and Justice - Juvenile Justice NSW (2011:153)</td>
</tr>
<tr>
<td></td>
<td>54% referred by court</td>
<td>Total number referred by court = Total number of YJC * 0.54</td>
<td>NSW Department of Attorney General and Justice - Juvenile Justice NSW (2011:153)</td>
</tr>
<tr>
<td></td>
<td>46% referred by police</td>
<td>Total number referred by police = Total number of YJC * 0.46</td>
<td>NSW Department of Attorney General and Justice - Juvenile Justice NSW (2011:153)</td>
</tr>
<tr>
<td><strong>% of finalisations in Children's Court that result in YJC</strong></td>
<td>( \frac{\text{Total number referred by court}}{\text{Total number of finalisations in Children's Court}} )</td>
<td>Calculation Based</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td><strong>Total no. of juveniles that go to YJC sent from Children's Court</strong></td>
<td>( \frac{\text{Total no. of juveniles that go to YJC sent from Children's Court}}{\text{% of finalisations in Children's Court that result in YJC} \times \text{Average no. of offences} \times \text{Cohort size}} )</td>
<td>Calculation Based</td>
<td></td>
</tr>
<tr>
<td><strong>Average length of YJC (day)</strong></td>
<td>-</td>
<td>Department of Human Services, NSW (2010:63)</td>
<td></td>
</tr>
<tr>
<td><strong>Average daily cost per juvenile in YJC</strong></td>
<td>-</td>
<td>Department of Human Services, NSW (2010:63)</td>
<td></td>
</tr>
<tr>
<td><strong>Cost of YJC</strong></td>
<td>( \text{Cost of YJC} = \frac{\text{Total no. of juveniles that go to YJC sent from Children's Court}}{\text{Average length of YJC}} \times \text{Cost per diem of YJC} )</td>
<td>Calculation Based</td>
<td></td>
</tr>
<tr>
<td><strong>Control (excluding remand)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total number of finalisations in Children's Court in 2010</strong></td>
<td>-</td>
<td>New South Wales Criminal Court Statistics (2010:70)</td>
<td></td>
</tr>
<tr>
<td><strong>Number of admissions into juvenile justice centres on &quot;control&quot; orders</strong></td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>% of finalisations in Children's Court that result in control orders</strong></td>
<td>( \frac{\text{Total number of juveniles that receive control orders}}{\text{% of finalisations in Children's Court that result in control orders} \times \text{Average number of offences} \times \text{Cohort size}} )</td>
<td>Calculation Based</td>
<td></td>
</tr>
<tr>
<td><strong>Total number of juveniles that receive control orders</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Average length of stay for young people in custody on control</strong></td>
<td>-</td>
<td>NSW Department of Attorney General and Justice - Juvenile Justice NSW (2011:164)</td>
<td></td>
</tr>
<tr>
<td><strong>Average daily cost per juvenile in custody</strong></td>
<td>-</td>
<td>Department of Human Services, NSW (2010:63)</td>
<td></td>
</tr>
<tr>
<td><strong>Cost of Control order</strong></td>
<td><strong>Cost of Control on remand orders</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of Control order = Total number of juveniles that receive control orders * average length of stay for young people in custody on control * Average daily cost per juvenile in custody</td>
<td>Cost of Control on remand orders = Total number of children that receive control on remand orders * Average length of stay for young people in control on remand orders * Cost per day in custody</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **Average number of offences** | Above |
| **Total number of finalisations in Children's Court in 2010/11** | - |
| **Number of admissions into juvenile justice centres on "control on remand" orders** | - |
| **% of finalisations in Children's Court that result in control on remand orders** | - |

Calculation Based

<table>
<thead>
<tr>
<th><strong>Cost of Control on remand orders</strong></th>
<th><strong>Calculation Based</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average number of offences</strong></td>
<td>Vignendra and Fitzgerald’s (2006:11)</td>
</tr>
<tr>
<td><strong>Total number of finalisations in Children's Court in 2010/11</strong></td>
<td>New South Wales Criminal Court Statistics (2010:66)</td>
</tr>
<tr>
<td><strong>Number of admissions into juvenile justice centres on &quot;control on remand&quot; orders</strong></td>
<td>NSW Department of Attorney General and Justice - Juvenile Justice NSW (2011:163)</td>
</tr>
<tr>
<td><strong>% of finalisations in Children's Court that result in control on remand orders</strong></td>
<td>Calculation Based</td>
</tr>
<tr>
<td><strong>Total number of children that receive control on remand orders</strong></td>
<td>Calculation Based</td>
</tr>
<tr>
<td><strong>Average length of stay for young people in control on remand orders</strong></td>
<td>NSW Department of Attorney General and Justice - Juvenile Justice NSW (2011:163)</td>
</tr>
<tr>
<td><strong>Cost per day in custody</strong></td>
<td>Department of Human Services, NSW (2010:63)</td>
</tr>
</tbody>
</table>

110
<table>
<thead>
<tr>
<th>Community supervision</th>
<th>Average number of offences</th>
<th>Total number of finalisations in Children's Court in 2010/11</th>
<th>Number of offences finalised in court that result in community supervision</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>% of finalisations in Children's Court that result in community supervision = Number of offences finalised in court that result in community supervision / Total number of finalisations in Children's Court in 2010/11</td>
<td>Calculation Based</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total number of children that enter community supervision = % of finalisations in Children's Court that result in community supervision * Average number of offences * Cohort size</td>
<td>Calculation Based</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Average length of community supervision = 30459 hours were allocated to juveniles under community service orders.</td>
<td>Department of Human Services, NSW (2010:63)</td>
</tr>
<tr>
<td></td>
<td>Cost per diem of community supervision</td>
<td>Cost of community supervision = Total number of children that enter community supervision * Average length of community supervision * Cost per diem of community supervision</td>
<td>Calculation Based</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cost of community supervision = Department of Human Services, NSW (2010:63)</td>
<td>Calculation Based</td>
</tr>
</tbody>
</table>
### iii. Parameterisation of Government Cost Savings

We use Table A3.1.2 to parameterize the government cost savings function in line with Fehr and Schmidt’s (2004) functional form, $S = e_1 e_2$. Government Cost Savings is the difference in the costs associated with juvenile reoffending when the recidivism rate is 85%, to when the recidivism rate is $X$, where $X = \{0.78, 0.68, 0.58; 0.48; 0.38; 0.28\}$, given a fixed cohort size.

<table>
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<tr>
<td>0.85 734804.96</td>
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<tr>
<td>0.78 674291.61</td>
<td>1384680.72</td>
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<tr>
<td>0.68 587843.97</td>
<td>1175772.94</td>
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<td>0.58 146960.99</td>
<td>293943.23</td>
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</table>

<table>
<thead>
<tr>
<th>Recidivism Rates</th>
<th>Cohort Size</th>
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</tr>
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</tr>
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</tr>
<tr>
<td>0.28 242053.40</td>
<td>484141.80</td>
</tr>
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<td>0.18 146960.99</td>
<td>293943.23</td>
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</table>

Table A3.1.5 simplifies Table A2.1.4.

<table>
<thead>
<tr>
<th>TABLE A3.1.5: GOVERNMENT COST SAVINGS FOR THE EXPERIMENT</th>
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<tbody>
<tr>
<td>Task 1</td>
</tr>
<tr>
<td>1 75 150 225 300 375 450</td>
</tr>
<tr>
<td>2 150 300 450 600 750 900</td>
</tr>
<tr>
<td>3 225 450 675 900 1125 1350</td>
</tr>
<tr>
<td>4 300 600 900 1200 1500 1800</td>
</tr>
<tr>
<td>5 375 750 1125 1500 1875 2250</td>
</tr>
<tr>
<td>6 450 900 1350 1800 2250 2700</td>
</tr>
</tbody>
</table>

We use Table A3.1.5 to construct the government cost savings parameter in line with Fehr and Schmidt’s (2004) complementary functional form:

$$S = 75e_1 e_2$$

Hence, a unit increase in $e_1$ corresponds to 20 more enrolments in the program and a unit increase in $e_2$ corresponds to a 10% reduction in recidivism.
B. COST OF REHABILITATION

i. Generating the Cost of Rehabilitation

The cost of intervention programs varies considerably depending on the type of intervention, the type of delinquent that enters the intervention program, and how cost is calculated. Table A3.1.6 shows the different costs of various programs.

<table>
<thead>
<tr>
<th>Reference</th>
<th>Program</th>
<th>Average Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARTD Consultants, 2007</td>
<td>Mission Australia operates a program called Pasifika Support Services, which targets Pacific Islander youth with risks of (re)offending in the South West Sydney area.</td>
<td>Pasifika Support Services is estimated to cost $2,500 per participant</td>
</tr>
<tr>
<td>Strategic Review of NSW Juvenile System, 2009</td>
<td>Juvenile Justice’s Intensive Supervision Program</td>
<td>Intensive Supervision Program costs $5.5 million for 27 families over a 4-year period</td>
</tr>
<tr>
<td>Juvenile Justice’s Post Release Support Program</td>
<td>Supports juveniles released from custody reintegrate back into their communities</td>
<td>Average cost for each client was $3,568 in 2002/03</td>
</tr>
<tr>
<td>Washington State Institute for Public Policy, 2004</td>
<td>Comprehensive report on the costs associated with different programs in Washington State</td>
<td>Multi-systemic therapy costs the government US$5,000 per family whereas Coordination of Services costs US$400 per family.</td>
</tr>
</tbody>
</table>

Due to the variable nature of the costs associated with delivering services, we simply assume that the cost of delivering the service is $3,000. This is because Mission Australia, which is an Australian not-for-profit that helps rehabilitate juvenile delinquents, is most suited to part of the SIB scheme. Note that we rounded up the cost to $3,000 for simplicity.

ii. Parameterisation of the Cost of Rehabilitation

In the theoretical framework, the cost of effort is $c(e_1, e_2)$, where $e_1$ is the amount of effort placed on task 1 and $e_2$ is the amount of effort placed on task 2. We assume that increasing $e_1$ by one unit is just as costly as increasing $e_2$ by one unit. The minimum effort level $e_1=e_2=1$, implies that 20 delinquents enroll in the program and have a recidivism rate of 78%. For every incremental increase in $e_1$, 20 additional delinquents are enrolled in the program. For every incremental increase in $e_1$, the quality dimension of the program improves and so the recidivism rate drops by 10%. Since the total cost of rehabilitation is estimated to be $3,000, we attribute $1500 to the costs associated with enrolling the delinquent in the program, and $1500 to the costs associated with providing good quality services.

$$c(e_1,e_2) = 1500*20*e_1 + 1500*20*e_2$$

____ (1)
where 20 reflects the fact that the cohort size and/or quality of the program increases in increments of 20. However to reflect the convexity of cost and to obtain an interior solution for the inputs-based contract, equation (1) only applies when effort levels are bounded between 1 and 6, $e_1 + e_2 \in [1, 6]$. For effort levels $e_1 + e_2 \in [7, 12]$, the equation becomes:

$$c(e_1, e_2) = 180000 + 3750 \times 20 \times e_1 + 3750 \times 20 \times e_2$$ (2)

Table A3.1.7 contains a comprehensive cost of rehabilitation schedule.

<table>
<thead>
<tr>
<th>Cohort</th>
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<th>2</th>
<th>3</th>
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<th>6</th>
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<tbody>
<tr>
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<td>90</td>
<td>120</td>
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<td>180</td>
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<td>150</td>
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<td>120</td>
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<td>90</td>
<td>120</td>
<td>150</td>
<td>180</td>
<td>255</td>
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</tbody>
</table>

Table A3.1.8 simplifies Table A3.1.7, and is the cost schedule that is used in the experiment.

<table>
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<tr>
<th>Cohort</th>
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</tr>
<tr>
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<td>60</td>
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<td>150</td>
<td>180</td>
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<td>330</td>
<td>405</td>
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<td>80</td>
<td>60</td>
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<td>150</td>
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<tr>
<td>100</td>
<td>60</td>
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<td>405</td>
<td>480</td>
<td>555</td>
<td>630</td>
</tr>
</tbody>
</table>

C. SOCIAL IMPACT BONDS

i. Cost of Monitoring

In the experiment, the cost of monitoring is fixed at 50 points (i.e. $50,000 in real life). The fixed nature of the monitoring cost reflects the fact that it is fixed in the theoretical framework. Though we could not find the precise cost of monitoring not-for-profits in Australia, we did find the cost of auditing charities in the UK. Beattie et al (2001) selected a sample of 210 from the top 500 charities identified in the 1998 edition of Baring Asset Management Top 3000 Charities, to determine the factors that influence audit fees. They found that the mean audit fee is 25 649 pounds and the median audit fee is 18 000 pounds, which we approximate to be $AUS 50,000.

ii. Not-for-profit’s reservation utility

The literature argues that one of the main innovations of SIBs is that it fully covers the not-for-profit’s program cost. However whether SIBs will provide funding in excess of the program cost is unclear. In light of this, in the experiment we ensure the investor offers a wage such that the employee’s reservation utility (or earnings per period) is set at 200, which equals $2. This reflects the fact that the investor extracts as much surplus from the not-for-profit as possible.
A3.2: BANKRUPTCY IN THE EXPERIMENT

A sizeable portion of participants made negative earnings in the experiment, which is an issue if it altered their behaviour. For example, a subject might intentionally make poor decisions, as s/he believes s/he will earn low points anyway. We thus examine whether the incidence of bankruptcy influenced behaviour in our experiment.

Table A3.2.1 contains the summary of the incidence of bankruptcy in the experiment. We include a count of how many participants obtained negative overall points over the entire experiment (i.e. “Experiment (Cumulative points over 8 periods)”), the number of times participants obtained negative points in terms of periods (i.e. Period (Points earned in each period)”), and the average earnings of subjects, which includes their show-up fee.

<table>
<thead>
<tr>
<th>Date</th>
<th># Bankruptcies</th>
<th># Subjects</th>
<th>%</th>
<th># -ve points</th>
<th># Periods</th>
<th>%</th>
<th>Avg Earnings ($)</th>
<th>Min</th>
<th>Max</th>
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</thead>
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<tr>
<td>C 28-02-12</td>
<td>5</td>
<td>24</td>
<td>21</td>
<td>49</td>
<td>192</td>
<td>26</td>
<td>33.33*</td>
<td>11</td>
<td>45</td>
</tr>
<tr>
<td>29-02-12</td>
<td>8</td>
<td>24</td>
<td>33</td>
<td>45</td>
<td>192</td>
<td>23</td>
<td>32.17*</td>
<td>22</td>
<td>42</td>
</tr>
<tr>
<td>IP 24-11-11</td>
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<td>20</td>
<td>0</td>
<td>26</td>
<td>160</td>
<td>16</td>
<td>25.25****</td>
<td>12</td>
<td>60</td>
</tr>
<tr>
<td>24-11-11</td>
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<tr>
<td>25-11-11</td>
<td>5</td>
<td>22</td>
<td>23</td>
<td>49</td>
<td>176</td>
<td>28</td>
<td>26.36***</td>
<td>10</td>
<td>67</td>
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</table>

* show-up fee = 30 ** show-up fee = 25 *** show-up fee = 15 **** show-up fee = 10

Table A3.2.1 shows that the incidence of bankruptcy was severe in Treatments C and IP. Note that there was no bankruptcy in Treatment PS. We thus ask: did bankruptcy influence subjects’ behaviour in Treatments C and IP? If so, how, and to what extent did it alter their behaviour?

There is no set way to determine whether bankruptcy influenced subjects’ behaviour. However for simplicity, we define bankruptcy in the following ways:

1) If the participant made significant losses (i.e. losses of 100 points or more) in three or more consecutive periods; or

2) If the participant made losses in three consecutive periods, where the loss in the following period is equal to or greater than the loss in the current period.

Our definition stems from our conception of how bankruptcy might influence behaviour. In particular, it might induce subjects to make poor decisions intentionally. Using these rules, we identify which subjects were influenced by bankruptcy in Table A3.2.2.

---

29 Since the incidence of bankruptcy was high and the average earnings in the experiment were variable, we increased the show-up fee after we calculated everyone’s earnings, such that participants would receive their promised average earnings of $30. Participants were informed of this once the experiment completed. We did this to ensure that their behavior during the experiment would not be affected by the knowledge that regardless of how much they earn in the experiment, they would obtain an average payout of $30. Also, note that when there was bankruptcy, the show-up fee was high enough to cover any losses that occurred in the actual experiment.
Table A3.2.2 contains which subjects were influenced by bankruptcy as per our definitions (1) and (2). It shows that 12.5% of subjects in Treatment C were most likely influenced by bankruptcy, whereas only 3% of subjects in Treatment IP were most likely influenced by bankruptcy. From this crude and elementary analysis, it appears that bankruptcy would not have influenced the results in the main body of the thesis, but may have influenced our results in the Control Experiment.
## APPENDIX 4: EXPERIMENTAL RESULTS

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Actual Bonus</th>
<th>OLS REGRESSION ON ACTUAL BONUS WITH DEMOGRAPHICS</th>
<th>(1) C</th>
<th>IP</th>
<th>PS</th>
<th>(2) 24 Clusters</th>
<th>IP</th>
<th>PS</th>
</tr>
</thead>
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<td>Constant</td>
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<td>254.46</td>
<td>-177.35</td>
<td>-209.95*</td>
<td>254.46</td>
<td>-177.35</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>(90.81)</td>
<td>(182.11)</td>
<td>(296.23)</td>
<td>(110.61)</td>
<td>(295.72)</td>
<td>(255.42)</td>
</tr>
<tr>
<td>(e_1 + e_2)</td>
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<td></td>
<td>29.89**</td>
<td>62.64***</td>
<td>32.75*</td>
<td>29.89</td>
<td>62.64***</td>
<td>32.75*</td>
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<td></td>
<td></td>
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<td>(12.86)</td>
<td>(7.39)</td>
<td>(17.73)</td>
<td>(20.92)</td>
<td>(12.38)</td>
<td>(17.77)</td>
</tr>
<tr>
<td></td>
<td>e_1 - e_2</td>
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<td>50.52</td>
<td>-13.60</td>
<td>-108.77***</td>
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<tr>
<td></td>
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</table>

*** 1% significant level ** 5% significant level *10% significant level
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<tr>
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<th>(1) Control</th>
<th>(2) Control</th>
<th>(1) IP</th>
<th>(2) IP</th>
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<th>(2) 21 clusters</th>
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<td>(0.16)</td>
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</tr>
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<td>(0.11)</td>
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<td>(0.01)</td>
<td>(0.01)</td>
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*** 1% significant level  ** 5% significant level  * 10% significant level
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<th>(1) IP</th>
<th>(1) PS</th>
<th>(2) Control 21 Clusters</th>
<th>(2) IP 33 Clusters</th>
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Adjusted \( R^2 \)          | 0.18        | 0.28   | 0.26   | 0.18                    | 0.28              | -                |

*** 1% significant level ** 5% significant level *10% significant level
a) Sample size is not big enough, and so not enough degrees of freedom.