Competitive Pricing in Markets with Different Overhead Costs: Concealment or Leakage of Cost Information ?

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ABSTRACT

This paper experimentally investigates how leaders and followers in a duopoly set prices for two product markets that have different overhead costs. In a fully crossed two-by-two design, we manipulate the participants' private cost report quality as either low or high, representing the extent to which these reports reveal that product markets have different overhead costs. We show that when only the leader is given a high-quality cost report, private cost information of higher quality is better incorporated into market prices (that are observable to participants). Both the leader and follower improve in profits and their prices better reflect the differences in overhead costs because the follower infers information from the leader's prices (information leakage). In contrast, when only the follower receives a high-quality cost report, the leader's profits and prices do not improve. This occurs because the follower conceals cost information when the leader has a low-quality cost report.

Key-words: Pricing, private cost information, signal efficiency, competitive markets

1. Introduction

This study examines how a leader (first mover) and a follower (second mover) respond to cost report quality, when they set prices for two product markets that vary in the amount of overhead or indirect product costs utilized. Textbooks often claim that cost reports that capture the differences in overhead costs across a firm's product-markets with less distortion, can improve the firm's profits and price setting (Kaplan and Cooper [1998]). While this assumption is reasonable for a monopolist (Narayanan [2003]), such a conclusion is less obvious in a competitive context. In a competitive setting, if price information reveals a firm's private cost information to other participants ('information leakage'), this may mitigate the potential advantage of the firm using the high-quality cost report.

We presume that the amount of private cost information that is revealed through market prices is strongly affected by the way private cost reports are distributed to firms in a duopoly. Specifically, we propose that more private cost information leaks out to the market if only the leader rather than the follower holds a cost report of higher quality. To test this claim, we use a fully-crossed two-by-two experimental design and manipulate the quality of the player's private cost reports as either having low or high quality[1]. A high-quality cost report better reflects the actual variation in the overhead costs consumed by the two product markets (per unit of volume). A low-quality cost report provides a distorted cost signal given that the overhead costs are the same for the two product markets (per unit of volume). We further disclose the players' total realized profits and their prices for the two product markets after each round of play.

Our results provide important insights into the market effects of price disclosures (Biddle and Hilary [2006]) as we show the conditions under which prices better reflect

[1] We focus on the two treatments in which only one agent (either the leader or the follower) uses a high-quality cost report. We contrast these against the two settings in which both agents receive cost reports of the same quality (both use a low or both use a high-quality cost report).

private cost information. Specifically, a market is defined as signal efficient with respect to a high-quality cost report, if prices and profits are similar to those that would be achieved if all agents had direct access to the high-quality cost report (Beaver [1991], Bloomfield and Libby [1996]). We show that signal efficiency is achieved, when only a leader uses a high-quality cost report. Followers using a low-quality cost report infer information from the leader's prices (information leakage) and all participants' prices and profits are similar than in the case where both leader and follower use a high-quality cost report. Signal efficiency is much lower when only followers hold the high-quality report. In this case, followers conceal their cost information to take advantage of leaders who use a low-quality cost report. As a result, prices of all participants reflect to a lesser extent the differences in overhead costs between the two product markets. The leader's profits are also lower than in the treatment where all agents use a high-quality report.

This study also questions the common argument that cost-related pricing errors disappear quickly through market feedback from more successful players (Kachelmeier [1996], Waller et al. [1999]) or from better-informed players in a market (Briers et al. [1999]). In our setting such pricing errors still persist if only the follower is given a high-quality cost report. In this case, leaders with a low-quality cost report do not adjust their prices between the two product markets to reflect the differences in indirect costs. Leaders make similar pricing errors than in the case where all players use a low-quality cost report. Conversely, we find that pricing errors of followers using a low-quality cost report quickly disappear when only the leader receives a high-quality cost report. Both leaders' and followers' prices reflect the differences in overhead costs, and both players improve their profits (compared to when all agents receive cost reports of low-quality).

Although we use a market with imperfect competition, a bit similar to Bloomfield and Luft [2006], our results qualify their view that participants in such markets have

more difficulty in avoiding cost-related pricing errors.[2] We contribute to this study in two important ways: 1) pricing errors can still quickly disappear or persist depending on who holds the high-quality cost report; and 2) this result is not driven by psychological factors, but by different forms of competitive behavior that arise when followers are given a high-quality report compared to when leaders are given a high-quality report.

Our findings suggest practical consequences for firms that want to invest in costing systems that better reflect differences in overhead costs when their competitors rely on systems that do not provide this information. Contrary to general intuition (Kaplan and Cooper [1998], Vives [1984; 1990]), a leader does not achieve superior profits vis-à-vis a follower, if only the leader uses a high-quality cost report (due to information leakage from a leader to a follower). Analyses also show that if only a follower is given a high-quality report, this follower performs worse (as he or she conceals cost information) than a follower with a low-quality report who faces a leader with a high-quality report.

2. Framework and hypotheses

The accounting literature has focused solely on competitions in which participants make simultaneous pricing decisions (Kachelmeier [1996], Waller et al. [1999], Bloomfield and Luft [2006]). In a sequential game, however, followers that move second have the advantage of observing the pricing decisions of a leader before markets clear and prices and profit information become available to all parties. Although such games are quite common, they have received little investigation (Huck et al. [2001]). We are the first to examine the impact on prices and profits of the quality of private cost information about the indirect product costs. The key question that we explore is how well market prices

[2] If markets are very competitive, the threat of being priced out of the market (Waller et al. [1999]) or of losing bids when there are bids and asks of buyers and sellers coming together (Kachelmeier [1996]) quickly disciplines these errors. We employ an imperfect duopoly where players would not lose all sales to their rivals if they set different prices than their competitor (Mishra and Vaysman [2001]) and similar to Bloomfield and Luft [2006], we do not have any interactions with buyers.

reflect private cost information of higher quality (that better captures the differences in overhead costs between product markets) if *only* the leader or *only* the follower is given such information. If indirect costs differ sharply between markets, participants can improve their profits when prices in the two markets differ accordingly. However, when prices are observable, acting on a high-quality cost report by setting different prices in the two markets may convey cost information to the other participant (Milgrom and Roberts [1987], Narayanan [2003]). This is called information leakage (Goenka [2003]).

We use a design in which we focus on the two treatments where only the leader is given a high-quality cost report (and the follower uses a low-quality cost report) or the follower is given a high-quality report (and the leader uses a low-quality cost report). We contrast these to the first benchmark in which both agents are given low-quality cost reports (i.e. reports that indicate little difference in the indirect costs of the two product markets). In this case, there are cost-related pricing errors as the participants' prices are unlikely to reflect the actual differences in indirect costs. From this, we can see how much participants improve their prices and profits when only the leader or the follower is given a high-quality report. In the second benchmark both agents receive high-quality cost reports. To explore signal-efficiency, we compare this second benchmark to the agents' prices and profits under conditions when only the leader or only the follower uses a high-quality cost report (Beaver [1991], Bloomfield and Libby [1996]).

We then predict that there is more information leakage when *only the leader* uses a high-quality cost report. Similar leakage does not occur when *only the follower* receives a high-quality cost report. This happens because a follower uses his second mover advantage differently dependent on whether or not he or she receives a high-quality cost report. Specifically, in a repeated pricing context (Matsui [1989]), leaders or followers can make their actions dependent on what they observe. If we presume that participants

act on the basis of their cost reports in the initial phases of play (Waller et al. [1999], Gupta and King [1997]), a leader will adjust prices in the two markets in response to a high-quality cost report that shows the differences in indirect unit costs, but will set the same price in both markets given a low-quality cost report. When only the leader has a high-quality report, the follower quickly observes that the leader attains higher profits when he set different prices in the two product markets. A follower with a low-quality cost report can then simply decide to copy the leader in the next rounds of play. Consistent with Oechssler [2002] and Huck et al. [2001], imitation is likely because followers with a low-quality cost report can then attain similar profits to the leader.

Conversely, if only a follower receives a high-quality cost report, we predict a more aggressive game. Since followers make their pricing decisions after observing a leader's prices (Gal-or [1985]), followers can use their high-quality cost report to outperform leaders who receive a low-quality cost report. In each round, a follower can always adjust prices more than the leader in order to improve their profits at the expense of the leader's profit. The follower, however, faces an important dilemma in that exploitation can trigger retaliation by the leader (Martini [2003], Dixon et al. [2002]). One way for leaders to retaliate is to react with prices that do not differ at all between the two markets (consistent with the low-quality cost report received by the leader). This reduces the profits of all players, even the profits of the follower, because total market profits would in fact be higher if all participants' prices incorporate the differences in the indirect costs. There are, however, motivations for followers to control the amount of cost information revealed via market prices (Gal-Or [1987]).[3] First, when the follower's prices are only slightly different in the two markets and exploit the prices of

[3] We can make an analogy to the situation described in Gal-Or [1987], where leaders hold a theoretical first-mover advantage in a quantity competition. She describes how reduced benefits can occur for a leader that has superior private information about the demand function. Leaders also hold back demand information in the first round to influence the second round of play. Nevertheless, Gal-Or [1987] analytically proves that having access to private information is then no longer beneficial.

a leader to a lower extent, leaders may be more inclined to correctly adjust their prices in further rounds. As a result, followers' profits may be higher than in the case when the leader retaliates by maintaining the same price for both product markets. Secondly, if a leader would retaliate, followers can try in later rounds to force the leader to set different prices in the two markets (Selten et al. [1997], Selten [1998], Cason and Mason [1989]) by setting the same price in both markets for at least one round. In both cases, of course, market prices incorporate cost information more slowly.

The above arguments suggest that a follower with a low-quality cost report can infer cost information from the leader's prices when the leader has a high-quality cost report. In hypothesis 1, we therefore predict that quality of the cost report will be less important for followers if the leader already uses a high-quality report (an interaction that shows that leader's information leaks to the market). Conversely, leaders with a low-quality cost report do not infer information from a follower with a high-quality report because a follower conceals part of the cost information. The leader may even continue to set prices that do not reflect the differences in overhead costs. Therefore, the leader is less likely to improve when a follower is given a high-quality report. Hence, we predict in hypothesis 2 that the leader only improves when he or she is given a high-quality report.

HYPOTHESIS 1: Providing the follower with a high-quality cost report improves the follower's profit and prices less, when a leader already has a high-quality cost report.
HYPOTHESIS 2: Providing the leader with a high-quality cost report improves the leader's profit and prices, regardless the type of cost report of the follower.

Support for the hypotheses would mean that providing *only the leader* with a high-quality cost report instead of providing *only the follower* with such a report will 1) more sharply improve both participants' profits and prices compared to the scenario in which

both leader and follower use low-quality cost reports; 2) improve signal efficiency more in the sense that prices and profits are then likely to be similar to those achieved when all participants have high-quality reports (due to information leakage from leaders).

3. Experimental design

Fifty-eight fixed pairs of participants compete in 10 rounds of pricing decisions for two product markets that have similar direct costs but very different indirect costs.[4] We randomly assign participants in each pair to the role of a leader (first mover) or follower (second mover who decides after a leader). After each round, total profits and prices per product market are made public and the participants review a private cost report regarding their own performance. Before the participants begin, they also review their cost report and the rival's profit and prices per product market for initial prices set by the researcher. In a fully crossed two-by-two between-subjects design, we assign either 'high' or 'low' quality to the participants' cost reports. A high-quality cost report better reflects the differences in indirect costs between the two markets. In contrast, a low-quality cost report indicates that the indirect costs per unit of volume are similar in both markets. We first discuss the demand and cost functions of the two product markets. Section 3.2 explains the cost report manipulation. Section 3.3 describes the procedures and our participants. Manipulation checks are discussed in Section 3.4.

3.1. THE MODEL: PRICE COMPETITION IN MARKETS WITH DIFFERENT INDIRECT COSTS

We employ a von Stackelberg price competition in two product markets, A and B that differ in terms of indirect costs (indices 'a' and 'b' represent markets A and B). As a result of these cost differences, profits increase if the prices in the two product markets, respectively P_a and P_b, are set differently. Followers have a second-mover advantage in

[4] Fixed pairs (Huck et al. [2001]) are commonly used if one is interested in behavior in a repeated play.

that they make their pricing decision after they observe the leader's prices. Below, we show the product demand and cost functions. Subscripts L and F index the leader and follower, respectively. For followers one should use the indices in parentheses.

Equations (1a) and (1b) show that we employ a differentiated demand function, Q, to represent sales volume in each market: Typically, a participant's own price in each product market affects sales volume to a greater extent than does a rival's price (e.g., Callahan and Gabriel [1998]). Examples are product markets in which similar products have different brand names. Total demand for each participant, Q_{tot}, is given in (1c).

Sales volume market A:	$Q_{a\,L(F)} = 5500 - 3.00\,P_{a\,L(F)} + 1.05\,P_{a\,F(L)}$	(1a)
Sales volume market B:	$Q_{b\,L(F)} = 2325 - 1.25\,P_{a\,L(F)} + 0.30\,P_{b\,F(L)}$	(1b)
Total sales volume:	$Q_{tot\,L(F)} = Q_{a\,L(F)} + Q_{b\,L(F)}$	(1c)

Both leaders and followers face the same cost structure. In each market we use a simple function representing the direct cost of goods sold, C (equations 2a, 2b, and 2c). A complex function represents the indirect costs or overhead costs, OH (equations 3a, 3b, and 3c). Product market A incurs much more overhead costs per unit of volume, than product market B. Product market A incurs more fixed overhead costs than product market B (1,750,000 versus 700,000) and overhead costs also increase more sharply with sales volume (the quadratic coefficient is 0.25 for market A versus 0.14 for market B). Also, the decreasing linear component is much smaller for market A than for market B (linear coefficient of 410 versus 515). This component offsets the lower direct cost of goods sold in market A (630 – 410 = 220 versus 710 – 515 = 195).

Direct cost market A:	$C_{a\,L(F)} = 630\,Q_{a\,L(F)}$	(2a)
Direct cost market B:	$C_{b\,L(F)} = 710\,Q_{b\,L(F)}$	(2b)
Total direct cost:	$C_{tot\,L(F)} = C_{a\,L(F)} + C_{b\,L(F)}$	(2c)
Indirect cost market A:	$OH_{a\,L(F)} = 1{,}750{,}000 - 410\,Q_{a\,L(F)} + 0.25\,Q_{a}^{2}{}_{L(F)}$	(3a)
Indirect cost market B:	$OH_{b\,L(F)} = 700{,}000 - 515\,Q_{b\,L(F)} + 0.14\,Q_{b}^{2}{}_{L(F)}$	(3b)
Total indirect cost:	$OH_{tot\,L(F)} = OH_{a\,L(F)} + OH_{b\,L(F)}$	(3c)

Equation (4a) shows the participants' total profit function across both markets. Since prices affect demand, which in turn determines costs, profits can be entirely rewritten in terms of price choices. Equations (4b) and (4c) show the prices and profits in a Nash equilibrium for leaders and followers. We derive this via backward induction, in which we first determine the best response for followers (to the leader's prices) and then given this strategy, we derive the optimal prices for leaders. Followers earn slightly higher profits than leaders in equilibrium because of their ability to move second. For profit maximization, participants should set a much higher price in product market A ($P_a > P_b$).

Total profits: $\text{Profit}_{\text{tot L (F)}} = Q_{a\ L\ (F)} P_{a\ L\ (F)} + Q_{b\ L(F)} P_{b\ L\ (F)} - C_{\text{tot L (F)}} - OH_{\text{tot L (F)}}$ (4a)

Nash equilibrium leader: $P_{a\,L} = 1{,}848.2$; $P_{b\,L} = 1{,}348.0$; $\text{Profit}_{\text{tot L}} = 777{,}215.8$ (4b)

Nash equilibrium follower: $P_{a\,F} = 1{,}834.4$; $P_{b\,F} = 1{,}337.3$; $\text{Profit}_{\text{tot F}} = 790{,}998.0$ (4c)

3.2. THE MANIPULATION OF THE PRIVATE COST REPORT

<Insert Table 1 about here>

The participants' cost report contains sales volume, revenue, cost and profit figures in total and by product market. The above functions for the total amounts are used to update total amounts of a cost report. Hence, total profits are in fact an actual reflection of the participant's performance and this figure is also publicly disclosed after each trial.

The cost reports also use these functions to display sales volume, revenues and direct costs per product market. We assume, however, that only the total indirect costs are observable, but not the actual differences of indirect costs between the two product markets. Hence, to account for differences in indirect product costs, the cost reports use a cost allocation method to assign the total indirect cost (equation 3c) to the two product markets A and B. As shown in Appendix A, we manipulate the quality of the cost report as the extent to which the cost allocation method reflects the differences in indirect cost

between the two product markets (see also Christensen and Demski [1995], Datar and Gupta [1994], and Gupta and King [1997]). A low-quality cost report allocates total indirect costs to the two markets based on sales volume and each product market gets an equal share of indirect costs per unit of volume. In contrast, a high-quality cost report assigns this total to three overhead categories. Because market A requires more of the cost driver, in proportion to sales volume, in each of these categories than does market B, this cost report more accurately reflects the differences in the indirect costs per unit.[5]

Panel A of Table 1 shows the unit costs displayed under respectively a low- or high-quality cost report in comparison to the actual cost per unit for the initial starting prices (e.g. leader). Panel B of Table 1 shows our experimental design with four treatments. In game A both leaders and followers receive low-quality cost reports; i.e. cost allocations in both the leader's and follower's private cost report provide a distorted picture of the per unit costs. In game B only the leader receives a high-quality cost report that reflects the difference in unit costs between the two product markets. In game C only a follower receives a high-quality cost report. Finally in game D, both the leaders and followers receive high-quality cost reports with cost allocations showing that market A is per unit more costly than market B. In all cases, the cost report is *private*. Leaders are not aware of the cost report quality of the followers and vice versa. Prices, however, are publicly revealed and may contain cost information (because prices in Nash equilibrium reflect these cost differences). Therefore, we primarily focus on the games in which only one agent has a high-quality cost report (games B and C) to see if participants with a low-quality report are able to infer information from participants with a high-quality report.

[5] An alternative is to introduce noise on a cost figure (Callahan and Gabriel [1998]). In practice, quality of the cost report can be assessed in the following manner. A firm may for example learn that the typical volume-related cost drivers have low explanatory power compared to non-volume-related cost drivers, when studying their past overhead cost behavior (e.g., Banker and Johnston [1993]). The costing system of such a firm would be of low-quality if they still use a volume-related cost driver. The quality of the cost report is expected to increase if non-volume-related drivers are used that assume that some products consume more overhead than others.

3.3. PARTICIPANTS AND EXPERIMENTAL PROCEDURES

We recruit 116 participants (58 pairs) from various cost accounting courses that deal with cost allocations and their use in pricing. Participants (mean age: 23.3 years) are post-graduates who follow additional programs in accounting, insurance, applied economics, or industrial management. When they enter the computer laboratory, we randomly assign participants to the four treatments (games A, B, C, or D) and disperse them widely across the computer terminals. In this way, they cannot communicate with one another nor can they determine with whom they are paired. All sessions have eight to 16 participants (four to eight pairs) and last about 90 minutes.

We introduce the materials as a business case. Participants assume the role of price competitors in the distribution of portable PCs. The case informs all participants about the cost differences. Clients in market A (PC shops) order slightly less expensive products (lower cost of goods sold). Nevertheless, they require much more support than clients in market B (business organizations). The case also explains how the cost report deals with customer-related support costs. In cases of low-quality cost reports, the cost report is labeled as volume-based costing (VBC) which allocates indirect costs on the basis of sales volume. In cases of high-quality cost reports, we label the system as activity-based costing (ABC) and participants are told that indirect costs are allocated on the basis of activity levels in three distinct support functions. From this description participants can assess the quality of their cost report (e.g., they can infer that a volume-related driver probably does not pick up all the differences in indirect costs).

We also describe the nature of play. Leaders set prices first because of their position in the market, and followers set prices after observing the leader's prices. We mention that both the leader and the follower face the same cost structure for the two markets, and that leaders and followers distribute slightly differentiated products (e.g. different

brand names of PC's). Participants know that prices and actual total profits of their rival become public after each round. This forms another source of feedback. Although the rival's cost report quality is private, participants are always able to compare their own profits with those of their rival given that costs are similar.

Participants then review their cost report and the rival's total profits and prices in product markets A and B (for the initial starting prices). They are told that feedback in subsequent rounds will have a similar format. Appendix B shows examples of these reports. Participants are instructed to maximize profits, with prices for both markets restricted to between €1,200 and €2,100. They are told that prices affect profits and that there is ample room to improve. To induce motivation, participants are informed that the eight best players (with the highest average profit over 10 trials) will receive a €20 gift coupon.[6] We further note that the prices and profits of the participant and their competitor for the previous five trials are always available on the screen. Participants then perform 10 rounds of pricing decisions. In each round, the leader sets prices for markets A and B (followers receive a message to wait). Next, we show these prices to the follower, who then decides on prices (leaders are instructed to wait). Markets clear and both players receive an update of their private cost report and the rival's total profits and prices in markets A and B. The experiment ends with an exit-questionnaire.

3.4. MANIPULATION CHECKS

We perform an ex-post test to assess subjects' perceptions of the quality of their cost reports. We use two five-point Likert-scale items of the exit questionnaire, with a score

[6] Consistent with McIntyre and Ryans [1983], the best-performing leader and follower in each treatment receive a coupon. Drawbacks of this tournament scheme are the dysfunctional effects (low motivation, risky decisions) that may arise among participants scoring low profits in certain trials (Bonner et al. [2004]). Drago and Heywood [1991] empirically tested this claim and did not find evidence of such suboptimal behavior. We also presume that our reward scheme has little effect on our results. Motivation, as assessed in the exit questionnaire, was high (4.3 on a 5-point Likert scale) and importantly, it did not differ across treatments. Participants are also instructed to perform as well as possible in every trial.

of 1 indicating "strongly disagree" and a score of 5 indicating "strongly agree." The two items are (1) "I had a feeling that the per unit costs in the cost report were highly distorted" and (2) "The cost report provided me a clear picture about which market was more costly". Leaders with high-quality reports scored lower than leaders with low-quality reports on item 1 and higher than leaders with low-quality reports on item 2 (item 1: $F_{quality} = 5.75$, $p < 0.02$; item 2: $F_{quality} = 10.74$, $p < 0.01$, where $F_{quality}$ is the F-value of an ANOVA analysis for the effect of report quality). For followers, we observe a similar difference (item 1: $F_{quality} = 4.01$, $p < 0.06$; item 2: $F_{quality} = 13.25$, $p < 0.01$). We then compute score differences between leaders and followers on both these items to derive a scale for the perceived quality differences (Cronbach's $\alpha = 0.615$).[7] In game B, where only leaders have high-quality reports, leaders rate the quality of their cost report higher than followers, as the score on the scale is positive and significantly different from zero ($t = 2.07$; $p < 0.06$). In game C, where only followers have high-quality reports, the score is negative and significantly different from zero ($t = -2.14$; $p < 0.06$), indicating that leaders rate the quality of their cost report lower than followers. In games A or D, where both leaders and followers have reports of similar quality, the quality is judged equally low or high (tests for scores different from zero in game A: $t = -0.28$, $p > 0.78$; in game D: $t = 0.34$, $p > 0.74$). In sum, the participants' views in each game are consistent with the way we manipulate cost report quality in each game.

Further tests also reveal that participants understand that followers have a second-mover advantage. Leaders record higher scores than followers (F_{role}: 64.53, $p < 0.01$) on the item "For my competitor, it was easier to determine selling prices." Subjects acting as a leader agree with this item (t-test of score different from 3, $t = 9.51$, $p < 0.01$), whereas followers disagree (t-test of score different from 3, $t = -2.74$, $p < 0.01$).

[7] We reverse-code the first item as it was framed in the opposite way to the second item.

4. Experimental results

We first provide the hypotheses tests for the prediction that there is more information leakage when only the leader rather than the follower is given a high-quality cost report. Section 4.1 explores this by studying differences in the leader's and follower's realized profit across treatments. Section 4.2 then compares the averages of the participants' price difference between the product markets A and B across treatments. If participants' prices are far apart (Pa > Pb; consistent with the price differences at Nash in equations 4b and 4c), prices better reflect the differences in indirect unit costs between the two product markets. Results in both these sections use game-by-game comparisons (e.g. Bloomfield [1997]) on the basis of contrast estimates in an ANOVA analysis. These estimates show a degree of difference between treatments and provide an indication of economic significance. Each difference can in fact be seen as a euro difference, given that the experiment displays figures in euros to the participants. Further analyses in section 4.3 provide evidence on the underlying motivations of our findings.

4.1. ANALYSES OF REALIZED PROFIT

<Insert Table 2 about here >

Panel A of Table 2 shows the average realized profit for the 10 rounds of play for participants acting as a leader or a follower. The market profit is the sum of both participants' profits. This panel also contains the detailed comparison of differences in realized profits across treatments. Panel B shows a graph of the realized profits.

Consistent with hypothesis 1, the interaction between report quality of the leader and report quality of the follower in Panel A of Table 2 is significant for the followers' realized profit (-81,106, p=0.06). This means that providing the follower with a high-

quality report, improves the follower's profits less when the leader already has a report of high-quality. This is also clear from the graph in panel B. This implies that followers with a low-quality cost report are able to infer information for profit improvement from a leader that is given a high-quality cost report. As indicated in Panel A, this interaction is not significant for leader's profit (-37,955, p = 0.23). Consistent with hypothesis 2, the graph in Panel B shows that for the leader's profit, only the leader's type of cost report is important, regardless the type of cost report of the follower.

Further evidence suggests that more cost information leaks out to followers (for profit improvement) when leaders have a high-quality cost report relative to the amount of information that leaks out to leaders when followers have a high-quality cost report. To this end, we compare in panel A of Table 2, the treatments in which only one participant has a high-quality cost report (games B or C) to the benchmarks where both participants have cost reports of the same quality (games A and D).

In comparison to the case in which both participants have low-quality cost reports (game A), providing only the leader with a high-quality cost report (game B) sharply increases market profits with *+206,475* (p< 0.01), because the profits of all participants increase (leaders +90,266, p < 0.01; followers +116,208, p< 0.01). This result in game B is also signal efficient with respect to the quality of the cost report because realized profits do not differ from game D in which both players have high-quality cost reports (leaders: –23,832, p = 0.25; followers: +5,728, p = 0.44; market: –18,104, p= 0.40). In contrast, when only a follower receives a high-quality report (game C), market profits only increase with *+100,959* (p = 0.08) relative to game A. Only followers improve their profits (+86,834, p = 0.01). Leaders do not significantly improve in profits (+14,124, p= 0.35). This market is also less efficient with respect to the cost signal, as

the leaders' profits remain lower than in game D in which both players have high-quality cost reports (comparison for leaders' profit: +52,311, p = 0.08).

Finally, when we focus on the games in which only one player has a high-quality cost report (comparison of games B and C, results not shown in panel A of Table 2), the follower's profit is similar when either the leader or the follower has a high-quality cost report (difference in followers' profit: –29,374, p = 0.22). However, compared to game B, the leaders' profit is significantly lower in game C in which only the follower uses a high-quality report (–76,143, p = 0.02) as are market profits (–105,517, p= 0.07). The fact that leaders' and market profits are lower, confirms that there is less information leakage when a follower uses a high-quality cost report.

4.2. ANALYSES OF PRICE DIFFERENCES BETWEEN PRODUCT MARKETS

Panels A and B of Table 3 show the average price differences between markets A and B for participants acting as leaders ($P_{a\,L} - P_{b\,L}$), and followers ($P_{a\,F} - P_{b\,F}$). A positive and larger price difference implies that participants' prices better reflect the differences in overhead or indirect costs between the two product markets.

<Insert Table 3 about here>

Unlike the evidence on profits, the interaction between report quality of the leader and report quality of the follower in Panel A of Table 3 is never significant (-29.0, p = 0.69 for followers; +27.9, p = 0.67 for leaders). This can be explained by the fact that price differences are large when both players are given high-quality cost reports in comparison to the other treatments. Nevertheless, further evidence still corroborates that there is more information leakage from leaders than from followers.

First, when we again contrast games B and C (results of this comparison not shown in panel A of Table 3), followers with a low-quality cost report (facing a leader with a high-quality report) have similar price differences than when they use a high-quality cost report (and face a leader with a low-quality report). Price differences for followers between games B and C are not significant (+44.2; p =0.38). This implies that a follower with a low-quality cost report (in game B) can infer some information from a leader's prices. This is not the case for a leader with a low-quality cost report: the leader's price difference is significantly lower in game C than in game B (–112.2, p = 0.02).

Second, Table 3 further shows that when *only the leader* is given a high-quality cost report (game B) price differences for both the leader (+169.9, p< 0.01) and the follower (+157.0, p< 0.01) increase relative to the game A where both players have low-quality reports. Signal-efficiency with respect to the high-quality cost report is nearly achieved, as price differences for both the leader and the follower in game B are only marginally different from the benchmark (game D) where all players use a high-quality report (leaders: +85.6, p = 0.07; followers: +83.8, p = 0.10). Conversely, providing *only a follower* with a high-quality report (game C) improves the degree of price difference for followers but not for leaders relative to the game A where both players have low-quality reports (leaders: +57.7, p = 0.23; followers: +112.8, p = 0.03). Signal efficiency is also much lower. Price differences of the leader, but also those of the follower reflect to a lesser extent the differences in overhead costs compared to game D in which both agents use high-quality reports (leaders: +197.8, p< 0.01; followers +128.0, p= 0.01).

Apparently, a follower with a high-quality cost report sets smaller price differences between the two product markets when they face a leader with a low-quality cost report. We speculate that such followers conceal the fact that prices should be farther apart, and as a result less information leaks out to a leader with a low-quality cost report.

4.3. FURTHER ANALYSES

We first test if followers indeed conceal information, when only they use a high-quality report. We need to rule out whether the lower price differences of a follower in game C stem from optimal behavior given the leader's prices or from active deviations from this optimum, which would imply that followers conceal information. To this end, the percentage ratio in Table 4 compares the follower's price difference in each trial to an optimal degree of difference using the best-response prices between the two product markets for that round (follower's optimal prices given a leader's prices for that round).

< Insert Table 4 about here >

Given that followers have the same high-quality information in both game C and game D, we would not expect any difference a priori in their optimum response in each treatment. Results in Table 4, however, show a large difference between the followers' prices in games C and D; both in the metric's mean (50.8% vs. 27.0%, $p < 0.03$) and in improvement over trials ($p < 0.06$). Followers set prices at only a small percentage of the best-response prices and thus actively *conceal* their cost information when they face a leader with a low-quality cost report. Even more, also the difference in improvement over trials between game B and C is significant ($p < 0.10$; differences in means (36.0% vs. 27.0%), however, are not significant; $p > 0.37$). Apparently, followers with a high-quality report (paired with a leader using a low-quality report) more slowly incorporate the differences in indirect costs into their prices (over multiple rounds) than followers with low-quality cost reports who face leaders with high-quality cost reports.[8]

[8] Consistent with information leakage, the level of price difference in relation to the difference in best-response prices in game B does not differ from the level achieved in game D where all players use high-quality cost reports (36.0% vs. 50.8%; $p>0.11$ for difference in mean and $p>0.40$ for improvement over trials). Also note that followers in games B, C, and D always improve vis-à-vis game A where all agents receive low-quality reports. This is logical, given that in game A, there is little information available for improvement. Yet, followers with a high-quality report who face a leader with a low-quality report *only marginally improve* (game A vs. C, $p>.07$), which may stem from the fact that they conceal information.

< Insert Table 5 about here >

Table 5 compares the follower's prices and profits against those of the leader in the treatments where only the leader (game B) or the follower (game C) receives a high-quality cost report. Consistent with the discussion in section 2, we expect no differences between leaders and followers when only the leader is given a high-quality cost report. Followers will then infer information from the leader's prices (information leakage) and imitate the price choices of their leader. When only the follower is given a high-quality cost report, we expect the follower's price differences and profits to be larger than those of the leader. This would imply that followers try to take advantage of a leader.

Evidence in Table 5 is consistent with this. When only the leader uses a high-quality cost report (Game B), we find no significant differences between leaders and followers in terms of price differences (+148.3 for followers vs. +156.5 for leaders, difference is -8.2; $p>0.57$) and profits (649,401 vs. 647,018; difference is +2,383; $p > 0.88$).

When only the follower is given a high-quality cost report (game C), a follower charges on average larger price differences between the two product markets than their leader (+104.3 for followers; for leaders it is only +44.3; difference is +59.8; $p<0.05$). As such, a follower realizes higher profits at the expense of the leader's profit (620,027 vs. 570,875; difference is +49,152, $p<0.02$). As discussed in section 2, followers cannot be sure that leaders will change their prices at all. As a form of retaliation, leaders may maintain the same prices for the two product markets (consistent with their low-quality cost report). We indeed find evidence that a leader on average sets similar prices for the two product markets. A t-test reveals that their price difference between markets A and B (+44.3, $p>0.12$) is not significantly different from zero.

This may explain why followers conceal part of their cost information (as shown in Table 4). If followers slowly incorporate the differences in overhead costs into their prices (and exploit leaders to a lesser extent), leaders may be inclined to change prices in future rounds. An alternative explanation is that followers sometimes deviate by also setting similar prices (so that everyone ends up with very low profits) to force leaders to set different prices for the two product markets in future rounds. Although followers conceal cost information, possibly to take advantage of leaders using a low-quality cost report, additional analysis shows that such followers still earn lower profits (because leaders retaliate by setting similar prices for the two product markets) than followers with a low-quality cost report facing a leader with a high-quality report.[9]

5. Conclusion

Many firms compete on the basis of private information with access to some public signals (e.g., prices and realized profits) of other players (Dolbear et al. [1968]). Yet, no prior study has disentangled how private cost reports of differing quality (i.e., reports that use cost allocations which either reflect or do not reflect the variations in indirect costs) affect outcomes in these markets. We create a laboratory experiment, using a sequential duopoly in which a leader and follower set prices in two markets that vary in terms of indirect costs. Our findings suggest that participants' profits and prices are sensitive to their access to low- or high-quality cost reports.

We show that high-quality cost reports can improve profits because participants appropriately set different prices for markets that have different indirect costs. The

[9] We find evidence consistent with this when we filter out the pairs in each treatment where followers understand that market A requires higher prices than market B; in other words those pairs for which the number of rounds with positive price differences for the follower is higher than the mean number of rounds with positive price differences for the follower (in total 10 pairs in Game B and 9 pairs in game C). If we test for differences in the follower's realized profits between these games (650,174 in game C vs. 709,430 in game B = –59,256, t-value: –1.85, p = 0.08) we observe that followers with a high-quality cost report facing a leader with a low-quality cost report (game C) end up with lower profits.

results also reveal that less cost information leaks out to the other participant (as indicated by lower price differences between the two markets) when only the follower and not the leader has a high-quality cost report. Signal efficiency is thus lower as all players adjust prices less, and the leader's profits are lower compared to the case in which all players are given a high-quality cost report. These results offer important new insights on whether accounting-related pricing errors can persist in markets where players act on different cost information (e.g., Bloomfield and Luft [2006], Kachelmeier [1996], Libby et al. [2002], Waller et al. [1999]). We show that such errors persist, in terms of prices that do not (fully) reflect differences in indirect costs, when only the follower has a high-quality cost report. Such followers conceal cost information, possibly to take advantage of leaders with low-quality cost reports. As a result, prices differ less between the two product markets (and errors persist). Conversely, pricing errors quickly disappear when leaders have high-quality cost reports as cost information leaks out via the leaders' prices to followers using a low-quality cost report.

Our findings suggest several avenues for further research. In contrast to Bloomfield and Luft [2006], who study the factors that make it more difficult for participants (that use cost estimates containing error) to learn from other market participants, we show that the way agents compete (e.g., concealing information as a result of exploitation and retaliation) can also affect market outcomes. It is interesting to investigate whether such considerations disappear or become more apparent when we introduce other changes in a market. Future work could vary the number of market agents (Lundholm [1991]), the severity of the competition (e.g., Waller et al. [1991]), or ways in which agents interact (Kübler and Müller [2002], e.g., fixed pairs or random matching).

Second, we study the conditions under which prices reflect or fail to incorporate private cost signals when prices are disclosed to participants. A next step is to consider

games in which participants have discretion over whether or not to disclose the price signal with noise (Callahan and Gabriel [1998]) or to disclose this signal at all (Darrough [1993]). This literature also focuses heavily on simultaneous moves (Cournot or Bertrand competitions). Using our insights, one may explore whether disclosure incentives (Bushman [1991]) vary conditional upon the distribution of cost signals in markets where players move sequentially.

In contrast to the claim that firms can earn more profits relative to their rivals (Kaplan and Cooper [1998]) when they use a more accurate cost reports, we show that this argument does not hold when the leader is given a high-quality report because all players improve in profits. Also, we contest the view that firms always benefit from more accurate cost information (Vives [1990]). Although followers with a high-quality cost report outperform leaders with a low-quality report, they suffer in that outcomes are inferior to those achieved when only the leader is given a high-quality report. Many additional insights may arise when the participants themselves can decide to invest in higher-quality cost information (Lundholm [1991b]). Followers might be less willing to spend money on this when their leader already possesses a high-quality cost report. Future empirical work can explore which firms invest in cost systems that better capture the differences in overhead cost and how this decision depends on their market position.

APPENDIX A

< Insert Table A here >

APPENDIX B

< Insert Table B here >

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TABLE 1
Overview of the experimental design

Participants act either as leader (first mover) or follower (second mover) and set prices for the two product markets that have different indirect costs. After each round, total profits and prices per product market are made public and participants receive an updated private cost report. Given the assumption that indirect costs per product market (equations 3a and 3b) are unobservable, the cost reports use a cost allocation method (see appendix A) to account for differences in the indirect costs per product market. We manipulate these cost reports as either having low quality (where product markets receive per unit of volume an equal amount of indirect costs) or high quality (where product market A is shown to be more costly than market B) in a fully crossed 2x2 design. Panel A shows the unit costs that are shown under a low- or high- quality cost reports in comparison to the actual costs at the start of the experiment (e.g. for the leader using the initial prices $P_{a\,L}$=1650; $P_{b\,L}$=1710; $P_{a\,F}$ =1645; $P_{b\,F}$=1706). Panel B shows our experimental treatments.

Panel A: unit cost shown in a high- or low-quality report (at start) vs. actual cost

Type of cost	*Actual Cost* Market A versus B	*Low-quality* cost report Market A versus B	*High-quality* cost report Market A versus B
Direct cost per unit	630.0 < 710.0	630.0 < 710.0	630.0 < 710.0
Indirect cost per unit	**927.8 > 583.9** (Equations 3a and 3b)	**847.0 = 847.0** (Appendix A)	**956.1 > 491.8** (Appendix A)
Total unit cost 'U'	1,557.8 > 1,293.9	1,477.0 < 1,557.0	1,586.1 > 1,201.8

Panel B: overview of experimental treatments (U: unit cost reported each trial)

Both agents receive low-quality cost report *Game A (n=14 pairs)* Leader: U (market A) < U (market B) Follower: U (market A) < U (market B)	*Only leader receives high-quality cost report* *Game B (n=15 pairs)* Leader: U (market A) > U (market B) Follower: U (market A) < U (market B)
Only follower receives high-quality cost report *Game C (n=14 pairs)* Leader: U (market A) < U (market B) Follower: U (market A) > U (market B)	*Both agents receive high-quality cost report* *Game D (n=15 pairs)* Leader: U (market A) > U (market B) Follower: U (market A) > U (market B)

TABLE 2

Analyses of the participants' realized profits across the treatments

Panel A shows the averages (for the 10 rounds of play) of the leaders' and followers' realized profits and the market profit (sum of profits of leaders and followers) per experimental treatment. Panel A compares these averages across treatments, based on contrast estimates within an ANOVA analysis (p-value, one-tailed). Note that the interaction shows whether the effect of providing a player with a high-quality cost report differs, depending on whether the other player has a low- or a high-quality cost report. A significant negative sign implies that the effect of providing a player with a high-quality cost report is lower, when the other player has already a high-quality report. To assess the economic significance of the results, each difference (Game A-B, A-C, B-D, C-D, and interaction) can be read as a euro difference given that the experiment used euro amounts. Panel B presents a graph of the average realized profits for leaders and followers.

Panel A: Average realized profits and comparisons across treatments

	Both agents low quality *Game A (n=14)*	*Only Leader high quality* *Game B (n=15)*	*effect report leader* *Game A-B*
Profit Leaders	556,751.7	647,018.3	+ 90,266.6 (p<0.01)
Profit Followers	533,192.4	649,401.2	+116,208.8 (p<0.01)
Market Profit	1,089,944.1	1,296,419.5	+206,475.4 (p<0.01)
	Only follower high quality *Game C (n=14)*	*Both agents high quality* *Game D (n=15)*	*Game C-D*
Profit Leaders	570,875.4	623,186.0	+ 52,310.6 (p=0.08)
Profit Followers	620,027.2	655,129.1	+ 35,101.9 (p=0.18)
Market Profit	1,190,902.6	1,278,315.1	+ 87,412.5 (p=0.11)

effect report follower	*Game A-C*	*Game B-D*	*Interaction*
Profit Leaders	+ 14,123.7 (p=0.35)	-23,832.3 (p=0.25)	-37,955.0 (p=0.23)
Profit Followers	+ 86,834.8 (p=0.01)	+5,727.9 (p=0.44)	-81,106.9 (p=0.06)
Market Profit	+100,958.5 (p=0.08)	-18,104.4 (p=0.40)	-119,062.9 (p=0.12)

Panel B: Graphical plots of the average realized profit for leader and follower

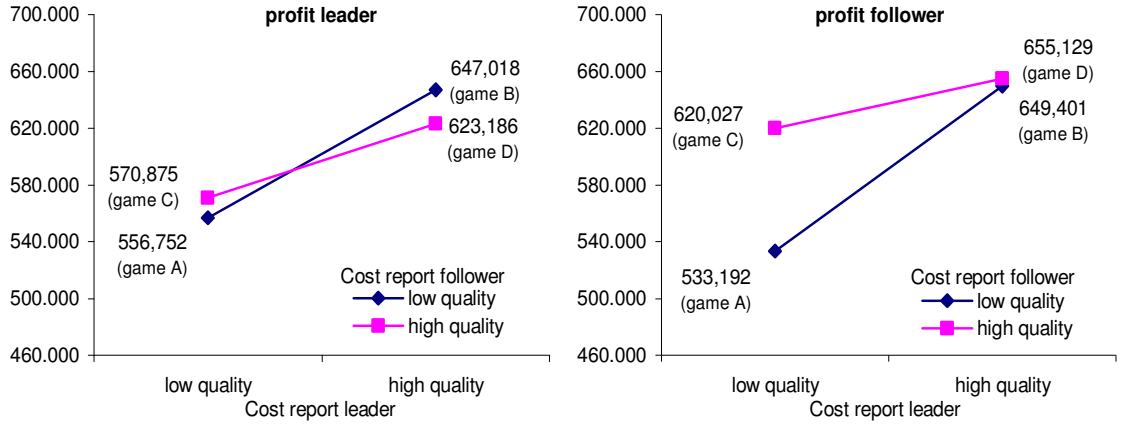


TABLE 3

Analyses of the participants' price difference between product markets A and B

Panel A shows the average (for the 10 rounds of play) price differences between product markets A and B for leaders and followers in each experimental treatment. It indicates how well prices of participants reflect the differences in overhead costs between the two product markets. Panel A compares these averages across treatments, based on contrast estimates within an ANOVA analysis (p-value, two-tailed). The interaction can be interpreted in a similar way as described in Table 2. To assess economic significance, each difference (Game A-B, A-C, B-D, C-D, and interaction) can again be seen as a euro difference. Panel B presents a graph of the average level of price differences for leaders and followers.

Panel A: Average level of price difference and comparisons across treatments

	Both agents low quality *Game A (n=14)*	*Only Leader high quality* *Game B (n=15)*	*effect report leader* *Game A-B*
Leader: $P_{a\,L}$ -$P_{b\,L}$	- 13.4	156.5	+ 169.9 (p<0.01)
Follower: $P_{a\,F}$ -$P_{b\,F}$	- 8.7	148.3	+ 157.0 (p<0.01)
	Only follower high quality *Game C (n=14)*	*Both agents high quality* *Game D (n=15)*	*Game C-D*
Leader: $P_{a\,L}$ -$P_{b\,L}$	44.3	242.1	+ 197.8 (p<0.01)
Follower: $P_{a\,F}$ -$P_{b\,F}$	104.1	232.1	+ 128.0 (p=0.01)

effect report follower	*Game A-C*	*Game B-D*	*Interaction*
Leader: $P_{a\,L}$ -$P_{b\,L}$	+ 57.7 (p=0.23)	+ 85.6 (p=0.07)	+ 27.9 (p=0.67)
Follower: $P_{a\,F}$ -$P_{b\,F}$	+ 112.8 (p=0.03)	+ 83.8 (p=0.10)	- 29.0 (p=0.69)

Panel B: Graphical plots of the level of price difference for leaders and followers

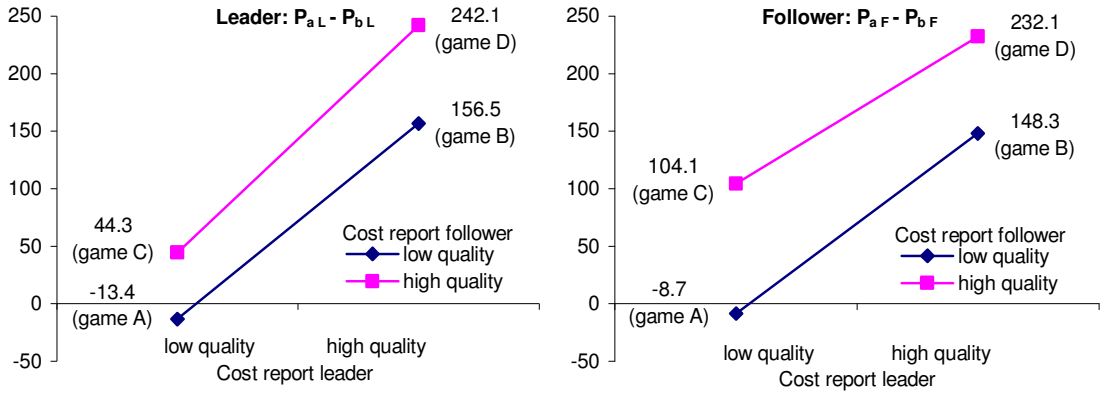
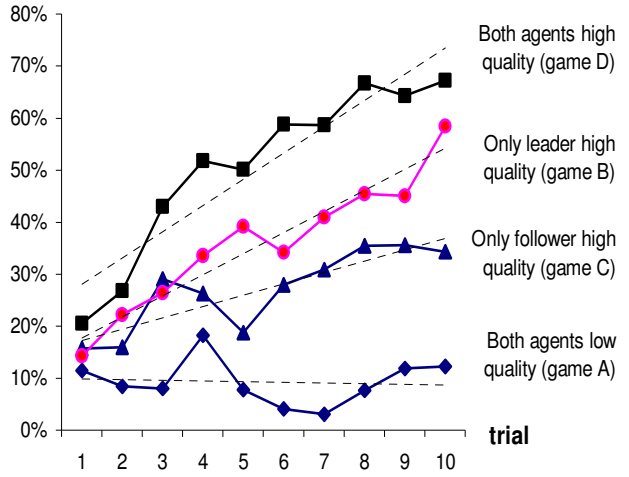


TABLE 4

Follower's price difference in relation to the price difference in best response prices

The percentage ratio of this table, divides the follower's price difference for the two product markets ($P_{a\,F} - P_{b\,F}$) in each round by the difference in best response prices for the two product markets, i.e. those prices that maximize the follower's profit given the leader's price choices for that round. We only consider choices of followers consistent with the sign of the difference for the best response prices (a follower's actual price in product market A should be higher than market B; otherwise the ratio was set to zero). The table displays the trial-by-trial mean (depicted in the figure), the overall mean for the 10 rounds of play, and results of repeated measures tests that compare differences in overall mean and across trial behavior for the treatments where at least one player receives a high-quality cost report. P-values are two-tailed (first line: p-value for difference in overall mean; second line: p-value of treatment x trial effect or the difference in improvement over trials).



	Mean for ten rounds of play	Games that are compared: C vs. D	B vs. D	B vs. C
Both agents high quality (game D)	50,8%	p<0.03** [p<0.06*]	p>0.11 [p>0.40]	p>0.37 [p<0.10*]
Only leader high quality (game B)	36,0%			
Only follower high quality (game C)	27,0%			
Both agents low quality (game A)	9,3%			

p-value for difference in means
[p-value for difference in improvement over trials]

TABLE 5

Follower versus leader in games where only one player uses a high-quality cost report

In this table, we compare the profits (Table 3) and the level of price difference (Table 4) of leaders against that of followers in the games where either the leader or the follower has access to the high-quality cost report. The p-value (two-tailed) reported in the table stems from a t-test which tests whether the difference between followers and leaders is significantly different from zero. It is clear that follower's behavior is very similar to that of leaders when the leader receives a high-quality cost report (game B) whereas followers take advantage of their leader when they receive high a high-quality cost report (game C).

	Price Difference: Pa - Pb (Table 4)			Realized Profits (Table 3)		
	Leader	Follower	Follower versus leader	Leader	Follower	Follower versus leader
Only leader high quality (game B, n=15)	156.5	148.3	**-8.2** (p>0.57)	647,018	649,401	**2,383** (p>0.88)
Only follower high quality (game C, n=14)	44.3	104.1	**59.8** (p<0.05)	570,875	620,027	**49,152** (p<0.02)

TABLE A

Allocation method employed by a low- and high-quality cost report

We give the example for the leader using the initial prices of $P_{a\,L}$=1650; $P_{b\,L}$=1710 for the leader and $P_{a\,F}$ =1645; $P_{b\,F}$=1706 for the follower. The total indirect cost, calculated via equation 3c, is then equal to 2,521,118. A low-quality cost report uses sales volume (Qa and Qb, calculated via equations 1a and 1b) to allocate this total indirect cost to the two product markets. A high-quality cost report divides this overhead into three categories, which represent respectively 35%, 40% and 25% of the total indirect cost. Overhead in these categories are then assigned by assuming cost drivers, in which market A always uses more of the cost driver per unit of sales volume than market B. When we carry out the cost allocation, it is clear that a low-quality cost report assigns the same amount of indirect costs to the two product markets per unit of volume, whereas a high-quality cost report shows product market A as more costly than product market B.

Low-quality cost report

Total indirect cost = 2,521,118	Cost driver market A		Cost driver market B	
	Qa: 2,277.25		Qb: 699.3	
Indirect costs allocated to markets	$\frac{2{,}277.25*2{,}521{,}118}{2{,}277.25+699.3}$	1,928,815	$\frac{699.3 \times 2{,}521{,}118}{2{,}277.25+699.3}$	592,302
	Per unit of volume:	**847.0**	=	**847.0**

High-quality cost report

Total indirect cost = 2,521,118	Cost drivers market A		Cost drivers market B	
Split up: 882,391.3 (35% of tot. indir. cost)	0.15 x Qa:	341.6	0.07 x Qb:	49.0
1,008,447.2 (40% of tot. indir. cost)	2.30 x Qa:	5237.7	1.20 x Qb:	839.2
630,279.5 (25% of tot. Indir. cost)	0.07 x Qa:	159.4	0.04 x Qb:	28.0
Indirect costs allocated to markets	$\frac{341.6 \times 882{,}391.3}{341.6+49.0}$	771,790	$\frac{49.0 \times 882{,}391.3}{341.6+49.0}$	110,601
	$\frac{5{,}237.7*1{,}008{,}477.2}{5237.7+839.2}$	869,189	$\frac{839.2*1{,}008{,}477.2}{5237.7+839.2}$	139,258
	$\frac{159.4 \times 630{,}279.5}{159.4+28.0}$	536,191	$\frac{28.0 \times 630{,}279.5}{159.4+28.0}$	94,088
		2,177,171		343,947
	Per unit of volume:	**956.1**	**>**	**491.8**

TABLE B

Screenshot of a private cost report and information of the other player's profit and prices

This table shows how we issue 1) the private cost reports to participants and 2) the other participant's total profits and his or her prices for the two product markets. We present the example for participants acting as a leader at the start of the experiment (with prices P_{aL}=1650; $P_{b\,L}$=1710 for the leader and $P_{a\,F}$ =1645; $P_{b\,F}$=1706 for the follower). The figures are calculated via the equations of section 3.1, and the allocation methods of appendix A. The example presents a low-quality cost report; figures that are different for a high-quality report are shown between brackets. Given the way we allocate cost, a low-quality cost report was labeled as '*volume-based costing* (VBC)'. A high-quality cost report was labeled as '*activity-based costing* (ABC)' because it has three specific overhead categories (which we label as order processing, software installations and delivery) and specific cost drivers in each of these categories (labeled as no. of orders, installations and deliveries).

VBC [ABC] report

	market A	margin	market B	margin	Total	Margin
Price	1650		1710			
Sales Volume	2277		699		2977	
Revenues	3757463		1195803		4953266	
Cost of goods sold	1434668	38.2%	496503	41.5%	1931171	39.0%
Indirect costs*	1928815	51.3%	592302	49.5%	2521118	50.9%
*Indirect costs**	*2177171*	*57.9%*	*343947*	*28.8%*		
	#	*costs*	*#*	*costs*		
Order processing	341.6	771790	49.0	110601		
Software installation	5237.7	869189	839.2	139258		
Delivery	159.4	536191	28.0	94088		
Profits	*393980*	*10.5%*	*106988*	*8.9%*	500977	10.1%
Profits	*145624*	*3.9%*	*355353*	*29.7%*		
Unit cost	1477.0		1557.0			
Unit cost	*1586.1*		*1201.8*			

* are allocated using sales volume as cost driver

[* #: respectively the number of orders, software installations and deliveries]

Report about your competitor

Price market A	1645
Price market B	1706
Total profit	500639