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Price Effects of Horizontal Mergers: A Retrospective on Retrospectives

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ABSTRACT

This comprehensive review of ex-post merger studies assesses the price effects of horizontal transactions to determine whether there are common post-merger price effects, both overall and in specific markets. The aim is to derive implications for policy makers and competition authorities in terms of effective merger enforcement and competition policy. By combining and further analysing the results of 52 retrospective studies on 82 mergers or horizontal transactions, it can be shown that the sector in which the respective transaction takes place alone is not a strong indicator of the direction of price-related merger effects. In contrast, the 'size' or 'importance' of a transaction, as well as market concentration seem to be correlated with post-transaction price increases, especially in already highly concentrated markets.

Overall, this meta-study shows the importance of ex-post case studies for improving ex-ante merger control: although generalisations can only be made with caution, the subsequent analysis of a case and its ex-post observable outcome can provide useful information for future merger enforcement in general, either in the same industry and/or with similar case characteristics, as well as for competition policy regulators.

JEL: D49, K21, L13, L40

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I. INTRODUCTION

Market concentration potentially created or strengthened by a horizontal merger or similar transaction may have negative competitive effects on parameters such as prices, innovation, and/or on overall welfare.[1] Several recent studies show that the intensity of market competition has decreased over the last decades, while at the same time corporate profit margins have increased. Both are associated with increasing inequality in society.[2] Due to the wide range of their potentially negative welfare effects, horizontal mergers are one of the focal points of competition policy and authorities in modern market economies. The merger regulation of the European Union, for example, challenges concentrations "which would significantly impede effective competition, in particular by the creation or strengthening of a dominant position, in the common market or in a substantial part of it" (EU Merger Regulation 139/2004 Art. 2 No. 3). However, the task of preserving competition and challenging potentially welfare-reducing mergers is not straightforward. Errors occur when competition authorities either prohibit non-welfare-reducing mergers (decision error type I – false positive) or fail to prohibit competition- and welfare-decreasing mergers (decision error type II – false negative). These two types of decision errors have different overall welfare effects, which result from the joint consideration of negative and positive effects.[3] In order to improve the decision-making process of antitrust authorities, it is crucial to analyse their decisions and identify potential errors. This can be done, among other things, by so-called 'ex-post evaluations' or 'retrospective studies', either by analysing individual cases and their outcomes or by measuring the effects of merger waves on whole industries.[4] The aim of these studies can never be to overturn past decisions (in most cases this is not possible and the actual effects may be irreversible), but rather to learn from past errors in order to avoid them in the future, e.g., through changes in case practice or even regulatory changes.[5]

In recent years and decades, a large number of such merger retrospectives have been published by academics and authorities, often focusing on specific industries (such as airlines, hospitals, banks, etc.).[6] The aim of this paper is to review these existing studies and their

[1] Jonathan B. Baker, *The Case for Antitrust Enforcement,* 17 Journal of Economic Perspectives 27 (2003); William E. Kovacic, *Assessing the Quality of Competition Policy: The Case of Horizontal Merger Enforcement*, 5 Competition Policy International 129 (2009); Justus Haucap, Alexander Rasch & Joel Stiebale, *How mergers affect innovation: Theory and evidence*, 63 International Journal of Industrial Organization 283 (2019).

[2] David Autor, David Dorn, Lawrence F. Katz, Christina Patterson & John Van Reenen, *Concentrating on the Fall of the Labor Share*, 107 American Economic Review 180 (2017); Germán Gutiérrez & Thomas Philippon, *Ownership, Concentration, and Investment*, 108 American Economic Review 432 (2018); Gustavo Grullon, Yelena Larkin & Roni Michaely, *Are US Industries Becoming More Concentrated?*, 23 Review of Finance 697 (2019); Thomas Philippon, *The great reversal: how America gave up on free markets* (The Belknap Press of Harvard University Press, Cambridge 2019); Jan De Loecker, Jan Eeckhout & Gabriel Unger, *The Rise of Market Power and the Macroeconomic Implications*, 135 The Quarterly Journal of Economics 561 (2020); David Autor, David Dorn, Lawrence F. Katz, Christina Patterson & John Van Reenen, *The Fall of the Labor Share and the Rise of Superstar Firms*, 135 The Quarterly Journal of Economics 645 (2020); Pauline Affeldt, Tomaso Duso, Klaus Gugler & Joana Piechucka*, Market Concentration in Europe: Evidence from Antitrust Markets*, CESifo Working Paper No. 8866 (2021); Matej Bajgar Giuseppe Berlingieri, Sara Calligaris, Chiara Criscuolo & Jonathan Timmis, *Industry Concentration in Europe and North America*, Industrial and Corporate Change, dtac059 (2023); Gábor Koltay, Szabolcs Lorincz & Tommaso Valletti, *Concentration and Competition: Evidence From Europe and Implications For Policy*, 19 Journal of Competition Law & Economics 466 (2023).

[3] Lars-Hendrik Röller, Johan Stennek & Frank Verboven, *Efficiency Gains from Mergers*, in Fabienne Ilzkovitz & Roderick Meiklejohn (eds), *European Merger Control – Do We Need an Efficiency Defence?* (Edward Elgar, Cheltenham 2006) 84. For antitrust decision errors in general see Frank H. Easterbrook, *The Limits of Antitrust*, 63 Texas Law Review 1 (1984).

[4] John E. Kwoka, *Mergers, Merger Control, and Remedies – A Retrospective Analysis of U.S. Policy* (MIT Press, Cambridge 2015); Malcom B. Coate, *A Retrospective on Merger Retrospectives in the United States*, 12 Journal of Competition Law & Economics 209 (2016).

[5] Henk Don, Ron Kemp & Jarig van Sinderen, *Measuring the Economic Effects of Competition Law Enforcement*, 156 De Economist 341 (2008); Stephen W. Davies & Peter L. Ormosi, *A Comparative Assessment of Methodologies Used to Evaluate Competition Policy*, 8 Journal of Competition Law & Economics 769 (2012).

[6] Paul A. Pautler, *Evidence on Mergers and Acquisitions*, 48 Antitrust Bulletin 119 (2003); Matthew Weinberg, *The Price Effects of Horizontal Mergers*, 4 Journal of Competition Law & Economics 433 (2007); Graeme Hunter, Gregory K. Leonard & G. Steven Olley, *Merger Retrospective Studies: A Review*, 23 Antitrust 34 (2008); Joseph Farrell, Paul A. Pautler & Michael G. Vita, *Economics at the FTC: Retrospective Merger Analysis with a Focus on Hospitals*, 35 Review of Industrial Organization 369 (2009); John E. Kwoka, *Does Merger Control Work? A Retrospective on U.S. Enforcement Actions and Merger Outcomes*, 78 Antitrust Law Journal 619 (2023); *Kwoka* (fn 4); Orley C. Ashenfelter, Daniel Hosken & Matthew Weinberg*, Did Robert Bork Understate the Competitive Impact of Mergers? Evidence from Consummated Mergers*, 57 Journal of Law & Economics S67 (2014); John E. Kwoka & Chengyan Gu, *Predicting Merger Outcomes: The Accuracy of Stock Market Event Studies, Market Structure Characteristics, and Agency Decisions*, 58 Journal of Law & Economics 519 (2015); *Coate* (fn 4).

findings, to develop classifications for cases with similar characteristics and to find potential patterns in the price effects of these horizontal transactions. This meta-study approach thus analyses whether there are common post-merger price effects in cases with specific similarities and derives implications for policy makers and competition authorities regarding the handling and regulation of merger cases in general. These implications may help to reduce the number of authority decision errors and thus improve the overall quality of merger enforcement across jurisdictions and industries. To this end, this contribution answers the following research questions:

1) Are there general price effects after horizontal transactions in certain groups of goods? Are some groups particularly prone to price increases after horizontal transactions?
2) What is the impact of the 'size' or 'importance' of a horizontal transaction on post-merger price effects?
3) What is the impact of market concentration on price developments after horizontal transactions?

In addition to price effects, labour market effects, incentives to innovate and invest, and efficiency effects are also well established in the theoretical and empirical literature on mergers.[7] For the sake of comparability and due to the wider availability of retrospective studies, this meta-study focuses only on the price effects of horizontal transactions. It provides an overview of the price effects found in the retrospective studies analysed and shows potential patterns. Therefore, the respective results of the studies, their assumptions and limitations are taken as given and potential (methodological or other) differences or shortcomings are not addressed here. As this meta-study does not attempt to identify errors in individual decisions made by competition authorities and analysed in ex-post studies, but rather to identify potential patterns in post-merger price effects, it does not address legal differences or the specific theory of harm applied by the respective authority. In doing so, this paper adds to the existing literature by compiling a larger data set than previous meta-studies in terms of retrospective studies and cases included, industries and jurisdictions covered, and additional determinants analysed in terms of their potential influence on post-merger price developments.

This paper is structured as follows: chapter II provides an overview of the benefits of ex-post studies for ex-ante merger control. The methodology and studies used in this meta-study are presented in chapter III, and groups of goods are developed using market and case characteristics in order to eventually assess (patterns of) post-merger price effects in these groups (chapter IV). Chapter V provides policy implications and concludes.

II. EX-POST-ANALYSIS FOR THE EVALUATION OF MERGER-EFFECTS

"Empirical evidence on the price effects of consummated mergers can both determine whether past antitrust enforcement was applied correctly, and aid regulators in developing more effective techniques to forecast the likely effects of mergers on competition.".[8] These are the overall goals of the ex-post assessment of merger decisions.[9] However, ex-post evaluations of

[7] If these effects are analysed in ex-post-studies, these mostly relate to e.g., efficiency or innovation effects of merger waves on whole industries. See, inter alia, B. Espen Eckbo, *Horizontal Mergers, Collusion, and Stockholder Wealth*, 11 Journal of Financial Economics 241 (1983); Stephen A. Rhoades, *Efficiency Effects of Horizontal (in-market) Bank Mergers*, 17 Journal of Banking and Finance 411 (1993); Steven T. Berry & Joel Waldfogel, *Do Mergers Increase Product Variety? Evidence from Radio Broadcasting*, 116 The Quarterly Journal of Economics 1009 (2001). For a timely summary of the vast literature on non-price effects of horizontal transactions, see Justus Haucap & Joel Stiebale, *Non-price Effects of Mergers and Acquisitions*, DICE Discussion Paper No. 402 (2023).

[8] Orley C. Ashenfelter, Daniel Hosken & Matthew Weinberg, *Generating Evidence to Guide Merger Enforcement*, 5 Competition Policy International 57, 57 (2009).

[9] See also Paolo Buccirossi, Lorenzo Ciari, Tomaso Duso, Sven-Olof Fridolfsson, Giancarlo Spagnolo & Cristina Vitale, *A Short Overview of a Methodology for the Ex-Post Review of Merger Control Decisions*, 156 De Economist 453 (2008).

competition authority decisions can have different motivations. In general, these can be divided into the following:[10]

- *Regime accountability* (external accountability of the competition authority in terms of justifying the use of taxpayers' money)
- *Authority accountability* (quality control of the decision, taking into account the institutional and other constraints at the time of the decision)
- *Policy learning* (evaluation of the effectiveness of competition law in terms of whether the final decision effectively protected competition and minimised decision errors of both types)

These three motivations for empirical ex-post evaluations imply different objectives and thus the need for different approaches. *Regime accountability* aims at evaluating competition policies regarding their potential welfare effects. Retrospective merger studies, on the other hand, are mostly conducted for reasons of *authority accountability* and *policy learning* – therefore, analysing individual decisions and their effects on competition. Ex-post studies aim to identify potential false negatives (given the fact that the mergers analysed must have been carried out in order to measure post-merger effects) and to take account of newly available information in order to determine the causes of decision errors and to improve future authority decisions.

In particular, the *policy learning* approach shows that ex-post analyses of merger cases are important ex-ante for several economic and political reasons.[11] One general objective is to provide an empirical basis for merger enforcement. To achieve this goal, the use of empirical models is crucial to generate explicit predictions of the potential competitive effects of mergers and to help authorities measure the effects of mergers ex-ante. These predictions can then be evaluated ex-post in retrospective studies of the individual mergers.[12] With the improved information available post-merger, researchers and authorities are able, first, to detect potential decision errors and second, to determine the accuracy of the ex-ante predictions. Retrospective studies thus can help understand, e.g., what types of mergers and other horizontal transactions lead to increased prices.[13] As merger control mostly operates ex-ante, it is crucial for the *policy learning* approach to use ex-post analyses to test the appropriateness of the respective merger control regime and to improve it where necessary.[14] Moreover, merger control has large implications for all other areas of competition policy.[15] Therefore, improving merger policy can also contribute to improving other areas of antitrust as it relates to, e.g., ex-post abuse control.

Methodologically, there are several empirical approaches and econometric techniques for the ex-post price evaluation of mergers and similar transactions, such as the estimation of structural econometric models combined with simulations, program-evaluation methods (in particular difference-in-differences (DiD) analysis, which is the most commonly used method in retrospective merger studies), event studies, and surveys.[16] All of these approaches rely on substantial information about the authority's review of the case,[17] as well as pre- and post-merger price data. However, one of the most crucial problems is the determination of the counterfactual price (the market price if the merger had not taken place). Since this price is

[10] *Don et al.* (fn 5); *Davies & Ormosi* (fn 5); Oliver Budzinski, *Impact Evaluation of Merger Control Decisions*, 9 European Competition Journal 199 (2013); Oliver Budzinski & Annika Stöhr, *Towards a Systematic Controlling of Antitrust Decisions*, November 2018 CPI Antitrust Chronicle 45.
[11] Dennis W. Carlton, *Why We Need to Measure the Effect of Merger Policy and How to Do It*, 5 Competition Policy International 77 (2009).
[12] *Ashenfelter et al.* (fn 8).
[13] Ibid.
[14] Damien Neven & Lars-Hendrik Röller, *Discrepancies between markets and regulators: An analysis of the first ten years of EU merger control*, in Konkurrensverket - Swedish Competition Authority (eds), *The Pros and Cons of Merger Control* (Stockholm 2002) 13; Tomaso Duso, *A Decade of Ex-post Merger Policy Evaluations: A Progress Report*, in Konkurrensverket - Swedish Competition Authority (eds), *More Pros and Cons of Merger Control* (Stockholm 2012) 125; Tomaso Duso, Klaus Gugler & Florian Szücs, *An Empirical Assessment of the 2004 EU Merger Policy Reform*, 123 The Economic Journal F596 (2013); *Coate* (fn 4).
[15] *Kovacic* (fn 1); *Duso* (fn 14).
[16] *Buccirossi et al. (*fn 9); *Duso* (fn 14); *Kwoka* (fn 4) 47-51.
[17] *Carlton* (fn 11); *Coate* (fn 4).

inherently unobservable, it has to be estimated in order to use a method such as DiD.[18] The suitability of certain methods for ex-post studies, e.g. simulations for analysing some oligopoly models, and high demands on data availability and quality may also lead to a sample selection problem, resulting in the over-representation of specific markets or small sample sizes.[19] Furthermore, potential post-merger price variation is often not included in these studies.[20] In addition to these methodological difficulties, there are other obstacles to interpreting and generalising the results of the ex-post evaluations of one or a few completed mergers. It is not convincing to draw conclusions on merger effects in general or to determine that there must be a systematic bias or error in antitrust policy on the basis of a single case reviewed – especially taking into account the sample selection bias mentioned above.[21] The latter challenge can be addressed by choosing a meta-analysis approach that includes several merger retrospectives – as is the aim of this paper. By empirically assessing the results of a large number of ex-post studies, generalised statements and interpretations can be better justified and explained, even if not perfectly, given the different market conditions. Overall, some conclusions can be drawn about the effects of mergers in certain industries[22] and about mergers with certain characteristics in different sectors.

III. OVERVIEW OF APPLIED ANALYSIS METHOD

A. Sampled retrospective studies

The selection of studies and cases included here goes beyond the existing literature[23] and includes a wide range of cases from different jurisdictions and sectors. Table 1 provides an overview:

Table 1. Analysed studies and cases of selected meta-studies

Meta-Study	Number of Retrospective Studies used	Number of Cases included	Number of industries covered	Jurisdictions covered
Coate (2016)	29	25	12	U.S.
Ormosi and others (2015)	18	25	10	EU, ES, FR, NL, SV, UK
Kwoka (2015)	47	49 (+19 groups)	14	U.S.
Ashenfelter and others (2014)	49	68 (+12 groups)	13	U.S., IT, ES, FR, UK, SV, CAN
Weinberg (2007)	9	15 (+3 groups)	8	US, IT
Present Meta-Study	52	82	15	U.S., EU, FR, UK, BE, AT, SV

In addition to the effects of individual mergers, three of the previous meta-studies also included studies that calculated the effects of groups of mergers or merger waves. The second column shows the total number of retrospective studies analysed by the respective meta-study, including those that examined groups of mergers, while the third column shows exactly how many merger cases were included. In order to link the FTC's challenge probabilities to the respective merger price effects, and to address the underlying sample selection problem of enforcement authorities, Coate (2016) uses 29 ex-post studies of U.S. merger cases across different sectors. The number of industries covered respectively, shown in the fourth column,

[18] *Ashenfelter et al.* (fn 8).
[19] *Carlton* (fn 11); *Davies & Ormosi* (fn 5).
[20] Franco Mariuzzo & Peter L. Ormosi, *Post-merger Price Dynamics Matters, So Why Do Merger Retrospectives Ignore it?*, 55 Review of Industrial Organization 403 (2019).
[21] *Carlton* (fn 11); Gregory J. Werden, *Inconvenient Truths on Merger Retrospective Studies*, 3 Journal of Antitrust Enforcement 287 (2015).
[22] See, inter alia, *Kwoka* (fn 4); *Kwoka* (fn 6); *Kwoka & Gu* (fn 6).
[23] *Coate* (fn 4); Peter Ormosi, Franco Mariuzzo & Richard Havell, *A review of merger decisions in the EU: What can we learn from ex-post evaluations?*, Report for the European Commission, Luxembourg (2015); *Kwoka* (fn 4); *Ashenfelter et al.* (fn 8); *Weinberg* (fn 6).

is based on the differentiation of groups of goods developed and used in chapter III. B. to ensure comparability. Ormosi et al. (2015) review 18 studies, including 25 cases from the European Union and the United Kingdom, to derive implications for enforcers and identify potential decision errors. Note that Ormosi et al. also analyse non-price effects of horizontal mergers, strictly separate from the analysis of price effects, using 12 additional ex-post studies that are not included in table 1. Kwoka (2015) provides in-depth insights into 49 single U.S. cases as well as 19 grouped merger analyses, using a total of 47 retrospective studies to assess current U.S. merger policy. The analysis of individual mergers and merger waves is strictly separated in his work. Ashenfelter et al. (2014) also include analyses of merger waves, e.g. in the banking and hospital sectors as well as in the newspaper market. Their meta-study includes several different jurisdictions in order to draw general conclusions about the effects of mergers in oligopolistic markets and to provide an empirically based critique of Robert Bork's *Antitrust Paradox*. Weinberg (2007) includes 15 individual mergers and three studies of grouped mergers, one of which analyses the Italian banking sector.

Using the mentioned previous meta-studies as a starting point, the 52 retrospective studies and 82 cases of horizontal transactions analysed in this meta-study differ from the database of these other works because a different approach to sample selection was taken. Overall, however, a potential sample bias resulting from the use of a non-random sample of ex-post studies cannot be completely avoided. The sample includes studies published in peer-reviewed journals as well as discussion papers and studies carried out by or for competition authorities. In addition to pure or at least substantially horizontal[24] mergers and acquisitions that have actually taken place (papers modelling hypothetical mergers and their effects are not included[25]), studies measuring the effects of other horizontal transactions, such as joint ventures or code-share agreements, are also analysed, as their effects are likely to be similar.[26] Throughout this meta-study, the term 'merger effects' is used to refer to all effects that may occur following a horizontal merger or similar transaction. Only retrospective studies that analyse specific price effects[27] of horizontal transactions using econometric methods are taken into account, i.e., studies that use post-merger data and have an appropriate control group.[28] Studies that only provide verbal descriptions of the case(s) or the performance of the competition authority, e.g. following an interview-based approach, are excluded because the effects cannot be properly captured in a quantitative analysis. In contrast to some of the previous meta-studies, papers analysing the effects of merger waves are excluded for the same reason.[29] A related area of research is the analysis of divestiture effects. However, papers that only measure the effectiveness of (potential) divestitures and other remedies in a merger case[30] are excluded because they do not analyse exactly the same effects. In addition, these papers often predict the potential effects of remedies on merger proposals rather than analysing the actual post-merger effects.

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[24] Vertical or conglomerate mergers are not analysed in this meta-study, due to the different competitive effects and potential policy implications (see *Kwoka* (fn 4)). Nevertheless, these mergers raise interesting and under-researched questions, especially in media and platform markets (for examples of such ex-post studies see, e.g., David Waterman, *CBS-Viacom and the Effects of Media Mergers: An Economic Perspective*, 52 Federal Communications Law Journal 531 (2000); Steven C. Salop, *Analyzing Vertical Mergers to Avoid False Negatives: Three Recent Case Studies*, 33 Antitrust 27 (2019); Margaret E. Slade, *Vertical Mergers: A Survey of Ex Post Evidence and Ex Ante Evaluation Methods*, 58 Review of Industrial Organization 493 (2020); Marissa Beck & Fiona M. Scott Morton, *Evaluating the Evidence on Vertical Mergers*, 59 Review of Industrial Organization 273 (2021).

[25] As well as papers, where mergers are theoretically undone ex-post (e.g., Joris Pinkse & Margaret E. Slade, *Mergers, brand competition, and the price of a pint*, 48 European Economic Review 617 (2004)). See also *Kwoka* (fn 4) 39ff. on prospective merger evaluation vs. retrospective merger evaluation.

[26] *Kwoka* (fn 4).

[27] Papers that analyse merger effects on stock market performance of the merging firms or their competitors (e.g., Tomaso Duso, Damien J. Neven & Lars-Hendrik Röller, *The Political Economy of European Merger Control: Evidence using Stock Market Data*, 50 Journal of Law & Economics 455 (2007)) are not included in this meta-study because these effects do not necessarily show the pro- or anti-competitive impact of a horizontal transaction (inter alia, *Kwoka & Gu* (fn 6)).

[28] *Pautler* (fn 6); *Kwoka* (fn 4).

[29] *Kwoka* (fn 6).

[30] See, e.g., Jim Burke, *Divestiture as an antitrust remedy in bank mergers*, 1998-14 Finance and Economics Discussion Series of the Board of Governors of the Federal Reserve System (1998); Tomaso Duso, Klaus Gugler & Burcin Yurtoglu, *EU Merger Remedies: An Empirical Assessment*, in Vivek Ghosal & Johan Stennek (eds), *The Political Economy of Antitrust, Contributions to Economic Analysis* (Vol. 282 Elsevier, Amsterdam 2007) 303.

In contrast to other meta-studies, contributions that analyse horizontal transactions in the hospital, railway, and banking sectors are not considered. There is empirical evidence that stricter regulation in these sectors, which can be based on a variety of (political) reasons, can lead to less organic competition, e.g. by raising entry barriers and reducing incentives to innovate.[31] Due to this distortion of the competitive process, the effects of horizontal transactions in these markets may also be skewed by the regulatory intervention.[32] It is difficult to control for which effects are due to the actual transaction and which are due to the (price) regulation – especially if this is not already taken into account in the retrospective studies. To measure the regulatory barriers for competition in a market, the OECD uses the Product Market Regulation (PMR) indicator at the sector level.[33] For the transport sector, this indicator is used here to exclude the railway industry. With a level of regulation well above the average for the transportation sector in OECD countries as a whole, the railway sector can be considered highly regulated. In contrast, air transport is the least regulated transport sector, with a level of regulation below the overall average.[34] Another sector excluded from this contribution is banking. As several financial crises have shown, banks can often be considered as 'too-big-to-fail' or even 'too-interconnected-to-fail'. In times of crisis, governments tend to create stability mechanisms or 'umbrellas' to protect banks from failure, creating significant moral hazards. Competition in the banking sector is thus heavily influenced by national and international regulation and 'real' competition in the sector is hard to find.[35] Moreover, most ex-post studies analysing bank mergers look at the aggregate (price) effects of merger waves rather than the effects of a single transaction. The last sector that is a priori excluded from the analysis is the hospital sector. A general assumption about the hospital market is that, if left unregulated, it would be inefficient, e.g., in terms of available patient beds.[36] Therefore, regulation can help to improve the quality of hospital services and is even seen as necessary to provide society with the required number of beds (and medical care in general).[37] This explains the high level of regulation in the market, but makes it difficult to compare the price effects of mergers in this sector with those in other markets.

Unlike some of the previous meta-studies,[38] this contribution does not focus on mergers and horizontal transactions in specific jurisdictions. The aim of this paper is not to measure the effectiveness of any particular competition authority or policy, but rather to provide an overview of the potential price effects of horizontal mergers and transactions in markets with specific characteristics and to draw implications that are applicable across jurisdictions. By using this approach, the contribution of this paper to the literature lies in particular in the

[31] Richard A. Posner, *Theories of Economic Regulation*, 5 The Bell Journal of Economics and Management Science 335 (1974); Richard A. Posner, *The Effects of Deregulation on Competition: The Experience of the United States*, 23 Fordham International Law Journal S7 (1999); Swedish Agency for Economic and Regional Growth, *Regulation and Competition – A literature review*, Stockholm (2017); Competition & Markets Authority, *Regulation and Competition – A Review of the Evidence*, London (2020); James B. Bailey & Diana W. Thomas, *Regulating away competition: the effect of regulation on entrepreneurship and employment*, 52 Journal of Regulatory Economics 237 (2017).

[32] Inter alia, David Balto & Meleah Geertsma, *Why Hospital Merger Antitrust Enforcement Remains Necessary: A Retrospective on the Butterworth Merger*, 34 Journal of Health Law 129 (2001); John E. Kwoka & Lawrence J. White, *Manifest Destiny? The Union Pacific and Southern Pacific Railroad Merger (1996)*, in John E. Kwoka & Lawrence J. White (eds) *The antitrust revolution: economics, competition, and policy* (4th ed., Oxford University Press, New York 2004) 64; Giulio Federico, *The economic analysis of energy mergers in Europe and in Spain*, 7 Journal of Competition Law & Economics 603 (2011); Stephen Littlechild, *The Nature of Competition and Regulatory Process*, 46 Intereconomics 10 (2011); Volodymyr Bilotkach & Kai Hüschelrath, *Airline alliances and antitrust policy: The role of efficiencies*, 21 Journal of Air Transport Management 76 (2012).

[33] Balázs Égert & Isabelle Wanner, *Regulations in services sectors and their impact on downstream industries: the OECD 2013 REGIMPACT indicator*, OECD Economics Department Working Papers, No. 1303 (2016).

[34] OECD, *Sector PMR Indicators – Values 2018*, <https://www.oecd.org/economy/reform/indicators-of-product-market-regulation/> accessed 21 February 2024.

[35] OECD, *Bank Competition and Financial Stability – Report*, Paris (2011).

[36] Paul L. Joskow, *The Effects of Competition and Regulation on Hospital Bed Supply and the Reservation Quality of the Hospital*, 11 Bell Journal of Economics 421 (1980).

[37] Justus Vogel, Alexander Geissler, M. Barkhausen & Christoph Pross, *Minimum volume regulation effects on outcome quality and the hospital sector in Germany*, 28 European Journal of Public Health 44 (2018).

[38] Inter alia, *Kwoka* (fn 4); *Kwoka* (fn 6); *Kwoka & Gu* (fn 6); Franco Mariuzzo, Peter L. Ormosi & Richard Havell, *What can merger retrospectives tell us? An assessment of European mergers*, 16(4) CCP Working Paper (2016).

categorisation and analysis of specific groups of goods and additional determinants that may affect the price effects of a merger.

B. Groups of goods

The sample selection resulted in a total of 52 retrospective merger studies, with some papers analysing more than one case, leading to a total of 82 mergers or horizontal transactions included here. Note that 15 cases were analysed by more than one retrospective study, resulting in multiple reported price effects for some transactions. In addition, in some cases the consideration of different regional markets, products concerned, etc. also resulted in several price effects per transaction. In total, 207 price effects were reported in the ex-post studies, of which 194 could actually be analysed further.[39] For the purpose of systematisation and generalisation, 15 groups of goods were developed and analysed regarding their price effects (see Annexes A1 and A2 for a list of the cases analysed and the ex-post studies used). This allows for the analysis of cases and general merger effects within specific industries to answer the first research question.

The groups of goods shown in table 2 contain differentiated products that are nevertheless similar enough that post-merger price increases or decreases may have similar effects on consumer welfare and overall competition in these markets. For example, the group 'alcoholic beverages' includes post-merger price developments for both beer and spirits, 'flights' includes non-stop and connecting flights, and 'groceries' includes price effects for both food and non-food consumer goods.

Table 2. Number of price effects per group of goods

Group of Goods	Number of Price Effects	Number of Cases
Alcoholic Beverages	12	4
Casinos	1	1
Cement	1	1
Cigarettes	2	1
Corrugating Medium	1	1
Flights	40	17
Gasoline	86	16
Groceries	24	16
Home Appliances	4	1
Media Products	19	14
Motor Oil	3	1
Parking Lots	1	1
Pharmaceutical Products	4	2
Telecommunications	8	3
Titanium Dioxide	1	1
Total	207	82

[39] Some of the price effects were only given in absolute terms, e.g., as price increase in cents per gallon. This type of data is not comparable and therefore, where it was impossible to convert the price effects into percentages, could not be analysed further. These price effects are only included in table 2 and figure 1, respectively.

This distinction between different groups of goods is a first step in the analysis of price effects. However, it is already clear that a more detailed analysis of individual groups of goods is only possible for selected sectors due to the small number of cases and limited data availability.

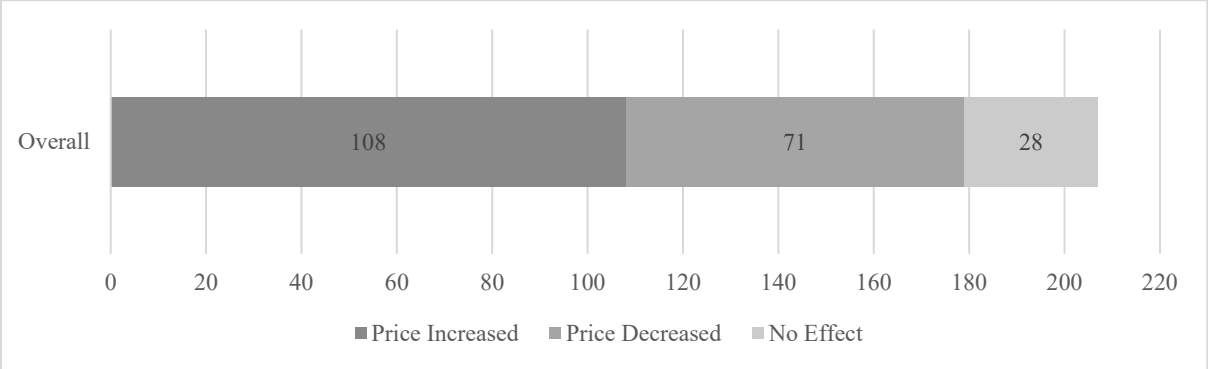
IV. ANALYSIS OF PRICE EFFECTS

Chapter IV analyses the different post-merger price effects based on the aforementioned research questions using the collected data on 82 mergers and horizontal transactions. As not all data are available for each case, mostly subsets are used to analyse the respective research question. The corresponding N is given for each analysis.

A. General price effects in groups of goods

Figure 1 provides an overview of all price effects analysed. For 108 out of 207 price effects, the retrospective studies find post-merger price increases (52 % of the analysed price effects). 71 of the analysed price effects show a price decrease post-transaction. In 28 cases, the authors of the respective study did not find a clear result, i.e., no meaningful change in price post-transaction.

Figure 1. Overview of all price effects



In all cases, the respective notification thresholds under the Hart-Scott-Rodino Act or the EU/national merger regulations were met. In addition, the U.S. Department of Transportation was involved in the U.S. airline merger cases and provided its own competitive analysis. [40] As all of the transactions in the sample had to be notified to the respective authorities and were either cleared (with or without remedies) or not challenged, in principle none of the mergers should have led to a post-merger price increase. However, the results in figure 1 are consistent with recent research, for example on the stringency of antitrust enforcement in the U.S., which finds that the likelihood of anti-competitive mergers being cleared is substantial, with estimates showing that agencies block mergers that they expect to raise prices by more than 8-9 %.[41] The results in table 3 show that most of the price effects considered in this meta-study, both overall and in the individual groups of goods, are below this threshold. This also shows that the probability of false positive decisions by competition authorities is low, which is underlined by the fact that, for example, the European Commission has taken an average of one prohibition decision per year over the last 30 or so years.[42]

[40] U.S. Department of Transportation, Mergers and Acquisitions, <https://www.transportation.gov/policy/aviation-policy/competition-data-analysis/mergers-acquisitions> accessed 19 March 2024 (2015).
[41] Vivek Bhattacharya, Gastón Illanes & David Stillerman, *Merger Effects and Antitrust Enforcement: Evidence from US Consumer Packaged Goods*, NBER Working Paper No. 31123 (2023).
[42] Pauline Affeldt, Tomaso Duso & Florian Szücs, *25 years of European merger control*, 76 International Journal of Industrial Organization 102720 (2021).

The assumption that some industries may be more susceptible to concentration and to the negative competitive effects of increased concentration is supported by developments in recent years – for example, increased concentration in several U.S. and EU markets[43] and, in particular, the evolution of digital platform markets, which have an inherent tendency to concentrate due to their platform characteristics alone.[44] Given this general assumption, most meta-studies use product-level price effects to address potential industry-specific patterns by calculating average price effects in these delineated industries.[45] The corresponding results for the sample used here are shown in table 3. For reasons of comparability mentioned above, the number of analysable price effects decreased to 194.

Table 3. Price effects per group of goods

Group of Goods	Obs	Mean	Std Dev	Min	Max
Alcoholic Beverages	12	0.0248	0.0331	-0.0238	0.1030
Casinos	1	-0.0027	.	-0.0027	-0.0027
Cement	1	-0.2300	.	-0.2300	-0.2300
Cigarettes	2	0.2020	0.0863	0.1410	0.2630
Corrugating Medium	1	0.0000	.	0.0000	0.0000
Flights	32	0.0313	0.0794	-0.1230	0.2940
Gasoline	81	0.0192	0.0886	-0.2330	0.2940
Groceries	24	-0.0007	0.0296	-0.1360	0.0860
Home Appliances	4	-0.0018	0.0301	-0.0268	0.0375
Media Products	19	0.0720	0.1384	-0.1992	0.4000
Motor Oil	3	0.0744	0.0133	0.0603	0.0868
Parking Lots	1	0.0300	.	0.0300	0.0300
Pharmaceutical Products	4	0.1040	0.1669	0.0000	0.3500
Telecommunications	8	0.1053	0.3827	-0.3400	0.9020
Titanium Dioxide	1	0.2800	.	0.2800	0.2800
Overall	194	0.0472	0.1207	-0.3400	0.9020

Note that the aggregate results should be interpreted with caution due to differences in methodology, data, and time period used across studies.[46] In addition, several groups consist of only one or a few price effects. Most of the groups with more observations show both price

[43] See, inter alia, *Gutiérrez & Philippon* (fn 2); *Grullon et al.* (fn 2); *Philippon* (fn 2); Matej Bajgar, Chiara Criscuolo & Jonathan Timmis, *Intangibles and Industry Concentration: Supersize me*, 2021/12 OECD Science, technology and Industry Working Papers (2021); *Affeldt et al.* (fn 2); *Bajgar et al.* (fn 2).

[44] David S. Evans & Richard Schmalensee, *The industrial organization of markets with two-sided platforms*, 3 Competition Policy International 151 (2007); Joseph Farrell & Paul Klemperer, *Coordination and Lock-In: Competition with Switching Costs and Network Effects*, in Mark Armstrong & Robert H. Porter (eds), *Handbook of Industrial Organization* (Vol. 3, North Holland, Amsterdam 2007) 1967; Justus Haucap & Ulrich Heimeshoff, *Google, Facebook, Amazon, eBay: is the internet driving competition or market monopolization?*, 11 International Economics and Economic Policy 49 (2014); Justus Haucap & Torben Stühmeier, *Competition and antitrust in internet markets*, in Johannes M. Bauer & Michael Latzer (eds) *Handbook on the Economics of the Internet* (Edward Elgar, Cheltenham 2016), 183; Oliver Budzinski & Annika Stöhr, *Competition policy reform in Europe and Germany – institutional change in the light of digitization*, 15 European Competition Journal 15 (2019).

[45] See, e.g., *Kwoka* (fn 4) 98f.

[46] *Ashenfelter et al.* (fn 8). Price effects of mergers can generally be very heterogenous due to different firm and market attributes (see, e.g., Ralph B. Siebert, *What Determines Heterogeneous Merger Effects on Competitive Outcomes?*, 70 Journal of Industrial Economics 217 (2022)), which applies also to this dataset, including several outliers that will be addressed respectively.

increases and decreases after the transaction. 'Telecommunications' has the widest distribution of calculated price developments, with both the highest price increase and the lowest price decrease post-transaction in the sample found in this group. Most groups of goods, as well as the overall sample, show an average post-merger price increase. However, the standard deviation is very high for some of the groups, especially those with only a few observations. Nevertheless, these first results provide an overview and a starting point for further analysis.

B. Price effects depending on additional determinants

1. Collusion History

Mergers are usually not one-off events, but are linked to past and future transactions in the same industry,[47] either by the same firms or other companies in the market. However, these practices, which are not in themselves unusual or anti-competitive, could be (mis)used by firms as a 'legal way of colluding' and thus as a substitute for illegal agreements, since they may have similar price- and profit-increasing effects. If firms or industries have a history of collusion, competition authorities may pay particular attention to these infringements. Therefore, mergers or other forms of legal cooperation could be an efficient strategy for firms in such highly scrutinised industries. In these industries, post-merger price increases might be more likely than in markets without a history of collusion. To test this theory against the sample, 185 price effects were analysed. For 47 price effects, the respective industry had no history of collusion, while for the remaining 138 effects, firms in the respective markets had previously been involved in illegal practices. Note that this refers to the market in question and not automatically to the specific firms. In addition, the check for a history of collusion was carried out for the specific time period of the respective horizontal transaction. Therefore, in some cases collusion history in one group of goods may be confirmed for one price effect, while for another effect in the same group, the existence of collusion history has to be denied[48] – of course only referring to detected collusion. It is very likely that some mergers in this sample were preceded by a number of unreported collusion cases. Price increases and decreases were observed for transactions in markets with and without a history of collusion. The mean price effect for mergers without a history of collusion is an increase of 3.58 %, while for mergers without collusion history, the average post-transaction price increase is only 0.24 % (see table 4).

Table 4. Price effects in markets with and without collusion history

Variable	Obs	Mean	Std Dev	Min	Max
No Collusion History	47	0.0024	0.1161	-0.3400	0.2630
Collusion History	138	0.0358	0.1079	-0.2330	0.9020

Overall, the only small differences in average post-transaction price changes could be a sign of a variant of the so-called 'cellophane fallacy', which states that in the case of a dominant firm, the observable market price is higher than the competitive price because prices already reflect the market power of the dominant firm.[49] Applied to the situation in question, this could mean that there is no greater difference in price effects between industries with and without a history of collusion, due to the distortion of competition and already higher prices resulting

[47] Joseph Farrell & Carl Shapiro, *Horizontal Mergers: An Equilibrium Analysis*, 80 American Economic Review 107 (1990); Volker Nocke & Michael D. Whinston, *Dynamic Mergers Review*, 118 Journal of Political Economy 1201 (2010).
[48] Groups of goods in which collusion was detected prior to every transaction in this sample: Corrugating Medium, Flights, Gasoline, Pharmaceutical Products, Titanium Dioxide; Groups of goods where no collusion was detected prior to any transaction in this sample: Casinos, Cement, Cigarettes, Home Appliances, Media Products, Motor Oil, Parking Lots; Groups of goods with mixed collusion history prior to the transactions in this sample: Telecommunication, Groceries, Alcoholic Beverages.
[49] Gene C. Schaerr, *The Cellophane Fallacy and the Justice Department's Guidelines for Horizontal Mergers*, 94 Yale Law Journal 670 (1985).

from past collusion. In markets with a history of collusion, prices are already adjusted to the anti-competitive level prior to the horizontal transaction, leading to relative price changes similar to those in competitive markets. However, this theory implies that the level of price effects in the group with collusion history tends to be underestimated. Interestingly, both the highest post-transaction price decrease in a market without collusion history (decrease of -34 % following the merger of T-Mobile Austria and tele.ring in 2006) and the largest price increase in a market with detected collusion history (90.20 % following the merger of H3G Austria and Orange in 2013) were found in the Austrian telecommunications market. This could serve as further verification for enhanced price-increasing effects of mergers in markets with a history of collusion. Taking both aspects into account, the results shown in table 4 could imply a positive correlation between collusion history and post-transaction price increases.[50]

2. Size/Importance of the transaction & market concentration

To answer research question 2), turnover and transaction volume are used as variables for the 'size' and 'importance' of a specific transaction. The summary statistics are shown in table 5. It should be noted that the sample may be biased in that the most harmful mergers were potentially either (i) prohibited, (ii) mitigated by remedies, or (iii) were not proposed at all in anticipation of prohibition. This applies to all interpretations in this paper, but particularly to the analysis of the three variables shown in table 5, since high transaction volumes and turnovers are already criteria that imply close scrutiny by competition authorities.[51]

Table 5. Summary statistics (relative) firm size and transaction volume [in bn $]

Variable	Obs	Mean	Std Dev	Min	Max
Transaction Volume	123	12.688	23.089	0.004	75.400
Combined Turnovers	94	53.654	67.050	0.697	408.554
Difference in Turnovers	93	22.286	41.178	0.277	342.606

Due to the different sources used to collect data on turnovers and transaction volumes, it cannot be guaranteed that all values have been calculated in the same way. However, any differences are likely to distort the proportions only slightly - the turnover dimension and the size of the firms assumed on this basis remain unchanged, and differences in firm size in terms of turnover can still be measured. Therefore, the data used here are sufficient to provide an overview and to make initial statements about a potential relation between relative firm size and post-merger price effects.

When looking at relative firm size, different measures can be used.[52] In general, a merger involving a relatively big firm merging with a relatively small firm may be less likely to lead to post-merger price increases than a 'merger of equals' or a so-called 'mega-merger' of two large firms. These 'unequal' mergers may be more profitable (or less unprofitable) to begin with, given the possibility of higher efficiency effects.[53] Therefore, there may be less incentive to raise prices post-merger. In addition, market concentration and market power tend to be

[50] It could also be interesting to analyse the respective merger history of a firm or an industry. Companies that want to concentrate the market (to ultimately derive market power rents) might shy away from big mergers that would probably be prohibited by competition authorities and, instead, engage in a series of smaller mergers leading to similar market concentration/power and rents (see Thomas G. Wollmann, *Stealth Consolidation: Evidence from an Amendment to the Hart-Scott-Rodino Act*, 1 American Economic Review: Insights 2019 77 (2019)). In this context the theory of pre-emptive mergers can also play a role (see Sven-Olof Fridolfsson & Johan Stennek, *Why Mergers Reduce Profits and Raise Share Prices - A Theory of Preemptive Mergers*, 3 Journal of the European Economic Association 1083 (2005); Jozsef Molnar, *Pre-Emptive Horizontal Mergers: Theory and Evidence*, Bank of Finland Research Discussion Paper No. 17/2007 (2007)). This theory states that it can be rational for a firm that fears that one of its rivals will gain competitive advantage by taking over some third firm, to pre-empt this merger by taking over the third firm itself. In a market that experienced several (small) mergers over time (that increased market shares/power of a few firms), an additional merger is potentially more likely to lead to price increases than a merger in a market without a comprehensive merger history.

[51] see *Wollmann* (fn 51).

[52] See Sol S. Shalit & Ulaganathan Sankar, *The Measurement of Firm Size*, 59 The Review of Economics and Statistics 290 (1977).

[53] In general, on efficiency effects of mergers, see Alan A. Fisher & Robert H. Lande, *Efficiency Considerations in Merger Enforcement*, 71 California Law Review 1582 (1983).

higher in cases of 'mega-mergers', providing further opportunities and incentives to raise prices post-merger.[54] To test these theories, difference in turnovers pre-merger and post-merger combined turnovers are used as a measure of relative firm size.

Another measure of the 'size' or 'importance' of a merger is the respective transaction volume. Transaction volume can be seen as an (imperfect) proxy for market power, as it illustrates the value of the transaction to the firms involved, in particular the acquiring firm, due to the market position of the target and the related pricing possibilities, (future) efficiencies, and other factors.[55] This value is likely to be higher the higher the anticipated profitability of the transaction due to expected market power rents, as increasing market power is often a major reason for firms to merge in the first place.[56] A higher transaction volume can therefore be 'translated' into greater market power. An assumption derived from this is that the higher the transaction volume (or in other words, the 'bigger' the merger), the more likely it is that post-merger prices will increases. It can be assumed that the companies involved expect a payback for the high transaction volume, at least in the mid-term, which in turn suggests a potential price increase over the same period. This is also related to the discussion on adding transaction-based thresholds in merger control regimes, as turnover does not always capture the full competitive relevance of firms, especially in, but not limited to, the digital economy.[57] New products or services are often offered (almost) free of charge, so the turnover of the firm may be low. Nevertheless, so-called 'mavericks' can be interesting acquisition targets for incumbent firms – to expand their own portfolio, but also to distort competition and secure their own market position.[58] The (profit) potential seen in the firms to be acquired is often reflected less in the actual turnover than in the transaction volume.

Market shares and the corresponding market concentration are important variables on which competition policy relies and which are used by competition authorities to assess the potential effects of mergers and other horizontal transactions.[59] Measuring market concentration is therefore a crucial step in any merger case, although it is not trivial due to the market delineation that has to be carried out beforehand.[60] Table 6 provides an overview of the relevant summary statistics for the sample used here.

Table 6. Summary statistics market concentration

Variable	Obs	Mean	Std. dev.	Min	Max
Pre-Merger HHI	42	2,678.333	1,903.558	597	10,000
Post-Merger HHI	41	3,247.902	1,904.578	819	10,000
Difference in HHI	82	770.561	843.1079	-454	3,437
Combined Market Shares	117	0.3067393	0.23209	0.06	1

[54] Robin A. Prager & Timothy H. Hannan, *Do Substantial Horizontal Mergers Generate Significant Price Effects? Evidence from the Banking Industry*, 46 Journal of Industrial Economics 433 (1998).
[55] Louis Kaplow, *On the Relevance of Market Power*, 130 Harvard Law Review 1303 (2017).
[56] Ibne Hassan, Pervez N. Ghauri & Ulrike Mayrhofer, *Merger and acquisition motives and outcome assessment*, 60 Thunderbird International Business Review 709 (2018).
[57] Natalie Harsdorf, *Digital Economy: New Test in Austrian Merger Control,* 8 Journal of European Competition Law & Practice 421 (2017); Juliane Scholl, *Why the New Merger Control Thresholds in Germany?,* 8 Journal of European Competition Law & Practice 219 (2017); Marc Bourreau & Alexandre de Streel, *Big Tech Acquisitions: Competition and Innovation Effects and EU Merger Control*, CERRE Issue Paper February 2020 (2020); Chiara Fumagalli, Massimo Motta & Emanuele Tarantino, *Shelving or Developing? The Acquisition of Potential Competitors under Financial Constraints,* CSEF Working Paper No. 637 (2022).
[58] See the literature on so-called killer acquisitions, inter alia, Tommaso M. Valletti & Hans Zenger, *Increasing Market Power and Merger Control*, 5 Competition Law & Policy Debate 26 (2019); Amy C. Madl, *Killing Innovation?: Antitrust Implications of Killer Acquisitions*, JREG Online Bulletin (2020); Daniel D. Sokol, *Merger Law for Biotech and Killer Acquisitions*, 72 Florida Law Review Forum (2020); Colleen Cunningham, Florian Ederer & Song Ma, *Killer Acquisitions*, 129 Journal of Political Economy 649 (2021); Igor Letina, Armin Schmutzler & Regina Seibel, *Killer Acquisitions and Beyond: Policy Effects on Innovation Strategies*, International Economic Review, DOI: 10.1111/iere.12689 (2024).
[59] Volker Nocke & Michael D. Whinston, *Concentration Thresholds for Horizontal Mergers*, 112 American Economic Review 1915 (2022).
[60] Dennis W. Carlton, *Market Definition: Use and Abuse*, 3 Competition Policy International 2 (2007).

A general conclusion drawn from oligopoly models is that the level of industry concentration is an indicator of market power.[61] Mergers as well as other horizontal transactions, and the associated changes in market concentration, therefore have an impact on market power in the respective industry. Increased market power can lead to incentives to discriminate against competitors, to collude, to be less innovative and, finally, market power can be exploited to the detriment of consumers, e.g., through price increases. For this reason, concentration-based thresholds are a central aspect of merger guidelines, e.g. in the U.S. or the EU, often based on potential post-merger concentration. However, recent empirical and theoretical analyses suggest that more emphasis should be placed on the actual change in market concentration induced by the transaction.[62] In the present dataset, both pre-[63] and post-merger HHI as well as the change in HHI are used as variables to answer research question 3). The data were collected from the ex-post studies included in the sample, as there is a high risk of inaccuracies in the underlying market definition when using sources other than the authors of the respective study. For this reason, the number of cases/price effects used in the analysis had to be significantly reduced. The same reasoning regarding data availability applies to the inclusion of divestiture effects. Due to the lack of systematic ex-post merger evaluations, data on specific price effects or the actual effects of divestitures and other remedies are often not available to the respective competition authorities and therefore cannot be used in the respective retrospective studies analysed here.[64] This could lead to a systematic underestimation of price effects compared to the counterfactual without divestitures, and thus to a failure to reflect the 'actual' effects the 'pure' transaction would have had.

After introducing all determinants, table 7 provides an overview of the pairwise correlations.

Table 7. Pairwise correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) Pre-Merger HHI	1.000								
(2) Post-Merger HHI	0.944*	1.000							
(3) Difference in HHI	-0.199	0.137	1.000						
(4) Combined Market Shares	-0.193	0.155	0.834*	1.000					
(5) Transaction Volume	-0.483*	-0.193	0.008	-0.261*	1.000				
(6) Combined Turnovers	0.253	-0.154	-0.319	-0.319*	0.467*	1.000			
(7) Difference in Turnovers	-0.008	-0.542*	-0.250	-0.236	0.231*	0.914*	1.000		
(8) Collusion History	0.212	0.238	0.038	-0.223*	0.130	0.268*	0.203	1.000	
(9) Price Effects	0.049	0.150	0.163	-0.031	0.086	0.208*	0.133	0.127	1.000

*** *p<0.01, ** p<0.05, * p<0.1*

There does not seem to be a particularly strong correlation between any of the variables observed in the sample and price developments. Only the correlation between price effects and post-merger combined turnovers is slightly higher and significant at the 10 % level. The results show, somewhat expectedly, a high correlation between some of the observed variables, e.g. pre- and post-merger HHI, as well as difference in and combined turnovers, indicating multicollinearity of the independent variables. In addition, a regression analysis may suffer from omitted variable bias (e.g., no variables on potential efficiencies of the respective transaction are included) and endogeneity of determinants. Combined with the very limited data availability, the results of a multiple linear regression analysis would be at least highly

[61] B. Espen Eckbo, *Mergers and the Market Concentration Doctrine: Evidence from the Capital Market*, 58 The Journal of Business 325 (1985). However, the rise of so-called superstar firms is discussed as an additional determinant of and indication for market power (see, inter alia, Carl Shapiro, *Protecting Competition in the American Economy: Merger Control, Tech Titans, Labor Markets*, 33 Journal of Economic Perspectives 69 (2019); *David Autor and others* (2020, fn 2); David Dorn, *The rise of superstar firms*, UBS Center Policy Brief Number 1 2021 (2021)).

[62] *Nocke & Whinston* (fn 60).

[63] See also Markus Reisinger & Hans Zenger, *The Competitive Effects of Mergers with Cournot Competition*, <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3881145> (2024) accessed 18 March 2024.

[64] *Kwoka* (fn 4).

unreliable. For these reasons, some of the determinants are further analysed in the remainder of this paper using descriptive statistics, starting with the pre-merger difference in turnovers and transaction volume as measures of the 'size' and 'importance' of the transaction.

Figure 2. Price effects depending on difference in turnovers

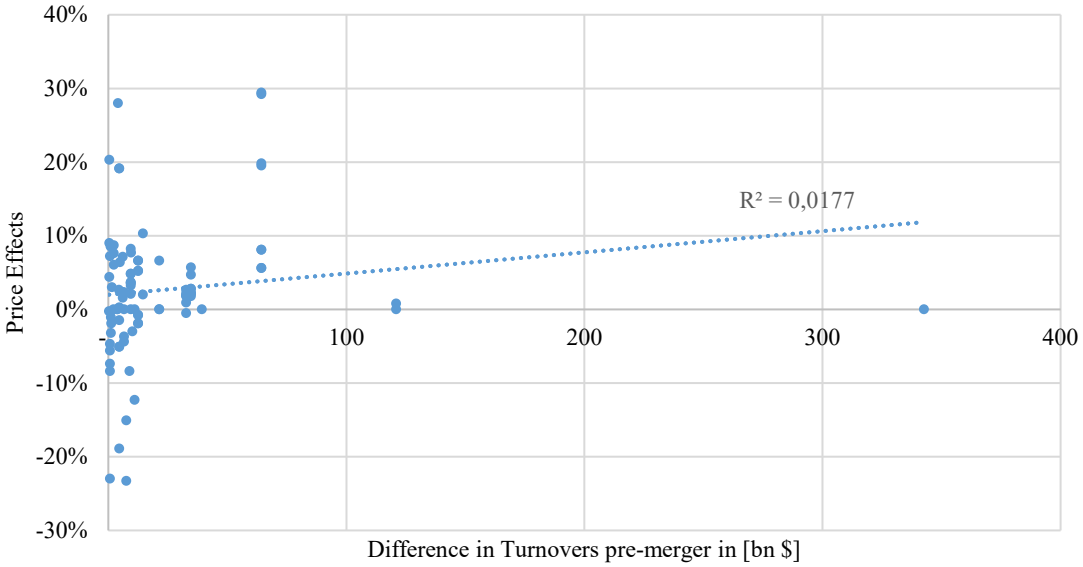


Figure 2 shows 93 price effects depending on the pre-merger difference in turnovers between the firms involved. A higher pre-merger turnover difference indicates a transaction where a smaller firm merges with a relatively bigger firm (the unequal merger mentioned above), while a lower difference in turnover points to a merger of equals. Overall, there does not appear to be a strong direct linear relationship between pre-merger difference in turnovers and post-merger price effects ($r = 0.1331$). The cases with the largest difference in pre-merger turnovers show hardly any post-transaction price effect. Moreover, the data scatter is very high ($R^2 = 0.0177$). There are two cases where the relative firm sizes in terms of turnover is very different, but the ex-post price effects are (almost) zero. There is a narrow cluster of data points near the y-axis and three price effects that lie outside this data cloud (Tesoro/BP with the largest difference in firm size and two price effects for the Lukeoil/Jet case) that could strongly drive the effects shown. The data shown, extracted from the ex-post studies, suggest a slight potential correlation between higher post-merger price increases and higher pre-merger differences in turnovers. This does not support the above-mentioned assumption of reduced incentives to raise prices in the case of 'unequal mergers' in terms of turnover, and implies that competition authorities need not only focus on the anti-competitive effects of 'mega-mergers', but rather apparently 'unproblematic' mergers may also have harmful price effects. One reason for such a finding could be an overly lenient approach of the authorities to these 'unproblematic' mergers in the first place.[65] However, the results presented here may support the findings of Wollmann (2019) on so-called stealth consolidation, where an individual transaction may escape close scrutiny by competition authorities due to the small size of the transaction and the firms involved, but cumulatively may have a significant impact on market structure and other parameters, such as prices.[66]

[65] See *Bhattacharya, Illanes & Stillerman* (fn 42).
[66] *Wollmann* (fn 51).

Figure 3. Price effects depending on transaction volume

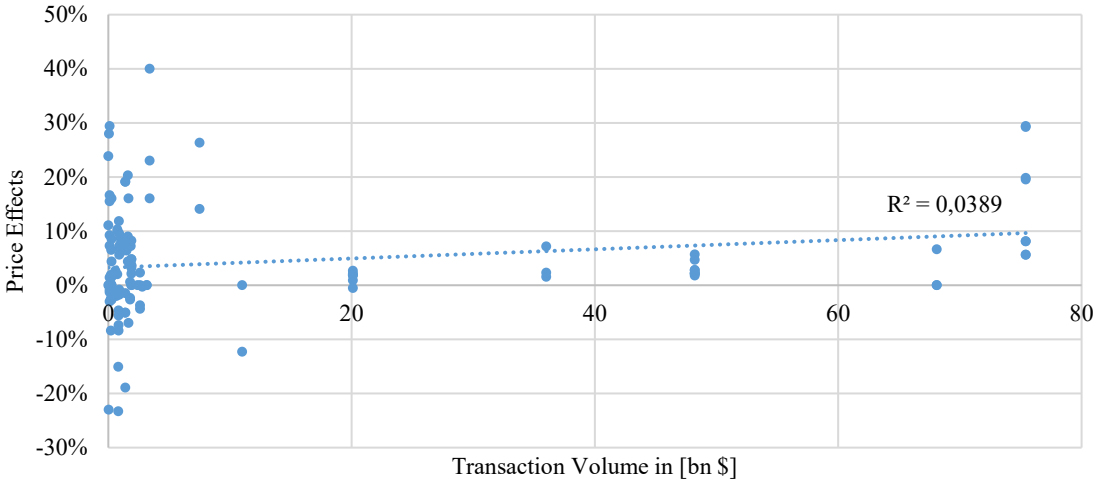


Figure 3 shows 123 price effects depending on the respective transaction volume of the case. Again, there is a strong clustering of data points near the y-axis. There may be a slight positive linear relation between transaction volume and price effects (r = 0.1971). However, the results may be driven by outliers with high price increases following relatively low-volume transactions. One such outlier is the 40 % price increase following the relatively low transaction volume Thomson/West Publishing merger. This could be an indication of high post-merger efficiencies expected by the merging parties, as well as an indication of the notable differences in the effects of mergers in platform markets compared to 'classical' market structures, as mentioned above. In this sample, overall price decreases occurred only in transactions with relatively low transaction volumes. For transactions above $ 20 billion, only price increases were observed. These results may indicate that the assumption of a link between higher transaction volumes and post-merger price increases cannot be rejected and that 'mega-mergers' with high transaction volumes in particular should be closely monitored by the authorities. This is also in line with the findings of Fumagalli et al. (2022) regarding an optimal merger policy that is sufficiently strict, in particular in restricting high transaction volume acquisitions of start-ups by incumbents.[67]

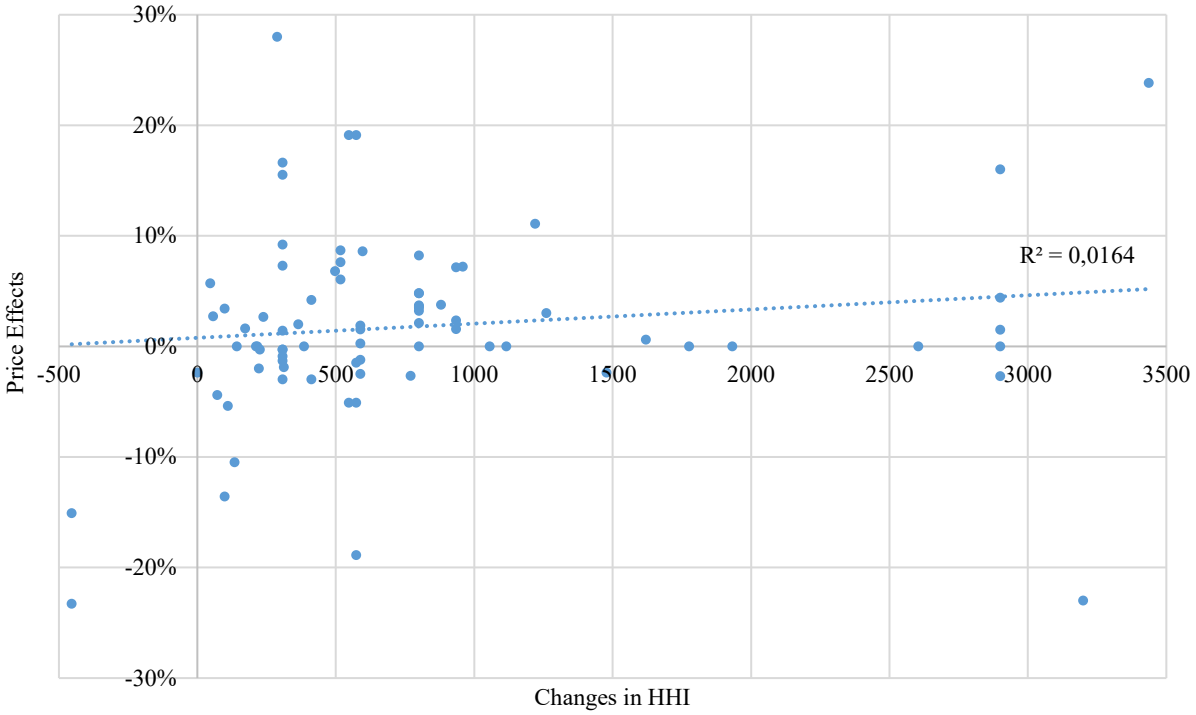
Overall, and as already shown in the pairwise correlations (table 7), the 'size' or 'importance' of a transaction show a slight correlation with post-merger price effects. One reason for the finding of only a slight correlation could be the limitations of the dataset already mentioned above. In addition, the dataset used here is relatively small and could be biased in terms of case selection. The 'biggest' and allegedly most harmful mergers may have been prohibited by the authorities (which, as mentioned above, is rare) or, more likely, deterred by merger control. There could also be a sample selection bias in the ex-post studies that cuts both ways. Competition authorities that conduct or commission their own ex-post analyses have an incentive to select cases where the ex-post assessment is positive (i.e., prices did not increase or even decreased). Academics, on the other hand, may have an interest in studying particularly controversial (i.e., 'big' or 'important') cases, e.g., to increase the likelihood of their findings being published. However, it is not possible in this meta-study to identify and differentiate why and how the cases were selected for each ex-post study. The additional descriptive analyses show a slight potential correlation of the difference in turnovers and transaction volumes with the price effects post-transaction. In regards to the mentioned transaction volume thresholds, the results support the idea behind this approach. Nevertheless, the use of transaction-based thresholds not only addresses potential price effects of a merger, but also potential innovation,

[67] *Fumagalli et. al* (fn 58).

for example, against the backdrop of so-called 'killer acquisitions' in highly innovative sectors such as pharmaceuticals or digital markets. These effects of horizontal transactions are analysed in a wide range of (empirical) literature[68] and will not be discussed further here.

Taking into account the results of Nocke and Whinston (2010, 2013, 2022) as well as agencies relying on measures of market structure, the further analysis of concentration-based determinants will focus on the change in HHI resulting from the transaction.[69] So-called 'structural presumptions', such as HHI, are not enforcement rules, but are intended to predict the potential harm of a merger. For example, the new 2023 U.S. Merger Guidelines state that markets with an HHI above 1,800 are highly concentrated, and a change in HHI of more than 100 points is a significant increase that is likely to substantially lessen competition.[70]

Figure 4. Price effects depending on changes in HHI



In figure 4, the difference in HHI is used as a measure of the specific impact of a transaction on market concentration. Overall, most of the cases took place in already highly concentrated markets and led to an increase of HHI of more than 100 points. The so-called market concentration doctrine implies that the greater the impact of a horizontal transaction on market concentration, the more likely it is to have anti-competitive effects (such as collusion, reduced incentives to innovate and ultimately higher prices for consumers).[71] Therefore, the higher the difference in HHI, the higher the post-merger price increases are expected to be. Figure 4 shows the analysis of 80 price effects. There is one notable case where market concentration decreased

[68] Inter alia, Peter Ormosi, Anna Rita Bennato, Steve Davies & Franco Mariuzzo, *Feasibility study on the microeconomic impact of enforcement of competition policies on innovation – Final Report*, Publications Office (2017); Nicolas Petit, *Significant Impediment to Industry Innovation: A Novel Theory of Harm in EU Merger Control?*, ICLE White Paper 2017-I (2017); Giulio Federico, Gregor Langus & Tommaso Valletti, *Horizontal Mergers and Product Innovation*, 59 International Journal of Industrial Organization 1 (2018); Mario Todino, Geoffroy van de Walle & Lucia Stoican, *EU Merger Control and Harm to Innovation – A Long Walk to Freedom (from the Chains of Causation)*, 64 Antitrust Bulletin 11 (2019); Nicolas Petit, *Innovation Competition, Unilateral Effects, and Merger Policy*, 82 Antitrust Law Journal 873 (2019); Marc Ivaldi, Nicolas Petit & Selçukhan Ünekbaş, *Killer Acquisitions: Evidence from EC Merger Cases in Digital Industries*, TSE Working Paper No. 13-1420 (2023).

[69] *Nocke & Whinston* (fn 48, fn 60); Volker Nocke & Michael D. Whinston, *Merger Policy with Merger Choice*, 103 American Economic Review 1006 (2013); *Bhattacharya, Illanes & Stillerman* (fn 42).

[70] U.S. Department of Justice and the Federal Trade Commission, *Merger Guidelines Issued December 18, 2023*, <https://www.justice.gov/d9/2023-12/2023%20Merger%20Guidelines.pdf> accessed 19 March 2024.

[71] *Eckbo* (fn 62).

rather than increased after the transaction. This is particularly noteworthy because the large post-acquisition price decreases in this case are consistent with the above-mentioned theory. Another notable result shown here is that in cases where the increase in HHI due to the transaction is lower (between 0 and 1,000), more post-merger price decreases occurred than in cases with higher net post-transaction increases in market concentration. There is also a strong outlier: in the case of Kaiser Cement Corporation/Lone Star Industries (1985), the increase in HHI is 3,200 with a simultaneous price decrease of 23 %, which may have been due to cost efficiencies or simplified import possibilities and thus a higher number of potential suppliers.[72] This case strongly skews the results, but overall there appears to be a linear correlation between merger-related changes in HHI and post-merger price effects (r = 0.1279), which supports the theory. Overall, and with respect to the underlying theory, the results cautiously support the hypothesis of a positive correlation between market concentration and post-merger price increases, especially in already concentrated markets. This can also be seen as the main result and conclusion to answer research question 3) and is in line with recent findings, e.g. by Koltay, Lorincz and Valletti, who find that the greater the initial market power of a firm, the greater the risk that mergers in already concentrated industries will impede effective competition.[73] However, an increase in market concentration due to a horizontal transaction and the associated increase in market power does not automatically lead to higher price increases, and the facts of each case are important. In particular, the potential underestimation of price effects due to simplifications and data limitations should be taken into account. When looking at individual groups of goods, i.e., the potential effect of higher market concentration in individual sectors, similar results emerge.[74]

V. CONCLUSION AND POLICY IMPLICATIONS

In line with the *policy learning* approach to ex-post evaluations of competition policy decisions mentioned above, this meta-study adds to the current literature by collecting and analysing existing results and placing them in a broader context. The aim of this is to draw general policy implications for the regulation of horizontal mergers. These implications are not limited to specific competition policy regimes, but are applicable regardless of the authority enforcing competition regulation.

In general, mergers tend to raise prices. Especially those that do not create any synergies.[75] However, when looking at specific sectors, the evaluation of a total of 194 price effects (table 3) does not show clear results in the sample used here. There are some groups of goods with a small number of analysed price effects, where only price increases or solely price decreases occurred (e.g., motor oil, cigarettes, cement). For larger groups, however, the results are less clear. Overall, the results do not necessarily point to industry-specific concerns: the data analysis does not show that industry alone determines an increased risk of anti-competitive pricing post-merger. However, the presence of certain concentration-related characteristics in specific markets may be an indication for authorities to investigate more closely.

Looking at the 'size' or 'importance' of a horizontal transaction, the analysis of the individual variables (combined turnovers, difference in turnovers, transaction volume) suggests a slight positive correlation. This is in line with the underlying theory and confirms the common practice of competition authorities. Moreover, the results show the importance of appropriate thresholds in merger control, not only in terms of turnover, but also in terms of transaction volume. Recent developments in several jurisdictions to introduce such thresholds based on transaction volumes are supported by the results of this paper, and there is much to suggest that

[72] Laurence Schumann, Robert P. Rogers & James D. Reitzes, *Case Studies of the Price Effects of Horizontal Mergers*, Bureau of Economics, Federal Trade Commission (1992); Chengyan Gu, *Summaries of Individually Studied Mergers*, in John E. Kwoka (ed) *Mergers, Merger Control, and Remedies – A Retrospective Analysis of U.S. Policy* (MIT Press, Cambridge 2015) 161.
[73] *Koltay, Lorincz & Valletti* (fn 2). See also *Valletti & Zenger* (fn 59).
[74] The analysis was done for the following groups of goods: Petroleum (N = 34), Groceries (N = 20).
[75] *Farrell & Shapiro* (fn 48).

they will become even more important in the future (see, for example, merger cases in digital markets, where the respective revenues often do not allow the authorities to take action). In particular, the analysis shows that so-called 'mega-mergers' will continue to require intensive monitoring by the authorities. In this context, the analysis of specific divestiture effects could provide further insights as to whether these can also mitigate anti-competitive effects or price increases in very large merger cases.

The analysis of the difference in HHI shows a slight positive correlation between market concentration and post-merger price increases. Overall, increased market concentration seems to be positively correlated with price increases post-transaction, in particular in already concentrated markets. Nevertheless, any authority investigation must take into account the specific facts of the case. Again, this highlights the importance of case-by-case analysis.

This is also the main conclusion of this meta-study based on the work of 52 retrospective merger studies. It is difficult to draw general or industry-specific implications for authorities dealing with horizontal transactions from the data. However, the introduction of more comprehensive ex-post analyses of mergers and horizontal transactions and the use of a meta-study approach could help to improve both case handling and ex-ante merger regulation as a whole. Assuming, for the sake of simplicity, that post-merger price increases following a cleared or not challenged transaction are indicative of a false negative authority decision, the overall simplified 'error rate' (expressed in terms of the ratio of post-merger price increases vs. price decreases) of the authorities appears to need improvement. Around 52 % of the price effects were post-merger price increases – when, in principle, none of the mergers should have led to price increases. Looking at individual groups of goods, the results of the meta-study are similar.

VI. APPENDIX

Table A1. Chronological List of Mergers Analysed

Year	Firms	Product Group	Transaction Type	Source(s)
1976	Scott Graphics/ Xidex	Media Products	Merger	Barton & Sherman (1984)
1979	Kalvar Corporation/ Xidex	Media Products	Merger	Barton & Sherman (1984)
1981	Weyerhaeuser/Menasha Coro	Corrugating Medium	Merger	Schumann and others (1992)
1983	SCM/Gulf & Western	Titanium Dioxide	Merger	Schumann and others (1992)
1985	Kaiser Cement Corporation/Lone Star Industries	Cement	Merger	Schumann and others (1992)
1986	TWA/ Ozark	Flights	Merger	Werden and others (1991) Borenstein (1990) Morrison (1996) Peters (2006) Brueckner and others (1992)
1986	Northwest/ Republic	Flights	Merger	Werden and others (1991) Borenstein (1990) Morrison (1996) Peters (2006) Brueckner and others (1992)
1987	USAir/ Piedmont Aviation	Flights	Merger	Morrison (1996) Peters (2006) Kwoka & Shumilkina (2010)
1987	Delta/ Western	Flights	Merger	Peters (2006)
1987	American/ Air Cal	Flights	Merger	Peters (2006)
1987	Continental/ People Express	Flights	Merger	Peters (2006)
1990	Wolters Kluwer/Lippincott	Media Products	Merger	McCabe (2002)
1991	Reed Elsevier/Pergamon	Media Products	Merger	McCabe (2002)
1994	Continental Airlines/America West Airlines	Flights	Code-Share	Bamberger and others (2004)
1995	Northwest Airlines/Alaska Airlines	Flights	Code-Share	Bamberger and others (2004)
1995	Thomson/Shepard's	Media Products	Merger	McCabe (2004)
1995	Wolters Kluwer/CCH	Media Products	Merger	McCabe (2004)
1995	Thomson/West Publishing	Media Products	Merger	McCabe (2004)
1996	Reed Elsevier/West Publishing	Media Products	Merger	McCabe (2004)
1996	Wolters Kluwer/Little, Brown	Media Products	Merger	McCabe (2004)
1997	Aurora Foods/ Kraft	Groceries	Merger	Ashenfelter & Hosken (2010) Weinberg & Hosken (2013)
1997	General Mills/ Ralcorp (Chex)	Groceries	Merger	Ashenfelter & Hosken (2010)
1997	Guinness/ Grand Metropolitan	Alcoholic Beverages	Merger	Ashenfelter & Hosken (2010)
1997	Proctor and Gamble/ Tambrands	Groceries	Merger	Ashenfelter & Hosken (2010)
1997	Tosco/ Unocal	Gasoline	Merger	Hosken and others (2011) GAO (2004) Karikari and others (2007)
1997	UDS/Total	Gasoline	Merger	GAO (2004) Karikari and others (2007)
1998	Reed Elsevier/Matthew Bender	Media Products	Merger	McCabe (2004)
1998	BP/Amoco	Gasoline	Merger	GAO (2004) Karikari and others (2007)
1998	Marathon/ Ashland	Gasoline	Joint Venture	GAO (2004) Karikari and others (2007) Taylor & Hosken (2007)
1998	Shell/ Texaco I	Gasoline	Joint Venture	GAO (2004) Karikari and others (2007)

1998	Shell/ Texaco II	Gasoline	Joint Venture	GAO (2004) Karikari and others (2007)
1998	Pennzoil/ Quaker State	Motor Oil	Merger	Ashenfelter & Hosken (2010) Weinberg & Hosken (2013)
1999	MAP/ UDS	Gasoline	Merger	GAO (2004) Simpson & Taylor (2008) Karikari and others (2007)
1999	Continental Airlines/Northwest Airlines	Flights	Code-Share	Armantier & Richard (2008)
1999	British American Tobacco/Rothmans International	Cigarettes	Merger	Pham & Prentice (2013)
2000	Exxon/ Mobil	Gasoline	Merger	GAO (2004) Karikari and others (2007)
2000	UDS/ Tosco	Gasoline	Merger	Hosken and others (2011)
2001	Carlsberg/ Pripps	Alcoholic Beverages	Merger	Friberg & Romahn (2015)
2001	GTM/Vinci	Parking Lot Operators	Merger	Choné & Linnemer (2012)
2002	EasyJet/Go Fly	Flights	Merger	Dobson & Piga (2013)
2003	Ryanair/Buzz	Flights	Merger	Dobson & Piga (2013)
2003	Pfizer/ Pharmacia	Pharmaceutical Products	Merger	Leheyda and others (2011)
2003	Cerealia AB/ Schulstad A/S	Groceries	Merger	Nilsson & Strand (2005)
2003	Morrisons/Safeway	Groceries	Merger	Skrainka (2012)
2004	DISA/Shell	Gasoline	Merger	Jiménez & Perdiguero (2014)
2004	Sunoco/ El Paso	Gasoline	Merger	Silvia & Taylor (2013)
2005	Valero/Premcor	Gasoline	Merger	Silvia & Taylor (2013)
2005	De Tijd/ De Persgroup	Media Products	Merger	Van Cayseele & Vanormelingen (2019)
2005	America West Airlines/ US Airways	Flights	Merger	Hüschelrath & Müller (2014)
2006	Maytag/ Whirlpool	Home Appliances	Merger	Ashenfelter and others (2013)
2006	Waterstone's/ Ottakar's	Media Products	Merger	Aguzzoni and others (2016)
2006	GDF/ Suez	Gasoline	Merger	Argentesi and others (2021a)
2006	T-Mobile/ tele.ring	Telecommunication	Merger	Aguzzoni and others (2018)
2007	T-Mobile/ Orange	Telecommunication	Merger	Aguzzoni and others (2018)
2007	Western Refining/Giant Industries	Gasoline	Merger	Kreisle (2015)
2007	Agip/Esso	Gasoline	Merger	Csorba and others (2011)
2007	Lukoil/Jet	Gasoline	Merger	Csorba and others (2011)
2007	Albertsons/ Raley's	Groceries	Merger	Hosken and others (2018)
2007	Kroger/ Farmer Jack	Groceries	Merger	Hosken and others (2018)
2007	C V Foodliner/ CVM Inc.	Groceries	Merger	Hosken and others (2018)
2007	Kroger/ SuperValu Inc.	Groceries	Merger	Hosken and others (2018)
2007	Save Mart Super Markets/Albertsons	Groceries	Merger	Hosken and others (2018)
2007	Rouse Enterprises/ Great A & P Tea Co.	Groceries	Merger	Hosken and others (2018)
2007	Great A & P Tea Co/ Pathmark	Groceries	Merger	Hosken and others (2018)
2007	Assoc Wholesale Grocers Inc/ Albertsons	Groceries	Merger	Hosken and others (2018)
2008	Kroger/Assoc Wholesale Grocers Inc.	Groceries	Merger	Hosken and others (2018)
2008	Houchens Industries/ Buehler Foods	Groceries	Merger	Hosken and others (2018)
2008	Game Group PLC/ Games Station Limited	Media Products	Merger	Aguzzoni and others (2014)
2008	Delta/Continental/Northwest	Flights	Code-Share	Gayle (2008)
2008	Delta/Northwest	Flights	Merger	Luo (2014) Carlton and others (2019)
2008	Miller/Coors	Alcoholic Beverages	Joint Venture	Ashenfelter and others (2015) Miller & Weinberg (2017)
2009	AstraZeneca Tica/GlaxoSmithKline	Pharmaceutical Products	Merger	Björnerstedt & Verboven (2016)
2010	United/Continental	Flights	Merger	Carlton and others (2019)
2011	Southwest/Airtran	Flights	Merger	Le (2016)

2011	Amazon/ The Book Depository	Media Products	Merger	Argentesi and others (2021c)
2012	Shell/Rontec	Gasoline	Merger	Office of Fair Trading (2014)
2012	Jumbo/C1000	Groceries	Merger	Argentesi and others (2021b)
2013	American/US Airways	Flights	Merger	Carlton and others (2019)
2013	H3G Austria/ Orange Austria	Telecommunication	Merger	RTR-GmbH (2015)
2013	Anheuser-Busch-InBev/ Grupo Modelo	Alcoholic Beverages	Merger	Wang and others (2023)
2013	Pinnacle/ Ameristar	Casinos	Merger	Osinski & Sandford (2021)
2013	Tesoro/BP	Gasoline	Merger	Greenfield and others (2015)

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