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**Price Effects of Horizontal Mergers: A Retrospective on
Retrospectives**

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*Annika Stöhr**

Abstract: In this comprehensive review of ex-post merger studies price effects of horizontal transactions are evaluated. By combining and further analyzing the results of 52 retrospective studies on 82 mergers or merger-like transactions it can be shown that the industry alone is no strong indication for the direction of price-related merger effects. However, the “size” or “importance” of a transaction as well as market concentration pre-merger and change in concentration due to the transaction seem to have an impact on post-transaction price development.

Keywords: Antitrust, Merger Control, Industrial Economics, Retrospective Studies, Ex-Post Studies, Competition Law Enforcement

JEL-Codes: D49, K21, L13, L40

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I. Introduction

Market concentration potentially created or strengthened by a horizontal merger or merger-like transaction may have negative competitive effects on e.g. prices, innovation, and overall welfare (inter alia, Kovacic 2009; Baker 2003; Haucap et al. 2019). Due to the wide range of potentially negative effects, horizontal mergers are in the focus of competition policy and authorities in modern industrial market economies – to preserve free competition, being a public interest. 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). Nevertheless, in the attempt to preserve competition and challenge potentially welfare-reducing mergers, competition authorities can make decision errors. Meaning, they may prohibit an actually not welfare-reducing merger (decision error type I – false positive) or they may fail to prohibit an in fact competition- and welfare-decreasing merger (decision error type II – false negative). These two types of decision errors have different overall welfare effects, which are derived from the accumulation of (negative and sometimes even positive, see Röller et al. 2006) effects resulting from the erroneous decision in the first place (in general for antitrust decision errors, see Easterbrook 1984). To improve the decision-making process of antitrust authorities, it is crucial to analyze authority decisions and detect potential errors. One way to do so is by using so-called “ex-post evaluations” or “retrospective studies”. For merger control decisions, this is done either by analyzing single cases and their outcomes or by measuring the effects of merger waves on whole industries (inter alia, Coate 2016; Kwoka 2015). The aim of these studies can never be to turn made decisions around (in most cases this is not a possibility at all and the actual effects may be irreversible), but rather to learn from potential mistakes and prevent the same errors from happening again (inter alia, Don et al. 2008; Davies & Ormosi 2012).

Over the last years and even decades a broad range of retrospective studies by researchers and authorities analyzing price effects of mergers were published, often with a focus on specific industries (such as airlines, hospitals, banks, etc.) (see, inter alia, Pautler 2003; Weinberg 2007; Hunter et al. 2008; Farrell et al. 2009; Kwoka 2013, 2015; Ashenfelter et al. 2014; Kwoka & Gu 2015; Coate 2016). Recently, the Federal Trade Commission’s Bureau of Economics has announced to even expand its existing Merger Retrospective Program to evaluate the FTC’s merger enforcement (FTC 2020). The aim of this contribution is to review the existing studies and their results, develop classifications of sectors and markets with similar features or

characteristics and find potential patterns in the price effects that horizontal transactions may have in these markets. The goal is to answer the question, whether there are common post-merger price effects in these delimited markets and derive implications for policy makers and competition authorities regarding the handling of merger cases overall as well as in these specific markets. These implications may help to decrease the number of authority decision errors and, thus, increase the overall quality of ex-ante merger enforcement. This contribution is divided into three parts answering following research questions:

- 1) Are there general price effects after horizontal transactions in delineated groups of goods? Are some groups particularly "vulnerable" to price increases after horizontal transactions?
- 2) What influence does the "size" or "importance" of a horizontal transaction have on the price effects post-merger?
- 3) What influence does market concentration have on price developments after horizontal transactions?

Besides price effects of a transaction, other effects, such as e.g. effects on labor markets, innovation incentives and investments, as well as efficiencies are also relevant and well established in the theoretical literature on merger effects. In retrospective studies of specific mergers, however, they are less commonly analyzed¹. Therefore, this meta-study concentrates on price effects of horizontal mergers and similar transactions by using descriptive statistics to empirically sum up results of a broad range of ex-post studies. The results, assumptions and limitations of these studies are considered to be given and potential (methodological or other) shortcomings are not addressed here. Because this meta-study does not try to detect errors in the single decisions made by competition authorities and analyzed in ex-post studies, but rather show patterns in post-merger price effects (if any), legal differences or the concrete theory of harm used by the respective authority are not relevant here.

This contribution is structured as follows: chapter II gives a theoretical overview of why ex-post studies are beneficial for ex-ante merger control. In chapter III, the methodology and studies used in this meta-study are introduced to then develop case groups by using market characteristics to divide the cases and eventually evaluate (patterns in) the post-merger price effects in these groups (chapter IV). Here, the difference to previous meta-studies will show – besides giving an overview of post-merger price effects in different industries (see, e.g. Kwoka

¹ If these effects are analyzed, the studies mostly relate to e.g. efficiency or innovation effects of merger waves on whole industries (see, inter alia, Eckbo 1983; Rhoades 1993; Berry & Waldfogel 2001).

2015), additional market and firm characteristics are used to point out if there are any similarities regarding price effects of horizontal transactions and to answer the three research questions. Chapter V develops policy implications and concludes with an outlook.

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.” (Ashenfelter et al. 2009: 57). These are the overall goals of the ex-post assessment of merger decisions (see also, Buccirossi et al. 2008). However, ex-post evaluations of competition authority decisions can have different motivations. In general, these can be divided into the following (Don et al. 2008; Davies & Ormosi 2012; Budzinski 2013; Budzinski & Stöhr 2018):

- *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 given institutional and other constraints at the time of the decision)
- *Policy learning* (evaluation of the effectiveness of the competition law in terms of showing whether the final decision did in fact protect competition and minimize 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 to evaluate whole competition policies regarding their potential welfare effects. Retrospective merger studies, however, are carried out for the other two reasons *authority accountability* and *policy learning*, which refer to single decisions and their effects on competition. Ex-post studies aim to detect potential false negatives (given the fact that the mergers analyzed must have been carried out to measure post-merger effects) and are taking into account new available information to determine the causes for the decision error and improve future authority decisions.

Especially the *policy learning* approach shows that ex-post analysis of merger cases is important ex-ante because of several economic and political reasons (Carlton 2009). One general aim is to build an empirical basis for antitrust and especially merger enforcement. For that goal, the usage of empirical models is crucial to generate explicit predictions of the

potential competitive effects of mergers and help the authorities measuring merger effects ex-ante. These predictions then can be evaluated ex-post in retrospective studies of the respective mergers (Ashenfelter et al. 2009). With the post-merger improved information situation, researchers and authorities are able to firstly, detect actual decision errors that were potentially made and secondly, to learn more about the accuracy of the ex-ante predictions. Retrospective studies, thus, can help learning, e.g. what types of mergers and other horizontal merger-like transactions lead to increased prices (Ashenfelter et al. 2009). Due to the fact that merger control, different from many other competition policy tools, works mostly ex-ante, for the *policy learning* approach, it is crucial to use ex-post analyses to test the appropriateness of the respective merger control regime and, if necessary, improve it (Neven & Röller 2002; Duso 2012; Duso et al. 2013; Coate 2016). Furthermore, merger control has large implications for all other areas of antitrust (Kovacic 2009; Duso 2012). Therefore, the improvement of merger policy may also help improving other areas of antitrust policy, given its interconnection with e.g. ex-post abuse control.

Methodologically, there are several possible 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 (especially difference-in-differences (DiD) analysis, which is the most commonly used method in retrospective merger studies), event studies, and surveys (Buccirosi et al. 2008; Duso 2012). Relevant for all these ex-post merger analyses is substantial information on the authority review undertaken in the respective case (Carlton 2009; Coate 2016), as well as price data from before and after the merger. One of the most crucial problems, however, is the determination of the counterfactual price (the market price if the merger would not have been consummated). Because this price is inherently unobservable, one has to estimate it to use a method such as DiD (Ashenfelter et al. 2009). Furthermore, there is a sample selection problem present in these studies, which affects the outcome of the estimations, due to the not random but rather selected sample (Carlton 2009; Davies & Ormosi 2012), as well as potential post-merger price variation, which is not included in most studies (Mariuzzo & Ormosi 2019). Besides these methodological difficulties, further obstacles arise regarding the interpretation and generalization of the results coming from the ex-post evaluation of one or a few consummated mergers. Generally, it appears hardly possible to conclude from one ex-post reviewed case to all mergers and their effects or to conclude that there has to be a systematic bias or error in antitrust policy – especially, coming back to the mentioned sample selection bias (Carlton 2009; Werden 2015).

This last critique may be partly healed through bigger meta-studies of several merger retrospectives – as it is the aim of this contribution. Through the comparison and the empirical assessment of results from a wide range of ex-post studies, generalized statements and interpretations may thus be better justified and explained. However, even by taking into account several studies, overall generalized assumptions on mergers or similar horizontal transactions in general remain impossible, given the different market conditions. Nevertheless, statements can be made about merger effects in certain industries (see, inter alia, Kwoka 2013, 2015; Kwoka & Gu 2015) as well as for mergers with certain characteristics in different markets.

III. Overview of the Applied Analysis Method

a. Sampled Retrospective Studies

Before introducing and analyzing the utilized studies, an overview of the methods and criteria used to select them is given. The selection of studies started with the existing literature and meta-studies by Kwoka (2013, 2015) and Kwoka & Gu (2015) and was then considerably extended beyond them. Some of the criteria that were applied for sample selection in the works of Kwoka have not been used in this contribution, therefore, the sample of ex-post studies used here is larger.

Besides purely or at least substantially horizontal² mergers and acquisitions that have actually occurred (papers, where hypothetical mergers and their effects are modelled, are not considered here³), studies that measure the effects of other horizontal transactions, such as joint ventures, are also analyzed. These can be seen as partial mergers and therefore are expected to have similar effects (Kwoka 2013). Throughout this meta-study, the term “merger effects” is used for all effects that may occur after a horizontal merger or merger-like transaction (such as joint ventures or code-share agreements). Only retrospective studies that analyze specific price effects⁴ of horizontal transactions using econometric techniques are taken into account – meaning, studies that use post-merger data and have an appropriate control group are included

² Vertical or conglomerate mergers will not be analyzed in this meta-study, due to the different competitive effects and potential policy implications (see Kwoka 2013). 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., Waterman 2000; Salop 2019; Beck & Scott Morton 2020; Slade 2020).

³ As well as papers, where mergers are theoretically undone ex-post (see, e.g., Pinkse & Slade 2004).

⁴ Papers, that analyze merger effects on stock market performance of the merging firms or their competitors (see, e.g., Duso, Neven & Röller 2007) are not used 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 2015).

here (Pautler 2003; Kwoka 2015). Studies that only give a verbal description or a purely theory- or interview-based approach on the case(s) or competition authority performance are left out because these only verbally presented effects cannot be properly included in the quantitative analysis in an at least descriptive empirical way. Papers that analyze effects of groups of several mergers or merger waves on whole industries or sectors are excluded from this meta-study for the same reason (see Kwoka 2013).

A related research field is the analysis of divestiture effects. Nevertheless, papers that only measure the effectiveness of divestitures and other remedies in a merger case (see, e.g., Burke 1998; Duso, Gugler & Yurtoglu 2007) are excluded because these two streams may be closely related but do not analyze exactly the same effects, as they also often only measure effects of remedies to merger proposals rather than the effects of a conducted merger and associated remedies itself.

Different to other meta-studies regarding the selection of sampled retrospective studies, contributions that analyze horizontal transactions in strongly regulated industries are not considered here. Stricter regulation, which can be based on a variety of reasons, regularly leads to less organic competition (inter alia, Posner 1974, 1999; Swedish Agency for Economic and Regional Growth 2017; Competition & Markets Authority 2020). Due to this somewhat biased competition process, effects of horizontal transactions on e.g. hospital or transportation markets may also be biased though the regulatory intervention (inter alia, Balto & Geertsma 2001; Kwoka & White 2004; Federico 2011; Littlechild 2011; Bilotkach & Hüscherlath 2012). It is difficult to control for what effects may occur because of the actual transaction and what effects are caused by the (price-)regulation. That would make the generation of general statements and potential policy implications – which eventually is the aim of this contribution – harder, if not completely impossible. Therefore, these studies are excluded to eventually get less biased results for markets that are not as strongly regulated. To measure the regulatory barriers for competition in a market, the OECD uses the Product Market Regulation (PMR) indicator on a sector level (Égert & Wanner 2016). Regarding the transportation sector, this indicator is used here to exclude the railroad industry. With a level of regulation well above the average for the transport sector in OECD countries as a whole, the rail sector can be considered highly regulated. Different to the airline sector: this is the least regulated industry in the transport sector, with a lower level of regulation than the overall average (OECD 2020). Therefore, the railroad sector is excluded from this meta-study, whereas the quite many ex-post studies of airline mergers and code-share agreements are included. Another sector excluded from this

contribution is banking: as seen in several financial crises, banks often times can be considered as “too-big-to-fail” or even “too-interconnected-to-fail”. In times of crisis, states tend to build umbrellas to save banks from failing. Therefore, banking competition is heavily influenced by national and international regulation and “real” competition in this sector is difficult to find (OECD 2011). The last sector to be excluded from the analysis a priori is the hospital sector. One general assumption regarding the hospital market is that this market, if left unregulated, would be inefficient in terms of patient beds available (Joskow 1980). Therefore, regulation can help improving the quality of hospital services and is seen as even necessary for providing the society with the number of beds (and overall medical help) required (Vogel et al. 2018). This explains the high level of regulation in the market, which, however, makes this sector unusable for further analysis in this contribution.

Different from the extensive meta-studies of e.g. Kwoka (2013, 2015), Kwoka & Gu (2015), and Mariuzzo et al. (2016), this contribution does not concentrate on mergers and other transactions in specific regions or countries. The aim of this paper is not to measure the effectiveness of a specific competition authority or policy, but rather to give an overview of the potential price effects of horizontal mergers and merger-like transactions in markets with specific characteristics and give implications that stand for all jurisdictions and competition authorities. These effects are mostly not specific to any region. An additional difference to the mentioned meta-studies is that there are no restrictions regarding the publication of the studies. Therefore, included here are studies published in peer-reviewed journals, as well as discussion papers and studies conducted by or for competition authorities.

To gather the sampled retrospective studies, at first, several meta-studies on the same topic have been consulted (Pautler 2003; Whinston 2006; Weinberg 2007; Hunter et al. 2008; Duso 2012; Kwoka 2013, 2015; Kwoka & Gu 2015; Mariuzzo et al. 2016). Subsequently, several competition authority studies (for example by the U.K. Competition Commission, the Swedish Konkurrensverket, and the European Commission) were examined and additional literature research was conducted. That led to an overall number of 52 retrospective merger studies used in this meta-study. Some of these studies analyzed the same cases, so that a total of 82 mergers or merger-like transactions were included in this meta-study. In addition, due to the consideration of different regional markets etc. in the studies, several price effects per transaction were included in some cases. That led to an overall number of 207 price effects

from which 194 were actually further analyzable⁵. Eventually, 15 groups of goods were developed and analyzed regarding their price effects (for a respective list of the analyzed cases and the used ex-post studies, see appendix).

b. Development of Groups of Goods

The overall 207 price effects were analyzed, starting with the systematization of markets and industries. For the purpose of generalization, broader groups of goods were developed. With that, the analysis of cases and general merger effects within specific industries can be conducted to answer the first research question on price effects of mergers in specific industries.

The different groups of goods shown in table 1 contain (partly) different products, which are nevertheless so similar, that merger effects in these groups, such as price increases or decreases, potentially have similar impact on consumer welfare and overall competition in these markets.

Table 1: Number of Price Effects per Group of Goods

<i>GROUP OF GOODS</i>	<i>NUMBER OF PRICE EFFECTS</i>
<i>ALCOHOLIC BEVERAGES</i>	12
<i>CASINOS</i>	1
<i>CEMENT</i>	1
<i>CIGARETTES</i>	2
<i>CORRUGATING MEDIUM</i>	1
<i>FLIGHTS</i>	40
<i>GASOLINE</i>	86
<i>GROCERIES</i>	24
<i>HOME APPLIANCES</i>	4
<i>MEDIA PRODUCTS</i>	19
<i>MOTOR OIL</i>	3
<i>PARKING LOT OPERATORS</i>	1
<i>PHARMACEUTICAL PRODUCTS</i>	4
<i>TELECOMMUNICATIONS</i>	8
<i>TITANIUM DIOXIDE</i>	1
<i>TOTAL</i>	207

⁵ 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, the cases in which it was not possible to convert the price effects into percentages could not be analyzed further and are only included in table 1 and figure 1, respectively.

This distinguishing between different groups of goods is a first step in analyzing the price effects. However, this contribution will not concentrate on the calculation of average price effects in these groups, as seen for example in the above-mentioned meta-studies by Kwoka and Co-authors. The division into groups is rather a tool for first obtaining an overview and identifying industries that may be prone to price increases. The grouping is then also used to further analyze market concentration etc. to show how, for example, increased market concentration in specific groups of goods may affect the price development post-merger. Simply forming an average price effect cannot reflect the different circumstances of different cases. The distortion of the results would thus be very high and the informative value of these (shown, for example, by means of the standard deviation or the median value) tends to be very low. Additionally, several groups only contain of one or a few price effects. That, too, would make the calculation of average effects uncertain at best.

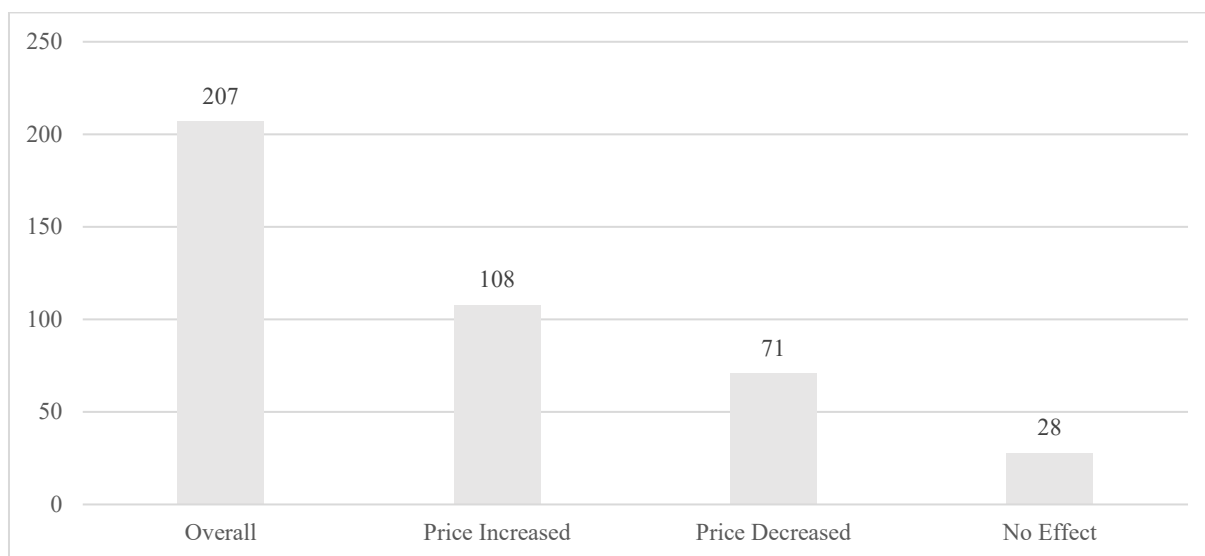
IV. Analysis of Price Effects

Chapter IV analyzes the different post-merger price effects based on the before-mentioned research questions using the collected data on 82 mergers and merger-like transactions. Since not all data is available for every case, mostly subsets of the overall data are used to analyze the respective research question. The respective N is given for each analysis.

a. RQ 1 – General Price Effects in Delineated Groups of Goods

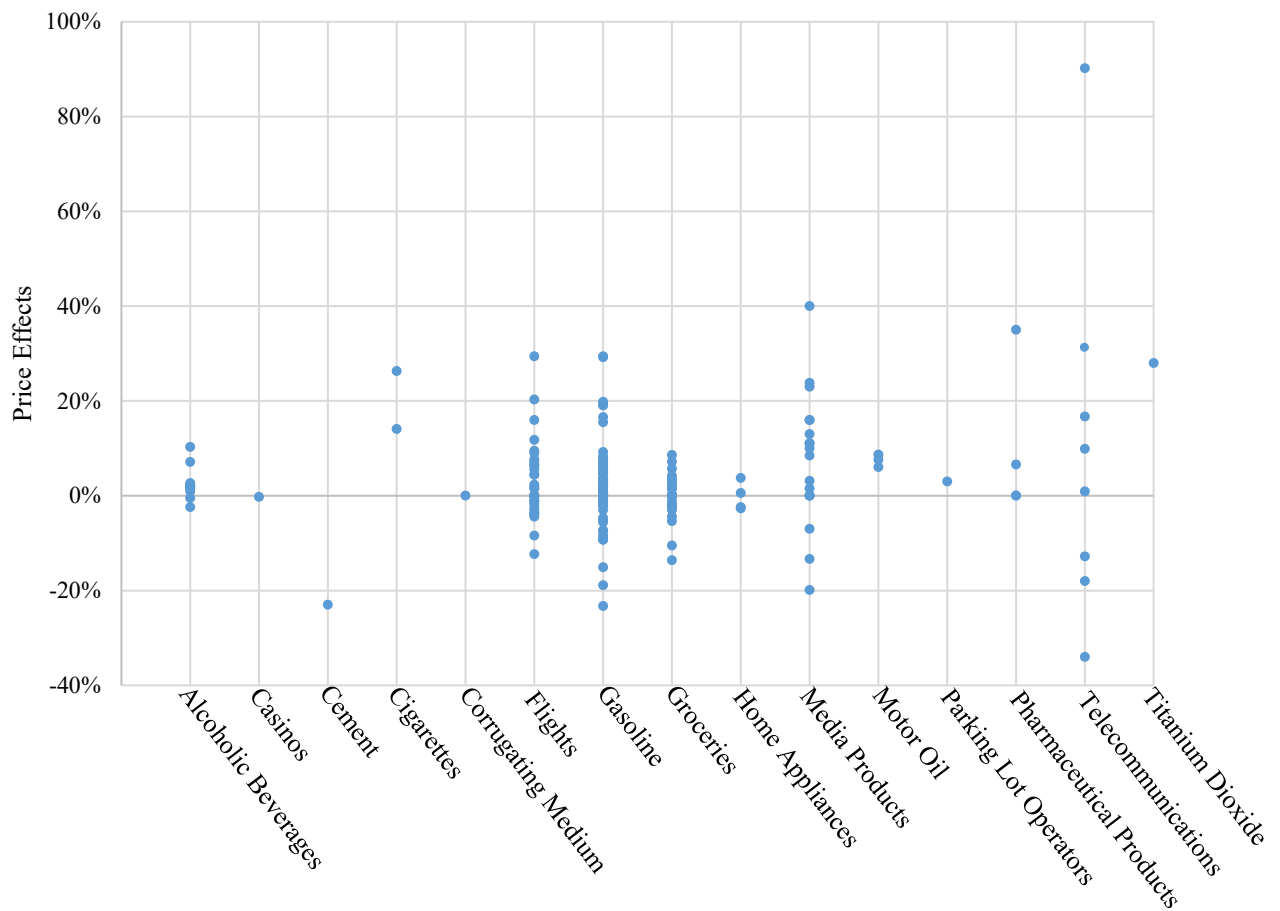
Figure 1 gives an overview of all price effects examined in 82 mergers and merger-like transactions. For 108 out of 207 price effects overall, the retrospective studies come to the conclusion that the respective horizontal transaction increased prices. In 71 cases prices actually decreased after the transaction. This is a rather high number, given the general assumption that horizontal mergers tend to lead to price increases, even including efficiency effects (Fisher et al. 1989). Nevertheless, more than 50 per cent, overall 108 of the price effects analyzed in this first step show price increases. In 28 cases the authors of the respective study did not find a clear result, i.e. no influence of the transaction on prices.

Figure 1: Overview All Price Effects



The assumption that some industries might be more prone to concentration and negative competitive effects resulting from increased concentration is supported by the visible and measurable developments over the last years – showing for example increased concentration in several U.S. and EU markets (inter alia, Gutiérrez & Philippon 2018; Bajgar et al. 2019; Grullon et al. 2019; Philippon 2019; Bajgar et al. 2020; Affeldt et al. 2021) and especially the evolution of digital platform markets which, due to their platform characteristics alone, have an inherent concentration tendency (Evans & Schmalensee 2007; Farrell & Klemperer 2007; Haucap & Heimeshoff 2014; Haucap & Stühmeier 2016; Budzinski & Stöhr 2019). Given this general assumption, most meta-studies use product-level price effects to address potential industry-specific patterns, calculating mean price effects in these delineated industries (see, e.g. Kwoka 2015: 98-99). This paper will also start with a consideration of the price effects in the various industries delineated and shown in table 1. However, here the specific price effects are used, no averages are calculated (see figure 2) given the relatively low informational value of such mean figures. The results regarding industry-specific price effects shown in figure 2 are later used and combined with other market characteristics to evaluate if and how certain characteristic in specific groups of goods may influence the price-related outcome of a merger or merger-like transaction.

Figure 2: Overview Price Effects Depending on Group of Goods



In the first step of the analysis every available price effect was delineated into a specific group of goods (see table 1). However, the number of actually analyzable price effects (due to the aforementioned comparability reasons⁶) that are shown in figure 2 is 194. Price effects vary for the most part between -5% and +20%. There are only a few cases where prices increased higher (e.g., media products, telecommunications) or decreased lower (e.g., gasoline, telecommunications). Some groups show more scattered effects (media products, telecommunications) than others that only vary slightly (alcoholic beverages, groceries). It becomes clear that the price effects are difficult to generalize within the groups (which again shows that averaging would not yield very conclusive results), and that overall, when comparing the groups with each other, only limited generally valid results can be derived.

These more general results shall only give a first impression and help answer research question 1). Clear results, in the sense of only price increases or only price decreases within a group, can only be seen in those groups in which the number of price effects considered is very low (e.g.,

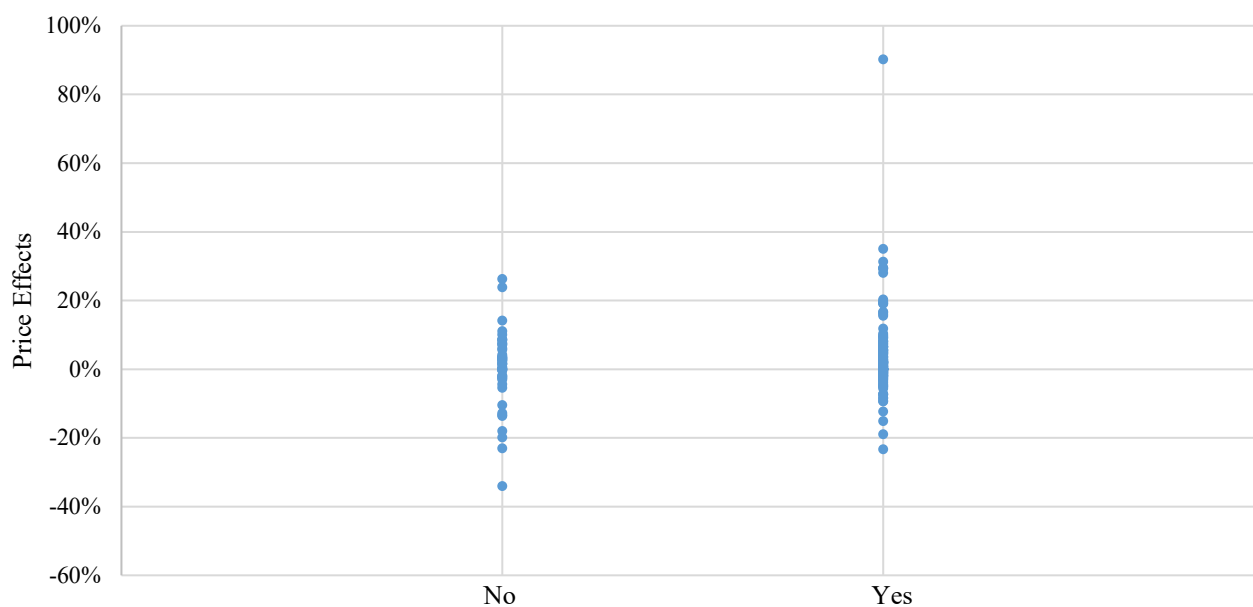
⁶ Excluding eight price effects in the group „Flights“ and five price effects in the group „Petroleum“.

cigarettes, motor oil). Due to the small N within the respective groups, these results are not particularly indicative regarding a conclusion that in these groups of goods mergers or merger-like transactions usually lead to price increases. Therefore, no strong statement can be made that specific groups seem to be particularly prone to price increases or decreases post-merger, but there may be some tendencies that shall be analyzed further in the following steps regarding research questions 2) and 3).

Another theory for price effects of a horizontal transaction may be that it could be seen by the companies involved as a “legal way for collusion” or a “legal cartel” and therefore used as a substitute for illegal agreements, given the fact that it may have similar price increasing effects. If companies or industries have a history of collusion, competition authorities may be especially attentive regarding future infringements. Therefore, it could be a strategy for companies in such particularly observed industries to merge or engage in other legal cooperations. If that is the conceivable, post-merger price increases may be more likely than in markets that do not have such a history.

Figure 3 gives an overview of the results using the collusion history of the respective market as a dummy (due to the potentially high obscuration rate). Regarding this analysis, there is no additional delineation into the groups of goods, as it is done for the subsequent characteristics because the check for collusion history could only be made for the specific time of the respective horizontal transaction. Therefore, in some cases collusion history in one group of goods can be confirmed for one price effect, whereas, for another effect in the same group resulting from an earlier transaction the occurrence of collusion history must be negated – of course only referring to detected collusion. There is very likely an unreported number of collusion cases preceding mergers that have not been uncovered by the authorities.

Figure 3: Price Effects Depending on Collusion History



Overall 185 price effects were analyzed here. For 47 price effects the respective industry had no history of collusion, whereas, regarding the other 138 effects, firms in the respective markets were involved in illegal practices before the transaction analyzed here. In both cases, price increases and price reductions were observed. The spread of price effects within the two groupings is quite similar as well, however, the group of cases with collusion history is slightly shifted upwards compared to the group without collusion history. The similarity could be a sign of a variant of the so-called “cellophane fallacy” that may apply here. This problem points to the fact that in the case of a dominant firm the observable market price is higher than the competitive price: prices already reflect the market power of the dominant firm (Schaerr 1985). Applied to the situation in question, this could mean that, due to the distortion of competition and prices already present as a result of former collusion, there is no significant difference in price effects between industries with a history of collusion and those without. In markets with a history of collusion, prices are already adjusted to the anti-competitive level before the horizontal transaction, leading to similar price increases or decreases after a merger or merger-like transaction as they occur in competitive markets. However, this theory implies that the level of price effects in the group with collusion history tends to be underestimated. Taking into account the above-mentioned slight upwards shift of price effects in the group with collusion history the results shown could imply that collusion history actually leads to stronger post-transaction price increases.

A similar characteristic that could be interesting to analyze here is the respective merger history of a firm or an industry. An effect of merger control could be that companies who want to concentrate the market (for deriving market power rents) may shy away from big mergers that may get prohibited by competition authorities and, instead, may engage in a series of smaller mergers leading to a similar result regarding market concentration/power and rents but making it harder for authorities to block a single merger because the single merger itself does not appear to be harmful. In this context, the theory of preemptive mergers can also play a role. 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 preempt this merger with taking over the third firm itself (Fridolfsson & Stennek 2005; Molnar 2007). In a market that experienced several (small) mergers over time (that increased market shares/power of a few firms and decreased the overall number of competitors in the market), an additional merger is potentially more likely to lead to price increases than a merger in a market without a comprehensive merger history (see also the details on research question 3)). Due to limited availability of data needed and the broad extent of such a comprehensive analysis, this could not be implemented in this paper. Nevertheless, testing this theory is an interesting research gap that points the way for future projects.

b. RQ 2 – Price Effects Depending on the Size/Importance of the Transaction

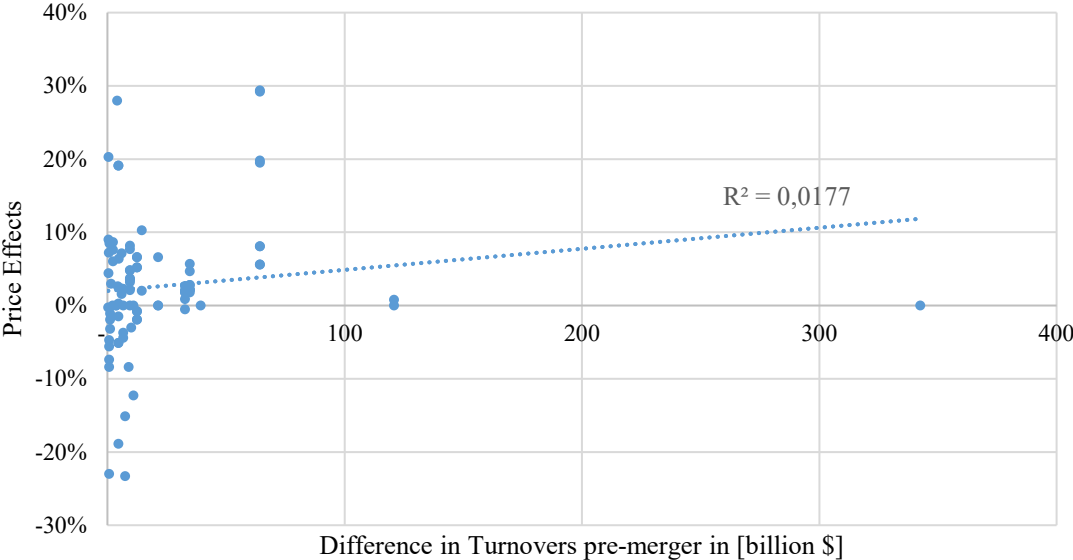
To answer research question 2), various characteristics are used to examine the "size" and "importance" of a transaction. Their potential relation with post-merger price effects will be shown and interpreted in a scatter plot, respectively. It should be noted that the sample is overall biased in that regard that the most harmful mergers (i) were either prohibited, (ii) mitigated by conditions or (iii) were not proposed or conducted at all in anticipation of merger control enforcement. This applies to all interpretations in this contribution but especially regarding RQ 2, since the sheer size of a transaction (which is represented here by the characteristics transaction volume and turnovers) is already a criterion for close scrutiny by the competition authorities.

First, the relative company sizes were applied for this analysis. Figure 4 shows 93 price effects depending on the pre-merger difference in turnovers of the companies involved. A merger where a relatively big company merges with a relatively small company may be less likely to lead to post-merger price increases than “mergers of equals” or so-called “mega-mergers” of two big firms. These kind of “unequal” merger may be the more profitable (or less unprofitable),

given the possibility of higher efficiency effects (in general on efficiency effects of mergers, see Fisher & Lande 1983). Therefore, there may be less incentives to raise prices post-merger. Additionally, the respective market concentration and market power are generally higher in cases of “mega-mergers”, giving further possibilities and incentives to increase prices post-merger (see part IV c.).

Given the different (kinds of) sources for collecting data on turnovers, the comparability between the individual cases is not fully given. It cannot be ensured that all values have been calculated in the same way. However, possible differences presumably distort the proportions only slightly - the dimension of turnovers and the size of the companies assumed according to them remain unchanged and differences in company sizes in terms of turnovers can still be measured. Therefore, the data used here is sufficient for the purpose of giving an overview and to make initial statements about a potential relation between pre-merger relative company sizes and post-merger price effects.

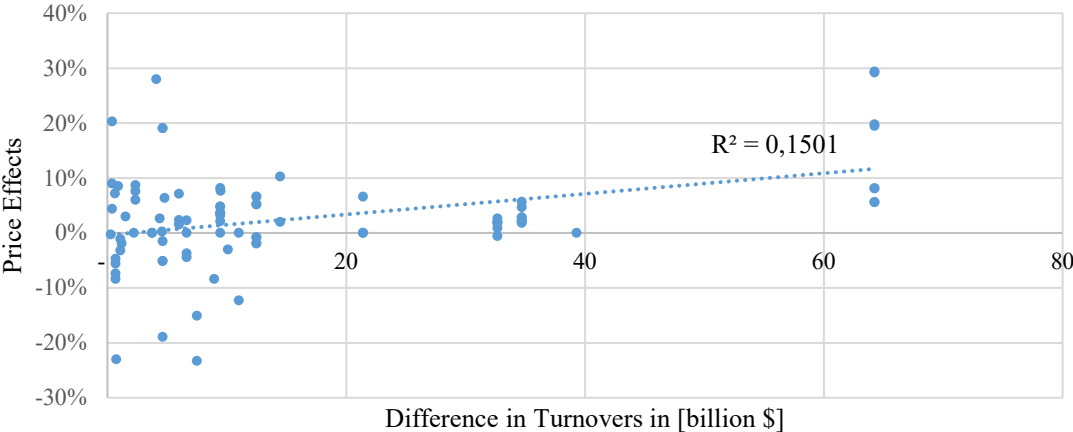
Figure 4: Price Effects Depending on Difference in Turnovers – All



A higher difference in turnover pre-merger indicates a transaction where a smaller company is acquired by a relatively bigger company (above-mentioned unequal merger), whereas a smaller difference in turnover points to a merger of equals. However, 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 biggest difference in pre-merger turnovers do hardly show any post-transaction price effect. Additionally, the data scatter is very high ($R^2 = 0,0177$).

Figure 4 includes two cases in which the relative firm sizes are very different, which bias the results. 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 biggest difference in firm size and two price effects for the Lukeoil/Jet-case). To avoid this distortion, figure 5 shows the 90 price effects in which the respective difference in relative firm size is less than \$100 billion.

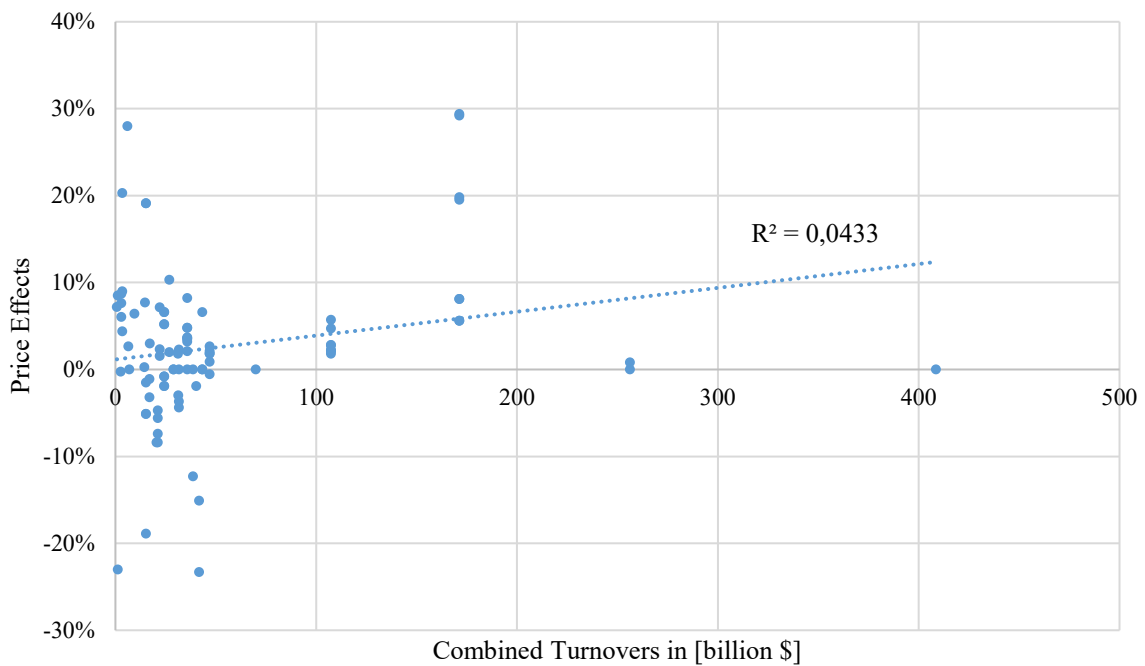
Figure 5: Price Effects Depending on Difference in Turnovers – Difference under \$100 Billion



After excluding the two mentioned cases the results become stronger, albeit, there seems to be an inverse relationship than the one expected in the hypothesis. The correlation coefficient increases to $r = 0,3874$ and R^2 rises to 0,1501. The data extracted from the ex-post studies does show higher post-merger price increases the higher the pre-merger differences in turnovers were (merger of unequal companies). This result does not support the afore-mentioned theory of less incentives for price increases and implicates that competition authorities do not only have to focus on the anti-competitive effects of “mega-mergers”, but rather that also seemingly more “unproblematic” mergers may have harmful price effects. A reason for the results shown could also lay in a too lenient approach of authorities regarding these “unproblematic” mergers in the first place.

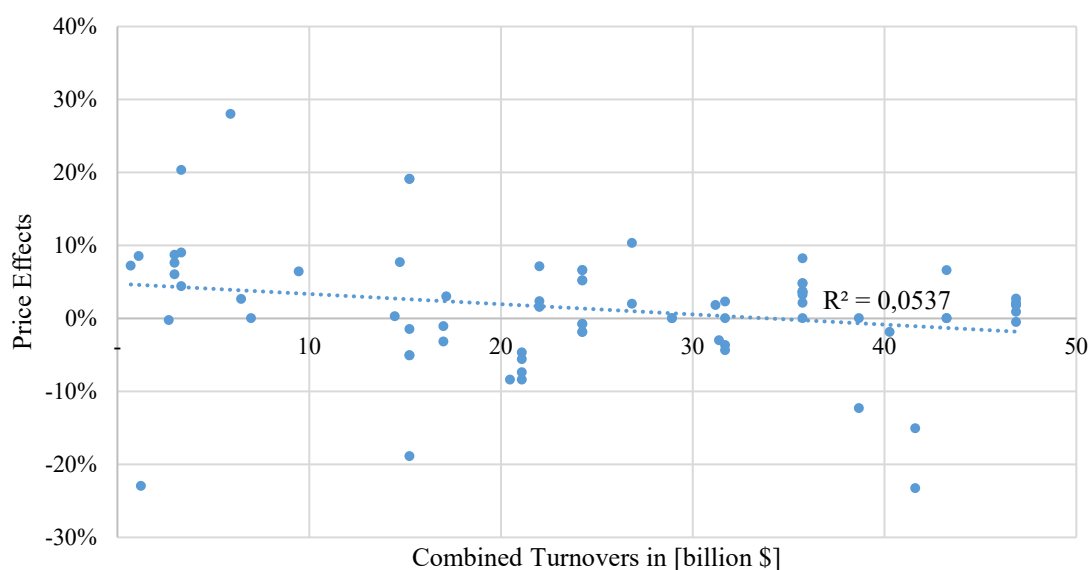
To take a closer look on turnovers as a potential influencing factor for post-merger price effects, figure 6 shows 94 price effects depending on combined post-merger turnovers. Derived from the above-mentioned reasoning that a merger of two big companies - in this case simplified, two firms with high turnovers each - potentially leads to larger price increases, it is assumed that the higher the combined turnovers, the higher the price increases.

Figure 6: Price Effects Depending on Combined Turnovers post-merger – All



The results indicate that the assumption can be cautiously supported and higher combined turnovers in fact overall lead to higher price increases post-merger ($r = 0,2080$). There is again a big data cloud near the y-axis. However, the strongest post-merger price decreases occur in cases with relatively low combined turnovers, again supporting the assumption of a correlation between the variables. To deepen the analysis, figure 7 shows 74 price effects depending on combined turnovers post-transaction with combined turnovers lower than \$50 billion excluding five cases and 20 price effects.

Figure 7: Price Effects Depending on Combined Turnovers post-merger – Combined Turnovers under \$50 Billion



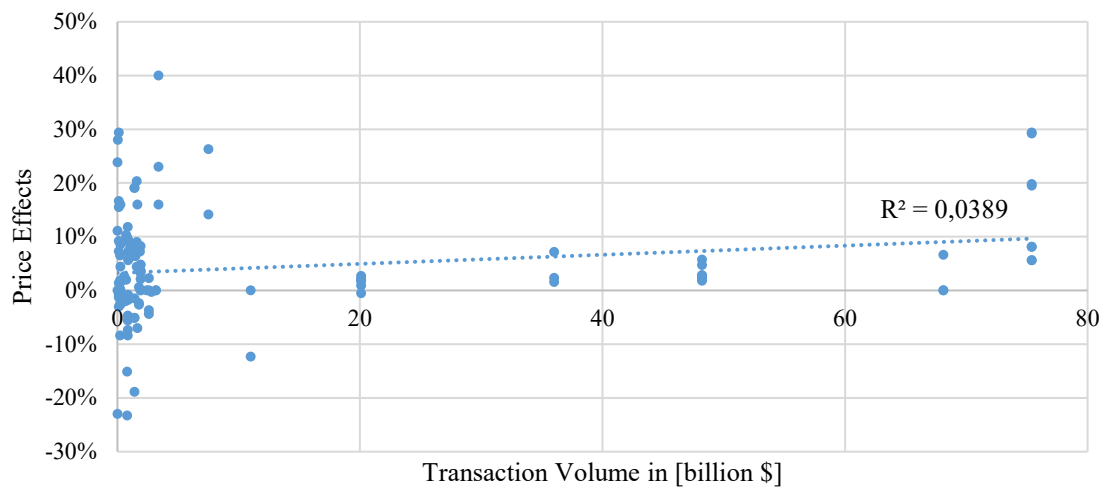
Surprisingly, the relationship between price effects and combined turnovers is reversed compared to figure 6, although this potential correlation should be interpreted with caution given the relatively high number of excluded price effects. $R^2 = 0,0537$ is slightly higher here and $r = -0,3387$ does not show a very strong relationship. Nevertheless, the comparison of results shows interesting differences: overall, increasing combined turnovers tend to lead to more harmful price effects, whereas in the group of mergers up to \$50 billion combined turnovers larger combined turnovers tend to be associated with less anti-competitive price effects. The results in figure 7 show a slight but existing negative linear relationship between combined turnovers post-transaction and the relating price effects. Reasons for this relation could be that bigger mergers (in terms of higher combined turnovers) may have to pass harder scrutiny of competition authorities in order to go ahead than smaller mergers. Thus, the results may be evidence of some success of competition authorities dealing with the bigger mergers – but also a too lenient approach with smaller and middle-sized mergers (given that really small mergers are probably not analyzed in retrospective studies and therefore are not part of the sample). Here, the price effects are shown to be as high as nearly +30%. Smaller mergers which only just exceed the take-up thresholds of competition authorities should not be treated as a “blind spot”, but be handled with the same amount of carefulness given the fact that even small mergers may have significant anti-competitive effects.

Another measure used to represent the "size" or "importance" of a merger is the respective transaction volume. Transaction volume can be seen as an (imperfect) proxy for market shares and thus market power, given that it illustrates the value of the transaction for the companies

involved, in particular the acquiring company, due to the respective market position of the company to be acquired and related pricing possibilities, efficiencies, and else (Kaplow 2017). This value is supposed to be higher, the higher the expected profitability of the transaction due to expected market power rents, as increasing market power is often a major reason for companies to get involved in mergers at the first place (Hassan et al. 2018). A higher transaction volume can therefore be "translated" as larger market shares/power. The assumption derived from this is that the higher the transaction volume (or in other words: the "bigger" the merger) the more likely are post-merger price increases (see also part IV c). 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 increase in prices over the same timeframe. This also relates to the recent discussion of adding transaction-based thresholds to turnover-based thresholds in merger control systems worldwide. Turnovers do not always capture the full "competitive relevance" of companies, especially in but not limited to the digital economy (Harsdorf 2017; Scholl 2017; Bourreau & de Streel 2020). New products or services are often offered (almost) free of monetary charge, therefore, turnovers of the respective firm may be low. Nevertheless, these so-called "mavericks" may be interesting takeover targets for established firms – to expand their own portfolio, but also to distort competition and secure their own market position (see the current literature regarding so-called "killer acquisitions", inter alia, Valletti & Zenger 2019; Letina et al. 2020; Madl 2020; Sokol 2020; Cunningham et al. 2021). The (profit) potential, which is seen in the companies to be acquired, is often reflected less in the actual turnovers, but quite obviously in the transaction volume.

Figure 8 shows 123 price effects depending on the respective transaction volume of the case. Again, a strong occurrence of data points near the y-axis is evident here, however, excluding cases and price effects where the transaction volume exceeded \$10 billion did not lead to any significant increase in conclusiveness of the results (R^2 only slightly increased to 0,0568). Therefore, the analysis is carried out with all available cases.

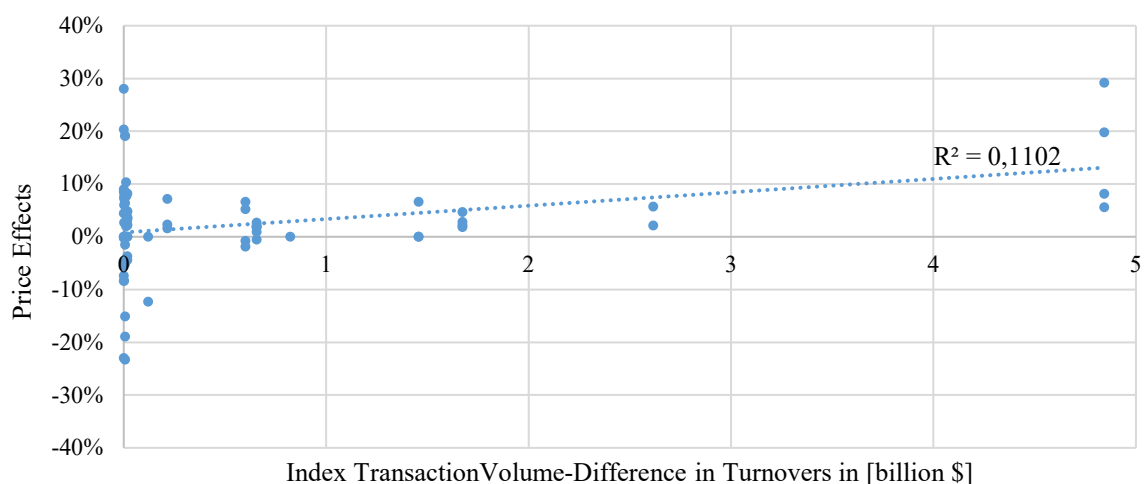
Figure 8: Price Effects Depending on Transaction Volume



The results weakly support the assumptions previously made on the basis of theory. There may be a slight positive linear relation between transaction volume and price effects ($r = 0,1971$). Nevertheless, definite conclusions should only be drawn cautiously, though it can be seen that price decreases only occurred for relatively low transaction volumes. In cases where the transaction volume was higher than \$20 billion, only price increases were observed. This may be an indication that the assumption of a link between higher transaction volumes and post-merger price increases cannot be rejected and that especially “mega-mergers” with exorbitantly high transaction volumes should be watched with scrutiny by the authorities.

To further analyze a potential relation between size/importance of a transaction and its price effects, two index variables were calculated by respectively multiplying two single indicators and putting the indices in relation with the post-transaction price effects. The first index variable was generated from the two characteristics transaction volume and pre-merger difference in turnovers. Figure 9 illustrates the interaction of 75 price effects and the respective index value.

Figure 9: Price Effects Depending on Transaction Volume-Difference in Turnovers-Index



A mixed picture emerges for smaller index values. However, the higher the index value resulting from the combination of transaction volume and difference in turnovers, the more likely post-merger price increases are to be expected. This finding is highly relevant in the discussion about transaction thresholds in merger control and provides evidence for merger cases in online (platform) markets and especially regarding so-called killer acquisitions, where transaction volumes as well as differences in turnovers are high (see, e.g., Facebook/Instagram, Facebook/WhatsApp). These cases were determining factors for the implementation of an additional transaction value-based notification threshold next to the turnover-based threshold in several jurisdictions over the past years, as discussed above. The results shown in figure 9 support the importance of this additional threshold.

To complete the analysis regarding RQ 2, an index of combined turnovers post-merger and transaction volume was calculated. A high transaction volume and simultaneously high combined turnovers suggest a so-called "mega-merger" of two potentially market-powerful companies and lead to the expectation of higher price increases post-merger. Therefore, a higher index value, indicating a large/important merger, suggests higher price increases.

Figure 10: Price Effects Depending on Transaction Volume-Combined Turnovers-Index

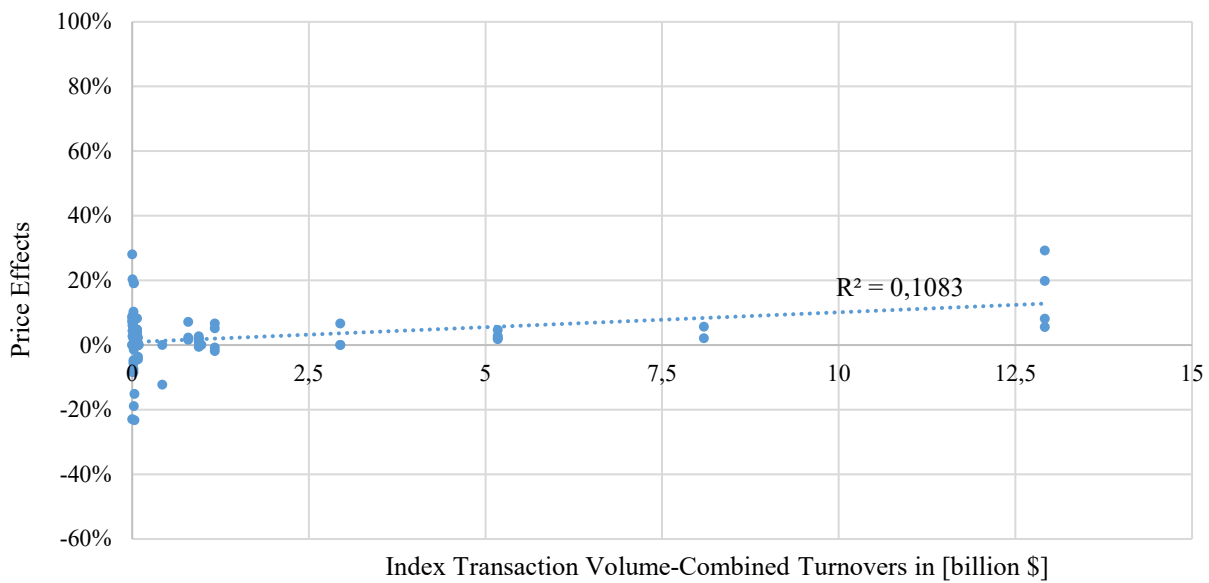


Figure 10 shows 75 price effects and the respective index value. The assumption made earlier is supported by the results: in cases with low index values price effects are again mixed while in those with larger index values the rising trend stands out comparatively clearly. Therefore, larger/more important mergers in terms of transaction volume and combined turnovers post-merger go hand-in-hand with post-merger price increases. This also supports the argument that “mega-mergers” are especially sensitive and should be monitored particularly closely by competition authorities.

Figure 9 and 10 show stronger results than those where only one single characteristic was set in relation with the corresponding price effects. This indicates that a high transaction volume can certainly “compensate” for lower turnovers with regard to the price effect and vice versa.

Overall, the variables used to represent “size” or “importance” of a transaction did not show particularly strong connections to post-merger price effects. This may be due to the fact that the datasets used here are relatively small and depend on the availability of information on the individual cases. Additionally, as mentioned above, the data used here is biased in terms of the selection of cases. The “biggest” and supposedly most harmful mergers have probably been prohibited by authorities or deterred by merger control. However, to conclude on the analysis regarding research question 2), the data does show a slight impact of the “size” or “importance” of a horizontal transaction on the price effects post-transaction. Especially regarding „mega-mergers“ of already market-powerful companies with high transaction volumes, as shown in the analysis of two index variables.

Besides using a broader dataset, another approach for future research could be to include additional measures for the “importance” of a transaction, such as the number of jurisdictions the respective case was handled in. The handling of the case in several different jurisdictions could be seen as a proxy for the influence of the case, or rather the assumed extent of the overall competitive effects (e.g. on prices). Therefore, if a case is handled in several jurisdictions, the companies involved presumably have higher market shares and, thus, may have higher market power worldwide. This could be an indicator for greater incentives and possibilities to increase prices post-merger. However, investigations by several antitrust agencies could also lead to companies being more compliant with competition rules because of a feeling of “surveillance” and eventually not raising prices.

c. RQ 3 – Price Effects Depending on Market Concentration

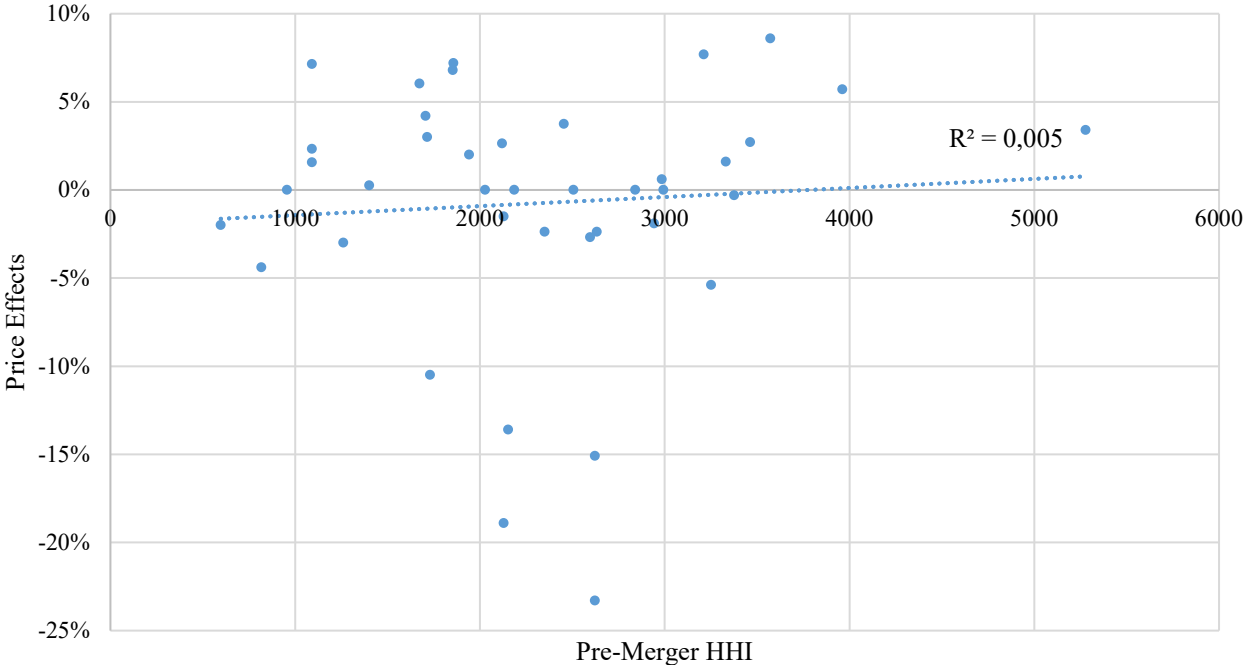
Market shares and corresponding market concentration are important variables that competition policy relies heavily on and that are used by competition authorities worldwide to evaluate potential (competitive) effects of mergers and other horizontal transactions. Therefore, measuring market concentration is a crucial step in every merger case, albeit not trivial because of the market delineation that has to be carried out beforehand (Carlton 2007).

A general inference drawn from oligopoly models (on the basis of Cournot 1897; Nash 1950) is that the level of industry concentration is a solid indicator for market power in this industry (Eckbo 1985). Mergers as well as other horizontal transactions and the associated change in market concentration thus have an impact on market power in the respective industry. Increased market power may lead to incentives to discriminate against competitors, to collude, to be less innovative, and eventually market power can be exploited to the detriment of consumers, e.g. through price increases. The rise of so-called “superstar firms” (with high efficiencies, innovation, and capital deployment) and platform markets (with strong network effects and a large amount of digital/intangible capital, e.g. software, intellectual property, and data) are two of the current developments that are held responsible for the increasing market concentration and decline of competition intensity that has been identified in several industries and sectors (inter alia, Autor et al. 2017, 2020; Gutiérrez & Philippon 2018; Grullon et al. 2019; De Loecker & Eeckhout 2020; De Loecker et al. 2020; Effenberger et al. 2020; Affeldt et al. 2021). In light of these developments it is especially interesting to check whether the data set compiled here allows conclusions to be drawn about a relationship between market concentration and post-merger price effects.

Assuming that market concentration is in fact a potentially important factor for price development post-merger, to answer research question 3) and to review the related theory, the Herfindahl-Hirschman-Index (HHI) and market shares are used here as measures. The data was collected from the sampled ex-post studies due to the high susceptibility to inaccuracies with regard to the underlying market definition when using other sources than the authors of the respective study. However, for this reason, the number of cases/price effects used for the analysis had to be considerably limited.

Starting with the analysis of the HHI pre-merger, the underlying assumption is that a higher market concentration pre-merger is more likely to lead to price increases post-merger. As mentioned, horizontal transactions tend to lead to increased market concentration even more because there is at least one competitor less in the market, whereas potential market changes may be of relevance here (e.g. the shift from four to three competitors in a narrow oligopoly leading to an especially strong increase in market concentration and market shares). Figure 11 takes a first look at 40 price effects depending on pre-merger HHI in the market to check whether there may be a linear relation.

Figure 11: Price Effects Depending on Pre-Merger HHI



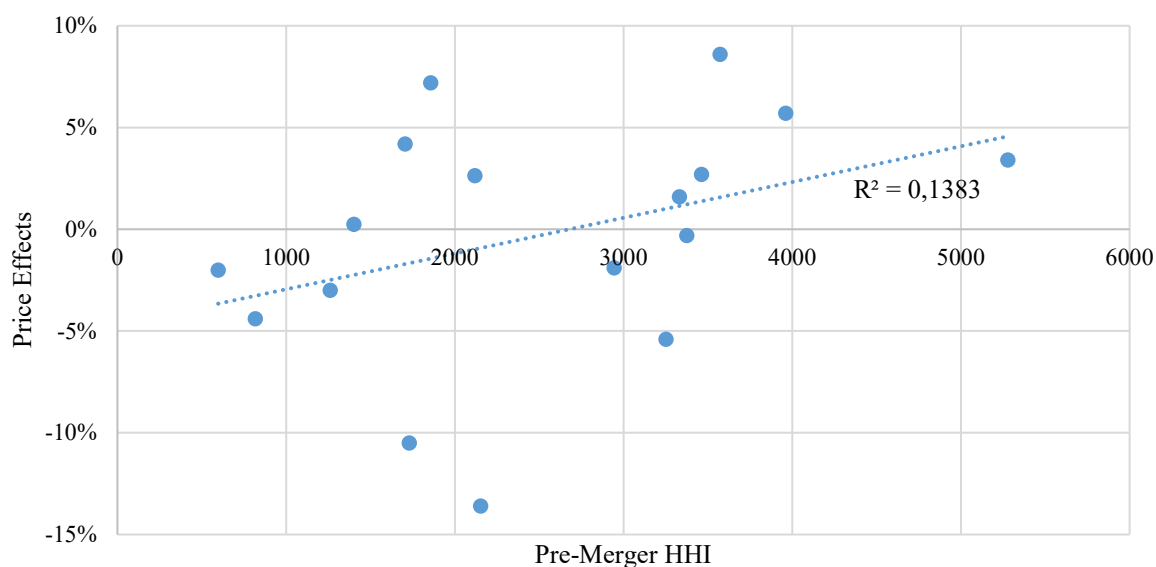
A first overall observation is that most of the cases took place in highly concentrated markets, which is due to the underlying sample selection bias. Authors of ex-post studies mostly concentrate on “bigger” and more controversial mergers to analyze their effects on competition and prices. Therefore, these cases are overrepresented in this meta-study. Only in three cases

was the HHI below 1.000, indicating low market concentration. In some cases, the value was between 1.000 and 1.800, which can be interpreted as medium market concentration. In most cases, however, the HHI was between 1.800 and 4.000, indicating high market concentration. In one case, the HHI was even above 4.000 (acquisition of SuperValu Inc. stores by Kroger in 2007 on Fort Wayne grocery store market). In the case of DISA/Shell Spain (2004), a monopoly already existed pre-merger on two of the regional markets considered, each of which was located on a Canary Island, and the HHI was therefore as high as 10.000. For this reason, the associated two price effects were excluded from the analysis - from a theory-based perspective, no price effect is to be expected here (and did not occur), as monopoly prices were already charged on the market before the merger. Nevertheless, even in some of the highly concentrated markets, post-merger price decreases did occur, sometimes even up to -20%. Most cases, however, did lead to price increases in a range between 0% and 10% although seemingly relatively independent of the respective pre-merger market concentration. Overall, the available data does not allow any strong conclusions to be drawn about an actual linear relationship between pre-merger HHI and post-merger price effects ($r = 0,0704$) even though an increase of post-merger prices seems more likely with higher pre-merger concentration.

An important aspect that plays a role in the evaluation of the results is that any effects caused by potential divestitures are not taken into account explicitly. This could lead to a systematic underestimation of the price effects compared to the counterfactual without divestitures, thus, to a failure to reflect the "actual" effects the "pure" transaction would have had. Explicitly eliminating the divestiture effects would most likely result in a clearer trend line than the one shown in figure 11, alas due to data restrictions this is not possible. This also applies for the interpretation of the results in figure 12.

It is now interesting to see whether the results change when looking at individual sectors. Due to the limited availability of data, this can only be done for the grocery sector. For the sectors alcoholic beverages (six price effects, three cases), petroleum (nine price effects, three cases) and home appliances (four price effects, one case) the analysis was carried out, but is not listed here due to the low explanatory power of the results. The analysis was not done for the sectors corrugating medium, parking lot operators, flights, and motor oil because the number of cases/price effects was too low respectively. However, some cases in these sectors are included in the overall 40 price effects analyzed in figure 11. Figure 12 shows the results for the grocery sector with 17 price effects included in the analysis.

Figure 12: Price Effects Depending on Pre-Merger HHI – Groceries



The results are more conclusive, although still not suitable for definite conclusions ($r = 0,3719$) and might again be underestimating the price effects due to any included divestiture effects. The illustrated data cloud shows a clearer trend in the grocery sector as some of the extreme outlier cases from figure 11 have been dropped. According to the authors, despite the still existing outliers with stronger price decreases, the results still support the general assumption that “most of the economically significant price increases occurred following mergers in highly concentrated markets”. However, they acknowledge that post-merger market concentration may be a better indicator for potential price increases (Hosken et al. 2018: 17).

Therefore, post-merger HHI will now be examined. Here, again, the assumption is made that higher post-merger market concentration tends to lead to higher post-transaction price increases due to the resulting higher market power of the merged entity. Any skewed price effects due to divestitures are not as problematic interpreting data on post-transaction concentration and changes in concentration - potential divestiture effects are already priced in here. Figure 13 shows the results for 39 price effects.

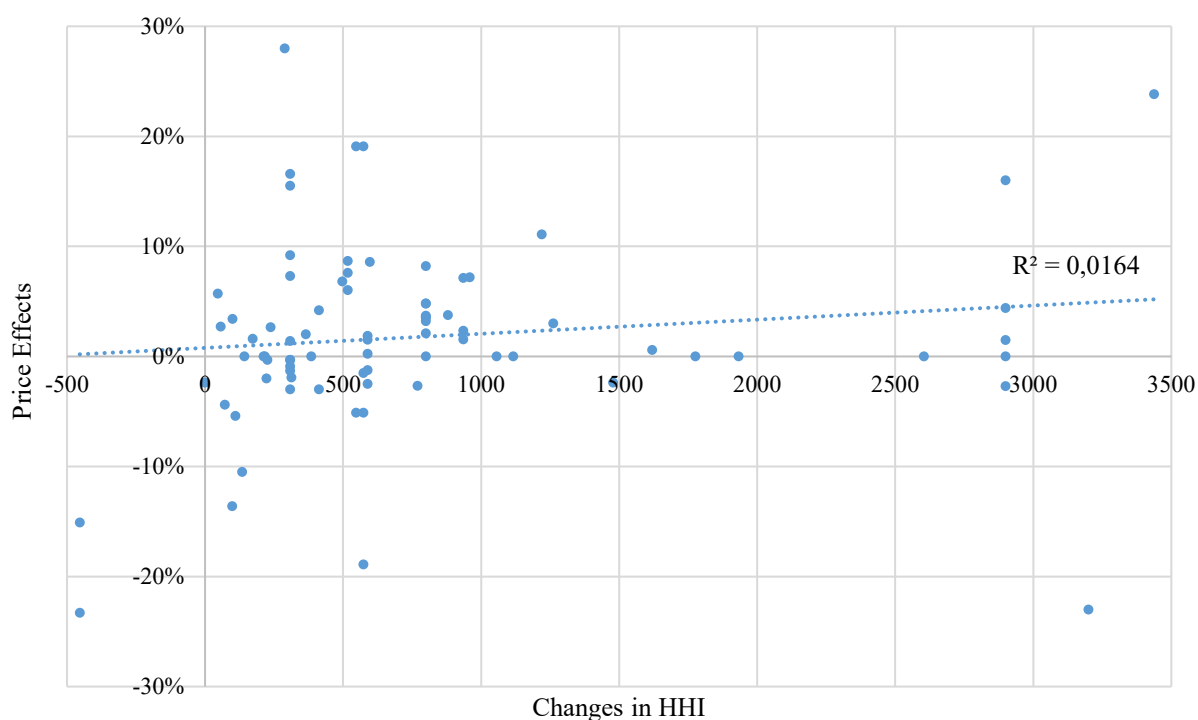
Figure 13: Price Effects Depending on Post-Merger HHI



The results are similar to those of the analysis of pre-merger HHI in figure 11 (again excluding the two price effects with HHI at 10.000), except for the fact that in even fewer cases market concentration remains on a low or medium level (HHI below 1.800) after the respective transaction. Again, there is no strong linear relation between the two variables ($r = 0,2296$), although an upward trend is observable.

To combine the two analyses regarding pre- and post-merger HHI, in the next step the difference in HHI is used as a measure to reflect the concrete impact of the transaction on market concentration. The so-called market concentration doctrine implies that a horizontal transaction is more prone to anti-competitive effects (such as collusion, less innovation incentives, and eventually consumer price increases) the greater the effects the transaction has on market concentration (Eckbo 1985). Therefore, the higher the difference in HHI, the higher the post-merger price increases are expected to be. Figure 14 shows the analysis of 80 price effects. The difference in the number of analyzed price effects/cases compared to the previously shown figures on HHI results from the varying information provided in the ex-post studies. Specific changes in market concentration, respectively changes in HHI, were given more often than information on market concentration pre- and post-merger individually. The two price effects of the DISA/Shell Spain case where pre- and post-merger HHI were both 10.000 are still excluded.

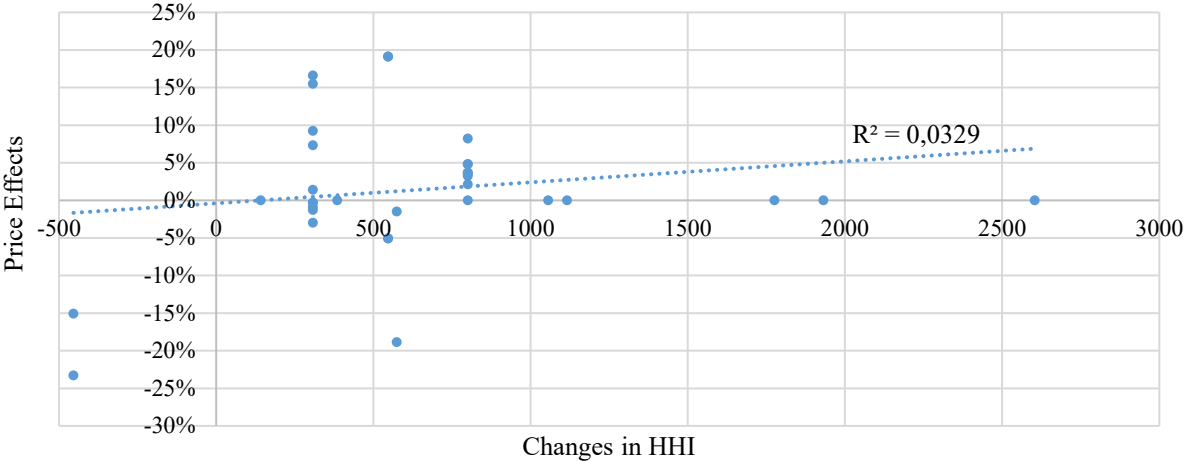
Figure 14: Price Effects Depending on Changes in HHI



There is one especially notable case where the market concentration has decreased instead of increased after the transaction. However, when excluding the acquisition of a Tosco refinery by UDS in 2000 the results become less definite. This is particularly noteworthy because the strong price decreases following the aforementioned acquisition are in fact in line with theory given the accompanying decline in market concentration. Another comprehensible result according to theory is that especially in cases where the increase in HHI through the transaction is lower (between 0 and 1.000) more post-merger price decreases occurred than in cases with higher net post-transaction increases of market power. 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 reduction of 23%, which may have been due to cost efficiencies or simplified import possibilities and therefore a higher number of potential suppliers (Schumann et al. 1992; Gu 2015). This case strongly skews the results, however, overall there is a slight linear relation between the merger-related changes in HHI and post-merger price effects ($r = 0,1279$) that supports the theory. Still, the data is very scattered and R^2 is relatively low even though the results are clearer compared to the analyses of pre- and post-merger HHI individually.

Again, individual groups of goods are to be examined for the existence of a stronger relation between transaction-induced changes in HHI and post-transaction price effects. Due to the low number of cases, respectively price effects, the specific analyses of the groups flights (five price effects, one case), alcoholic beverages (six price effects, three cases), home appliances (four price effects, one case), and motor oil (three price effects, one case) are not included in this contribution. Figure 15 shows the results for 34 price effects in the petroleum sector.

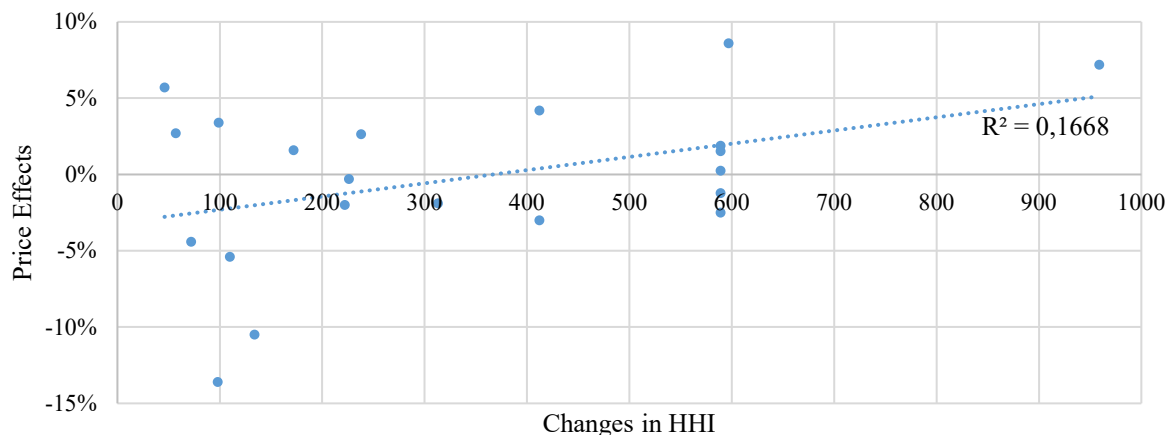
Figure 15: Price Effects Depending on Changes in HHI – Petroleum



The UDS/Tosco case, where the difference in HHI is actually negative, is again included here. Another noteworthy aspect is the relatively high number of cases where the price effect is 0% even if the post-transaction increase of the market concentration is high. One of them being the already mentioned DISA/Shell Spain case on the Canary Islands, which also led to two data points being again excluded, where price effects as well as the change in HHI on specific regional markets were 0 because of both, pre- and post-merger HHI being 10.000 (monopoly position “switched” from one company to another). There are no cases with HHI increases above 750 and price decreases at the same time. Overall, the results paint a similar picture as those including the price effects in all groups of goods ($r = 0,1813$).

Figure 16 now shows the results of the analysis of 20 price effects in the grocery sector.

Figure 16: Price Effects Depending on Changes in HHI – Groceries



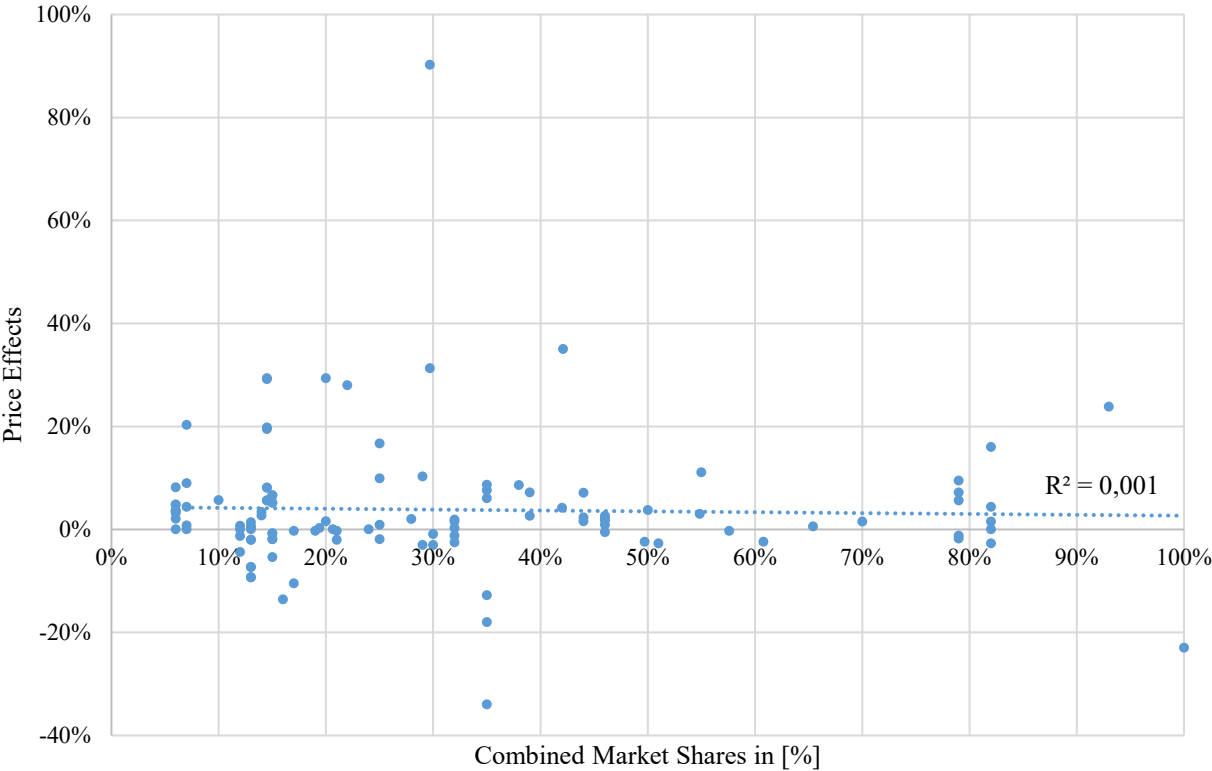
The results for the grocery sector are relatively conclusive compared to the other analyses ($r = 0,4084$). All cases have an HHI increase below 1.000, actually only one case shows a post-transaction increase in market concentration above 600 (Procter & Gamble/Tambrands case in 1997). However, according to the data post-merger price decreases are possible even with higher increases of HHI in this group of goods, though, stronger price decreases are only apparent in areas with HHI increases below 200. Overall, the data relating to this group show a picture that is expected according to the underlying theory.

The evaluation of HHI-analyses as a measure for the impact of market concentration on post-transaction price effects does not show particularly strong results. However, the direction of the effects shown is in line with the expected result in each case, even if the relation between HHI and price effect does not appear to be very strong respectively. Only when looking at the grocery sector individually does a potentially stronger correlation emerge. Overall, with regard to the underlying theory, this means that all results point in the expected direction and support the hypothesis of higher market concentration leading to stronger post-merger price-increases, especially when taking into account the potential partial underestimation of price effects due to possible divestiture effects.

In order to verify the results, another measure of market concentration will now be examined for its potential relationship with post-transaction price effects. Again, the data was collected from the sampled ex-post studies due to potential problems regarding comparability when using other market delineations. For this reason of limited data availability pre-merger market shares

given in the literature are added up to the combined market shares post-transaction. Potential divestitures are again not taken into account since it would not be clear from the analysis of the price effects which effect in fact has occurred as a result of these potential remedies (which effects would have occurred without them, respectively). This simplifies the approach and needs to be considered in the interpretation, however, making it actually practicable. The basic theoretical assumptions remain the same: the loss of a competitor in a market through a horizontal transaction and the accumulation of market shares will likely increase market concentration and market power (Hovenkamp & Shapiro 2018). For this reason, it is assumed that the higher the combined market shares, the higher the post-transaction price increases. Figure 17 gives a first overview of 117 price effects depending on post-transaction combined market shares.

Figure 17: Price Effects Depending on Combined Market Shares



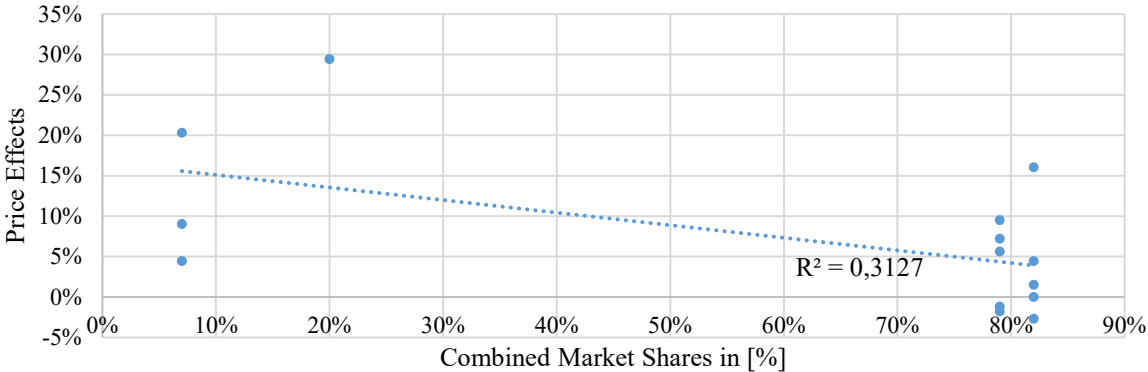
The results show a very scattered data cloud with an R² being nearly 0. Overall, there seems to be no apparent relation between combined market shares and post-transaction price effects. One reason for this inconclusive results could be the underestimation of price effects due to not specifically priced in divestiture effects, resulting from the simplified calculation of combined market shares. If any, there is a slightly negative relation apparent ($r = -0,0309$), which is somewhat surprising, given that theoretically merged entities with higher market shares and,

therefore, market power have actually higher incentives to increase prices. Most of the horizontal transactions covered resulted in combined market shares ranging around 10% to 50%, whereas actual price decreases were possible in cases with combined market shares as high as 100% (Kaiser Cement Corporation/Lone Star Industries case in 1985). Another outlier is the H3G Austria/Orange Austria merger in 2013, which led to a price increase of over 90% for smartphone users with relatively low combined market shares of just below 30%. This could be due to the special characteristics of the telecommunications market (e.g. relatively easy implementation of price discrimination, so-called “flat rate” pricing models, etc., inter alia, Peitz 2005; Howell 2010). It is notable here that the users classified by the authors as "traditional" (lower use of mobile and internet services) were only exposed to a far lower price increase of just over 31% (RTR-GmbH 2016).

Since there are no conclusive results in the analysis of combined market shares across all groups of goods the next step is, again, to take a look at some of these groups individually. Maybe some of these sectors are more prone to post-transaction price increases if combined market shares are considerably high. As in the analyses of HHI before, due to data availability this group specific investigation is only included here for three groups. The analyses of the sectors telecommunications (eight price effects, three cases), home appliances (four price effects, one case), motor oil (three price effects, one case), and media products (four price effects, four cases) were carried out but are not included in this contribution due to the small number of data points and therefore low expressiveness of the results. For the petroleum group of goods the number of price effects and cases was actually relatively good (44 price effects, eight cases), however, the results look quite similar to those of the overall analysis across all groups of goods ($R^2 = 0,0013$) and are thus not implying any existing connection ($r = -0,0365$).

Figure 18 now shows the results for 14 price effects in the group of flights.

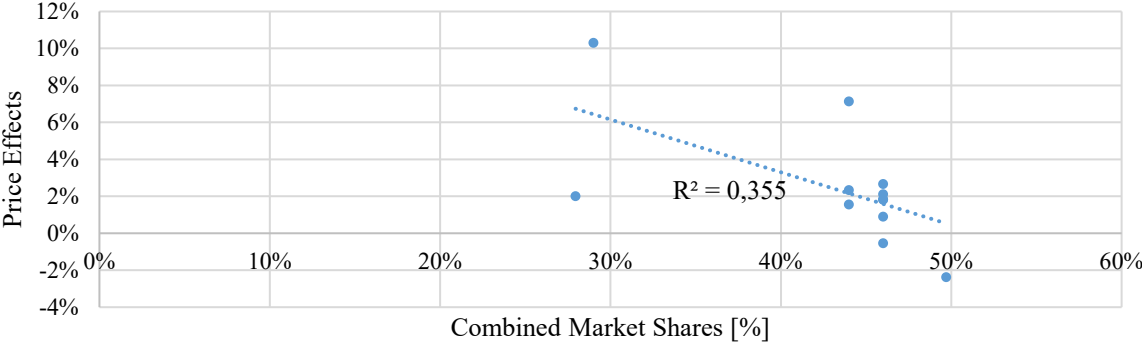
Figure 18: Price Effects Depending on Combined Market Shares – Flights



In this sector there seems to be a stronger connection between combined market shares and post-transaction price effects, however, not in the expected direction ($r = -0,5592$). In cases where the merged entities actually had lower market shares, prices increased up to just under 30% (Continental/People Express case in 1987), whereas in cases with higher market shares and concentration even slight post-transaction price decreases occurred besides the incentives and possibilities to raise prices post-merger. For the TWA/Ozark and Northwest/Republic cases in 1986 it is noteworthy that both cases were not “only” code-share agreements but Ozark and Republic were acquired by and merged into TWA and Northwest, respectively. However, there are other price effects included in the results shown here for the same cases, where the respective authors actually computed price increases post-merger, again showing that interpretations of the retrospective-study-data used here must be made with caution.

A similar and even stronger picture shows when analyzing the group of alcoholic beverages in figure 19. Here, twelve price effects are included, which represents all available effects and four cases (see table 1).

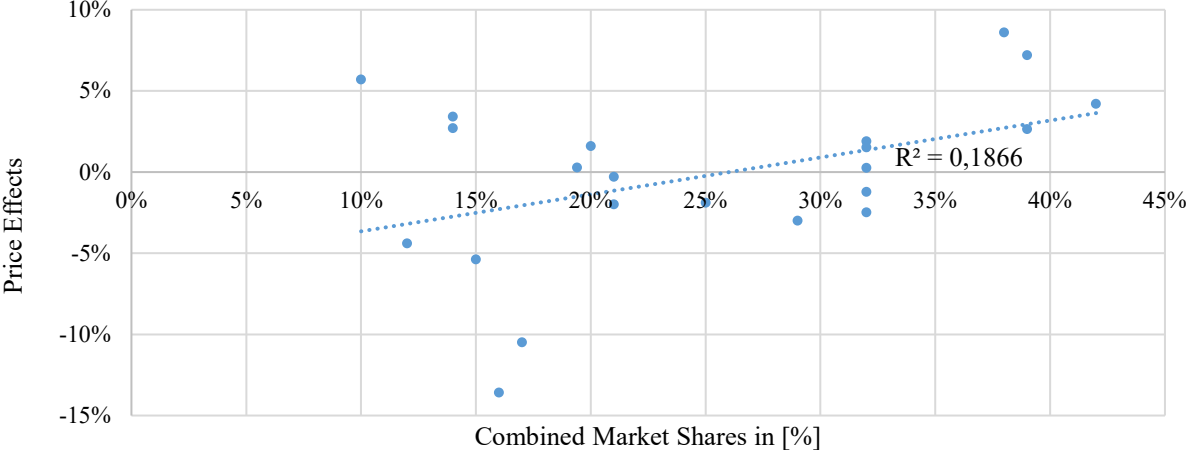
Figure 19: Price Effects Depending on Combined Market Shares – Alcoholic Beverages



Due to the low number of cases the potential relation shown in the graph ($r = -0,5958$) needs to be interpreted with caution, however, the results shown in graphs 17 to 19 are somewhat counter-intuitive and indicate that (at least in some sectors) higher post-transaction market shares go hand in hand with lower price increases or even price decreases. In fact, figure 19 shows the case with the highest combined market shares post-merger (Carlsberg/Pripps case in 2001) with an associated price decrease of -2,38%. According to the authors, the price decrease might have occurred due to a “disciplining effect” of substantial divestitures, which were regulatory requirements in the case (Friberg & Romahn 2015). This would emphasize the effectiveness and importance of such tools in the portfolio of competition authorities and demonstrate their concrete impact on pricing behavior post-transaction. Additionally, this strengthens the aforementioned potential underestimation of price effects due to not specifically

including divestitures in the conducted analyses. Overall, the market shares in this group of goods are not as high as in the previously examined group, nevertheless showing similar results. However, the study of the last individual group of goods indicates that this cannot be generalized. Figure 20 shows the results for 22 price effects in the grocery sector.

Figure 20: Price Effects Depending on Combined Market Shares – Groceries



Here, higher combined market shares appear to be associated by higher price increases ($r = 0,4320$). The results are stronger in this subgroup than they were in the overall examination (figure 17). However, price effects might still be systematically underestimated, due to potential divestiture effects that cannot be explicitly measured here. This would suggest an even stronger link between market concentration and post-merger prices in this particular group of goods than is shown in figure 20 and would also speak for an overall correlation. In this group of goods market shares overall are not as high as in the other analyzed groups and especially lower combined market shares often times seem to actually lead to price decreases post-transaction, which is in line with the assumptions based on theory. This again shows that generalized statements on potential interrelationships between price effects and their assumed influence factors are hard to make. Still, this overall indicates that a general tendency towards higher prices associated with higher combined market shares is likely to exist in general but that some industries in this sample display systematic exceptions from the general trend.

This can also be seen as a main takeaway and conclusion to answer research question 3). The whole section shows, with notable exceptions in some cases in the groups of flights and alcoholic beverages, a consistent picture: a concentration-induced increase in prices post-transaction is the most likely explanation for the results shown. Increasing market concentration through a horizontal transaction and the accompanying increased market power cannot automatically be equated with higher price increases and the facts of the respective case matter,

but the results from the analysis of the dataset seem to support the theoretical assumption that higher common market shares, i.e. higher market power and market concentration, in general tend to lead to higher prices post-transaction. Especially taking into account potential underestimations of the price effects due to simplifications and data restrictions.

V. Policy Implications and Conclusion

In line with the above-mentioned policy learning approach regarding ex-post evaluations of competition policy decisions, this meta-study adds to the current literature by gathering and analyzing existing results and putting them into a broader context. The aim of this is to derive general as well as industry specific policy implications concerning the handling of horizontal transactions. These implications shall not be limited to specific competition policy regimes, as of the EU or the U.S., but rather applicable regardless of the respective authority handling a transaction.

Note again that the sample used here is biased with respect to the selection of cases analyzed: the most anti-competitive ones are not included because they were not allowed by the authorities in the first place and it is also likely that more "unproblematic" (where less strong anti-competitive effects, respectively price increases, were anticipated) cases were not picked up by the authors of the ex-post studies included here. Therefore, the results presented in this contribution may not be as indicative regarding the necessity of e.g. specific sector regulation or close scrutiny by competition authorities with respect to merger control. Complementary information, such as numbers of actually prohibited cases per group of goods or data on potential divestitures or other remedies imposed by the authorities might be interesting additions for future research.

To develop policy implications, three research questions were analyzed. The results of the analyses will be summarized here in order to deduct the specific conclusions in each case.

- 1) Are there general price effects after horizontal transactions in delineated groups of goods? Are some groups particularly "vulnerable" to price increases after horizontal transactions?

The evaluation of a total of 194 price effects collected (figure 2) showed no clear results in the overall sample. There are some groups of goods, with low numbers of price effects analyzed respectively, in which only price increases or solely price decreases occurred (e.g., motor oil, cigarettes, cement). In bigger groups, however, the results are not as indicative. In some groups,

the price effects are more "compressed" or "stretched." Yet, this does not allow to draw any concrete conclusions regarding the susceptibility of these groups to post-merger price increases.

In combination with other concentration-related characteristics (pre-merger HHI, changes in HHI, combined market shares; see RQ 3), the analysis of individual groups of goods shows clearer results than the overall sample. For example, in the market for groceries: both the analysis of pre-merger HHI and changes in HHI and their effects on post-merger prices show that market concentration appears to have an impact regarding transaction effects in this market and that there might be a correlation between higher concentration/HHI and higher post-transaction prices. Overall, the results here do not necessarily indicate industry-specific concerns: according to the analysis of the data, industry affiliation alone does not justify an increased risk of anticompetitive pricing behavior post-merger. However, the occurrence of certain concentration-related characteristics in specific markets may be an indication for authorities to scrutinize more closely. A more detailed discussion of this follows when analyzing the specific characteristics in RQ 3.

- 2) What influence does the “size” or “importance” of a horizontal transaction have on the price effects post-merger?

The analysis of individual variables (combined turnovers, difference in turnovers, transaction volume) and the analysis of two indices show a slight overall trend: the more important/bigger a transaction is, the higher the post-merger price increases. This is in line with the underlying theory and confirms the common practice of competition authorities. Moreover, the results show the importance of adequate thresholds in merger control - not only related to turnover, but also related to transaction volume! The recent developments in several jurisdictions with regard to the introduction of corresponding transaction-volume-based thresholds are supported by the results of this contribution, and there is much to suggest that these will become even more important in the future (see, for example, merger cases in new and digital markets, in which the respective revenues would not always allow the authorities to take action).

The analysis of the two indices shows in particular that so-called "mega-mergers" must continue to be intensively observed by authorities. In this context, the analysis of specific divestiture effects could also provide further insight into whether these can also contain the anti-competitive effects, or price increases respectively, in very large merger cases. Do remedies fail their task in “mega-mergers” or are they sufficient to actually “cushion” the negative price effects? Additionally, deterrence effects of remedies imposed by competition authorities could have an impact on future cases.

3) What influence does market concentration have on price developments after horizontal transactions?

With the last research question, this paper aims to give empirical evidence regarding the evaluation of concentration-based thresholds, such as HHI and market shares. Are these tools sufficient to detect transactions with especially negative outcomes with respect to post-transaction prices?

The analysis of the combined market shares as a whole cannot confirm this. In some groups of goods, the price increases are even lower the higher the combined market shares. However, this counter-intuitive effect may be explained by divestiture effects, which could not be included in this study. The analysis of the HHI (pre-merger, post-merger and changes), in turn, tends to show a correlation between higher market concentration and higher post-merger price increases, both overall and in individual groups of goods. As already shown with regard to RQ 1, the importance of case-by-case decisions is again evident here. Fundamental generalizations cannot be made on the basis of the data available here. However, some results in individual groups of goods provide interesting clues as to the sectors in which market concentration that may exist or increase as a result of the transaction may have a particularly price-increasing effect. Overall, increased market concentration appears to induce price increases post-transaction. Nevertheless, the inquiry must address the specific facts of the case.

This is also the main takeaway of this contribution. General or industry specific implications for authorities handling horizontal transactions are difficult to read from the data. However, some could be obtained.

If it is assumed for the sake of simplicity that post-merger price increases after a permitted transaction are indicative of a false negative decision error by the authorities, overall, the simplified "error rate" (expressed in terms of the ratio of post-merger price increases vs. price decreases) of the authorities appears to be in need of improvement. Around 50% of the price effects were post-merger price increases (see figure 1). When looking at the individual groups of goods, the results of the meta-study suggest similar (figure 2). This again shows the importance of ex-post studies for improving ex-ante merger control: although generalizations are difficult to make, the subsequent analysis of a case and the now observable outcome can provide important information for the handling of future cases in general, in the same industry and/or with similar characteristics.

VI. Literature

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VII. Appendix

Table A1: Chronological List of Mergers Analyzed

Year	Firms	Product Group	Transaction Type	Source(s)
1976	Scott Graphics/ Xidex	Microfilm	Merger	Barton & Sherman 1984
1979	Kalvar Corporation/ Xidex	Microfilm	Merger	Barton & Sherman 1984
1981	Weyerhaeuser/Menasha Coro	Corrugating Medium	Merger	Schumann et al. 1992
1983	SCM/Gulf & Western	Titanium Dioxide	Merger	Schumann et al. 1992
1985	Kaiser Cement Corporation/Lone Star Industries	Cement	Merger	Schumann et al. 1992
1986	TWA/ Ozark	Flights	Merger	Werden et al. 1991 Borenstein 1990 Morrison 1996 Peters 2006 Brueckner et al. 1992
1986	Northwest/ Republic	Flights	Merger	Werden et al. 1991 Borenstein 1990 Morrison 1996 Peters 2006 Brueckner et al. 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 et al. 2004
1995	Northwest Airlines/Alaska Airlines	Flights	Code-Share	Bamberger et al. 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	Hygiene Products	Merger	Ashenfelter & Hosken 2010
1997	Tosco/ Unocal	Gasoline	Merger	Hosken et al. 2011 GAO 2004

				Karikari et al. 2007
1997	UDS/Total	Gasoline	Merger	GAO 2004 Karikari et al. 2007
1998	Reed Elsevier/Matthew Bender	Media Products	Merger	McCabe 2004
1998	BP/Amoco	Gasoline	Merger	GAO 2004 Karikari et al. 2007
1998	Marathon/ Ashland	Gasoline	Joint Venture	GAO 2004 Karikari et al. 2007 Taylor & Hosken 2007
1998	Shell/ Texaco I	Gasoline	Joint Venture	GAO 2004 Karikari et al. 2007
1998	Shell/ Texaco II	Gasoline	Joint Venture	GAO 2004 Karikari et al. 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 et al. 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 et al. 2007
2000	UDS/ Tosco	Gasoline	Merger	Hosken et al. 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 et al. 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 et al. 2013
2006	Waterstone's/ Ottakar's	Media Products	Merger	Aguzzoni et al. 2016
2006	GDF/ Suez	Gasoline	Merger	Argentesi et al. 2017
2006	T-Mobile/ tele.ring	Telecommunication	Merger	Aguzzoni et al. 2018
2007	T-Mobile/ Orange	Telecommunication	Merger	Aguzzoni et al. 2018
2007	Western Refining/Giant Industries	Gasoline	Merger	Kreisle 2015
2007	Agip/Esso	Gasoline	Merger	Csorba et al. 2011
2007	Lukoil/Jet	Gasoline	Merger	Csorba et al. 2011
2007	Albertsons/ Raley's	Groceries	Merger	Hosken et al. 2018
2007	Kroger/ Farmer Jack	Groceries	Merger	Hosken et al. 2018
2007	C V Foodliner/ CVM Inc.	Groceries	Merger	Hosken et al. 2018
2007	Kroger/ SuperValu Inc.	Groceries	Merger	Hosken et al. 2018

2007	Save Mart Super Markets/Albertsons	Groceries	Merger	Hosken et al. 2018
2007	Rouse Enterprises/ Great A & P Tea Co.	Groceries	Merger	Hosken et al. 2018
2007	Great A & P Tea Co/ Pathmark	Groceries	Merger	Hosken et al. 2018
2007	Assoc Wholesale Grocers Inc/ Albertsons	Groceries	Merger	Hosken et al. 2018
2008	Kroger/Assoc Wholesale Grocers Inc.	Groceries	Merger	Hosken et al. 2018
2008	Houchens Industries/ Buehler Foods	Groceries	Merger	Hosken et al. 2018
2008	Game Group PLC/ Games Station Limited	Media Products	Merger	Aguzzoni et al. 2014
2008	Delta/Continental/North west	Flights	Code-Share	Gayle 2008
2008	Delta/Northwest	Flights	Merger	Luo 2014 Carlton et al. 2019
2008	Miller/Coors	Alcoholic Beverages	Joint Venture	Ashenfelter et al. 2015 Miller & Weinberg 2017
2009	AstraZeneca Tica/GlaxoSmithKline	Pharmaceutical Products	Merger	Björnerstedt & Verboven 2016
2010	United/Continental	Flights	Merger	Carlton et al. 2019
2011	Southwest/Airtran	Flights	Merger	Le 2016
2011	Amazon/ The Book Depository	Media Products	Merger	Argentesi et al. 2019
2012	Shell/Rontec	Gasoline	Merger	Office of Fair Trading 2014
2012	Jumbo/C1000	Groceries	Merger	Argentesi et al. 2018
2013	American/US Airways	Flights	Merger	Carlton et al. 2019
2013	H3G Austria/ Orange Austria	Telecommunication	Merger	RTR-GmbH 2016
2013	Anheuser-Busch-InBev/ Grupo Modelo	Alcoholic Beverages	Merger	Wang et al. 2017
2013	Pinnacle/ Ameristar	Casinos	Merger	Osinski & Sandford 2020
2013	Tesoro/BP	Gasoline	Merger	Greenfield et al. 2015

Overview A2: Studies Used for Meta Study

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