Price Setting and Multitasking by Sales Agents: Evidence from a Contract Change *

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Abstract

I study price setting behavior by sales agents of an electrical wholesale company following a change in their compensation contract. Originally, agents received a fixed share of the revenues from their sales. Under the new scheme, agents' commission rates increase with the price-cost margin of the sale. This contract creates a multitasking conflict among products historically sold with different margins. Employees of the firm decide how much effort to allocate to the sale of each good and can modify prices by offering discounts. A simple multitasking principal-agent model predicts that, even when incentives increase for all products, if efforts across goods are substitutes for the agent, the new scheme will increase price and effort of the more-compensated goods at the expense of price and effort of the less-compensated goods. The reform was enacted at different times in different stores, enabling measurement of its impact by difference-in-differences. Commissions on 95% of goods increase but workers do not raise prices on all these products. Despite the stronger financial incentives, the price of 18% of goods decreases, suggesting workers reallocate effort among products.

JEL codes: J33, L20, M52, M12

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I Introduction

Nonlinear pricing is ubiquitous. Our understanding of firms' optimal pricing is based on the assumption that there is no agency problem involved in implementing it. Yet in practice, in several markets, firms carry out nonlinear pricing through workers by delegating pricing decisions.[1] For instance, sales personnel are frequently empowered to offer discounts to their customers. Additionally, sellers can impact customer choice through quality, advertising, or other unobservable measures that require effort. In these contexts, compensation contracts serve the dual purpose of incentivizing employees to set optimal prices and exert effort. This raises questions about how compensation contracts influence both price and worker effort.

I study how sales agents in a Mexican electrical wholesale company responded to a change in their compensation contract. I use a natural experiment type design and detailed information on around 1.4 million transactions conducted by 75 workers over two years. The reform was enacted at different times in different stores of the company, enabling measurement of its impact by difference-in-differences. The firm sells more than ten thousand goods. This complicates the analysis because workers set the price of every product and decide which goods to push. To guide the analysis and disentangle the mechanisms driving workers' responses, I develop a theoretical framework in which workers set prices and choose sales effort. The main contributions of the paper are, first, to shed light on how incentives affect pricing decisions delegated to workers in a setting with asymmetric information. Secondly, I show that effort allocated to the sales of certain goods can decrease even when financial incentives are raised. Previous work on multitasking has focused on testing the effects of incentives on *compensated* and *uncompensated* tasks. In contrast, I look at products for which compensation increased, and I find that workers nevertheless decreased sales effort on some of these goods.

The company increased commissions for most goods sold and changed sales workers' com-

[1] For example, Alonso et al. (2008) suggest that it might be desirable to delegate pricing decisions when demand conditions are privately observed by local managers. Wickelgren (2005) points out that allowing workers to choose prices might incentivize them to exert more effort to increase profits.

pensation scheme from a linear wage contract to a piecewise linear one. Prior to the change, workers received a fixed commission on the revenues from each sale.[2] With the new incentive system, workers receive a higher commission for transactions with higher price-cost margins.[3] The new contract and historical price-cost margins imply commissions increased for most goods observed and that they increased more for high-margin products. Workers have a portfolio of customers and have full discretion to set prices anywhere above cost.[4] How does the salesperson respond when she is selling multiple products and setting the prices of those products?

To better understand the underlying mechanisms and guide the empirical analysis, I develop a simple theoretical framework inspired by the canonical principal-agent model. I assume that workers influence demand by choosing price and an unobserved effort level for each product sold.[5] It is optimal for workers to move price and effort in the same direction. So, when efforts across goods are complements or independent among each other, the new contract brings about an increase in the optimal effort level and price of all goods. However, if goods compete for the salesperson's attention, under the new contract workers reallocate effort from the less-rewarded to the more-rewarded products. Thus, the price of the less-rewarded products decreases and increases for the more-rewarded ones.

Using a difference-in-differences specification to rule out confounding factors, the empirical analysis proceeds in two stages. First, I estimate the overall effect on price, quantity, firm's value added, and workers' earnings. The switch to the piecewise pay schedule causes a positive and significant increase in average price of 9%. We cannot reject that quantity sold remained constant, reinforcing the intuition that adjusting price is not the only mechanism that workers have to affect demand. The estimated effects on profits and value added for

[2] I refer to commission as the percentage of revenue that the employee receives as part of her compensation.

[3] The price-cost margin is the price minus the cost over the price $\frac{p-c}{p}$. This ratio is also known as the Lerner index. In the remainder of the paper I refer to this index as the price-cost margin or margin, which are the terms employed by the firm.

[4] Managers from the firm stated that, in practice, sales agents never go above the list price. So basically they adjust prices by giving lower or higher discounts.

[5] Think of the unobserved effort as how much energy and time workers spend advertising each good to customers.

the firm are around 7% and 8%, respectively, but are not statistically significant.[6] Less than one percentage point of the value added increment goes to workers. Yet, this represents an increase of more than 30% in workers' wages.

Second, I look into the impact of the contract on products with different historical price-cost margins. In line with the predictions from the model when efforts are substitutes for sales agents, I find evidence on effort reallocation among products whose commissions increased. The new scheme raised average commissions for 95% of goods, but workers did not raise prices on all these products. Despite the stronger financial incentives, the prices of 18% of goods decreased.

An alternative explanation of these changes would be that workers are taking advantage of the new payment scheme by bundling goods together. When selling products in a bundle, workers could increase their earnings by giving larger discounts on low-margin goods and raising the price of high-margin products without changing effort. If this "gaming" strategy is the only mechanism driving the results, we would only observe opposite price changes of goods bundled together. If workers are reallocating effort and gaming exists, the price changes would be exacerbated when products are sold in a bundle but would exist for goods sold alone. I find evidence supporting the latter. The price drop is exacerbated for low-margin products sold in a bundle but is also present in sales of a single item. Even if overall profits increased with the new compensation scheme,[7] gaming is costly for the firm. I estimate that without this behavior profits would have increased 11% instead of 7%.

The results speak to the importance of understanding complementarities among tasks when designing incentive schemes. Raising compensation for all tasks might not be sufficient for workers to increase effort in all tasks. The interaction of incentivized tasks is critical. This is a general result that can be applied to other contexts such as health or education.

The paper contributes to different strands of literature. First, I contribute to the literature on incentive schemes and workers' productivity.[8] I lay the groundwork for future research

[6] Value added includes profits and wages; in other words, it is revenues minus the products' cost.

[7] However, the point estimate is not statistically significant.

[8] For reviews of the hiring and incentives literature see Prendergast (1999), Oyer and Schaefer (2011) and Lazear and Oyer (2013).

on the relation between the design of worker compensation and firms' pricing strategies. Although the theory is yet to be worked out in more detail, I take the first steps to explore firms' optimal pricing through the lens of a principal-agent problem. Delegating pricing decisions has been studied by the organizational industrial organization (OIO) literature that links organizational design and traditional industrial organization variables, such as price and quantity (Legros and Newman, 2014).[9] However, previous studies do not delve into the effect of incentives on pricing decisions.[10]

Second, my results complement the literature on multitasking showing workers can reallocate effort among incentivized tasks. The theory of multitasking, well described in Holmstrom and Milgrom (1991), Baker (1992) and Holmstrom and Milgrom (1994), formally demonstrates that if tasks are substitutes for the agent, raising financial incentives in one task leads to a decrease in effort on the *nonincentivized* tasks. Similarly, previous empirical work on personnel economics has focused on testing the effects on compensated and uncompensated tasks. Some examples of research that analyzes whether workers trade off performance in the rewarded task at the expense of the un-rewarded one include Paarsch and Shearer (2000), Feng Lu (2012), Hong et al. (2013), Jackson and Schneider (2016),[11] Shearer (2004) and Bandiera et al. (2005) that analyze whether workers trade off performance in the *rewarded* task at the expense of the *un-rewarded* one.[12] In contrast, I focus on workers trading off performance in a *rewarded* task at the expense of *another rewarded* task.[13]

[9]See for instance, Lo et al. (2016), Alonso et al. (2008), and Wickelgren (2005).

[10]Oyer (1998) and Larkin (2014) focus on workers gaming incentive schemes by giving unnecessary discounts to customers but not on how firms implement nonlinear pricing through their employees.

[11]Paarsch and Shearer (2000) find that, for a British Columbia tree-planting firm, the change from fixed wages to piece rates caused an increase in productivity but that workers also respond to incentives by reducing quality. Feng Lu (2012) shows that after the introduction of a mandatory quality disclosure policy in the nursing home industry, the Nursing Home Quality Initiative (NHQI) scores of quality measure improve for the publicly reported dimensions but deteriorate for the unreported ones. Hong et al. (2013) test the theory of multitasking using a field experiment in Chinese factories and find that as a result of a piece rate bonus scheme workers trade off quantity at the expense of quality. In an experiment with car repair shops, Jackson and Schneider (2016) find that high-powered incentives for checklist use crowd out time for actual repairs.

[12]Although Shearer (2004) is not aiming at directly testing multitasking, his study suggests that there is no difference in quality under two compensation systems: fixed wages and a piece rate contract. Bandiera et al. (2005) compare productivity under a piece rate and under a relative incentives scheme (where individual effort imposes a negative externality on others) in a fruit farm. They also find that the higher productivity of the piece rate scheme does not come at the expense of the quality of fruit picked.

[13]Basinga et al. (2011) study a pay-for-performance scheme in Rwanda that rewarded health facilities on

II Context and the Incentives Change

II.A Context

The firm studied is a branch of an international company specialized in distribution of electrical products and related services. In 2008-2009 the firm was divided into twelve storehouses across Mexico, sold more than 10,000 different products, had around 250 workers, and had four main competitors.[14] Since then, the company has been growing rapidly in terms of sales and number of employees and is currently one of the most important electrical distributors in the country.

Out of the 250 workers, 75 were sales agents. From now on I refer to sales agents interchangeably as employees or workers. To avoid competition between its employees the firm determines the portfolio of clients that each worker is allowed to sell to. Another important characteristic of this firm is that sales agents can modify the price at which they sell each product as long as the price is greater than or equal to the cost. There is some monitoring of the prices set by workers by one upper-level manager. This probably discourages workers from constantly setting very low prices but allows them a considerable degree of freedom.[15]

II.B The Contract Change

As in many companies, under the original incentive scheme sales workers received a fixed salary and a commission on the revenues they made from sales.[16] In order to induce higher effort, employees' base wages were low compared to the income they received from commis-

fourteen key outputs but do not frame it as a multitasking problem. They find that the pay-for-performance scheme had positive effects on services for which facilities received larger financial incentives and those over which the provider had greater control. Although they find no statistical effect on a less-rewarded task, timely completion of child immunization schedules, their point estimate is negative. Incentivizing immunization was not enough for this output to increase when health facilities had to perform other tasks.

[14] I exclude the first week of 2008 from the analysis because the data are incomplete for this week.

[15] In practice, workers never go above the list price, so they are changing prices by giving higher or lower discounts.

[16] In a survey using a mailing list provided by the editor of *Sales and Marketing Management*, Joseph and Kalwani (1998) find that only about 5% of companies in the sample use no incentive component and pay exclusively a fixed salary to their sales personnel.

sions, and they still are after the change. Before mid-2008, sales commissions were a fixed percentage of the client's payment.[17] In 2008 this scheme changed. Now, the commission percentage varies among transactions and increases as the price-cost margin $[(p-c)/p]$ of the transaction increases.[18]

This policy was implemented in order to encourage sales employees to protect profits. At the same time, a minimum quota requirement was introduced, establishing that workers need to satisfy a monthly quota in order to be in good standing (i.e., every month workers need to sell at least x dollars). Failure to meet the quota in several successive months may result in termination of employment. However, although the concept of the quota was introduced in 2008, it was not strictly enforced. Also, promotions for sales workers within the firm are very rare. Thus, the main tool for aligning sales personnel incentives with the company's objectives is the commissions scheme.

The monthly wage $w(p,q)$ has a fixed component, s, and a variable one, $\sum_j b_j(p_j q_j)$, where b is the commission specified by the firm, p is price, q is quantity, and j denotes each transaction, such that:

$$w(p,q) = s + \sum_{j=1}^{J} b_j(p_j q_j)$$

With the introduction of the new contract, the sales workers' wage went from having a fixed commission for all transactions to a piecewise linear one. Thus, with the old contract:

$$b_j = \bar{b}, \quad \forall j$$

With the new contract, the commission for each transaction depends on the price-cost

[17] Sales workers get paid as long as the customers they sell the products to pay the firm what they owe; no payment by the client means no commission for sales employees.

[18] One transaction is composed of a sale of one product at one price to a given client, i.e., the sale of five light-bulbs for $1 per light-bulb to client A is one transaction.

margin of that transaction:

$$
b_j = \begin{cases} b_A & \text{if } \frac{p_j - c_j}{p_j} < x \\ b_B & \text{if } x < \frac{p_j - c_j}{p_j} \leq x + k_1 \\ b_C & \text{if } x + k_1 < \frac{p_j - c_j}{p_j} \leq x + k_2 \\ b_D & \text{if } x + k_2 < \frac{p_j - c_j}{p_j} \end{cases}
$$

where $b_A < b_B < \bar{b} < b_C < b_D$.[19] With the new payment structure: a higher price-cost margin translates into a higher commission. Also, if the price-cost margin of the transaction is above $x + k_1$, compared to the previous scheme, workers receive a higher commission. On the other hand, if the price-cost margin of the transaction is below $x + k_1$ with the new contract workers get paid a lower commission than before. Workers do not negotiate the provision of goods to the firm, so they cannot directly affect costs. This implies that they can only modify margins by changing the price.

III Theoretical Framework

The agent (the sales worker) chooses an unobservable effort level to generate output. The principal (the firm), who owns the output, pays the agent a wage that depends on output (Gibbons, 2005). The main departure from the basic principal-agent model is that the agent decides not only effort but also the price of each sale.

Pay-for-performance schemes have been studied in different settings in which the agent can either change effort[20] or influence sales by giving discounts.[21] However, no study that focuses on the response to incentives has integrated in a model and tested the idea that workers may choose both effort and price.[22] This seems particularly relevant for sales representatives

[19] $\bar{b} = 1\%$, $b_A = 0.375\%$, $b_B = 0.75\%$, $b_C = 1.125\%$ and $b_D = 1.5\%$. As for the cutoffs, $x = 0.05$, $x + k_1 = 0.11$, and $x + k_2 = 0.14$.

[20] Some examples include studies analyzing the behavior of workers in an automobile glass company (Lazear, 2000), of tree planters (Shearer, 2004), and of fruit pickers (Bandiera et al., 2009).

[21] For instance, Oyer (1998) and Larkin (2014).

[22] Sæthre (2016) incorporates sales effort to a structural model but focuses on the problems of ignoring

whom are allowed to offer discounts to clients and can influence demand by providing a better service, by being more active with customers, or by advertising more. Wickelgren (2005) and Sæthre (2016) argue that in several markets sellers impact consumer choice through channels other than price, such as quality, advertising, or other unobservable measures that require effort.

The timing of events is the following:

1. The principal and the agent sign a compensation contract $w(p, q)$ that depends on the revenue and price-cost margin of each sale.

2. The agent chooses actions or effort levels $a = (a_1, a_2, ..., a_J)'$ for each transaction, but the principal cannot observe these choices. At the same time, the agent chooses prices $p = (p_1, p_2, ..., p_J)'$.

3. The effort and price, given the demand functions $q(a, p)$, determine the quantity sold $q = (q_1, q_2, ..., q_J)'$, revenue, and profits.

4. The agent receives compensation specified by the contract.

In addition, I assume that quantity for transaction j is a function of effort and price for that transaction only. Also, I assume that quantity is increasing in effort ($\frac{\partial q_j}{\partial a_j} > 0$) at a decreasing rate ($\frac{\partial^2 q_j}{\partial a_j^2}$) and decreasing in price ($\frac{\partial q_j}{\partial p_j} < 0$), and that the cross partial derivative of quantity with respect to effort and price is not negative ($\frac{\partial^2 q_j}{\partial a_j \partial p_j} \geq 0$).[23] This implies that effort does not increase demand price sensitivity. The intuition is that if workers "convince" a client to buy more of a certain good by promoting it, then either this has no effect on the client's demand price sensitivity or it makes demand respond less to price changes because the client is convinced of needing the good.

effort for demand estimation. He argues that standard methods for estimating demand used in the industrial organization literature may yield biased estimates when there are non-price actions undertaken by firms to influence demand. Wickelgren (2005) models how price and effort interact when there is intra-firm competition in a multi-product firm.

[23] This is not a necessary condition for the results. It would suffice that $\frac{\partial^2 q_j}{\partial a_j \partial p_j}$ is not too negative. See Appendix A for more details.

The agent is risk neutral with utility $U = w(p, q(a, p)) - \gamma(a)$, where $w(p, q(p, a))$ is the wage received by workers and $\gamma(a)$ is the convex cost of effort (i.e., $\gamma_j(a) > 0$, $\gamma_{jj}(a) > 0$). Finally, for simplicity, I transform the discrete linear and piecewise linear schedules into a continuous one in which the commission b is a linear function of price:[24]

$$w(p, q) = s + \sum_{j=1}^{J} b_j(p_j) \cdot (p_j q_j)$$

Setting $b_j(p_j) = \bar{b} \quad \forall j$ replicates the old contract. As for the new contract, the piecewise scheme implies the commission is increasing along with the price-cost margin. Because workers cannot affect cost,[25] the commission received for the sale of each good can be thought as an increasing function of price. Thus, setting $db_j/dp_j > 0$ approximates the new contract.

With the old contract, sales employees cared only about maximizing revenues, whereas with the new contract a higher price also means they receive a higher share of revenues. I illustrate the differences in the share of revenues received by workers as the price-cost margin increases between old, new, and continuous contracts in Figure 1.

The agent's maximization problem is the following:

$$\max_{\{a,p\}} \quad s + \sum_{j=1}^{J} b_j(p_j) \cdot [p_j \cdot q_j(a_j, p_j)] - \gamma(a_1, ..., a_J)$$

Workers maximize utility by choosing effort (a) and price (p) for every transaction j. I start by setting up the case with no multitasking problem in order to contrast it later with the case that results in substitution of effort between tasks. Thus, in a first instance I assume that there is no relation between goods in the cost of effort function (i.e., $\gamma_{jm}(a) = 0$). With $\gamma_{jm}(a) = 0$, price and effort for all goods change in the same direction. So, for the following propositions that summarize the implications of the contract change, I drop the j subscripts and use a, p, q, and c as scalars (proofs are contained in Appendix A).

[24] In the current draft, I assume that $\frac{d^2 b_j}{dp_j^2} = 0$.

[25] In very extreme cases sales agents could affect cost. For instance, if they sell an unusually large amount of a good, managers could potentially buy that good at a better price from producers.

Proposition 1: If efforts allocated to different goods are independent for workers (i.e., $\gamma_{jm} = 0\,\forall j \text{ and } m$) and incentives increase for all goods (i.e., $b(p^o) \geq \bar{b}$, where p^o is the equilibrium price with the old compensation scheme),[26] with the new contract both price and effort increase for all goods.

The predictions on price and effort are the same when efforts are complements for each other (i.e., $\gamma_{jm} > 0$). Moreover, if $dp > 0$ and $da > 0$, the overall effect on quantity is ambiguous. Consider that

$$dq = dp \cdot \frac{\partial q}{\partial p} + da \cdot \frac{\partial q}{\partial a}$$

The first term of the change in quantity is negative (the *price effect*) and the second term is positive (the *effort effect*). So the overall effect of the new contract on quantity is ambiguous.

In summary, when there is no relation between goods in the cost of effort function (or efforts across goods are complements for sales agents), with the introduction of the new contract workers increase price and effort on all goods. Therefore, price increases while the overall effect on quantity is ambiguous as higher prices reduce quantity and higher effort increases it. The intuition for this result is strong and can be divided in three pieces: (1) the increased commission, (2) the change in the slope of the commission, and (3) the interaction between effort and price. First, a higher commission promotes higher effort. Second, since the new commission rate is increasing in price, if workers do not raise price they could do just as well as previously given that $b(p^o) \geq \bar{b}$. But now they can do even better by raising the price, which increases the marginal commission. Third, raising prices increases the commission and therefore the optimal effort level.[27] The old payment scheme only required workers to maximize revenues, while the new contract better aligns workers' incentives with profit maximization.

[26] This condition means that using the prices chosen by workers with the old contract (p^o) to calculate the commission with the new incentive scheme $b(.)$, they would receive at least the same percentage $\bar{b}$ of sales as before.

[27] Note that $b(p^o) \geq \bar{b}$ is a sufficient condition given that $\frac{db}{dp} > 0$, but it is not necessary.

III.A Multitasking Case

Now, I consider the case when efforts for selling different products are substitutes in the sales agent's cost function as described by Holmstrom and Milgrom (1991). For simplicity, I assume that there are two products $\{L, H\}$. For both goods commissions increase, but for the H good the commission increases more (i.e., $b(p_H^0) > b(p_L^0) \geq \bar{b}$). Hence, I refer to L as the low-reward good and to H as the high-reward good. To provide actions a_L and a_H the agent faces an effort cost of $\gamma(a_L, a_H)$, where

- $\gamma(a_L, a_H)$ is strictly convex and twice continuously differentiable and
- $\frac{\partial^2 \gamma(a_L, a_H)}{\partial a_L \partial a_H} \equiv \gamma_{LH}$ is strictly positive.

The second condition implies that increasing effort in one product increases the marginal cost of effort in the other. Therefore, increasing effort in one product leads to some negative externality on the other product. A strong assumption that I impose is that demand functions for all goods are independent. Repeating the analysis, we get theoretical predictions of the effect of the change in the incentive scheme on prices and efforts for both products. The following propositions summarize the differential effect of the contract change on L and H products.

Proposition 2: If the increase in the commission for the high-reward good is greater than the change for the low-reward one (i.e., $db_H > db_L \geq 0$) and γ_{LH} is sufficiently large, then price and effort increase for product H and decrease for good L.

Moreover, if $dp_H > 0$, $da_H > 0$, $dp_L < 0$, and $da_L < 0$, then the effect on quantity for both goods is ambiguous. When efforts allocated to different goods are substitutes for workers, the new bonus scheme incites them to trade off effort on one task (product) at the expense of another. This implies that if $\gamma_{LH} > 0$, price decreases for low-reward goods while it increases for high-reward goods.

III.B Gaming the System

Another possibility is that, with the new contract, workers *game the system*. That is, they could take advantage of the payment scheme when products are sold together by using discounts on low-reward goods to increase the price of high-reward goods, without changing clients' total payments. Also, workers could try to bundle products more often to use the strategy described.[28]

I assume that, if gaming is happening, worker and client set prices and quantities in two stages when products are sold in a bundle. First, workers maximize utility by choosing efforts ($\bar{a}_L$, $\bar{a}_H$) and prices ($\bar{p}_L$, $\bar{p}_H$). Together with the demand functions these determine the quantities sold ($\bar{q}_L$, $\bar{q}_H$) as in the previous subsection. Then, workers rewrite prices without changing quantities and the total payment by the client ($R = \bar{p}_L\bar{q}_L + \bar{p}_H\bar{q}_H$). This rewriting is costly to the worker and increases as workers deviate from the first-stage prices. So, the agent's maximization problem in the second stage for products bundled together is the following:

$$\max_{\{p_L, p_H\}} \quad s + b_L(p_L) \cdot [p_L \cdot \bar{q}_L] + b_H(p_H) \cdot [p_H \cdot \bar{q}_H] - \bar{\gamma} - \frac{1}{2}\theta(p_L - \bar{p}_L)^2$$
$$s.t. \quad R^o = p_L \cdot \bar{q}_L + p_H \cdot \bar{q}_H$$

Proposition 3: With the new contract, if workers are gaming the system with $\theta > 0$ and $b_H(p_H^0) > b_L(p_L^0)$: (1) with multitasking (i.e., $\gamma_{LH} > 0$), the price of low-reward goods sold in a bundle decreases more than low-reward goods sold alone, while the price of high-reward goods sold in a bundle increases more than high-reward goods sold alone; (2) with no multitasking (i.e., $\gamma_{LH} = 0$), only the price of low-reward goods sold in a bundle may decrease, and prices of all goods sold alone increase.

The theoretical framework described yields different testable predictions. First, with the

[28] I do not model this possibility, but in fact I find no empirical evidence that more bundling is happening after the announcement of the new incentive scheme.

new contract when there is no interaction between effort levels of different products, the price of all goods increases. However, if effort levels for selling different products are substitutes for the agent, the new scheme shifts effort toward high-reward goods and away from low-reward ones. This implies that if there is a multitasking problem, the price increases for high-reward goods and decreases for low-reward goods. Finally, if the new policy promotes gaming the system and a multitasking problem exists, the previous results would be exacerbated in products bundled together, whereas if there is no multitasking problem, only the price of low-reward goods bundled together with high-reward goods may decrease. The price of high-reward goods and all goods sold separately increases in this gaming but no multitasking scenario.

IV Data and Descriptive Evidence

IV.A The Data

I merge information from the commissions and sales records. The data compiled contains detailed information on every transaction since 2008, including a product ID number,[29] the revenue made, price-cost margin, price and quantity of each transaction, employee who closed the deal, commission earned, customer, invoice number, invoice date, and payment date. Information on about 20% of all transactions is incomplete: on the sales records quantity sold, product price, and cost are missing. To address this and use as many observations as possible for the statistical analysis, I calculate weekly average cost for every product (and monthly average cost for goods that were not sold every week). Then, I impute cost using the averages per product for the transactions with incomplete information. With the imputed cost, revenue, and price-cost margins, I back out price and quantity. Finally, I drop observations that have prices above $25,000 that represent sales of special products.

[29] The product ID number is constant through time but unfortunately I cannot observe what the product sold is.

The dataset contains almost 1.4 million transactions and different variables that allow me to analyze in detail the effect of the contract change on workers' behavior.

The new scheme was announced at the end of June 2008 in three out of twelve stores that the company had at that time. I refer to these stores as the *main offices stores* because the central offices are located in two out of these three storehouses. In the other nine stores the new policy was announced and explained to the sales workforce by the end of September of the same year. This offers the possibility of a difference-in-differences analysis, between the *main offices stores'* and the *other stores'* employees, of two experiments: the announcement of the new contract in the first group of 29 workers and then on the second group of 46 workers.[30] The difference-in-differences specification is critical for identification; for instance, it allows me to control for the decrease in sales and profits induced by the financial crisis.[31]

One potential concern is that the human resources team was not able to implement the new incentive scheme as planned. Despite the announcement in which it was specified that starting the following month the wage contract for all workers of the relevant stores would change, the new contract was gradually introduced and it was not until December 2008 that all workers were shifted to the new contract (see Figure 4). However, employees were not aware that the introduction of the new payment scheme would be gradual. Therefore, one would expect to see a change in their behavior in the weeks following the announcement.

IV.B Descriptive Evidence

I observe 75 workers and more than 10,000 different products during the period studied. On average sales employees closed a total of 13,407 deals every week, making a profit per transaction of $40.50. The average unit price of all transactions is $24.20 and the mode is $5. Some other general descriptive statistics per transaction are depicted in Table 1.

[30] All the stores are concentrated in six states relatively close to the capital (see Figure 2) where the effects of the financial crisis on the construction industry were similar.

[31] The financial crisis affected the construction industry in Mexico (see Figure 3) and therefore sales and profits of the firm in question.

With the new contract, transactions with a price-cost margin below $x + k_1$ receive a lower commission than before. However, even before the announcement of the new contract, more than 90% of transactions register a margin above this threshold. As can be seen in Figure 5, this is still the case after the announcement of the new scheme (91% of sales have a margin above $x + k_1$). An interesting fact is that there does not seem to be any bunching after the x and $x + k_1$ cutoffs. However, for the last cutoff imposed by the new incentive scheme of $x + k_2$, I test and reject the null hypothesis of continuity of the density using the McCrary test. This suggests that workers are responding to the new compensation contract.

Using the piecewise scheme I calculate the average commission per product before and after the announcement of the new contract.[32] Figure 6 shows a second piece of evidence that workers adjust to the new scheme. The two lines show the cumulative distribution functions of revenues according to the average commission per product calculated before (solid line) and after (dashed line) the announcement, using the new scheme. The takeaway from this figure is that in the post-period, workers seem to shift sales from what would have been lower commission goods in the pre-period to higher commission ones. They can do this by increasing prices to increase the commission of several products or/and by increasing the sales of goods that already had higher commissions.

The main variable that I consider to measure workers' performance and response to the new contract is average price. I also analyze the effect on quantity and profits. The model yields testable predictions for price while the effect on quantity is theoretically ambiguous. Figure 7 shows average weekly item price in the main offices and in the other stores averaged over the workers of each group. The two vertical lines correspond to the contract announcement dates. In the main offices stores the new incentive scheme was announced at the end of June 2008 (solid line), and in the other stores at the end of September 2008 (dashed line). The horizontal lines are the means for both groups in each of the relevant periods: (1) when both groups know nothing, (2) when only the main offices employees know about the new

[32]For the pre-announcement period I use the new scheme and the old prices to compute what would have been the commission per product. I will call this the *predicted commission*. This provides an empirical approximation of $b(p^0)$.

contract, and finally, (3) when both groups of workers know about the new scheme.

After the announcement of the new incentive scheme in the main offices stores, the mean of the average price per worker increases in the main offices. In turn, the mean of average price per worker in the other stores slightly decreases after June 2008. Then, at the end of 2008 and beginning of 2009 the mean of the average price in the main offices stores decreases (probably due to the financial crisis). However, thanks to the change in incentives, workers in the other stores manage to maintain similar price levels as before. From this figure it is also clear that average prices for the two groups of workers have parallel trends.

V Effects on Workers' Performance

Originally, workers received a fixed share of revenues, which incentivized them to maximize revenues. With the new contract the share of revenues received increases as the price-cost margin of the transaction increases. In response to this change in their compensation schedule we expect workers to modify behavior. In the following subsections, I estimate the effect that the announcement of the new incentive scheme has on workers' sales performance. First, I look at workers' weekly measures (average price, quantity sold, and profits). Then, to start disentangling the different mechanisms behind these weekly aggregate effects, I analyze worker-product weekly measures and estimate the effect of the new contract on prices, quantities, and profits within products. I test and reject the hypothesis that workers increase the prices of all goods that had an increase in financial incentives. The results suggest workers reallocate effort among products, focusing more on goods that give them a higher reward given the new payment scheme (i.e., products with higher average commission when considering the pre-period transactions) at the expense of low-reward goods. Finally, I test whether the differential effects on high- and low-reward products can be entirely explained by employees gaming the system using discounts on low-reward products to increase the price on high-reward ones that are bundled together.

V.A Evidence on Workers' Response to the New Contract

To investigate the effect of the new incentive scheme on overall average price, quantity sold, and profits, I start by aggregating transactions at the worker-week level. I add revenue, profits, and quantity from all transactions that worker i registered every week to calculate weekly revenue, profits, and quantity sold, respectively. Then, I divide weekly revenue by quantity to calculate average weekly price. The panel data specification that I estimate using these aggregated data is

$$y_{it} = \tau D_{it} + \lambda_t + \gamma_i + x_{it}\beta + u_{it} \tag{1}$$

where y_{it} is the log of average price, the log of quantity, or the log of profits of all products sold by employee i on week t, and D_{it} is a dummy equal to one after the announcement of the new contract was made in the store to which worker i belongs, and zero otherwise. The λ_t are a full set of week time effects, the γ_i are individual fixed effects which capture permanent differences in ability across sales personnel. The x_{it} are individual specific covariates: age, age squared, male, and tenure.[33] Finally, the u_{it} are identically distributed error terms with mean zero. The parameters of interest are the coefficients on the new contract announcement dummy, τ. These capture, in reduced form, the effect of the change in the incentive scheme on the three outcome variables. Table 2 reports the estimates with and without worker fixed effects.

Column (1) shows that after the announcement of the new contract there is a statistically significant increase of 9% in average weekly price. This result, as shown in column (2), is robust to introducing employee fixed effects that account for differences in individual ability. From columns (3) and (4) we see that there is a negative but statistically insignificant effect on quantity. Finally, the last two columns depict the statistically insignificant and positive coefficient of the new contract for weekly profits per worker.

There are different approaches that workers could take that would give rise to an increase

[33] Age, male, and tenure are only included when there are no individual fixed effects.

in average weekly price without any effect on quantity. One possibility is for them to increase effort and prices on the sales of all goods. This would be optimal for workers if the cross partial derivative of cost of effort between products is equal to zero (i.e., $\gamma_{LH} = 0$). Another possibility is for workers to change effort differentially among products, which could also yield higher average weekly prices. This would be optimal if efforts for selling different products are substitutes in the sales agent's cost function (i.e., $\gamma_{LH} > 0$). A third possibility is that employees take advantage of the new contract, without exerting more effort, by increasing prices of goods that are more rewarded in exchange for larger discounts on goods that are less rewarded.

In the next subsections I focus on disentangling the mechanism behind workers' response to the new contract. First, I test whether the effect of the new contract is the same for goods with different average commissions when considering the pre-change prices and the piecewise scheme. Then, I address the idea that workers are gaming the system.

V.B Evidence on Effort Reallocation

If increasing effort in one product increases the marginal cost of effort in the other (i.e., $\gamma_{LH} > 0$), then a higher reward on the sales of some goods incites the worker to substitute effort away from less-rewarded products even if financial incentives are raised for all goods. The theoretical framework described in Section III.A predicts that this substitution of effort brings about an increase in the price of the more-rewarded products and a decrease in the price of the less-rewarded ones.

To test if this is the case I calculate the *predicted commission* ($b(p^o)$) per product using the pre-change observations and the new scheme.[34] Then, for interpretation and exposition purposes I calculate the change in the commission given the pre-change prices ($\Delta b \equiv b(p^0) - \bar{b}$), which is simply the predicted commission minus the old commission. The link with the theoretical framework is straightforward: if $\gamma_{LH} \leq 0$, a sufficient condition for effort and

[34]Predicted commission is a function of price-cost margins (and therefore of prices) of transactions that happened before the contract change. Workers choose price, so it is an endogenous variable. Yet, pre-change price can be expressed using the primitives of the model.

price of all goods to increase with the new contract is $\Delta b \geq 0$. Nonetheless, if $\gamma_{LH} > 0$, $\Delta b \geq 0$ is not sufficient for effort and price of all goods to increase. Regarding goods with $\Delta b < 0$, the predictions from the model are ambiguous, but it would not be surprising to find that effort decreases.

My preferred specification presented in this subsection is to consider all observations before the announcement of the new scheme to calculate the change in the commission for each good and test whether there is a differential effect of the new contract depending on Δb. The regressions estimated are:

$$y_{ijt} = \mu D_{it} + \tilde{\mu}(\Delta b_j * D_{it}) + \lambda_t + \gamma_i + \theta_j + x_{it}\beta + u_{ijt} \tag{2}$$

where y_{ijt} is one of the three outcome variables previously analyzed: the log of average price, the log of quantity, or the log of profits for product j sold by employee i in week t. As before, D_{it} is a dummy equal to one after the announcement of the incentive change was made in the store to which worker i belongs, and zero otherwise. The λ_t are a full set of week time effects, the γ_i are individual fixed effects, the θ_j are product fixed effects, and the x_{it} are individual specific covariates. Finally, Δb_j is the change in the commission. The coefficients of interest are μ and $\tilde{\mu}$, which capture the effect of the new contract according the the change in the commission of each good.[35]

Before discussing the regression results, I want to point out two potential biases one should have in mind. First, the effect of the contract by predicted change in commission (the estimate of $\tilde{\mu}$) could be subject to attenuation bias due to measurement error. I address this using a split sample instrumental variable strategy in the robustness section. Second, the same estimate could be biased upwards because goods with lower predicted changes in commission probably also have more transactions that received a lower commission with the new scheme (transactions with margins below $x + k_1$). Thus, a concern might be that even if incentives on average increase for all goods with $\Delta b \geq 0$ workers decrease effort on some

[35]In the robustness check section I allow for the effect of the new contract to be nonlinear in Δb by dividing products into five groups. Results are qualitatively similar to this linear specification.

goods because the chances of receiving a lower commission than before are higher for these products. I also address this second concern in the robustness section by looking at the effect of the contract on goods that have all transactions with margins larger than $x + k_1$.

The results of the regression of Equation (2) are shown in Tables 3, 4, and 5. In line with the theoretical predictions, when efforts are substitutes for the agent ($\gamma_{LH} > 0$), Table 3 shows that $\Delta b_j \geq 0$ is not sufficient for price to increase. In columns (1) and (2) we see that after the announcement of the new payment scheme the average price of goods that experienced no change in commission (i.e., $\Delta b_j = 0$) decreases by 39%. In contrast, for the highest-rewarded goods (i.e., $\Delta b = 0.5$) price increases around 5%. In columns (3) and (4) I include product fixed effects. The magnitudes of the within-product changes in price are lower than the within-worker changes (-12% and 3% for $\Delta b_j = 0$ and $\Delta b_j = 0.5$, respectively). This suggests workers are changing the prices of goods and the composition of the goods they sell. Using the estimates in the first and second line from column (4) we can calculate that price increases only for goods with $\Delta b \geq 0.36$.

The effects on quantity are reported in Table 4. Estimates are not statistically significant when we include product fixed effects. Moreover, the point estimate on the differential effect by expected commission is close to zero. It is worth pointing out that for the lowest-reward goods we cannot reject that quantity sold is unchanged even though average price decreases. Finally, the estimated effects of the new contract on profits are shown in Table 5. The two coefficients of interest are not statistically significant across specifications. The results suggest that profits decrease less on the sales of high-reward goods.

The fact that quantity sold of low-reward goods does not change even when prices are lower is in line with the model's intuition that workers can also affect quantity demanded by changing effort level. Still, is there anything more precise we can say about effort and its effect on sales? The main complication when addressing empirically the question of how effort changes is that we do not observe effort. However, if quantity depends on effort and price: $q = q(a, p)$, the change in quantity sold as described in the theoretical framework section comes from an effort effect and a price effect:

$$dq = \underbrace{da \cdot \frac{\partial q}{\partial a}}_{\text{effort effect}} + \underbrace{dp \cdot \frac{\partial q}{\partial p}}_{\text{price effect}}$$

From workers' first-order condition when the old contract is in place we know that

$$\left.\frac{\partial q}{\partial p}\right|_{b(p)\,=\,\bar{b}} = -\frac{q}{p}$$

given that:

$$dq = da \cdot \frac{\partial q}{\partial a} + dp \cdot \frac{\partial q}{\partial p} \Longrightarrow \Delta a \cdot \frac{\partial q}{\partial a} = \Delta q - \Delta p \cdot \left(-\frac{q}{p}\right)$$

This implies that we can calculate the price effect ($dp \cdot \frac{\partial q}{\partial p}$) and back out the effort effect ($da \cdot \frac{\partial q}{\partial a}$). To back out the effort effect first, I use the estimates from regressions and the average weekly-worker quantities and price before the change to compute Δq and Δp. Then, I calculate $(-q/p)$. This allows me to correct for price sensitivity and estimate the effect on quantities due only to shifts in effort. The results are shown in Table 6. If prices remained unchanged, the reallocation of effort would have increased sales of the highest-rewarded goods by 2 items per week and decreased sales of goods with $\Delta b_j = 0$ by 20 items per week for each worker.

V.C Evidence on Gaming

In this subsection, I test whether the differential effect of the new contract between high- and low-reward products can be solely explained by workers taking advantage of products bundled together. Sales employees could use discounts on low-reward goods to increase the price of high-reward ones without changing effort at all. If this is true, then, there would be no room for the multitasking story because the decrease in price of low-reward products (and increase for high-reward ones) would be driven by workers gaming the system and not by a reallocation of effort between goods.

In order to test this I estimate the effect of the new contract on goods with different predicted commissions that were sold alone and with other goods. The database collected allows me to differentiate the invoice that each transaction belongs to. An invoice is generated to charge the client for all the goods provided after a given negotiation.[36] If the bundling theory is the only mechanism behind the differential effect between high and low-reward products, the new contract would only cause a decrease in prices of low-reward products sold in *mixed invoices* (invoices with multiple goods). The specification used is the following:

$$y_{ijk} = \mu_1 D_{it} + \tilde{\mu}_1(\Delta b_j * D_{it}) + \mu_2(\alpha_k * D_{it}) + \tilde{\mu}_2(\Delta b_j * \alpha_k * D_{it}) + \lambda_t + \gamma_i + \theta_j + x_{it}\beta + u_{ijk} \quad (3)$$

where y_{ijk} is output of product j, sold by employee i in invoice k; Δb_j is the change in the commission; and α_k is equal to one if invoice k has other goods and zero otherwise. The other variables are the same as explained above. We are particularly interested in knowing: (1) if the price of low-reward products decreases even when they are sold alone (i.e., $\mu_1 < 0$); and (2) if the effect of the contract is more extreme in mixed invoices (i.e., $\mu_2 < 0$ and $\tilde{\mu}_2 > 0$).

Line 1 of Table 7 shows that the price of goods with $\Delta b_j = 0$ sold alone decreases, rejecting the hypothesis that gaming is the only mechanism behind workers' response to the new contract. The coefficient on the interaction between mixed invoice and the new contract is positive and significant when no fixed effects are included (column (1)). The estimate loses significance in column (2) when we add individual fixed effects that control for workers' unobservable ability and then becomes negative when we include product fixed effects. Thus, if we consider the within-product effect of the contract, when bundled with other products, the price of goods with $\Delta b_j = 0$ decreases even more (line 2, column (4)).

In line 3 we can see that for goods sold alone prices increase more as the change in commission increases. The coefficient of the interaction with mixed invoices is positive, as shown in line 4, but it is not statistically significant in any of the specifications. So, we

[36] Aggregating at the week-client or month-client level yields very similar results.

cannot reject that the effect of the contract for high-reward goods is the same when goods are sold alone and in a bundle with other products. Even if it is not clear that workers increase prices of high-reward goods in mixed invoices more than in nonmixed invoices, they decrease prices of a larger range of goods when they are bundled together. If sold with other products the price of goods with $\Delta b_j < 0.35$ decreases, while if sold alone only the price of goods with $\Delta b_j < 0.21$ decreases.

The effects on quantity are shown in Table 8. The only statistically significant effect is an increase in quantity sold for goods sold in nonmixed invoices when we include product fixed effects. Interestingly, for goods sold alone with $\Delta b_j > 0.4$ for which price increases, quantity also increases with the new contract. Quantities of goods sold in mixed invoices are not affected by the announcement of the new contract. The results on profits are depicted in Table 9. Again, estimates are only significant for nonmixed invoices and suggest profits made on high-reward goods increase while they decrease for low-reward products.

A caveat worth mentioning is that sales employees have repeated interactions with the same clients. If there exists intertemporal collusion between worker and client that affects prices of high- and low-reward goods, it could be problematic for identification and interpretation of the coefficients in the previous specification. It is not unreasonable to consider that employees and clients could agree on lower prices for low-reward goods sold today in exchange for higher prices for high-reward goods sold tomorrow, for example. I address this concern in two ways. First, I collapse data at the week-client and month-client level. The results do not change. The second strategy I use is to identify clients that only bought once during the 103 weeks observed and check if workers behave differently with these customers. There are around nine thousand clients, and 30% of them only buy once in the period observed. With this new indicator I run the following regressions:

$$y_{cijt} = \mu_1 D_{it} + \tilde{\mu}_1(\Delta b_j * D_{it}) + \mu_2(\phi_c * D_{it}) + \tilde{\mu}_2(\Delta b_j * \phi_c * D_{it}) + \lambda_t + \gamma_i + \theta_j + x_{it}\beta + u_{cijt} \quad (4)$$

where y_{cijt} is output of good j sold by employee i to customer type c (there are two types–

those that buy only once and everyone else) in week t. ϕ_c is equal to one for customers that bought more than once and zero otherwise. The other variables are the same as in previous equations. To get a sense of whether intertemporal gaming is the only mechanism or part of workers' adjustment to the new contract, we are interested in knowing the following: (1) if the price of low-reward products decreases even when they are sold to customers that only buy once (i.e., $\mu_1 < 0$); and (2) if the effect of the contract is more extreme for customers with repeated interactions (i.e., $\mu_2 < 0$ and $\tilde{\mu}_2 > 0$).

Table 10 reports the coefficients estimated for log of price as dependent variable. The first line shows that prices of goods with no change in incentives decrease even for clients that buy only once. The same is true for all goods with a change in commission below 0.35. This suggests that intertemporal gaming is not the only mechanism. Finally, though the effect of the contract is more extreme for goods sold to customers with repeated interactions, the estimates are not statistically significant across specifications.

Regardless of the underlying mechanism behind workers' response, an interesting point to analyze is how much workers and firm (before paying commissions) would have gained from the new strategy adopted, assuming the new contract was implemented when the announcements were made.[37] Using the log of workers' weekly earnings from commissions and the log of value added (i.e., $(p-c) \times q$) as dependent variables, I estimate Equation (1). Results are shown in Table 11. With the new contract, workers' strategies should have increased their commissions more than 30%. The effect on value added is also positive (around 8%) but very imprecisely measured.

[37]This is what was promised to workers. Yet the implementation process was slower as mentioned in Section II.B (see Figure 4).

VI Robustness Checks

VI.A Placebo Test and the Two Announcements

Using data from 2011 and 2012 I define two fake announcement dates, at the end of June 2011 for the main offices stores and at the end of September 2011 for the other stores. Then, using these fake announcements I generate a *placebo dummy* P_{it} that is equal to one after the fake announcement of the new contract in the store where worker i belongs, and zero otherwise. I estimate the following panel data specification:

$$y_{it} = \tau_p P_{it} + \lambda_t + \gamma_i + x_{it}\beta + u_{it} \tag{5}$$

where y_{it} is the log of average price, the log of quantity, or the log of profits of all products sold by employee i on week t. The other variables are defined in Section V.A for Equation (1). Because there were no changes in 2011 and 2012 in the compensation scheme, we should not be able to reject that the coefficients on the placebo dummy τ_p are equal to zero. Table 12 shows that indeed the placebo announcement has no effect on weekly measures, we cannot reject that any of the estimates are statistically equal to zero.

For the second robustness check I use again the data from 2008-2009. To separate the effect of the two announcements I estimate the following equation:

$$y_{it} = \tau_m D^m_{it} + \tau_o D^o_{it} + \lambda_t + \gamma_i + x_{it}\beta + u_{it} \tag{6}$$

where D^m_{it} is a dummy variable that is equal to one after June 2008 if worker i belongs to the main offices stores and zero otherwise. D^o_{it} is also a dummy variable, equal to one after September 2008 if worker i belongs to the other stores and zero otherwise. Table 13 presents the results for Equation (6). The point estimates on the effect of the new contract for both groups of workers are positive for the log of price and log of profits and negative for the log of quantity. For the three dependent variables considered we cannot reject that the effect of the announcement is the same in both groups of stores although the effect falls short of statistical significance in "other stores."

VI.B Separating goods in groups according to their $b(p^0)$

To allow for a specification that does not impose linearity in the effect of the contract on products according to their predicted commission, I divide goods in four groups and estimate the effect of announcing the new scheme on each group of products. The first group includes all products with the highest predicted commission ($b(p^0) = b_D$). The second group includes goods with revision commissions between the two highest cutoffs (b_C and b_D); the third one includes goods with predicted commission between the old commission $\bar{b}$ and the following cutoff of the new scheme b_C. Finally, the fourth group includes goods for which incentives on average decreased (given the old equilibrium prices) and have a predicted commission below $\bar{b}$. The regressions estimated are:

$$y_{ijt} = \sum_{\tau=1}^{4} \mu_\tau(\epsilon_\tau * D_{it}) + \lambda_t + \gamma_i + \theta_j + x_{it}\beta + u_{ijt} \tag{7}$$

where y_{jit} is one of the three outcome variables previously analyzed: the log of average price, the log of quantity or the log of profits for product j sold by employee i in week t. As before, D_{it} is a dummy equal to one after the announcement of the incentive change was made in the store to which worker i belongs, and zero otherwise. The λ_t are a full set of week time effects, the γ_i are individual fixed effects, the θ_j are product fixed effects, and the x_{it} are individual specific covariates. The new variables, ϵ_1, ϵ_2, ϵ_3, and ϵ_4 are equal to one if product j is in each one of the four groups described above.

The results of regression (7) are shown in Tables 14, 15, and 16. We can see from the first four lines of these tables that the new contract does not have a homogeneous effect on products with different predicted commissions. In line with the theoretical predictions, Table 14 shows that after the announcement of the new payment scheme, the average price of the highest-rewarded goods ($b(p^0) = b_D$) increases around 3%. In contrast, for the lowestrewarded products for which incentives increase ($\bar{b} < b(p^0) < b_C$), as predicted by the model, the new contract causes a decrease in average prices of 8%.

The effects on quantity reported in Table 15 are negative but not statistically significant for most groups of products when we include product fixed effects (columns (3) and (4)). Finally, the estimated effects of the new contract on profits are shown in Table 16. Profits decrease for goods with commissions between $\bar{b}$ and b_D. For the highest-rewarded product the estimate is also negative but imprecisely measured. Surprisingly, for goods with predicted commissions below the old commission, profits increase.

VI.C Measurement Error and SSIV

Because we are using a subsample of observations to calculate the predicted change in commission for every good, Δb_j, the estimate of the effect of the contract by the predicted change in commission could be biased. For instance, if the Δb_j we calculate, given the observations we have in the pre-change period, is higher for the highest-rewarded goods than its real value then we would be underpredicting the effect of the contract for the highest-rewarded goods. To address such attenuation bias concern I use a split sample instrumental variable strategy.

First, I randomly split the raw data in two subsamples. Then, I calculate the predicted change in commission for every good separately in both subsamples. After that, I aggregate my observations at the product-worker-week level and use the predicted change in commission from Subsample 2 as an instrument for the Δb_j in Subsample 1. The results shown in Table 17 are consistent with attenuation bias when we include product fixed effects. Although the difference is rather small, the estimated effect on average price of the new contract by predicted commission is larger when instrumenting for Δb_j.

VI.D Excluding Goods with Transactions with Margins below $x+k_1$

For this last robustness check I use a more conservative approach to make sure I only consider goods for which, taking the pre-change observations, financial incentives would increase not only in expectation but also for every single transaction. In other words, I drop goods that in the period before the contract announcement had any transaction with a price-cost margin below $x + k_1$.[38]

The estimated effects on average prices are presented in Table 18. As in the main specification and the previous robustness check, average price for the highest-rewarded products increases around 3% with the announcement of the new contract. The coefficient for lower-margin goods is negative but very imprecisely measured, probably due to the smaller sample used. However, this point estimate is not statistically different from the result found when including all goods (shown in Table 14). The effects on quantity and profits for the two groups are shown in Tables 19 and 20. The results are not different from the previous estimations discussed in Section VI.B.

VII Conclusions

I test the implications of a change in the financial incentives of sales employees on their behavior using a new database. For this purpose, I propose a simple theoretical framework in which workers have many tasks (to sell different products) and choose price and effort of every sale. The model yields different predictions on the effect of the new contract depending on the interaction among efforts allocated to each task (or product). Taking advantage of the timing of the announcement of the new policy, I use a difference-in-differences specification to estimate the average aggregate effect of the new contract and test the theoretical predictions.

With the old contract, the wage received by sales employees in the firm studied was linear in the value of all transactions; workers got paid a fixed percentage (a commission) of the revenue of every sale they made. With the new piecewise linear scheme the commission of each transaction increases as the price-cost margin of that particular sale increases. The policy on average raises financial incentives for most products, but the increase is stronger for products for which the demand curve allows higher price-cost margins.

After the announcement of the new contract, weekly average price increases 9%. It is

[38]With the new incentive scheme, transaction with margins below $x + k_1$ receive a lower commission than before.

not clear if profits increase, and the effect on quantity is very imprecisely measured. There are different mechanisms that could give rise to an increase in average weekly price without any effect on quantity. On the one hand, employees could increase effort and prices on the sales of all goods. This would be optimal for workers if efforts allocated to selling different products are independent. On the other hand, if increasing effort in one product increases the marginal cost of effort in another, it is optimal for workers to reallocate effort between products and increase prices of goods that are more rewarded while decreasing prices of low-reward goods. I also model and test for whether workers are gaming the system by using discounts on low-reward products to increase prices of high-reward goods when products are bundled together.

In line with the theoretical predictions when efforts are substitutes for workers, I find evidence on effort reallocation from products that have low predicted commissions to goods that have higher predicted commissions, even if commissions increase for all goods. After the announcement of the new payment scheme the price of high-reward products increases 3% while the price of low-margin goods decreases about 7%. The effects on quantities are statistically insignificant, reinforcing the modeling idea that workers can influence demand by other means than price. Furthermore, using workers' first-order conditions on price and the estimated changes in prices and quantities, I back out the effect on quantities that is due only to effort reallocation between high- and low-reward goods. From this exercise it is clear that for high-reward products effort increases while for low-reward goods effort decreases. With the new contract, workers shift their effort to the task that pays a higher commission to the detriment of other tasks.

Finally, I find some evidence of gaming. Workers increase the price of high-reward goods that are sold with other products more (this probably gives them more room for negotiation) than the price of high-reward goods sold alone. Similarly, they decrease the price of low-reward products that are sold in a bundle more than those sold alone. However, we also observe that the price of low-reward goods sold alone decreases. This suggests that employees gaming the system by taking advantage of products bundled together is not the only response to the change in the contract.

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Appendix A - Proofs of Propositions

Proof of Proposition 1: First-order conditions for p and a, respectively, are

$$\begin{aligned} b(q + p\frac{\partial q}{\partial p}) + \frac{db}{dp}pq &= 0 \\ bp\frac{\partial q}{\partial a} - \frac{\partial \gamma}{\partial a} &= 0 \end{aligned}$$

Fully differentiating

$$\begin{bmatrix} u_{pp} & \frac{db}{dp}p\frac{\partial q}{\partial a} + b\frac{\partial q}{\partial a} + bp\frac{\partial^2 q}{\partial a \partial p} \\ \frac{db}{dp}p\frac{\partial q}{\partial a} + bq_a + bp\frac{\partial^2 q}{\partial a \partial p} & u_{aa} \end{bmatrix} \begin{bmatrix} dp \\ da \end{bmatrix} = \begin{bmatrix} -pq \cdot d\left(\frac{db}{dp}\right) - (q + p\frac{\partial q}{\partial p}) \cdot db \\ -p\frac{\partial q}{\partial a} \cdot db \end{bmatrix}$$

where u_{pp} and u_{aa} are the second-order conditions and the 2x2 matrix is the Hessian, so $u_{pp} < 0$, $u_{aa} < 0$, and $det(Hessian) > 0$. The assumption that $\partial^2 q/\partial a \partial p \geq 0$ is sufficient (but not necessary) for the remaining term of the Hessian to be positive. Then, applying Cramer's rule, we obtain the following results. If $d\left(\frac{db}{dp}\right) > 0$, a sufficient condition for $dp > 0$ and $da > 0$ is $db \geq 0$. However, $d\left(\frac{db}{dp}\right) > 0$ is only really true at the cutoff points. If $d\left(\frac{db}{dp}\right) = 0$, $db > 0$ is sufficient and necessary for $dp > 0$ and $da > 0$. Therefore, a sufficient condition for price and effort to increase if $\gamma_{LH} = 0$ is that the new commission is strictly higher than the old commission given the pre-change equilibrium prices (i.e., $b(p^0) > \bar{b}$).

Proof of Proposition 2: Using the first-order conditions with respect to p_L, a_L, p_H, and a_H and fully differentiating

$$\begin{bmatrix} u_{p_L p_L} & u_{p_L a_L} & 0 & 0 \\ u_{p_L a_L} & u_{a_L a_L} & 0 & -\gamma_{LH} \\ 0 & 0 & u_{p_H p_H} & u_{p_H a_H} \\ 0 & -\gamma_{LH} & u_{p_H a_H} & u_{a_H a_H} \end{bmatrix} \begin{bmatrix} dp_L \\ da_L \\ dp_H \\ da_H \end{bmatrix} = \begin{bmatrix} -p_L q_L \cdot d\left(\frac{db_L}{dp_L}\right) - (q_L + p_L\frac{\partial q_L}{\partial p_L}) \cdot db_L \\ -p_L\frac{\partial q_L}{\partial a_L} \cdot db_L \\ -p_H q_H \cdot d\left(\frac{db_H}{dp_H}\right) - (q_H + p_H\frac{\partial q_H}{\partial p_H}) \cdot db_H \\ -p_H\frac{\partial q_H}{\partial a_H} \cdot db_H \end{bmatrix}$$

where $u_{p_jp_j}$ and $u_{a_ja_j}$ are the second-order conditions, $u_{p_ja_j}$ are the cross partial derivatives of utility for $j = \{L, H\}$, and the 4x4 matrix is the Hessian. Thus, $u_{p_jp_j} < 0$, $u_{a_ja_j} < 0$, $u_{p_ja_j} > 0$ for $j = \{L, H\}$, and $det(Hessian) > 0$. Assume $d\left(\frac{db_L}{p_L}\right) = d\left(\frac{db_H}{p_H}\right) = 0$; in fact, these slopes are only positive near the cutoffs. Then, set $db_L = 0$ given that $db_H > db_L$ and $db_H > 0$. Using Cramer's rule and the first-order conditions one can show that $dp_H > 0$, $da_H > 0$, $dp_L < 0$, and $da_L < 0$. By continuity, with a γ_{LH} sufficiently large this is the case even when $db_L > 0$.

If $d\left(\frac{db_j}{dp_j} > 0\right)$ for $j = \{L, H\}$ and $db_L > 0$, a necessary condition on γ_{LH} for price and effort of low-reward goods to decrease is (the condition is also sufficient for effort of L goods to decrease):

$$\gamma_{LH} > \frac{p_L \frac{\partial q_L}{\partial a_L} \cdot db_L \cdot A_H}{p_H \frac{\partial q_H}{\partial a_H} \cdot db_H \cdot -u_{p_Hp_H} + p_H q_H \cdot d\left(\frac{db_H}{dp_H}\right) \cdot u_{p_Ha_H}}$$

where $A_H = (u_{p_Hp_H} u_{a_Ha_H} - u^2_{p_Ha_H})$.

Interpretation of this condition is clearer when $d\left(\frac{db_H}{dp_H}\right) = 0$:

$$\gamma_{LH} > \frac{p_L \frac{\partial q_L}{\partial a_L} \cdot db_L}{p_H \frac{\partial q_H}{\partial a_H} \cdot db_H} \cdot \frac{A_H}{-u_{p_Hp_H}}$$

The first fraction on the right-hand side is the ratio of the changes in the marginal benefits of effort. Thus, if the cross partial derivative (i.e., the increase in the marginal cost of effort H imposed by increasing effort L) is larger than the ratio of the increase in the marginal benefit of effort L over the increase in the marginal benefit of effort H, effort allocated to the low-reward good decreases.

Proof of Proposition 3: Using the first-order conditions, the new equilibrium price for low-margin goods is

$$p_L = \frac{\theta \bar{p}_L - (b_H - b_L)\bar{q}_L - \frac{dbH}{dp_H}\frac{\bar{q}_L}{\bar{q}_H} R}{\theta - \left[\frac{db_L}{dp_L} + \frac{db_H}{dp_H}\frac{\bar{q}_L}{\bar{q}_H}\right]\bar{q}_L}$$

If $\theta = 0$, the optimal strategy for the worker at the second stage is to set p_L as low as possible and increase p_H for products sold in a bundle. At the limit, as $\theta \to \infty$, using l'Hopital's rule, we know that $p_L = \bar{p}_L$. This means that for $\theta \in (0, \infty)$, $p_L < \bar{p}_L$ and thus $p_H > \bar{p}_H$. These results imply that with multitasking, the price of low-reward goods sold in a bundle decrease more than low-reward goods sold alone while the price of high-reward goods sold in a bundle increase more than high-reward goods sold alone. Furthermore, when there is no multitasking problem, prices of high- and low-reward goods increase in the first stage, so the only goods that could have a decrease in prices after the second stage are low-reward goods sold in a bundle.

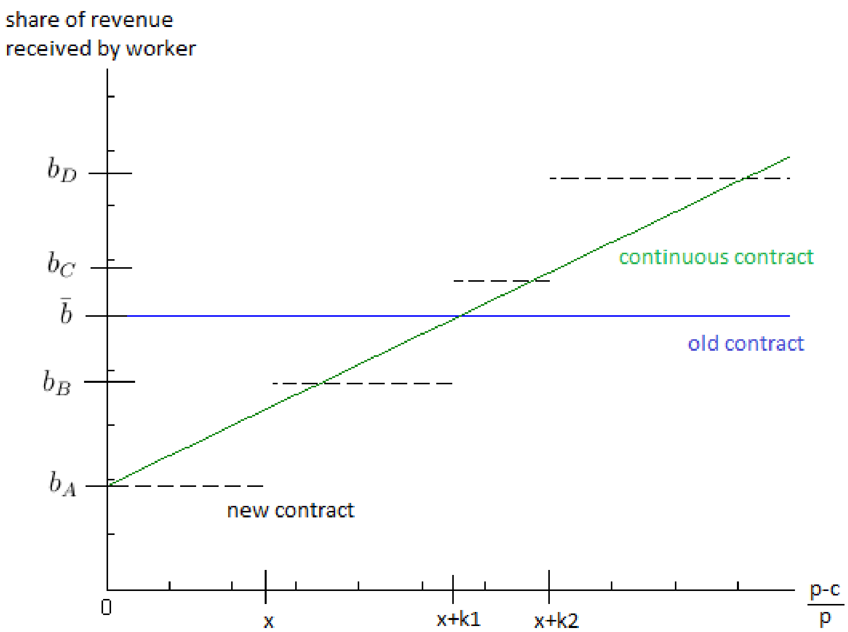

Figure 1: Share of Revenue Received by the Worker

Figure 2: Stores Locations

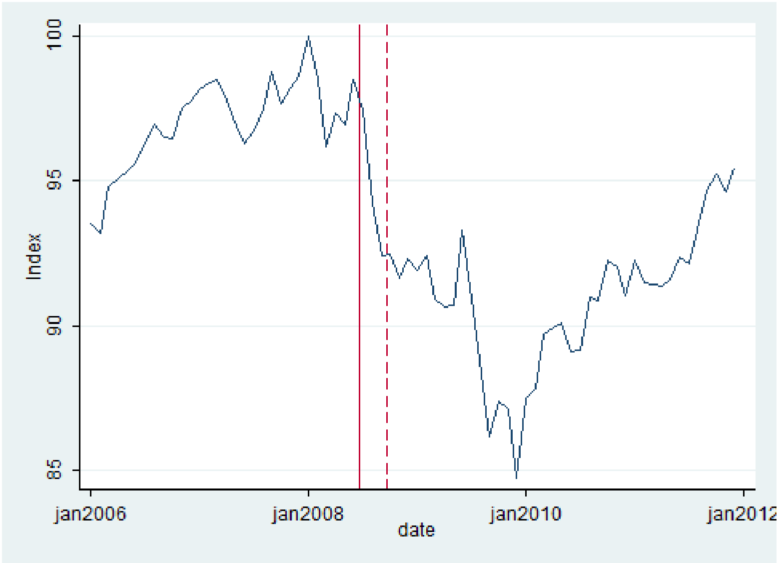

Figure 3: Construction Index (Jan. 2008 = 100)

Notes: Index calculated using the value of production reported by private firms in the construction sector. Source: Banco de Informacion Economica (BIE)-INEGI.

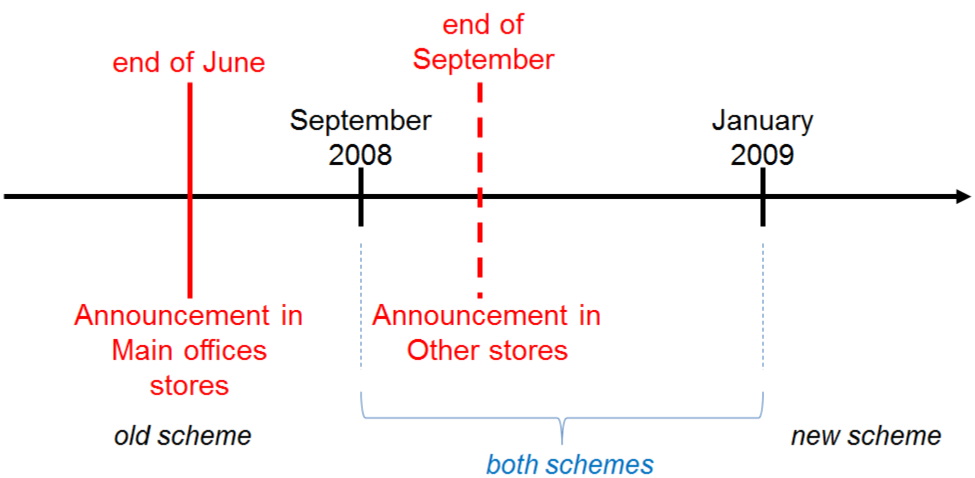

Figure 4: Timing of the Introduction of the New Incentives Scheme

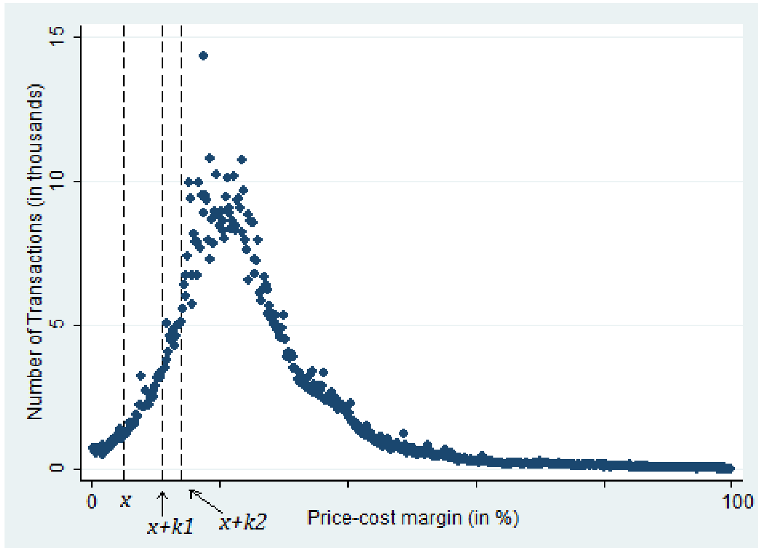

Figure 5: Transactions by Price-Cost Margin
After the Announcement of the New Contract

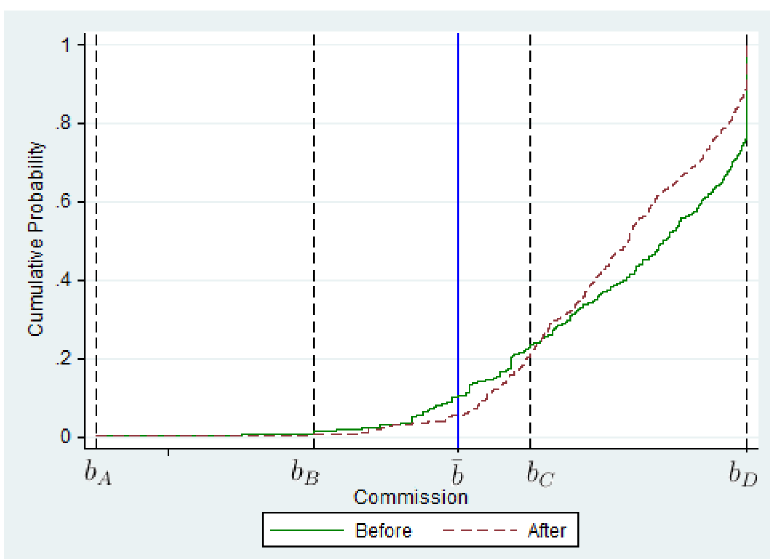

Figure 6: Cumulative Distribution Function of Sales Before and After the Announcement of the New Contract by Predicted and Average Commission Given the New Scheme

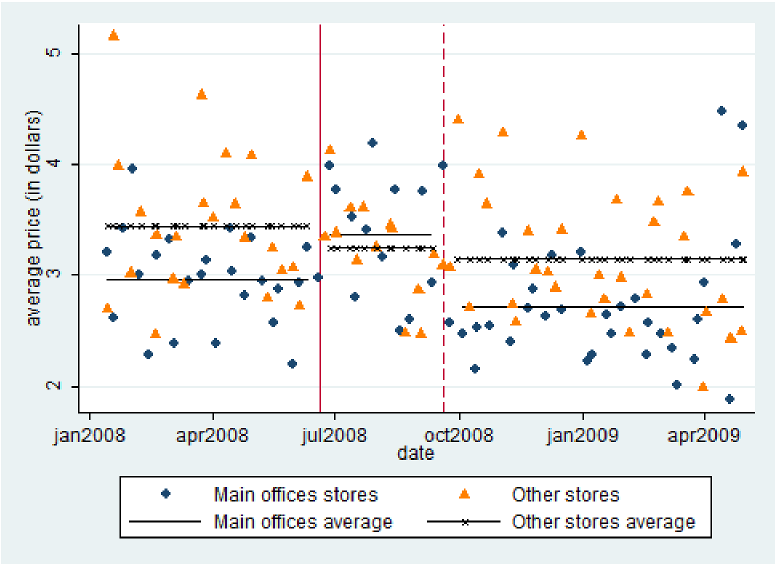

Figure 7: Average Weekly Item Price per Worker in Main Offices and Other Stores

Table 1: Descriptive Statistics per Transaction

	Mean	**Std. Dev.**	**Min**	**Max**
Revenue ($)	183.58	(1,609.63)	0.00	866,242.10
Profit ($)	40.51	(375.43)	0.00	116,704.20
Unit price ($)	24.21	(192.22)	0.01	24,575.04
Quantity	85	(555)	1	123,300
Price-cost margin (%)	24.66	(12.60)	0.00	100.00
Transactions per week	13,407	(2,272)	7,122	20,012

Notes: All the variables that contain monetary values are in dollars of January 2008. Number of observations: 1,380,871.

Table 2: Effect of the New Incentives Scheme on Weekly Measures

Dependent variable	**log(price)**		**log(quantity)**		**log(profits)**	
	(1)	(2)	(3)	(4)	(5)	(6)
New contract announcement dummy	0.093*	0.090*	-0.027	-0.063	0.098	0.063
	(0.051)	(0.048)	(0.092)	(0.073)	(0.083)	(0.064)
Main offcies stores dummy	0.008		0.554***		0.532***	
	(0.024)		(0.043)		(0.039)	
Age	0.006		-0.013		-0.014	
	(0.007)		(0.012)		(0.011)	
Age^2	0.000	0.000	0.000	-0.005***	0.000	-0.003***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)
Male	-0.179***		0.143***		-0.068	
	(0.029)		(0.052)		(0.047)	
Tenure	-0.014***		0.125***		0.105***	
	(0.003)		(0.005)		(0.005)	
Individual fixed effects	No	Yes	No	Yes	No	Yes
R-squared	0.042	0.165	0.250	0.539	0.247	0.550

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent. Standard errors are clustered at the employee level (i.e., there are 75 clusters). Estimates are calculated using data for years 2008 and 2009. All regressions have week fixed effects. Number of observations: 7,120.

Table 3: Effect of the New Incentives on Average Price by Product

Dependent variable: log(price)	(1)	(2)	(3)	(4)
New contract dummy	-0.200***	-0.200***	-0.071***	-0.071***
	(0.048)	(0.046)	(0.011)	(0.010)
$\Delta b \times$ New contract dummy	0.450***	0.446***	0.196***	0.196***
	(0.099)	(0.098)	(0.014)	(0.014)
Δb	-2.148***	-2.161***		
	(0.129)	(0.123)		
Main offices stores dummy	0.008		-0.002	
	(0.052)		(0.005)	
Age	0.019		-0.001	
	(0.013)		(0.001)	
Age^2	0.000	0.000	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.000)
Male	-0.121**		0.001	
	(0.048)		(0.006)	
Tenure	0.000		-0.001	
	(0.006)		(0.001)	
Individual fixed effects	No	Yes	No	Yes
Product fixed effects	No	No	Yes	Yes
R-squared	0.022	0.027	0.993	0.993

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent. Standard errors are clustered at the employee level (i.e., there are 75 clusters). Estimates are calculated using data for years 2008 and 2009. Number of observations: 913,482.

Table 4: Effect of the New Incentives on Quantity by Product

Dependent variable: log(quantity)				
	(1)	(2)	(3)	(4)
New contract dummy	0.063	0.049	-0.036	-0.046
	(0.068)	(0.058)	(0.041)	(0.037)
Δb × New contract dummy	-0.193	-0.190	-0.005	-0.005
	(0.122)	(0.119)	(0.052)	(0.049)
Δb	-1.480***	-1.293***		
	(0.181)	(0.157)		
Main offices stores dummy	0.311***		0.276***	
	(0.117)		(0.087)	
Age	-0.047		-0.022	
	(0.029)		(0.024)	
Age^2	0.001*	0.001	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.001)
Male	-0.080		-0.090	
	(0.095)		(0.078)	
Tenure	0.018		0.018	
	(0.015)		(0.011)	
Individual fixed effects	No	Yes	No	Yes
Product fixed effects	No	No	Yes	Yes
R-squared	0.034	0.068	0.617	0.637

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent. Standard errors are clustered at the employee level (i.e., there are 75 clusters). Estimates are calculated using data for years 2008 and 2009. Number of observations: 913,482.

Table 5: Effect of the New Incentives on Profits by Product

Dependent variable: log(profits)				
	(1)	(2)	(3)	(4)
New contract dummy	-0.103	-0.130**	-0.076	-0.093**
	(0.070)	(0.064)	(0.049)	(0.046)
Δb × New contract dummy	0.105	0.130	0.054	0.068
	(0.090)	(0.084)	(0.059)	(0.059)
Δb	-3.003***	-2.890***		
	(0.117)	(0.109)		
Main offices stores dummy	0.286**		0.262***	
	(0.113)		(0.076)	
Age	-0.026		-0.022	
	(0.027)		(0.023)	
Age^2	0.000	0.000	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.001)
Male	-0.196**		-0.092	
	(0.080)		(0.077)	
Tenure	0.011		0.009	
	(0.014)		(0.010)	
Individual fixed effects	No	Yes	No	Yes
Product fixed effects	No	No	Yes	Yes
R-squared	0.061	0.093	0.534	0.549

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent. Standard errors are clustered at the employee level (i.e., there are 75 clusters). Estimates are calculated using data for years 2008 and 2009. I exclude goods with $\Delta b < 0$ because profits increase sharply for this very small group. See Table 12.

Number of observations: 913,482.

Table 6: Effort Effect of the New Incentives by Predicted Commission

	Δp	$\partial q/\partial p$	$\Delta a \cdot \partial q/\partial a$
	(1)	(2)	(3)
$b(p^0) = b_D$	0.05	-43.87	2.33
$b(p^0) = b_C$	-0.12	-94.25	-11.00
$b(p^0) = \bar{b}$	-0.14	-112.00	-20.21

Note: Calculated using estimates from Table 3.
$b_D > b_C > \bar{b}$.

Table 7: Effect of the New Incentives on Average Price by Product and Invoice

Dependent variable: log(price)	(1)	(2)	(3)	(4)
New contract	-0.276***	-0.261***	-0.062***	-0.039***
	(0.062)	(0.059)	(0.013)	(0.013)
Mixed invoice $\times$ New contract	0.119*	0.100	-0.001	-0.027***
	(0.067)	(0.065)	(0.002)	(0.003)
Δb $\times$ New contract	0.322**	0.294**	0.190***	0.189***
	(0.138)	(0.136)	(0.016)	(0.017)
Δb $\times$ Mixed invoice $\times$ New contract	0.029	0.056	0.002	0.001
	(0.137)	(0.135)	(0.005)	(0.005)
Δb	-0.709***	-0.690***		
	(0.153)	(0.144)		
Δb $\times$ Mixed invoice	-2.051***	-2.107***		
	(0.158)	(0.155)		
Mixed invoice	-0.171**	-0.128	-0.001	0.026***
	(0.081)	(0.079)	(0.002)	(0.002)
Main offices stores dummy	0.016		-0.002	
	(0.046)		(0.006)	
Age	0.018		-0.001	
	(0.012)		(0.001)	
Age^2	0.000	0.000	0.000	0.000***
	(0.000)	(0.001)	(0.000)	(0.000)
Male	-0.108**		0.002	
	(0.048)		(0.007)	
Tenure	-0.003		-0.001**	
	(0.006)		(0.001)	
Individual fixed effects	No	Yes	No	Yes
Product fixed effects	No	No	Yes	Yes
R-squared	0.055	0.060	0.993	0.993

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent. Standard errors are clustered at the employee level (i.e., there are 75 clusters).

Estimates are calculated using data for years 2008 and 2009. Number of observations: 1,224,474.

Table 8: Effect of the New Incentives on Quantity by Product and Invoice

Dependent variable: log(quantity)				
	(1)	(2)	(3)	(4)
New contract	0.130	0.085	0.102**	-0.132***
	(0.087)	(0.076)	(0.046)	(0.040)
Mixed invoice $\times$ New contract	-0.059	-0.040	-0.116***	0.121***
	(0.063)	(0.059)	(0.029)	(0.031)
Δb $\times$ New contract	-0.067	-0.049	0.323***	0.316***
	(0.165)	(0.162)	(0.083)	(0.067)
Δb $\times$ Mixed invoice $\times$ New contract	-0.072	-0.069	-0.381***	-0.360***
	(0.131)	(0.127)	(0.068)	(0.062)
Δb	-1.763***	-1.564***		
	(0.178)	(0.188)		
Δb $\times$ Mixed invoice	0.862***	0.891***		
	(0.207)	(0.188)		
Mixed invoice	-0.359***	-0.383***	-0.116***	-0.236***
	(0.095)	(0.084)	(0.029)	(0.015)
Main offices stores dummy	0.256*		0.213**	
	(0.132)		(0.092)	
Age	-0.057*		-0.031	
	(0.031)		(0.024)	
Age^2	0.001**	0.001	0.000	0.001
	(0.000)	(0.001)	(0.000)	(0.001)
Male	-0.152		-0.153**	
	(0.095)		(0.074)	
Tenure	0.016		0.016	
	(0.016)		(0.012)	
Individual fixed effects	No	Yes	No	Yes
Product fixed effects	No	No	Yes	Yes
R-squared	0.027	0.068	0.609	0.631

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent. Standard errors are clustered at the employee level (i.e., there are 75 clusters).

Estimates are calculated using data for years 2008 and 2009. Number of observations: 1,224,474.

Table 9: Effect of the New Incentives on Profits by Product and Invoice

Dependent variable: log(profits)				
	(1)	(2)	(3)	(4)
New contract	-0.207**	-0.242***	0.045	-0.125**
	(0.082)	(0.079)	(0.053)	(0.055)
Mixed invoice × New contract	0.187***	0.183***	-0.070*	0.089**
	(0.062)	(0.062)	(0.041)	(0.044)
Δb × New contract	0.391***	0.397***	0.376***	0.374***
	(0.145)	(0.141)	(0.094)	(0.089)
Δb × Mixed invoice × New contract	-0.429***	-0.399***	-0.450***	-0.414***
	(0.132)	(0.135)	(0.089)	(0.088)
Δb	-1.737***	-1.601***		
	(0.148)	(0.144)		
Δb × Mixed invoice	-1.262***	-1.308***		
	(0.170)	(0.166)		
Mixed invoice	-0.452***	-0.421***	-0.070*	-0.170***
	(0.074)	(0.072)	(0.041)	(0.015)
Main offices stores dummy	0.248**		0.213***	
	(0.117)		(0.074)	
Age	-0.038		-0.030	
	(0.028)		(0.023)	
Age^2	0.001*	0.000	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.001)
Male	-0.249***		-0.142**	
	(0.079)		(0.070)	
Tenure	0.005		0.004	
	(0.014)		(0.009)	
Individual fixed effects	No	Yes	No	Yes
Product fixed effects	No	No	Yes	Yes
R-squared	0.088	0.120	0.546	0.561

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent. Standard errors are clustered at the employee level (i.e., there are 75 clusters).

Estimates are calculated using data for years 2008 and 2009. Number of observations: 1,224,474.

Table 10: Effect of the New Incentives on Price by Product and Client Type

Dependent variable: log(price)				
	(1)	(2)	(3)	(4)
New contract	-0.075	-0.076	-0.049***	-0.055***
	(0.229)	(0.230)	(0.016)	(0.017)
Repeated sales client × New contract	-0.123	-0.123	-0.022*	-0.016
	(0.230)	(0.231)	(0.011)	(0.013)
Δb × New contract	0.060	0.038	0.154***	0.160***
	(0.513)	(0.515)	(0.032)	(0.031)
Δb × Repeated sales × New contract	0.392	0.410	0.043	0.036
	(0.531)	(0.533)	(0.027)	(0.026)
Δb	-2.838***	-2.861***		
	(0.424)	(0.426)		
Δb × Repeated sales	0.694	0.705		
	(0.435)	(0.438)		
Repeated sales client	-0.227	-0.251	-0.022*	-0.005
	(0.182)	(0.184)	(0.011)	(0.006)
Main offices stores dummy	0.008		-0.002	
	(0.052)		(0.005)	
Age	0.019		-0.001	
	(0.013)		(0.001)	
Age^2	0.000	0.000	0.000	0.000***
	(0.000)	(0.001)	(0.000)	(0.000)
Male	-0.121**		0.001	
	(0.047)		(0.006)	
Tenure	0.000		-0.001	
	(0.006)		(0.001)	
Individual fixed effects	No	Yes	No	Yes
Product fixed effects	No	No	Yes	Yes
R-squared	0.022	0.027	0.993	0.993

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent.

Standard errors are clustered at the employee level (i.e., there are 75 clusters).

Estimates are calculated using data for years 2008 and 2009.

Number of observations: 913,482.

Table 11: Effect of the New Incentives on Workers' Commissions and Value Added

Dependent variable	log(commission)		log(value added)	
	(1)	(2)	(3)	(4)
New contract announcement dummy	0.356***	0.316***	0.111	0.076
	(0.129)	(0.115)	(0.082)	(0.064)
Main offcies stores dummy	0.548***		0.532***	
	(0.188)		(0.039)	
Age	-0.009		-0.014	
	(0.078)		(0.011)	
Age^2	0.000	-0.004	0.000	-0.003***
	(0.001)	(0.004)	(0.000)	(0.001)
Male	-0.054		-0.067	
	(0.226)		(0.047)	
Tenure	0.107***		0.105***	
	(0.029)		(0.005)	
Individual fixed effects	No	Yes	No	Yes
R-squared	0.277	0.567	0.249	0.551

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent. Standard errors are clustered at the employee level (i.e., there are 75 clusters).

Estimates are calculated using data for years 2008 and 2009. Number of observations: 7,120.

Table 12: Placebo Test on Weekly Measures

Dependent variable	**log(price)**	**log(quantity)**	**log(profits)**
Placebo dummy	-0.023	-0.065	-0.102
	(0.063)	(0.111)	(0.103)
Individual fixed effects	Yes	Yes	Yes
R-squared	0.173	0.655	0.685

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent.

Standard errors are clustered at the employee level (i.e., there are 75 clusters).

Estimates are calculated using data for years 2011 and 2012.

Number of observations: 8,094.

Table 13: Effect of the Two Announcements on Weekly Measures

Dependent variable	**log(price)**		**log(quantity)**		**log(profits)**	
	(1)	(2)	(3)	(4)	(5)	(6)
New contract dummy	0.146**	0.141*	-0.099	-0.064	0.105	0.117
in main offices	(0.073)	(0.073)	(0.173)	(0.160)	(0.137)	(0.125)
New contract dummy	0.075	0.073	-0.005	-0.062	0.095	0.045
in other stores	(0.074)	(0.075)	(0.165)	(0.156)	(0.152)	(0.144)
Main offcies stores dummy	-0.045		0.623**		0.524**	
	(0.113)		(0.259)		(0.228)	
Age	0.006		-0.014		-0.014	
	(0.027)		(0.081)		(0.082)	
Age^2	0.000	0.000	0.000	-0.005	0.000	-0.003
	(0.000)	(0.001)	(0.000)	(0.004)	(0.001)	(0.004)
Male	-0.178***		0.138		-0.068	
	(0.064)		(0.248)		(0.231)	
Tenure	-0.014		0.124***		0.105***	
	(0.009)		(0.032)		(0.031)	
Individual fixed effects	No	Yes	No	Yes	No	Yes
R-squared	0.0424	0.165	0.250	0.539	0.247	0.550

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent. Standard errors are clustered at the employee level (i.e., there are 75 clusters). Estimates are calculated using data for years 2008 and 2009. Number of observations: 7,120.

Table 14: Effect of the New Incentives on Price by Type of Product Groups

Dependent variable: log(price)				
	(1)	(2)	(3)	(4)
$(b(p^0) = b_D) \times$ New contract	0.024	0.023	0.030***	0.030***
	(0.032)	(0.032)	(0.006)	(0.006)
$(b_C \leq b(p^0) < b_D) \times$ New contract	-0.030	-0.031	-0.016***	-0.015***
	(0.035)	(0.035)	(0.007)	(0.007)
$(\bar{b} < b(p^0) < b_C) \times$ New contract	-0.116**	-0.118***	-0.090***	-0.090***
	(0.045)	(0.042)	(0.008)	(0.008)
$(b(p^0) \leq \bar{b}) \times$ New contract	-0.099	-0.091	-0.064***	-0.066***
	(0.070)	(0.067)	(0.014)	(0.014)
$(b(p^0) = b_D)$	-1.301***	-1.314***		
	(0.097)	(0.095)		
$(b_C \leq b(p^0) < b_D)$	-0.745***	-0.754***		
	(0.088)	(0.086)		
$(\bar{b} < b(p^0) < b_C)$	-1.214***		0.000***	
	(0.072)		(0.000)	
Main offices stores dummy	0.003		-0.002	
	(0.055)		(0.005)	
Age	0.019		-0.001	
	(0.013)		(0.001)	
Age^2	0.000	0.000	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.000)
Male	-0.127**		0.001	
	(0.051)		(0.006)	
Tenure	0.001		-0.001	
	(0.006)		(0.001)	
Individual fixed effects	No	Yes	No	Yes
Product fixed effects	No	No	Yes	Yes
R-squared	0.024	0.029	0.993	0.993

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent.

Standard errors are clustered at the employee level (i.e., there are 75 clusters).

Estimates are calculated using data for years 2008 and 2009.

Number of observations: 913,482.

Table 15: Effect of the New Incentives on Quantity by Type of Product Groups

Dependent variable: log(quantity)				
	(1)	(2)	(3)	(4)
$(b(p^0) = b_D) \times$ New contract	-0.015	-0.031	-0.031	-0.042
	(0.051)	(0.044)	(0.041)	(0.038)
$(b_C \leq b(p^0) < b_D) \times$ New contract	-0.024	-0.036	-0.042*	-0.052
	(0.049)	(0.041)	(0.038)	(0.035)
$(\bar{b} < b(p^0) < b_C) \times$ New contract	-0.015	-0.034	-0.045	-0.063*
	(0.075)	(0.068)	(0.040)	(0.038)
$(b(p^0) \leq \bar{b}) \times$ New contract	0.182**	0.176**	-0.013	-0.007
	(0.083)	(0.074)	(0.057)	(0.052)
$(b(p^0) = b_D)$	-0.484***	-0.335***		
	(0.152)	(0.118)		
$(b_C \leq b(p^0) < b_D)$	-0.341**	-0.232**		
	(0.139)	(0.110)		
$(\bar{b} < b(p^0) < b_C)$	0.960***		0.000***	
	(0.130)		(0.000)	
Main offices stores dummy	0.312**		0.276***	
	(0.118)		(0.087)	
Age	-0.047		-0.022	
	(0.029)		(0.024)	
Age^2	0.001*	0.001	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.001)
Male	-0.079		-0.091	
	(0.096)		(0.078)	
Tenure	0.018		0.018	
	(0.016)		(0.011)	
Individual fixed effects	No	Yes	No	Yes
Product fixed effects	No	No	Yes	Yes
R-squared	0.042	0.077	0.617	0.637

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent.

Standard errors are clustered at the employee level (i.e., there are 75 clusters).

Estimates are calculated using data for years 2008 and 2009.

Number of observations: 913,482.

Table 16: Effect of the New Incentives on Profits of Product Groups

Dependent variable: log(profits)				
	(1)	(2)	(3)	(4)
$(b(p^0) = b_D) \times$ New contract	-0.037	-0.054	-0.042	-0.052
	(0.050)	(0.043)	(0.042)	(0.039)
$(b_C \leq b(p^0) < b_D) \times$ New contract	-0.079	-0.094**	-0.061*	-0.072*
	(0.048)	(0.042)	(0.041)	(0.037)
$(\bar{b} < b(p^0) < b_C) \times$ New contract	-0.066	-0.087	-0.091*	-0.106**
	(0.073)	(0.068)	(0.048)	(0.044)
$(b(p^0) \leq \bar{b}) \times$ New contract	0.356***	0.352***	0.162**	0.160***
	(0.073)	(0.068)	(0.064)	(0.060)
$(b(p^0) = b_D)$	-0.971***	-0.865***		
	(0.078)	(0.057)		
$(b_C \leq b(p^0) < b_D)$	-0.555***	-0.475***		
	(0.065)	(0.047)		
$(\bar{b} < b(p^0) < b_C)$	-0.079		0.000***	
	(0.068)		(0.000)	
Main offices stores dummy	0.279**		0.255***	
	(0.117)		(0.076)	
Age	-0.027		-0.022	
	(0.027)		(0.023)	
Age^2	0.000	0.000	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.001)
Male	-0.207**		-0.097	
	(0.084)		(0.079)	
Tenure	0.014		0.011	
	(0.014)		(0.010)	
Individual fixed effects	No	Yes	No	Yes
Product fixed effects	No	No	Yes	Yes
R-squared	0.050	0.083	0.535	0.551

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent.

Standard errors are clustered at the employee level (i.e., there are 75 clusters).

Estimates are calculated using data for years 2008 and 2009.

Number of observations: 913,482.

Table 17: Effect of the New Incentives on Average Price by Product using SSIV

Dependent variable: log(price)				
	(1)	(2)	(3)	(4)
New contract dummy	-0.166***	-0.164***	-0.083***	-0.083***
	(0.055)	(0.053)	(0.012)	(0.012)
$\Delta b \times$ New contract	0.395***	0.386***	0.229***	0.228***
	(0.118)	(0.116)	(0.018)	(0.018)
Δb	-2.627***	-2.651***		
	(0.156)	(0.149)		
Main offices stores dummy	0.014		0.002	
	(0.054)		(0.005)	
Age	0.020		-0.001	
	(0.014)		(0.001)	
Age^2	0.000	0.000	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.000)
Male	-0.120**		0.000	
	(0.050)		(0.007)	
Tenure	-0.001		-0.001*	
	(0.007)		(0.001)	
Individual fixed effects	No	Yes	No	Yes
Product fixed effects	No	No	Yes	Yes
R-squared	0.027	0.032	0.991	0.991

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent. Standard errors are clustered at the employee level (i.e., there are 75 clusters). Estimates are calculated using data for years 2008 and 2009. Number of observations: 524,254.

Table 18: Effect of the New Incentives on Price of Product Groups with $\frac{p-c}{p} > x + k_1$

Dependent variable: log(price)				
	(1)	(2)	(3)	(4)
$(b(p^0) = b_D) \times$ New contract	0.017	0.015	0.030***	0.030***
	(0.032)	(0.031)	(0.006)	(0.006)
$(b_C \leq b(p^0) < b_D) \times$ New contract	-0.004	-0.002	-0.004	-0.005
	(0.034)	(0.034)	(0.006)	(0.005)
$(b(p^0) = b_D)$	-0.545***	-0.566***		
	(0.111)	(0.110)		
Main offices stores dummy	0.014		-0.002	
	(0.054)		(0.005)	
Age	0.019		-0.001	
	(0.013)		(0.001)	
Age^2	0.000	0.000	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.000)
Male	-0.117**		0.001	
	(0.050)		(0.006)	
Tenure	0.000		-0.001	
	(0.006)		(0.001)	
Individual fixed effects	No	Yes	No	Yes
Product fixed effects	No	No	Yes	Yes
R-squared	0.037	0.042	0.993	0.993

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent.

Standard errors are clustered at the employee level (i.e., there are 75 clusters).

Estimates are calculated using data for years 2008 and 2009.

Number of observations: 440,837.

Table 19: Effect of the New Incentives on Quantity of Product Groups with $\frac{p-c}{p} > x + k_1$

Dependent variable: log(quantity)				
	(1)	(2)	(3)	(4)
$(b(p^0) = b_D) \times$ New contract	-0.015	-0.030	-0.032	-0.042
	(0.051)	(0.044)	(0.041)	(0.038)
$(b_C \leq b(p^0) < b_D) \times$ New contract	-0.002	-0.010	-0.056	-0.061
	(0.052)	(0.046)	(0.041)	(0.038)
$(b(p^0) = b_D)$	-0.501***	-0.377***		
	(0.150)	(0.125)		
Main offices stores dummy	0.311**		0.276***	
	(0.118)		(0.087)	
Age	-0.047		-0.022	
	(0.029)		(0.024)	
Age^2	0.001*	0.001	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.001)
Male	-0.080		-0.091	
	(0.096)		(0.078)	
Tenure	0.018		0.018	
	(0.016)		(0.011)	
Individual fixed effects	No	Yes	No	Yes
Product fixed effects	No	No	Yes	Yes
R-squared	0.042	0.077	0.617	0.637

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent.

Standard errors are clustered at the employee level (i.e., there are 75 clusters).

Estimates are calculated using data for years 2008 and 2009.

Number of observations: 440,837.

Table 20: Effect of the New Incentives on Profits of Product Groups with $\frac{p-c}{p} > x + k_1$

Dependent variable: log(profits)				
	(1)	(2)	(3)	(4)
$(b(p^0) = b_D) \times$ New contract	-0.043	-0.060	-0.042	-0.052
	(0.050)	(0.043)	(0.042)	(0.039)
$(b_C \leq b(p^0) < b_D) \times$ New contract	-0.037	-0.052	-0.102**	-0.110***
	(0.044)	(0.037)	(0.041)	(0.038)
$(b(p^0) = b_D)$	-0.326***	-0.245***		
	(0.069)	(0.049)		
Main offices stores dummy	0.288**		0.255***	
	(0.115)		(0.076)	
Age	-0.027		-0.022	
	(0.027)		(0.023)	
Age^2	0.000	0.000	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.001)
Male	-0.199**		-0.097	
	(0.083)		(0.079)	
Tenure	0.013		0.011	
	(0.014)		(0.010)	
Individual fixed effects	No	Yes	No	Yes
Product fixed effects	No	No	Yes	Yes
R-squared	0.062	0.094	0.535	0.551

Notes: *** denotes significance at 1 percent, ** at 5 percent, and * at 10 percent.

Standard errors are clustered at the employee level (i.e., there are 75 clusters).

Estimates are calculated using data for years 2008 and 2009.

Number of observations: 440,837.