Product Guidance by Digital Platforms: A Welfare Analysis

Abstract: Prior to the invention of the Internet, shopping for goods was relatively simple: a consumer visited a brick-and-mortar retailer and selected a product from what was available or, for some retailers, shopped using a catalog. Today, a simple Internet search may return a bewildering number of possible products across hundreds—if not thousands—of online retailers. The same is true for some digital platforms that permit third-party sellers. Overwhelmed with options, consumers may prefer some guidance and, as such, the digital platform must present results in some sort of ordering. For digital platforms, such guidance and ordering has come under scrutiny in the antitrust arena. Previously, we demonstrated that digital platforms which permit third-party sellers have less incentive to favor their own products over those of third-party sellers when compared to those who do not. In this BULLETIN, we show that a platform retailer who can provide credible informative signals to customers will raise consumer welfare. This welfare enhancement occurs in equilibrium in the absence of any legal requirement. Accordingly, prohibitions against such signals or randomized ordering—such as those proposed in the pending American Innovation and Choice Online Act—are likely to reduce consumer welfare.
I. Background

A central pillar of President Biden’s domestic agenda is an expanded role for antitrust, especially in the digital space.1 Some in Congress are playing along, introducing several antitrust reform bills targeting large digital platforms.2 At the forefront of the legislative effort is the “American Innovation and Choice Online Act,” which proposes a regulatory framework for digital retail platforms based largely on allegations of preferential treatment by platforms of their own products and services over those of independent sellers.3 This preference, it is often claimed, is implemented in the way search results are presented to consumers—i.e., a bias towards the platform’s own products.4 This bill also contains an assortment of prohibitions against retail platform operators’ efforts to provide information signals which promote the sale of either their own or third-party products when the platform operator benefits from those sales through the provision of vendor or other service offerings.5 While the alleged motivation for the bill is non-discrimination (which certainly has a nice ring to it), the problem is that these proposed legislative prohibitions against information signaling may not produce welfare-enhancing outcomes.

In previous research, we demonstrated that a vendor who also operates a platform has less incentive to steer customers to its own wares than a vendor who does not, since the platform profits from third-

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4 See, e.g., Prepared Statement by U.S. Senator Chuck Grassley (R-Iowa) Ranking Member, Senate Judiciary Committee Markup on American Innovation and Choice Online Act (January 20, 2022) (available at: https://www.judiciary.senate.gov/grassley-statement-at-markup-on-big-tech-competition-bill) (This legislation prevents dominant Big Tech platforms from anti-competitively preferencing their own products or discriminating against competing products. This will ensure that there is robust competition on dominant tech platforms. Our bill will help level the playing field for small businesses and entrepreneurs that rely on dominant Big Tech platforms to reach their customers.”).

5 Seller fees on platforms are ubiquitous. See, e.g., eBay seller fees (https://www.ebay.com/help/selling/fees-credits-invoices/selling-fees?id=4822); Reverb seller fees (https://help.reverber.com/hc/en-us/articles/360002914813-What-are-my-fees-as-a-Reverb-Preferred-Seller-#:::text=For%20all%20sales%20on%20the%20maximum%20fee%20is%20%245000); Amazon selling plans (https://sell.amazon.com/pricing#selling-plans).
party sales.6 While our previous analysis focused on the seller’s incentives, we did not address the issue of why signals from a retail platform would be useful to potential customers. This is an important question for platforms that can utilize data unavailable to consumers when the consumer is faced with a bewildering number of choices. For instance, a search on Amazon returns over 1,000 options for a six-foot HDMI cable, and these results must be sorted in some way and perhaps labeled for the quality of the product and reliability of the seller, among other factors. Due to thousands of prior sales, the platform, in an aim to enhance the customer experience/access, may surface a product that is a particularly good choice for consumers based on a standard set of criteria including product type, cost, product quality, sales experience, customer service experience, and ancillary services including shipping speed and returns. In general, that product may not be the most immediately profitable to the seller, but an excellent choice for the consumers. Since the preferences of the customer and the vendor are not perfectly aligned, how, and to what extent, can the customer rely on the vendor’s recommendations? It may well be socially desirable for the vendor/platform operator to provide informative signals to the customer, but what mechanism could support such an outcome? It is this question that we examine below.

Fortunately, the basic economics of informative signaling of the sort that concerns us here has been developed in recent years, much of this work stemming from the influential analyses of Crawford and Sobel (1982).7 In particular, unlike many classic signaling problems in which signals are costly, the Crawford and Sobel framework highlights how informative signals can arise in perfect Bayesian equilibria when signals are essentially costless.8 Their basic insight is that the misalignment of the incentives between vendor (i.e. profits) and customer (i.e., best product) precludes perfectly informative signals (customer driven, not sales driven). This misalignment is not unique to platforms: sellers’ and buyers’ incentives are rarely perfectly aligned. However, even if incentives are not perfectly aligned, this does not mean that sellers will not take actions that benefit buyers beyond what would occur under some intrusive rules governing their transactions. In fact, some sellers recognize that customer retention is far more important in the long term and actively choose to align their incentives with those of the customer.

These insights are crucial for the evaluation of public policies regulating signals such as search results on platforms, where the platform operator may offer its own goods in competition with those of third-party sellers. In simple terms, will the platform operator bias its search results or

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8 Bayesian games permit solutions to games with incomplete information. They are like complete information games but allow incomplete information through the assignment of a probability. See, e.g., R. Gibbons, GAME THEORY FOR APPLIED ECONOMISTS (1992).
recommendations towards its own products to the detriment of rival sellers? As explained earlier, the platform’s immediate profit incentive is to recommend the product it is most profitable to sell regardless of who supplies it. Long term profit incentives may better align platform operator and customer incentives as the platform operator may value customer retention over immediate profit. The question then, is whether the platform can provide a credible signal that the customer can believe which, when acted upon, improves customer welfare (when compared to consumer choice based solely on prior information) and improves the profit of the vendor? The answer to this question depends on the preferences of the parties of course, but we suspect that in most cases the answer is “yes.” We demonstrate this important conclusion using a simple version of the signaling game of Crawford and Sobel (1982), adapted to the case at hand.

II. Analysis

Suppose a platform retailer sells a large array of products to a consumer. Furthermore, there are competitors on the platform that also sell substitutes to the products sold by the platform retailer. Let \( x \in [0,1] \) denote the fraction of the large array of products the consumer buys from the platform retailer versus these competitors. Hence, the fraction \((1-x)\) is purchased from the competitors on the platform. Let \( \theta \) represent the optimal fraction of products the consumer should purchase from the platform retailer. We will assume for simplicity the consumer’s utility is quadratic in the deviation from \( \theta \):

\[
U(x, \theta) = -(x - \theta)^2
\]

The consumer lacks information concerning the true characteristics of all the products offered by the competitors and the platform retailer. Hence, absent any signal from the platform retailer, we assume the consumer believes \( \theta \) to be uniformly distributed on the unit interval.\(^9\) The platform retailer knows the true value of \( \theta \) while the customer does not: this assumption reflects the differential information possessed by the platform. Obviously, this is potentially valuable information, and the consumer would wish to know it.

Our analysis highlights the valuable information the platform and its third-party sellers may have which is not as readily available to the consumers. The platform retailer possesses information concerning the true characteristics of the products sold on their platform and possibly on the consumer’s preferences. In other words, the platform retailer is assumed to know the value of \( \theta \). However, the platform retailer is also assumed to make a higher margin on the sale of his own products compared to the fees collected from the sales of competitors using the platform. (This assumption need not be true, of course, but we make it because many critics of

\(^9\) The assumption is for illustrative purposes. Alternative specifications are more complicated but offer no additional insights.
platform search algorithms assume it is true.) The higher margin on its own sales must be balanced against the loss of future platform value due to any misallocation of differentiated goods to consumers. So, we assume a limited bias \((b)\) in the preferences of the platform retailer in favor of a higher percentage own sales compared to the optimum for consumers. The platform retailer’s reward function \((V)\) is quadratic in the deviation from \((\theta + b)\):

\[
V(x, \theta, b) = -(x - (\theta + b))^2
\]

The platform retailer’s optimal own fraction of purchases \((x)\) is thus greater than would be optimal for the consumer. In other words, the platform wants the consumer to buy a greater fraction of its own products than is optimal for the consumer, but the platform does not want the customer buying literally 100% of platform retailer products because such an extreme outcome leads to the customer buying products that are poor matches. That outcome damages platform reputation and traffic. Although our model is a one-shot game, platform sales are not, so some allowance needs to be made for the future consequences of poor customer experiences. The bias parameter \(b\) economically serves this purpose.

Prior to consumer’s selection of the fraction \((x)\) to purchase from the platform retailer, the informed platform retailer is assumed to send a costless signal \((s)\) to the consumer concerning the true value of \(\theta\). If the bias \((b)\) in the preferences of the platform retailer is not too large, then there exists an informative Bayesian Nash equilibrium where the signal \((s)\) provides beneficial information to the rational consumer concerning the optimal purchases. Thus, even though the rational consumer is aware of the platform retailer’s bias, she can acquire valuable information from the signal and act accordingly. A fundamental insight of the analyses of Crawford and Sobel concerns the role of reducing the precision of the signal provided to the consumer. For our purposes, we will let the equilibrium signal take the simple form of a two-state outcome of “low or high” regarding the value of \(\theta\). Accordingly, the platform retailer would signal low \((L)\) if the true \(\theta\) comes in below a certain value, and they would signal high \((H)\) if the true \(\theta\) comes in above a certain value. Hence,

\[
s(\theta) = \begin{cases} L & \text{if } \theta < \theta^* \\ H & \text{if } \theta \geq \theta^* \end{cases}
\]

The consumer’s ex-ante belief concerning \(\theta\) is that \(\theta\) has a simple uniform distribution on the unit interval. Assuming Bayesian rationality of the consumer implies a posterior belief of a uniform distribution on the interval \([0, \theta^*]\) if the consumer receives a low signal \((L)\). Likewise, if the consumer receives a high signal \((H)\) from the platform retailer, then the consumer would have the refined belief that \(\theta\) was uniformly distributed on the interval \([\theta^*, 1]\). The rational consumer’s posterior beliefs are thus characterized by the density functions:
The rational consumer would seek to maximize his expected utility given these posterior beliefs. The consumers would choose the fraction \( x \) to purchase from the platform retailer to solve the following two optimization problems:

\[
\max_x \left\{ \frac{1}{\theta} \int U(x, \theta) f_i d\theta \right\}, \quad \text{where} \quad i = \{L, H\}. \tag{6}
\]

The first-order conditions for these two optimization problems are given by:

\[
\int_0^1 \frac{\partial U}{\partial x} f_i d\theta = 0, \quad \text{where} \quad i = \{L, H\}. \tag{7}
\]

Using the quadratic form of the utility function to find the marginal utility, these conditions become:

\[
\int_0^1 (x^* - \theta) f_i d\theta = 0, \quad \text{where} \quad i = \{L, H\}. \tag{8}
\]

The uniform posterior density functions \( f_i \) imply the following optimal purchase fractions for the consumer:

\[
x^*_L = \frac{1}{2} \theta^* \quad \text{and} \quad x^*_H = \frac{1}{2} \theta^* + \frac{1}{2}. \tag{9}
\]

The rational consumer can refine their beliefs due to the informative signal from the platform retailer and make differential purchases depending on the signal. Notice that if \( \theta^* \) were to be zero, then the platform retailer would always signal high and thus the signal contains no information and the consumer would simply choose one-half based on their ex-ante beliefs. To establish an informative Bayesian Nash equilibrium, we need merely to find a positive \( \theta^* \) where it is optimal for the platform retailer to signal low when the true \( \theta \) is below \( \theta^* \), given the above optimal behavior of the consumer. The following proposition characterizes the equilibrium.

**Proposition 1.** If \( b < \frac{1}{4} \), then \( \theta^* = \frac{1}{2} - 2b \) is an informative equilibrium where \( x^*_L = \frac{1}{4} - b \) and \( x^*_H = \frac{3}{4} - b \).
**Proof.** Suppose \( b < \frac{1}{4} \) and thus \( \theta^* = \frac{1}{2} - 2b > 0 \). If \( 0 < \theta^* \), then \( 2\theta < \frac{1}{2} - 2b + \theta^* \), which implies \( 2(\theta + b) < \frac{1}{4} + \frac{1}{2} \theta^* + \frac{1}{2} \theta^* = x_H^* + x_L^* \). Rearranging yields, \( (\theta + b) - x_L^* < x_H^* - (\theta + b) \). We thus conclude that \( x_L^* \) is closer to \( (\theta + b) \) than \( x_H^* \). Hence, \( V(x_L^*, \theta, b) > V(x_H^*, \theta, b) \) and it is optimal for the platform regulator to signal low when \( \theta < \theta^* \).

Examining the informative equilibrium in the above proposition, it is important to note that the platform retailer does not receive a higher fraction of sales due to the bias. Both \( x_L^* = \frac{1}{4} - b \) and \( x_H^* = \frac{3}{4} - b \) are decreasing in the bias. Thus, the fraction of sales received by the platform retailer declines with an increase in bias for both signals due to the rationality of the consumer. The probability the platform retailer sends the high signal increases with bias. These two effects exactly cancel and the expected share of sales of the platform retailer is independent of bias:

\[
E[x^*] = \theta^* x_L^* + (1 - \theta^*) x_H^* = \frac{1}{2}.
\] (10)

Likewise, the expected fraction of sales of the competitors on the platform would also be independent of the bias given Bayesian rational consumers.

The signal from the (biased) platform retailer in the informative equilibrium provides value to the consumer in that their expected utility would be lower in the absence of the signal. We can calculate the consumer welfare from the ex-ante expected utility:

\[
CW = -\int_0^{\theta^*} (x_L^* - \theta)^2 d\theta - \int_{\theta^*}^{1} (x_H^* - \theta)^2 d\theta.
\] (11)

Inserting the expressions for \( x_L^* \), \( x_H^* \), and evaluating the integrals yields:

\[
CW = \left[ \left( \frac{1}{4} \theta^* - \theta \right)^3 \right]_0^{\theta^*} + \left[ \left( \frac{1}{2} + \frac{1}{2} \theta^* - \theta \right)^3 \right]_{\theta^*}^{1}.
\] (12)

Hence,

\[
CW = -\frac{1}{4} \Delta, \text{ where } \Delta = 1 - 3\theta^* (1 - \theta^*). \] (13)

Complex regulation of the platform retailer resulting in a loss of the informative signal generates the consumer choosing a fraction of 50% for the platform retailer sales based on the (uninformed) ex-ante prior of a uniform distribution on the unit interval. This corresponds to the case of \( \theta^* \) equal to zero in the above expression and consumer welfare would be negative one-quarter. When the platform retailer can signal to the rational consumer (resulting in the informative equilibrium in Proposition 1), \( \theta^* \) is greater than zero, but less than one-half, resulting in a \( \Delta \) less...
than one in the above expression. Hence, consumer welfare would rise above negative one-quarter and the consumer is better off due to the platform retailer’s signal.

In simple terms, this analysis shows that the platform retailer can provide informative signals to consumers which raise the welfare of the consumers compared to the no signal case. This increase in consumer welfare occurs in equilibrium in the absence of any legal requirement.

One would expect the bias of the platform retailer to be significantly smaller than the bias of any traditional retailer as the platform retailer has a positive margin associated with the sales of competitors on the platform. Furthermore, the forward reputation—and thus the value of the platform—is also dependent on quality matching of products with consumers. If the platform retailer’s bias is sufficiently small, then it can also be shown (see Crawford and Sobel (1982)) that signals based on a finer partition of the support space for \( \theta \) can generate informative equilibria with even greater consumer welfare than our simple two-state (high/low) signal. Thus, as discussed in the next section, regulation resulting in the loss of such equilibrium signals could lead to an even greater decline in consumer welfare.

### III. Legislative Efforts to Prohibit Information Signaling

As noted above, our analysis shows that when a platform retailer can provide credible informative signals to consumers, overall welfare can be improved. By extension, our analysis also means that regulation which results in the loss of such equilibrium signals could lead to a decline in consumer welfare. In this section, we review pending legislation which could produce the latter result.

This January, the Senate Judiciary Committee—without the benefit of a legislative hearing—voted to approve S. 2992, the “American Innovation and Choice Online Act” subject to a Manager’s Amendment. As the ostensible purpose of the bill is to impose a non-discrimination standard on platforms to prevent self-preferencing, many of the bill’s provisions are expressly directed towards prohibiting information signaling by covered platforms.

For example, under Section 3(a)(1) of the Manager’s Amendment, it would be illegal for a covered platform to preference its products and services over another business user on the covered platform “in a manner that would materially harm competition.” Similarly, under Section 3(a)(2) of the Manager’s Amendment, it would be illegal for a covered platform to limit the ability of other business users “to compete on the covered platform relative to the products, services, or lines of business of the covered platform operator in a manner that would materially harm competition.”

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10 See Ford and Stern, supra n. 6.
There are two related problems with both provisions regarding the ability of a platform to signal consumers. First, signaling—by definition—is a form of deliberate preference, as a signal purposefully seeks to highlight one product over another. Thus, under these provisions, any form of signaling would be sufficient *prima facie* evidence to trigger an inquiry into a possible violation of the statute. Still, under the language of the bill, the presence of signaling is not in and of itself illegal; the draft bill also requires a showing that the signaling “would materially harm competition.” But as Spiwak (2022) points out, the phrase “would materially harm competition” presents a highly problematic legal standard, for at least two reasons.\(^\text{12}\) First, the phrase “would materially harm competition” is ambiguous. What constitutes “material” and what is a “minimum amount” is highly subjective. Second,

... it is odd that the bill deliberately uses the word “would” to evaluate on-going—rather than future—conduct. If some on-going conduct “would” violate a statute, then a firm could be in violation without any showing of actual harm. Basic due process, at least in the United States, requires an affirmative determination about whether some conduct does or does not violate a statute before the government can mete out punishment. We have a presumption of innocence in this country; we do not have a presumption of guilt.\(^\text{13}\)

Plainly, the American Innovation and Choice Online Act is poorly drafted. The bill’s presumption of guilt is likely to support legal challenges to the legislation.

Next, we have the dispute over the use of data to develop a signal. Common sense would dictate that in order for a signal to be effective, the signal must be derived using accurate data. If the signal is inaccurate, then consumers will get upset and stop using the platform in the future. Section 3(a)(6) of the Manager’s Amendment, however, makes it illegal for a covered platform to use nonpublic data that are obtained from or generated on the covered platform by the activities of a business user or by the interaction of a covered platform user with the products or services of a business user to offer, or support the offering of, the products or services of the covered platform operator that compete or would compete with products or services offered by business users on the covered platform.

Yet, while a covered platform would be prohibited from using non-public data to develop an accurate signal—even if this signal is derived using fair and neutral metrics—Section 3(a)(7) of the Manager’s Amendment forces the covered platform to provide third-party sellers on the platform with these same non-public data, even going so far as to mandate “portability by the

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\(^{12}\) Spiwak, *supra* n. 3.

\(^{13}\) *Id.*
business user to other systems or applications of the data of the business user.” Needless to say, notwithstanding data and privacy security issues, a blanket statutory provision which requires any large retailer to hand over non-public data to any third-party establishes a dangerous precedent for other industries in the American economy.

Third, just to make sure nothing is missed under the sections just highlighted above, the bill also includes a broad catch-all provision in Section 3(a)(9) of the Manager’s Amendment. Under this provision, it would be illegal for any covered platform to “treat the products, services, or lines of business of the covered platform operator more favorably relative to those of another business user than under standards mandating the neutral, fair, and nondiscriminatory treatment of all business users” with regard to “any covered platform user interface, including search or ranking functionality offered by the covered platform...” Again, even if the signal is developed in a fair and neutral manner, because a signal — by definition — is a form of deliberate preference by purposefully seeking to highlight one product over another, this provision also appears to ban all forms of signaling (albeit with an easier legal threshold than provided for in Sections 3(a)(1) and 3(a)(2) discussed above).

Moreover, the sponsors of the bill appear to have left very little wiggle room for covered platforms to avoid liability for signaling consumers. The bill provides only very narrowly tailored affirmative defenses, focusing primarily on consumer safety and privacy.\(^{14}\) Not only are these affirmative defenses incredibly difficult to obtain due to the statutory requirement that the defendant must show that the alleged conduct “would not result in material harm to competition” (see supra), but these affirmative defenses also create a perverse disincentive for firms to protect aggressively their customers’ privacy and data security. Indeed, covered platforms are limited only to conduct that is “narrowly tailored, [that] could not be achieved through less discriminatory means, [is] non-pretextual, and [is] reasonably necessary,”\(^{15}\) but many mechanisms that platforms use to protect their customers are by nature extensive (and, in some cases, even duplicative) in order to anticipate all potential harms and to maintain a secure environment for customers. Telling platforms that the only way they can avoid liability is to engage in the bare minimum to protect customers is a recipe for serious data security and privacy problems.

Finally, conspicuously absent in the entire bill is a reference to the lodestar of antitrust law — the consumer welfare standard.\(^{16}\) This omission means that when evaluating whether a covered platform may have “materially harmed competition,” there is no possibility to conduct a rule of

\(^{14}\) See Manager’s Amendment, supra n. 11, Section 3(b).

\(^{15}\) See id., Section 3(b)(2)(B).

reason analysis to see if any of the alleged harms are outweighed by potential efficiency benefits. Penalties for any violation would be severe. If found guilty, the bill would impose a penalty of up to 15% of total U.S. revenues for the time of the alleged infraction.17 While the ultimate interpretation of the application of this bill, if ever enacted, would rest with the courts, it is probably safe to assume that the broad provisions, coupled with the draconian proposed penalties, would nonetheless have the intended effect of ending the practice of information signaling by retail platforms, and possibly end the practice of allowing third-party sellers to use the platform as the financial risks are too high.18

IV. Conclusion

As Congress continues to debate the American Innovation and Choice Act, our analysis provides some crucial insights for policymakers to evaluate the welfare effects of regulating signals such as search results on platforms where the platform operator may offer its own goods in competition with those of third-party sellers. As we demonstrated in our earlier research, in general a platform operator who sells its own goods on the platform in competition with other vendors offers a less biased assessment to consumers regarding products. And, as we demonstrate in this paper, allowing a retail platform to provide an information signal to consumers can be welfare enhancing, and no legal obligation is necessary to insure this result. Accordingly, because the American Innovation and Choice Act directly targets such welfare-enhancing practices, this bill is likely to do more harm than good.

17 Spiwak, supra n. 3. Thus, for example, for a company such as Amazon that has nearly $1 billion in sales per day, the risks to Amazon are enormous, especially considering the company’s operating margin is only 6%. Data available at: https://finance.yahoo.com/quote/AMZN/financials?p=AMZN.

18 See Spiwak, id., see also Ford, supra n. 3.