Consumer Protection in Economies with Limited Attention*

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October 4, 2024

Abstract

We investigate the effects of consumer-protection regulations limiting post-purchase harm when there are many markets and consumers have limited attention to examine prices or product features. Such regulation lowers the attention necessary for valuable purchases, which can allow a consumer to purchase in more markets, or serve to induce competition. The first benefit is most important when few markets are regulated, while the second emerges when regulatory scope is sufficiently broad to create "spare" — i.e., in equilibrium unused — attention. Because little spare attention can enforce competition in many markets, consumer welfare can be highly non-linear in regulatory scope. The benefits of regulating a market often accrue in other markets, and there is a sense in which overly tight regulation outperforms overly lax regulation. Broad consumer protection can help the economy reach productive efficiency, and when this is achieved less regulation may suffice.

Keywords: consumer protection, regulation, competition, participation, limited attention

*We thank Paul Belleflamme, Andreas Grunewald, Heiko Karle, Jens Prüfer, Patrick Rey, Anne-Lise Sibony, and seminar and conference audiences for comments. Heidhues and Kőszegi thank the European Research Council for financial support under Grant #788918. Heidhues thanks the German Science Foundation (DFG) for financial support under project number 462020252. Funded by the Deutsche Forschungsgemeinschaft (DFG) in the framework of the German Excellence Strategy-EXC2126/1-390838866.

1 Introduction

> "Consumers rightly feel ripped off, let down and frustrated. They should not have to be constantly 'on guard' or spend hours negotiating to get a good deal. This erodes people's trust in markets ..." (Competition & Markets Authority, 2018, page 5)

Researchers and policymakers have identified roles for consumer-protection regulation that arise because consumers have limited attention for understanding purchase options. For instance, since comprehending all contracts we consider signing is beyond our capacity, regulation banning provisions that most consumers would not want can help in two ways. First, it can lower the adverse selection or distrust created by consumers' inability to check all terms, expanding market activity. Second, it can simplify the comparison of alternatives, facilitating competition.[1] Existing theories, however, make these arguments in a single-market framework — while both consumers and regulators face many interconnected decisions across markets. Consumers must decide which contracts to pay attention to, and regulators often evaluate specific interventions in the context of broader regulatory principles.

In this paper, we study the effects of consumer-protection regulation on outcomes and welfare when there are many valuable and complex products sold in different markets, and consumers have limited attention to examine product features. Our analysis yields several novel insights. First, the benefits of regulating a market often accrue in other markets, so that regulation can be beneficial even if it is not binding in equilibrium and does not change prices and volume in the regulated market. Second, when the social planner regulates only a few markets, the main benefit of regulating an additional market is often an increase in participation. Third, in contrast, when regulation reaches a sufficiently broad scope, additional regulation can greatly increase competition. As a result, consumer welfare can be highly non-linear in regulatory scope. Fourth, overly tight regulation often outperforms overly lax regulation. Fifth, it is optimal to prioritize intervention in easy-to-regulate markets

[1] See below for references.

at low regulatory scope and in hard-to-regulate markets at high regulatory scope. Sixth, broad consumer protection can help the economy reach productive efficiency, and when this is achieved such broad regulation may become unnecessary.

We begin in Section 2 by laying out and discussing our formal model. We consider an economy that consists of N ex-ante symmetric markets, each of which houses two firms with identical marginal costs selling homogeneous products. Each firm can split the price a consumer must pay for its product into two additive components, a more salient headline price and a less salient additional price. For instance, the total price a consumer pays for credit-card borrowing is determined by the annual fee as well as interest and fees, and the total price a consumer pays for an appliance is determined by the appliance's price as well as its energy efficiency. In J of the markets, consumer-protection regulation is in place: the additional price is capped at a level known to consumers. The cap could correspond, for instance, to limits on interest and fees for credit cards, or to minimum efficiency or safety standards for physical products.

Rational consumers are looking to buy up to one product in each market, and initially observe one randomly chosen headline price per market. Afterward, a consumer can sequentially make $K < N$ further observations, each time either "browsing" the other headline price in a market or "studying" the additional price of a product whose headline price she already checked. As a reduced-form way of incorporating a need to safeguard against very costly post-purchase surprises, we assume that the consumer must study an unregulated product before purchase. We look for perfect Bayesian equilibria in which firms deploy pure strategies, making plausible equilibrium-selection assumptions to rule out no-trade and no-competition traps.

Section 3 identifies how the scope of regulation J influences the number of trades a consumer makes and the prices she pays. When $J = 0$ — i.e., the economy is entirely unregulated — consumers are limited to participating in K markets due to the attention required to purchase within each one. Since they have no attention left to comparison shop,

firms do not compete, and all products are sold at the monopoly price.

Now suppose that the planner introduces regulation in $J < N - K$ markets. We show that in the unique equilibrium outcome, firms in the regulated markets charge the maximum additional price. Consumers can then infer the total price from the headline price, and hence they can buy without studying. This frees up their attention to participate in other markets, so they now participate in $K + J$ markets. But they still use all their attention for entering markets rather than comparison shopping, so firms charge the monopoly price.

Once the scope of regulation reaches $J = N - K$, the consumer has sufficient attention to enter all markets, and the mechanism changes drastically. If one more market is regulated, consumers end up with "spare" — in equilibrium unused — attention, transforming all regulated markets from monopolistic to perfectly competitive. Indeed, if a firm deviates from competitive pricing, its consumers browse and buy from its competitor. Furthermore, if one more market is regulated, consumers are left with two units of spare attention, making unregulated markets competitive too. Now if an unregulated firm deviates from competitive pricing, its consumers browse, study, and buy from its competitor. After this point, more regulation creates more spare attention, but this does not change outcomes.

Several economic implications follow from the above insights. At a broad level, whether regulation increases participation or generates competition is determined endogenously, and depends on the scope of regulation. Relatedly, regulation can have a sharply non-linear effect on consumer welfare. To increase participation in many markets at low scope, a regulator must free up many units of attention. This is because one unit of attention can only be used to participate in one unregulated market. But to increase competition in many markets at the intermediate scope, it is sufficient to free up one or two units of attention. This is because the same attention can be used as a threat to enforce competition in many markets. Finally, the benefits of regulating one market can often be seen in other markets, either through an increase in participation or through an increase in competition. This cross-market externality implies that even if regulation does not increase participation or lower prices in the regulated

market — a common argument against intervention — it could still increase overall welfare.

In Section 4, we extend our model by allowing for various asymmetries between markets or firms. We first assume that in some markets, charging an additional price not only redistributes money from consumers to firms, but also has efficiency implications. Then, non-binding regulation can improve outcomes by lowering firms' incentives to deviate from the efficient additional price, and thereby lowering the amount of attention necessary to deter misbehavior. Furthermore, regulation set at an inefficiently tight level often results in higher consumer welfare than regulation set at an inefficiently lax level. Under overly lax regulation, consumers may use their attention to enforce an efficient additional price, resulting in a non-competitive outcome at little increase in efficiency. The same is not possible under overly tight regulation.

We also consider the possibility that some products are more difficult to study as well as regulate than others. For instance, evaluating the quality and safety of clothing is simpler than deciphering the terms of a mortgage contract; and by the same token, developing and enforcing regulation is easier for the former than for the latter. Such differences raise the natural question of which markets should be regulated. At low scope, the role of regulation is to open up more markets for consumers, which is best served by regulating as many markets as possible. Hence, it is optimal to focus on easy-to-regulate markets. At broad scope, however, the aim of regulation is to ensure competition, which is fully successful if consumers have sufficient spare attention to check out the competitor in any one regulated *or* unregulated market. Since the competitors are most difficult to check out in high-cost unregulated markets, it is optimal to focus regulation on high-cost markets. Indeed, to the extent that developing nations regulate markets, they often focus more on the heavy control of simple products than more developed nations. For instance, simple transparent prices for basic services such as gas or electricity (enforced through state monopolies) are more common in developing nations.

Finally, we allow for cost differences across firms, and study the role of attention and

regulation in weeding out inefficient firms. At low regulatory scope, all firms participate and charge monopoly prices. At intermediate scope, there can be multiple equilibria, one with and one without inefficient firms participating. Intuitively, an inefficient firm wants to participate if and only if the others do, as this ensures that consumers do not have sufficient spare attention to reliably find the efficient firms. Continuing the same logic, at high regulatory scope, there is no equilibrium with inefficient firms participating. Now the consumer has many units of spare attention, so she could find an efficient firm even if all inefficient firms participated. Hence, broad regulation can ensure productive efficiency, and once this is achieved, less regulation may be sufficient. At that point, it is unlikely that inefficient firms coordinate to enter the market.

We conclude in Section 5 with some questions for future research. While our analysis centers on restrictions on products and contracts, many real-life regulations aim to improve disclosure. We argue that our framework can be readily used to study such regulations. In addition, while we have assumed that consumers perfectly understand the regulations in place, in reality learning about and understanding these also requires attention. This suggests that overarching, easy-to-understand regulations are likely to have greater effects, and fine-tuning interventions too much to individual market conditions may be counterproductive.

Related Literature No other work studies consumer protection in a multi-market framework — ingredients critical to all of our main predictions — but several previous contributions relate to ours. In terms of consumer choices, we incorporate the choice between browsing and studying that we have introduced for single-market environments in Heidhues et al. (2021). Our previous paper predicts that regulation generates competition by facilitating browsing, which our multi-market setting both modifies and qualifies. On the one hand, at low regulatory scope the pro-competitive effect of regulation is non-existent or less important than its market-expansion effect. On the other hand, in some situations the pro-competitive effect can apply to many markets simultaneously, so it can be very powerful.

In terms of modeling the economy, we build on the multi-market framework of De Clippel et al. (2014). They suppose that consumers first see the leader's (single-dimensional) price in each market, and can then check a limited number of rivals. Their main result establishes that market leaders effectively compete for consumer *inattention* across markets. By lowering its price, a leader increases the chance that the consumer ignores its rival.

Although typically not studied in a framework with limited attention, the two main effects of consumer protection driving our results, expanding markets and inducing competition, both have close precursors in the literature. Related to the former, researchers argue that regulation can mitigate adverse selection when consumers cannot ascertain some dimensions of quality or lack trust in sellers (Shavell, 1980, Bar-Gill and Warren, 2008, Christensen et al., 2016). Related to the latter, researchers argue that regulation may make offers more comparable and thereby generate competition (Enthoven, 1993, Piccione and Spiegler, 2012, Grubb, 2015b, Heidhues et al., 2021, Johnen and Leung, 2023). But because they focus on single-market settings, these papers do not make any of our main predictions, such as those on the relative importance of the two effects at different scopes of regulation or the potentially non-linear benefit of regulation.[2]

A small literature studies the positive and normative properties of consumer protection when consumers are "fallible" in that they do not necessarily make optimal decisions (Armstrong, 2008, Heidhues and Kőszegi, 2010, Armstrong and Vickers, 2012, Inderst and Ottaviani, 2012, Grubb, 2015a).[3] In developed countries, consumer protection affects almost every economic transaction, often not only mandating transparency, but also significantly restricting what can be traded. Relative to the practical importance of this kind of inter-

[2] Consumer protection is often captured in reduced form as lowering search or transaction costs, thereby benefiting market participation and competition. Since these papers consider neither the choice between studying and browsing nor multi-market settings, they do not imply our results. In fact, received wisdom from the search literature is that price caps *lower* consumers' propensity to comparison shop, decreasing competition and potentially increasing prices (Fershtman and Fishman, 1994, Armstrong et al., 2009).

[3] Schwartzstein and Shleifer (2013) develop a case for regulatory standards when instead courts are fallible in that they make errors in tort litigation cases.

vention, surprisingly little research provides broad theoretical foundations for it.

Our view contrasts with the "nanny-state" concern, a common argument against interventions aimed at improving individuals' decisions. Just like an overprotective nanny can hurt the long-run health of a child by preventing her from learning when to be careful, the argument goes, an overly paternalistic policymaker can hurt consumers by lowering their incentives to protect themselves.[4] While such an outcome is possible in a version of our model with very inefficient regulation, our more important message is the opposite: consumer protection can free up consumer attention to be used for economically valuable activities.

2 A Model of Multi-Market Regulation

2.1 Setup

There are $N \geq 1$ markets, and in each market n, there are two firms n_i, $i \in \{1, 2\}$ selling identical products. A firm operates in only one market, and all firms have the same marginal cost c. Firms simultaneously choose headline prices $f_{n_i} \in \mathbb{R}$ and additional prices $a_{n_i} \in \mathbb{R}$. In $J \leq N$ markets, a_{n_i} is commonly known to be bound by the regulatory cap $\overline{a}$.

A representative consumer first observes one f_{n_i} (and n_i) chosen randomly and with equal probability in each market. She then makes up to $K \geq 1$ other price observations, sequentially choosing either to "browse" the other headline price in a market, or to "study" the additional price of a firm whose headline price she has already observed. Finally, she buys up to two units of one product per market. She cannot buy any product whose headline price she did not observe, or any unregulated product she did not study. She values the first and second units of any product at v_H and v_L, respectively, where $v_H > v_L > c$, and the unique monopoly price is v_L (i.e., $2(v_L - c) > v_H - c$). If she buys product n_i, she pays a

[4] Besides being a regular question in seminars, this argument is commonly made in the popular press (e.g., "The avuncular state", Economist, April 6th, 2006) as well as scholarship in law (Klick and Mitchell, 2006, 2016) and economics (Fershtman and Fishman, 1994, Armstrong et al., 2009).

total price of $f_{n_i} + a_{n_i}$ per unit.

We look for perfect Bayesian equilibria in which firms play pure strategies, making three equilibrium-selection assumptions. First, if a firm deviates, the consumer does not infer anything about other firms' prices. This assumption is in the spirit of sequential equilibrium, and variants of it are often part of the definition of perfect Bayesian equilibrium.[5] Second, the consumer believes that firms with no demand in equilibrium set a total price of v_L. We can think of such a firm as catering to an infinitesimal portion of fully informed consumers who have no other purchase option. This assumption rules out Diamond-paradox-type no-trade traps in which a consumer with leftover attention does not study because she believes that prices are too high, and firms therefore have no incentive to charge lower prices. Third, on the equilibrium path, the consumer achieves her equilibrium level of utility with the lowest possible amount of attention, and then proceeds in the following way. If she has at least one unit of attention left over, she uses a continuation strategy in which in any regulated market she browses the competitor with positive probability. And if she has at least two units of attention left over, she uses a continuation strategy in which in any unregulated market she browses and studies the competitor with positive probability. This rules out Diamond-paradox-type no-competition traps where firms do not compete because the consumer does not comparison shop, even though she has sufficient attention to do so.

2.2 Discussion

Our model starts from the widely accepted premise that many products feature price or contract components that consumers may not fully observe or understand when making purchase decisions. Numerous models in industrial organization starting from Ellison (2005) and Gabaix and Laibson (2006) presume such hidden prices in some form, and researchers

[5] For instance, Fudenberg and Tirole (1991, page 333) include a closely related condition in their definition of perfect Bayesian equilibrium for games with observable actions. They call it the "no signaling what you do not know" condition.

have documented them in a variety of markets.[6] Consumers may, for instance, underestimate the management fees for investment products or out-of-pocket expenses for insurance contracts. Furthermore, a_i can represent not just unexpected payments, but any secondary feature over which a firm and a consumer have conflicting interests. An unsafe product, for instance, lowers the firm's cost and hurts the consumer.

We also posit that the consumer can study the additional price. She may, for instance, read a financial contract, ask around for experiences with a durable good, or negotiate to find out the seller's actual price when the headline price is unserious. Analogously, the cap $\overline{a}$ on the additional price in regulated markets is consistent with regulatory limits on fees for financial products, minimum safety or efficiency standards for physical products, or price-posting regulation for simple retail products.[7]

Following Heidhues et al. (2021), we suppose that the attention consumers can devote to understanding products is limited. Consistent with this notion, research documents that consumers' propensity to search for other, readily available alternatives drops off sharply after investigating a few options (De Los Santos et al., 2012, Consumer Financial Protection Bureau, 2015, Honka and Chintagunta, 2017, Alexandrov and Koulayev, 2018), and there are attentional spillovers across tasks (Altmann et al., 2021, 2024, Archsmith et al., 2023). To illustrate the potential highly non-linear effects of regulation most cleanly, we assume that consumers have the same attentional limit, i.e. the same K.

Our model also makes some technically convenient, but economically less central assumptions. First, consumers cannot buy a product in an unregulated market without studying

[6] See, e.g., Spiegler (2006), Armstrong and Vickers (2012), Grubb (2015a), Bachi and Spiegler (2018) and Gamp and Krähmer (2022) for theoretical contributions, and Choi et al. (2010), Anagol and Kim (2012), Duarte and Hastings (2012), Agarwal et al. (2015, 2016) and Grubb and Osborne (2015) for evidence. Heidhues and Kőszegi (2018) provide a review.

[7] We assume that consumers know the regulation is in place, but—fortunately for those with limited attention—they do not need to be aware of any specifics. In particular, there is no need for consumers to think through or understand the potential sources of ex-post harm or how the social planner goes about limiting it. So long as the consumer trusts the social planner, she does not need to know, for instance, the conceivable list of extra fees for a service or the spectrum of illnesses a food item can carry.

it. A simple microfoundation is that in an unregulated market, the consumer must protect herself from (unbounded) post-purchase surprises by unscrupulous or very inefficient firms. For simplicity, we do not explicitly incorporate such a microfoundation in the model.

Second, our assumptions regarding the consumer's values for two units of a good (v_H and $v_L < v_H$) and the monopoly price (v_L) serve to create a situation in which the consumer values entering a market even if she faces a monopolist. Other assumptions, for instance that consumers are heterogeneous in their valuations, would serve the same purpose.

Third, we have set up our model so that we can demonstrate our insights using pure-strategy equilibria. In our setting with multidimensional pricing strategies and many markets — some regulated, some not — mixed-strategy equilibria appear intractable in general. Nevertheless, based on (restrictive) special cases we have analyzed, our insights continue to hold in mixed-strategy settings. For instance, if even the first K units of attention were costly for some consumers, then a situation with spare attention would never arise, and a perfectly competitive outcome could not be enforced. But with low attention costs, a mixed-strategy equilibrium enforcing low average prices in many markets would still exist, again giving rise to a non-linear benefit from regulation.

3 Regulatory Scope and the Effects of Regulation

3.1 Theorem and Intuition

The main result of the basic model is the following:

Theorem 1. *For any J, all equilibria are equivalent in terms of the number of trades a consumer makes and the prices she pays. Furthermore:*

I. If $J \leq N - K$, then a consumer participates in $J + K$ markets, which include all regulated markets and K unregulated markets. She pays a total price equal to the monopoly price v_L for each product she buys.

II. If $J = N - K + 1$, then a consumer participates in all markets, pays a total price equal to the monopoly price v_L in the unregulated markets, and pays a total price equal to the competitive price c in the regulated markets.

III. If $J \geq N - K + 2$, then a consumer participates in all markets, and pays a total price equal to the competitive price c in all of them.

To appreciate Theorem 1, we describe the comparative statics of outcomes as the scope of regulation, J, widens. This also provides economic intuition for key steps in our proof.

Suppose first that $J = 0$ — the economy is fully unregulated. In order to purchase in a market, a consumer must study in that market. This means that she is limited to participating in $K < N$ markets, with two implications. First, she does not have attentional capacity left for comparison shopping, so all markets are monopolistic. Second, she stays away from some markets in which it would be valuable for her to participate, lowering consumer as well as producer welfare.

Now suppose that a social planner introduces small-scale regulation ($J \leq N - K$). Our proof establishes that as a result, all regulated firms charge an additional price of $\overline{a}$. Hence, a consumer seeing a headline price of $v_L - \overline{a}$ is assured that the total price does not exceed v_L, so she does not need to study to purchase. This frees up attentional capacity for something else. How does the consumer use this extra attention? In our single-market model (Heidhues et al., 2021), she switches to browsing in the same market, generating perfect competition between the firms. Crucially, however, this is not an equilibrium in the multi-market model. In such a candidate equilibrium, the consumer browses even though she can buy from her assigned firm at a competitive price. But she is better off using her attention to enter an additional unregulated market, and obtain positive consumer surplus, by studying.

In equilibrium, then, all firms charge the monopoly total price v_L, and a consumer buys from her assigned firms in J regulated markets and K unregulated markets, participating in $J + K$ markets. If a regulated firm charges a headline price above $v_L - \overline{a}$ or an unregulated

firm charges a total price above v_L, the consumer reduces her demand, ensuring that firms do not deviate.

Once the scope of regulation reaches $J = N - K$, the consumer has sufficient attentional capacity to enter all markets. Then, if one more market is regulated ($J = N - K + 1$), she is left with one unit of "spare" attention that she does not need to use for the mere purpose of participating in the markets. Theorem 1 says that at this point, *all* regulated markets suddenly turn from monopolistic to perfectly competitive. If this was not the case, each consumer would use her spare attention to browse in a market in which she found the worst price relative to the competitor. As a result, firms charging such high prices would be pressured to lower them, a contradiction. This logic makes clear that a little spare attention is sufficient to enforce widespread competition, generating a potentially sharp non-linear regulatory effect. It also means that the private and social values of attention diverge greatly, with the former being zero and the latter being large. We are unaware of a former model that identifies this central role of spare attention in market competition.

In the above case with $J = N - K + 1$, all unregulated markets remain monopolistic. If one more market is regulated, however, these also become competitive. The logic is similar to that above. In equilibrium, the consumer studies her assigned firm to ensure that she can participate in the market. If she then sees that the firm charges a total price above c, she uses her two units of spare attention to browse and study, and buy from, the competitor.

After regulating $J = N - K + 2$ markets, further regulation in our model has no effect on payoff-relevant outcomes. Such regulation does free up more attention, and it is plausible that consumers can use such attention for purposes outside our model.

3.2 Economic Implications

Cross-Market Externality Our model features a novel cross-market externality, due to which the benefits of regulating a market often accrue in other markets. Suppose that the

economy is at a low scope of regulation ($J < N - K$), and all consumers buy in the unregulated market n. If the planner regulates market n, outcomes in market n remain unchanged: all consumers continue to participate and to pay the same (monopoly) price. This is the type of observation that many analysts or policymakers might use against regulation. Nevertheless, both consumers and firms benefit from the regulation, as consumers enter more markets. More generally, the total benefit of regulating an active market is always strictly lower than its market-specific benefit.

While it is present at a low scope of regulation, the cross-market externality is perhaps greatest at the next stage. Regulating the $N - K + 1$-st market turns that market from monopolistic to competitive, so it is extremely beneficial for consumers in the regulated market. Even so, the within-market accounting can again drastically underestimate the effect of the regulation: now the regulation enables competition in all previously regulated markets. Similarly, regulating the $N - K - 2$-nd market enforces competition in all unregulated markets, not only the newly regulated market.

Potential Non-Linear Benefits of Regulation Our model says that the incremental benefit of regulating an additional market can be highly non-linear in regulatory scope. In particular, the incremental benefit for consumers is (i) positive at low scope, where it derives from entering one new market; (ii) potentially tremendous when regulation becomes sufficiently broad to induce competition; and (iii) zero at higher scope.

The benefits under points (i) and (ii) above provide a rationale for broad legal principles that apply to many markets and are easy for consumers to understand. For instance, the EU's principle of unfair terms in standard business-to-consumer contracts regulates additional prices in many markets, including warranties, subscriptions, holidays, car or home rentals, and standard goods. Emerging regulation against "dark patterns" in digital services partly serves the same purpose.[8] Our model says that such regulations allow consumers to enter the

[8] For instance, the EU's Consumer Rights Directive gives consumers the right to reimbursement if a trader

affected markets, and if sufficiently broad, they can help induce competition. While we are unaware of causal evidence for this prediction, it is consistent with one correlational pattern. Duflo (2012) argues that due to the lack of regulation, consumers in developing countries are often overwhelmed with having to pay attention to basic things like food and drug safety. At the same time, Atkin et al. (2021) review evidence that retail markets are generally less competitive in developing than in developed countries.

The lack of a benefit under point (iii) above says that a planner can stop short of regulating all markets. This is fortunate since there are likely to be markets where regulation is too costly or for another reason undesirable. As a case in point, in Section 4.1 we allow for the possibility that in a few markets the additional price has efficiency implications. We show that if $\overline{a}$ is far from the efficient level, it may be better to leave these markets unregulated.[9]

Effects on Firms and Self-Regulation In addition to the benefits for consumers, the incremental effect of regulation on firms is (i) positive at low scope; (ii) negative when the scope for competition is reached; and (iii) zero afterwards.[10] Similarly to other research on the market-creating effect of regulation, the benefit under point (i) suggests that at least at this stage, firms may be willing to self-regulate. Our multi-market model, however, provides a reason for why self-regulation is a poor substitute for public regulation. Since a seller organization does not internalize the externalities on other markets, its motive to

used "default options which the consumer is required to reject in order to avoid additional payment," and prohibits traders from charging consumers above cost for their means of payment. Other examples abound.

[9] As another example, suppose that in some markets, consumers have very heterogeneous tastes for additional features, and understanding these features requires studying. It can then be efficient to leave the market unregulated and for consumers to study and find the product they want. There may also be markets, such as new markets that are not yet well understood, where the planner does not have sufficient knowledge or technical capacity for effective regulation. New markets might also be best left alone for the purpose of encouraging innovation and allowing consumer attention to select the most valuable innovations.

[10] In our model, the only effect of competition is to redistribute surplus from firms to consumers. Of course, it is natural to assume that consumer surplus is socially more valuable than profits, in which case the net effect is positive. In addition, if consumers are heterogeneous in their valuations, the decrease in prices induced by competition also has the classical welfare-increasing effect of drawing more consumers into the market.

self-regulate is always inefficiently low. And firms would of course be strongly opposed to further regulation once regulatory scope nears point (ii) above.

4 Extensions and Modifications

In this section, we analyze natural variants of our basic model. In doing so, we consider the technically difficult issue of uniqueness only selectively, and mostly look for the types of equilibria we have identified previously.

4.1 Inefficient Additional Prices

So far, we have assumed that paying an additional price merely redistributes money from consumers to firms. In reality, however, an additional price can also have efficiency implications, for instance in the form of a shortfall in quality or safety that consumers value above cost. We incorporate this possibility into our model.

Suppose that in M of the markets, the consumer's total disutility from paying prices f_{n_i}, a_{n_i} is not $f_{n_i} + a_{n_i}$, but $f_{n_i} + r(a_{n_i})$. The function $r(\cdot)$ is strictly increasing and strictly convex, and satisfies $r(0) = 0$, $\lim_{a_{n_i} \to -\infty} r'(a_{n_i}) = 0$, and $\lim_{a_{n_i} \to \infty} r'(a_{n_i}) > 1$. In the quality example, $r(a_{n_i})$ would be a consumer's utility loss if the firm saves marginal cost a_{n_i} by skimping on quality. The efficient level of the additional price is a^* (i.e., $r'(a^*) = 1$), and the unique monopoly headline price with additional price a^* is $v_L - r(a^*)$. This implies that it is optimal for a monopolist in a full-information environment to sell two units.

We first study the role of attention and regulation in enforcing efficiency and competition. For this question, we suppose that $N = M = 2$ and $K = 1$. With no regulation, we get:

Observation 1. *If $J = 0$, there is an equilibrium in which firms charge the efficient additional price a^* and the corresponding monopoly headline price $v_L - r(a^*)$, and each consumer purchases two units in one market. There is no equilibrium in which consumers purchase in*

both markets, or in which consumers or producers receive a higher surplus.

In the most efficient equilibrium, consumers study and purchase one product. Because buyers are studying but not browsing, firms offer efficient terms but monopoly prices.

Now consider regulating both markets ($J = 2$), with the cap $\overline{a}$ satisfying $v_L > c - \overline{a} + r(\overline{a})$. This means that $\overline{a}$ is sufficiently low for trading two units to be optimal even if the consumer pays an additional price of $\overline{a}$. Such a relatively efficient cap makes sense from a regulatory point of view, and also ensures the existence of a pure-strategy equilibrium.

Proposition 1. *The following types of equilibria are possible.*
I. [Efficient Monopolies.] *If $\overline{a} > a^*$ but $\overline{a}$ is sufficiently close to a^*, there is an equilibrium in which firms set $f = v_L - r(a^*), a = a^*$ and consumers purchase two units in both markets.*
II. [Competition.] *There is an equilibrium in which firms set $f = c - \overline{a}$, $a = \overline{a}$ and consumers purchase two units in both markets. If $\overline{a} \leq a^*$, there is no other equilibrium.*
III. [Hybrid.] *If $\overline{a} > a^*$ but $\overline{a}$ is sufficiently close to a^*, there is an equilibrium in which firm behavior in one market is as in I, and in the other it is as in II.*

Part I implies that non-binding but sufficiently tight regulation can expand activity while maintaining efficiency. In all of our previous examples, in contrast, whenever the regulatory cap improved outcomes, it was binding in the post-regulation equilibrium. Roughly, regulation lowers the extra profit a firm can obtain by deviating and exploiting inattentive consumers, and hence lowers the attention necessary to deter misbehavior. More precisely, to enforce efficiency with one unit of attention per consumer ($K = 1$), about half of a firm's assigned consumers study, and the rest buy blindly. If a firm raises its additional price to exploit the latter consumers, it loses the former consumers, so for $\overline{a}$ sufficiently close to a^* the deviation is unprofitable.[11] In a rental market, for instance, sufficiently many tenants

[11] In this equilibrium, browsing consumers who see a decrease in f assume that the deviating firm sets the maximum additional price $\overline{a}$, so they can only be attracted with a discrete cut in f. Because this entails an efficiency loss, for a sufficiently small portion of browsers it is unprofitable.

may be reading their leases that — in combination with regulatory constraints — landlords do not want to deviate from efficient terms.

The equilibrium in Part II is similar to that in our basic model. Regulation allows consumers not to study, which induces firms to charge the maximum additional price, but also creates spare attention that enforces competition. Unlike in the basic model, however, charging the maximum additional price is inefficient, so the welfare effect of regulation is ambiguous. In particular, if the inefficiency $r(\overline{a}) - \overline{a}$ from the maximum additional price is sufficiently high — e.g., terribly low amount of care from landlords is mandated — then regulation harms both consumers and firms.[12] It does so by inducing consumers to rely on the overly lax regulation instead of their own studying.[13]

Part II also says that if regulation is at least as tight as the efficient level, then only the competitive equilibrium exists. In combination with Part I, this implies that to maximize consumer welfare, it may be better to err on the side of overly tight rather than overly lax regulation. This is because slightly inefficient overly lax (but not overly tight) regulation may result in monopoly prices with little increase in efficiency. To see the intuition behind the asymmetry, suppose that the additional price is not at the maximal level. Then, limited consumer attention limits competition: if a firm lowers its headline price, a consumer can harbor a suspicion that it raised its additional price. To credibly signal that it has a better deal, therefore, the firm can lower its headline price discretely, and raise the additional price to the cap. This results in a loss of efficiency with lax regulation but a gain in efficiency with tight regulation. Hence, the limit to competition is stronger with lax regulation.

[12] Without regulation, consumers participate in one market, and because firms charge the monopoly price equal to the consumer's value from the second unit, they derive a surplus of $v_H - v_L$. With regulation, consumers participate in two markets, and derive consumer surplus of $v_H + v_L - 2f - 2r(\overline{a}) = v_H + v_L - 2(c - \overline{a}) - 2r(\overline{a}))$ in each. Hence, their welfare is higher without regulation if $r(\overline{a}) - \overline{a} > (v_H + 3v_L)/4 - c$.

[13] The concern that a badly chosen price cap can hurt consumers also appears in Fershtman and Fishman (1994) and Armstrong et al. (2009). There, the price cap compresses prices and thereby induces fewer consumers to become informed, lowering competition and raising the average price.[14] In our setting, in contrast, regulation makes the markets more competitive, and consumers can potentially be harmed due to a decrease in efficiency.

Finally, Part III says that with lax regulation, a hybrid between the two equilibria above also exists. In one market, firms offer an efficient deal at the monopoly price, and sufficiently many consumers study for firms not to raise the additional price to $\overline{a}$. In the other market, firms set the maximum additional price, and choose the headline price competitively. If a firm deviates, its consumers browse in this market instead of studying in the other market. Hence, one unit of attention simultaneously enforces efficiency in one and competition in the other market.

For our second question, we assume that $0 < M < N$, and ask whether the $N - M$ "transfer" markets (in which the additional price is a transfer) or the M "distortable" markets (in which the additional price has efficiency implications) are more important to regulate. One may think that to reduce the potential for inefficiencies, distortable markets are the better targets for regulation. We provide an example in which the opposite is the case.

Proposition 2. *Suppose that $\overline{a} > a^*$, $M \leq K - 2$, and $J \geq N - K + 2$.*
I. If at least $N - K + 2$ transfer markets are regulated, then there is an equilibrium with the efficient and competitive outcome in all markets.
II. Suppose M_r distortable markets are regulated. If $J \leq N - K - 1 + M_r$, then there is no equilibrium in which the efficient and competitive outcome obtains in all markets.

The proposition says that with sufficient attention and regulatory scope, regulation should focus on transfer markets. More precisely, the efficient and competitive outcome obtains if sufficiently many transfer markets are regulated (Part I); but without abundant regulatory scope, the same may not obtain if distortable markets are regulated (Part II). Intuitively, to ensure both efficiency and competition in a distortable market, consumers must study to prevent firms from raising the additional price. Since this is the case with and without regulation, regulation does not save any consumer attention. Ensuring efficiency and competition in a regulated transfer market, in contrast, does not require consumers to study. Since studying is necessary without regulation, regulation saves a unit of attention. As a

result, using regulation on a distortable market is wasteful.

4.2 Different Costs of Studying and Regulating Additional Prices

Our baseline model assumes that browsing as well as studying in any market has the same cost. While the cost of browsing — looking at a single transparent price — may indeed be similar across markets, the cost of studying — which often involves more in-depth research and understanding — can vary significantly across markets. For instance, bargaining to find out the price at which a seller is willing to sell is relatively simple, while understanding a credit-card or mortgage contract is difficult. We now incorporate this possibility into our model, which both has positive implications and raises normative questions.

Formally, instead of assuming that studying always costs one unit of attention, we posit that it costs one unit in N_l markets and $s > 1$ units in $N_h = N - N_l$ markets, where s is an integer. We refer to the former as l-markets and the latter as h-markets. Abstracting from the obvious point that more valuable markets are more important to enter or regulate, we continue to assume that all markets have the same value for consumers and cost to firms.

Positive Implications Theorem A.1 in the Appendix identifies outcomes for any N_l, N_h, and pattern of regulation. The theorem implies that the key insights from our basic model continue to apply. These messages include that (i) at low regulatory scope, regulating an additional market is beneficial because it raises participation; (ii) at a sufficiently high regulatory scope, all markets become competitive, creating a potentially highly non-linear effect; and (iii) the benefits of regulating a market can accrue partly or fully in other markets. One difference, however, is that in the current model regulated markets can become competitive even at low regulatory scope. This can happen when all unregulated markets are h-markets. Then, the consumer may have spare attention that is sufficient to enforce competition in regulated markets, but not sufficient to enter another unregulated market. The economy

therefore divides into up to three parts: regulated competitive markets, unregulated monopolistic markets in which (some) consumers participate, and potentially also dormant markets in which no consumer participates.

Optimal Consumer-Protection Regulation When markets differ in studying costs, a natural question is which markets should be prioritized for regulation. To start, notice that if it is equally easy to regulate all markets, then regulating an h-market generates greater total surplus than regulating an l-market. Since participating in h-markets is more costly without but equally costly with regulation, regulating these markets allows consumers to enter more markets.

Markets that are difficult for consumers to navigate, however, are plausibly also difficult for planners to regulate. Returning to our examples from the beginning of the subsection, enforcing price posting regulation that obviates the need for bargaining is relatively simple, but running effective contract law is difficult. We assume, therefore, that a set of markets whose studying costs total J are regulated, so that regulation costs are proportional to studying costs. Where does the regulator want to concentrate its regulatory effort?

Proposition 3.

I. **Low Regulatory Scope.** *If $J + K \leq N_l$, then regulating as many l-markets as possible uniquely maximizes consumer and total surplus.*

II. **High Regulatory Scope.** *If $N_l + sN_h + 1 + s > J + K \geq N_l + sN_h + 2$, then regulating as many h-markets as possible maximizes total and uniquely maximizes consumer surplus.*

III. **Abundant Regulatory Scope.** *If $J + K \geq N_l + sN_h + 1 + s$, then any pattern of regulation maximizes consumer and total surplus.*

At low scope (Part I), the role of regulation is to open up more markets for consumers, which is best served by regulating as many markets as possible. Hence, it is optimal to focus regulation on l-markets. At high scope (Part II), however, regulation also aims to ensure

competition. This is fully successful if consumers have sufficient spare attention to check out the competitor in any one regulated *or* unregulated market. Since the competitors are most difficult to check out in unregulated h-markets, these are the markets that should be regulated. And at an abundant scope (Part III), any pattern of regulation ensures participation and competition in all markets, so regulatory choices make no difference.

Proposition 3 does not cover the intermediate case between low and high scopes. We have found that in this case, results depend in subtle and non-robust ways on the tradeoff between the consumer benefits of competition and opening up markets. Indeed, unlike in the cases stated in the proposition, now the regulator may prefer to decrease J (i.e., not to use all regulatory capacity) to generate spare attention and thereby competition.

As one potential illustration, developing countries often regulate the contractual terms for essential services such as gas or electricity through state monopolies. In contrast, many developed nations have deregulated retail markets for the same services in which various difficult-to-understand pricing structures are permitted and used. At the same time, developed nations regulate many complex products and services more heavily than do developing nations.

4.3 Heterogeneous Firm Productivity

We consider what happens when there can be inefficient firms in the market, modifying our model in the following ways. In one of the N markets, there are $M \geq 2$ inefficient firms in addition to the previously specified efficient ones. The inefficient firms have marginal cost $c' > c$ such that $c' - c < v_H - v_L$ and the monopoly price with cost c' for fully informed consumers is still v_L. Each inefficient firm first decides whether to be in the market, staying out if it expects zero demand. Entry decisions are observed before firms set prices, and a consumer also knows whether she is assigned to an efficient or inefficient firm. Furthermore, markets are partially segregated: if a consumer assigned to an efficient (resp. inefficient) firm

browses, she finds the other efficient firm (resp. inefficient firms) first. Finally, the inefficient market is regulated.[15] We find:

Proposition 4.

I. If $J \leq N - K$, then inefficient firms participate, and consumers can only purchase at the monopoly price.

II. If $N - K < J < N - K + M$, there are two equilibrium outcomes in the inefficient market.

1. *Inefficient firms participate. The efficient regulated firms charge a total price of c, and the inefficient firms charge a total price of c'.*

2. *Inefficient firms are out of the market. The efficient firms charge a total price of c.*

III. If $J \geq N - K + M$, then inefficient firms do not participate, and consumers buy at the competitive price c in all markets.

As in the discussion of Theorem 1, we walk through possible outcomes as the scope of regulation expands. Part I says that at low scope of regulation, all firms charge monopoly prices, which also implies that the inefficient firms participate. This is a version in our setting of the classical concern that market power allows inefficient firms to survive.

Part II says that as the scope of regulation expands, there is a range in which two equilibria exist. In a new type of equilibrium, inefficient firms participate in the market and price at their higher cost c'. Consumers enter all markets, and have $J + K - N < M$ units of spare attention. This attention is insufficient for a consumer assigned to an inefficient firm to find an efficient firm, so the inefficient firms survive. At the same time, a competitive equilibrium akin to that in our basic model also exists. If only efficient firms are in the market, then an inefficient firm cannot attract consumers by unilaterally entering. If it did enter, a consumer assigned to it would use a unit of spare attention to find an efficient firm. In other words, the inefficient firms require each other to relax competition.

[15] The last assumption simplifies the statements of our results, while the preceding one ensures the existence of pure-strategy equilibria.

Part III says that when the scope of regulation becomes sufficiently large, it is no longer part of an equilibrium for the inefficient firms to participate. Since the consumer has at least M units of spare attention, she could find an efficient firm even if all inefficient firms stayed in, leaving the latter with no demand.

At a general level, this version of our model implies that consumer protection can engage consumers in eliminating inefficient firms, and thus has a role in ensuring productive efficiency. In addition, Proposition 4 suggests that obtaining productive efficiency requires an initially broad regulatory scope that can later be scaled back. As the scope of regulation expands, it is plausible that equilibrium 1 in Part II is played, since firms have been in the market and may naturally stay there. Hence, productive efficiency obtains only when regulatory scope reaches that in Part III. At this point, however, it is plausible that inefficient firms cannot coordinate on entering or re-entering, so equilibrium 2 in Part II results even with lower regulatory scope.

5 Conclusion: Further Issues

Implications for Transparency Regulations Our paper focuses on regulations that limit the ex-post harm a consumer can suffer if she purchases without studying. Another key approach to consumer protection is disclosure regulation, which mandates firms to truthfully inform consumers about relevant product attributes. From the perspective of our attention framework, we can think of disclosure regulation as facilitating browsing or studying. For example, standardized nutrient labels make it easier for a consumer to find relevant information, arguably lowering studying costs, and government-run price comparison sites can lower browsing costs. Furthermore, there are restrictions on products and fees that are also best understood as lowering studying costs rather than imposing a binding cap on the additional price. For instance, if the government bans some but not all fees, this can make it easier for the consumer to learn about possible ex-post harm, but she still needs to study the

remaining fees. The effect of such interventions can be readily studied in simple variants of our framework. One can ask, for instance, which type of transparency or partial regulations policymakers should focus on. We conjecture that it is those that reduce studying costs in unregulated markets or browsing costs in uncompetitive regulated markets. The former can facilitate participation in more markets, and the latter can help leverage existing spare attention to enforce competition.

Knowledge about Regulations Our model also assumes that consumers know which markets are regulated. An interesting question for future research — which however requires non-trivial modifications of our formal framework — is what happens when consumers are only partially informed about regulations. As one possibility, consumers may know the scope J of regulation, but not which markets are the regulated ones. A natural conjecture, then, is that a multiplier on regulatory scope arises. At low scope, consumers do not feel protected enough to purchase without studying a product's additional price (or perhaps the regulations in place), so the regulation does not liberate much attentional capacity. At sufficiently high scope, consumers may start purchasing blindly in many markets, suddenly freeing up a lot of attention. Now the problem is that firms can exploit trusting consumers in unregulated markets, so it would seem important to either close holes in the regulation or explicitly warn consumers of unregulated markets.

Alternatively, consumers may know which markets are regulated, but not the particulars of the regulation, for instance not the precise cap on the additional price. Such a situation can naturally arise, for instance, if regulations are very different across markets. Again, uncertainty in $\overline{a}$ creates an incentive to study, so that it may defeat the attention-saving role of regulation. From this perspective, fine-tuning consumer protection too much to specific markets can be counterproductive — policies should instead be coordinated to allow for easy understanding by consumers.

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A Appendix: Proof of Main Theorem

We refer to $f_{n_i} + a_{n_i}$ as the total price t_{n_i}. Consider the setup of Section 4.2. Let $N_l^u \geq 0$ be the number of unregulated low-studying-cost markets and $N_h^u \geq 0$ be the number of unregulated high-studying-cost markets. Below $\mathbb{I}_{\{\}}$ refers to the indicator function. We prove the following generalization of Theorem 1:[16]

Theorem A.1. *I. If* $K < N_l^u + sN_h^u + 2 + \mathbb{I}_{\{N_h^u \geq 1\}}(s-1)$*, we have:*

(a) If either $K < N_l^u$ *or* $(K - N_l^u) \mod s = 0$*, the consumer studies in as many unregulated low-studying cost markets as possible, and uses any additional attention* $K - N_l^u$ *to study in high-cost unregulated markets. All firms set total prices equal to* v_L*.*

(b) If $K > N_l^u$ *and* $(K - N_l^u) \mod s = 1$*, the consumer studies in all low-cost unregulated markets and in* $\lfloor (K - N_l^u)/s \rfloor$ *unregulated high-cost studying markets. Firms in regulated markets charge a total price of* c *and in unregulated markets a total price of* v_L*.*

(c) If $K > N_l^u$ *and* $(K - N_l^u) \mod s > 1$*, the consumer studies in all low-cost unregulated markets and in* $\lfloor (K - N_l^u)/s \rfloor$ *unregulated high-cost studying markets. Firms in regulated and unregulated low-cost studying markets charge a total price of* c*, and in unregulated high-cost studying markets a total price of* v_L*.*

[16] For integers a and $s > 0$, we write $a \mod s = r$ if $0 \leq r < s$ and $(a - r)$ is divisible by s.

II. If $K \geq N_l^u + sN_h^u + 2 + \mathbb{I}_{\{N_h^u \geq 1\}}(s-1)$ *then firms in all markets charge a total price of* c*.*

Proof of Theorem A.1. We refer to any history h_a in which the consumer has enough attention left to look at another (headline or additional) price as an attention history. We call histories h_p in which the consumer does not have enough attention to look up another price purchase histories. An attention strategy $\sigma_a(h_a)$ is a mapping from all possible attention strategies into a probability distribution over the remaining prices the consumer may look up. A purchase strategy $\sigma_p(h_p)$ maps the prices the consumer has observed into feasible purchases. (Appendix B provides a formal definition of these intuitive notions.)

Next, we establish necessary conditions for equilibria in which firms play pure strategies in a sequence of Lemmas.

Necessary Conditions. The following Lemmas collect necessary conditions for an equilibrium independently of the amount of attention.

Lemma 1. *A firm in an unregulated market charges a total price* $t_{n_i} \leq v_L$*.*

Proof. Suppose otherwise, i.e. that there exists a firm n_i that charges a total price above v_L in the unregulated market n. Without loss of generality, suppose $t_{n_i} \geq t_{n_j}$ where $j \neq i$.

In case the firm n_i has zero demand in equilibrium, our second equilibrium-selection assumption implies that $t_{n_i} = v_L$.

Thus, we are left to consider the case in which the firm n_i has positive demand in equilibrium. Suppose first that $t_{n_i} > t_{n_j}$. Then, all of n_i's demand comes from consumers who purchase from n_i without having seen both of n_j's prices. Consider only such consumers from now on. We argue that if n_i lowers its total price to $v_L - \epsilon$ for a sufficiently small $\epsilon > 0$, it strictly increases profits from these consumers. To do this, we argue that if it was optimal for a consumer to use attention strategy σ_a that does not involve studying n_j's additional price for any history h_k on the path of play, then it is strictly suboptimal for this consumer to use

a continuation attention strategy σ'_a that involves studying the additional price of firm n_j for any history h' that differs from an on path history h_k only in that the candidate equilibrium a_{n_i} is replaced by the observed deviation $a'_{n_i} = a_{n_i} + v_L - \epsilon - t_{n_i}$. Intuitively, observing a lower additional price makes it weakly less attractive to study the rival because beliefs about other firms' prices are unaffected (by our first equilibrium-selection assumption).

Formally, note that if the consumer follows an attention strategy $\sigma_a(h')$ that does not involve studying a_{n_j}, then following the deviation she purchases two units from firm n_i, which increases her payoff by $t_{n_i} - v_L + 2\epsilon$ relative to that in the candidate equilibrium. Suppose that there were an alternative attention strategy σ'_a that involves studying a_{n_j} following a history h' (that differs from an on path equilibrium history only in that the candidate equilibrium a_{n_i} is replaced by an observed above deviation to a'_{n_i}) and increases payoffs by more than $t_{n_i} - v_L + 2\epsilon$. Let $P(h''_p)$ be the set of products (and their prices) that is induced when all firms other than i play their equilibrium pricing strategy, i deviates as specified above, and the consumer uses the attention strategy σ'_a. Note that absent the deviation, if the consumer would follow the attention strategy σ''_a that prescribes the same attention allocation as σ'_a for all histories in which a'_{n_i} is replaced by the original candidate equilibrium additional price a_{n_i}, it would induce a set of $P(h'''_p)$ that differs from $P(h''_p)$ only in the additional price for product n_i. Hence, the optimal purchase behavior in all markets other than n would be identical; we are left to consider the change in the induced consumer surplus in market n. If the consumer purchases from firm n_i following σ'_a, then the consumer's reduction in surplus when buying from firm n_i is bounded by $t_{n_i} - v_L + 2\epsilon$. Hence, it would be an optimal deviation to adopt σ''_a in the candidate equilibrium. If it is optimal to buy from firm n_j under σ'_a after the deviation it remains optimal for σ''_a absent the deviation, so again there is a profitable deviation. This contradicts that σ_a is optimal in the candidate equilibrium.

Now because the consumer does not study n_j after having observed the deviation, conditional on the consumer studying a_{n_i}, firm n_i's profits are $2(v_L - 2\epsilon - c)$, which increases profits for sufficiently small ϵ since $2(v_L - c) > v_H - c$.

Now suppose that $t_{n_i} = t_{n_j}$. In this case, any consumer who studied the additional price of firm n_i will buy from it following the deviation independently of whether or not she is also aware of firm n_j's prices. Thus, firm n_i earns profits $2(v_L - 2\epsilon - c)$ following the deviation, which is profitable for sufficiently small ϵ. □

Lemma 2. *A firm in a regulated market charges a total price $t_{n_i} \leq v_L$.*

Proof. Suppose otherwise, i.e. that there exists a firm n_i that charges a total price $t_{n_i} > v_L$ in a regulated market n. Without loss of generality, suppose $t_{n_i} \geq t_{n_j}$.

In case firm n_j with $j \neq i$ charges $t_{n_j} < v_L$, then n_j can strictly increase profits by charging $f_{n_j} = v_L - \overline{a} - \epsilon$, $a_{n_j} = \overline{a}$ for a sufficiently small $\epsilon > 0$. To see this, note that before the deviation, consumers initially assigned to n_j and consumers initially assigned to n_i who browse purchase from n_j. Because $t_{n_i} > v_L$ and all consumers who observed n_j's headline price know that its total price continues to be below v_L, demand from these consumers stays the same. Hence, despite the fact that consumers who observe the deviation of n_j might change how they allocate attention after observing n_j's headline price, this does not affect demand for firm j. Furthermore, since the deviation by n_j cannot affect the browsing choice of consumers assigned to n_i, n_j's overall demand remains unaffected. We conclude that the deviation strictly increases profits.

In case n_j with $j \neq i$ charges $t_{n_j} \geq v_L$, we consider two cases: (i) $t_{n_j} < t_{n_i}$ and (ii) $t_{n_j} = t_{n_i}$. In case (i), firm n_i earns strictly less than monopoly profits from its own assigned consumers: n_j's assigned consumers do not buy from firm n_i even if they browse, and consumers who purchase from n_i buy only one unit. By charging $(v_L - \overline{a} - \epsilon, \overline{a})$, firm n_i attracts all of its assigned consumers and earns $2(v_L - \epsilon - c)$ on them. As $\epsilon \to 0$ this approaches the monopoly profits on its assigned consumers, and hence for sufficiently small ϵ, this deviation strictly increases profits. Next, consider case (ii) in which $t_{n_j} = t_{n_i} > v_L$. Observe that in the candidate equilibrium any consumer who purchases from firm i buys at most a single unit. Consider a deviation by firm i to $(v_L - \overline{a} - \epsilon, \overline{a})$. Then any consumer who

observes firm i's headline price must purchase two units from it. Hence, for sufficiently small ϵ the deviating firm earns strictly greater profits from all consumers initially assigned to it. Furthermore, any consumer initially assigned to i's rival that browses must purchase two units from firm i following the deviation. Because the probability that a consumer assigned to i's rival browses is independent of i's prices, thus, for sufficiently small ϵ this deviation strictly increases profits. We conclude that $t_{n_i} \leq v_L$. □

Lemma 3. *Total prices in all markets n are symmetric, i.e. $t_{n_i} = t_{n_j}$.*

Proof. Suppose otherwise, i.e. there exists some market n in which in equilibrium $t_{n_i} < t_{n_j}$. Since by our second equilibrium-selection assumption a firm with no demand sets a total price of v_L, firm n_i must have positive demand in equilibrium, and thus also $t_{n_i} \geq c$. We consider two cases: (a) market n is an unregulated market and (b) market n is regulated. In case (a), suppose firm n_i deviates and raises a_{n_i} to a'_{n_i} in such a way that $f_{n_i} + a'_{n_i} < t_{n_j} \leq v_L$. This cannot affect the probability that the consumer observes the headline price or that she studies firm n_i at any point in the search process. And once she studied firm n_i, it remains strictly optimal to purchase from firm n_i independently of how the consumer spend her attention otherwise. Hence, this deviation does not affect the firm n_i's demand and therefore increases its profit. In case (b), consider a deviation by firm n_i to $(f'_{n_i}, \overline{a})$ such that $t_{n_i} < f'_{n_i} + \overline{a} < t_{n_j} \leq v_L$. This deviation does not affect when the consumer first becomes aware of firm n_i's headline price, and whenever she observed firm n_i's headline price the consumer strictly prefers to purchase from firm n_i independently of her beliefs regarding a_{n_i} in case she did not study it and independently of how she spends her attention otherwise. Thus, this deviation cannot decrease firm n_i's demand and is therefore profitable. We conclude that $t_{n_i} = t_{n_j}$ in all markets. □

Lemma 4. *In equilibrium, the consumer studies in as many unregulated markets as possible.*

Proof. Because in equilibrium firms in any market n deterministically set the same total price, the consumer on the path of play has no benefit of browsing. Because becoming active

by studying the initially-assigned firm in any unregulated market n gives the consumer an additional surplus of at least $v_H - v_L$, the consumer is only willing to browse in any market in case reallocating her attention does not allow her to study more unregulated markets. □

We next specify further necessary conditions that rely on the amount of attention the consumer has in three steps.

Step (i): If $K \leq N_l^u$, all firms charge total prices of v_L. By Lemma 4, the consumer uses all her attention to study in unregulated low-cost markets. Suppose for the sake of contradiction that there exists a market n in which firms charge prices $t_{n_i} = t_{n_j} < v_L$. If the market is unregulated, by the second equilibrium-selection assumption the firms must have positive demand. Then, the firm n_i can deviate from its equilibrium offer (f_{n_i}, a_{n_i}) to (f_{n_i}, a'_{n_i}) such that $0 < a'_{n_i} - a_{n_i} < (1/2)\min\{v_L - t_{n_i}, v_H - v_L\}$. Following such a price increase, the consumer could save $2(a'_{n_i} - a_{n_i})$ by browsing and studying a_{n_j} once she becomes aware of it. Doing so, however, requires to study in one less unregulated market, which lowers her utility by at least $v_H - v_L$ in an unregulated low-cost studying market and therefore is suboptimal following the deviation. Hence, the deviation is profitable, a contradiction. Similarly, if the market is regulated and $t_{n_i} = t_{n_j} < v_L$, a firm n_i can deviate and charge $(t_{n_i} + \epsilon - \overline{a}, \overline{a})$ for some $\epsilon \in (0, \min\{v_L - t_{n_i}, (1/2)(v_H - v_L)\})$. In that case, browsing in market n saves the consumer less than $v_H - v_L$ and requires her to study in at least one less unregulated low-cost market. The latter generates utility of $v_H - v_L$, so browsing in market n following the deviation is suboptimal. Because the consumer does continue to buy from n_i, we conclude that firm n_i has a profitable deviation.

Step (ii): If $N_l^u < K < N_l^u + sN_h^u + 2 + \mathbb{I}_{\{N_h^u \geq 1\}}(s-1)$, we distinguish three cases: (a) $(K - N_l^u) \mod s = 0$; (b) $(K - N_l^u) \mod s = 1$; and (c) $(K - N_l^u) \mod s > 1$. For each case, we now prove the statement in the theorem.

For Case (a), Lemma 4 implies the consumer studies in all unregulated low-cost studying markets and in as many unregulated high-cost studying markets as possible. When doing

so the consumer uses all her attention, and as a result she browses with probability zero in equilibrium. By essentially the same argument as in the case where $K \leq N_l^u$ (where the consumer now forgoes studying in some unregulated market not necessarily a low-cost one), all firms charge a total a price of v_L. Thus, any equilibrium satisfies Statement I(a).

In Case (b), she has one unit of attention left when studying in all unregulated low-cost markets and studying in as many unregulated high-cost markets as possible. Conversely, for $s > 2$, any attention allocation in which the consumer does not study in all low-cost markets leads her to participate in less markets, contradicting Lemma 4. In case $s = 2$, the consumer could potentially study in all but one unregulated low-cost studying market n' and use all remaining attention (i.e. $K + 1 - N_l^u$) to study in an additional high-cost market without violating Lemma 4; since in Case (b) $K + 1 - N_l^u \mod 2 = 0$, she then has no attention left to browse. Any such attention strategy, however, violates our third equilibrium-selection assumption as we establish next. First, we observe that the total price in an unregulated high-cost studying market must be v_L; suppose otherwise, i.e. it is $t_n < v_L$. Then a firm n_i can increase a_{n_i} by $\epsilon \in (0, \min\{v_H - v_L, v_L - t_n\}/2)$. Note that upon studying firm n_i following the deviation, a consumer does not want to browse and study its rival n_j. Doing so would cost $s + 1 = 3$ units of attention, and would require the consumer to study in at least one less unregulated market. Because, however, all firms set prices weakly below v_L, not participating in an unregulated market reduces the consumer surplus by $v_H - v_L$, so the consumer is strictly better of not browsing and studying firm n_j. Thus, increasing the additional price by ϵ does not decrease firm n_i's demand and hence increases its profits. Given that firms in unregulated high-cost markets charge v_L, however, the consumer can reach her equilibrium utility by not studying in a high-cost market and studying in all unregulated low-cost markets (including the one n' she did not do so in the candidate equilibrium). This uses one unit less of attention, and since firms in n' charge a price weakly below v_L does not reduce her expected consumer surplus. Hence, the consumer must do so by our third equilibrium-selection assumption, a contradiction. We conclude that also

in Case (b) the consumer studies in all unregulated low-cost markets and in $\lfloor (K - N_l^u)/s \rfloor$ unregulated high-cost markets. Thereafter, she has one unit of attention left. Because she then must use this unit of attention to browse in any regulated market with positive probability by our third equilibrium-selection assumption, firms in equilibrium cannot set an identical total price above c. We conclude that firms set a total price of c in all regulated markets. Furthermore, because at any total price below v_L in an unregulated market a firm could deviate and increase the additional price by $\epsilon \in (0, \min\{v_H - v_L, v_L - t_n\}/2)$ without inducing the consumer to browse and study its rival, by the same logic as above, firms in any unregulated market also charge a total price of v_L. Thus, any equilibrium satisfies Statement I(b).

In Case (c), the consumer has $(K - N_l^u) \mod s > 1$ units of attention left when studying in all unregulated low-cost markets and studying in as many unregulated high-cost markets as possible. Conversely, for $(K - N_l^u) \mod s \neq s - 1$, any attention allocation in which the consumer does not study in all low-cost markets leads her to participate in less markets, contradicting Lemma 4. In case $(K - N_l^u) \mod s = s - 1$, the consumer could also study in all but one unregulated low-cost studying market n' and use all remaining attention (i.e. $K + 1 - N_l^u$) to study in high-cost markets without violating Lemma 4, since in this case $(K + 1 - N_l^u) \mod s = 0$, she then has no attention left to browse. Any such attention strategy, however, violates our third equilibrium-selection assumption by the same argument as in Case (b): because the consumer uses all her attention in this candidate equilibrium, firms in an unregulated high-studying cost market must charge a price of v_L and then the consumer could reach her candidate equilibrium utility faster by studying in all low-cost studying markets and one less high-cost studying market. By our third equilibrium-selection assumption she must do so, and then use her $s - 1 \geq 2$ units of attention to browse with positive probability in all regulated markets as well as browse and study the rival in all unregulated low-cost studying markets. This, in turn, implies that firms cannot have a mass point on the same total price of $t_n > c$ in regulated or unregulated low-cost studying markets.

We conclude that in Case (c), firms charge a total price of c in all regulated or unregulated low-cost studying markets, and a total price of v_L in all unregulated high-studying cost markets. Thus, any equilibrium satisfies Statement I(c).

Step (iii): if $K \geq N_l^u + sN_h^u + 2 + \mathbb{I}_{\{N_h^u \geq 1\}}(s-1)$ all firms charge a total price of c. By Lemma 4 the consumer must study in all unregulated markets, and because by Lemma 3 total prices are symmetric in all markets, the consumer can reach her equilibrium level of utility if and only if she studies in all unregulated markets; by our third equilibrium-selection assumption she hence must do so and then use her remaining units of attention (which are weakly greater than $s+1$) to browse in all regulated markets with positive probability as well as browse and study in all unregulated markets with positive probability. Hence, firms cannot set the same total price $t_n > c$ in any market. We conclude that all markets are perfectly competitive in this case. Hence, any equilibrium satisfies Statement II.

Finally, we prove the existence of an equilibrium satisfying our selection criteria by explicitly constructing it for each case in the Appendix B. Doing so involves specifying behavior and beliefs for a large set of on- and off-path histories in a standard way that induces the outcomes specified in the theorem. □

Proof of Theorem 1 The theorem is a special case of Theorem A.1 in which $N_h = 0$. □