A Price Theory of Multi-Sided Platforms: Comment*

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Abstract

Weyl (2010) shows that in multi-sided platform settings, profit maximization leads to classical and Spence distortions, with the Spence distortion providing a new explanation for why prices may sometimes be too high (or too low) on platforms. However, the key formulas Weyl gives comparing privately and socially optimal prices are misstated. Properly interpreted, his results only explain marginal incentives with respect to setting prices and not the total distortion in prices, which can be very different.

One of the most important contributions to the theory of pricing in multi-sided platforms is Weyl (2010). By focusing on a monopoly platform that uses insulating tariffs to avoid a coordination failure, Weyl is able to obtain a number of new results on how platforms set prices. In standard (one-sided) settings, profit maximization by a monopoly firm leads to a classical market power distortion—restricting output to increase price. One of Weyl's key insights is that in multi-sided platform settings, "Profit maximization leads to classical and Spence distortions" (p. 1657).

Profit maximization distorts in the spirit of Spence (1975) by internalizing externalities with respect to marginal users rather than all participating users. In particular, Weyl argues that after adjusting for the classical market power distortion, a monopoly platform will set its price too high on side $\mathcal{I}$ compared to the socially optimal price on side $\mathcal{I}$ when the interaction values of average users is greater than the interaction value of marginal users on side $\mathcal{J}$ of the platform (the Spence distortion). He presents this key result in equation (7) and again for his more general model in equation (11) in Theorem 3. However, equation (7) and equation (11) in Theorem 3 are incorrect.

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These equations come from directly substituting the FOC for the socially optimal price into the FOC for the privately optimal price as if the two FOCs are evaluated at the same allocation, which they are not.

To see this more formally, note Weyl's equation (4) gives the FOC for the socially optimal price, which we reproduce here (we have added a subscript S on the socially optimal price for clarity):

$$P_S^{\mathcal{I}} = \underbrace{C^{\mathcal{I}} + cN^{\mathcal{J}}}_{\textit{marginal private cost}} - \underbrace{\overline{b^{\mathcal{J}}}N^{\mathcal{J}}}_{\textit{external benefit}}. \tag{4}$$

The term $\overline{b^{\mathcal{J}}}$ is the average interaction benefit across *all* participating users on side $\mathcal{J}$. (In the interests of space, the reader is referred to Weyl (2010) for the formal definitions and derivations of the various expressions.) Similarly, Weyl's equation (6) gives the FOC for the privately optimal price, which can be rewritten as:

$$P^{\mathcal{I}} = \underbrace{C^{\mathcal{I}} + cN^{\mathcal{J}}}_{\textit{marginal private cost}} + \underbrace{\frac{P^{\mathcal{I}}}{\epsilon^{\mathcal{I}}}}_{\textit{classical market power distortion}} - \underbrace{\widetilde{b^{\mathcal{J}}}N^{\mathcal{J}}}_{\textit{external benefit}}, \tag{6a}$$

where $\widetilde{b^{\mathcal{J}}}$ is the average interaction benefit across *marginal* users on side $\mathcal{J}$.

Subtracting $\overline{b^{\mathcal{J}}}N^{\mathcal{J}}$ from "marginal private cost" in (6a) and adding it back to the last term on the right-hand side of (6a) gives Weyl's equation (7), which is expressed as a comparison between the privately optimal price and the socially optimal price:

$$P^{\mathcal{I}} = \underbrace{C^{\mathcal{I}} + cN^{\mathcal{J}} - \overline{b^{\mathcal{J}}}N^{\mathcal{J}}}_{\textit{socially optimal price}} + \underbrace{\frac{P^{\mathcal{I}}}{\epsilon^{\mathcal{I}}}}_{\textit{classical market power distortion}} + \underbrace{\left(\overline{b^{\mathcal{J}}} - \widetilde{b^{\mathcal{J}}}\right)N^{\mathcal{J}}}_{\textit{Spence distortion}}. \tag{7}$$

If instead one puts the subscript S on the terms $\overline{b^{\mathcal{J}}}$ and $N^{\mathcal{J}}$ in (4) to reflect that they are evaluated at the socially optimal allocation, the correctly written comparison is actually

$$P^{\mathcal{I}} = \underbrace{C^{\mathcal{I}} + cN_S^{\mathcal{J}} - \overline{b_S^{\mathcal{J}}}N_S^{\mathcal{J}}}_{\textit{socially optimal price}} + \underbrace{\frac{P^{\mathcal{I}}}{\epsilon^{\mathcal{I}}}}_{\textit{classical market power distortion}} + \underbrace{c\left(N^{\mathcal{J}} - N_S^{\mathcal{J}}\right) + \overline{b_S^{\mathcal{J}}}N_S^{\mathcal{J}} - \widetilde{b^{\mathcal{J}}}N^{\mathcal{J}}}_{\textit{additional distortions}}, \tag{7a}$$

where the additional distortions are in general different from the Spence distortion defined by Weyl. The same issue arises in Theorem 3 in the context of a more general version of the model, where Weyl gives an expression for the platform's monopoly price (equation 10) and then writes "or equivalently" and gives the same monopoly price written as the sum of the socially optimal price, the classical market power distortion and the Spence distortion. This is equation (11) in his paper.

It is straightforward to show that the difference in the derivatives of welfare and profit with respect to $N^{\mathcal{I}}$, when evaluated at the same allocation, leads to the expression $\frac{P^{\mathcal{I}}}{\epsilon^{\mathcal{I}}} + \left(\overline{b^{\mathcal{J}}} - \widetilde{b^{\mathcal{J}}}\right)N^{\mathcal{J}}$, i.e., the sum of the classical market power distortion and the Spence distortion. Thus, properly interpreted, Weyl's results compare marginal incentives in setting output rather than a comparison of outcomes (i.e., the total distortion in prices). This is akin to the difference between tests for upward pricing pressure which look only at the incentive for the merged firm to increase prices starting from the pre-merger prices, and a full merger analysis which compares equilibrium prices before and after a merger. The marginal incentives approach has value provided it aligns qualitatively with the outcomes approach.

In Tan and Wright (2018) we explore this issue in the context of Weyl's pricing comparisons above, showing there can be a complete misalignment of the two approaches when it comes to the Spence distortion. To illustrate the point, consider the example used by Weyl, in which it is claimed American Express (AmEx) sets its price too high to merchants in part because loyal cardholders value the participation of merchants more than those indifferent between AmEx and another payment form do. He writes (p.1642) "Given its limited ability to price discriminate, AmEx fails to fully internalize the preferences of loyal users, putting too little effort into attracting merchants and charging them a higher price than would be socially optimal." That is, he links the high price to merchants to the existence of a large Spence distortion. However, as noted above, Weyl's result only implies the marginal incentive is for AmEx to set its price too high to merchants when evaluated at the socially optimal allocation. This reflects that AmEx doesn't take into account that loyal cardholders value additional merchants more than marginal cardholders (i.e., the existence of the Spence distortion). But under monopoly pricing, there will tend be too few cardholders, which means the marginal cardholders' valuations are higher than would be the case in the socially optimal solution. Thus, the fact AmEx focuses on marginal cardholders rather than loyal cardholders in setting fees to merchants may turn out to be second best. Put simply, marginal cardholders facing monopoly prices might have the same valuations as loyal cardholders facing socially optimal prices.

In Tan and Wright (2018) we show this property indeed holds when users are heterogeneous only in their interaction benefits, the setting in which the Spence distortion is largest. Specifically, when interaction benefits are distributed according to the generalized Pareto distribution with log-concave demand, the only distortion explaining the difference between monopoly and socially optimal prices is the classical market power distortion. This suggests that the high merchant fees in the payment industry may not be well explained by a Spence-type distortion.[1] We thus urge caution in following Weyl's advice that "... the novel element in two-sided markets is that regulators should focus most on reducing price opposite a side with a large Spence distortion" (p. 1666).

References

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[1] Rochet and Tirole (2002) and Wright (2012) explain how excessive merchant fees for card payments result from merchant internalization, which itself is due to price coherence. This mechanism is unrelated to the Spence distortion.

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