Sales Agent Compensation Scheme and Consumer Search*

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Abstract

This paper studies the incentives for stores to invest effort in serving customers if effort is costly and might be merely persuasive that reduces consumption utility. We conduct the analysis by developing a sequential search model. Each store must hire a sales agent, who is paid by fixed wage or by commissions. The commissions motivate sales agents to provide more advice, which could be indeed useful to increase clients’ willingness to pay, or merely persuasive without affecting it. Consumers are sophisticated that understand the dual roles of effort before visiting firms, but they could be impressionable and therefore could not stay away from the effect of persuasion when they are making purchasing decision. When consumers are heterogeneous in terms of their impressionability, they are sorted into stores with fixed wage and commissions in the equilibrium. The composition of stores varies with the search cost and the ability of sales agents to increase consumers’ willingness to pay (effectiveness of advice). When the advice is relatively ineffective, there will be an increase in mass of fixed wage stores in response to a reduction in search cost. The reverse is true when the advice is sufficiently effective. Additionally, the mass of fixed wage stores always increases as the advice becomes less effective. The competitive equilibrium outcome might imply that there are too many commission-based stores, so it could be social welfare enhancing by encouraging more consumers to visit the fixed wage stores.

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1 Introduction

Do stores always find it profitable to compensate sales agents by commissions? On the first glance, it is reasonable to think that the answer is positive because commissions motivate sales agents to provide more advice to customers. Moreover, Kalra, Shi and Srinivasan (2003) contain some examples to show that Best Buy, PrinSource Financial Center, Charles Schwab and Virgin Financial are themselves prided on using the noncommission-based compensation scheme and routinely inform consumers about it. Their rationale for the practice is that sales agents’ effort is a double-edged sword. On the one hand, it could be indeed useful to increase consumers’ willingness to pay. On the other hand, it could also be merely persuasive that without affecting the willingness to pay. A sophisticated consumer, who notices the risk of being misled in a commission-based store might then discount the product value significantly. Thus, it is not immediately clear that stores always benefit from investing effort in serving customers. We intend to show that whether stores use commissions or fixed wage in compensating their sales agents depends on the nature of the product and the consumers’ search behavior.

Firstly, a common nature of the mentioned products in the above examples is that they all belong to a kind of credence good. Darby and Karni (1973) introduce the notion of credence good and define it as the product that consumers have difficulties to evaluate its exact value even after consumption. As a result, it is difficult for them to distinguish between the useful advice and the merely persuasive activities, which means there is a rich room for sales agents to induce consumers to buy the more expensive product by employing some selling techniques. Understanding the possibility of being misled, a sophisticated consumer would discount the perceived product value in the commission-based stores accordingly.

Secondly, the wide usage of the Internet might provide stores with higher incentives to compensate their sales agents by fixed wage. The wide usage of the Internet has reduced search cost and changed the consumers’ search behavior dramatically. This encourages consumers to search for more information, so that they have a better understanding on their own need and the products reducing sales agents’ ability to enhance the product value. Thus, it might be profitable for stores to simply use fixed wage in compensating their sales agents.

Combining the two observations, this paper argues that stores manage to segment the market and direct the consumers’ search through choosing and announcing
different compensation schemes when consumers are sophisticated but impression-
able. If consumers are heterogeneous in terms of their impressionability, both fixed wage and commission-based stores can coexist in the equilibrium. The less impressionable consumers with high ability to gain from the interaction with sales agents would visit commission-based stores but the more impressionable one would visit the fixed wage stores instead. Additionally, the composition of stores varies with the search cost and the effectiveness of sales agents’ advice. When there is a change in external environment altering the search cost and the effectiveness of advice, the consumers’ search direction and the expected demand in each type of stores would be altered accordingly. This would in turn induce stores to modify their sales agents compensation scheme.

We develop our model based on Wolinsky (1986), by introducing a sales agent for each store and allowing stores to choose their sales agents compensation scheme. Each store must hire a sales agent, who manages to increase the consumers’ willingness to pay by making an extra effort. The store could pay the sales agent by fixed wage or by commissions, but the sales agent would provide active assistance to consumers only when being motivated by commissions. Without observing the prices and the exact nature of the products, each consumer enters the market with a problem, searches sequentially, and encounters sales agents who are responsible for assisting her to make the buying decision. It is assumed that consumers are sophisticated in the sense that they understand that sales agents’ services consist of both useful advice that increases consumption utility and persuasive activities that reduce it. Moreover, they are impressionable and therefore could not help being persuaded to follow the advice once inside the commission-based stores. Observing stores’ sales agent compensation scheme and expecting sales agents’ behaviors, consumers first decide on the type of stores to visit and then search randomly among the same types stores. Furthermore, we also discuss the extended model with endogenous choice of effort levels from the sales agents, with free entry of stores and with an additional dimension of heterogeneity for the consumers. We show that the market segmentation effect remains in these extended frameworks but it becomes much more difficult to conduct the detailed comparative static analysis. We leave them for future research.

Intuitively, there are two counteracting forces governing consumers’ visiting di-
rection. Since active help from a sales agent is available only in commission-based stores, consumers would like to visit the commission-based stores to obtain useful information. But the problem is that there might also be excessive persuasion em-
bedded in the advice, so the sophisticated consumers would take it into consideration in choosing the type of stores to visit. Depending on their impressionability levels,
different consumers would have different ability to resist persuasion and take advantage from the interaction with a sales agent. Given that the less impressionable consumers are the one that is not easily affected by the persuasion activities, they have more incentives to visit the commission-based stores so as to enjoy the services from the sales agent. In contrast, the more impressionable consumers will visit the fixed wage stores instead to avoid the possibility of being persuaded to buy the more expensive product.

There are two implications from our comparative static analysis. Firstly, the reduction in search cost will increase the number of fixed wage stores only under the environment with relatively ineffective advice. Secondly, the increase in effectiveness of advice always induce more stores to choose a commission-based compensation scheme. If the advice is not so effective in enhancing product value, the perceived benefit for searching in the commission-based stores is relatively small. As a result, the search intensity of the consumers in commission-based stores would only increase slightly upon the reduction of search cost. This implies that the price reduction in the commission-based stores is not so large, so that the perceived utility in fixed wage stores would not differ a lot from that in commission-based one. Thus, more consumers prefer to visit the fixed wage stores to avoid the disutility from being misled. Conversely, if the advice is relatively effective in increasing the product value, the reduction in search cost could induce consumers to conduct search much more actively causing a larger amount of price reduction. This implies that the perceived surplus from visiting the commission-based stores is higher than that from fixed wage stores, which induce more consumers to visit the commission-based stores. The same intuition applies in explaining the increase in commission-based stores as the sales agents’ advice are more effective.

Our results predict that more of the fixed wage stores might emerge during this information age. The wide usage of the Internet dramatically reduces search cost, which allows consumers to be more informed about their own need. This will in turn weaken sales agents’ ability to enhance consumers’ willingness to pay. Given that both search cost and the effectiveness of advice decrease dramatically, our model implies that stores would have higher incentive to choose fixed wage rather than commissions during the information age.

Additionally, we also analyze the welfare and policy implications of our model. We show that when the required commissions to motivate sales agents are small enough, sales agents’ effort manages to increase the expected consumer surplus from commission-based stores. Moreover, it is not necessarily for stores’ profit. Because
the increase in perceived product value might induce consumers to search more actively, which could dramatically reduce the market price. As a result, the mass of commission-based stores under competitive market equilibrium could be smaller or larger than that under the social optimal. We interpret this result as an indication that the competitive equilibrium outcome might imply that there are many commission-based stores, so it could be social welfare enhancing by encouraging more consumers to visit the fixed wage stores. Moreover, under uniformly distributed willingness to pay, we show that expected profit in commission-based stores is higher than that in fixed wage one and there are insufficient amount of stores with commissions under the market equilibrium.

There is an extensive literature concerning consumer search theory. Varian (1980) and Burdett and Judd (1983) are two different models with comparison shoppers in a homogeneous good market. Their results involve mixed stores’ pricing strategies interpreted as sales. Wolinsky (1986) is the seminal paper in modeling sequential consumer search in a heterogeneous good market. Anderson and Renault (1999) extend the model to capture heterogeneous product quality. Moreover, sales agents play no role in their models. In contrast, we emphasize that sales agents play a key role in directing the consumers’ search. In terms of modelling, Bar-Isaac et al. (2012), Larson (2013) and Yang (2013) share some similarities with our model. We all work on a continuous version of the Wolinsky (1986) model but differ from each other significantly. Bar-Isaac et al. (2012), Larson (2013) endogenize stores’ choice of product design, which is not observable to consumers ex-ante. Yang (2013) introduces multiple types of consumers and endogenize stores’ choice of product type. Each type of consumer, only demanding one type of product, searches in the market without observing the product types. Given the assumption that there is not any ex-ante noticeable difference among the stores, all consumers have to search for the products randomly. Differently we have a stage for the stores to post the compensation scheme, so that consumers could decide on their search direction based on the announcements.

Our model also relates to persuasion literature. Shapiro (2006) and Lauga, D. (2010) analyze the impact of persuasion advertising to the consumers. They assume that the persuasion advertising could influence the consumers’ belief on the product valuation through converting bad experience to good one. We share similarity with their models by assuming sophisticated but impressionable consumers. The difference is that our consumers are affected inside the stores by a sales agent but they assume that persuasions affect consumers before visiting of stores through advertising. Besides, there is no consumer search in their model.
In terms of environment, Rotemberg (2010) also discusses the market impacts of the persuasion from sales agents. He introduces the sales agents into Burdett and Judd’s (1983) model and have an unique mixed strategy pricing equilibrium for stores. Moreover, the products market we considered usually has a predetermined pricing schedule and does not involve frequent sales. We believe that pure strategy outcome is more relevant for our purpose. Thus, we modify the Wolinsky’s (1986) model, which has a pure strategy price equilibrium for stores. Furthermore, our main objective is to analyze stores’ incentive in choosing different compensation scheme in directing the consumers’ search, but Rotemberg (2010) analyzes the different effects of the selling techniques in the presence of empathy from sales agents. We emphasize that stores switch to fixed wage and post it to the public so as to segment the market and direct the consumers’ search.

The consumers in our paper have dynamically inconsistent preferences. Our sophisticated but impressionable consumers could be interpreted as a result of the different ability of the consumers to forecast their preference changes as it is in Eliaz and Spiegler (2006). Moreover, the impressionability of our consumers is owing to their personal characteristic rather than their naivete. Gabaix and Laibson (2006) show that the market will involve stores to hide add-on price with the existence of sufficient large amount of the myopic consumers, who do not observe the add-on price. Within our framework, we could interpret the myopic consumers to be the more impressionable one because they will change the purchasing decision inside the stores. We show that the increase in amount of more impressionable consumers will reduce the amount of commission-based stores. The difference is that our consumers are sophisticated and rationally discount the perceived product value. Armstrong and Chen (2008) contain the analysis on the model with naive consumers who could only do not observe product quality. They show that the existence of the naive consumers could make the sophisticated one worse off. Differently the stores’ prices in our model are the competitive outcome of the market independent of the impressionability levels of the consumers. Inerst and Ottaviani (2013) shows that stores have incentive to exploit the credulous consumers by inflating the product value and setting unfavorable cancellation terms. They show that competition policy reduces inefficiencies only with rational customers. In contrast, we show that the presence of the more impressionable consumers might increase or decrease the social welfare depending on the distribution of the product valuation. Our modeling of sophisticated but impressionable could also be considered as a result of consumers’ rational inattention to the probability of being persuaded as it is in Grubb (2014). The difference is that the consumers in our model will be persuaded to act according to the
expanded distribution by the sales agents which is chosen by the stores, but Grubb (2014) assumes a true underlying preference for all the consumers.

The rest of the paper is organized as follows. Section 2 presents a persuasive selling model. Section 3 derives the consumers’ search equilibrium. Section 4 contains the analysis on the stores’ optimal price decision. In section 5 we analyze the factors in influencing the consumers’ search direction by assuming heterogeneous impressionability levels for consumers. In section 6 we derive the equilibrium ratio of the stores using different types of the compensation schemes. In section 7, we assume uniform distribution for the consumers’ willingness to pay and derive the comparative results on the change in search cost and the effectiveness of the sales agents’ advice to the optimal composition of stores. In section 8, we discuss the social welfare and policy implications of the model. Section 9 concludes the paper by discussing three possible extensions.

2 A Model of Persuasive Selling

The model is a modified version of Wolinsky (1986), in which a sales agent is introduced for each store. There are continuum of stores and consumers with mass $n$ and $m$, respectively.\(^1\) Each consumer enters the market with a problem, which could be solved by buying a product from a store. Each store is selling a heterogeneous product that it can produce with zero marginal cost and must hire a sales agent to handle customers. Stores could pay the sales agent by fixed wage or by commissions, but the sales agent will make efforts in serving customers only if being compensated by commissions. We assume that there are only two effort levels - effort or no effort. The efforts from sales agents will increase the consumers’ willingness to pay by $\overline{v}$ times with $\overline{v} > 1$.\(^2\) We normalize the fixed wage to be zero and assume that commissions increase marginal cost by $c$.\(^3\) Additionally, stores manage to commit to the posted compensation scheme: commissions or fixed wage and consumers could never

\(^1\)The continuum assumption is an approximation to the environment with a large number of agents. It captures the idea that each agent is so small such that no one manages to have significant impact to the market.

\(^2\)Rotemberg (2010) uses a similar assumption to analyze the interaction between salespeople and customer in the presence of persuasion and with different empathy levels for sales agents.

\(^3\)Depending on the cost needed to motivate the sales agents, stores will decide on the compensation scheme accordingly. We will show that stores might choose a commissions based compensation scheme only in an environment with sufficiently small $c$. 
know the compensation scheme unless observing an announcements from stores.

Consumers visit stores sequentially and encounters sales agents, who are respon-
sible to assist them in the buying decision. The consumers need to pay a search
cost, $s$, for each visit but could always return to buy from the previous visited stores
without additional cost. They first choose the type of stores to search, and then
randomly visit a store from the chosen type. Denote $\varepsilon_{ij}$ as the realized utility for
consumer $i$ in store $j$ and $p_j$ as the price in it. The consumer $i$’s utility from store
$j$ is then equal to $v_{ij} = \varepsilon_{ij} - p_j$. In the symmetric equilibrium, the expected utility
for the consumers buying in a fixed wage store and a commission-based store are
$v^f = \varepsilon^f - p^f$ and $v^c = \varepsilon^c - p^c$, respectively.

Let $F^f (\varepsilon^f)$ with $\varepsilon^f \in [0, 1]$ and $F^c (\varepsilon^c)$ with $\varepsilon^c \in [0, \bar{\varepsilon}]$ be consumers’ per-
ceived distribution for the product value available from the fixed wage stores and the
commission-based stores, respectively. We assume that sales agents in fixed wage
stores do not provide advice on the buying decision, so both the prior and posterior
distributions for product value from fixed wage stores are $F^f (\varepsilon^f)$. In contrast, the
consumers’ posterior belief about the product value from commission-based stores
differ from their prior belief about it. Before visiting a commission-based store, con-
sumer $\alpha$ believes that the true product value in it is $\frac{\varepsilon^c}{\bar{\varepsilon}}$ with probability $\alpha$ and $\varepsilon^c$ with
probability $1 - \alpha$. After interacting with a sales agent in the commission-based store,
the consumer is persuaded to believe that the product value is $\varepsilon^c$ with probability
one. In addition, we assume that $\alpha$ follows a distribution $G (\alpha)$ with $\alpha \in [0, 1]$ and
interpret it as the consumer’s impressionability level.

The timing of the game is as follows. In the first stage, stores simultaneously
decide on their sales agent compensation schemes and post them to the public. In
the second stage, stores set prices simultaneously. In the third stage, a sales agent is
hired by each store and makes the required efforts. In the fourth stage, consumers
decide on the search direction and the buying decision.

3 Consumer Search Behavior

Since all stores post their sales agent compensation schemes to the public, consumers
could first choose the type of stores to visit based on the announcements. With the

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4We always assume that $s$ to be sufficiently small to ensure the existence of the search market. In the paper, we will not list the exact bounds for $s$ unless it is needed in the proof.
continuum of stores assumption, the visiting history does not affect the expected consumer surplus from continuing to search. As a result, consumers would never switch the type of stores to visit, so stores compete with each other only when they have the same sales agent compensation scheme. Both the stores and the consumers could be divided into two segments, in which each one is a continuous version of the Wolinsky’s (1986) model. The consumer search behavior in each segment of the market is determined by a stationary stopping rule. Similar analysis also appears in Bar-Isaac et al. (2012), Lauga (2010) and Yang (2013), we include the arguments here for completeness.

Let $\tilde{p}$ be the expected price in a store and $F(\varepsilon)$ be the distribution of the product valuation and $v'$ be the highest achievable utility. Suppose further that the current visited store is the first one with utility $v'$ to the consumer. If the consumer decides to conduct an additional search, the expected surplus from the newly visited store is $\varepsilon - \tilde{p}$. The consumer will buy from the newly visited store if and only if $\varepsilon - \tilde{p} \geq v'$ and will go back to buy from the previous store whenever $\varepsilon - \tilde{p} < v'$. Thus, the expected gain from conducting an additional search is $\varepsilon - \tilde{p} - v'$ when $\varepsilon \geq v' + \tilde{p}$, and is zero when $\varepsilon < v' + \tilde{p}$. Given that search cost $s$ must be involved in each visit, the expected net gains from an additional search is

$$\int_{\varepsilon + \tilde{p}}^{\varepsilon} [\varepsilon - \tilde{p} - v'] dF(\varepsilon) - s$$

Since $\int_{\varepsilon + \tilde{p}}^{\varepsilon} [\varepsilon - \tilde{p} - v'] dF(\varepsilon)$ is strictly decreasing with $v'$, there is a unique cutoff utility, $w$, such that

$$\int_{w + \tilde{p}}^{\varepsilon} [\varepsilon - \tilde{p} - w] dF(\varepsilon) = s$$

From the equation for search equilibrium, the magnitude of $w + \tilde{p}$ is determined by $F(\varepsilon)$ and $s$ independent of the price decision of an individual store. Denote $w + \tilde{p}$ by $\tilde{\varepsilon}$. The consumers’ search behavior is then solely governed by $\tilde{\varepsilon}$. They enter the market if and only if $\tilde{\varepsilon} \geq \tilde{p}$, continue to search as long as $\tilde{\varepsilon} > \varepsilon$ and buy immediately whenever $\varepsilon \geq \tilde{\varepsilon}$. We interpret $\tilde{\varepsilon}$ as the consumers’ reservation utility in deciding to buy the products. Since the perceived product values for different types of stores are different from each other, there are two reservation utilities, cutoff utilities and price expectations for the two segments of the market. For $j = c, f$, denote $\tilde{\varepsilon}^j$, $w^j$
and \( \widetilde{p}^j \) as the reservation utility, cutoff utility and the expected price for type \( j \) store, respectively.\(^5\) Our Lemma 1 shows that the expected net consumer surplus for searching in the market is closely related to \( w^f = \widetilde{c}^j - \widetilde{p}^j \). Denote the buying probability in type \( j \) store as \( b^j = \int_{\epsilon_j}^1 dF_j^j (\epsilon) \) for \( j = c, f \).

**Lemma 1.** The expected net consumer surplus for searching among stores with fixed wage and those with commissions are \( U^f = w^f \) and \( U^c = \frac{\alpha}{\beta} \left( \frac{1}{\beta} - 1 \right) \int_{\epsilon^c}^\infty \epsilon dF^c (\epsilon) + \frac{\epsilon}{w^c} \), respectively.

**Proof.** 1) The expected net consumer surplus in a fixed wage store is

\[
U^f = \left[ \int_{\epsilon^f}^1 (\epsilon - \widetilde{p}^f) dF^f (\epsilon) - s \right] + (1 - b^f) \left[ \int_{\epsilon^f}^1 (\epsilon - \widetilde{p}^f) dF^f (\epsilon) - s \right] + ...
\]

\[
= \int_{\epsilon^f}^1 (\epsilon - \widetilde{p}^f) dF^f (\epsilon) - s \\
= w^f
\]

where the last equality uses the search equilibrium for fixed wage stores,

\[
\int_{\epsilon^f}^1 [\epsilon - \widetilde{p}^f - w^f] dF^f (\epsilon) = s
\]

2) The expected net consumer surplus in a commission-based store is

\[
U^c = \alpha \int_{\epsilon^c}^\infty \left( \frac{\epsilon}{\beta} - \widetilde{p}^c \right) dF^c (\epsilon) + (1 - \alpha) \int_{\epsilon^c}^\infty (\epsilon - \widetilde{p}^c) dF^c (\epsilon) - s
\]

\[
+ (1 - b^c) \alpha \int_{\epsilon^c}^\infty \left( \frac{\epsilon}{\beta} - \widetilde{p}^c \right) dF^c (\epsilon) + (1 - \alpha) \int_{\epsilon^c}^\infty (\epsilon - \widetilde{p}^c) dF^c (\epsilon) - s \]

\[
= \alpha \int_{\epsilon^c}^\infty \left( \frac{\epsilon}{\beta} - \widetilde{p}^c \right) dF^c (\epsilon) + (1 - \alpha) \int_{\epsilon^c}^\infty (\epsilon - \widetilde{p}^c) dF^c (\epsilon) - s
\]

Using the search equilibrium in commission base stores

\(^5\)We use superscript to indicate the type of the store - commission and fixed wage based, which is represented by \( c \) and \( f \), respectively.
\[
\int_{\tilde{x}^{c}}^{\pi} \left[ \varepsilon - \tilde{\varepsilon}^{c} - w^{c} \right] dF^{c} (\varepsilon) = s.
\]

The expected net surplus can be rewritten as

\[
U^{c} = \frac{\alpha \int_{\tilde{x}^{c}}^{\pi} \varepsilon \left( \frac{1}{b} - 1 \right) dF^{c} (\varepsilon) + \int_{\tilde{x}^{c}}^{\pi} w^{c} dF^{c} (\varepsilon)}{b_{2}}
\]

\[
= \alpha \left( \frac{1}{b} - 1 \right) \left[ \frac{1}{b^{c}} \int_{\tilde{x}^{c}}^{\pi} \varepsilon dF^{c} (\varepsilon) \right] + w^{c}
\]

\[
\]

Comparing the expected net surplus for consumers in visiting the two types of stores, there is an additional term for that in commission-based stores to account for the possibility of consumers being misled to pay a higher price. A sophisticated consumer rationally expects that sales agents in commission-based stores have higher incentives to involve in the persuasive activities. She would then discount the perceived utility in commission-based stores accordingly. The discounted value could be decomposed into three parts: (i) \( \alpha \) measures a consumer’s impressionability level. The higher value of \( \alpha \) indicates that the consumer is more easily persuaded to follow the recommendation from a sales agent. Expecting themselves to be subject to severer influence of persuasive efforts, the consumer with higher \( \alpha \) would discount the perceived product value by a larger amount. (ii) \( \left( \frac{1}{b} - 1 \right) \) could be considered as a measure of the effectiveness of the sales agents in enhancing consumers’ willingness to pay. The lower the value for \( \left( \frac{1}{b} - 1 \right) \) indicates that sales agents advice is more effective to increase the perceived product value. Considering the possibility that the expanded value might come from persuasion, a sophisticated consumer would then have a larger discount to the perceived value as \( \left( \frac{1}{b} - 1 \right) \) becomes smaller. (iii) \( \left[ \frac{1}{b_{2}} \int_{\tilde{x}^{c}}^{\pi} \varepsilon dF^{c} (\varepsilon) \right] \) is the conditional expectation for product value from a store with commissions. The consumers use the conditional expected product value as a base for the discounting process.
4 Store Optimal Price

Given consumers’ search behavior is responsive to expected market price only, the expected demand for each store is independent of their own price decision. The objective of a type $j$ store is to maximize the per consumer profit.

$$\max_{p^j} \pi^j = (p^j - c^j) [1 - F^j (p^j + \underline{w}^j)]$$

Assume $f^j$ is strictly logconcave, a unique profit maximizer $p^{j*}$ for each type $j$ store is determined by

$$p^{j*} - c^j = \frac{1 - F^j (p^{j*} + \underline{w}^j)}{f^j (p^{j*} + \underline{w}^j)}$$

With the expected optimal price, the expected profit for each type of stores could be obtained as it is in Yang (2013). This is summarized in our Lemma 2 below.

**Lemma 2.** For $j = c, f$, denote $m^j$ and $n^j$ be the amount of type $j$ stores and consumers, respectively. The optimal profit for a type $j$ store is

$$\Pi^{j*} = \frac{m^j}{n^j} (p^{j*} - c^j)$$

**Proof.** Once inside a store, price $p^j$ and product value $\varepsilon$ are observed. Since a consumer expect to obtain surplus $\underline{w}^j$ by continuing to search in the same type stores, she would buy from the visited store if and only if $\varepsilon^j - p^j \geq \underline{w}^j$. This implies that the buying probability from store $j$ to charge price $p^j$ is $b^j = 1 - F^j (\underline{w}^j + p^j)$.

With the assumption that consumers random search among the same type stores, each type $j$ store shares $\frac{m^j}{n^j}$ of the first visit consumers. After the first round, it is expected that $\frac{m^j}{n^j} F^j (\bar{\varepsilon}^j)$ of the consumers will not buy the product and continue to search randomly within the same type of stores. The process continue until all the consumers having bought a product from a store. Thus, the total expected demand for type $j$ stores is
\[
\frac{m^j}{n^j} \left[ 1 - F^j \left( w^j + p^j \right) \right] + \frac{m^j}{n^j} F^j \left( \bar{z} \right) \left[ 1 - F^j \left( w^j + p^j \right) \right] + \ldots \\
= \frac{m^j}{n^j (1 - F^j \left( \bar{z} \right))} \left[ 1 - F^j \left( w^j + p^j \right) \right].
\]

That means the expected profit the stores is

\[
\Pi^j = \frac{m^j}{n^j (1 - F^j \left( \bar{z} \right))} \left[ 1 - F^j \left( w^j + p^j \right) \right] \left( p^j - c^j \right)
\]

At the symmetric equilibrium, we have \( p^j = p^{j*} \) and \( \bar{z} = \bar{w}^{j*} + p^{j*} \). Therefore, the expected profit for type \( j \) store is

\[
\Pi^{j*} = \frac{m^j}{n^j} \left( p^{j*} - c^j \right).
\]

□

The expected profit in each type of stores have intuitive interpretation. Since a consumer always searches randomly within the same type stores and will buy one unit of the product from a store eventually, the same type stores will just share equal amount of the consumers in each segment.

## 5 Consumers’ Search Direction

We first analyze the consumers’ perceived utility and perceived welfare inside different types of stores. After that we take the consumers’ heterogeneous impressionability into consideration to determine the expected amount of consumers in each segment of the market. Under our assumption, \( \alpha \) is the consumer’s belief that the product from a commission-based store is of lower value than the perceived one. Since we assume that all the consumers are persuaded to believe that the product value comes from the same distribution after interacting with the sales agent, the higher \( \alpha \) indicates that the consumer is more impressionable and susceptible to the
effect of persuasions. Thus, it is expected that while the group of the consumers with higher $\alpha$ would prefer to visit a fixed wage store, those with lower $\alpha$ would visit a commission-based store instead. We summarize this market segmentation outcome as our proposition 2. Before that, we first show our Lemma 3 and proposition 1 to understand the changes in perceived social welfare in response to the changes in the sales agents’ commissions.

**Lemma 3.** 1) $w^c$ is strictly decreasing with $c$. 2) $p^{*c}$ is strictly increasing with $c$.

**Proof.** Note that the market equilibrium is determined by

$$\left\{ \begin{array}{ll} \int_{w^c+p^{*c}} \left[ \varepsilon - p^{*c} - w^c \right] dF^c (\varepsilon) = s \\ \frac{1-F^c(p^{*c}+w^c)}{F^c(p^{*c}+w^c)} \\ \end{array} \right.$$

The first equation implies that $w^c + p^{*c}$ is constant for any given distribution $F^c (\varepsilon)$ and search cost $s$. Then the second equation implies that $p^{*c} - c$ is also constant for any given distribution $F^c (\varepsilon)$ and search cost $s$. Thus, when $c$ increase, $p^{*c}$ must increase and $w^c$ must decrease by the same magnitude so as to remain in the market equilibrium.\(\square\)

Lemma 3 shows that stores always would like to increase the price to match the change in $c$, so consumers perceive themselves to be worse off in the commission-based stores whenever there is an increase in $c$. This implies that consumers might visit the commission-based stores only in an environment with sufficiently low commissions. The remaining questions are that whether there are indeed some consumers find it profitable to visit the fixed wage stores for some low value of $c$ and what the welfare implications are whenever some stores choose the fixed wage compensation scheme. We summarize these results in proposition 1 below.

**Proposition 1.** 1) $w^c + \tilde{p}^c$ is always greater than $w^f + \tilde{p}^f$. 2) There exist $\tilde{c}$ such that $w^c$ is greater than $w^f$ for all $c < \tilde{c}$. 3) $\tilde{p}^c - c$ can be greater than or smaller than $\tilde{p}^f$.

**Proof.** 1) The search equilibria for the consumers in the two types of stores are

$$\left\{ \begin{array}{ll} \int_{w^f+\tilde{p}^f}^{1} \left[ \varepsilon - \tilde{p}^f - w^f \right] dF^f (\varepsilon) = s \\ \int_{w^c+\tilde{p}^c}^{\tilde{c}} \left[ \varepsilon - \tilde{p}^c - w^c \right] dF^c (\varepsilon) = s \\ \end{array} \right.$$

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It is easy to see that $F^c(\varepsilon) \leq F^f(\varepsilon)$ for all $\varepsilon$ with strict inequality holding for some $\varepsilon$ and $\int_{\varepsilon'}^{\varepsilon} [\varepsilon - \varepsilon'] dF(\varepsilon)$ is strictly decreasing with $\varepsilon'$. Thus, it must be that $w^f + \tilde{p}^f < w^c + \tilde{p}^c$ for the holding of the search equilibria.

2) Based on our assumption on the consumers’ perceived product value insider the stores, the equilibrium conditions for two segments of the market are, respectively

$$
\begin{align*}
\int_{\tilde{p}^c}^{\tilde{p}^f} \left[ \bar{\pi} \varepsilon - \tilde{p}^c - w^c \right] dF^f(\varepsilon) &= s \\
\tilde{p}^f - c &= \bar{\pi} \frac{1-F^f(\tilde{p}^f+w^c)}{f^f(\tilde{p}^f+w^c)}
\end{align*}
$$

and

$$
\begin{align*}
\int_{w^f+\tilde{p}^f}^{\tilde{p}^f} \left[ \varepsilon - \tilde{p}^f - w^f \right] dF^f(\varepsilon) &= s \\
\tilde{p}^f &= \frac{1-F^f(\tilde{p}^f+w^f)}{f^f(\tilde{p}^f+w^f)}
\end{align*}
$$

Since $\int_{\varepsilon'}^{\varepsilon} [\varepsilon - \varepsilon'] dF(\varepsilon)$ is strictly decreasing with $\varepsilon'$ and $\bar{\pi} > 1$, it must be that $\frac{1}{\bar{\pi}} (w^c + \tilde{p}^c) > w^f + \tilde{p}^f$ for the holding of the search equilibria. By the strict logconcave assumption on $f$, it must be that $\frac{1-\bar{\pi}F^f(\tilde{p}^f+w^c)}{f^f(\tilde{p}^f+w^c)} < \frac{1-\bar{\pi}F^f(w^f+\tilde{p}^f)}{f^f(w^f+\tilde{p}^f)}$. For $c = 0$, the inequality implies that $\tilde{p}^c = \bar{\pi} \frac{1-\bar{\pi}F^f(\tilde{p}^f+w^c)}{f^f(\tilde{p}^f+w^c)} < \bar{\pi} \tilde{p}^f$. That means the inequality $w^c > \bar{\pi}w^f + \bar{\pi}\tilde{p}^f - \tilde{p}^c > w^f$ must hold at $c = 0$. Additionally, our Lemma 3 shows that $w^c$ is strictly decreasing with $c$ without bound. Thus, there exist a critical value $\bar{c}$ such that $w^c > w^f$ for all $c < \bar{c}$.

3) By Lemma 3, $\tilde{p}^c - c$ is constant for different $c$. So it is sufficient to show the relationship at $c = 0$. We show before that $\frac{1-\bar{\pi}F^f(\tilde{p}^f+w^c)}{f^f(\tilde{p}^f+w^c)} < \frac{1-\bar{\pi}F^f(w^f+\tilde{p}^f)}{f^f(w^f+\tilde{p}^f)}$. Without further assumption on the function $\frac{1-F^f(\varepsilon)}{f^f(\varepsilon)}$, it is impossible to know the relative magnitude between $\bar{\pi} \frac{1-F^f(\tilde{p}^f+w^c)}{f^f(\tilde{p}^f+w^c)}$ and $\frac{1-F^f(w^f+\tilde{p}^f)}{f^f(w^f+\tilde{p}^f)}$. $\square$

Given the assumption that there is unit demand for all the consumers, the price paid is only a transfer from consumers to stores. This implies that the expected social welfare of the economy is completely determined by the amount of the consumers in
the market. We then discuss the social welfare in terms of per consumer one, which is the expected net consumer surplus plus the product price, $w + \bar{p}$. Proposition 1 shows that the impressionability of consumers and the sales agents’ persuasion would increase the perceived product value in the commission-based stores. This leads to an increase in perceived per consumer social welfare. But the distribution of the social welfare would be determined by the market competition, induced by the consumers’ search behavior.

There are two counteracting forces that jointly determine the expected consumer surplus. Firstly, the increase in perceived product value from the commission-based stores would induce consumers to search more actively, which increases the stores’ incentive to charge a lower price. Secondly, the increase in marginal cost, due to the introduction of commissions, would push up the commission-based stores’ price. For a market with low commissions, the competition enhancing effect dominates and consumers perceived themselves to be better off in the commission wage stores. Moreover, it does not necessarily for stores, because the server competition might drives the market price to a significantly lower level.

To continue our analysis, our proposition 2 shows that the less impressionable consumers will prefer to visit the commission-based stores for sufficient low commissions, generating market segmentation based on the impressionability level.

**Proposition 2.** For sufficient low $c$, there is a unique cutoff $\tilde{\alpha}$, such that all the consumer with $\alpha \leq \tilde{\alpha}$ will search among the stores with commissions and those with $\alpha > \tilde{\alpha}$ will search among the stores with fixed wage.

**Proof.** Recall that the consumer’s expected utility from two types of stores are

$$U^f = w^f \quad \text{and} \quad U^c = \alpha \left( \frac{1}{\bar{v}} - 1 \right) \left[ \frac{1}{\bar{v}^c} \int_{\mathbb{R}} \varepsilon dF^c (\varepsilon) \right] + w^c. $$

Note that both $w^f$ and $w^c$ are independent of $\alpha$. Furthermore, proposition 1 shows that $U^c > U^f$ for sufficient small $c$ with $\alpha = 0$. Given that $\bar{v} > 1$, it must be that $U^c$ is strictly decreasing in $\alpha$. Thus, there is a unique $\tilde{\alpha}$, such that $U^c \geq U^f$ for all $\alpha \leq \tilde{\alpha}$ and $U^c < U^f$ for all $\alpha > \tilde{\alpha}. \square$
6 Store Optimal Compensation Scheme

With the expected amount of consumers visiting the two types of stores, we could determine the relative mass of the stores employing commissions to that employing fixed wage as follows.

Proposition 3. The ratio of stores with commissions to those with fixed wage is

\[
\frac{n_c}{n_f} = \frac{G(\bar{\alpha}) p^c}{(1 - G(\bar{\alpha})) p^f}.
\]

Proof. Combining Lemma 2 with proposition 2, the expected profit from a store with fixed wage and that with commissions are, respectively

\[
\Pi^{f^*} = \frac{m_f}{n_f} p^f = \frac{m (1 - G(\bar{\alpha}))}{n_f} p^f
\]

and

\[
\Pi^{c^*} = \frac{m_c}{n_c} (p^c - c) = \frac{mG(\bar{\alpha})}{n_c} (p^c - c).
\]

Since stores are free to choose to their own compensation scheme, the two types of the stores will earn the same profit at the market equilibrium. Thus, we have the following relationship for \( n_c \) and \( n_f \).

\[
\frac{m (1 - G(\bar{\alpha}))}{n_f} p^f = \frac{mG(\bar{\alpha})}{n_c} (p^c - c)
\]

\[
\Leftrightarrow \frac{n_c}{n_f} = \frac{G(\bar{\alpha}) p^c}{(1 - G(\bar{\alpha})) p^f}
\]

□

Since \( p^c \) and \( p^f \) only depend on the perceived distribution of the product value in the stores and the search cost, the expected markets prices are independent of the
determinant of $\tilde{\alpha}$. The ratio of the commission-based stores to that fixed wage one depends on the distribution of $\alpha$ only. Proposition 3 indicates that more stores would choose to pay sales agents by commissions as the consumers perceive themselves to be less easily affected by sales agents. Intuitively, as the impressionability level of consumers decreases, there would be less discount on the perceived product value from the commission base stores.

Now if there are some "naive" consumers who believes that sales agents always make the truthful advice on the buying decision, they would not discount on the perceived product value and behave in the same way as the consumers with low level of impressionability. Our model then implies that the increase in amount of "naive" consumers would increase the amount of commission-based stores without affecting the expected market prices. Thus, introducing some "naivete" consumers would only affect the mass of commission-based stores but not the welfare levels of other consumers because of the assumption on perfectly competitive market. This is in contrasting with the results in Gabaix and Laibson (2006) and Armstrong and Chen (2008), who show that "naive" consumers could make the sophisticated consumers better off and worse off, respectively. The reason for the difference result is that all consumers in our model are persuaded to behave in the same way once inside a store. As a result, there is no subsidy to the sophisticated consumers from the "naive" consumers as in Gabaix and Laibson (2006) or no substitution between the products as in Armstrong and Chen (2008).

7 Uniformly Distributed Product with Linear Demand

In this section, we would like to impose additional structures to the model by assuming uniform distribution for the product value to derive additional analytical result. Under the added structure, the product value, $c^f$, from a fixed wage store follow uniform distribution in the interval $[0, 1]$. This implies that the product value, $c^c$, from a commission-based store follows uniform distribution in an expanded interval $[0, \bar{v}]$. Under the the added structure, the market equilibria in the two segments of market are, respectively
\[
\begin{align*}
\tilde{\varepsilon}^f &= 1 - \sqrt{2s} \\
\gamma^f &= 1 - 2\sqrt{2s} \\
p^f &= \sqrt{2s} \\
\pi^f &= \frac{m_s(1-G(\alpha))}{n_s}\sqrt{2s}
\end{align*}
\]

and

\[
\begin{align*}
\tilde{\varepsilon}^c &= \bar{v} - \sqrt{2\bar{v}s} \\
\gamma^c &= \bar{v} - c - 2\sqrt{2\bar{v}s} \\
p^c &= c + \sqrt{2\bar{v}s} \\
\pi^c &= \frac{m(1-G(\bar{\alpha}))}{\bar{v}}\sqrt{2\bar{v}s}
\end{align*}
\]

The expected net consumer surplus from the fixed wage and the commission-based stores are

\[
\begin{align*}
U^f &= 1 - 2\sqrt{2s} \\
U^c &= \frac{\bar{\alpha}}{2} \left(1 - \frac{1}{\bar{v}}\right) \left(2\bar{v} - \sqrt{2\bar{v}s}\right) + \bar{v} - c - 2\sqrt{2\bar{v}s}
\end{align*}
\]

where \(\bar{\alpha}\) is determined by \(U^c = U^f\) as follows.

\[
\frac{\bar{\alpha}}{2} \left(1 - \frac{1}{\bar{v}}\right) \left(\bar{v} + \tilde{\varepsilon}_2\right) + \bar{v} - c - 2\sqrt{2\bar{v}s} = 1 - 2\sqrt{2s}
\]

\[
\bar{\alpha} = \frac{\bar{v} - c - 2\sqrt{2\bar{v}s}}{\frac{1}{2} \left(1 - \frac{1}{\bar{v}}\right) \left(2\bar{v} - \sqrt{2\bar{v}s}\right)}
\]

**Proposition 4.** 1) There is a critical value \(\bar{v}^c\) such that \(\frac{\partial \alpha}{\partial s} > 0\) for all \(\bar{v} < \bar{v}^c\) and \(\frac{\partial \alpha}{\partial s} < 0\) for all \(\bar{v} > \bar{v}^c\). 2) \(\frac{\partial \alpha}{\partial \bar{v}} > 0\) for all \(\bar{v} > 1\).

**Proof.** 1) Recall that \(\bar{\alpha}\) is determined by

\[
\bar{\alpha} = \frac{\bar{v} - c - 2\sqrt{2\bar{v}s}}{\frac{1}{2} \left(1 - \frac{1}{\bar{v}}\right) \left(2\bar{v} - \sqrt{2\bar{v}s}\right)}
\]
Differentiate both sides with respect to $s$.

\[
\frac{d\tilde{\alpha}}{ds} = \frac{(2\bar{\nu} - \sqrt{2\bar{\nu}s}) \left( \sqrt{\frac{2}{s}} - \sqrt{\frac{2\bar{\nu}}{s}} \right) + \frac{1}{2} \left[ (\bar{\nu} - c - 2\sqrt{2\bar{\nu}s}) - (1 - 2\sqrt{2s}) \right] \sqrt{\frac{2s}{s}}}{\frac{1}{2} \left( \frac{1}{\bar{\nu}} - 1 \right) (2\bar{\nu} - \sqrt{2\bar{\nu}s})^2}
\]

\[
\frac{d\tilde{\alpha}}{ds} = \frac{(2\bar{\nu} - \sqrt{2\bar{\nu}s}) \sqrt{\frac{2}{s}} - \sqrt{\frac{2\bar{\nu}}{s}} \left( \frac{3}{2} \bar{\nu} + \frac{1}{2} - \sqrt{2s} + \frac{1}{2} c - \sqrt{2\bar{\nu}s} \right)}{\frac{1}{2} \left( \frac{1}{\bar{\nu}} - 1 \right) (2\bar{\nu} - \sqrt{2\bar{\nu}s})^2}
\]

\[
\frac{d\tilde{\alpha}}{ds} = \frac{\sqrt{\frac{2}{s}} \sqrt{\bar{\nu}} (2\sqrt{\bar{\nu}} - \frac{3}{2} \bar{\nu} - \frac{1}{2} - \frac{1}{2} c + \sqrt{2s\bar{\nu}})}{\frac{1}{2} \left( \frac{1}{\bar{\nu}} - 1 \right) (2\bar{\nu} - \sqrt{2\bar{\nu}s})^2}
\]

Note that the sign of $\frac{d\tilde{\alpha}}{ds}$ is completely determined by $2\sqrt{\bar{\nu}} - \frac{3}{2} \bar{\nu} - \frac{1}{2} - \frac{1}{2} c + \sqrt{2s\bar{\nu}}$. Denote $Y = 2\sqrt{\bar{\nu}} - \frac{3}{2} \bar{\nu} - \frac{1}{2} - \frac{1}{2} c + \sqrt{2s\bar{\nu}}$. We will show that $Y$ is positive for sufficiently small $\bar{\nu}$ and is negative for sufficiently large $\bar{\nu}$.

We first show that $Y$ is strictly decreasing in $\bar{\nu}$.

\[
\frac{\partial Y}{\partial \bar{\nu}} = \frac{1}{\sqrt{\bar{\nu}}} - \frac{3}{2} + \frac{\sqrt{2s}}{2\sqrt{\bar{\nu}}}
\]

\[
= \frac{1}{2\sqrt{\bar{\nu}}} \left( 2 - 3\sqrt{\bar{\nu}} + \sqrt{2s} \right)
\]

\[
= -2 \left( \sqrt{\bar{\nu}} - 1 \right) - \left( \sqrt{\bar{\nu}} - \sqrt{2s} \right).
\]

Since $\bar{\nu} > 1$, it must be that $\sqrt{\bar{\nu}} - 1 > 0$. Furthermore, $w^f \geq 0$ must hold for the existence of search market in fixed wage stores. Thus, the inequality $s \leq \frac{1}{8}$ holds, which implies that $\sqrt{\bar{\nu}} - \sqrt{2s} > 0$. So it must be that $\frac{\partial Y}{\partial \bar{\nu}} < 0$. In addition, by calculation the limit of $Y$ and assuming sufficiently small $c$, $Y$ is positive for sufficient small $\bar{\nu}$ and is negative for sufficient large $\bar{\nu}$. There exist a unique $\bar{\nu}^c$ such that $Y$ is positive for all $\bar{\nu} < \bar{\nu}^c$ and $Y$ is negative for all $\bar{\nu} > \bar{\nu}^c$. This implies that
\[
\frac{d\tilde{\alpha}}{ds} > 0 \text{ for all } \overline{v} < \overline{v}^c \\
\frac{d\tilde{\alpha}}{ds} < 0 \text{ for all } \overline{v} > \overline{v}^c
\]

2) Next, differentiate \( \tilde{\alpha} \) with respect to \( \overline{v} \).

\[
\frac{d\tilde{\alpha}}{d\overline{v}} = \frac{2 \left( 1 - \frac{1}{v_j} \right) \left( 2\overline{v} - \sqrt{2\overline{v} s} \right) \left( 1 - \sqrt{\frac{2s}{\overline{v}}} \right) + 2 \left[ (\overline{v} - c - 2\sqrt{2\overline{v} s}) - (1 - 2\sqrt{2s}) \right] \left[ \frac{1}{\overline{v}} \left( 2\overline{v} - \sqrt{2\overline{v} s} \right) + (1 - \frac{1}{\overline{v}}) \left( 2 - 2\sqrt{\frac{2s}{\overline{v}}} \right) \right]}{(1 - \frac{1}{\overline{v}})^2 \left( 2\overline{v} - \sqrt{2\overline{v} s} \right)^2}
\]

Note that each term in \( \frac{d\tilde{\alpha}}{d\overline{v}} \) is positive for sufficiently small \( c \), so \( \frac{d\tilde{\alpha}}{d\overline{v}} \) must be greater than 0. Thus, the proportion of the stores choosing commissions is increasing with the effectiveness of advice. \( \square \)

Our result indicates that the response of stores to the change in search cost depends on the effectiveness of the sales agents to improve willingness to pay. The decrease in search cost would induce more stores to compensate their sales agents by commissions when sales agents’ advice is sufficiently effective, but the reverse is true when the advice is sufficiently ineffective. Intuitively, when the advice from sales agents has been very effective, the consumers’ perceived product value is high as well. When there is a reduction in search cost, the market price is driven down by a large amount because of the higher expected benefit by continuing to search. This means the consumers expect to enjoy a larger increase in surplus from the commission-based stores. Thus, the commission-based stores will become even more attractive to the consumers upon the reduction of search cost. In contrast, when the sales agents’ advice is not very effective, the perceived product value in the fixed wage stores and the commission-based one are in a comparable level, so the perceived consumer surplus in visiting the two types of stores is also in a similar level. Thus, more consumers would like to visit fixed wage stores to avoid the possible reduction in utility in case they do not like the product. In addition, it is always the case that the increase in effectiveness of advice leads to an increase in number of the commission-based stores. The effects of the increase in perceived product value from commission-based stores always dominates the discount on the product value from consumers.
8 Social Welfare

In this section, we analyze the social welfare of the economy under both the market equilibrium and the social optimal one. We will argue that it might be social welfare enhancing to encourage more consumers to visit the fixed wage stores.

**Proposition 5.** With general assumption on consumers’ willingness to pay, the mass of stores choosing commission-based in the market equilibrium could be higher or lower than the social optimal one.

**Proof.** The expected social welfare per consumer under fixed wage and commission-based stores are

\[ W^f = w^f + p^f \]

and

\[ W^c = \frac{\alpha}{b^c} \left( \frac{1}{\bar{v}} - 1 \right) \int_{\varepsilon_e}^{\bar{\varepsilon}} \varepsilon dF^c(\varepsilon) + w^c + p^{c*} - c. \]

Under the social optimal, the threshold consumer, \( \tilde{\alpha}' \), is determined by \( W^f = W^c \), which means

\[ w^f + p^{f*} = \frac{\alpha}{b^c} \left( \frac{1}{\bar{v}} - 1 \right) \int_{\varepsilon_e}^{\bar{\varepsilon}} \varepsilon dF^c(\varepsilon) + w^c + p^{c*} - c \]

Under the market equilibrium, the threshold consumer, \( \tilde{\alpha} \), is determined by

\[ w^f = \frac{\alpha}{b^c} \left( \frac{1}{\bar{v}} - 1 \right) \int_{\varepsilon_e}^{\bar{\varepsilon}} \varepsilon dF^c(\varepsilon) + w^c \]

Comparing the two conditions, the relative magnitude between \( \tilde{\alpha}' \) and \( \tilde{\alpha} \) is govern by the relative magnitude between \( p^{c*} - c \) and \( \tilde{p} \). If \( p^{c*} - c \) is greater than \( \tilde{p} \), the following inequality is true for \( \alpha = \tilde{\alpha} \).
\[ w^f + p^{f*} < \frac{\alpha}{b^c} \left( \frac{1}{\overline{v}} - 1 \right) \int_{\underline{v}}^{\overline{v}} \varepsilon dF^c (\varepsilon) + w^c + p^{c*} - c. \]

As a result, the movement of consumer \( \tilde{\alpha} \) to commission-based stores improve the social welfare, so it must be that \( \tilde{\alpha}' \geq \tilde{\alpha} \) whenever \( \tilde{p}_2 - c \geq \tilde{p}_1 \). This combines with proposition 3 indicates that there are larger amount of commission-based stores in the social optimal comparing with that in competitive equilibrium. Similarly, the reverse holds whenever \( \tilde{p}_2 - c < \tilde{p}_1 \).

\( \Box \)

Proposition 5 indicates that it might be that there are too many commission-based stores under the competitive equilibrium outcomes. This would happen when the introducing of sales agents’ effort induces excessive consumers’ search forcing down market price and expected firms’ profits.

To further illustrate the discrepancy between market equilibrium and social optimal, we assume uniform distributed consumers’ willingness to pay so as to obtain explicit expressions for the threshold consumer. The threshold consumer \( \tilde{\alpha} \) in the market equilibrium is determined by \( U^c = U^f \), which is

\[ \tilde{\alpha} = \frac{1}{2} \left( \frac{1}{\overline{v}} - 1 \right) (\overline{v} + w^c) + \overline{v} - c - 2\sqrt{2\overline{v}s} = 1 - 2\sqrt{2s} \]

\[ \tilde{\alpha} = \frac{2 (\overline{v} - c - 2\sqrt{2\overline{v}s}) - 2 (1 - 2\sqrt{2s})}{(1 - \frac{1}{\overline{v}}) (2\overline{v} - \sqrt{2\overline{v}s})} \]

Additionally, the critical consumer \( \tilde{\alpha}' \) in the social optimal is determined by \( W^c = W^f \), which is

\[ \alpha \left( \frac{1}{\overline{v}} - 1 \right) \frac{(\overline{v} + w^c)}{2} + \overline{v} - c - \sqrt{2\overline{v}s} = 1 - \sqrt{2s} \]

\[ \tilde{\alpha}' = \frac{2 (\overline{v} - c - \sqrt{2\overline{v}s}) - 2 (1 - \sqrt{2s})}{(1 - \frac{1}{\overline{v}}) (2\overline{v} - \sqrt{2\overline{v}s})} \]

Combining the two formulas, we have
\[ \tilde{\alpha} - \tilde{\alpha} = \frac{2\sqrt{2\pi s}}{(1 - \frac{1}{n})(2\bar{v} - \sqrt{2\pi s})} > 0 \]

Thus, there are too little consumers visiting the commission-based stores under market equilibrium with uniform distributed consumers’ willingness to pay. Combining with the result in proposition 3, we then have the conclusion that there are insufficient amount of commission-based stores in market equilibrium comparing with the social optimal one under the assumption of uniform distribution.

9 Concluding Remarks

In this paper, we develop a search model to analyze the impact of sales agent-customers interaction to the compensation scheme chosen by the stores. We show that the using of commission-based compensation scheme for stores is due to the existence of the less impressionable consumers, who discount the perceived product value by a relatively small amount. Our results shows that stores post different compensation scheme to segment the market, in which the less impressionable consumers visit commission-based stores and the more impressionable one visit fixed wage one. As the consumers become more impressionable or the sales agents’ advice becomes less effective to increase utility, more stores would like to choose the fixed wage compensation scheme. Nevertheless, the reduction in search cost might decrease or increase the commission-based stores depending on the effectiveness of the sales agents’ advice. This is consistent with the recent observation under the wide usage of the Internet. Additionally, we show that there might be too many to too little fixed wage stores in the competitive equilibrium comparing with the social optimal. This illustrates that it might be social welfare improving by encouraging more consumers to visit the fixed wage stores. Throughout the paper, we use some simplification assumptions so as to convey the main message in a clear way. In the remaining of this section, we will argue that the market segmentation effect remains in a more general model by discussing some possible extensions.

Firstly, we assume that there are only two possible effort levels and the sales agents receiving commissions are required to make the high effort levels. Now suppose the effort levels, \( e \), is a continuous variable chosen by the sales agent with cost function \( d(e) \) and expands utility by \( \bar{v}(e) \). When stores announce that the commis-
sions paying schedule $c (e)$, the expected net benefits for a sales agent by making efforts $e$ is $B (e) = c (e) \int_{\varepsilon(e)}^{\pi(e)} dF^c (\varepsilon) - d (e)$. The sales agent will choose the optimal effort level, $e^*$, determined by to maximize $B (e)$. Note that the optimal effort level chosen by the sales agents is independent of the individual store’s pricing decision. As long as the optimal effort level is determined, we could conduct the same analysis as the previous section to obtain the market segmentation results by posting different sales agents compensation scheme. Moreover, it becomes much more difficult to obtain analytical and comparative static results.

Secondly, allowing free entry of stores could have the same qualitative results as it is in Yang (2013). Suppose the entry cost for each store is $k$. With free entry, each stores are gaining 0 profit at the equilibrium. The additional equation for the equilibrium is $\Pi^f = \Pi^c = k$, which means

$$\frac{m (1 - G (\tilde{\alpha}))}{n^f} p^f = \frac{m G (\tilde{\alpha})}{n^c} (p^c - c) = k$$

This equation would pin down the number of the fixed wage store, $n^f$, and that of commission-based stores, $n^c$. The only difference is that both $n^f$ and $n^c$ could increase with the free entry assumption. Moreover, the ration of $\frac{n^c}{n^f}$ remains the same as our previous analysis.

Thirdly, we assume that the sales agents’ effort affect all consumers in the same way. As a result, the store’s demand is invariant with the composition of the consumers in the store. This implies that the distribution of the consumers’ ability to resist the effect of persuasion does not affect the optimal store prices. One way to extend the model is to introduce a new dimension of consumer heterogeneity, $t \in [0, 1]$, which represents the suitability of the product. When the suitability of the product is only observable to sales agents, the search equilibrium and the optimal store price could be modified as

$$\int_0^1 \int_{\frac{w^c + p^c}{t}}^{\frac{w^c + p^c}{t + 1}} [t \varepsilon - \tilde{p}_t - w^c] dF^c (\varepsilon) dF_t (t) = s.$$

and
\[ p^c_t - c = t \frac{1 - F^c \left( \frac{p^c_t + w_c}{t} \right)}{f^c \left( \frac{p^c_t + w_c}{t} \right)}. \]

Now suppose that consumers have more information about the suitability of the products, the distribution function \( F^c_t(t) \) will shift to the right. So the stores could charge for a higher price for each type of the consumers. Thus, it is possible that the increase in information available to the consumers about their own type to make the originally informed consumers worse off. Moreover, the complete comparative static analysis is complicated under this general assumption. We leave this kind of analysis for future research.

References


