

Online Appendix for “Is Pay-for-Performance Detrimental to Innovation?”

A Lemonade Stand Experiment

A.1 Experimental Instructions

Instructions

You are now taking part in an economic experiment. Please read the following instructions carefully. Everything that you need to know in order to participate in this experiment is explained below. Should you have any difficulties in understanding these instructions please notify us. We will answer your questions at your cubicle.

During the course of the experiment you can earn money. The amount that you earn during the experiment depends on your decisions. All the gains that you make during the course of the experiment will be exchanged into cash at the end of the experiment. The exchange rate will be:

$$100 \text{ francs} = \$1$$

The experiment is divided into 20 periods. In each period you have to make decisions, which you will enter on a computer screen. The decisions you make and the amount of money you earn will not be made known to the other participants - only you will know them.

Please note that communication between participants is strictly prohibited during the experiment. In addition we would like to point out that you may only use the computer functions which are required for the experiment. Communication between participants and unnecessary interference with computers will lead to the exclusion from the experiment. In case you have any questions don't hesitate to ask us.

Experimental Procedures

In this experiment, you will take on the role of an individual running a lemonade stand. There will be 20 periods in which you will have to make decisions on how to run the business. These decisions will involve the location of the stand, the sugar and lemon content and the lemonade color and price. The decisions you make in one period, will be the default choices for the next period.

At the end of each period, you will learn what profits you made during that period. You will also hear some customer reactions that may help you with your choices in the following periods.

Previous Manager Guidelines

Dear X,

I have enclosed the following guidelines that you may find helpful in running your lemonade stand. These guidelines are based on my previous experience running this stand.

When running my business, I followed these basic guidelines:

Location:	Business District
Sugar Content:	3%
Lemon Content:	7%
Lemonade Color:	Green
Price:	8.2 francs

With these choices, I was able to make an average profit of about 90 francs per period.

I have experimented with alternative choices of sugar and lemon content, as well as lemonade color and price. The above choices were the ones I found to be the best. I have not experimented with alternative choices of location though. They may require very different strategies.

Regards,

Previous Manager

Compensation

(The following paragraph is used in the instructions for subjects in the treatment with the fixed wage contract.) You will get paid a fixed wage of 50 francs per period during the 20 periods of the experiment. Your final compensation does not depend on your profits from the lemonade stand.

(The following paragraph is used in the instructions for subjects in the treatment with the pay-for-performance contract.) Your compensation will be based on the profits you make with your lemonade stand. You will get paid 50% of your own total lemonade stand profits during the 20 periods of the experiment.

(The following paragraph is used in the instructions for subjects in the treatment with the exploration contract.) Your compensation will be based on the profits you make with your lemonade stand. You will get paid 50% of your own lemonade stand profits in the last 10 periods of the experiment.

(The following paragraph is used in the instructions for subjects in the treatment with the termination contract.) Your compensation will be based on the profits you make with your lemonade stand. You will get paid 50% of the profits you make during the last 10 periods of the experiment. However, if the profits you make during the first 10 periods of the experiment are below 800 francs, the experiment will end early.

(The following paragraph is used in the instructions for subjects in the treatment with the golden parachute contract.) You will get paid 50% of the profits you make during the last 10 periods of the experiment. If the profits you make during the first 10 periods of the experiment are below 800 francs, the experiment will end early and you will receive a payment of 250 francs.

A.2 Experimental Design

The subjects were able to make the following parameter choices:

- Location = {Business District, School, Stadium}
- Sugar Content = {0, 0.1, 0.2, ..., 9.9, 10}
- Lemon Content = {0, 0.1, 0.2, ..., 9.9, 10}
- Lemonade Color = {Green, Pink}
- Price = {0, 0.1, 0.2, ..., 9.9, 10}

The table below shows the optimal product mix in each location.

	Business District	School	Stadium
Sugar	1.5%	9.5%	5.5%
Lemon	7.5%	1.5%	5.5%
Lemonade Color	Green	Pink	Green
Price	7.5	2.5	7.5
Maximum Profit	100	200	60

In order to calculate the profits in each location when the choices are different from the optimal choices above, we implemented a linear penalty function with a floor set 0 such that losses in absolute terms for the subject were impossible. In each location, the penalty factors associated with a deviation of one unit for each of the variables are given by the next table.

	Business District	School	Stadium
Sugar	5	6	0.5
Lemon	5	6	0.5
Lemonade Color	20	60	0.5
Price	5	6	0.5

B Eliciting Risk and Ambiguity Aversion

We measured the subjects' risk and ambiguity aversion by observing choices under uncertainty in an experiment that took place after the business game experiment. As part of this study, the subjects participated in a series of lotteries of the following form.

Risk Aversion

Lottery A: Win \$10 with probability $1/2$, or win \$2 with probability $1/2$. If subjects reject lottery A they receive \$7.

Lottery B: Win \$10 with probability $1/2$, or win \$2 with probability $1/2$. If subjects reject lottery B they receive \$6.

Lottery C: Win \$10 with probability $1/2$, or win \$2 with probability $1/2$. If subjects reject lottery C they receive \$5.

Lottery D: Win \$10 with probability $1/2$, or win \$2 with probability $1/2$. If subjects reject lottery D they receive \$4.

Lottery E: Win \$10 with probability $1/2$, or win \$2 with probability $1/2$. If subjects reject lottery E they receive \$3.

Ambiguity Aversion

If a red ball is chosen you will win \$7, if a blue ball is chosen you will win \$2.

Case A: Choose Urn 1 containing 20 balls that are either red or blue OR choose Urn 2 containing 16 red balls and 4 blue balls.

Case B: Choose Urn 1 containing 20 balls that are either red or blue OR choose Urn 2 containing 14 red balls and 6 blue balls.

Case C: Choose Urn 1 containing 20 balls that are either red or blue OR choose Urn 2 containing 12 red balls and 8 blue balls.

Case D: Choose Urn 1 containing 20 balls that are either red or blue OR choose Urn 2 containing 10 red balls and 10 blue balls.

Case E: Choose Urn 1 containing 20 balls that are either red or blue OR choose Urn 2 containing 8 red balls and 12 blue balls.

Case F: Choose Urn 1 containing 20 balls that are either red or blue OR choose Urn 2 containing 6 red balls and 14 blue balls.

Case G: Choose Urn 1 containing 20 balls that are either red or blue OR choose Urn 2 containing 4 red balls and 16 blue balls.

After subjects had made their choices for both risk and ambiguity aversion one lottery was chosen at random and each subject was compensated according to his or her choice. The above lotteries enable us to construct individual measures of risk and ambiguity aversion. For each measure we then used the median observation to split the sample into a more and a less risk/ambiguity-averse group.

C Gold Prospecting Experiment

Instructions

You are now taking part in a series of economic experiments. Please read the following instructions carefully. Everything that you need to know in order to participate in this series of experiments is explained below. Should you have any difficulties in understanding these instructions please notify us. We will answer your questions at your cubicle.

At the beginning of the experiments you will receive an initial endowment of \$5 in addition to your show-up fee. During the course of the experiments you can earn a further amount of money by gaining gold nuggets. The amount that you gain during the experiments depends only on your own decisions. All the gains that you make during the course of the experiments will be exchanged into cash at the end of the experiments. The exchange rate will be:

$$3 \text{ gold nuggets (gn)} = \$1$$

At the end of the series of experiments you will receive the money that you earned during the experiments.

During each experiment you have to make decisions, which you will enter on a computer screen. The decisions you make and the amount of money you gain will not be made known to the other participants. Only you will know them.

Please note that communication between participants is strictly prohibited during the experiments. In addition we would like to point out that you may only use the computer functions which are required for the experiments. Communication between participants and unnecessary interference with computers will lead to the immediate exclusion from the experiments. In case you have any questions please don't hesitate to ask us.

Overview of the Experimental Procedures

In this series of experiments, you will be playing several instances of a gold prospecting game. In each experiment the game will be the same, but the payoffs of your choices and the way you are compensated will differ. In particular, the choices on each screen constitute an entirely new game.

Each gold prospecting game consists of 2 periods. In each period you may choose to prospect gold in one of two mountains or to stay at home. Each of these options has an associated revenue and cost:

- **“Stay at home”** always yields 0gn and it costs you 0gn to choose this option.
- **“Mountain 1”** is a well-explored mountain that is close to your home. When you choose to prospect gold at this mountain, it yields 100gn with a probability of 50% and 0gn with a probability of 50%. Thus, by choosing “Mountain 1” you cannot learn whether it yields 0gn or 100gn. It costs you 0.25gn to travel to “Mountain 1” and to prospect gold there.
- **“Mountain 2”** is an unexplored mountain that is further away. With a probability of p , “Mountain 2” is a gold-rich mountain, in which case it always yields 100gn whenever you choose this option. With a probability of $1 - p$, “Mountain 2” is a gold-poor mountain, in which case it always yields 0gn whenever you choose this option. You only learn the quality of “Mountain 2” if you choose to prospect gold at that mountain. Since it is further away it costs you 0.75gn to travel to “Mountain 2” and to prospect gold there. Finally, note that each gold prospecting game you play is independent. Thus, you can only learn about the quality of “Mountain 2” for that particular instance of the gold prospecting game.

First, there will be 3 practice trials with different values of p which do not affect your compensation and will help you get acquainted with the interface.

After that, there will be a total of 4 experiments, which differ in terms of the probability p that “Mountain 2” is a gold-rich mountain. At the beginning of each experiment we will announce the probability p that will be relevant during that experiment. The probability p can take on three values: 5%, 35%, 45% or it may be unknown.

In each of the 4 experiments, you will be playing the gold prospecting game under 3 different compensation schemes. Thus, there is a total of $4 * 3 = 12$ separate gold prospecting games which are all independent. Your compensation will depend on your gold production in the two periods of each game. In particular, the 3 compensation schemes are:

1. You will be paid a fixed wage of 0gn per period plus 10% of the gold revenue during the 1st and the 2nd period of the experiment.
2. You will be paid a fixed wage of 0gn per period plus 10% of the gold revenue in the 2nd period of the experiment.
3. You will be paid a fixed wage of 1gn per period.

The different compensation schemes and experiments (12 in total after the trial phase) are completely independent. That is, your choices in each gold prospecting game have no effect on any other choices in the experiment. What you learn about the payoffs is specific to each game.

How is your income calculated?

Your total income in the two periods is calculated in the following way:

$$\begin{aligned} \text{total income} &= \text{fixed wage in 1st period} + \text{fixed wage in 2nd period} \\ &\quad + \text{revenue in 1st period} * \text{revenue percentage in 1st period} \\ &\quad + \text{revenue in 2nd period} * \text{revenue percentage in 2nd period} \\ &\quad - \text{costs in 1st period} - \text{costs in 2nd period} \end{aligned}$$

Your income is therefore higher when your fixed wage, your revenue and your revenue percentage are higher and your costs are lower.

Your fixed wage in each period depends on the compensation of the experiment you are currently in. It is either 0gn or 1gn.

Your revenue in each period depends on the choice you made and the type of mountain. The revenue percentage is 0% or 10% and depends on the compensation of the experiment you are currently in. That is to say you may receive no share of the revenue or you receive some of the revenue depending on the compensation of the current experiment. Finally, as mentioned before the cost of choosing one of the two mountains is 0.25gn or 0.75gn whereas staying at home is costless.

Example

Let's assume the following scenario. In the 1st period and the 2nd period you receive a fixed wage of 0gn and that the revenue percentage in the 1st period is 0% and 10% in the 2nd period.

Let's assume you choose "Mountain 2" in the 1st period. If the mountain revenue was 0gn in the 1st period, then in the 2nd period you choose "Mountain 1". If the mountain revenue was 100gn in the 1st period you choose "Mountain 2".

Case A: Revenue of "Mountain 2" is 0gn in 1st period

Your income in the 1st period therefore is

$$0 + 0*0 - 0.75 = -0.75\text{gn}$$

and in the 2nd period you choose "Mountain 1" which may yield 0gn or 100gn (and you know for sure that "Mountain 2" yields a revenue of 0gn in the 2nd period). Let's assume that "Mountain 1" yields a revenue of 100gn in the 2nd period. Hence your income in the 2nd period is

$$0 + 100*0.1 - 0.25 = 9.75\text{gn}$$

Case B: Revenue of "Mountain 2" is 100gn in 1st period

Your income in the 1st period therefore is

$$0 + 100*0 - 0.75 = -0.75\text{gn}$$

and in the 2nd period you choose “Mountain 2”. Since “Mountain 2” had a revenue of 100gn in the 1st period you know for sure that “Mountain 2” yields a revenue of 100gn in the 2nd period. Hence your income in the 2nd period is

$$0 + 100 \cdot 0.1 - 0.75 = 9.25\text{gn}$$