Experimental Simulations of a Subsidy System for Sustainable Production

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A multi-trial duopoly price-setting experiment was conducted to investigate the potential effectiveness of a governmental subsidy system aimed to reduce sales and therefore production of environmentally harmful products. Two levels of a subsidy for unsold units were compared with a control condition without a subsidy. The results showed that the subsidies did not erode competition but nevertheless led to the setting of higher prices that resulted in fewer sales. In the control condition a price-war led to decreasing prices and increasing sales. The ways in which the proposed subsidy system may be implemented in the transport sector and other sectors are discussed. Specifically, it is proposed that the subsidy system may complement the newly introduced European Emission Trading Scheme.

Key words: Emission policy, experimental game, governmental subsidies, market experiment, sustainable production

The Kyoto Protocol from 1997, with the goal of reducing greenhouse gas (GHG) emissions (Kyoto Protocol, 1997) was the first step towards a worldwide agreement to reduce the negative environmental impacts on the climate. In February 2005 implementation of the Kyoto Protocol was initiated. In order to accomplish the goal of the protocol, a portfolio of governmental policies must be implemented to change the behaviors of consumers as well as producers (Carraro & Galeotti, 1997; Comeau & Chapman, 2002).

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However, despite the goal set by the Kyoto Protocol and the breadth of available knowledge in the scientific community, a report from the United Nations Framework Convention on Climate Change (UNFCCC, 2003) states that it is likely that emissions will continue to increase despite the implementation of different policies to limit them. Indeed, according to projections made by the governments themselves, emissions are expected to increase by 11 % from 2000 to 2010 (IPCC, 2001). Therefore, it is important to develop, evaluate, and implement new forms of regulation and policies.

One important source of the emissions is the transport sector which has increased its GHG emissions by 20% between 1990 and 2000, and which has the highest projected increase of GHG emissions in the current decade (UNFCCC, 2003). There are also additional environmental and social consequences of the increasing trends in motorized traffic such as congestion, noise, and excessive land use (Greene & Wegener, 1997). Many metropolitan areas are already experiencing these problems, and a number of policy measures for reducing motorized traffic in these areas are therefore being considered. Since these policy measures focus on changing or reducing travel demand, they are generally referred to as travel demand management (TDM) measures (Gärling, et al., 2002; Kitamura, Fujii, & Pas, 1997; Pas, 1995). Some TDM measures, such as congestion pricing, aim at reducing car traffic in city centres and are, therefore, effective measures for reducing emissions at a local level. Achieving reduced levels of emissions from motorized traffic at a national level requires other forms of governmental regulations. Petrol taxes, carbon taxes, and subsidies for environmentally friendly cars have been proposed. Whether or not these measures are sufficient is being debated (Babiker, Metcalf, & Reilly, 2003; Carraro & Galeotti, 1997; Hensher, 1998; Sterner & van den Bergh, 1998;).

One step toward reaching the goal of the Kyoto Protocol has been taken with the introduction of The European Emission Trading Scheme (EU ETS) at the beginning of 2005. The basic feature of this system is that the governments of the member states allocate specified quotas (agreed upon among the member states) of emission allowances to its national industry. How these allowances are allocated differs between states. One option is to allocate the allowances, without charge, using previous emission volumes as guidelines (“grandfathering”). A second option is to use auctions for a certain proportion of allowances, where industries have to buy their allowances from the government. The emission allowances can either be used as “payment” for producing emissions, or they can be sold on a free market within the EU where other companies could buy them to be able to produce more emissions themselves (The Carbon Trust, 2004; van Ierland, 2004).

The target of governments is to reduce emissions across time so that emission levels in 2012 will be in line with the goal of the Kyoto Protocol. However, using the EU ETS as an attempt to reduce emissions suffers from some weaknesses that need to be addressed. First, the system only captures about 46 % of carbon emissions in the EU (The Carbon Trust, 2004). It excludes the transport sector which contributes about 20 % of the total GHG emissions in Europe and which has the highest projected increase in the coming decade (UNFCCC, 2003). Thus, the EU ETS is only a part of the solution of emission reduction in Europe (EEA, 2004), and additional policies need to be implemented to achieve reduction of the remaining 54 % of carbon emissions stemming from other sources (e.g., the transport sector). One way to do so would be to expand the existing system and incorporate industries not covered at present; another would be to create one or several separate systems for the excluded sectors, in particular the transport sector. Secondly, the effectiveness of the EU ETS is not determined and will in part depend on the prices of the allowances sold on the free market. These prices will vary from time to time depending on supply and demand. If the prices of allowances are set low, the incentives to reduce emissions would also be low, leading to a system that lacks incentives to reduce emissions below the governmentally regulated quotas.

As a complementary measure, we investigate the possibility that governments implement a system of subsidies targeted at the reduction of production. Like in EU ETS an upper maximal level of production (emissions) is set. A subsidy is then provided for producing less than the maximal level.

In order not to violate current laws, a subsidy system needs to be implemented in ways that it does not limit market competition. It is assumed that producers in a competitive market want to earn as much as possible. Obtaining the subsidy would then not be attractive if they can make more profit from selling their products.[1] At the same time, if the subsidy makes producers set higher prices, counteracting a price war, demand will decrease. Over time producers will adjust their production to the reduced demand. Hence, the subsidy acts to increase prices that reduce demand and therefore production. In the particular application in the transport sector that we envisage, the cost of the subsidy system may be borne by fuel taxes that would lead to an additional reduction of demand.

The proposed subsidy system may be implemented in the transport sector where the EU ETS is particularly difficult to put into operation. It may also complement the existing emission trading scheme. If producers are guaranteed a price (subsidy) for each allowance not used, it would be easier for governments to influence the producers to voluntarily reduce production to levels below the allowed quotas. In order to have a long-term effect, the maximal level of production (and the subsidy) would need to be successively reduced, like the number of allowances within the EU ETS.

In a free market producers try to sell as much as possible of their products at the highest possible price in order to increase profits. The producer offering lower prices will, all else being equal, sell more and earn more than other producers if the price is not lower than the production cost. If producers are reimbursed with a subsidy for the amount they do not sell below a pre-specified maximum allowed level, one may expect that they will only decrease their price to the subsidy level. The subsidy would thus counteract price decreases and thereby inhibit increases in sales and production.

However, even if the subsidy system creates incentives that make producers set higher prices and sell less, previous research (Dawes, 1998; Hastie & Dawes, 2001; Kahneman & Tversky, 2000) has shown that lay people and experts frequently deviate from rational principles of decision making. Thus, in order to be able to conclude that the subsidy system works, it is essential that it is subjected to empirical tests. To this end we report a market experiment (e.g., Smith, 1982) testing the effects of different levels of a subsidy. The market experiment consists of a multi-trial duopoly price-setting game with imperfect price competition (Basu, 1994; Capra, Goeree, Gomez, & Holt, 1999, 2002), implying that the producer setting the lower price does not sell all units. An imperfect price competition simulates real markets where some proportion of buyers is insensitive to price differences, for instance, because they have committed themselves to buy from a certain supplier.

[1] We assume that new producers are prevented from entering the market to only obtain the subsidy. There are several different ways in which this can be accomplished, such as for instance, requiring that producers produce more than a pre-specified lowest level to obtain the subsidy.

In the price-setting game dyads of participants are initially informed about the payoffs, they make simultaneous decisions unaware of the opponent's decision, and they receive feedback after each trial. In two conditions different subsidy levels are introduced; in a third control condition there is no subsidy. We expect that the higher the subsidy, the higher the prices and the fewer the sales. In the control condition we expect prices to be successively reduced resulting in sales increases.

Method

Participants

Seventy-two undergraduates at Göteborg University volunteered to participate in return for the equivalent of SEK 50 (SEK 1.00 is approximately EUR 0.11 or USD 0.14) plus any bonuses they earned in the price-setting game. Equal numbers were randomly assigned to one of three conditions: no-subsidy, low-subsidy, and high-subsidy. Within each condition participants were randomly assigned to one of twelve dyads.

A non-competitive price-setting game was conducted in a pilot study to assess the participant's understanding of the instructions and payoffs. Another 36 participants were recruited from the same pool of undergraduates. They were compensated in the same way as the other participants. As in the main experiment, equal numbers of participants were randomly assigned to the no-subsidy, low-subsidy, and high-subsidy conditions.

Procedure

Appointments were made with the participants to come to the laboratory. In the laboratory participants met, but were not formally introduced. After arriving they were seated in private cubicles and were asked to read written instructions (see Appendix A) presented to them. These instructions informed the participants in the dyads that they would compete with each other trying to sell a number of units of an unspecified product so as to maximize their income. The instructions were repeated aloud by the experimenter after the participants had finished reading them. Repeating or paraphrasing parts of the instructions answered any questions from the participants. No communication was allowed between participants.

Participants were told that they each could sell a maximum of 140 units in each of an unspecified number of trials. Their task was to individually set a price between 0 and 100 points per unit. The task was self-paced and the competitor's price was not disclosed. Both participants wrote their price on a form that was handed to the experimenter. Ten trials were administered. Beginning with the second trial onwards, on the form participants received prior to each new trial, the experimenter had recorded data from the previous trial: the prices both participants had set, the number of units they had sold, and the number of points they had earned. Since participants were not informed about the number of trials the game would last, they were under the impression that it could end at any time.

The payoffs to each participant in the dyads as a function of the prices they set are given in Appendix B.[2] In all conditions the total number of sold units decreased in proportion to the increase in the lowest set price. The share sold by the participant who

[2] This payoff matrix was not shown to participants. Derivations of the payoffs are available upon request from the corresponding author.

set the lowest price increased in proportion to the price difference between the participants, and for the participant who set the higher price, the share was reduced accordingly. In the no-subsidy condition, the points each participant earned were calculated as the number of sold units multiplied by the set price for each unit. In the subsidy conditions the participants also received points for their unsold units (calculated as the difference to the fixed maximum), 20 points in the low-subsidy condition and 40 points in the high-subsidy condition. All information about the payoffs was given to the participants in the written instructions. Participants were also informed that they would obtain a bonus between SEK 0 and SEK 50 that was proportional to the points they earned in three randomly selected trials.

The procedure in the non-competitive game was identical to the main experiment except that no reference was made to any competitor. The instructions were changed accordingly and the feedback after each trial informed participants only about their own outcome which depended on the price they set themselves and the number of units they sold. The payoff is shown in Appendix C.

In the competitive game each session lasted approximately 25 minutes. At the completion of the session, participants were debriefed and paid their monetary compensation.

Results

In both the non-competitive and the competitive games price setting was the primary dependent variable. In the competitive game additional dependent variables were examined including number of sold units, income from sales, and cost of the subsidy that all are related to price setting. These analyses were performed to clarify consequences of the subsidy.

All statistical analyses reported below are performed on the means in blocks consisting of trials 2-4, 5-7, and 8-10. The first trial was excluded as participants only received feedback subsequent to this trial. In the non-competitive game the means were based on the prices participants set, whereas in the competitive game the means were based on the averages of the prices set by the members of each dyad.

Non-competitive game

Two outliers in the subsidy conditions were detected and removed. Apparently, the instructions were misunderstood (revealed during debriefing after the experiment); the prices they set varied widely across trials, occasionally going below the level of the subsidy. However, analyses with the outliers included did not markedly influence the results.

Figure 1 displays mean prices set in the three conditions plotted against blocks. As can be seen, prices are on average lower in the no-subsidy control condition ($M_{no\text{-}subsidy}$ = 67.8) than in the two subsidy conditions ($M_{low\text{-}subsidy}$ = 71.6 and $M_{high\text{-}subsidy}$ = 82.3). Since the prices for receiving maximum payoff (70, 80, and 90 for the no-subsidy, low-subsidy, and high-subsidy conditions, respectively) varied between conditions, statistical analyses of the differences between set prices and optimal prices were performed. These analyses revealed that the average set prices in the no-subsidy condition did not differ at $p = .05$ from the optimal price in any of the blocks, whereas in the subsidy conditions the differences were significant in the first block for the low-subsidy condition, $t(10) = -3.94$, $p < .01$, and for the high-subsidy condition, $t(10) = -6.89$, $p < .001$. Furthermore, comparing the deviation from optimal prices between the subsidy conditions and the control condition yielded a significant difference in the first block, $t(31) = 2.70$, $p < .02$, but not in the second or third block, showing that participants' set optimal prices after minimal experience.

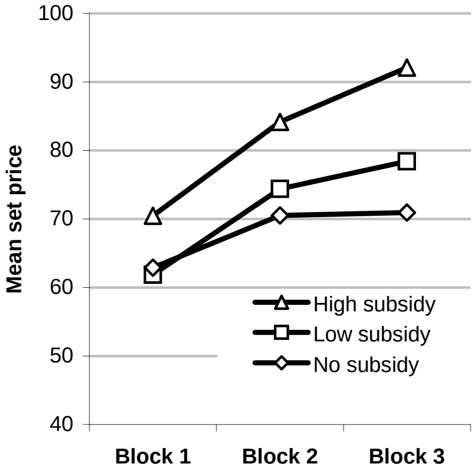

Figure 1. Mean set prices across blocks separately for high-subsidy, low-subsidy and no-subsidy conditions in the non-competitive game.

Competitive game

Analyses of price setting. Figure 2 displays the mean prices for each condition plotted against blocks. As can be seen, on average prices are set substantially lower in the no-subsidy condition ($M_{no\text{-}subsidy} = 28.2$) than in either subsidy condition ($M_{low\text{-}subsidy} = 45.6$ and $M_{high\text{-}subsidy} = 58.3$). Furthermore, it is only in the no-subsidy condition that prices decrease across blocks. Statistical analyses with planned contrasts revealed that on average prices were significantly higher at $p = .05$ in the subsidy conditions than in the no-subsidy condition, $t(33) = 5.91$, $p < .001$. Furthermore, the average price in the high-subsidy condition was significantly higher than in the low-subsidy condition, $t(33) = 2.72$, $p < .05$. Contrasts corresponding to the interaction between conditions and blocks revealed a significant decreasing linear trend only in the no-subsidy condition, $t(22) = -4.76$, $p < .001$. No such significant trends were found in the remaining conditions.

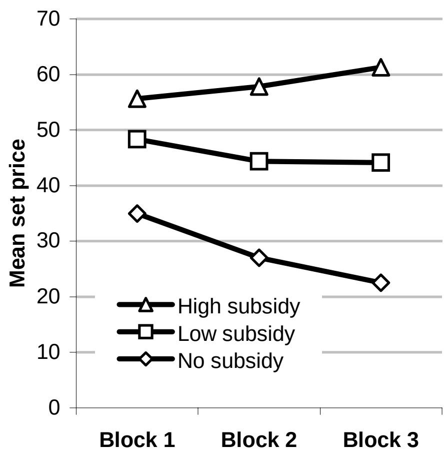

Figure 2. Mean set prices across blocks separately for high-subsidy, low-subsidy and no-subsidy conditions in the competitive game.

Analyses of sold units. The mean total number of sold units per dyad in each condition is plotted in Figure 3 against blocks. As expected, fewer units were sold in the two subsidy conditions than in the no-subsidy condition ($M_{high\text{-}subsidy}$ = 89.3 and $M_{low\text{-}subsidy}$ = 104.9 vs. $M_{no\text{-}subsidy}$ = 118.9), $t(33) = -5.82$, $p < .001$, and significantly fewer were sold in the high-subsidy condition than in the low-subsidy condition, $t(33) = -3.61$, $p = .001$. Contrasts corresponding to the interaction between conditions and blocks showed a significant linear trend only in the no-subsidy condition, $t(22) = 5.94$, $p < .001$, due to an increased number of sold units across blocks. No trends were found to be significant in the two subsidy conditions.

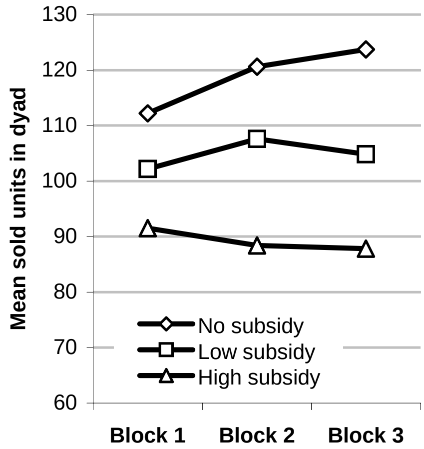

Figure 3. Mean number of sold units in dyad across blocks separately for high-subsidy, low-subsidy and no-subsidy conditions in the competitive game.

Analyses of income from sales. To investigate effectiveness on price setting of the subsidy, analyses of income from sales were performed. Figure 4 shows that the income from sales (with income from the subsidy excluded) was on average higher in the subsidy conditions than in the no-subsidy condition ($M_{high\text{-}subsidy}$ = 2271 and $M_{low\text{-}subsidy}$ = 1823 vs. $M_{no\text{-}subsidy}$ = 1228), and higher in the high-subsidy condition than in the low-subsidy condition. Both differences were significant, $t(33) = 4.90$, $p < .001$, and $t(33) = 2.32$, $p < .05$, respectively.

Contrasts corresponding to the interaction between conditions and blocks showed a significant linear trend only in the no-subsidy condition, $t(22) = -6.40$, $p < .001$, due to a reduction in income from sales across blocks. For the two subsidy conditions no such a trend was found to be significant.

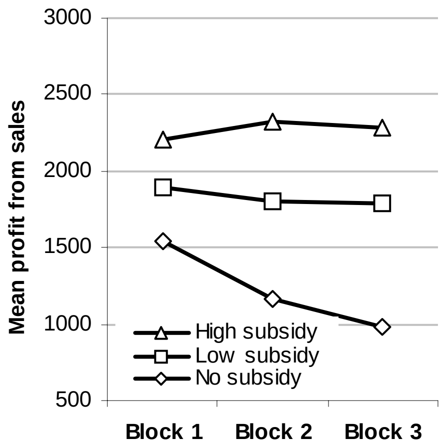

Figure 4. Mean profit from sales across blocks in the competitive game separately for high-subsidy, low-subsidy and no-subsidy conditions.

Analyses of cost of the subsidy. Additional analyses were performed to assess the cost of the subsidies, which is defined as the points received for unsold units. As Figure 5 shows, this cost increases slightly in the high-subsidy condition but remains unchanged in the low-subsidy condition. The average cost was significantly higher in the high-subsidy condition than in the low-subsidy condition ($M_{high\text{-}subsidy} = 3585$ vs. $M_{low\text{-}subsidy} = 1631$), $t(22) = 20.06$, $p < .001$. A slight increase of the cost was found in the high-subsidy condition, $t(22) = 3.17$, $p < .01$, but not in the low-subsidy condition, $t(22) = .19$, $p = .84$.

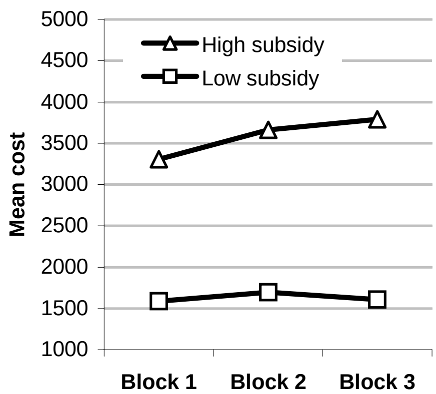

Figure 5. Mean cost across blocks for the high- and low-subsidy in the competitive game.

Discussion

The market experiment revealed that the subsidies counteracted price decreases and thereby inhibited increases in sales. This contrasts with the control condition without a subsidy where prices decreased and sales increased. Furthermore, a high subsidy had a stronger effect than a low subsidy. At the same time, the average income or profit from sales (with income from the subsidy not included) did not decrease over time in any of the subsidy conditions. In contrast, in the no-subsidy condition the average income decreased over time due to the fact that the price decrease was not compensated for by the increase in the number of sold units. In other words, the subsidy made participants set prices closer to the level of maximum income. In summary, the results showed that introducing the proposed subsidy system led to reduced sales compared to the no-subsidy condition by preventing the onset of a price war which occurred in the latter condition. It may further be noted that prices were set close to the subsidy levels, thus indicating that the participants competed, trying to sell as many units as possible.

The results in the non-competitive game indicated that participants set prices close to the levels of maximum income after minimal experience with the game. Although a difference was observed in the first block between the subsidy conditions and the no-subsidy condition, this difference was reduced and was not significant in the remaining blocks. Since the price setting led to price levels of maximum income, it indicates that the instructions and the payoffs were understood. Still, it is conceivable that the competitive game was perceived as more complex, thereby making understanding somewhat more difficult.

One possible explanation as to why set prices differed between the subsidy conditions and the no-subsidy condition is that the subsidy reduced the uncertainty associated with the competitor's prices because participants believed that their competitor was unwilling to set prices below the level of the subsidy. This parallels the effect of knowledge of an opponent's reservation price in dyadic price negotiations (Kristensen & Gärling, 1997a, 1997b). Another potential explanation is that in the subsidy conditions participants' higher set prices reflected increased risk taking, given that the probability of selling did not change, and also less loss aversion since not selling at the lowest price still guaranteed some income. In other studies of imperfect price competition, Capra et al. (1999, 2002) showed that participants who knew they would receive a high percentage of the earnings of a lower bidder set higher prices than participants who knew they would receive a low percentage. A similarity between these studies and the present one is that despite the uncertainty regarding the competitor's decision, and thereby uncertainty regarding the income, participants with a higher "guaranteed" income set higher prices.

Sterner (2002) noted several problems with implementing subsidy systems. One is that subsidies create incentives for firms and people to obtain the subsidy. To counteract this, new producers can be prevented from entering the market to only obtain the subsidy. There are several different ways in which this can be accomplished, such as for instance, requiring that producers produce more than a pre-specified lowest level to obtain the subsidy, and to exclude producers exploiting the subsidy. Another problem is that the cost of the subsidy may become too high. As already noted, in the transport sector taxes could finance the subsidy. Only increasing gasoline taxes may however lead to that producers are prematurely forced out of the market. A subsidy system will motivate producers to remain at the same time as their total production is controlled. Not cutting their income drastically also gives the producers the opportunity to make alternative investments.

The fact that the experiment was conducted with no reference to any specified market suggests that the observed results reflect basic principles of human functioning. If invariant across different contexts, the proposed subsidy system would be possible to implement in several markets where the government has a goal of reducing sales and production of environmentally harmful products. Furthermore, it would also be possible to implement as a method of preventing the depletion of finite resources. There is an ongoing debate concerning how to regulate the cod fishing industry so that stocks are not depleted. The cod stock has problems reproducing at the same rate as the present levels of catch. If something is not done in the near future, the cod stock faces the possibility of depletion, and fishers, trying to make a living on the diminishing cod stock in an increasingly harder competitive climate, face the possibility of an end to their trade. The fishing industry has a quota specifying how much they are allowed to fish but argue that they will be unable to make enough profit should this quota be reduced. Critics from the opposing side argue that if the quota is not reduced, then cod stocks will be depleted as was the case in the collapse of the cod stocks in 1992 in Newfoundland, resulting in that about 40,000 lost their jobs (Mason, 2002). If the proposed subsidy system were to be implemented, then the fishing industry would be compensated for the part of their quota that they voluntarily do not utilize, thereby motivating them to reduce their catch.

As mentioned earlier, the proposed subsidy policy may also be used as a complement to or as a new function within the EU ETS to provide incentives for producers to voluntarily reduce production below the governmentally regulated maximum levels. The subsidy may be one way of making the EU reduction targets more interesting for producers to achieve. If the EU ETS in its present form has little effect, introducing a subsidy system could be a potential solution bringing governments and industries closer to the goal set by the Kyoto Protocol. Furthermore, the transport sector, contributing to a large fraction of the emissions, is not part of the emission trading scheme in its present form. Therefore, it is important to either include this sector in the EU ETS system or to implement some other environmental policy, such as the proposed subsidy system, so as to achieve emission reduction in the transport sector.

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Appendix A

Instructions for the low-subsidy condition

You will be presented with several situations in which you will compete for points with another participant. The possibility of receiving a bonus varying between SEK 0 and 50 exists. The size of the bonus is proportional to the number of points you receive in the competition. You and your opponent each have the role of a producer trying to sell units of a product, thereby earning points. The competition will consist of an unknown number of trials. When the competition is over, three of these trials will be randomly selected. The points received in these trials determine the size of the bonus.

In each trial you will each have 140 units to sell of the product. Your task is to set a price between 0 and 100 points per unit. You will not know the price your opponent sets before you have set your price, and your opponent will not know your price until he/she has set his/her price. After each trial the results of you and your opponent's price setting will be revealed to both of you. Your points will be calculated by multiplying the price you chose with the number of units you sold at that price (i.e., if you manage to sell 50 units at the price of 50 points per unit, you will receive 50*50=2500 points).

The total number of units sold in each trial depends on the prices you both set. The higher the price, the fewer the number of units sold, and the lower the price, the greater the number of units sold. The difference between your price and your opponent's price decides the split of the number of sold units. If you set a higher price than your opponent you will sell fewer units than your opponent. If you set a lower price than your opponent you will sell more than your opponent. If you set a price that is much higher when compared with your opponent's price, you will only sell a few units, and may consequently earn only a few points. If you set a much lower price compared to your opponent you will sell many units but the total points earned could still be low. For each price set by your opponent, you can set a price that maximizes the points you earn.

You and your opponent will receive additional points for each unsold unit. You will receive 20 points for each of your unsold units.

Example: If you manage to sell 40 units at a certain price, you will not only receive points for the 40 units you managed to sell but also for the 100 units you did not manage to sell. Each unsold unit is worth 20 points, and therefore you will receive 100*20=2000 points for these unsold units, in addition to the points received for the sold units. If, on the next occasion, you manage to sell 100 units and you receive 20 points for each unsold unit, you will receive 40*20=800 points for the 40 units you did not manage to sell, in addition to the points you receive for the 100 sold units.

During the competition you are not allowed to communicate with your opponent.

In summary, your task is to set a price between 0 and 100 points per unit. You and your opponent have 140 units each at your disposal, and will sell different numbers of units depending on the price each of you set. The competition will consist of an unknown number of trials. When the competition is over, three of these trials will be randomly selected, deciding the size of the bonus. If you require any clarification regarding the instructions or if you have any questions, please feel free to contact the experimenter.

Appendix B

Table B1

Payoffs in the Competitive Price-setting Game

		Price set by *i*																			
		10		**20**		**30**		**40**		**50**		**60**		**70**		**80**		**90**		**100**	
	Income	**I**	**T**	**I**	**T**	**I**	**T**	**I**	**T**	**I**	**T**	**I**	**T**	**I**	**T**	**I**	**T**	**I**	**T**	**I**	**T**
Price set by *j*	**10**	650	3650	380	5220	330	5490	320	5600	300	5660	300	5700	280	5720	320	5760	270	5750	300	5780
	20	1100	2300	1200	4400	750	5350	680	5600	650	5730	660	5820	630	5870	640	5920	630	5950	600	5960
	30	1180	2060	1880	3720	1650	5050	1080	5600	1000	5800	960	5920	910	5990	880	6040	900	6100	800	6080
	40	1210	1970	2040	3560	2460	4780	2000	5600	1350	5870	1260	6020	1190	6110	1120	6160	1080	6200	1100	6260
	50	1230	1910	2120	3480	2670	4710	2880	5600	2250	6050	1560	6120	1400	6200	1360	6280	1350	6350	1300	6380
	60	1240	1880	2160	3440	2790	4670	3120	5600	3150	6230	2400	6400	1680	6320	1600	6400	1440	6400	1400	6440
	70	1250	1850	2200	3400	2880	4640	3280	5600	3450	6290	3300	6700	2450	6650	1760	6480	1620	6500	1500	6500
	80	1250	1850	2220	3380	2940	4620	3400	5600	3600	6320	3600	6800	3290	7010	2400	6800	1800	6600	1600	6560
	90	1260	1820	2240	3360	2970	4610	3480	5600	3750	6350	3780	6860	3570	7130	3200	7200	2250	6850	1700	6620
	100	1260	1820	2260	3340	3030	4590	3520	5600	3800	6360	3900	6900	3780	7220	3440	7320	2880	7200	2000	6800

Note: In the matrix the income (*I*) to *i* is given for the price set by *i* and the price set by the competitor *j*. Also shown is the total income (*T*) when the subsidy is added in the high subsidy condition. (An example for the no-subsidy condition: If *i* set the price of 50 and *j* set the price of 70, *i* will earn 3450. If *i* set the price of 70 and *j* set the price of 50, *i* will earn 1400.)

Appendix C

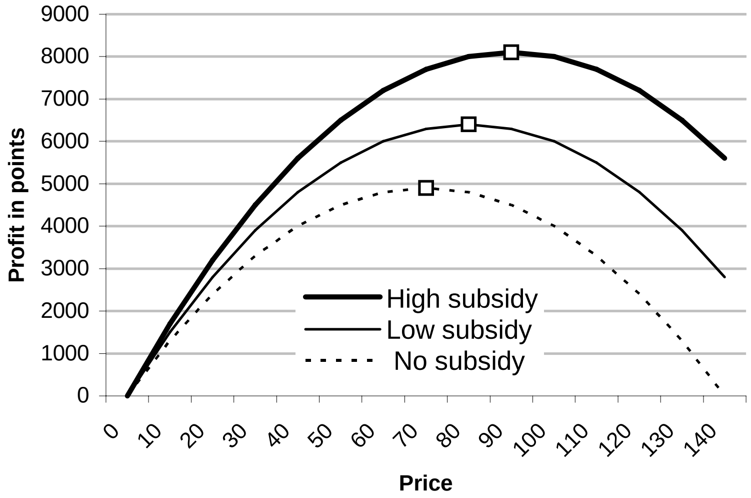

Figure C1. Point payoff distribution for prices set in the non-competitive pilot study for the no-subsidy, low-subsidy, and high-subsidy conditions respectively (it was only possible for the participants to set prices between 0 and 100).