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**Price Pressure Indices, Innovation and  
Mergers Between Commonly Owned  
Firms**

Roman Inderst and Stefan Thomas

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*Roman Inderst and Stefan Thomas*

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Centre for Economic Policy Research  
33 Great Sutton Street, London EC1V 0DX, UK  
Tel: +44 (0)20 7183 8801  
[www.cepr.org](http://www.cepr.org)

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## Abstract

The potentially anticompetitive effects of common ownership are being discussed controversially. While the US agencies still display reluctance, the Commission has already invoked common ownership as part of a theory of harm in Dow/DuPont and Bayer/Monsanto. In our paper we focus on how common ownership can bear on the application of price pressure indices in unilateral effects analysis of horizontal mergers between portfolio companies. We do not assess whether the underlying premise of common ownership to lead to an internalization of shareholders' expectations of high overall market returns is convincing. Rather, we hypothesize such common shareholder influence. Our main conclusion is that common ownership should still not be considered a general circumstantial factor indicating competitive harm with respect to post-merger price increases or effects on innovation competition. Rather, it calls for case-by-case analysis.

JEL Classification: L21, L22, L41

Keywords: Common ownership, Herfindahl-Hirschman Index, horizontal effects, innovation competition, Merger Control, Unilateral Effects, upward pricing pressure

Roman Inderst - [inderst@finance.uni-frankfurt.de](mailto:inderst@finance.uni-frankfurt.de)  
*Goethe University Frankfurt and CEPR*

Stefan Thomas - [thomas@jura.uni-tuebingen.de](mailto:thomas@jura.uni-tuebingen.de)  
*University of Tuebingen*

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Firms

Roman Inderst & Stefan Thomas<sup>1</sup>

*running title:* Price Pressure, Innovation and Commonly Owned Firms

ABSTRACT

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1 Professor Dr. Roman Inderst, Chair in Finance and Economics, Goethe-University, Frankfurt a.M. Email: Inderst@finance.uni-frankfurt.de; Professor Dr. Stefan Thomas, Chair in Private Law, Commercial Law, Competition Law and Insurance Law, Faculty of Law of the Eberhard Karls University, Tübingen. Email: thomas@jura.uni-tuebingen.de.

## Inhalt

|   |    |
|---|----|
| 1. MOTIVATION .....   | 3  |
| 2. PRICE EFFECTS OF A MERGER .....                                      | 8  |
| A. Benchmark without common ownership.....                              | 8  |
| B. Price effects under common ownership: Setting up the analysis .....  | 10 |
| C. When common ownership mitigates the price effect of a merger .....   | 13 |
| D. When common ownership has a reinforcing effect .....                 | 13 |
| 3. EFFECT ON INNOVATION .....   | 15 |
| A. Business stealing effect from innovation dominates .....             | 15 |
| B. Externality effect from innovation dominates .....                   | 17 |
| APPENDIX .....  | 19 |
| A. Derivation of the PPI and merger delta under common ownership.....   | 19 |
| B. Illustration of the mitigating price effect of common ownership..... | 20 |
| C. Illustrating the reinforcing effect of common ownership.....         | 21 |
| D. Merger effect on innovations.....                                    | 22 |

## 1. MOTIVATION

In this article we refer to common ownership as various shareholders, notably index funds, holding minority stakes, typically far below a threshold that would be indicative of control in terms of Article 3 EUMR<sup>2</sup>, in different firms in the same relevant market. US agencies still appear reluctant about the idea of challenging mergers based on the existence of common ownership.<sup>3</sup> The EU Commission, on the other hand, in *Dow/DuPont*<sup>4</sup> and in *Bayer/Monsanto*<sup>5</sup> has crafted the idea that the mere existence of common ownership in the affected market can contribute to a competitive impediment in a horizontal merger of portfolio companies. In that regard, the Commission holds that competitive impediments resulting from common ownership can relate to price as well as to innovation. While we do not venture to evaluate whether the Commission's conclusions in these two cases are ultimately convincing, we address the more general question as to whether the mere existence of common ownership *reinforces* potential negative effects of a merger without more. If that were the case, it could constitute a “default plus factor”. Our key finding, however, is that such a simple conclusion would not be warranted.

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- 2 Some authors assert that common ownership amounts to a type of *de facto* joint control based on the alleged commonality of interests among shareholders, *see* German Monopolies Commission, Main Report XX (2016), para. 678, available at: [https://www.monopolkommission.de/images/HG21/HGXXI\\_Gesamt.pdf](https://www.monopolkommission.de/images/HG21/HGXXI_Gesamt.pdf) (last accessed 26/06/2019); Germany, *Common Ownership by Institutional Investors and its Impact on Competition*, Background Note by the Secretariat, 5-6 December 2017, DAF/COMP(2017)87, para. 21, available at: [http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DAF/COMP/WD\(2017\)87&docLanguage=En](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DAF/COMP/WD(2017)87&docLanguage=En) (last accessed 26/06/2019); Einer Elhauge, *New Evidence, Proofs, and Legal Theories on Horizontal Shareholding*, 4 January 2018, at 33-36, available at: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3096812](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3096812) (last accessed 26/06/2019), at 33-36. We do not share this view since it does not reconcile with the Commission's stipulation in its Horizontal Merger Guidelines that for *de facto* joint control to arise, the position of a minority shareholder must be akin to that of a blocking position, EU Commission, Consolidated Jurisdictional Notice under Council Regulation (EC) No 139/2004 on the control of concentrations between undertakings, OJ 2008 C 95/1, para. 77. A minority stake, even if part of a common shareholding, does not provide such a blocking position. Persuasively rejecting the idea of control in terms of Article 3 EUMR through common minority shareholdings Riccardo Fadiga, *Horizontal shareholding within the European competition law framework: assessment and a way forward*, 40 E.C.L.R. 157-165 (2019).
- 3 Speaking at a conference at Fordham University School of Law, head of the US DOJ's antitrust division, *Makan Delrahim* was quoted as follows: “Let's remember, from where we sit as enforcers of the antitrust laws, concerns about common ownership need to be rooted in theories of harm that can be proven in a court of law”, FTC chairman *Joseph Simons* and FTC commissioner *Noah Philips* reportedly expressed sceptical views, too, reported by Ben Remaly for Global Competition Review, *Delrahim: common ownership theories must be proven in court*, report of 2 May 2019, available at <https://globalcompetitionreview.com/article/usa/1190854/delrahim-common-ownership-theories-must-be-proven-in-court> (last accessed 26/06/2019).
- 4 Commission 27/03/2017, Case M.7932 *Dow/DuPont* Annex 5.
- 5 Commission 21/03/2018, Case M.8084 *Bayer/Monsanto* paras. 177, 208-29: “thus, [...] common shareholding in these industries are to be taken as an element of context in the appreciation of any significant impediment to effective competition that is raised in this Decision.”

In this article, we set our research focus on the application of pricing pressure indices in an environment of common ownership. We additionally analyze whether the rationale underlying pricing pressure analysis in the context of common ownership can be transferred to innovation competition. Our economic analysis takes place against the backdrop of the legal principles governing the standard and burden of proof in merger cases. Based on the consumer welfare standard<sup>6</sup>, it is upon the Commission to adduce sufficient evidence to support its theory of harm. While the burden of proof for offsetting efficiencies is deemed to rest – at least to a large extent – on the parties<sup>7</sup>, the allegation of an upward pricing pressure arising from the merger must be substantiated by the Commission.<sup>8</sup>

Before we summarize our results, we briefly point to the limitations of this short article. The main limitation is that we do not weigh in on the ongoing discussion whether common ownership has *by itself* the inherent propensity to impede competition.<sup>9</sup> Various contributions have indeed raised serious concerns about not only the empirical studies that purport to provide

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6 We apply a consumer welfare standard in this analysis, as it is endorsed by the US agencies and widely accepted by the EU Commission, Neelie Kroes: “Consumer welfare is now well established as the standard the Commission applies when assessing mergers...”, SPEECH/05/512: *European Competition Policy – Delivering Better Markets and Better Choices*, European Consumer and Competition Day, London, 15 September 2005, available at [http://europa.eu/rapid/press-release\\_SPEECH-05-512\\_en.htm](http://europa.eu/rapid/press-release_SPEECH-05-512_en.htm) (last accessed 10/05/2019); Joaquín Almunia: “All of us here today know very well what our ultimate objective is: Competition policy is a tool at the service of consumers. Consumer welfare is at the heart of our policy and its achievement drives our priorities and guides our decisions.”, SPEECH/10/233, Competition and consumers: the future of EU competition policy, speech at European Competition Day, Madrid, 12 May 2010, available at [http://ec.europa.eu/competition/speeches/index\\_speeches\\_by\\_the\\_commissioner.html](http://ec.europa.eu/competition/speeches/index_speeches_by_the_commissioner.html) (last accessed 10/05/2019); Svend Albæk, *Consumer Welfare in EU Competition Policy*, in AIMS AND VALUES IN COMPETITION LAW 67 (Caroline Heide-Jørgensen et al. eds., 2013). See also, albeit on Article 82 EC, Case C-95/04 P [British Airways v Comm’n] ECLI:EU:C:2007:166 para. 86.

7 On the integration of efficiencies into the SIEC test and the implications on the burden of proof, see Stefan Thomas, *The Known Unknown: In Search for a Legal Structure of the Significance Criterion of the SIEC Test*, 13 Journal of Competition Law & Economics 346-387 (2017).

8 To be more precise: It can be assumed that – at least in theory – any horizontal merger precipitates a gross upward pricing pressure to a certain extent. In order to assess whether this effect is offset by efficiencies constituting a downward pricing pressure and whether any remaining net upward pricing pressure suffices for the finding of a significant impediment to effective competition, it is inevitable, however, to quantify this effect. That makes a case-by-case analysis essential. On that see Stefan Thomas, *The Known Unknown: In Search for a Legal Structure of the Significance Criterion of the SIEC Test*, 13 Journal of Competition Law & Economics 346-387 (2017); Stefan Thomas, *Close Competitors in Merger Review*, Journal of European Competition Law & Practice, 2013, 391-401.

9 Arguing that Einer Elhauge, *Essay: Horizontal Shareholding*, 129 Harvard L.Rev. 1267-1317 (2016); Einer Elhauge, *New Evidence, Proofs, and Legal Theories on Horizontal Shareholding*, *supra* note 2; Einer Elhauge, *How Horizontal Shareholding Harms Our Economy - And Why Antitrust Law Can Fix It* (April 11, 2019), available at SSRN: <https://ssrn.com/abstract=3293822> or <http://dx.doi.org/10.2139/ssrn.3293822> (last accessed 26/06/2019); Eric A. Posner, Fiona M. Scott Morton & E. Glen Weyl, A Proposal to Limit the Anti-Competitive Power of Institutional Investors 81 Antitrust L.J. 669. Providing an overview over the existing strands of literature Ulrich Schwalbe, *Common Ownership and Competition – The Current State of the Debate*, 9 JECL&P, 1-8 (2018).

causal evidence for such effects<sup>10</sup> but more importantly about the lack of effective mechanisms through which such minority shareholders could induce management to act against their individual firm's best interest.<sup>11</sup> While our analysis assumes such an effectiveness of common ownership *in arguendo*, this does not necessarily reflect our own view on this matter. Given that notably the European Commission has already moved beyond this point and seems to take such an effectiveness as a given, we think that despite the ongoing scholarly debate about the merits of this assumption it is necessary to test whether, given such assumption, general conclusions on the *interaction* between common ownership and a merger are justified. Taken the assumption of the effectiveness of common ownership as given, our contribution thus seeks to narrowly answer the following questions: How are the unilateral effects resulting from a merger between portfolio companies affected by the presence of common ownership in the market<sup>12</sup> and, especially, in what way does it impact on the use of pricing pressure indices? Also, we address whether the rationale underlying PPI analysis in the context of common ownership is transferable to effects on innovation competition.

To answer this question in what follows we take recourse to a commonly used metric to gauge at first the potential price effects of a merger, so-called "price pressure indices". For simplicity, we refer to such measures shortly as PPI(s), as for our purpose we do not need to distinguish between, for instance, variants that already include some efficiency gains (such as the UPP) or that are "gross" of such gains (such as the GUPPI). Already the early literature on the conceptualization of common ownership has extended PPIs to the presence of common ownership and termed the resulting metric a "modified pricing pressure index" (M-PPI).<sup>13</sup> As we will see below, already the definition of the M-PPI makes strong assumptions on the precise

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10 The respective empirical literature that claims to have identified such a causal relationship is summarized in a recent article in this journal, see José Azar & Martin C. Schmalz, *Common Ownership of Competitors Raises Antitrust Concerns*, 8 JECL&P 329–332 (2017).

11 The respective empirical literature that claims to have identified such a causal relationship is summarized in a recent article in this journal, Daniel P. O'Brien & Keith Waehrer, *The Competitive Effects of Common Ownership: We know less than we think*, 81 Antitrust L.J. 729-776 (2017); Daniel P. O'Brien, *The Competitive Effects of Common Ownership: Ten Points on the Current State of Play*, OECD Hearing on Common Ownership by institutional investors and its impact on competition, DAF/COMP/WD(2017)97, available at [https://one.oecd.org/document/DAF/COMP/WD\(2017\)97/en/pdf](https://one.oecd.org/document/DAF/COMP/WD(2017)97/en/pdf) (last accessed 26/06/2019).

12 We thus also abstract fully from coordinated effects that may arise when a merger increases the potential for tacit collusion. While it is a simple economic exercise to embed common ownership in a respective toy model of tacit collusion, one should be careful to draw conclusions from such an exercise. Such highly stylized models rarely capture the complexities of (repeated) interactions, and in the present context it seems highly speculative to make assumptions even on how minority shareholders adjust their stakes over time.

13 In particular: Daniel P. O'Brien & Steven C. Salop, *Competitive effects of partial ownership: Financial interest and corporate control*, 67 Antitrust L.J. 559 (2000).



effectiveness of common ownership on firms' strategies. Following the approach in this article, as laid out above, we also take these assumptions as a given.<sup>14</sup>

We now summarize the results of our subsequent analysis. We should stress that this summary is based on a first look at how common ownership may interact with unilateral merger effects, provided common ownership is effective at all. The analysis is thus surely far from complete. It reveals, however, that effective common ownership adds substantive complexity to any effects analysis. A simple answer, such as that suggested by the Commission in *Dow/DuPont*<sup>15</sup> and in *Bayer/Monsanto*<sup>16</sup> referencing common ownership as an (implicitly detrimental) "element of context in the appreciation of any significant impediment to effective competition"<sup>17</sup>, therefore appears problematic (even though we do not state that the Commission's findings in these two particular cases were eventually wrong, which we do not venture to analyze). The subsequent summary that seeks to provide some guidance for substantive merger analysis therefore comes with these caveats. In order to streamline both, the analysis and our summary of results, we consider throughout the incentives of a formerly stand-alone firm, called firm 1, respectively the particular business unit that will change its price and innovation strategies after the merger.<sup>18</sup>

Our first conclusion is the following: If the merger largely keeps firm 1's set of owners unchanged, pre-merger common ownership tends to mitigate the merger's effects. The opposite holds if the merger extends the web of common ownership through which firm 1 relates to

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14 That said, because of the various criticisms in the literature we have abstained from applying a similarly modified extension of concentration measures such as the HHI. See, in particular, Daniel P. O'Brien & Keith Waehrer, *The Competitive Effects of Common Ownership: We know less than we think*, 81 Antitrust L.J. 729-776 (2017); Daniel P. O'Brien, *The Competitive Effects of Common Ownership: Ten Points on the Current State of Play*, OECD Hearing on Common Ownership by institutional investors and its impact on competition, DAF/COMP/WD(2017)97, available at [https://one.oecd.org/document/DAF/COMP/WD\(2017\)97/en/pdf](https://one.oecd.org/document/DAF/COMP/WD(2017)97/en/pdf) (last accessed 26/06/2019).

15 Commission 27/03/2017, Case M.7932 *Dow/DuPont* Annex 5.

16 Commission 21/03/2018, Case M.8084 *Bayer/Monsanto* paras. 177, 208-29.

17 Commission 21/03/2018, Case M.8084 *Bayer/Monsanto* paras. 177, 208-29:

18 That is, while for simplicity we will always refer to firm 1, it is understood that post merger this no longer refers to a stand-alone firm but to the respective business unit (and, notably, the respective products in its portfolio).

competitors. In that case, common ownership in the market tends to increase the merger's effects.

Our second result now relates to a merger's price effect. If the merger widens the common ownership of the considered firm, the presence of common ownership tends to increase the merger's upward pricing pressure. If this is not the case, however, the presence of common ownership reduces the merger's (incremental) price effect. These findings also imply that there can be no presumption that the presence of common ownership generally reinforces the unilateral effects of a merger.

Our third and fourth corollaries relate to innovation activity. If innovation activity is such that a firm can successfully shield rivals from positive spillovers, e.g., through patents, the interaction between common ownership and a merger is analogous to that on price, so that the presence of common ownership reinforces the merger's negative effect on innovation so long as the merger widens the common ownership of the considered firm. Otherwise, pre-merger common ownership mitigates the potential negative effect of the merger on innovation incentives. The fourth and last result relates to innovation activity that has positive externalities on rivals, which a firm cannot contain. If such innovation externalities are sufficiently substantial to generate merger specific efficiencies (so called appropriability)<sup>19</sup>, then such efficiencies are higher under common ownership if the merger widens the considered firm's common ownership. Otherwise, when no such widening occurs, the incremental efficiencies from the merger are lower under common ownership. The intuition is, again, that in the latter case such externalities may have been already partially internalized under pre-merger common ownership, so that the merger's incremental effect is thereby subdued.

Before proceeding with the analysis, it seems necessary to point out the close relationship to discussions about *cross-shareholdings*.<sup>20</sup> Evidently, the effects that we identify with respect to common ownership apply in principle also to the establishment or existence of cross-shareholdings. For instance, when two firms have already established cross-shareholdings, this already leads to some pre-merger internalization of each others' profits and

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19 See Giulio Federico, *Horizontal Mergers, Innovation and the Competitive Process*, 8 *Journal of European Competition Law & Practice*, 668, 675 (2017). Appropriability is recognized as an efficiency in the US Horizontal Merger Guidelines, section 10, p. 31: "The Agencies also consider the ability of the merged firm to appropriate a greater fraction of the benefits resulting from its innovations."

20 On cross shareholdings see Nadav Levy, Yossi Spiegel & David Gilo, *Partial Vertical Integration, Ownership Structure, and Foreclosure*, 10 *American Economic Journal: Microeconomics* 132-180 (2018); Ariel Ezrachi & David Gilo, *EC Competition Law and the Regulation of Passive Investments Among Competitors*, 26 *Oxford Journal of Legal Studies* 327-349 (2006).

may thereby mitigate the unilateral effect of a (full) merger. Furthermore, a merger may also extend such internalization when it widens the extent of such cross-shareholdings. That said, also the (formal) analysis under common ownership shows differences. For instance, when firm 2 owns a non-controlling stake in firm 3, it is typically assumed that such cross-shareholdings would not directly affect strategies of firm 3. When such a nexus is, however, established through common owners, which thus own stakes in both firm 2 and firm 3, under the theory of common ownership it would be assumed that this affects the strategies of both firms. Thus, even when leaving aside the basic question of whether the theory of the effectiveness of common ownership has merits, such differences to the analysis of cross-shareholdings exist. Ultimately, however, as will also become clear, both the question of the unilateral effects of a merger and that of the effects of cross-shareholdings and common ownership center on the issue of the mutual *internalization* of rivals' profits. If nothing else, then the subsequent analysis should have at least the message that a substantive merger analysis must carefully discuss to what extent the merger affects such an internalization in the given circumstances, including thus potentially the pre-merger existence of common ownership.

## 2. PRICE EFFECTS OF A MERGER

### A. Benchmark without common ownership

We start our analysis by considering a scenario without common ownership. We focus on a merger between firms 1 and 2 and consider the price effect for firm 1. We now introduce briefly the well-known derivation of the PPI. While we must considerably extend notation below to account for common ownership, it seems instructive to first reduce complexity and focus on what is essential for the standard calculations. We denote the profits of the two firms by  $\pi_1$  and  $\pi_2$  (respectively the post-merger profits of the two business units). We presently focus on the price of firm 1,  $P_1$ , which thus maximizes stand-alone profits  $\pi_1$  before the merger and the sum  $\pi_1 + \pi_2$  after the merger. The PPI is now calculated by solving this maximization problem, precisely the (marginal) trade-off that the firm faces when increasing its price, thereby earning a higher margin on any sold units but, at the same time, reducing quantity. Before the

merger the optimal price is given by the standard mark-up formula:  $P_1 = M_1 c_1$ , where  $c_1$  denotes the applicable marginal cost and  $M_1$  the mark-up factor.<sup>21</sup>

After the merger, the objective function extends to the profits of firm 2, so that the firm internalizes the margin that is earned on volume that is diverted from firm 1 to firm 2. This margin is denoted by  $m_2$ . This diverted demand from firm 1 to firm 2 is in turn captured (“at the margin”) by the diversion factor  $\delta_{21}$ , where the first part of the subscript denotes the “receiving” part, here firm 2. With this notation at hand, after the merger the price  $P_1$  is described by the extended mark-up formula:  $P_1 = M_1 [c_1 + \delta_{21} m_2]$ . The term  $\delta_{21} m_2$  is frequently referred to as the respective “delta” and represents the upward pricing pressure that results from the post-merger internalization of the (business stealing) effect on the now integrated firm.<sup>22</sup> It is higher when the firms’ products are closer substitutes, as expressed by a higher diversion factor  $\delta_{21}$ ,<sup>23</sup> and when the margin earned on the product of firm 2,  $m_2$ , is higher.

As is also well known, the PPI represents a highly partial analysis, as typically the incentives to raise prices are considered while holding all else constant at the pre-merger levels, notably both the price of the integrated firm 2 and the prices of outsiders. Clearly, as the same analysis applies to firm 2, absent sufficiently large efficiencies the firm’s price and thus also its margin will rise, which in turn exerts an additional upward pricing pressure on  $P_1$ . In addition, price increases of the integrated firm should trigger so-called “second round effects” by other firms in the market. When this leads to overall price increases<sup>24</sup>, this has repercussions on all parameters entering the post-merger mark-up formula. Typically, these second-round effects should all reinforce the upward pricing pressure. One justification of the use of a partial PPI analysis is thus to provide a first, but not final, screen of whether efficiencies are sufficient to counter the inherent (gross) upward pricing pressure of a merger.<sup>25</sup> Still, it must be kept in mind that the PPI is based on such a partial analysis. Under common ownership, where the nexus

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21 This is derived from the firm’s own-price elasticity (which in turn derives from the demand function). Denoting the own-price elasticity of firm (respectively, product)  $j$  by  $e_j$ , we generally obtain for the mark-up factor  $M_j = e_j / (e_j - 1)$ . (Often, the own-price elasticity is also written as  $e_{jj}$  when cross-price elasticities  $e_{jk}$  are considered as well.)

22 From this expression, one can also see immediately how large the efficiency gains, expressed as a reduction of marginal costs  $c_1$ , must be to exactly outweigh the upwards pricing pressure.

23 On the closeness of competition, see Stefan Thomas, *Close Competitors in Merger Review*, *supra* note 8.

24 Precisely, this holds when prices represent so-called strategic complements.

25 On the interplay between gross upward pricing pressure and efficiencies under the significance criterion of Article 2 EUMR see Stefan Thomas, *supra* note 7.

between firms in an industry is by definition wider, such a *ceteris paribus* assumption is clearly less innocuous. Moreover, through such a nexus even firms that remain outsiders to the merger may see changes in their objective function when they have common owners with the merged firms. Finally, the considered merger may entail changes in ownership patterns that spill over to outsiders. In the present article we do not seek to analyze further such effects that may well imply considerable differences in how close the partial analysis of a PPI gets to the full equilibrium outcome of a merger under common ownership. This issue must, however, be borne in mind when a PPI is calculated under common ownership, and it may well deserve further analysis. In what follows, however, we simply follow the standard partial analysis when calculating a PPI.

### **B. Price effects under common ownership: Setting up the analysis**

Though our subsequent analysis will focus on illustrative cases, also for reference it seems useful to start with some general formulation of the PPI under common ownership. This, however, necessitates an extended notation.

The consideration of common ownership requires identifying the ownership structure in the industry as well as how different owners are affected by firms' decisions. Generally, this is quite a complex task, as notably the latter may be affected by the type of financial claims individual investors hold, but also by the time horizon of their holding and, more generally, their investment strategies. All this is now assumed away in that we consider only stakes in common stock, from which then the respective cash-flow rights derive. Referring to owners as  $i = A, B$ , etc. and to firms as  $j = 1, 2$ , etc.,  $\beta_{ij}$  captures the share of profits of firm  $j$  going to owner  $i$ . For instance,  $\beta_{A1}$  captures the share of profits of firm 1 going to owner  $A$ . The mutual fund stakes that are typically considered in the empirical literature on common ownership are far below the respective thresholds that would guarantee control of the firms. This distinguishes the subsequent derivation from, for instance, the analysis of cross-ownerships and joint ventures, where one typically does not make a distinction between the identity (and profits) of firms and owners. With such a distinction, however, we need to set up management's objective function and how this incorporates the interest of various owners. Following the literature, we simply stipulate that management places on each owner's profits some weight  $\gamma_{ij}$ , so that, for

instance,  $\gamma_{A1}$  is the weight placed by management of firm 1 on the profits of owner A. We first treat these weights as a given, additional input for the analysis.

With these additional building blocks, one can now write down the objective function of each firm. For an illustration we first derive the pre-merger objective function for firm 1 for the case when firm 1 has only two owners A and B and when these owners only hold stakes in firms 1 and 2. Recall that firm profits are denoted by  $\pi_1$  and  $\pi_2$ , which are now, however, not the objective of firm management. As an intermediate step for the derivation of management's objective, we have to derive profits of the two owners, which we denote by  $\pi^A$  and  $\pi^B$ , that is, with a superscript for the respective owner. Given our notation and the assumption that A has only stakes in firms 1 and 2, profits of owner A are equal to  $\pi^A = \beta_{A1}\pi_1 + \beta_{A2}\pi_2$  and thus represent simply the sum of the profits from firm 1 and firm 2 that accrue to A. The profits of B are likewise  $\pi^B = \beta_{B1}\pi_1 + \beta_{B2}\pi_2$ . We denote the objective function of the management of firm 1 by  $\Pi_1$ , which comprises, with the respective weights, the profits of its owners, that is:  $\Pi_1 = \gamma_{A1}\pi^A + \gamma_{B1}\pi^B$ . Of course, the objective can be equally derived for all other firms  $i$  in the market, and also for the case where each firm has more owners and owners have arbitrary stakes in different firms. When prices are now chosen to maximize the newly derived objective functions, such as  $\Pi_1$  for firm 1, it is intuitive that the whole formal apparatus that is used to construct a PPI can be used here as well.

To simplify the discussion, we next take as given a somewhat shorted expression of the equilibrium pricing (or mark-up) equation, which we derived above for the main case. Intuitively, through the web of common ownership, represented by the profit shares of owners and the weight that firm management supposedly places on the profits of each owner, the pricing equation for firm 1 places some weight also on profits of some rivals. These weight factors are derived in the Appendix. From firm 1's perspective and considering some rival  $k$ , the weight factor  $w_{1k}$  then represents the weight that the management of firm 1 places on profits of firm  $k$  relative to that of its own firm 1. Using such weights, the pre-merger mark-up formula for firm 1's price is given by

$$P_1 = M_1 \left[ c_1 + \sum_{k=2,3,\dots} w_{1k} \delta_{k1} m_k \right].$$

where we have made use of the "sum operator"  $\Sigma$  (so that, for instance,  $\Sigma_{k=2,3,\dots}$  simply indicates that all the following terms are calculated for  $k = 2, 3, \dots$  and then summed up). Generalizing the notation from above,  $m_k$  denotes now the margin of firm  $k$  and  $\delta_{k1}$  is the volume diverted

from firm 1 to firm  $k$ . When firm 1 is not connected to other firms, e.g., as its owners have no other stakes in the industry, then  $w_{1k} = 0$  holds for all rival firms  $k = 2, 3, \dots$ , so that the preceding formula obviously collapses to the standard mark-up formula  $P_1 = M_1 c_1$ . When the management instead places already pre-merger the same weight on some firm  $k = 2$  as after the merger, then  $w_{2k} = 1$ , and the profits of firm 2 would be perfectly internalized. We discuss this and other scenarios below.

Deriving and generalizing the mark-up formula is only the first step, as ultimately we are interested in the “delta” compared to the post-merger case. Again, we consider a merger of firms 1 and 2. This merged firm is now denoted by (12), and we have to introduce a separate notation for the post-merger case and the respective new common ownership structure. Here, with the help of the introduced weights  $w_{1k}$  we can again simplify the derivation. From the perspective of the merged firm, we denote the respective weights by  $\hat{w}_{(12)k}$ . Importantly, we have  $\hat{w}_{(12)2} = 1$ , i.e., the merged firm obviously places the same weight on the profits of the integrated firm 2.

With this at hands, we can simply extend the derived (pre-merger) mark-up formula to the post-merger scenario, where, of course,  $P_1$  now denotes the equilibrium price of the respective “business unit” in the merged firm. Ultimately we can extend the “merger delta” formula, which captures the upward pricing pressure, to common ownership, as follows:

$$\text{delta} = (1 - w_{12})\delta_{21}m_2 + \sum_{k=3,4,\dots} (\hat{w}_{(12)k} - w_{1k}) \delta_{k1}m_k.$$

Again, though this may look unwieldy, at least in this generality, the formula is intuitive, and we later show in our illustrations how it simplifies greatly when a restricted ownership structure is considered. The first expression in the calculated delta relates only to the merged firm 2: Post-merger firm 1 places the weight 1 on the integrated business unit, while pre-merger the respective weight is given by  $w_{12}$ . When there is no nexus through common ownership, we would have  $w_{12} = 0$ , so that with respect to the merged firm 2 the delta is the same as in the benchmark case,  $\delta_{21}m_1$ . The second term in the delta expression sums up how the merger affects the integration of outsiders’ profits into the objective function of firm (or post-merger business unit) 1. When there is no common ownership nexus to outsiders both before and after the merger, of course,  $\hat{w}_{(12)k} = w_{1k} = 0$ , and this term vanishes.

We are now prepared for the substantive part of our analysis. Turning to illustrative cases, where the respective formula simplifies, we will see how the merger delta changes under

common ownership. Subsequently, we argue that the respective delta or an adjusted version of it can also be informative on the impact on innovation (incentives), and we extend our analysis accordingly.

### **C. When common ownership mitigates the price effect of a merger**

For the subsequent illustration we suppose that the two considered firms, 1 and 2, have the same two owners, A and B, and that these owners have no further stakes in the considered industry. This implies that in the PPI formula we do not need to consider the internalization of profits obtained by firms other than 1 and 2. Consequently, the merger delta becomes particularly simple:  $\text{delta} = (1 - w_{12})\delta_{21}m_2$ . When pre-merger common ownership implies that the management of firm 1 places some weight on the profits of the (former) rival 2, so that  $w_{12} > 0$ , the merger delta is consequently strictly lower than in the absence of common ownership.

This finding is straightforward and robust. When pre-merger common ownership effectively impacts on firms' strategies, here on the price of firm 1, then firms already internalize at least partially their rivals' profits, leading to a lower upward pricing pressure if compared to the situation absent such common ownership. Consequently, as a potential internalization of rivals' profits already takes place before the merger, the *incremental* effect of the merger is lower - and with it also the resulting upward pricing pressure that is attributable to the merger. In the Appendix we use additional expressions to illustrate this further. In particular, we thereby express the pre-merger weight  $w_{12}$  with its primitives, that is, the respective profit shares and ownership weights.

### **D. When common ownership has a reinforcing effect**

The following case differs from the preceding illustration in one important aspect: the merger now widens common ownership from the perspective of the considered firm 1. To model this, we consider the following ownership structure. Now firm 1 has only a single owner A before the merger, who has also no other financial interests in the industry. The restriction to a single owner is only for simplicity. Firm 2 has, in order to keep matters simple, also only one



owner, B, who however also holds a stake in another competitor, firm 3. In this illustration, from the perspective of firm 1 there is thus no pre-merger common ownership nexus to its rivals.

With our notation this implies  $w_{1k} = 0$  for all competitors  $k = 2, 3, \dots$ , so that the pre-merger management of firm 1 indeed does not put any weight on competitors' profits. Instead, when setting  $P_1$  after the merger, the firm's management fully internalizes the profits of the merged firm 2 and partially internalizes also profits of the outsider 3, provided that the original owner of the merged firm, B, kept both a stake in the merged firm (1,2) and a stake in the competitor 3. The merger delta is then

$$\text{delta} = \delta_{21}m_2 + \widehat{w}_{(12)3}\delta_{31}m_3,$$

where  $\widehat{w}_{(12)3}$  denotes the weight that the management of the integrated firm places on firm 3 profits, through the common owner B. Again, details on the composition of the weight  $\widehat{w}_{(12)3}$  are relegated to the Appendix, where it is made transparent how, under the respective assumptions,  $\widehat{w}_{(12)3}$  depends on the post-merger distribution of firm profits across owners.

Comparing the merger deltas with and without common ownership, obviously the difference lies now in the positive term  $\widehat{w}_{(12)3}\delta_{31}m_3$ , by which the upward pricing pressure of the merger is now reinforced under common ownership. While the considered example is admittedly rather extreme, in that firm 1 did not have any pre-merger nexus to other firms in the market, evidently the insight applies more generally. When, from the perspective of one of the merging entities, the merger extends the common ownership nexus to other competitors, then, provided common ownership is effective at all, it can lead to an increased upward pricing pressure.

Taken together, the two illustrative cases have shown the following. First, it is evident that under the made assumptions, the presence of common ownership may both mitigate or aggravate the price effect of a merger. The Commission's implicit suggestion that there is always an aggravating effect so that common ownership can be considered an "element of context in the appreciation of any significant impediment to effective competition"<sup>26</sup>, can thus not be supported. Second, while effective common ownership thus makes the substantive analysis more complex, our first analysis already suggests the following categorization. Considering only price effects (under the discussed *ceteris paribus* assumption), when the merger does not extend the set of common owners and with it the nexus to remaining

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26 Commission 21/03/2018, Case M.8084 *Bayer/Monsanto* paras. 177, 208-29.

competitors, the pre-merger presence of common ownership should thus mitigate the incremental effect of the merger. When the merger widens the nexus of common ownership, this may instead increase the upward pricing pressure.

### 3. EFFECT ON INNOVATION

#### A. Business stealing effect from innovation dominates

In this and the following section we extend the substantive merger analysis to innovation. We proceed in two steps. In the first step we suppose that the benefits from the respective innovation activity accrue only to the respective firm, i.e., that there are no positive externalities on competitors (e.g., as an innovation is protected by patents). Depending on the particular innovative activity, however, a possible formalization of the firm's costs and benefits may look different, e.g., as the benefits are more or less sure (or however highly unlikely), costs may be incurred incrementally or as a large lump-sum expenditure, and the innovation may, when successful, disrupt the industry or lead to a more gradual shift in market shares. This is why a formalization of (additional) innovative activity may sometimes, but clearly not always, be akin to a price cut, by which a firm seeks to increase market share (at the cost of a lower margin).

Even without a full model of the innovation activity under consideration, we can derive insights by relying solely on the preceding expressions that capture the degree to which competitors' profits are internalized, the respective weights  $w_{jk}$ . In fact, by returning to the origins of the preceding derivation of the PPI, one can show that generally the objective function of (under common ownership) firm 1's management is to maximize the expression

$$\pi_1 + \sum_{k=2,3,\dots} \pi_k w_{1k},$$

where  $w_{1k}$  represent, as before, the weights that firm 1's management puts on its rival's profits *relative* to its own profits (and where we make again use of the sum operator). Even without specifying how the respective innovative activity of firm 1 affects all rivals' profits, the preceding expression allows to compare to what extent such effects are internalized, before and after the merger, as well as with and without the nexus of common ownership. This observation

allows us now to fully apply the preceding insights obtained with respect to the merger's price effect as follows.

Taking again first the case where, from the perspective of firm 1, the merger did not lead to a widening of common ownership, without common ownership the merger's delta, in terms of the internalization of rivals' profits, is now the weight 1 that is placed on the profits  $\pi_2$  of the merged firm. With pre-merger common ownership, however, the *incremental* weight is no longer 1 but  $1 - w_{12}$ . Again, the merger's effect is thus lower because some of the internalization has already incurred pre-merger.

Take now the case of a widening of the common ownership nexus through the merger. Recall that we supposed that there was no common ownership between the two merged firms before, so that with and without common ownership, the incremental weight put on the merged firm 2 is exactly 1. Now, however, the merger leads the integrated firm (12) to place additional weight  $\widehat{w}_{(12)3}$  on the profit of the rival firm 3. More explicitly, the difference between the objectives of the merged firm with and without common ownership is precisely the term  $\widehat{w}_{(12)3}\pi_3$ . To the extent that there is a business stealing effect of the innovation, so that it decreases a rival's profit, the widening of common ownership through the merger will additionally subdue innovation activity.

We have thus shown that the preceding analysis of how common ownership interacts with the price effect of a merger can be extended to the case of innovation activity that has predominantly a business stealing effect (i.e., a negative externality on competitors, so that its increased internalization indeed reduces innovation incentives). Again, a general presumption that pre-merger common ownership, if effective at all, will aggravate such a downward pressure on innovation activity is not justified.<sup>27</sup>

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<sup>27</sup> Moreover it must be noted that horizontal mergers can yield a range of efficiencies in the field of innovation that must be weighed against any potential consumer harm. We address one aspect below at B with respect to the *externality effect from innovation*. Yet there are other potential efficiencies beyond that, such as synergies resulting from complementing r&d capabilities or cost reductions. We do not address these innovation specific merger efficiencies in this article. Yet it would be wrong to assume a significant impediment to effective competition without a thorough analysis of the efficiency potential.

## B. Externality effect from innovation dominates

In the second step of our analysis, we finally turn to another side of innovation activity, from which merger specific efficiencies could arise. We thus suppose that innovation activity has positive spillover effects also on rivals, e.g., as the benefits cannot be sufficiently protected by means such as patents.<sup>28</sup> As we argue now, the preceding discussion still applies, albeit with a “change in sign”: When common ownership previously mitigated or aggravated a negative effect from a merger, it now has the same impact on the positive effect.

To see this clearly, take again first the case where the merger between 1 and 2 does not widen common ownership from the perspective of firm 1. Without common ownership, before the merger firm 1 did not internalize at all the positive externality of such innovation activity on firm 2, while after the merger it puts equal weight also on the profits of firm 2. Instead, under common ownership the incremental internalization was muted and only equal to the difference  $1 - w_{12}$ , where  $w_{12}$  is the weight that firm 1’s management placed on firm 2’s profits already before the merger. This partial internalization now implies that the incremental efficiencies from the merger are mitigated.

This differs in the second illustration. There, under common ownership the merger induces the now integrated firm (12) to place the weight  $\hat{w}_{(12)3}$  also on the profits of the outsider firm 3, which is not the case without common ownership. Hence, the efficiency gains from the merger, which arise from the internalization of innovation spillovers, are now larger, as such internalization also extends partially to firm 3 through the nexus of common ownership.

## 4. CONCLUSION

Summing up, throughout this article we have looked at the impact of common ownership on the effects of a merger through the lenses of the incremental internalization of rivals’ profits that the merger induces and that interacts with common ownership. The pre-merger presence of common ownership can both increase or reduce such incremental internalization, thereby increasing or decreasing the upward pricing pressure as well as having a positive or negative impact on the merger’s effect on innovation activity. A substantive merger analysis must precisely consider such an incremental effect, e.g., the merger’s delta in

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<sup>28</sup> See *supra* 1.

case of a PPI-analysis, and with it how common ownership affects precisely this incremental effect. We hope that our analysis provides a first contribution to such a substantive analysis in cases where there is indeed evidence of the overall effectiveness of common ownership.

## APPENDIX [Not essential for publication]

### A. Derivation of the PPI and merger delta under common ownership

This appendix contains some additional formal derivations that add to the main text, allowing to apply the analysis more generally. For this we first extend the equilibrium pricing (or mark-up) equation from the benchmark case without common ownership to the case with common ownership. Again, we confine ourselves to the statement and discussion of the respective formula, from the perspective of the pricing incentives of firm 1:<sup>29</sup>

$$P_1 = M_1 \left[ c_1 + \sum_{k=2,3,\dots} \left( \left( \frac{\sum_{i=A,B,\dots} \gamma_{i1} \beta_{ik}}{\sum_{i=A,B,\dots} \gamma_{i1} \beta_{i1}} \right) \delta_{k1} m_k \right) \right],$$

where we have made use of the “sum operator”  $\Sigma$  (so that, for instance,  $\Sigma_{k=2,3,\dots}$  simply indicates that all the following terms are calculated for  $k = 2, 3, \dots$  and then summed up). Though the notation looks unwieldy in its generality, it is, provided that the underlying assumptions such as the effectiveness of common ownership are true, relatively easy to calculate and apply. The key term in square brackets, which would be zero with a stand-alone firm without any ownership linkages to other firms, captures the degree to which the management of firm 1 internalizes the profits of all other firms  $k = 1, 2, \dots$ . While the respective product  $\delta_{k1} m_k$  of the diversion ratio and the margin has already been introduced in the main text, for each considered rival firm  $k$  the ratio of the sums

$$w_{1k} = \frac{\sum_{i=A,B,\dots} \gamma_{i1} \beta_{ik}}{\sum_{i=A,B,\dots} \gamma_{i1} \beta_{i1}}$$

is novel. The variable  $w_{1k}$ , which is used in the main text, essentially represents the weight that the management of firm 1 places on profits of firm  $k$  relative to that of its own firm 1. Here, the numerator sums up over all potential owners  $i$  of firm 1 the respective ownership shares in the considered rival  $k$ ,  $\beta_{ik}$ , multiplied by the weight  $\gamma_{i1}$  that management of firm 1 places on this owner. The denominator, which refers to ownership in firm 1, essentially normalizes this, allowing us to say that the respective weight placed on firm  $k$  is relative to the weight of one placed on the firm’s own profits. Using the short-hand notation  $w_{1k}$ , we can simplify the mark-up formula as in the main text, again using the “sum operators” to obtain generality:

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<sup>29</sup> See Daniel P. O’Brien & Steven C. Salop, *supra* note 13.

$$P_1 = M_1 \left[ c_1 + \sum_{k=2,3,\dots} w_{1k} \delta_{k1} m_k \right].$$

We now extend this to the post-merger case. For simplicity, we suppose that the considered set of owners has not been widened in the course of the merger and now denote for the merged firm (12) the respective shares in the firm's profits by  $\hat{\beta}_{i(12)}$  (with the "hat" indicating the post-merger scenario). The respective weights that the management of the merged firm puts on the respective owner are denoted likewise by  $\hat{\gamma}_{i(12)}$ . Possibly in course of the merger also the respective shares of profits change for owners of other firms, and with it possibly the respective weights that the management of other firms put on these owners. To capture this generally, we simply extend the post-merger notation (with the "hat") to all other firms  $j$ , thus denoting all ownership weights by  $\hat{\gamma}_{ij}$  and all profit shares by  $\hat{\beta}_{ij}$ .

With this at hands, we can simply extend the derived (pre-merger) mark-up formula to the post-merger scenario, where, of course,  $P_1$  now denotes the equilibrium price of the respective "business unit" in the merged firm. And with this we can finally extend the "merger delta" formula, which captures the upwards pricing pressure, under common ownership. Writing out all the intermediate step, before inserting the weight variables, we have for the delta:

$$\begin{aligned} \text{delta} &= \left( 1 - \frac{\sum_{i=A,B,\dots} \gamma_{i1} \beta_{i2}}{\sum_{i=A,B,\dots} \gamma_{i1} \beta_{i1}} \right) \delta_{21} m_2 \\ &+ \sum_{k=3,4,\dots} \left( \left( \frac{\sum_{i=A,B,\dots} \hat{\gamma}_{i(12)} \hat{\beta}_{ik}}{\sum_{i=A,B,\dots} \hat{\gamma}_{i(12)} \hat{\beta}_{i(12)}} - \frac{\sum_{i=A,B,\dots} \gamma_{i1} \beta_{ik}}{\sum_{i=A,B,\dots} \gamma_{i1} \beta_{i1}} \right) \delta_{k1} m_k \right) \\ &= (1 - w_{12}) \delta_{21} m_2 + \sum_{k=3,4,\dots} (\hat{w}_{(12)k} - w_{1k}) \delta_{k1} m_k. \end{aligned}$$

## B. Illustration of the mitigating price effect of common ownership

Substituting back the expression for the pre-merger weight  $w_{12}$ , we have again, starting from the general expression,

$$\text{delta} = \left( 1 - \frac{\sum_{i=A,B,\dots} \gamma_{i1} \beta_{i2}}{\sum_{i=A,B,\dots} \gamma_{i1} \beta_{i1}} \right) \delta_{21} m_2$$

$$\begin{aligned}
&= \left(1 - \frac{\gamma_{A1}\beta_{A2} + \gamma_{B1}\beta_{B2}}{\gamma_{A1}\beta_{A1} + \gamma_{B1}\beta_{B1}}\right) \delta_{21}m_2 \\
&= \left(\frac{\gamma_{B1}(\beta_{B1} - \beta_{B2}) - \gamma_{A1}(\beta_{A2} - \beta_{A1})}{\gamma_{A1}\beta_{A1} + \gamma_{B1}\beta_{B1}}\right) \delta_{21}m_2,
\end{aligned}$$

so that the mitigating effect is now expressed in terms of the pre-merger profit shares and ownership weights. In the literature, a common, though not necessarily always realistic, specification of the ownership weights is that of so-called “proportional control”<sup>30</sup>. Here, the weight that management places on a given owners equals the owner’s cash-flow rights:  $\gamma_{ij} = \beta_{ij}$ . With two owners only, we can further replace  $\beta_{B2} = 1 - \beta_{A2}$  and  $\beta_{B1} = 1 - \beta_{A1}$  and so we obtain that the sign of delta depends on the sign of  $(\beta_{B1} - \beta_{A1}) \cdot (\beta_{A2} - \beta_{A1})$ .

With this simplification we can now even ask when the delta of the merger is *negative*. For this we stipulate that A has a larger stake in firm 1 than owner B. Then we can see immediately that the delta is *negative* when owner A has a still larger share in the former rival 2,  $\beta_{A2} > \beta_{A1}$ . While this effect, whereby the merger exerts a (gross) downward pricing pressure, seems somewhat unrealistic, it is a direct effect of the combination of the PPI-methodology and the assumptions on how common ownership affects firm incentives (under, in addition, proportional control). In the considered extreme case, the pre-merger management of firm 1 essentially favored profits of firm 2 above profits of firm 1 as its main owners had a greater interest in the rival firm. The merger sets this “imbalance” straight, so that profits from both firms (respectively, business segments) enter the objective with same weights.

### C. Illustrating the reinforcing effect of common ownership

Taking up the illustrative case from the main text, we again express explicitly the respective weight put on other rivals, which is now  $\widehat{w}_{(12)3}$  (i.e., the post-merger weight put in firm 3 by the management of the integrated firm (12)). As by assumption firm 2 was owned by B, who had and still keeps a stake in firm 3, with respective shares in the profits of the integrated firm and with the respective weights, the merger delta is then

$$\delta_{21}m_2 + \frac{\gamma_{B(12)}\beta_{B3}}{\gamma_{A(12)}\beta_{A(12)} + \gamma_{B(12)}\beta_{B(12)}} \delta_{31}m_3.$$

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30 Note that the expression “control” in this sense is not tantamount to control in terms of Article 3 EUMR, *see supra* note 2.



Obviously, when B keeps a larger stake in firm 3, as expressed by  $\beta_{B3}$ , and when the merged firm's management puts a larger weight  $\gamma_{B(12)}$  on B, that is, relatively to its other owner  $\gamma_{A(12)}$ , then the additional upward pricing pressure arising from a widening of common ownership is higher.

#### D. Merger effect on innovations

As discussed in the main text, we return to the original derivation of management's objective under common ownership. Making now use of the general notation (via the sum operator), we have the following objective function relating to the pre-merger management of firm 1. The management maximizes a weighted sum of its owner's profits, that is, with the previously introduced notation,  $\Pi_1 = \sum_{i=A,B,\dots} \gamma_{i1} \pi^i$ . These profits in turn derive, under the given assumptions, from the owners' stakes  $\beta_{ik}$  in firms  $k$  in the considered industry. For instance, we have for owner  $A$  profits of  $\pi^A = \sum_{k=1,2,\dots} \beta_{Ak} \pi_k$ , where the subscript in  $\pi_k$  denotes the respective firm  $k$ . Substitution for owners' profits thus yields the objective for firm 1's management

$$\Pi_1 = \sum_{i=A,B,\dots} \gamma_{i1} \pi^i = \sum_{i=A,B,\dots} \gamma_{i1} \left( \sum_{k=1,2,\dots} \beta_{ik} \pi_k \right).$$

We can rearrange this expression, collecting terms referring to each firm  $k = 1, 2, \dots$  in the industry, as follows:

$$\Pi_1 = \sum_{k=1,2,\dots} \pi_k \left( \sum_{i=A,B,\dots} \gamma_{i1} \beta_{ik} \right).$$

We now finally "normalize" this expression as follows:

$$\begin{aligned} \Pi_1 &= \left( \sum_{i=A,B,\dots} \gamma_{i1} \beta_{i1} \right) \left[ \pi_1 + \sum_{k=2,3,\dots} \pi_k \left( \frac{\sum_{i=A,B,\dots} \gamma_{i1} \beta_{ik}}{\sum_{i=A,B,\dots} \gamma_{i1} \beta_{i1}} \right) \right] \\ &= \left( \sum_{i=A,B,\dots} \gamma_{i1} \beta_{i1} \right) \left[ \pi_1 + \sum_{k=2,3,\dots} \pi_k w_{1k} \right]. \end{aligned}$$

As the first term is just a multiplicative factor, the objective of firm 1's management is indeed to maximize  $\pi_1 + \sum_{k=2,\dots} \pi_k w_{1k}$ , where the weights  $w_{1k}$  have been constructed so as to compare with the weight of 1 that is placed on the firm's own profits.