A NOTE ON THE UNIQUE IMPLICATIONS OF CONSUMER PRICE SENSITIVITY FOR MERGER ASSESSMENT IN CANADA

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Greater consumer price sensitivity is associated with lower merger price effects, all else equal. This is because a merged firm has less of an incentive to raise prices when its customers are more price sensitive. Less appreciated is the fact that greater consumer price sensitivity may lead to higher or lower effects from a merger on total welfare (i.e., deadweight loss), depending on the prevailing market prices and margins, as well as the features of demand. We show that under certain circumstances, the deadweight loss arising from a merger can be an "inverted U-shaped" function of the elasticity of demand, such that the effect of greater consumer price sensitivity on deadweight loss depends on case-specific facts and economic modelling assumptions. This has important implications for merging parties and their counsel putting forth an efficiencies defence: while greater consumer price sensitivity will lead to lower estimates of merger price effects, it may nonetheless result in a higher deadweight loss.

La sensibilité des consommateurs aux prix suit une courbe inverse aux effets d'une fusion sur les prix, toutes choses égales par ailleurs. La raison en est qu'une entreprise issue d'une fusion a moins intérêt à augmenter les prix lorsque sa clientèle y est plus sensible. Fait moins connu : une plus grande sensibilité des consommateurs aux prix peut avoir des effets plus ou moins grands sur le bien-être économique après la fusion d'une entreprise (perte sèche pour l'économie), d'après les prix en vigueur sur le marché et les marges ainsi que les caractéristiques de la demande. Les auteurs démontreront que dans certaines circonstances, la perte sèche pour l'économie découlant d'une fusion peut être une fonction en U inversé de l'élasticité de la demande, de sorte que l'effet d'une plus grande sensibilité des consommateurs aux prix sur la perte sèche pour l'économie dépendra des faits du cas précis et des hypothèses d'établissement de modèle économique. Tout cela a des conséquences importantes pour les parties qui fusionnent, et leurs conseillers juridiques qui recourent à une défense reposant sur les gains d'efficacité : même si la sensibilité accrue des consommateurs aux prix entraînera sans doute une moins forte hausse des prix après une fusion, il est tout de même possible que la perte sèche pour l'économie soit plus grande.

I. Introduction

The price sensitivity of consumers is an important factor in the assessment of merger price effects. Standard models of competition that

economists use to estimate the price effects of mergers most often employ some measure of consumers' price sensitivity. The price elasticity of demand (or simply the "elasticity of demand") is a direct measure of consumer sensitivity, or responsiveness, to price changes. The elasticity of demand is important for estimating merger price and welfare effects because it directly affects the merged firm's evaluation of whether a price increase would be profitable.[2] This is because when the merged firm is setting its profit-maximizing price(s), it must balance the gain from a price increase—which is the increased margin it earns on the sales it retains at the higher price—with the lost margin from customers unwilling to pay the higher price.

This article explains how the elasticity of demand can differentially affect estimated price effects and deadweight loss arising from a merger.[3] In particular, we show that as demand becomes increasingly elastic (inelastic), and holding other parameters constant, price effects *always* decrease (increase), but the effect on deadweight loss could work in *either direction*. This is due to the interaction between (1) the predicted price effect (from the model of competition) and (2) the subsequent calculation of deadweight loss that takes the predicted price effect as an input. For certain supply and demand specifications, as the elasticity of demand increases, deadweight loss can increase over an initial range of demand elasticities, reach a maximum, and then decrease (i.e., take on the form of an "inverted-U").

The elasticity of demand generally factors into a merger effects analysis in Canada in two ways:

1) Through a **price effects analysis**, which answers the question: "how much does the chosen model of competition predict that the market price(s) will rise post-merger?" This analysis can play a key role in the assessment of whether the merger is likely to substantially lessen or prevent competition in a relevant market.

2) Through an **anticompetitive effects analysis**, which generally quantifies the deadweight loss from the merger.[4] This analysis is required if the merging parties put forth an efficiencies defence under section 96 of the *Competition Act* ("Act"), as it quantifies the harm from the merger in the form of the merger's welfare effects against which to compare the efficiencies (the "s. 96 tradeoff"). The price effect from the merger is itself an input into the quantification of deadweight loss.

At higher elasticities of demand, the predicted price effect of the merger will be *smaller*, but the consumers' reactions to any given price increase (in the form of purchasing lower quantities) will be *larger*. This is intuitive:

when consumers are more price sensitive, a merged firm will have a lower incentive to increase price because of the risk of losing customers (resulting in a modest price effect), but even this modest price effect may cause many consumers to forego purchasing the product (leading to a higher output effect and higher deadweight loss). On the other hand, when consumers are less price sensitive, the reverse is true: a merged firm will have a greater incentive to increase price, but the higher price increase may not cause many consumers to forego their purchase.

Thus, it can be important for merging parties and their advisors (including legal counsel and economists) to understand the implications of the elasticity of demand in their specific case. This is especially true because deadweight loss arising from a merger can be an "inverted U-shaped" function of the elasticity of demand, such that higher elasticities may result in higher deadweight loss—despite a smaller price effect.

This article proceeds as follows. Section II explains the concept of elasticity of demand and common assumptions on demand used in merger analysis. Section III shows the effect of the elasticity of demand on merger-induced price effects. Section IV explains the standard economic welfare implications of a merger and shows the effect of the elasticity of demand on post-merger deadweight loss. Section V concludes.

II. Elasticity of Demand

The market elasticity of demand is a quantitative measure of consumers' aggregate responsiveness to a product's price changes. Formally, the price elasticity of demand is defined as the percentage change in total quantity demanded in response to a given percentage change in price. For example, an elasticity of 2 means that a 1% increase in price would be associated with a decrease in the quantity demanded of 2%.[5]

When consumers are relatively sensitive to price changes, demand is said to be "elastic," which means that when faced with a price increase a relatively high proportion of consumers would substitute away from the product(s) in question. On the other hand, when consumers are relatively insensitive to price changes, demand is said to be "inelastic," which means that when faced with a price increase relatively few consumers would substitute away.[6] The elasticity of demand ranges between two extremes: "perfectly elastic" demand, which implies *all* consumers would substitute away from the relevant product(s) when faced with a price increase, no matter how small; and "perfectly inelastic" demand, which implies *no* consumers would substitute away when faced with a price increase, no matter how large. In the middle

between these two extremes is "unitary elastic" demand (an elasticity of 1 in absolute value), where the price effect is equal to the quantity effect (in percentage terms).

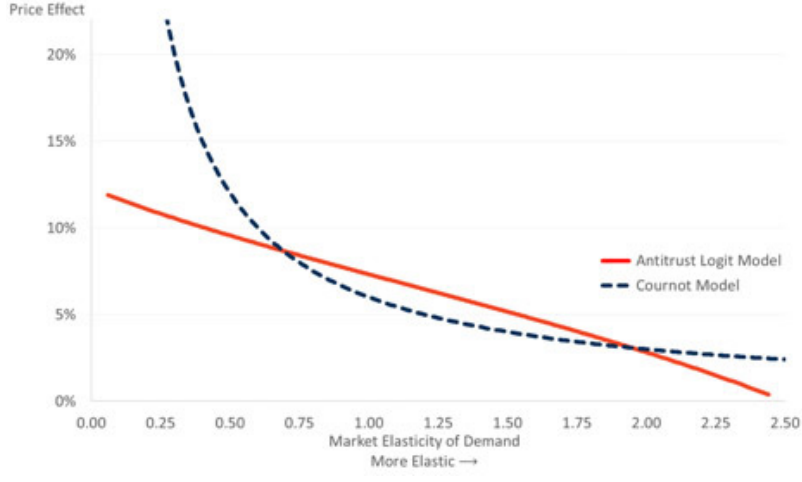
III. Effect of Elasticity of Demand on Merger-Induced Price Increases

Economic theory predicts that a merger between competitors will result in incentives for the merged firm to increase prices post-merger.[7] Prior to the merger, each company's incentive to raise prices is constrained, in part, by the possibility that customers will divert to the other company in the event of a price increase. Post-merger, the potential to recapture diverted sales may make a price increase profitable after the merger that would not have been profitable before the merger, and this causes upward pricing pressure on the merged firms' products.

Models of competition for estimating merger effects find that, all else equal, as demand becomes more elastic, a firm will have less incentive to raise its price. Intuitively, this is because as demand becomes more elastic, customers are more willing to substitute to alternatives outside the product(s) in question in greater number, leaving fewer to be potentially recaptured.

In Figure 1 below, we illustrate the relationship between the elasticity of demand and the equilibrium price increase for a hypothetical industry under two commonly used models of oligopoly competition: the Antitrust Logit Model and the Cournot model.[8] As shown, under both models, more elastic demand unequivocally results in lower price effects, all else equal.[9]

Figure 1: Relationship Between Elasticity of Demand and Price Effect



IV. Effect of Elasticity of Demand on Merger-Induced Deadweight Loss

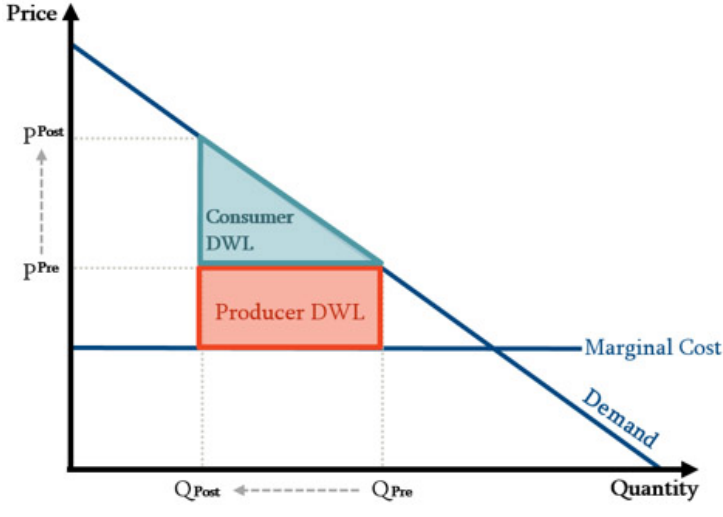
A) Deadweight Loss and Market Elasticity

A merger-induced price increase will generally lead to an allocative inefficiency—also known as deadweight loss—because the price increase will decrease the quantities demanded by consumers and therefore reduce market output.[10] Deadweight loss is generally a combination of loss in consumer surplus and loss in producer surplus.

The consumer deadweight loss ("Consumer DWL") is the lost consumer surplus on sales that would no longer occur at the higher post-merger price. The producer deadweight loss ("Producer DWL") is the lost profits on sales that would no longer occur as a result of the reduced demand following the merger.[11]

As illustrated in Figure 2, the Consumer DWL is the triangle under the market demand curve and above the pre-merger price, given the reduced quantity that stems from the merger-induced price increase. The Producer DWL is the rectangle below the market demand curve and above industry marginal cost, and can be estimated by multiplying the pre-merger price-cost margin by the reduction in sales associated with the higher post-merger price.

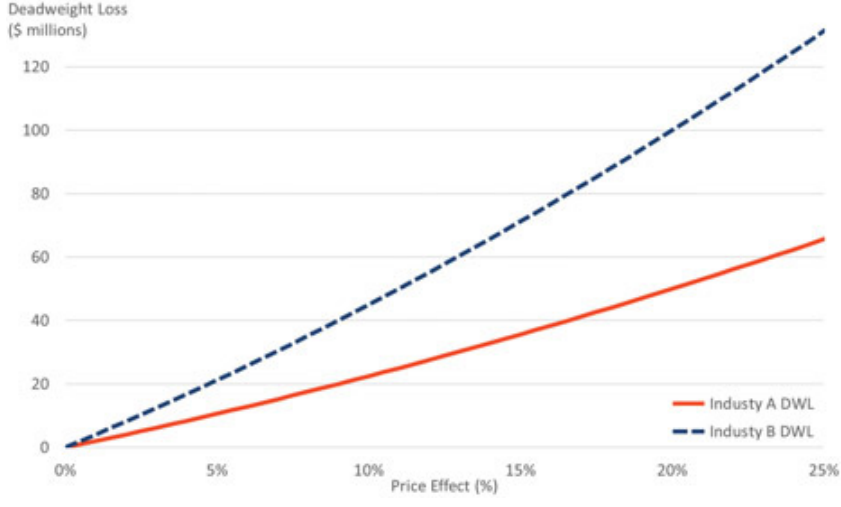
Figure 2: Deadweight Loss from a Merger-Induced Price Increase



The magnitudes of both the Consumer DWL and Producer DWL are affected by the elasticity of demand because they result from the reduced output following the merger-induced price increase.[12]

For given values of the industry parameters (including the elasticity of demand), the deadweight loss from a merger can be expressed as a function of the price increase alone. This allows us to examine how the deadweight loss is affected by the value of these parameters. For example, Industry A (the solid/red line) in Figure 3 reflects a case where the total market size is $1 billion in revenues, the producer margin is 40% and the elasticity of demand is 0.5. In this case, a merger-induced price increase of say 10% would lead to a deadweight loss of $22.5 million. Now consider Industry B (the dashed/blue line) with the same total market size and margin as Industry A, but with a market elasticity of 1 (i.e., twice as elastic). As shown, the greater the elasticity of demand, the greater the deadweight loss at any given merger-induced price increase. For example, the same assumed 10% price increase in Industry B would now be associated with a deadweight loss of $45 million—exactly double what it was in the baseline industry (since we "doubled" the elasticity of demand).

Figure 3: Relationship Between Deadweight Loss and Price Effect



B) Post-Merger Deadweight Loss

The previous section looked at how deadweight loss varies over a range of *given* price effects. We saw that more elastic demand leads to greater deadweight loss at any *given* price increase. However, the price increase is *itself*

dependent on the elasticity of demand. To fully capture how the elasticity of demand affects deadweight loss, we need to understand how elasticity of demand affects the price effect and deadweight loss *together*.

The elasticity of demand affects the magnitude of the deadweight loss from a merger in two opposite ways:

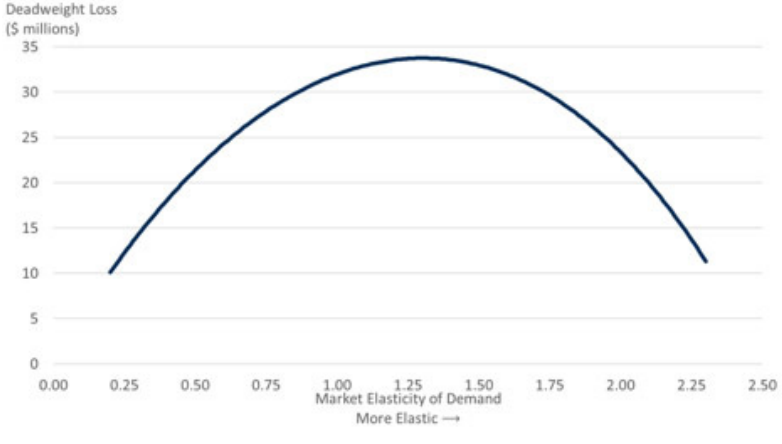
1) Price impact: More elastic demand indirectly *decreases* the deadweight loss from a merger by lowering the merger-induced price effect and thus lowering the output effect of the price increase.

2) Quantity impact: More elastic demand directly *increases* the deadweight loss from a merger through the reduced output associated with a given merger-induced price increase.

Accounting for the fact that the merger-induced price increase depends on the elasticity of demand, these two effects together *may*—under certain assumptions on demand and the mode of competition—result in an inverted U-shaped relationship between the elasticity of demand and deadweight loss.

Figure 4 illustrates this inverted U-shaped relationship between the elasticity of demand and deadweight loss for Industry A with price effects simulated using the Antitrust Logit Model.[13]

Figure 4: Relationship Between Elasticity of Demand and Post-Merger Deadweight Loss



Note: This figure uses inputs of a $1 billion market size, 40% producer margin, merging-party market shares of 40% and 30%, and three remaining competitors with respective market shares of 15%, 10%, and 5%.

Figure 4 shows that as the elasticity of demand increases over a range of inelastic and moderately elastic demand, below 1.3 in this example, deadweight loss also increases.[14] This is because the "quantity impact" on deadweight loss dominates the "price impact" on deadweight loss over this range of demand elasticity. In other words, as demand becomes more elastic: (1) the merger-induced price effect decreases, which indirectly lowers deadweight loss, but this effect is more than offset by (2) the direct increase in deadweight loss from the greater elasticity of demand. Over a range of more elastic demand however, above 1.3 in this example, the opposite is true: as demand becomes more elastic, the indirect "price impact" dominates the direct "quantity impact," and as a result deadweight loss decreases.[15]

As this example illustrates, care must be taken to ensure there is consistency across both the price effects and deadweight loss analyses in terms of the inputs and modeling assumptions. In particular, the elasticity used for the analysis must be consistent with the facts about market shares and producer margins, as all of these are related in equilibrium.[16] In other words, the degree to which the assumed elasticity can vary (e.g., within a reasonable range) is limited if other parameters are to be held constant, as they are in this illustration.

Note that while the inverted U-shaped relationship between the elasticity of demand and the deadweight loss exists in the particular example presented above, the relationship does not always take this form. Under certain alternative assumptions on demand, more elastic demand always leads to lower deadweight loss (i.e., the relationship between the elasticity of demand and the deadweight loss is downward-sloping rather than inverted U-shaped).[17]

V. Conclusion

In this article we have shown that, all else being equal, higher elasticity leads to lower merger–induced price effects, but the direction and magnitude of the corresponding impact on total welfare (deadweight loss) depends on other information and assumptions on demand and supply. In certain circumstances, higher elasticities may result in higher deadweight loss. It is therefore important that merging parties and their advisors fully understand the economic implications of arguments regarding the elasticity of demand, particularly when using a range of elasticity estimates and asserting an efficiencies defence under section 96 of the Act.

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ENDNOTES

[1] Ian Cass is a Senior Associate and Dimitri Dimitropoulos is a Senior Consultant at The Brattle Group in Toronto. The opinions expressed in this article are our own and do not necessarily reflect the views of The Brattle Group or its clients. We would like to thank our many colleagues and the editors at the CCLR who provided feedback on drafts of this article and greatly helped improve it.

[2] All references to the elasticity of demand in this article, unless otherwise indicated, refer to the market elasticity of demand (i.e., the demand across all firms and consumers for the product(s) in question). Market elasticity of demand measures consumer substitution between the product at issue and other goods, and it is this substitution that drives the deadweight loss arising from a given merger-induced price increase. This is distinct from the demand that any individual firm faces. For example, in oligopolistic markets, individual firms will face downward sloping demand curves that are related to—but generally

more elastic—than overall market demand because consumers, in addition to substituting between the product at issue and other goods (reflected by the market demand curve), can also switch between different producers of the product at issue. We note that, while it is ultimately individual firm-level elasticities that drive the price effects of a merger, these will be dependent on the overall market elasticity, as well as the mode of competition under which prices are set. See, for example, Moresi and Zenger (2018) for a detailed technical analysis of the relationship between the market elasticity of demand and firm-level price elasticities.

[3] This issue was the source of a misidentified controversy at the time of the original set of *Superior Propane* decisions. The dissenting Tribunal panelist opposed the decision allowing the merger, partly on the grounds that "an anti-competitive merger would more easily [pass the s. 96 efficiencies tradeoff under a total surplus standard] as the demand for the relevant product becomes less elastic (i.e., less price-sensitive). This perverse result arises from the fact that the calculated deadweight loss is proportional to the elasticity of demand." [*Superior Propane*, 2000 Comp Trib 15, para. 507.] This position was later echoed by the Federal Court of Appeal where it held that "where the demand for particular goods is inelastic, as it is for propane, the goods cannot be substituted as cost-effectively as where the demand is elastic. […] Therefore, a significant price increase will result in a smaller deadweight loss in a product where demand is inelastic than where it is elastic." [*Superior Propane*, 2001 FCA 104, para. 124] This reasoning is incorrect because it ignores the incentives of the merging firm to charge larger price increases as demand becomes more inelastic. Whether the larger price increases would be sufficient to outweigh the smaller output effect at low elasticities and thereby cause a larger deadweight loss depends on case-specific facts and economic modelling assumptions.

[4] The topic of what constitutes the totality of anticompetitive effects from a merger (e.g., whether to include some or all of the wealth transfer from consumers to producers in addition to the deadweight loss) is case-specific and beyond the scope of this article. In this article, we focus on the deadweight loss associated with the (static) loss of allocative efficiency that would result from a merger-induced price increase.

[5] The "law of demand" dictates that demand curves are downward sloping (i.e., consumers purchase lower quantities as prices rise) and the elasticity of demand is therefore a negative number. Nevertheless, with this understanding in mind, demand elasticities are often discussed—including in this article—in absolute value terms (i.e., ignoring the negative sign).

[6] More specifically, consumer demand is said to be "elastic" in cases where the elasticity of demand is greater than 1 in absolute value (i.e., where a 1% increase in price is associated with a more-than 1% percent decrease in quantity demanded). Conversely, consumer demand is said to be "inelastic" in cases where the elasticity of demand is less than 1 in absolute value (i.e., where a 1% increase in price is associated with a less than 1% decrease in quantity demanded).

[7] Variable cost savings may mitigate or offset a merger's upward pricing

pressure. However, in this article, we do not focus on this scenario as we are considering the scenario in which a merger has positive price effects and deadweight loss.

[8] The Antitrust Logit Model is a model of Bertrand price competition between producers of differentiated products. The implicit assumption is that consumers prefer certain "brands" due to their characteristics, and firms price accordingly. The Cournot Model is a model of quantity or capacity competition between producers of a commodity. The assumption underlying the Cournot model is that products are homogeneous, which means that consumers can perfectly substitute between the output of the different competitors in the market, i.e., there is no "brand" preference. The economics literature often refers to price competition as Bertrand competition in deference to mathematician Joseph Bertrand, who (upon reviewing Augustine Cournot's model of competition in terms of quantities) argued that it was more natural for competition to take place in terms of prices. For a technical discussion of these models, see e.g., Davis and Garcés (2009).

[9] In either model, prices will increase following the merger of two competitors. In the Bertrand price-setting case, this is due to the merging parties internalizing the inclination to undercut each other's prices to win out sales. In the Cournot quantity-setting case, it is due to the merging parties rationalizing their quantities/capacities.

[10] Mergers can also have effects on other forms of efficiency, including productive and dynamic efficiency. See, e.g., "Merger Enforcement Guidelines," Competition Bureau, October 6, 2011, ss. 12.14–12.18 and 12.25.

[11] Consumer surplus is an economic measure of consumer welfare based on the difference between what consumers are willing to pay for a good and the price consumers actually pay. Producer surplus is an economic measure of producer welfare based on the difference between the price of the good and what it costs to supply it (i.e., the price-cost margin). In an efficient market, transactions between consumers and producers should occur up to the point where the amount consumers are willing to pay for a marginal unit of the good is equal to the amount it costs to supply that marginal unit. The existence of Producer DWL implies some degree of pre-merger market power such that price exceeds marginal cost. In other words, it represents the surplus from consumers that had already been captured by firms in the industry but is now lost. As noted by Mathewson and Winter (2010, p. 5), "[a]s a consequence of the initial gap between price and marginal cost, the departing consumers are no longer consumers whose value for the product is only marginally above the cost of production. As a result, each of the departing consumers represents the loss of substantial gains to trade."

[12] For example, in the extreme, if output would not change at all following a price increase, there would be no deadweight loss (the price increase would entirely be a wealth transfer from consumers to producers). This would happen if demand was perfectly inelastic such that consumers would demand the same quantity at any price. It could also happen in situations where a single seller bargains with a single buyer over the terms of a contract with a fixed quantity.

[13] In addition to the assumptions of a 40% producer margin and market size

of $1 billion, the example assumes that the merging parties have a combined market share of 70% (40% and 30% pre-merger, respectively) and that there are three remaining competitors with respective market shares of 15%, 10%, and 5%. These assumptions are chosen for illustrative purposes only and do not change the general nature of the relationship shown in Figure 4 (provided, of course, the demand and modelling assumptions remain the same). For a formal discussion of merger simulation models see, e.g., Werden and Froeb (2008).

[14] It is important to note that this threshold of 1.3 is specific to the example presented in this article and cannot be generalized. The threshold, if it exists, would differ on a case-by-case basis.

[15] In this example, elasticities at the "extremes" of near 0 and 2.5 both result in zero or negligible deadweight loss. As the elasticity approaches 0, demand becomes perfectly inelastic, so there is no consumer substitution in response to the price effect (i.e., no output effect and thus no deadweight loss) regardless of the magnitude of the price effect. At an elasticity of 2.5, the equilibrium price effect is so negligible (because consumer substitution makes price any price increases unprofitable) that there is negligible deadweight loss even though consumers would be highly responsive to a price increase.

[16] See Werden and Froeb (2008) and Sheu and Taragin (2012) for a discussion of these relationships between parameters in the context of calibrating merger simulations models. See Grieco, Pinske and Slade (2018) for an application where the price effects and marginal-cost efficiencies from a merger are jointly estimated for purposes of ensuring consistency.

[17] For example, using the same parameter values as our example but estimating price effects under the Cournot model, the equilibrium relationship between the elasticity of demand and deadweight loss is monotonically downward sloping.