# A Rationale for the "Meeting Competition Defense" when Competitive Pressure Varies Across Markets

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12 July 2022

# A Rationale for the "Meeting Competition Defense" when Competitive Pressure Varies Across Markets[1]

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## Abstract

This paper analyzes the economic implications of oligopoly price discrimination when competition pressure varies across markets. We find that a necessary condition for price discrimination to enhance social welfare is satisfied when the number of firms is higher in the strong market compared to the weak market. We also investigate certain economic implications of the Robinson-Patman Act (RPA) associated with "meeting competition defense" (MCD). Using equilibrium models, we find a basic rationale for the MCD: in cases of primary-line injury, when competitive pressure is more pronounced in the strong market relative to the weak market, the use of MCD might allow price discrimination to enhance welfare by boosting consumer surplus in the weak market. This result holds true regardless of whether price discrimination occurs in the final good market or intermediate good market, and it is robust to the nature of competition. We also unravel that these results change drastically under secondary-line injury.

Key words: third-degree price discrimination, Robinson-Patman Act, meeting competition defense, oligopoly, welfare.

JEL: D42, L12, L13.

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[1] Financial support from the Ministerio de Ciencia, Innovación y Universisdades (MCIU): PID2019-106146GB-100, and from the Departamento de Educación, Política Lingüística y Cultura del Gobierno Vasco (IT1367-19) is gratefully acknowledged. We thank Takanori Adachi, Jeanine Miklós-Thal and Ignacio Palacios-Huerta for hepful comments.
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1. **Introduction**

Many, if not most, cases of anti-discrimination litigation are characterized by competitive pressure varying across markets. This paper studies the economic and welfare effects of third-degree price discrimination in such asymmetric competitive environments. Suppose a multi-market seller engages in price discrimination and the Federal Trade Commission (FTC) initiates a case against the discriminating seller. Per Robinson-Patman Act (RPA), it is unlawful "to discriminate in price between different purchases of commodities of like grade and quality." The injury to competition can arise under RPA at any one of three levels (see, for example, Schwartz (1986)): (1) primary-line which entails injury to direct rivals of the discriminating firm; (2) secondary-line which involves harm to buyers competing with favored buyers; and (3) tertiary-line which implies damage to competitors of customers of favored buyers. In this paper, we concentrate on the most prevalently observed primary-line injury and secondary-line injury cases. Section 2(b) of the RPA permits a seller to rebut the prima facie presumption of illegality by demonstrating that its discriminatory price was quoted "in Good Faith to meet (not beat) an equally low price of a competitor" (see, for example, Scherer and Ross (1990)). In this paper, we find a rationale for this meeting competition defense (MCD), particularly in cases of primary-line injury.[4] When MCD allows the discriminating multi-market firm to set a lower price in the market that exhibits a lower competitive pressure, there is a tendency for price discrimination to increase total output and hence social welfare. This defense would serve to correct the inadvertent negative effect of banning price discrimination on social welfare.

[4] The economic analysis of the MCD is also relevant for cases not covered by the RPA. *In American Airlines v. AMR Corp.*, the claim was brought under the standards of Section 2 of the Sherman Act instead of the RPA. American Airlines defended its action using the MCD.

We analyze the implications of the MCD when price discrimination is practiced in the final good and intermediate good markets. Provided that the MCD is contingent on the existence of different competitive pressure across markets, we consider a multi-market firm that sells a (final or intermediate) product in two separate markets, which differ in the degree of competitiveness. When discrimination occurs in the final good market, we consider both price competition and quantity competition. This setting allows us to capture those cases where, under RPA, it might be considered that there exists primary-line injury, to wit: "Primary-line injury occurs when one manufacturer reduces its prices in a specific geographic market and causes injury to its competitors in the same market. When discrimination affects an intermediate good, we consider two cases: (1) price discrimination might induce a primary-line injury; and (2) price discrimination might generate a secondary-line injury which occurs when the favored customers of a supplier are given a price advantage over competing customers so that the injury is at the buyer's level. The RPA applies fundamentally to sales in intermediate good markets (where downstream firms are retailers, for example) and restricts intermediate price discrimination. *Utah Pie Co. v. Continental Baking Co.*[5] and *Brooke Group Ltd. v. Brown & Williamson Tobacco Corp.* are the most commonly studied primary-line cases and *FTC v. Morton Salt Co.* and *Volvo Trucks North America, Inc. v. Reeder-Simco GMC, Inc.* are closely-related secondary-line cases. Therefore, our final good market model should not necessarily be interpreted literally as sales to final buyers but also as a model in which the demand functions are the derived demands of downstream firms. See Viscusi et al. (2018) for an apt example where duPont's patented superstrength synthetic fiber Kevlar is

[5] *Utah Pie Co. v. Continental Baking Co.* is likely the most famous primary-line case. We follow Blair and DePasquale (2014) in the description of this case. Prior to Utah Pie entry into the frozen dessert pie market in Salt Lake City, three multi-market firms (Carnation, Continental Baking and Pet Milk) supplied the market. In 1957, Utah Pie enters the frozen pie market and its strategy of undercutting the rivals' prices proves successful, obtaining a share of 67% in its second year. In 1959 the multi-market sellers respond to Utah Pie by lowering prices, and as a consequence, Utah Pie's share of the market falls down to 34%. Given that Carnation, Continental Baking and Pet Milk charge prices in Salt Lake City below those they charge in other geographic markets, under the RPA, "selling frozen dessert pies in Salt Lake City at prices below those charged in other markets constitutes primary-line price discrimination."

used as an input in undersea cables, the strong market, and tires, the weak market.[6] The economic analysis of MCD in final good markets is also relevant for cases not covered by RPA. As a case in point, in *American Airlines v. AMR Corp.*, the claim was brought under the standards of Section 2 of the Sherman Act instead of RPA because the latter applies merely to the predatory pricing for goods, and FTC specifies that airline flights are services, not goods. American Airlines defended its action using successfully the MCD. Other case involving final good markets and both the Sherman Act and the RPA is *Matsushita Electric Industrial Co., Ltd. v. Zenith Radio Corp*. In this case, several Japanese companies were charged by American competitors with conspiring to fix low television prices in the United States and high prices in Japan with the intention of driving American companies out of business in the United States.

We consider settings where the MCD could be used successfully (in an economic sense) given that the discriminating multi-market firm sets a lower price in a market that exhibits a higher degree of competitiveness.[7] In order to assess RPA and MCD, we consider different models under two alternative scenarios. First, we consider that price discrimination is legal (or possible due to MCD) and thus the multi-market seller can make its pricing/quantity decisions independently across markets. Second, we study the case in which price discrimination is illegal and the multi-market seller has to adjust prices/quantities across markets to satisfy the price uniformity constraint. We obtain the general result that there is a tendency for price discrimination to enhance social welfare if the weak market is the less competitive market. Our results are robust to different kinds of competition (price or quantity competition) and

[6] Alternatively, we might assume that firms are vertically-integrated so that price discrimination in the final good market is equivalent to intermediate price discrimination.

[7] Other possible defense is the cost justification defense which states that a seller who offered a discriminatory price may defeat a RPA claim by establishing that the price difference was justified by “differences in the cost of manufacture, sale, or delivery, resulting from the differing methods or quantities” in which the goods are sold. Proving cost justification is difficult because of the complicated accounting analysis required to establish the defense and thus it is rarely used.

different types of market (final good or intermediate good). We also show that under secondary-line injury, price discrimination in the intermediate good market reduces social welfare and there exists no rationale for the MCD.

The paper is organized as follows. In Section 2, we connect our research to the relevant literature. In Section 3, we consider the effects of price discrimination on social welfare alongside the potential role of the MCD in the final good market. In Section 4, we analyze the economic effects of price discrimination in the intermediate good market. Section 5 presents concluding remarks. All proofs of our primary analyses are deferred to Appendix A. Appendix B goes over the problem of price discrimination in the final good market under price competition. Appendix C extends the analysis of secondary-line injury to allow price competition in the final good market.

## 2. **Literature Review**

In this section, we discuss our paper's connections with three branches of literature: (1) price discrimination in final good markets; (2) price discrimination in intermediate good markets; and (3) the antitrust literature on price discrimination.

A well-known result in the economics of monopolistic third-degree price discrimination in final good markets is that a move from uniform pricing to third-degree price discrimination reduces welfare if the total output does not increase. Pigou (1920) and Robinson (1933) show that if a monopolist faces two independent linear demand curves, price discrimination will not affect output but will reduce welfare. Schmalensee (1981) proves this conjecture assuming non-linear demand curves, perfectly separated markets and constant marginal cost.[8] Varian

[8] We assume that all markets are served under both price regimes, uniform pricing and price discrimination. See, for instance, Hausman and Mackie-Mason (1988) for a model where price discrimination may lead to a Pareto welfare improvement by opening markets.

(1985) extends the result by allowing marginal cost to be constant or increasing, and Schwartz (1990) generalizes it to the case in which marginal cost is decreasing.[9]

We follow the strategy of Varian (1985) of bounding welfare to assess the social desirability of price discrimination in contexts covered by the RPA. After discussing the economic aspects of the RPA, Varian (1989) concludes "Thus, it would seem that an economically sound discussion of whether price discrimination is in the social interest should focus on the output effects." However, when oligopoly price discrimination is considered, although the approach of focusing on the output effects is fine under homogeneous product, it becomes incomplete under product differentiation. Here, we derive a new upper bound that serves to illustrate how price discrimination can enhance social welfare even in contexts where total output decreases.

Much research in the literature has studied third-degree price discrimination in oligopolistic settings. Holmes (1989) studies a discriminating duopoly, with firms producing differentiated products and competing on price. What determines which regime has a larger output is the sum of an adjusted-concavity condition and an elasticity-ratio condition (see Dastidar (2006) for a related extension).[10] Adachi and Matsushima (2014) show that price discrimination can improve social welfare especially if firms' products are substitutes in the market where the discriminatory price is higher and are complements in the market where it is lower; however, it never improves the welfare in the opposite case. The economic effects of oligopoly price discrimination have also been studied considering homogeneous product and quantity

[9] Aguirre et al. (2010) find sufficient conditions for third-degree price discrimination to enhance welfare contingent upon the shape of demand functions. Weyl and Fabinger (2013) elegantly re-interpret results in terms of pass-through. Miklós-Thal and Shaffer (2021a) extend analysis of Weyl and Fabinger (2013) to obtain new results on the output and welfare effects of third-degree price discrimination in monopoly and oligopoly markets.

[10] Corts (1998) shows that price discrimination may intensify competition. Allowing firms to set market-specific prices through discrimination breaks the cross-market profit implications of aggressive price moves that may restrain price competition when firms are limited to uniform pricing. Therefore, firms may price more aggressively in some markets when allowed to discriminate; if firms differ in which markets they target for this aggressive pricing and the competitive reactions are strong, prices in all markets may fall.

competition.[11] Neven and Phlips (1985) show that whenever the price elasticity varies across markets, oligopolists tend to price discriminate exactly in the same way as the discriminating monopolist would. They consider a multimarket Cournot duopoly with homogenous product and conclude that allowing duopolists to discriminate across markets leads to a welfare loss. In their model, demands are linear and the total output is unchanged by price discrimination (see Stole, 2007, for an elegant proof). We also explore the effects of price discrimination both under strategic complements (Bertrand competition with product differentiation) and strategic substitutes (Cournot competition with perfect substitutes). We show that our results are robust to these different types of competition.

Following Varian (1985), we obtain an upper bound on welfare change when the two-market firm moves from uniform pricing to price discrimination. This bound on welfare change provides a necessary condition for price discrimination to increase social welfare. Aguirre (2016) studies the effects of price discrimination in a context where a firm faces competition only in one of its two markets. In order to study the effects of the MCD, he focuses on cases where the multi-market seller states a lower price in the more competitive market and shows that, under linear demand, price discrimination reduces welfare if the duopolistic market is weak, both under price competition and under quantity competition. Yenipazarli (2022) obtains a similar result considering price discrimination in a distribution channel under price competition with product differentiation. This paper generalizes the analysis by considering a multi-market firm selling a product in two oligopolistic markets. We find in this setting a rationale for the MCD.

Over the last decades, price discrimination in input markets has been prevalently studied. Katz (1987) analyzes the welfare effects of price discrimination by an input monopolist that sells to

[11] Stole (2007) notes that "Perhaps the simplest model of imperfect competition and price discrimination is the immediate extension of Cournot's quantity-setting, homogeneous-good game to firms competing in distinct market segments."

many local firms and a chain store. In his model, the downstream firms differ in their capability for backward integration. He finds conditions for price discrimination to reduce total output and welfare. Moreover, he shows that price discrimination is welfare-improving only if inefficient backward integration is prohibited. DeGraba (1990) focuses on how price discrimination by upstream firms affects downstream producers' long-run choice of a production technology. He shows that price discrimination discourages downstream firms' efforts in R&D activities resulting in a reduction in welfare.[12] Inderst and Valletti (2009) consider an input monopolist facing a threat of demand-side substitution and obtain the result opposite of that of Katz (1987), namely that the more efficient downstream firm always receives a price discount from the upstream monopolist. They show that banning price discrimination benefits consumers in the short run but reduces consumer surplus in the long run, which is once again the opposite of what is found without the threat of demand-side substitution.[13] Although all of these papers on input price discrimination by a monopolist in the input market might involve primary-line or secondary-line injury, they do not fit well in the context of this paper because in order to value the role of MCD, we need that the degree of competitiveness, measured by the number of firms, to vary across input markets. Thus, in order to analyze the effects of input price discrimination on social welfare, we need a model of successive oligopolies. We consider a Cournot model with an upstream and a downstream sector.[14] In contexts of primary-line injury, we obtain the result that input price discrimination by a multi-market firm tends to increase social welfare (by increasing total output) when the number of firms is higher in the strong input market than in the weak input market, while the opposite result is obtained when the weak input market exhibits a higher degree of

[12] Yoshida (2000) shows that an increase in the total output of the final good is a sufficient condition for deterioration in welfare as price discrimination reinforces the inefficiency of the downstream production.
[13] Miklós-Thal and Shaffer (2021a) and Miklós-Thal and Shaffer (2021c) extend the analysis to study input price discrimination in a resale market, and analyze the effect of oligopoly price discrimination with endogenous input cost, respectively.
[14] See the seminal work of Salinger (1988); here we follow the version of Belleamme and Peitz (2015).

competitiveness. We also find that under secondary-line injury, input price discrimination reduces social welfare irrespective of the nature of competition in the final good market (Cournot competition with homogeneous product or Bertrand competition with differentiated product).

Finally, there is a vast antitrust literature analyzing the effects of the anti-discriminating RPA. During its almost ninety-year history, this act has been severely criticized in terms that can be hardly compared to any other antitrust statute.[15] Blair and DePasquale (2014) analyze the central prohibitions of the act and explore their competitive implications. They conclude by agreeing with the recommendation of the Antitrust Modernization Commission in its 2007 report: "Congress should repeal the RPA in its entirety." Therefore, it seems that the "Antitrust's Least Glorious Hour" (Bork 1978) is running out. In fact, the number of cases under the RPA has sharply fallen down in the last years. Sokol (2015) examines RPA cases for primary-line and secondary-line claims for structural breaks in enforcement. He analyzes the entire history of RPA cases to determine the likelihood that a court will find a defendant liable under either a primary- or secondary-line RPA claim. He demonstrates that there has been a structural shift in the enforcement of Robinson-Patman. This has resulted in a decline in plaintiff victories for both primary- and secondary-lines cases over time, particularly since *Brooke Group Ltd. v. Brown & Williamson Tobacco Corp*.

The economic implications of the MCD have been deeply studied in the legal literature but, to the best of our knowledge, they remain almost unexplored in the economics literature. This is the contribution of this paper. Using equilibrium models, we find a rationale for the MCD, showing that in cases of primary-line injury when competitive pressure is greater in the strong market than in the weak market, this defense would allow price discrimination in favor of

[15] See, for example, the criticism of Bork (1978) and the perverse effects found by Schwartz (1986) on the occasion of the fiftieth anniversary of the law.

consumers in the weak market which tends to be welfare-increasing. This result holds true both when discrimination occurs in the final good market and when it is used in the intermediate good market, and it is robust to different types of competition. We also find that these results drastically change under secondary-line injury cases.

## 3. **MCD and Price Discrimination in the Final Good Market**

In order to analyze the economic and welfare effects of price discrimination when competitive pressure varies across markets, we consider a stylized model where a multi-market firm sells in two geographically separated markets that differ in the extent of competition. We primarily generalize the test for welfare improvement proposed by Varian (1985) and Varian (1989).

Consider a concave and differentiable aggregate utility function of the form $u(\mathbf{q}_A, \mathbf{q}_B) + y$, where $\mathbf{q}_A$ is the vector of the $n_A$ product varieties supplied in market *A*, $\mathbf{q}_B$ is the vector of the $n_B$ product varieties supplied in market *B* and $y$ is the money to be spent on other goods. The inverse demand functions are $p_j\,(\mathbf{q}_A, \mathbf{q}_B) = \frac{\partial u(\mathbf{q}_A,\mathbf{q}_B)}{\partial q_j}$, for $j = \{1,..,n_A\}$ in market *A*, and $P_k\,(\mathbf{q}_A, \mathbf{q}_B) = \frac{\partial u(\mathbf{q}_A,\mathbf{q}_B)}{\partial q_k}$, for $k = \{1,..,n_B\}$ in market *B*. Suppose that the output configurations, $(\mathbf{q}_A^0, \mathbf{q}_B^0)$ and $(\mathbf{q}_A^1, \mathbf{q}_B^1)$ correspond to uniform pricing and price discrimination, respectively, with concomitant market prices $(\mathbf{p}_A^0, \mathbf{p}_B^0)$ and $(\mathbf{p}_A^1, \mathbf{p}_B^1)$. The concavity of the utility function (equivalently, the downward-sloping demand functions) yields:

$$u(\mathbf{q}_A^1, \mathbf{q}_B^1) \leq u(\mathbf{q}_A^0, \mathbf{q}_B^0) + \sum_{j=1}^{n_A} \frac{\partial u(\mathbf{q}_A^0, \mathbf{q}_B^0)}{\partial q_j} \Delta q_j + \sum_{j=1}^{n_B} \frac{\partial u(\mathbf{q}_A^0, \mathbf{q}_B^0)}{\partial q_k} \Delta q_k. \quad (1)$$

In accordance, the following lemma establishes an upper bound on the change in the social welfare, generalizing the upper bound proposed by Varian (1985).

LEMMA 1. An upper bound on the change in social welfare, stemming from a shift from uniform pricing toward price discrimination, is given by:

$$\text{UB} = \sum_{j=1}^{n_A} (p_j^0 - c)\Delta q_j + \sum_{k=1}^{n_B} (p_k^0 - c)\Delta q_k. \quad (2)$$

The upper bound in LEMMA 1 provides a necessary condition for price discrimination to enhance social welfare, to wit: a positive weighted sum of the increase in each firm output where the weights are the profit margins under uniform pricing. Note that when output is homogeneous across firms, the upper bound in LEMMA 1 simplifies to $(p^0 - c)\left(\sum_{j=1}^{n_A} \Delta q_j + \sum_{k=1}^{n_B} \Delta q_k\right)$, and therefore we obtain the well-known result that an increase in total output is a necessary condition for price discrimination to enhance social welfare.

Now assume that a two-market firm (indexed by *m*) engages in competition with $[n_A - 1]$ firms in market *A* and $[n_B - 1]$ firms in market *B*. Let $p^A$, $p^B$ and $\overline{p}_m$ be the equilibrium prices offered by the two-market firm *m* in markets *A* and *B* under price discrimination and uniform pricing, respectively, such that $p^A > \overline{p}_m > p^B$. For the sake of simplicity, we focus on symmetric equilibria under price discrimination and $p^A$ (respectively, $p^B$) is thereupon the equilibrium price of firms operating merely in market *A* (respectively, market *B*). Denote by $\overline{p}_A$ and $\overline{p}_B$ the equilibrium prices offered by single-market firms under uniform pricing in market *A* and market *B*, respectively. It holds under regularity conditions that $p^A \geq \overline{p}_A \geq \overline{p}_m \geq \overline{p}_B \geq p^B$. Following Robinson (1933), the high-price market (market *A*) is called the strong market and the low-price market (market *B*) is called the weak market. Figure 1 demonstrates a typical primary-line injury case in the final good market under RPA. We consider settings where market *B* is weak and hence where it is satisfied that: (1) price discrimination by the two-market firm harms competitors in market *B* and therefore one firm present in that market (or the FTC) might initiate a case against firm $m$ invoking a violation of the RPA, in particular a primary-line injury; and (2) given that $p^A > p^B$, the two-market seller $m$ might use the MCD arguing that it was acting in Good Faith to meet an equally low price of a competitor.

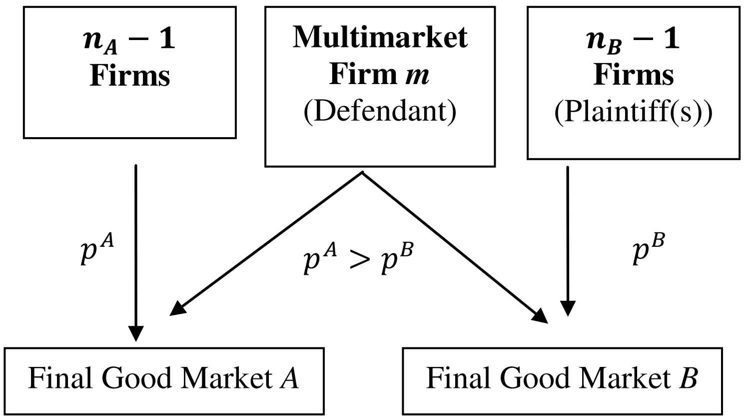


**Figure 1**. Primary-line case in the final good market.

We primarily consider Bertrand competition with product differentiation in each market and subsequently turn our attention to Cournot competition with homogeneous products. We assume throughout the analysis that parameters are such that all firms are non-trivial participants in their respective markets under both price discrimination and uniform pricing policies.

## 3.1. **Price Competition**

Consider a Bertrand oligopoly selling differentiated goods in two geographically separated markets, market $A$ and market $B$. The Shubik-Levitan demand function in market $k \in \{A, B\}$ faced by firm $i = \{1, 2, .., n_k\}$ is given by

$$q_{ik} = \frac{1}{n_k}\left[\alpha_k - p_{ik} - \gamma\left(p_{ik} - \frac{\sum_{j=1}^{n_k} p_{jk}}{n_k}\right)\right], \tag{3}$$

where $\alpha_k > 0$ and $\gamma \in [0, \infty)$ represents the extent of product substitutability in market $k \in \{A, B\}$, assumed to be constant across markets. Each firm incurs a common constant marginal cost, which is normalized to zero to aid exposition.[16]

Under price discrimination, firm $i = \{1, 2, .., n_k\}$ in market $k \in \{A, B\}$ chooses its product price $p_{ik}$ to maximize $\pi_{ik} = p_{ik} q_{ik}$. It is trivial to show that each firm's profit function is (jointly) concave in the respective prices. Then, the resolution of the first order conditions yields the equilibrium prices and attendant quantities as follows:

$$p^k \doteq p_i^k = \frac{\alpha_k n_k}{n_k[2+\gamma] - \gamma};$$

$$q^k \doteq q_i^k = \frac{n_k[1+\gamma] - \gamma}{n_k^2} p_i^k \text{ for } i = \{1, , ., n_k\}, k \in \{A, B\} \quad (4)$$

Note that the two-market firm *m* follows the conventional thinking for third-degree price discrimination in equilibrium: it charges a higher price in the market having lower elasticity of the residual demand (in absolute value). Given that market *A* is the strong market and market *B* is the weak market (by assumption), the necessary condition for the price difference across the two markets, $[p^A - p^B]$, to be strictly positive is:

$$p^A - p^B = \frac{n_A n_B [2+\gamma][\alpha_A - \alpha_B] - [\alpha_A n_A - \alpha_B n_B]\gamma}{[n_A(2+\gamma) - \gamma][n_B(2+\gamma) - \gamma]} > 0$$

$$\Rightarrow \frac{\alpha_A}{\alpha_B} > \frac{n_B[n_A(2+\gamma) - \gamma]}{n_A[n_B(2+\gamma) - \gamma]} \quad (5)$$

Under uniform pricing, the profit of each single-market firm $i = \{1, , ., n_k\}, i \neq m$ in market $k \in \{A, B\}$ is $\pi_{ik} = p_{ik} q_{ik}$, and the profit of the two-market firm *m* is $\pi_m = p_m[q_{mA} + q_{mB}]$. It is trivial to show that each firm's profit function is (jointly) concave in the respective prices.

[16] Adachi (2022) and Chen et al. (2021) analyze the welfare effects of price discrimination in a Bertrand duopoly with differentiated products allowing firms' marginal costs to vary across markets.

Then, the resolution of the first-order conditions of the profit maximization problems yields the equilibrium prices and attendant quantities as follows:

$$\overline{p}_k = \frac{\alpha_k n_k^3[(2+2\gamma)n_{-k}-\gamma][(2+\gamma)n_{-k}-\gamma] - \alpha_k n_k n_{-k}^3 \gamma(2+\gamma)}{\Gamma}$$

$$+\frac{n_k^2 n_{-k}[2\alpha_{-k} n_{-k}\gamma(1+\gamma) + 2\alpha_k n_{-k}^2(1+\gamma)(2+\gamma) - \alpha_{-k}\gamma^2]}{\Gamma}, \;\; k \in \{A,B\} \qquad (6)$$

$$\overline{p}_m = \frac{\alpha_A n_A n_B^3[(2+2\gamma)n_A - \gamma] + \alpha_B n_A^3 n_B[(2+2\gamma)n_B - \gamma]}{\Gamma}, \qquad (7)$$

$$\overline{q}_k = \frac{[(1+\gamma)n_k - \gamma]}{n_k^2}\overline{p}_k, \qquad (8)$$

$$\overline{q}_m \doteq \overline{q}_m^A + \overline{q}_m^B = \left[\frac{(1+\gamma)n_A - \gamma}{n_A^2} + \frac{(1+\gamma)n_B - \gamma}{n_B^2}\right]\overline{p}_m, \qquad (9)$$

where $\overline{p}^k \doteq \overline{p}_i^k$, $\overline{q}^k \doteq \overline{q}_i^k$ for $i = \{1,,.,n_k\}$, $i \neq m$ and $k \in \{A,B\}$, and $\Gamma = (2+\gamma)\{n_B^3[(2+\gamma)n_A - \gamma][(2+2\gamma)n_A - \gamma] + n_A^3[(2+\gamma)n_B - \gamma][(2+2\gamma)n_B - \gamma]\}$.

As expected, under uniform pricing, the two-market firm *m* chooses a uniform price which is a weighted average of the product prices charged in markets *A* and *B* under discriminatory pricing: $\overline{p}_m = wp^A + (1-w)p^B$, where

$$w = \frac{n_B^3[(2+\gamma)n_A - \gamma][(2+2\gamma)n_A - \gamma]}{\Gamma} \in (0,1). \qquad (10)$$

Since $w \in (0,1)$, the uniform price charged by the two-market firm *m* is always bounded by the market-specific prices it charges under discriminatory pricing, viz., $p^A > \overline{p}_m > p^B$ (given that market *A* is the strong market and market *B* is the weak market). This averaging by the two-market firm puts a downward pressure on prices charged by single-market firms in strong market A whereby $\overline{p}_i^A < p_i^A$, for $i = \{1,,.,n_A\}, i \neq m$. In contrast, it allows single-market firms in the weak market B to raise their product prices and hence $\overline{p}_i^B > p_i^B$, for $i = \{1,,.,n_B\}, i \neq m$. Note also that $w = \frac{1}{2}$ when both $n_A \to 1$ and $n_B \to 1$, meaning that when the two-market firm does not face any rivals in markets *A* and *B*, its uniform price simply equals the average of its product prices tailored to each market under discriminatory pricing.

A movement from uniform pricing to price discrimination has implications for equilibrium quantities supplied by single-market firms and the two-market firm in markets *A* and *B*. Specifically, the two-market firm *m* supplies smaller (respectively, greater) quantities in the strong market *A* (respectively, weak market *B*) as a consequence of price discrimination: $\overline{q}_m^A > q^A$ and $\overline{q}_m^B < q^B$. In stark contrast, the single-market firms in market *A* (respectively, market *B*) supply greater (respectively, smaller) quantities: $\overline{q}_i^A < q_i^A$ for $i = \{1,,.,n_A\}$, $i \neq m$ and $\overline{q}_i^B > q_i^B$ for $i = \{1,,.,n_B\}$, $i \neq m$. As the next lemma illustrates, the impact of third-degree price discrimination on the total quantity supplied across the two markets hinges upon the degree of competitiveness exhibited by market *B* relative to market *A*.

LEMMA 2. *Effect of price discrimination on total output*

*(a) If competitive pressure is greater in the strong market, $n_A > n_B$, then price discrimination increases total output;*

*(b) If competitive pressure is equal across markets, $n_A = n_B$, then price discrimination maintains total output unchanged; and*

*(c) If competitive pressure is greater in the weak market, $n_A < n_B$, then price discrimination increases total output.*

Given the crucial effect of differences in competitive pressure across markets on total output, the following proposition summarizes the welfare implications of third-price discrimination.

PROPOSITION 1. *Given* $\alpha_k > 0$ *and* $n_k \geq 1$ *for* $k \in \{A, B\}$, *and* $\gamma \in [0, \infty)$*:*

*(a) If competitive pressure in the strong market is greater than or equal to that in the weak market,* $n_A \geq n_B$*, then the necessary condition for price discrimination to enhance total welfare is satisfied; and*

*(b) The upper bound on the welfare change may be positive even when price discrimination reduces total output.* [17]

By part (a) of PROPOSITION 1, when competitive pressure is less pronounced in the weak market $B$ (vis-á-vis its strong counterpart $A$), the discriminatory pricing practice of the firm operating in both markets harms localized competitors therein. This, in turn, is apt to enhance the total welfare. At this juncture, the MCD could serve to negate the inadvertent negative effects of banning two-market firm's price discrimination so as to enhance the total welfare when discriminatory pricing is in favor of the weak market characterized by less competitive pressure. This pinpoints a rationale for the use of MCD successfully. Part (b) of PROPOSITION 1 reveals that an increase in total quantity supplied across two markets is not a necessary condition for price discrimination to enhance total welfare.[18] For instance, suppose $n_A < n_B$ and $\alpha_A > \alpha_B$. This ensures that market $A$ (respectively, market $B$) is the strong market (respectively, weak market) and the total quantity supplied across two markets decreases with the transition from uniform pricing to price discrimination.

[17] The critical theme of our paper continues unabated when we draw our analysis on the Spence-Dixit-Vives demand specification rather than the Shubik-Levitan demand specification. The reader is referred to Appendix B for a description of both demand specifications and a sketch of the proof on how results in PROPOSITION 1 also hold under the Spence-Dixit-Vives demand approach.

[18] This result that an increase in total output is not a necessary condition for price discrimination to increase social welfare holds both under the Spence-Dixit-Vives alternative demand specification and under quantity competition. This result appears under product differentiation when competitive pressure varies between markets. In the literature on oligopoly price discrimination, this effect has gone unnoticed because symmetric models with the same firms selling in the same markets are considered (see, for example, Holmes, 1989).

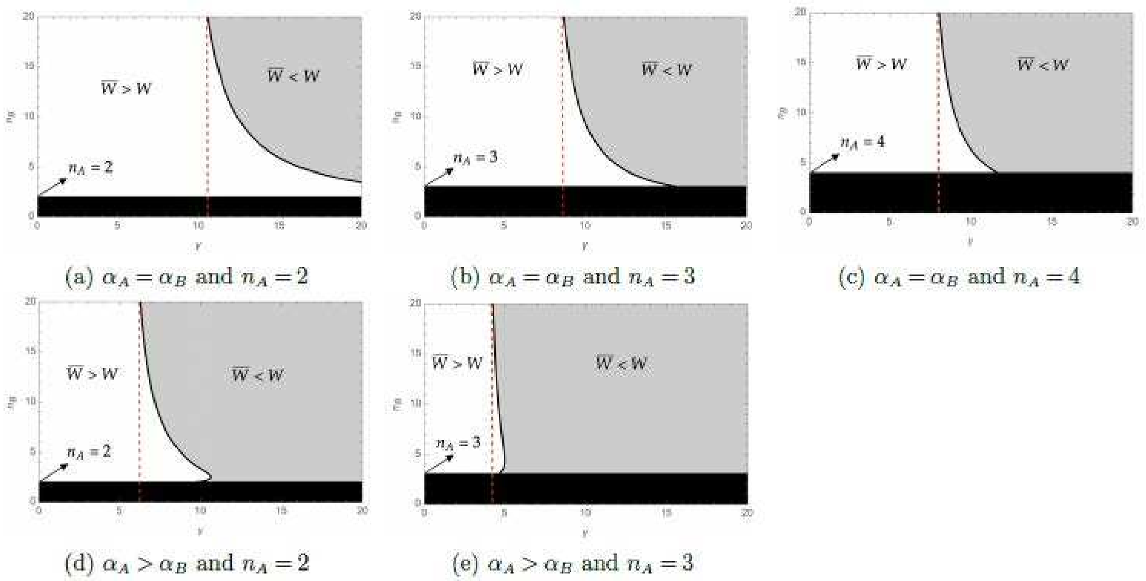


**Figure 2**. Comparison of social welfare obtained under discriminatory pricing ($W$) and uniform pricing ($\overline{W}$) when competitive pressure is greater in the weak market, $n_B > n_A$.

Figure 2 depicts the fact that even though the total quantity is smaller, the total welfare can be higher under discriminatory pricing relative to uniform pricing (in the shaded regions), unless the extent of product substitutability $\gamma$ is quite small. As can be seen, the shaded region where discriminatory pricing dominates uniform pricing (with respect to the total welfare) expands as the strong market $A$ exhibits a higher demand potential and/or a higher degree of competitiveness than the weak market $B$.

### 3.2. **Quantity Competition**

Under Cournot-type quantity competition, the inverse demand function in market $k \in \{A, B\}$ is given by $p_k(Q_k) = \alpha_k - \beta_k Q_k$, where $\alpha_k > 0, \beta_k > 0$ and $Q_k$ is the total quantity supplied in market $k$. Each firm incurs a common constant marginal cost, which is normalized to zero to aid exposition.

Under price discrimination, firm $i \in \{1, .., n_k\}$ in market $k \in \{A, B\}$ chooses its output to maximize its profit $\pi_{ik} = p_k(Q_k) q_{ik}$. It is trivial to show that each firm's profit function is (jointly) concave in the respective quantities. Then, the resolution of the first-order conditions yields the equilibrium quantities, each market total output and concomitant prices as follows:

$$q^k \doteq q_i^k = \frac{\alpha_k}{\beta_k[n_k+1]};\ Q^k = \frac{n_k\alpha_k}{\beta_k[n_k+1]};$$

$$p^k = \frac{\alpha_k}{n_k+1} \text{ for } i = \{1,,.,n_k\}, k \in \{A,B\}. \qquad (11)$$

Given that market *A* is the strong market and market *B* is the weak one (by assumption), the necessary condition for the price difference, $[p^A - p^B]$, to be strictly positive is:

$$p^A - p^B = \frac{\alpha_A[n_B+1] - \alpha_B[n_A+1]}{[n_A+1][n_B+1]} > 0 \Rightarrow \frac{\alpha_A}{\alpha_B} > \frac{n_B+1}{n_A+1}. \qquad (12)$$

Under uniform pricing, the profit function of the multimarket firm *m* is $\overline{\pi}_m = p_A(Q_A)q_{mA} + p_B(Q_B)q_{mB}$. Under uniform pricing, the two-market seller has to adjust its output across markets in order to satisfy $p_A(Q_A) = p_B(Q_B)$; that is, $\alpha_A - \beta_A Q_A = \alpha_B - \beta_B Q_B \Leftrightarrow q_{mB} = \frac{\alpha_B - \alpha_A + \beta_A Q_A}{\beta_B} - Q_{B-m}$. Therefore, the profit function of the two-market seller under uniform pricing becomes $\overline{\pi}_m = (\alpha_A - \beta_A Q_A)[q_{mA} + \frac{\alpha_B - \alpha_A + \beta_A Q_A}{\beta_B} - Q_{-mB}]$. If we aggregate the first order conditions of the single-market firms in market $k \in \{A,B\}$, we get $[n_k - 1][\alpha_k - \beta_k \overline{Q}^k] - \overline{Q}^k_{-m} = 0$. The resolution of that condition and the first order condition for the two-market seller yields the total output in market *k* as follows:

$$\overline{Q}^k = \frac{\alpha_k\beta_k n_{-k} - \alpha_{-k}\beta_k + \alpha_k\beta_k - \alpha_k\beta_{-k}n_k}{\beta_k\beta_{-k}[n_k+1] + \beta_k^2[n_{-k}+1]}, k \in \{A,B\}. \qquad (13)$$

The following proposition summarizes the welfare implications of price discrimination under Cournot competition.

PROPOSITION 2. *Given* $\alpha_k > 0, \beta_k > 0$ *and* $n_k \geq 1$ *for* $k \in \{A, B\}$*:*

*(a) If competitive pressure in the weak market is greater than or equal to that in the strong market,* $n_B \geq n_A$*, then price discrimination reduces social welfare; and*

*(b) If competitive pressure is greater in the strong market than in the weak market,* $n_A > n_B$*, the necessary condition for price discrimination to enhance social welfare is satisfied.*

From part (a) of PROPOSITION 2, when competitive pressure is greater in the weak market than in the strong one, price discrimination simultaneously harms competitors in the weak market and reduces social welfare. Up to this point, the RPA would run properly. But here is where the MCD applies: this defense allows to price discriminate with the end of meeting an equally low price of a competitor. The consequence would be that the MCD might be successfully used precisely when price discrimination reduces social welfare. From part (b), when competitive pressure greater in the strong market than in the weak market, price discrimination simultaneously harms competitors in the weak market and there is a tendency for price discrimination to raise social welfare. In this point the MCD would allow to correct the undesirable effects on social welfare of banning price discrimination on the basis of the RPA. This defense when allows to price discriminate in favor of the weak market consumers tends to be welfare improving when the weak market exhibits less competitive pressure. Thus, we have found a rationale for the MCD that is robust to different types of competition.

## 4. **MCD and Price Discrimination in the Intermediate Goods Market**

The fact that competitive pressure varies across markets is a common feature in most cases of anti-discrimination litigation. To analyze the implications of price discrimination in the intermediate good market, we consider two cases: (1) primary-line injury case where a firm causes harm to a competitor by using discriminatory pricing; and (2) secondary-line injury case where favored customers of a supplier are given an input price advantage over competing customers.

### 4.1. **Primary-line Injury in the Input Market**

We consider a Cournot industry with an upstream and a downstream sector.[19] A multi-market upstream firm (indexed by $mU$) produces a homogeneous intermediate good at a constant marginal cost $c > 0$, and sells it in two monopolized downstream markets: market $A$ and market $B$. There are other $n_A - 1$ additional firms supplying the intermediate good in market $A$ and $n_B - 1$ additional firms supplying the intermediate good in market $B$. In the downstream sector, the intermediate good is an input and firms transform one unit of input into one unit of a final good at a constant marginal cost. Marginal costs in the downstream sector are normalized to zero. The inverse demand for the final good in market $k$ is $p_k(Q_k) = \alpha_k - \beta_k Q_k$, for $k \in \{A, B\}$, and we assume that each market is monopolized by firm $k \in \{A, B\}$. Figure 3 demonstrates a typical primary-line case in the intermediate good market.

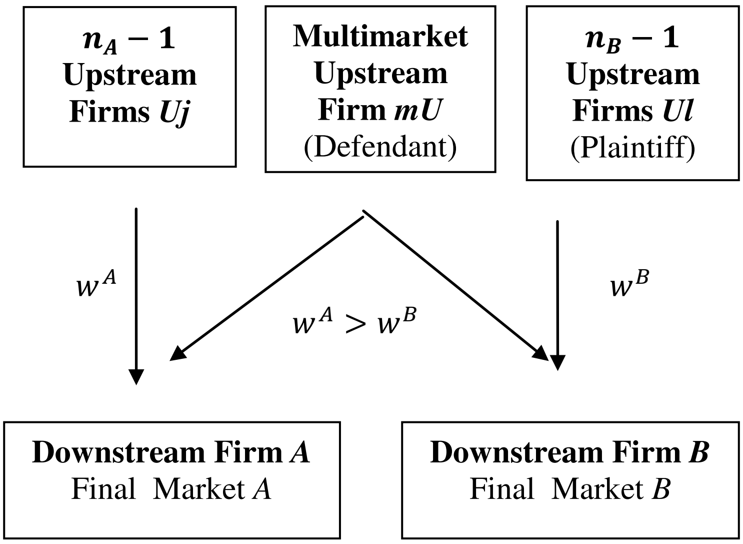


**Figure 3**. Primary-line case in the intermediate good market.

[19] In order to maintain the analysis as simple as possible, we follow the treatment of vertical relationships according to Chapter 17 of Belleflamme and Peitz (2015).

We model the problem as a two-stage game and then solve it by backward induction (so the equilibrium concept is subgame perfect equilibrium). At the first stage, upstream firms set upstream quantities simultaneously (firm $mU$ decides how much input to supply in market *A* and *B*, and each firm *Uj* decides how much input to sell in market *A* and each firm *Uk* decides how much input to sell in market *B*). The market clearing input prices (from the point of view of downstream firms), denoted by $w_k, k \in \{A, B\}$, are determined by equalizing the total amount of input supplied by the upstream firms in each market with the demand of the downstream firms. At the second stage, the monopolistic firm in each final good market chooses its quantity. The downstream firms are assumed not to have market power in the upstream sector; i.e., they take $w_k$ as given.[20] Therefore, the profit function of the monopolistic firm in market $k \in \{A, B\}$ is $\pi_k(Q_k) = [p_k(Q_k) - w_k]Q_k = (\alpha_k - \beta_k q_k - w_k)Q_k$. The monopolistic retail quantity and price in market $k \in \{A, B\}$ are obtained as a function of $w_k$ as follows:

$$Q_k(w_k) = \frac{\alpha_k - w_k}{2\beta_k} \text{ and } p_k(w_k) = \frac{\alpha_k + w_k}{2}. \tag{14}$$

The inverse demand for the intermediate good in market $k \in \{A, B\}$ is defined accordingly as $w_k(x_k) = \alpha_k - 2\beta_k x_k$, given that in equilibrium $x_k = Q_k$.

Under price discrimination, the profit function of the two-market upstream firm in markets *A* and *B* are $\pi_{mU}^A(x_{mU}^A, x_{-mU}^A) = (\alpha_A - 2\beta_A x_{mU}^A - 2\beta_A x_{-mU}^A - c)x_{mU}^A$ and $\pi_{mU}^B(x_{mU}^B, x_{-mU}^B) = (\alpha_B - 2\beta_B x_{mU}^B - 2\beta_B x_{-mU}^B - c)x_{mU}^B$ under price discrimination in the intermediate good markets. The profit function of the upstream firm *Uj* in the input market *A* is $\pi_{Uj}^A(x_{Uj}^A, x_{-Uj}^A) = [\alpha_A - 2\beta_A(x_{Uj}^A + x_{-Uj}^A) - c]x_{Uj}^A$, for $j = 1, .., n_A - 1$, and the profit function of the upstream firm *Ul* in the input market *B* is $\pi_{Ul}^B(x_{Ul}^B, x_{-Ul}^B) = [\alpha_B -$

[20] See, for instance, Belleflamme and Peitz (2015), footnote #102, for a nice justification of this assumption.

$2\beta_B(x_{Ul}^B + x_{-Ul}^B) - c]x_{Ul}^B$, for $l = 1,..,n_B - 1$. The equilibrium wholesale price, quantity and price for the final good in market $k \in \{A, B\}$ are given by:

$$w^k = \frac{\alpha_k + n_k c}{(n_k + 1)}, x^k = Q^k = \frac{n_k(\alpha_k - c)}{2(n_k + 1)\beta_k}, \text{and } p^k = \frac{(n_k + 2)\alpha_k + n_k c}{2(n_k + 1)}, \tag{15}$$

For the sake of definiteness, suppose the upstream market *A* (respectively, market *B*) is the strong (respectively, weak) market. Therefore, we assume that the parameters are such that the wholesale price difference is strictly positive: $w^A - w^B = \frac{\alpha_A(n_B+1) - \alpha_B(n_A+1) + (n_A - n_B)c}{(n_A+1)(n_B+1)} > 0$.

Under uniform pricing, the two-market upstream firm has to charge a uniform price and therefore $w_A(x_A) = \alpha_A - 2\beta_A x_{mU}^A - 2\beta_A x_{-mU}^A = \alpha_B - 2\beta_B x_{mU}^B - 2\beta_B x_{-mU}^B = w_B(x_B)$ must hold. In other words, the two-market upstream firm must adjust its sales in market *A* to satisfy the following constraint: $x_{mU}^A = \frac{\alpha_A - \alpha_B + 2\beta_B(x_{mU}^B + x_{-mU}^B)}{\beta_A} + x_{-mU}^A$. Accordingly, we can express the profit function of the two-market seller as $\pi_{mU} = [\alpha_B - 2\beta_B x_{mU}^B - 2\beta_B x_{-mU}^B - c]\left(\frac{\alpha_A - \alpha_B + 2\beta_B(x_{mU}^B + x_{-mU}^B)}{\beta_A} + x_{-mU}^A + x_{mU}^B\right)$. The uniform wholesale price and the equilibrium quantity in market $k \in \{A, B\}$ are given by

$$\overline{w} = \frac{\alpha_A\beta_A + \alpha_B\beta_A + (\beta_A n_B + \beta_B n_A)c}{[(n_B + 1)\beta_A + (n_A + 1)\beta_B]}, \tag{16}$$

$$\overline{x}^k = \overline{Q}^k = \frac{\alpha_k\beta_k(n_{-k} + 1) + \alpha_k\beta_{-k}n_k - \alpha_{-k}\beta_k - (\beta_k n_{-k} + \beta_{-k}n_k)c}{2[(n_{-k} + 1)\beta_k + (n_k + 1)\beta_{-k}]\beta_k}. \tag{17}$$

Comparing the total quantities supplied under price discrimination and uniform pricing, we obtain that the change in total quantity due to a move from uniform pricing to third-degree price discrimination by the two-market firm is

$$\Delta Q = \Delta x = \frac{(n_A - n_B)\,[w^A - w^B]}{2[(n_B + 1)\beta_A + (n_A + 1)\beta_B]}. \tag{18}$$

In order to study the potential effects of the RPA in the intermediate goods market, we focus our analysis on the contexts where $w^A > w^B$, as in the situation represented in Figure 3. This setting satisfies: (1) price discrimination by the two-market upstream firm harms competitors in input market *B* and thus one (or more) firm(s) in this market (or the FTC) might initiate a case against firm *mU* alleging a violation of the RPA, in particular invoking a primary line injury; and 2) given that $w^A > w^B$, the two-market upstream firm might use the MCD arguing that it was acting in Good Faith to meet (nor to beat) an equally low price of a competitor.

The following proposition states the effect of input price discrimination on social welfare.

PROPOSITION 3. *Given* $\alpha_k > 0, \beta_k > 0$ *and* $n_k \geq 1$ *for* $k \in \{A, B\}$*:*

*(a) If competitive pressure is greater in the strong market,* $n_A > n_B$*, then a necessary condition for price discrimination to increase social welfare is satisfied; and*

*(b) If competitive pressure is greater (or equal) in the weak market,* $n_A \leq n_B$*, then social welfare decreases with input price discrimination.*

Part (a) of PROPOSITION 3 shows that if competitive pressure is greater in the strong market, $n_A > n_B$, the MCD might be successfully used when input price discrimination tends to increase social welfare. This rationale for the MCD in the intermediate good market is similar to that found in the final goods market. By part (b), if competitive pressure is greater (or equal) in the weak market, $n_A \leq n_B$, the MCD might be successfully used precisely when price discrimination reduces social welfare.

4.2. **Secondary-line Injury in the Intermediate Good Market**

Assume again a Cournot industry with an upstream and a downstream sector. Consider a two-market upstream firm, indexed by *mU*, producing a homogeneous intermediate good at a constant marginal cost $c > 0$ and selling it in two upstream markets: market $A$ and market $B$. There are $n_A$ firms serving the intermediate good market $A$ and $n_B$ firms serving the intermediate good market $B$. In each input market, firms are engaged in Cournot competition. In the downstream market, two firms, firm 1 and firm 2, produce a homogeneous product and compete under Cournot rules.[21] In this final good market, the intermediate good is an input and firms transform one unit of input into one unit of a final good at a constant marginal cost. Firm 1 buys the input in market $A$ whereas firm $B$ purchases it in the input market 2. Figure 4 represents this situation in which one competitor in the final good market has access to a more competitive input market than the other competitor. Marginal costs in the downstream sector are normalized to zero. Inverse demand for the final good is $p(q) = \alpha - \beta Q$.

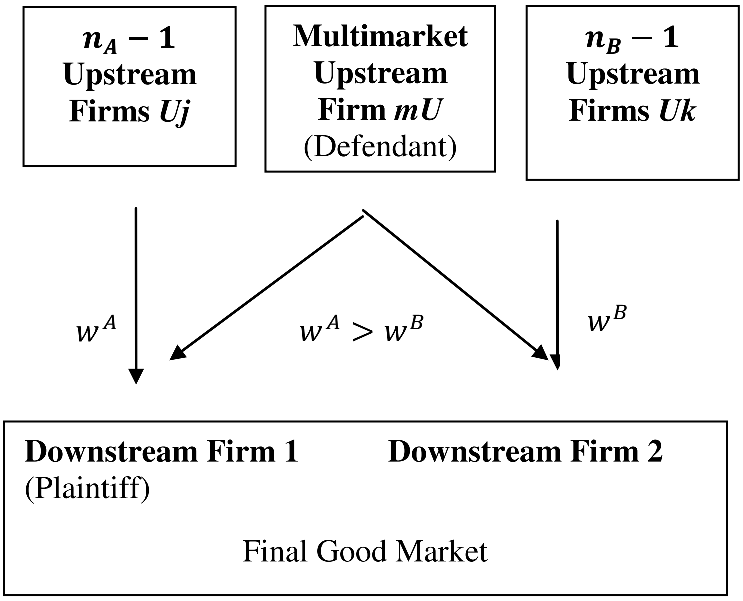


**Figure 4**. Secondary-line case in the intermediate good market.

[21] The reader is referred to Appendix C for the analysis of secondary-line injury case in the intermediate good market under price competition in the final good market.

We model the problem as a two-stage game and solve it by backward induction (with subgame perfect equilibrium as the equilibrium concept). At the first stage, upstream firms set upstream quantities simultaneously: firm $mU$ decides how much input to sell to firm 1 and firm 2, and firm $Uj$, $j = 1,..,n_A - 1$, decides how much input to sell to firm 1 and firm $Ul, l = 1,..,n_B - 1$, decides how much input to sell to firm 2. The market clearing input prices, denoted by $w_k, k \in \{A, B\}$, are determined by equalizing the total amount of input supplied by the upstream firms in each market with the demand of the downstream firms. At the second stage, firms 1 and 2 choose their output simultaneously in the final good market. To simplify notation, we identify each firm in the final good market with the input market that serves it. From now on, we refer to firm 1 and firm 2 as firm *A* and firm *B*, respectively. Downstream firms are assumed not to have market power in the upstream sector and take $w_k$ as given. Accordingly, the profit function of the duopolistic firm $k \in \{A, B\}$ is $\pi_k(q_A, q_B) = [p(q_A + q_B) - w_k]q_k$. The equilibrium outputs are given by:

$$Q^k(w_k, w_{-k}) = \frac{\alpha - 2w_k + w_{-k}}{3\beta}, k = A, B. \tag{19}$$

The equilibrium total output and the equilibrium price are, respectively:

$$Q(w_A, w_B) = \frac{2\alpha - w_A - w_B}{3\beta}, \text{and} \quad p(w_A, w_B) = \frac{\alpha + w_A + w_B}{3}. \tag{20}$$

Firm *A* buys the intermediate product in the intermediate market *A* that is supplied by the two-market upstream firm $mU$ and $n_A - 1$ single-market upstream firms. Condition (19) defines the inverse demand for the intermediate good in market *A*, $w_A = \alpha - 2\beta(x_{mU}^A + x_{-mU}^A) - \beta(x_{mU}^B + x_{-mU}^B)$ given that in equilibrium $Q^A = (x_{mU}^A + x_{-mU}^A)$ and $Q^B = (x_{mU}^B + x_{-mU}^B)$. Likewise, from condition (19) we also obtain the inverse demand for the intermediate good in market *B*, $w_B = \alpha - 2\beta(x_{mU}^B + x_{-mU}^B) - \beta(x_{mU}^A + x_{-mU}^A)$ given that in equilibrium $Q^A =$

$(x^A_{mU} + x^A_{-mU})$ and $Q^B = (x^B_{mU} + x^B_{-mU})$. The profit function of the two-market upstream firm under price discrimination in the intermediate good market is $\pi_{mU}(x^A_{mU}, x^A_{-mU}, x^B_{mU}, x^B_{-mU}) = [\alpha - 2\beta(x^A_{mU} + x^A_{-mU}) - \beta(x^B_{mU} + x^B_{-mU}) - c]x^A_{mU} + [\alpha - 2\beta(x^B_{mU} + x^B_{-mU}) - \beta(x^A_{mU} + x^A_{-mU}) - c]x^B_{mU}$. The profit function of firm *Uj*, for $j = \{1, .., n_A - 1\}$, in intermediate good market *A* is $\pi^A_{Uj}\left(x^A_{Uj}, x^A_{-Uj}, x^B_{Ul}, x^B_{-Ul}\right) = [\alpha - 2\beta(x^A_{Uj} + x^A_{-Uj}) - \beta(x^B_{Ul} + x^B_{-Ul}) - c]x^A_{Uj}$. The profit function of firm *Ul*, for $l = \{1, .., n_B - 1\}$, in intermediate good market *B* is $\pi^B_{Ul}\left(x^A_{Uj}, x^A_{-Uj}, x^B_{Ul}, x^B_{-Ul}\right) = [\alpha - 2\beta(x^B_{Ul} + x^B_{-Ul}) - \beta(x^A_{Uj} + x^A_{-Uj}) - c]x^B_{Ul}$. Solving the first-order conditions yields

$$\underbrace{x^k_{mU} + x^k_{-mU}}_{Q^k} = \frac{(\alpha - c)(3n_k n_{-k} + 7n_k + n_{-k} - 3)}{3\beta(3n_k n_{-k} + 5n_k + 5n_{-k} + 3)}, k = A, B, \quad (21)$$

with the corresponding wholesale prices:

$$w^k = \frac{\alpha[2n_{-k} + 6] + (3n_k n_{-k} + 5n_k + 3n_{-k} - 3)c}{(3n_k n_{-k} + 5n_k + 5n_{-k} + 3)}, k = A, B. \quad (22)$$

For the sake of definiteness, suppose the upstream market *A* (respectively, market *B*) is the strong (respectively, weak) market. Therefore, we assume that parameters are such that the wholesale price difference is strictly positive, $w^A - w^B = \frac{2(\alpha - c)(n_B - n_A)}{3n_A n_B + 5n_A + 5n_B + 3} > 0$. Note that market *A* is the strong market if and only if it is less competitive, $n_B > n_A$, and therefore the two-market input firm discriminates against the less competitive market.

Under uniform pricing, the two-market upstream firm has to charge a uniform price across the input markets. Therefore, $w_A = \alpha - 2\beta(x^A_{mU} + x^A_{-mU}) - \beta(x^B_{mU} + x^B_{-mU}) = \alpha - 2\beta(x^B_{mU} + x^B_{-mU}) - \beta(x^A_{mU} + x^A_{-mU}) = w_B$. The two-market upstream firm must adjust its sales of input in markets *A* and *B* to satisfy $x^A_{mU} + x^A_{-mU} = x^B_{mU} + x^B_{-mU}$. Accordingly, we may express the total profit of firm $mU$ as $\pi_{mU}(x^A_{mU}, x^A_{-mU}, x^B_{mU}, x^B_{-mU}) = [\alpha - 3\beta(x^B_{mU} + x^B_{-mU}) - c](2x^B_{mU} + x^B_{-mU} - x^A_{-mU})$. Solving the first order conditions yields

$$\underbrace{\overline{x}^k_{mU} + \overline{x}^k_{-mU}}_{\overline{Q}^k} = \frac{(\alpha - c)(3n_k + 3n_{-k} - 2)}{3\beta(3n_k + 3n_{-k} + 2)}, k = A, B, \text{and}$$

$$\overline{w} = \frac{4\alpha + (3n_A + 3n_B - 2)c}{(3n_A + 3n_B + 2)}. \qquad (23)$$

By comparing the total output supplied under price discrimination and uniform pricing, we have that $\Delta Q = -\frac{(\alpha - c)(n_A - n_B)^2}{\beta(3n_A n_B + 5n_A + 5n_B + 3)(3n_A + 3n_B + 2)}$; that is, total output decreases with input price discrimination if competitive pressure varies across input markets (unless $n_A = n_B$). This setting satisfies: (1) price discrimination by the two-market upstream firm harms downstream firm *A* in its competition with firm *B*; consequently, firm *A* (or the FTC) might initiate a case against firm *mU* alleging a violation of the RPA, in particular invoking a secondary-line injury; and (2) given that $w^A > w^B$, the two-market upstream firm *mU* might use the MCD arguing that it was acting in Good Faith to meet an equally low price of a competitor. The following proposition characterizes the effect of price discrimination on social welfare.

PROPOSITION 4. *Given* $\alpha_k > 0, \beta_k > 0$ *and* $n_k \geq 1$ *for* $k \in \{A, B\}$, *third-degree price discrimination reduces social welfare, and the MCD might be successfully used precisely when price discrimination reduces social welfare.*

## 5. **Concluding remarks**

The effect of price discrimination by a multi-market firm on total output and social welfare crucially depends on differences in the degree of competitiveness across markets. First, we have analyzed the effects of price discrimination in contexts of primary-line injury. When competitive pressure measured by the number of firms is greater in the strong market, we have that the necessary condition for price discrimination to increase social welfare is satisfied. Therefore, we have found a rationale for the MCD. Our results are robust to different types of competition (price or quantity competition) and different types of market (final or intermediate). We also find that under secondary-line injury the negative results are maintained in the intermediate good market: when a multi-market upstream firm discriminates in favor of the buyer in the more competitive market social welfare decreases and, therefore, the MCD also goes in the wrong direction.

There are several ways in which this work could be extended. For instance, contracts among sellers and buyers are linear in our model and buyers (both end-consumers of goods or downstream firms) take prices set by producers of final goods or the upstream sector (in a take-it-or-leave-it environment) as given. It would be interesting to investigate how non-linear contracts (see, for example, Inderst and Shaffer, 2009, and Miklós-Thal and Shaffer, 2021b) and bargaining power and negotiation among firms (see, for example, O'Brien and Shaffer, 1994, and O'Brien, 2014) would affect economic and welfare implications of price discrimination when competitive pressure varies across markets.

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## Appendix A: Proofs of Lemmas and Propositions

### A.1. Proof of LEMMA 1

Given $u(\mathbf{q}_A^1, \mathbf{q}_B^1) \leq u(\mathbf{q}_A^0, \mathbf{q}_B^0) + \sum_{j=1}^{n_A} \frac{\partial u(\mathbf{q}_A^0, \mathbf{q}_B^0)}{\partial q_j} \Delta q_j + \sum_{k=1}^{n_B} \frac{\partial u(\mathbf{q}_A^0, \mathbf{q}_B^0)}{\partial q_k} \Delta q_k$, a move from uniform pricing to price discrimination leads to $\sum_{j=1}^{n_A}(p_j^0 - c)\Delta q_j + \sum_{k=1}^{n_B}(p_k^0 - c)\Delta q_k \geq \Delta W$, where $\Delta w = \Delta u - \Delta c$, $\Delta q_j = q_j^1 - q_j^0,\ j = 1,..,n_A$, $\Delta q_k = q_k^1 - q_k^0$, $k = 1,..,n_B$ and *c* is the common constant marginal cost. Consequently, the left-hand term in the inequality represents an upper bound on the welfare change.

### A.2. Proof of LEMMA 2

The change in total output due to a movement from uniform pricing to price discrimination can be expressed as $\Delta Q = \frac{(p^A - p^B)}{\Gamma}[(2+2\gamma)n_B - \gamma][(2+2\gamma)n_A - \gamma]\{[(1+\gamma)n_A - \gamma][(2+\gamma)n_B - \gamma]n_A^2 - [(1+\gamma)n_B - \gamma](2+\gamma)[(2+\gamma)n_A - \gamma]n_B^2\}$, where $\Gamma = (2+\gamma)\{n_B^3[(2+\gamma)n_A - \gamma][(2+2\gamma)n_A - \gamma] + n_A^3[(2+\gamma)n_B - \gamma][(2+2\gamma)n_B - \gamma]\}$.

Given that we assume that market *A* is the strong market, $p^A > p^B$: (a) If competitive pressure is greater in the strong market, $n_A > n_B$, then $\Delta Q > 0$; (b) If competitive pressure is constant across markets, $n_A = n_B$, then $\Delta Q = 0$; and (c) If competitive pressure is greater in the weak market, $n_A < n_B$, then $\Delta Q < 0$.

### A.3 Proof of PROPOSITION 1

With the equilibrium expressions, the upper bound on the welfare change given in LEMMA1 can be expressed as follows: $\text{UB} = k_A(n_A - 1)\overline{p}^A\left(p^A - \overline{p}^A\right) + k_A\overline{p}_m(p^A - \overline{p}_m) + k_B(n_B - 1)\overline{p}^B(p^B - \overline{p}^B) + k_B\overline{p}_m(p^B - \overline{p}_m)$, where $k_A \doteq n_A(1+\gamma) - \gamma$ and $k_B \doteq n_B(1+\gamma) - \gamma$. Note that since market *A* is the strong market, we have that $p^A > \overline{p}^A > \overline{p}_m > \overline{p}^B > p^B$. Therefore,

$\text{UB} = k_A(n_A - 1)\overline{p}^A\left(p^A - \overline{p}^A\right) + k_A\overline{p}_m(p^A - \overline{p}_m) + k_B(n_B - 1)\overline{p}^B\left(p^B - \overline{p}^B\right) + k_B\overline{p}_m(p^B - \overline{p}_m) > k_A(n_A - 1)\overline{p}_m\left(p^A - \overline{p}^A\right) + k_A\overline{p}_m(p^A - \overline{p}_m) + k_B(n_B - 1)\overline{p}_m\left(p^B - \overline{p}^B\right) + k_B\overline{p}_m(p^B - \overline{p}_m) = \overline{p}_m\Delta Q$. From LEMMA 2 we obtain that when competitive pressure in the strong market is greater than or equal to that in the weak market, then $\Delta Q \geq 0$. This implies that the upper bound is positive, $\text{UB} > 0$, and that the necessary condition for price discrimination to increase social welfare is satisfied. When competitive pressure is greater in the weak market, price discrimination reduces total output, $\Delta Q < 0$. Given that $\text{UB} > \overline{p}_m\Delta Q$, the upper bound might be positive and, consequently, price discrimination might increase social welfare.

### A.4. Proof of PROPOSITION 2

Total output is $Q = \frac{\alpha_A\beta_B n_A[n_B+1]+\alpha_B\beta_A n_B[n_A+1]}{\beta_A\beta_B[n_A+1][n_B+1]}$ under price discrimination and $\overline{Q} = \frac{\alpha_A\beta_A\beta_B n_B+\alpha_B\beta_A\beta_B n_A+\alpha_A\beta_B^2 n_A+\alpha_B\beta_A^2 n_B}{\beta_A\beta_B[\beta_B(n_A+1)+\beta_A(n_B+1)]}$ under uniform pricing. Then, the change in total output due to a move from uniform pricing to price discrimination is given by $\Delta Q = \frac{\alpha_A n_A n_B+\alpha_A n_A+\alpha_B n_B+\alpha_B n_A n_B-\alpha_A n_B-\alpha_B n_A-\alpha_A n_B^2-\alpha_B n_A^2}{[n_A+1][n_B+1][\beta_B(n_A+1)+\beta_A(n_B+1)]}$, which can be expressed as $\Delta Q = \frac{[n_A-n_B][p^A-p^B]}{[\beta_B(n_A+1)+\beta_A(n_B+1)]}$. Given that market $A$ is the strong market and so $p^A > p^B$, when competitive pressure is greater in the strong market, $n_A > n_B$, then $\Delta Q > 0$ and hence the necessary condition for an increase in social welfare is satisfied. When $n_A \leq n_B$ then price discrimination does not increase total output and, consequently, reduces social welfare.

### A.5. Proof of PROPOSITION 3

The change in total output due to a move form uniform pricing to price discrimination is $\Delta Q = \frac{(n_A-n_B)\,[w^A-w^B]}{2[(n_B+1)\beta_A+(n_A+1)\beta_B]}$. Given that the intermediate good market *A* is the strong market, $w^A > w^B$, if competitive pressure is greater in the strong market, $n_A > n_B$, then $\Delta Q > 0$ and hence the necessary condition for an increase in social welfare is satisfied. If $n_A \leq n_B$, then $\Delta Q \leq 0$, and, consequently, social welfare decreases with input price discrimination.

### A.6. Proof of PROPOSITION 4

It is trivial since third-degree price discrimination reduces total output and increases the price for the final good.

## Appendix B: Price Discrimination in the Final Good market Under Price Competition

### B.1. Shubik-Levitan Demand Specification

In a fully supplied market, this demand structure has an intuitive interpretation: demand of a specific product decreases directly with its own price and additionally if its price increases above the average price. In addition, total demand $nq$ is independent of the number of product varieties $n$ and the product differentiation parameter $\gamma$ for a common price since $nq = \alpha - p$. Therefore, there is no market expansion (demand) effect. As a consequence, the degree of competition and product substitutability can vary without affecting the size of the market so that we can isolate the competition effect. In general, the utility foundation for this demand function assumes that the representative consumer's utility in a market with $n$ product varieties is:

$$u(\mathbf{q}) = \alpha \sum_{i=1}^{n} q_i - \frac{1}{2}\left(\sum_{i=1}^{n} q_i\right)^2 - \frac{n}{2(1+\gamma)}\left[\sum_{i=1}^{n} q_i^2 - \frac{\left(\sum_{i=1}^{n} q_i\right)^2}{n}\right], \qquad (B1)$$

where $\gamma \in [0, \infty)$ is the extent of product differentiation such that the products are completely independent if $\gamma = 0$ and they approach to perfect substitutability when $\gamma \to \infty$. The direct and inverse demand functions are derived, respectively, as follows:

$$q_i = \frac{1}{n}\left[\alpha - p_i - \gamma\left(p_i - \frac{\left(\sum_{j=1}^{n} q_j\right)^2}{n}\right)\right] \text{ for } i = \{1, .., n\} \quad (B2)$$

$$p_i = \alpha - \frac{nq_i + \gamma\left(\sum_{j=1}^{n} q_j\right)}{1+\gamma} \text{ for } i = \{1, .., n\} \quad (B3)$$

**B.2. Spence-Dixit-Vives Demand Specification**

This demand structure exhibits the classical economic properties that the utility of owning a product decreases as the consumption of the substitute product increases, and the representative consumer's marginal utility for a product diminishes as the consumption of the product increases. It also implies that the value of using multiple substitutable products is less than the sum of the separate values of using each product on its own.

In order to derive the demand function, a representative consumer is assumed to have a quadratic and strictly concave utility function over all product varieties as follows:

$$u(\mathbf{q}) = \alpha \sum_{i=1}^{n} q_i - \frac{1}{2}\left[\sum_{i=1}^{n} q_i^2 + \gamma \sum_{i=1}^{n} \sum_{j \neq i, j=1}^{n} q_i q_j\right], \quad (B4)$$

where $\gamma \in (0,1)$ represents the degree of substitutability between the varieties. When $\gamma = 0$, varieties are independent, and when $\gamma \to 1$, the varieties are perfect substitutes. This utility characterization leads to the following direct and inverse demand functions, respectively:

$$q_i = \delta - \beta p_i + \varphi \sum_{j \neq i}^{n} p_j \text{ for } i = \{1, .., n\} \quad (B5)$$

$$p_i = \alpha - q_i - \gamma \sum_{j \neq i}^{n} q_j \text{ for } i = \{1, .., n\} \quad (B6)$$

where $\delta = \frac{\alpha}{1+(n-1)\gamma}$, $\beta = \frac{1+(n-2)\gamma}{(1-\gamma)[1+(n-1)\gamma]}$, and $\varphi = \frac{\gamma}{(1-\gamma)[1+(n-1)\gamma]}$.

## B.3. Economic Effects of Price Discrimination with Spence-Dixit-Vives Demand

Firm *m* operates in two perfectly separated markets, *A* and *B*, and faces $n_A - 1$ single-market rivals in market *A* and $n_B - 1$ single-market rivals in market *B*. The demand function in market $k \in \{A, B\}$ is:

$$q_{ik} = \frac{\alpha_k}{1+(n_k-1)\gamma} - \frac{[1+(n_k-2)\gamma]p_{ik}}{(1-\gamma)[1+(n_k-1)\gamma]} + \frac{\gamma \sum_{j\neq i}^{n_k} p_{jk}}{(1-\gamma)[1+(n_k-1)\gamma]}, \text{for } i = \{1,.,n_k\}. \qquad (B7)$$

Equilibrium prices and outputs under price discrimination are given by:

$$p^k \doteq p_i^k = \frac{\alpha_k(1-\gamma)}{[2+(n_k-3)\gamma]};$$

$$q^k \doteq q_i^k = \frac{\alpha_k[1+(n_k-2)\gamma]}{[2+(n_k-3)\gamma][1+(n_k-1)\gamma]} \text{ for } i = \{1,,.,n_k\}, k \in \{A,B\} \quad (B8)$$

We assume again that market *A* is the strong market and, consequently, $p^A > p^B$.

Equilibrium prices and outputs under uniform pricing are given by:

$$\overline{p}_k = \frac{(n_{-k}-1)\varphi_{-k}(\varphi_k\delta_{-k}-\varphi_{-k}\delta_k)-[\varphi_{-k}(n_{-k}-2)-2\beta_{-k}][\varphi_k(\delta_k+\delta_{-k})+2\delta_k(\beta_k+\beta_{-k})]}{\Omega}, \; k \in \{A,B\}$$

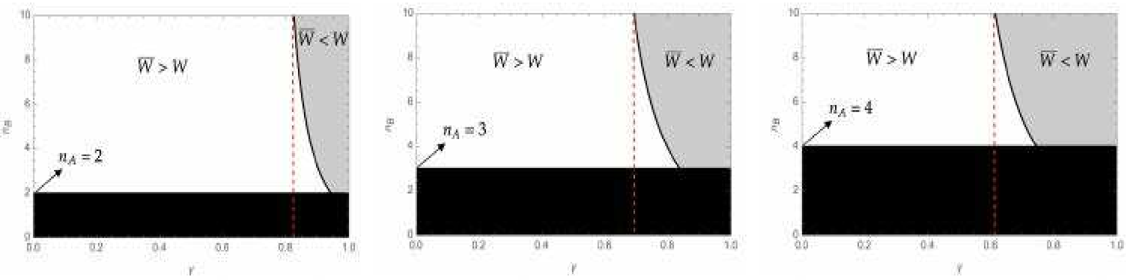
$$\overline{p}_m = \frac{\delta_B(2\beta_B+\varphi_B)[2\beta_A-\varphi_A(n_A-2))]+\delta_A(2\beta_A+\varphi_A)[2\beta_B-\varphi_B(n_B-2))]}{\Omega},$$

$$\overline{q}_k = \beta_k\overline{p}_k,$$

$$\overline{q}_m \doteq \overline{q}_m^A + \overline{q}_m^B = (\beta_A+\beta_B)\overline{p}_m. \quad (B9)$$

where $\overline{p}^k \doteq \overline{p}_i^k$, $\overline{q}^k \doteq \overline{q}_i^k$ for $i = \{1,,.,n_k\}$, $i \neq m$ and $k \in \{A,B\}$, and $\Omega = \varphi_A^2(n_A - 1)[\varphi_B(n_B-2) - 2\beta_B] + \varphi_B^2(n_B-1)[\varphi_A(n_A-2) - 2\beta_A] + 2(\beta_A+\beta_B)[\varphi_A(n_A-2) - 2\beta_A][\varphi_B(n_B-2) - 2\beta_B]$.

Given that we assume that market $A$ is the strong market, $p^A > p^B$, it is easy to check that results in LEMMA 2 are held and, therefore, when competitive pressure is greater (lower) (equal) in the strong market than in the weak market, $n_A > n_B$ ($n_A < n_B$) ($n_A = n_B$), total output increases (decreases) (remains unchanged) with price discrimination. Moreover, given that $p^A > \overline{p}_A > \overline{p}_m > \overline{p}_B > p^B$ and that $\overline{q}_m^A > q^A$, $\overline{q}_m^B < q^B$, $\overline{q}_i^A < q_i^A$ for $i = \{1,,.,n_A\}$, $i \neq m$ and $\overline{q}_i^B > q_i^B$ for $i = \{1,,.,n_B\}$, $i \neq m$ then from LEMMA 1 we get UB $= \overline{p}_m \Delta q_m^A + \overline{p}^A \sum_{i=1,i\neq m}^{n_A} q_i^A + \overline{p}_m \Delta q_m^B + \overline{p}^B \sum_{i=1,i\neq m}^{n_B} q_i^B >$ $\overline{p}_m \Delta q_m^A + \overline{p}_m \sum_{i=1,i\neq m}^{n_A} q_i^A + \overline{p}_m \Delta q_m^B + \overline{p}_m \sum_{i=1,i\neq m}^{n_B} q_i^B = \overline{p}_m \Delta Q$. Therefore, results in PROPOSITION 1 are held. The next figure illustrates part b) and how an increase in total output is not necessary for a welfare improvement.




(a) $\alpha_A = \alpha_B$ and $n_A = 2$ (b) $\alpha_A = \alpha_B$ and $n_A = 3$ (c) $\alpha_A = \alpha_B$ and $n_A = 4$

**Figure 5**. Comparison of social welfare under discriminatory pricing ($W$) and uniform pricing ($\overline{W}$) when $n_A < n_B$.

## Appendix C: Secondary-line Injury Case in the Intermediate Good Market Under Price Competition

Assume now that in the final good market firms produce imperfect substitutes and compete on price. Demands are $D_A(p_A, p_B) = a - bp_A + dp_B$ and $D_B(p_A, p_B) = a - bp_B + dp_A$. Profit functions are: $\pi_i(p_i, p_j) = (p_i - w_i)D_i(p_i, p_j), i, j = A, B\ j \neq i$. From the first order condition of firm $i$'s profit maximization problem, we get:

$$p_i(p_j) = \frac{a + bw_i + dp_j}{2b}.$$

The Bertrand –Nash equilibrium prices and quantities are given by:

$$p_i = \frac{2ab + ad + 2b^2 w_i + bdw_j}{4b^2 - d^2}$$

$$q_i = \frac{2ab^2 + abd - 2b^3 w_i + bd^2 w_i + b^2 dw_j}{4b^2 - d^2} i,j = A,B \; j \neq i. \qquad (C1)$$

From condition (C1) we obtain that the inverse demands for the intermediate good in market *A* and market *B*, are given by:

$$w_i = e - fq_i - \; gq_j, i,j = A,B \; j \neq i. \quad (C2)$$

where $e = \frac{ab^2(4b^2-d^2)(b+d)}{(2b^3-bd^2)^2-b^4d^2}$, $f = \frac{(4b^2-d^2)(2b^3-bd^2)}{(2b^3-bd^2)^2-b^4d^2}$ and $g = \frac{(4b^2-d^2)b^2d}{(2b^3-bd^2)^2-b^4d^2}$.

Given that in equilibrium $Q^A = (x_{mU}^A + x_{-mU}^A)$ and $Q^B = (x_{mU}^B + x_{-mU}^B)$, the profit function of the two-market upstream firm under price discrimination in the intermediate good market is $\pi_{mU}(x_{mU}^A, x_{-mU}^A, x_{mU}^B, x_{-mU}^B) = [e - f(x_{mU}^A + x_{-mU}^A) - g(x_{mU}^B + x_{-mU}^B) - c]x_{mU}^A + [e - f(x_{mU}^B + x_{-mU}^B) - g(x_{mU}^A + x_{-mU}^A) - c]x_{mU}^B$. The profit function of firm *Uj*, for $j = \{1,..,n_A - 1\}$, in intermediate good market *A* is $\pi_{Uj}^A(x_{Uj}^A, x_{-Uj}^A, x_{Ul}^B, x_{-Ul}^B) = [e - f(x_{Uj}^A + x_{-Uj}^A) - g(x_{Ul}^B + x_{-Ul}^B) - c]x_{Uj}^A$. The profit function of firm *Ul*, for $l = \{1,..,n_B - 1\}$, in intermediate good market *B* is $\pi_{Ul}^B(x_{Uj}^A, x_{-Uj}^A, x_{Ul}^B, x_{-Ul}^B) = [e - f(x_{Ul}^B + x_{-Ul}^B) - g(x_{Uj}^A + x_{-Uj}^A) - c]x_{Ul}^B$. From the first order conditions we obtain the total sales of the intermediate product at each intermediate market:

$$\underbrace{x_{mU}^{A} + \overbrace{x_{-mU}^{A}}^{(n_A-1)x_{Uj}^{A}}}_{Q^A} = \frac{(e-c)}{2(f+g)f^2(n_A+1)(n_B+1)-g^2(n_A-1)(n_B-1)}\{f^2(n_A+1)(n_B+1) +$$

$$(f+g)f\,(n_A-1)(n_B+1) - (f+2g)g(n_A-1)(n_B-1)\}, \text{and}$$

$$\underbrace{x_{mU}^{B} + \overbrace{x_{-mU}^{B}}^{(n_B-1)x_{Ul}^{B}}}_{Q^B} = \frac{(e-c)}{2(f+g)f^2(n_A+1)(n_B+1)-g^2(n_A-1)(n_B-1)}\{f^2(n_A+1)(n_B+1) + (f+$$

$$g)f\,(n_A+1)(n_B-1) - (f+2g)g(n_A-1)(n_B-1)\}. \qquad \text{(C3)}$$

The wholesale price difference is given by:

$$w^A - w^B = (f-g)\frac{(e-c)(n_B-n_A)}{[f^2(n_A+1)(n_B+1)-g^2(n_A-1)(n_B-1)]}. \qquad (C4)$$

As in the case of quantity competition, under price discrimination the two-market upstream firm discriminates against the less competitive market and it can be shown that this type of price discrimination deteriorates social welfare.