

University of Groningen

Competitive reactions to personal selling

Holtrop, Niels; Wieringa, Jakob; Gijsenberg, Maarten; Stern, P.

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Publication date:
2016

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Holtrop, N., Wieringa, J., Gijsenberg, M., & Stern, P. (2016). *Competitive reactions to personal selling: the difference between strategic and tactical actions*. (SOM Research Reports; Vol. 16004-MARK). University of Groningen, SOM research school.

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.



university of
 groningen

faculty of economics
 and business

16004-MARK

**Competitive Reactions to Personal
 Selling: The Difference between
 Strategic and Tactical Actions**

Niels Holtrop
 Jaap E. Wieringa
 Maarten J. Gijsenberg
 Philip Stern



SOM is the research institute of the Faculty of Economics & Business at the University of Groningen. SOM has six programmes:

- Economics, Econometrics and Finance
- Global Economics & Management
- Human Resource Management & Organizational Behaviour
- Innovation & Organization
- Marketing
- Operations Management & Operations Research

Research Institute SOM
Faculty of Economics & Business
University of Groningen

Visiting address:
Nettelbosje 2
9747 AE Groningen
The Netherlands

Postal address:
P.O. Box 800
9700 AV Groningen
The Netherlands

T +31 50 363 9090/3815

www.rug.nl/feb/research



Competitive Reactions to Personal Selling: The Difference between Strategic and Tactical Actions

Niels Holtrop

University of Groningen, Faculty of Economics and Business, Department of Marketing
n.holtrop@rug.nl

Jaap E. Wieringa

University of Groningen, Faculty of Economics and Business, Department of Marketing

Maarten J. Gijsenberg

University of Groningen, Faculty of Economics and Business, Department of Marketing

Philip Stern

Exeter Business School, University of Exeter & Ehrenberg-Bass Institute, University of South Australia

Competitive Reactions to Personal Selling: The Difference Between Strategic and Tactical Actions ^a

Niels Holtrop ^{b,c}

Jaap E. Wieringa ^c

Maarten J. Gijsenberg ^c

Philip Stern ^d

^a The authors would like to thank Koert van Ittersum , Peter Verhoef, participants at the 2013 Marketing Science Conference in Istanbul and the 11th Marketing Dynamics Conference in Las Vegas, and seminar participants at the University of Groningen for valuable feedback

^b Address for correspondence: Niels Holtrop, Department of Marketing, Faculty of Economics and Business, University of Groningen, PO Box 800, 9700 AV Groningen, The Netherlands, Tel. +31 503639621; N. Holtrop@rug.nl.

^c Department of Marketing, Faculty of Economics and Business, University of Groningen, PO Box 800, 9700 AV Groningen, The Netherlands; J.E.Wieringa@rug.nl; M.J.Gijsenberg@rug.nl

^d Exeter Business School, University of Exeter, Streatham Court, EX4 4ST, Exeter, United Kingdom, and Ehrenberg-Bass Institute, University of South Australia; P.Stern@exeter.ac.uk

Competitive Reactions to Personal Selling: The Difference Between Strategic and Tactical Actions

Abstract

A recurring question facing managers is how (if at all) to react to competitive actions. In this research the authors distinguish between reactions to competing strategic and competing tactical actions, different from prior homogeneous definitions of competitive actions. Using a unique, single-source dataset of personal selling interactions between firms and customers covering fourteen drug categories, the authors shows that substantial differences in reactions exist. In particular, strategic actions elicit competitive responses with stronger short- and long-term consequences compared to tactical actions. Furthermore, while the decision to react to competing strategic actions is always warranted, this is not the case for a substantial amount of tactical actions, where firms retaliate with an ineffective marketing instrument, or accommodate with an effective marketing instrument. This divide between actions is further exacerbated in the strength of the reactions that we observe: stronger or weaker reactions to strategic actions occur in line with theoretical expectations, whereas reactions to tactical actions often are not. Based on these findings, the authors suggest directions to improve decision maker's reactions to competing tactical actions.

Key words: competitive strategy, personal selling, empirical generalizations, time series analysis

1. Introduction

Markets are shaped by the interplay of firms that engage in a seemingly endless series of moves and countermoves vying for a favorable position. Successful (or unsuccessful) moves directly affect the performance of firms involved (Chen 1996; Porter 1980). It should therefore come as no surprise that the market-response literature has a long tradition in analyzing the effects of competition on firms involved (see for example Leeflang and Wittink 1992, 1996, 2001; Nijs et al. 2001; Steenkamp et al. 2005). The insights of these analyses inform managerial decision making about the adequacy of actions taken by evaluating their short- and long-term outcomes, an important but also challenging task for managers (Montgomery, Moore and Urbany 2005). An additional aspect that was not addressed by these prior studies is that while all competitive moves carry some weight, some moves may carry more weight than others with respect to firm outcomes. The strategy literature characterizes this difference by distinguishing between strategic and tactical actions (Chen, Smith and Grimm 1992; Porter 1980; Smith et al. 1991; see also Table 1). Strategic actions are initiated by higher management and require a significant commitment of resources. Once implemented, they have a strong influence on a firm's future path and are not easily reversed (Miller and Chen 1994; Smith et al. 1991). Tactical actions on the other hand require relatively low resource commitment, and are implemented by lower and middle (henceforth junior) management. They often serve to fine tune strategy, and are more easily reversed once implemented (Smith et al. 1991). Assessing the impact and adequacy of actions taken at these different firm levels in the face of competition will be our goal in this article. Prior work in the marketing-response literature (e.g. Leeflang and Wittink 1992, 1996, 2001; Nijs et al. 2001; Steenkamp et al. 2005) did not take into account this differentiation and its potentially distinct effects on the strength of reactions and their short- and long term consequences (see Table 1). On the other hand, the strategy literature does not discern short- from long-term

consequences, and often does not consider reaction strength, but only number and timing of responses (e.g. Chen 1996; Chen, Smith and Grimm 1992; Miller and Chen 1994; Smith et al. 1991; see also Table 1). By illustrating that reaction strength is also an important determinant, we guide managerial decision making on *how* to react, and address an open research topic (Smith et al. 1991).

Furthermore, while prior marketing-response research is predominantly focused on advertising and price promotions, we extend these findings to personal selling (see Table 1), a marketing instrument with an estimated spending in the US alone of \$800 billion (Zoltners, Sinha and Lorimer 2008). The setting of personal selling is an example where this dichotomy is highly pronounced. In this setting, higher management determines the general strategy by allocating total brand budgets. This allocation is based partly on own marketing effectiveness, sales force size and competitive activity. Increasing or decreasing budgets for certain products then corresponds to strategic actions in this setting. Once this allocation has been determined, it is communicated to junior managers, who implement the strategy by allocating sales personnel to products depending on available budgets. Based on in-the-field feedback, deviations from the outlined strategy can occur in order to cater to customer needs or respond to activity by competing sales people. This gives rise to tactical actions. For example, increasing visits to a customer to promote a certain product knowing that a direct competitor visited last week is considered a tactical action. Besides the difference in type of decision maker outlined above, we corroborate the differences between action types based on our data in Section 4.

Given this strategy typology, this article focusses on identifying the differences between these actions in terms of effectiveness and firm performance in the face of competition. In particular, we make three distinct contributions: First, we show that firm reactions to competing strategic actions have stronger short- and long-run consequences than

reactions to competing tactical actions. Second, we show that while retaliating (by increasing sales force effort) to competing strategic actions is always warranted from a marketing effectiveness point-of-view, retaliating to and accommodating (by reducing sales force effort) competing tactical actions is often unwarranted. Third, we show that the use of sales objectives for junior managers induces a short-term orientation. Consequently, we find that their reactions are stronger or weaker counter to theoretical expectations. In addition, their reactions decisions are often opposite to those taken by higher management, which are in line with a rational long-term strategy.

Table 1: Overview of Studies about Competition

Study	Marketing Instrument	Distinction strategic vs. tactical actions	Strength of reactions	Distinction short- vs. long-term effects
Chen (1996)	NA	-	✓	-
Chen, Smith and Grimm (1992)	NA	✓	✓	-
Leeflang and Wittink (1992)	Price & Non-Price Promotions	-	-	✓
Leeflang and Wittink (1996)	Price & Non-Price Promotions	-	✓	-
Leeflang and Wittink (2001)	Price & Non-Price Promotions	-	✓	-
Miller and Chen (1994)	NA	✓	-	-
Nijs et al. (2001)	Price Promotions	-	✓	✓
Smith et al. (1991)	NA	✓	-	-
Steenkamp et al. (2005)	Advertising & Price Promotions	-	✓	✓
This study	Personal Selling	✓	✓	✓

These findings derive from the analysis of a unique, single-source panel of British physicians. This representative sample reported detailing calls¹ received from pharmaceutical firms (sales force effort) and prescriptions for drugs written (sales) covering the period 1987-2006. We analyze a subset of the data which focusses on 14 different chemical entities, with each one having more than one branded drug based on the *same* molecule on the market. Given that it is impossible to separate the effects of competitive actions from differences in drug efficacy, by controlling for drug efficacy we are able to study competitive interaction in isolation in this setting. Furthermore, the use of single-source data enables the observation of all relevant marketing activities of brands within these molecule categories aimed at these physicians, and we can also assess the subsequent sales impact on all brands. Using structural vector-autoregressive models with exogenous variables (SVARX) in combination with impulse response analysis, we obtain firms' short- and long-term reaction- and sales-elasticities in the face of competing sales force attacks. We use these elasticity estimates to quantify firms' reaction strength and their associated sales impact, and to investigate the impact of theoretically derived set of brand, category and regional characteristics on reaction strength. To differentiate between strategic and tactical attacks, we perform these analyses at two firm levels: the brand level (strategic) and the brand-regional level (tactical). The use of the same modeling approach and variables for each molecule category, and elasticities as our unit of measurement, allows us to make between-category comparisons and thus provide empirical generalizations (Van Heerde 2005).

The remainder of this article is organized as follows. In Section 2, we present our research framework in more detail and provide expectations for the strength of reactions for both action types. Furthermore, we use prior research to derive a set of moderating variables potentially influencing reaction strength. Section 3 presents our data set in more detail, and

¹ In the setting of the pharmaceutical industry, visits by representatives of a pharmaceutical firm to a physician are known as details or detailing calls. Detailing is the major marketing instrument in the pharmaceutical industry (e.g. Dong, Manchanda and Chintagunta 2009).

explains the analytical methods used. The results of our analysis are provided in Section 4, where we provide empirical evidence for the presence of strategic and tactical reactions, present results on the strength of reactions for both action types, relate the reaction elasticities to the sales elasticities to assess whether reactions were justified and evaluate the impact of moderating variables on reaction strength. We discuss our findings in Section 5 and provide implications for managers in Section 6. Finally, Section 7 discusses the limitations of this study and directions for future research.

2. Research Background

We investigate the occurrence of reactions of a strategic or tactical attack initiated by an attacking brand on a defending brand. We only consider reactions using the same instrument (i.e. the sales force) as we do not observe other marketing activities aimed at the physicians, such as sampling, journal advertising, and symposium meetings. This is not a severe limitation however, as detailing accounts for 90% of marketing activity in Great Britain during this period (e.g. Janakiraman et al. 2008).

In addition to the occurrence of a reaction to an attack, we also consider factors that moderate the strength of the reaction if it occurs. Next, we discuss our expectations for the strength of reactions on attacks, and provide a rationale and expectations for the chosen moderating factors influencing variation in the strength of these reactions based on prior research in this area.

2.1 Strategic and Tactical Reactions to Sales Force Attacks

Prior research distinguishes strategic from tactical actions mainly based on the number and the timing of reactions that occur (Chen, Smith and Grimm 1992). As reactions to tactical actions are more easily implemented than reactions to strategic actions, their frequency is

higher and their implementation is faster (e.g. Ferrier 2001; Smith et al. 1991). However, these measures do not take into account the effectiveness of such reactions, which makes it impossible to evaluate their consequences. Furthermore, consequences of reactions could differ over the time period considered for evaluating the effects. We address both issues here by quantifying the strength of reactions using elasticities, allowing us to accurately evaluate their consequences by comparing their strengths, and by considering both short- and long-term effects, allowing us to differentiate between time horizons.

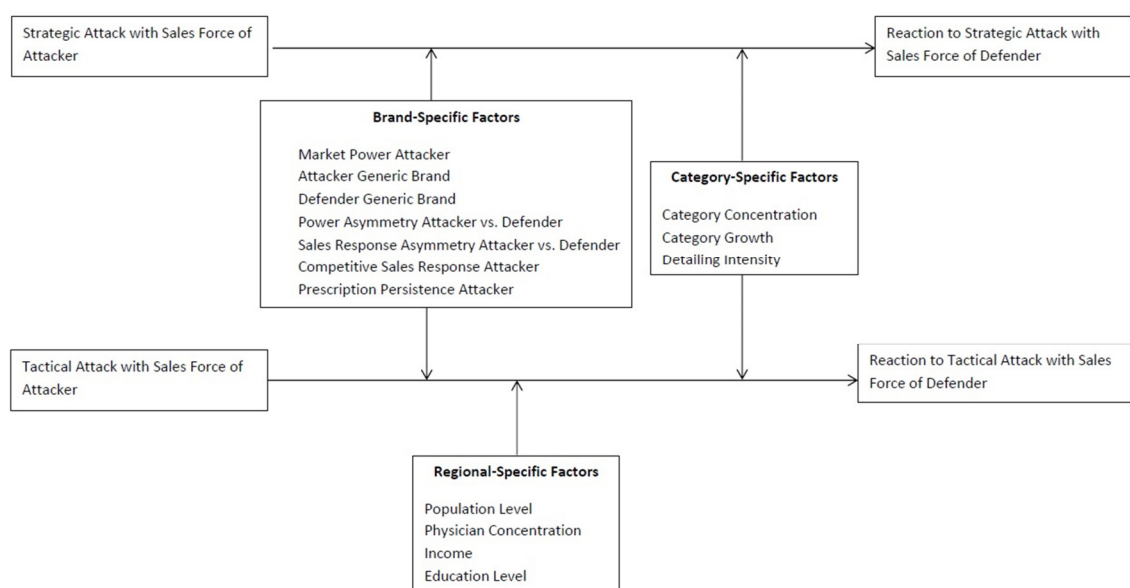
We expect that reactions to tactical actions have stronger short-term consequences, while reactions to strategic actions have stronger long-term consequences. As tactical actions seek to fine tune existing strategy, their implementation is quick and requires low levels of resources (Chen, Smith and Grimm 1992; Miller and Chen 1994; Smith et al. 1991). Thus, their short-term effect should be strong due to their ‘quick fix’ nature. However, their long-term effect is expected to be limited compared to strategic actions. Such strategic actions take longer to implement, but have a greater impact on a firm’s future path (Miller and Chen 1994). Therefore, we expect strategic decisions to have stronger long-term impact.

While we are interested in strategic and tactical actions that elicit competitive response, prior research on advertising and promotions suggests that the extent to which firms react to each other is limited and mostly a short-run phenomenon (e.g. Steenkamp et al. 2005). Not reacting seems to be the most common reaction, followed by retaliatory action (increasing marketing efforts) and then accommodating behavior (decreasing marketing efforts) (Leeflang and Wittink 1996; Nijs et al. 2001; Steenkamp et al. 2005). In this study we extend these findings to the field of personal selling.

2.2 Moderating Factors Influencing Reaction Strength

Next, we focus on factors that potentially influence the strength of reactions. In selecting these factors, we use prior research as a guide and select moderators relevant to our setting from this body of work (e.g. Nijs et al. 2001; Ramaswamy, Gatignon and Reibstein 1994; Steenkamp et al. 2005). Figure 1 provides an overview of these moderators, and their relation to strategic and tactical actions taken by firms. What encompasses these factors is that they relate to three concepts from the strategy literature that have been identified as drivers of firm actions: awareness, motivation and capability (AMC) (Chen et al. 1992; Chen 1996; Miller and Chen 1994). While awareness and motivation serve to describe the relations between competing firms, capability captures the strategic or resource endowments that translate these relations into actual actions (Chen 1996). We use the AMC framework when we develop expectations about the factors that moderate reaction strength, and use the framework to synthesize our findings afterwards. In addition, we divide the moderators into three groups: Brand-specific factors, category-specific factors and regional-specific factors. The latter group is only considered for the analysis of tactical actions (see Figure 1) due to the level at which we observe these actions

Figure 1: Conceptual Framework



2.2.1 Brand-Specific Factors

Market Power of Attacking Brand Market power reflects the strength of the presence a brand has in a category. Brands with significant market power often have higher budgets and a larger sales force, which makes actions initiated by them more noticeable to competitors. As awareness is a necessary condition for reactions to occur (Chen, Smith and Grimm 1992), we expect this factor to lead to stronger reactions. Additionally, the threat emanating from an attack initiated by a firm with strong market power is larger (Gatignon and Reibstein 1997), which motivates competitors to react more strongly (Dutton and Jackson 1987).

Power Asymmetry In line with the findings of Steenkamp et al. (2005), we posit that the intensity of reactions depends on the relative power difference between brands. In the setting of personal selling, this capability to react is largely determined by sales force size, as it dictates how many detailing calls can be made. If the attacking brand has a sales force that is much larger than the defending brand, reactions are expected to be weakened due to lack of resources to do so (Gatignon and Reibstein 1997). Not only are weaker defenders likely to have smaller budgets (reflected in their sales force size) available to retaliate, but such defenders could also be faced with the fear of strong retaliation if they do react, making reactions less likely (e.g. Kumar, Scheer and Steenkamp 1998). Conversely, in the case that the difference between the attacking and defending brand is small, defenders are not faced by these constraints and we expect stronger reactions to occur.

Branded vs. Generic Drugs After patent expiration, lower-priced variants of branded drugs based on the same molecule are allowed to enter the market. These generic drugs rely on price as their main marketing instrument, and generally deploy less marketing effort before and

after their introduction to the market² (Osinga, Leeﬂang and Wieringa 2011). Given this limited attention to marketing using detailing, we expect generic brands to react less to attacks of branded manufacturers due to limited motivation to react. Similarly, as manufacturers of branded drugs tend to cater to a price-insensitive market segment (e.g. Berndt, Kyle and Ling 2003), we expect these manufacturers to react less to attacks initiated by generic manufacturers. Instead, we expect that they will focus on competition with other branded manufacturers, as they serve the same market segment and thus have the motivation to react.

Sales Response Asymmetry The decision which physicians to detail is not made randomly, but depends (amongst other things) on the response of physicians to (past) detailing efforts (Zoltners and Sinha 2005). Firms often have knowledge about the effectiveness of their own marketing (e.g. Dong, Manchanda and Chintagunta 2009; Manchanda, Rossi and Chintagunta 2004; Montoya, Netzer and Jedidi 2010; Zoltners and Sinha 2005), and in some cases also about competitive marketing effectiveness (e.g. Dong, Manchanda and Chintagunta 2009). We expect that if the attacker's marketing effectiveness is greater than the defender's, then defending brands will be less prone to react, as such marketing is likely to be spoiled arms (Leeﬂang and Wittink 1996). Similarly, when this pattern is reversed, the defending brand can use its own marketing efforts effectively to counter competitive moves made by the attacker. We thus expect the overall moderating effect to be negative.

Information about sales response is only incorporated at the level of strategic decisions and not at the level of tactical decisions (Dong, Manchanda and Chintagunta 2009), due to the data requirements and modeling involved in such decisions (Zoltners and Sinha 2005). Prior research therefore suggests that sales response asymmetry only affects strategic actions.

² This does not mean that generic brands do not use detailing at all. In our data, we observe sufficient details for generic brands to be able to apply time-series methods. However, the number of details tends to be much lower than for branded variants.

Competitive Sales Response Attacker In addition to differences in own sales response, the cross-sales response can also differ by brand (e.g. Dong, Manchanda and Chintagunta 2009). This means that some brands are more receptive to competitive attacks than other brands. When an attacking brand induces a high competitive sales response, we expect this attack to lead to stronger reactions from the defending brand due to the increased effectiveness of such actions (Fischer and Albers 2010), motivating responses. This way, defending brands can attenuate the attack. Conversely, when the attacking brand's sales are not strongly affected by competitive detailing actions, reactions from the defending brand will be lower due to limited motivation to react. In line with the reasoning above we expect this situation to apply to strategic actions, not to tactical actions.

Prescription Persistence Attacker In addition to information received from detailing calls, physicians also utilize their own experiences when writing prescriptions (e.g. Camacho, Donkers and Stremersch 2011; Ching and Ishihara 2012). Repeat prescriptions of the same drug can lead to habit formation, which is also known as inertia, loyalty or persistence (Janakiraman et al. 2008). If physicians show persistence towards a certain brand, they are not affected by competitive detailing (Janakiraman et al. 2008). For a defending brand, reacting to a competitive attack from a brand whose customer base shows a high degree of persistence would not increase sales, as the physicians (in this customer base) do not readily switch their prescribing behavior under the influence of detailing. Hence, one line of reasoning would say that reactions are less strong when the customer base of the attacking brand has a high degree of persistence, because defending brands would want to avoid spoiled arms (Leeftang and Wittink 1996). On the other hand, a substantial threat could emerge when a brand that is successful in building a customer base of persistent physicians initiates an attack. In order to avoid loss of sales, defending brands would be motivated to react strongly. Thus, reactions

could also be stronger when physicians in the attacker's customer base show strong persistence. We leave this issue open, to be answered empirically. In line with prior reasoning, we expect this situation to apply to strategic actions only, and not to tactical actions.

2.2.2 Category-Specific Factors

Category Concentration Economic theory suggests that the larger the number of firms active in a category, the lower are prices and margins. In categories with few competing firms, margins are higher and price competition is less likely (Ramaswamy, Gatignon and Reibstein 1994), and instead firms switch to non-price competition such as advertising (Lipczynski and Wilson 2001). We therefore expect that in high concentration categories (fewer firms), firms will retaliate strongly using their salesforce. Conversely, reactions using the sales force are expected to be weaker in categories with more active firms (lower concentration categories).

Category Growth In the literature there is mixed evidence, both theoretically and empirically, about the effects of category (market) growth on competitive reactions. On the one hand, in categories with little growth, competitive actions quickly lead to a zero-sum game, motivating and intensifying competitive reactions by the defender to avoid loss of sales (Aaker and Day 1986; Smith et al. 1992). On the other hand, high category growth can indicate future profits, motivating firms in these categories to invest extra and react more strongly to preserve their position (Gatignon, Weitz and Bansal 1990). This mixed evidence is also present empirically, with Ramaswamy, Gatignon and Reibstein (1994) finding stronger competitive reactions using the sales force in high growth markets, while competitive reactions using price promotions and advertising appear to be weaker in high growth markets (Ramaswamy, Gatignon and Reibstein 1994; Steenkamp et al. 2005). Given this mixed

evidence, we do not form a-priori expectations about the direction of the effect of category growth, for both strategic and tactical reactions.

Detailing Intensity Similar to advertising and price-promotion intensity (Nijs et al. 2001; Steenkamp et al. 2005), we consider detailing intensity as a variable that moderates reaction strength. Economic theory proposes that the greater the sensitivity of demand to advertising, the greater the effectiveness of advertising is and the greater should be the advertising budget (Dorfman and Steiner 1954; Leeflang et al. 2000). We expect that a similar relationship applies to the sales force resource, and that in categories where the elasticity of detailing is higher, the intensity of detailing will also be higher. In turn, given the higher effectiveness of detailing in these categories, competitive reactions with sales force will also be stronger. In addition, if some firms are successful in using detailing, other firms might be motivated to follow and thus strategies converge (Saunders et al. 2000), strengthening and possibly even escalating competitive reactions (Metwally 1978). However, we expect that this effect will only be present for strategic actions. The allocation of budgets to marketing instruments is a decision taken by higher management when deciding on the overall strategy. Once the decision to use a sales force has been taken, all junior managers can do is operate within the boundaries of this decision.

2.2.3 Regional-Specific Factors

Physician Concentration For sales people active in areas where physicians are located close to each other, it is easier to visit multiple physicians than when these physicians are located further away from each other (Dong, Janakiraman and Xie 2014). As this holds for sales people from the attacking and defending brand, frequent interactions between sales people take place and knowledge about competitors' activity is observed, increasing awareness of

competitor's efforts. As a consequence, we expect that stronger tactical reactions will occur in these areas, because junior managers will respond to increased competitive activity in order to achieve their own sales goals, and avoid loss of sales to competitors.

Population Level In areas with a higher population level the potential market size is higher. Therefore, increased sales in such areas are easier to achieve compared to areas with lower population levels. As such high population areas are more attractive for firms from a sales point-of-view as it is easier to achieve a good return-on-investment, we expect that firms in these areas are more motivated to compete and competition is fiercer, and therefore reactions to competitive attacks will be stronger. In addition, sales goals for these areas might be set higher to reflect the ease with which sales can be generated, which leads to an additional motivator for junior managers to do well compared to their peers in other areas, strengthening their reactions to competitive attacks.

Income and Education Level The sales potential of a market can be categorized by the underlying patient base that demands a certain drug. In markets with higher potential, managers and sales people are likely to realize the importance of a market to a firm. In turn, competitive intensity in such markets is likely to increase, and reactions to competitive attacks will be stronger. Because health status is difficult to measure, we use income and education level as proxies for health status (e.g. Geronimus and Bound 1998). We expect higher levels of income and education to relate to a better health status, thus reducing demand for drugs and therefore lowering competitive reactions due to reduced motivations compared to markets where the demand for drugs is higher.

An overview of our expectations can be found later on in Table 7. We expect the absence of some effects due to the unavailability of information to decision makers (e.g. sales

response information for tactical moves) or due to the inability to measure the variables at the desired level (i.e. regional factors). Furthermore, due to mixed evidence from the literature, we do not formulate expectations for all moderators, but leave them as empirical questions

3. Data and Methodology

3.1 Data

We obtain our results using a unique single-source panel data set of 1502 representative British physicians covering the years 1987-2006. Over this period, these physicians recorded all the new prescriptions³ they wrote as well as the detailing visits by pharmaceutical companies they received on a daily basis. We thus have a complete view of the sales and personal selling activity by all brands active in the category.

The 14 molecules on which we focus cover three therapeutic classes, namely hypertension (9), stomach ulcers (3) and analgesics (2). For these therapeutic classes, the different drugs marketed using the same molecule are substitutable, but substitution between categories is not possible. This is a unique feature of the dataset which derives from firms agreeing to co-market a molecule to share marketing costs⁴ (see Ching and Ishihara 2012 for a prior application). In Appendix A we provide more detail on these drugs used in the analysis. In addition to the branded variants, a generic is also present. The advantage of the co-marketing setting is that we control for differences in drug efficacy which can influence the prescription rate of drugs. If one drug is more efficacious than another, the prescription rate for this drug will increase due to other factors than

³ These are actual prescription decisions, as repeat prescriptions have been excluded from the dataset.

⁴ Being in a co-marketing agreement does not mean that the firms do not compete with each other, which would go against anti-trust laws. In the data this is confirmed in two ways. First, most physicians are visited by representatives from multiple manufacturers, and all manufacturers are active in all regions of Great Britain. Thus, we do not find evidence for market division in our data. Second, we observe a substantial amount of brand switches within each category despite the molecules being the same. Such switches seem to point to detailing effects, which are positive on average (Kremer et al. 2008). Hence, brands are actively and successfully trying to influence physicians to change their prescription behavior.

detailing activity. Given the impossibility of accurately measuring efficacy of different drugs due to side effects, tolerance dosage etc., controlling for efficacy allows us to study competitive reactions driven by sales force attacks in isolation.

For our analyses, we aggregate the prescription and detailing data to the quarterly level, as this is the level on which decision making takes place (Dong, Manchanda and Chintagunta 2009). We obtain two sets of time series by aggregating across physicians in two ways: one set at the brand level reflecting strategic actions, and one set at the brand-regional level reflecting tactical actions. The regions used are based on the locations of the physicians recorded in the data set and correspond to the eleven NUTS-1 regions for Great-Britain (Eurostat 2014). This way, we can enrich our data with statistics from Eurostat and the National Health Service (NHS) to obtain regional characteristics. While these regions may not correspond exactly to the sales regions used by individual firms, they are disaggregate enough to capture differences in regional characteristics (population size, ethnicity, urbanization, number of physicians, sales force size etc.) to reflect differences normally encountered in such regions (e.g. Dong, Janakiraman and Xie 2014; Stremersch, Landsman and Venkataraman 2013; Zoltners and Sinha 2005).

3.2 Obtaining Reaction and Sales Elasticities

Our analysis continues in two stages. In the first stage, we apply structural vector autoregressive models with exogenous variables (SVARX) in combination with impulse response analysis to the sales and detailing time series to obtain the short- and long-term reaction elasticities characterizing the strength of competitive reactions, and their associated own- and cross-sales impact. We perform this analysis twice for each drug, at the brand level and at the brand-regional level for each region. In the second stage, we

regress the estimated reaction elasticities on our set of moderating variables to explain differences in reaction strength for both types of strategies.

Instead of vector autoregressive models with exogenous variables (VARX) as used in prior studies (e.g. Nijs et al. 2001; Steenkamp et al. 2005), we rely on structural vector autoregressive models with exogenous variables (SVARX) . The reason for this lies in our objective to obtain elasticities using impulse response analysis applied to our estimated models. Wieringa and Horváth (2005) show that elasticities based on VAR models computed in these prior studies do not match with the formal definition of elasticities, and they provide an alternative approach to compute elasticities based on SVAR models, which we utilize here. More details on the method are provided in Appendix B.

In our SVARX specification, we follow previous work and analyze only two brands per molecule category simultaneously to avoid overparametrization (Nijs et al. 2001; Srinivasan et al. 2002; Steenkamp et al. 2005). That is, we specify a four-equation SVARX model with the log-transformed number of prescriptions (Rx) and the log-transformed number of detailing calls (Det) as endogenous variables for two brands i and j . We estimate the model for all possible combinations of i and j depending on the number of brands included in a molecule category in our data. In addition, we add a trend (t) and seasonal dummies (SD) as exogenous controls. Depending on unit root and cointegration tests, we specify the model in levels or first differences, and add a cointegration term if required. For identification purposes, we disallow immediate own effects for all endogenous variables. Furthermore, we disallow the immediate effects for the number of prescriptions on the competing number of detailing calls, as these feedback effects take time to materialize due to the decision making process. For the most common case in our analysis where the time series are level or trend stationary, the structural model becomes:

$$\begin{bmatrix} \ln Rx_{i,t} \\ \ln Det_{i,t} \\ \ln Rx_{j,t} \\ \ln Det_{j,t} \end{bmatrix} = \begin{bmatrix} \alpha_{0,Rx_i} + \sum_{s=2}^4 \alpha_{s,Rx_i} SD_s + \delta_{Rx_i} t \\ \alpha_{0,Det_i} + \sum_{s=2}^4 \alpha_{s,Det_i} SD_s + \delta_{Det_i} t \\ \alpha_{0,Rx_j} + \sum_{s=2}^4 \alpha_{s,Rx_j} SD_s + \delta_{Rx_j} t \\ \alpha_{0,Det_j} + \sum_{s=2}^4 \alpha_{s,Det_j} SD_s + \delta_{Det_j} t \end{bmatrix} + \begin{bmatrix} 0 & \gamma_{12} & \gamma_{13} & 0 \\ \gamma_{21} & 0 & \gamma_{23} & \gamma_{24} \\ \gamma_{31} & 0 & 0 & \gamma_{34} \\ \gamma_{41} & \gamma_{42} & \gamma_{43} & 0 \end{bmatrix} \begin{bmatrix} \ln Rx_{i,t} \\ \ln Det_{i,t} \\ \ln Rx_{j,t} \\ \ln Det_{j,t} \end{bmatrix} + \sum_{k=1}^K \begin{bmatrix} \beta_{11}^k & \dots & \beta_{14}^k \\ \vdots & \ddots & \vdots \\ \beta_{41}^k & \dots & \beta_{44}^k \end{bmatrix} \begin{bmatrix} \ln Rx_{i,t-k} \\ \ln Det_{i,t-k} \\ \ln Rx_{j,t-k} \\ \ln Det_{j,t-k} \end{bmatrix} + \begin{bmatrix} \epsilon_{Rx_{i,t}} \\ \epsilon_{Det_{i,t}} \\ \epsilon_{Rx_{j,t}} \\ \epsilon_{Det_{j,t}} \end{bmatrix},$$

where $[\epsilon_{Rx_{i,t}} \ \epsilon_{Det_{i,t}} \ \epsilon_{Rx_{j,t}} \ \epsilon_{Det_{j,t}}]' \sim N(0, \Sigma)$. In case of level stationary series, the δ parameters become zero. In case of unit-root series, we replace the endogenous variables with their first difference, i.e. X_t becomes $\Delta X_t = X_t - X_{t-1}$, and we add an error correction term in case a cointegrating relation is found. We determine the lag length K by estimating the model for different lag lengths, and selecting the model with the lowest Bayesian Information Criterion (Schwarz 1978).

After model estimation, we derive impulse response functions (IRFs) to operationalize a competitive attack and trace its effects over time on the all the variables in the system (see e.g. Dekimpe and Hanssens (1999) for a technical overview of IRFs, and Wieringa and Horváth (2005) for a description of the specific procedure used here). Standard errors for these IRFs are derived based on a bootstrap procedure (see Srinivasan et al. 2004 for technical details). A competitive attack is operationalized as a one-unit shock to the attacking brand's detailing series, i.e. the attacker increases its sales force effort Det . Following the procedure in Appendix B, we obtain three types of elasticities. In particular, the effect of the competitive attack of brand i on the detailing variable Det_j of brand j characterizes the *reaction elasticity*: the extent to which the defending brand reacts by

adjusting its own sales force effort Det_j . Furthermore, the effect of this attack on Rx_j , the number of prescriptions of brand j , characterizes the *cross-sales elasticity*, while the effect of the attack on Rx_i , the number of prescriptions of brand i , is referred to as the *own-sales elasticity*. These elasticities summarize the average reaction of brand j to competitive attacks by brand i , and also provide the average sales effects of such an attack. Hence, we do not analyze actual individual attacks and their reaction as was done in previous work (e.g. Chen, Smith and Grimm 1992; Miller and Chen 1994; Smith et al. 1991), but study the average effects of these competitive attacks over the entire time frame covered by the model.

We summarize the IRFs in line with previous work (e.g. Nijs et al. 2001; Steenkamp et al. 2005) into two statistics: the net effect over a dust-settling period, capturing the short-term effect, and the convergence value, capturing the long-term effect. The dust-settling period is defined as the time until four consecutive periods for which the IRF does not differ from the convergence value. The short-term effect is then defined as the total effect over the dust-settling period. In the case of stationary time-series, the convergence value is zero, while in the case of non-stationary time-series this value is non-zero. These two summary statistics helps us quantify the short- and long-term consequences of reactions to strategic and tactical actions, and their associated impact on own- and competing-sales gives us insight on the firm performance implications and justifiability of competitive reactions. Finally, to investigate what determines differences in reaction strength, we use the reaction elasticities obtained from the IRFs in a second-stage analysis.

3.3 Determining Differences Between Strategic and Tactical Reaction Strength

To explain the differences in reaction strength between strategic and tactical reactions, we link the reaction elasticities to our set of moderating variables defined before. This yields

four models: two models categorizing the differences in reaction strength between short-term and long-term effects for strategic reactions, and two models categorizing the short-term and long-term effects for tactical reactions. The dependent variables in these models are the short- and long-term reaction elasticities obtained from IRFs. We link these dependent variables to the moderators using weighted least squares regression, because our dependent variables are estimated quantities (see Saxonhouse 1976 for a justification hereof, and e.g. Frison et al. 2014; Nijs et al. 2001; Steenkamp et al. 2005 for applications in marketing). As weights we use the inverse standard error of the dependent variable. We operationalize our moderating variables in accordance with prior studies; see Table C1 in Appendix C for an overview. We compute the brand-specific factors at the brand level for the analysis of strategic reactions, and at the brand-regional level for the analysis of tactical reactions.

4. Results

Before presenting our results in detail, we first provide empirical evidence supporting the existence of strategic and tactical actions in our data. Next, we discuss our findings for each type of reactions observed (no reaction, retaliation or accommodation), and their associated strength, for both action types. We then discuss the sales impact of these reactions, and whether these reactions were justified or not from a firm performance point of view. Finally, we discuss the drivers of differences in reaction strength for both reaction types.

4.1 Existence of Strategic and Tactical Reactions

Besides the differences in terms of decision maker depending on the firm level investigated (brand vs. brand-regional) outlined before, based on prior research we can

derive some other conditions that set apart strategic from tactical actions. First, as strategic actions require more effort to implement and their effectiveness remains uncertain for a longer period of time (Wernerfelt and Karnani, 1987), the responses to strategic actions will be slower compared to tactical actions (Chen, Smith and Grimm 1992). The implementation lag is reflected in the number of lags we require to accurately fit a SVARX model. For strategic actions, the average number of lags is significantly higher than for tactical actions (2.20 vs. 1.64, $p = .09$) In addition, based on a high frequency spectral analysis⁵, we find that cycles for strategic actions are on average longer than those for tactical actions (2.90 vs. 2.69, $p = .07$). Both these findings are in line with prior research suggesting that strategic actions take longer to implement, and our data reflect this assertion.

Second, prior research also suggested that strategic actions should provoke fewer responses than tactical actions, because responding to strategic actions takes more time and requires more effort (Chen, Smith and Grimm 1992). In our case, the absolute number of responses to tactical actions is higher by construction (816 elasticities vs. 94 elasticities). On the other hand we find that a larger proportion of strategic actions (than tactical actions) have a significant impact (0.39 vs 0.24, $p < .01$). Given the more influential nature of strategic actions on firm direction (Miller and Chen 1994), this increased impact provides validity to the distinction we make here. Furthermore, this illustrates that considering the strength of reactions as done in this study instead of the absolute number of reactions provides a different view than that provided by prior studies, and thus adds to our understanding of competitive interactions.

4.2 Nature and Strength of Strategic and Tactical Actions

⁵ See Harvey (1975) for technical details and Bronnenberg, Mela and Boulding (2006) for an application in marketing.

Based on the results of the SVARX and IRF analysis, we classify reactions as retaliatory (positive, significant elasticities), accommodating (negative, significant elasticities) or no reaction (non-significant elasticities). We present the results of this classification for both short- and long-term reactions in Table 2. In line with prior studies (Nijs et al. 2001; Steenkamp et al. 2005), we find that for the short-run effects, no reaction is the most prominent behavior observed for both strategic (60.6%) and tactical (75.7%) actions. When a reaction takes place, retaliation is the most common action (39.4% and 15.2% respectively). Additionally, we find that accommodation does not take place for strategic actions. This can be interpreted, as accommodation at the firm level would imply category withdrawal, which we do not observe in our data. When we consider the strength of reactions, we find that retaliatory strategic actions have stronger short-term effects than tactical actions (1.89 vs 1.17, $p < .01$).

For the long-run effects we find that no reaction is most observed for both strategic (98.9%) and tactical (97.9%) actions. Again only retaliatory actions are observed for strategic actions; no accommodation occurs. For tactical actions both retaliation and accommodation take place, but only to a limited extent. In terms of reaction strength, strategic actions have stronger long-term effects than tactical actions (3.30 vs 2.56⁶).

Combined with our previous findings for the short-term effects, this suggests that strategic actions provoke stronger reactions on the short- *and* the long-run compared to tactical actions. This contrasts with our prior expectations, where we expected strategic actions to have stronger long-term effects, while tactical actions would have stronger short-term effects. As an explanation for this finding, we offer the following: Given the higher resource cost and associated commitment strategic actions signal (Chen, Smith and Grimm 1992; Miller and Chen 1994; Smith et al. 1991), they invoke stronger reactions

⁶ No significance test is performed here as we only observe one significant reaction elasticity for strategic actions

due to the increased threat emanating from them (Dutton and Jackson 1987). In contrast, because tactical actions have less far reaching consequences in general, reactions are weaker in these cases because the threat is smaller. Hence, it is the type of action and its potential consequences instead of its time horizon that motivates reactions. In addition, higher uncertainty or risk averseness of junior management can also explain why we find that tactical actions evoke weaker reactions, as junior managers do not want to risk unjustified actions (e.g. Basu et al. 1985; Lal and Staelin 1986; Wernerfelt and Karnani 1987).

Table 2 Size and Percentage of Significant Reaction Elasticities for Strategic Actions (Top Panel) and Tactical Actions (Lower Panel)

Size (Percentage) of Significant Reaction Elasticities for Strategic Actions			
	Not significant*	Retaliation	Accomodation
Short-run	NA (60.6 %)	1.89 (39.4 %)	NA (0.0 %)
Long-run	NA (98.9 %)	3.30 (1.1 %)	NA (0.0 %)
Size (Percentage) of Significant Reaction Elasticities for Tactical Actions			
Short-run	NA (75.7%)	1.17 (15.2 %)	-1.16 (9.1 %)
Long-run	NA (97.9%)	2.56 (1.1 %)	-3.47 (1.0 %)

*Elasticities are classified based on the sign and significance of the estimates

4.3 The Performance Implications of Strategic and Tactical Reactions

Having quantified the strength of reactions, we next discuss the performance implications of both action types. We are mainly concerned with the justifiability of an action, as this determines whether the actions should have been taken in the first place or not.

Consistently making wrong decisions can have severe consequences, especially in the case of strategic actions that are difficult to reverse. Due to the limited number of significant long-term effects found previously, we only focus on short-term effects here.

We first consider the case of no reaction in Table 3. We find that not reacting for both strategic and tactical actions is usually the correct action, as the most common occurrence is the absence of a significant cross-sales effect - 32 out of 57 cases, or 56%, for strategic actions and 506 out of 617 cases, or 82%, for tactical actions. In addition, positive cross-sales effects are present for the remaining 25 (44%) strategic actions and for 74 (12%) of the tactical actions. Negative-cross sales effects are absent for strategic actions, and occur only in 37 (6%) of the tactical actions. Not reacting to competitive moves hence is a justified decision in the vast majority of the cases, either because sales are unaffected or because sales are actually gained despite not reacting. Only in a small amount of cases for tactical actions do we find harmful negative cross-sales effects when not reacting. Risk aversion of junior managers (e.g. Basu et al. 1985; Lal and Staelin 1986; Wernerfelt and Karnani 1987) can play a role in these latter cases, where the fear of taking an unjustified action leads to (unjustified) absence of actions.

Table 3 Performance Implications of Not Reacting

	Strategic Actions (n = 57 out of 94)	Tactical Actions (n = 617 out of 816)
Positive cross-sales effect	25	74
No significant cross-sales effect	32	506
Negative cross-sales effect	0	37

Next, we consider the consequences of retaliatory behavior, i.e. increasing sales force effort in response to increased competitive sales force effort. Table 4 summarizes our findings. We find that justified retaliation (i.e. with positive own-sales elasticity) occurs more frequently for strategic actions (37 out of 37 cases, 100%) than for tactical actions (72 out of 126 cases, 57%). Given the higher risks involved with strategic actions, this is a reassuring finding. In addition, for all these strategic actions the cross-sales elasticity is also non-negative. This implies that the retaliation is highly effective in all the cases

considered, and is strong enough to counter the sales loss as indicated by the positive sum of own- and cross-sales elasticities.

For tactical actions, 43% (54) of the actions are spoiled arms (Leeflang and Wittink 1996) due to the negative own-sales elasticity. While the costs of failure are relatively low in this case, the repeated use of ineffective actions can still add up and lead to a sizeable waste of resources. We thus find evidence here that for a substantial amount of actions taken by junior management the decision taken is not optimal given the circumstances. Our findings are more optimistic if we consider the cases where the own-sales elasticity is positive. In 69% (50) of these cases the reaction is also strong enough to counter the attack as reflected through a non-negative sum of own- and cross-sales elasticity.

Table 4 Performance Implications of Retaliation

	Strategic Actions (n = 37 out of 94)	Tactical Actions (n = 126 out of 816)
Own Elasticity Defender > 0	37	72
Cross-elasticity < 0	0	28
Cross-elasticity ≥ 0	37	44
Own + Cross-elasticity < 0	0	22
Own + Cross-elasticity ≥ 0	37	50
Own Elasticity Defender ≤ 0	0	54

Finally, we discuss the consequences of accommodating behavior, i.e. reducing sales force effort in response to increased competitive sales force effort. Such an action is warranted in the face of a non-positive sales impact of own sales force effort. Our findings are presented in Table 5. As noted before, we do not observe any accommodation behavior for strategic actions. For tactical actions we find that accommodation occurs in 9% (73) of the total cases. In 43 out of these 73 cases, or 59%, accommodation is not warranted as the own sales elasticity is positive. However, the sum of own- and cross-sales elasticity is non-negative in 25 out of these 43 cases (58%), indicating that a sales

loss is mitigated. In these cases, a brand profits from market expansion due to increased competitive detailing efforts (e.g. Fischer and Albers 2010). While not directly harmful to sales, the firm does miss out on an opportunity to create a competitive advantage by using an effective marketing instrument in these cases (Porter 1980). Therefore, a more sound response from a sales maximizing point-of-view – which junior managers have given their sales objectives (e.g. Zoltners, Sinha and Lorimer 2012) – would have been possible.

Table 5 Performance Implications of Accommodation

	Strategic Actions (n = 0 out of 94)	Tactical Actions (n = 73 out of 816)
Own Elasticity Defender > 0	NA	43
Cross-elasticity < 0	NA	8
Cross-elasticity ≥ 0	NA	35
Own + Cross-elasticity < 0	NA	18
Own + Cross-elasticity ≥ 0	NA	25
Own Elasticity Defender ≤ 0	NA	30

4.4 Moderators of Reaction Strength of Strategic and Tactical Actions

Having assessed the performance impact of both action types, we conclude with an investigation of factors that influence the strength of competitive reactions. Knowledge hereof can assist managers in determining what types of reactions to expect from certain competitors, and help them improve their strategic and tactical planning. We present the results for the short-term effects in Table 6. As the number of insignificant long-term reactions was large, there were no significant moderating relations, and we only focus on the differences in reaction strength on the short-run. Furthermore, for effects where we expected directional effects, we report one-sided tests. A comparison between our expectations and our findings can be found in Table 7.

First, we consider moderating effects affecting the strength of reactions to strategic actions. We find that the larger the market power of the attacking brand, the stronger the

reaction by the defender becomes ($b = 4.442, p < .01$). Hence, in line with our expectations, if a brand with a strong market presence increases its detailing effort, the visibility of such an action coupled with an increased threat will attract stronger responses by competing brands. In contrast with our expectations, we find that a larger difference in power asymmetry also increases competitive strategic reactions ($b = 0.058, p < .01$). An explanation could be that firms with larger sales forces also attract more attention when making a competitive move, or that firms feel compelled to react given the threat posed by those with larger sales forces (Dutton and Jackson 1987). An alternative explanation could be leader-follower behavior by the defending firm, where the follower with a more limited sales force/budget relies on signals of the leader to determine when to increase marketing efforts in a certain category. When the attacking brand is a generic, reactions by competitors are weaker ($b = -3.824, p < .01$). Similarly, when the defending brand is a generic, reactions are also weaker ($b = -1.001, p < .01$). Hence, most competitive activity takes place between manufacturers of branded drugs that compete for the same type of physician, and branded manufacturers react less strongly to generic manufactures and vice versa due to their different positioning within the market, which is in line with our expectations.

Larger differences in own sales response lead to reactions that are weaker ($b = -0.071, p < 0.10$), which is in line with our expectations. If the detailing of the attacking firm is more effective than that of the defending firm, the defending firm will react less strongly as such an action would be ineffective. Conversely, when the defending firm's detailing is more effective than that of the attacking firm, it will react more strongly to competitive attacks. In contrast, differences in competitive sales response and the average physician persistence of the attacking brand do no lead to significant differences in reaction strength. At the category level, and in line with our expectations we find that weaker reactions occur in categories with more competing firms ($b = -0.886, p < .05$). The diminished motivation to react using sales

forces in the presence of more firms is the reason for these weaker reactions. Finally, for category growth and detailing intensity we do not find any significant effects.

Next, we consider differences in reaction strength for tactical actions. Market power does not lead to an increased response in this case as expected, nor does power asymmetry influence reaction strength for tactical actions. In contrast with our expectations and with our findings for strategic actions, we find that tactical actions are stronger when the attacking brand is a generic brand ($b = 0.748, p < .10$) or when the defending brand is a generic brand ($b = 0.396, p < .10$). These results suggest that as junior managers have sales objectives to meet, they react strongly to any threat to these objectives. This includes attacks from generics, which could be perceived as more threatening due to their price positioning. Similarly, those managing generics try to achieve their own sales goals as well and react strongly to all other competitors.

Table 6 Effects of Moderating Variables on Strategic and Tactical Reaction Strength for Short-Term Reactions

Moderator	Strategic Actions		Tactical Actions	
	Parameter	<i>t</i> -value	Parameter	<i>t</i> -value
Market Power Attacker	4.442 ^a	6.852	-0.609	-0.979
Power Asymmetry	0.058 ^a	5.126	0.026	0.797
Attacker Generic	-3.824 ^a	-9.285	0.748 ^d	1.606
Defender Generic	-1.001 ^a	-3.762	0.396 ^c	1.849
Sales Response Asymmetry	-0.071 ^c	-1.867	0.002 ^c	1.880
Competitive Sales Response Attacker	0.099	1.258	-0.0005	-0.461
Physician Persistence Attacker	0.008	0.095	0.002	0.612
Category Concentration	-0.886 ^b	-3.411	0.572 ^a	3.081
Category Growth	8.725	1.055	0.406 ^a	7.193
Detailing Intensity	-0.293	-0.659	-0.109	-0.436
Physician Concentration			3.169 ^b	1.981
Population Level			0.0002 ^d	1.560
Income			0.00003	0.668
Education Level			-2.313 ^a	-3.785
Intercept	5.646 ^a	4.980	2.116 ^d	1.547

^a = $p < 0.01$ (two-sided) ^c = $p < 0.10$ (two-sided)

^b = $p < 0.05$ (two-sided) ^d = $p < 0.10$ (one-sided)

We find that larger differences in response to detailing lead to stronger reactions ($b = 0.002, p < .10$). This contrasts with our expectations, where we expected no effect, and our finding for strategic actions, where we found a negative effect. An explanation for not finding a null effect could be that junior management – through interactions with the sales force – is able to infer response to detailing based on whether physicians are willing to receive sales calls of the focal firm compared to other firms. If other firms are better able to make sales calls, their sales response could be inferred to be higher. The positive effect we find can be explained by the sales objectives which junior managers have. In an effort to achieve these objectives and despite the reduced inferred efficiency of more sales calls, they increase their effort in order to try and offset potential sales losses. In contrast, we find that the competitive sales response of the attacker and prescription persistence do not lead to differences in reaction strength.

In less concentrated categories tactical reactions are stronger ($b = 0.572, p < .01$). In categories where more firms are active, junior managers face increased competition to reach their own sales objectives. Hence, they react more strongly to competitive moves in order to maintain a sufficient share of category sales (Armstrong and Collopy 1996). Category growth also leads to more aggressive tactical reactions ($b = 0.406, p < 0.01$), in line with the findings of Ramaswamy, Gatignon and Reibstein (1994). They attribute this to the heavy investments firms make in growing markets to secure future profits. For tactical actions specifically, an explanation for this finding could be the use of market share (i.e. sales objectives relative to competitors) as a performance metric for junior management (Armstrong and Collopy 1996). In growing markets, retaining market share requires increasing marketing effort to maintain share-of-voice, and thus we observe stronger reactions in this case (e.g. Metwally 1978). Detailing intensity does not affect the strength of reactions, in line with expectation that the decision which marketing instrument to use is a strategic decision and not a tactical decision.

Reactions to tactical actions are stronger in areas with a higher concentration of physicians ($b = 3.169, p < .05$), confirming our expectation that frequent interactions between rival firms increase competitive responses. In areas with a higher population level reactions are also stronger ($b = 0.00002, p < .10$), confirming our expectation that firms prioritize these areas. Finally, we find that for the determinants of health status, only education level, affects the intensity of competitive reactions, in a negative way ($b = -2.313, p < 0.01$). In line with our expectations, in areas where this determinant of health status is larger, firms expect fewer sales to be generated due to the better health status of inhabitants, and therefore focus their efforts on areas with more sales potential, reducing competitive reactions.

Table 7 Comparison of Findings with Expectations

	Strategic Actions		Tactical Actions	
	Expected Sign	Observed Sign	Expected Sign	Observed Sign
<i>Brand Specific Factors:</i>				
Market Power Attacking Brand	+	+	+	n.s.
Power Asymmetry	-	+	-	n.s.
Attacker Generic Brand	-	-	-	+
Defender Generic Brand	-	-	-	+
Sales Response Asymmetry	-	-	0	+
Competitive Sales Response Attacker	+	n.s.	0	n.s.
Prescription Persistence	?	n.s.	0	n.s.
<i>Category-Specific Factors:</i>				
Category Concentration	+	-	+	+
Category Growth	?	n.s.	?	+
Detailing Intensity	+	n.s.	0	n.s.
<i>Region-Specific Factors</i>				
Physician Concentration	NA	NA	+	+
Population Level	NA	NA	+	+
Income	NA	NA	-	n.s.
Education Level	NA	NA	-	-

Note: A + indicates that reactions are (expected to be) stronger, a - indicates that reactions are (expected to be) weaker, a 0 indicates that no effect is expected, a ? indicates that the direction of the effect is not specified a-priori, n.s. indicates that no significant effect was found, and NA indicates that the moderator is not measured for this action.

5. Discussion

Firms continuously engage in competitive interactions with other firms and this determines firm performance. To succeed in this competitive game, knowledge of the expected strength, direction and consequences of competitive reactions are required. In this article we examine the short- and long-term differences between two types of actions: Strategic actions and tactical actions. The former are actions implemented by higher management that determine the general strategy, require a large resource effort to implement and are difficult to reverse (Miller and Chen 1994; Smith et al. 1991). The latter are actions implemented by more junior managers that seek to fine-tune the general strategy, require less resource commitment and are more easily reversed (Smith et al. 1991). We empirically explore differences between these competitive actions in the setting of the pharmaceutical industry using the sales force as a marketing instrument. Using a unique, single-source panel dataset consisting of 1502 British physicians and covering twenty years of prescriptions and detailing data in combination with time-series methods (i.e. SVARX models) we quantify the short- and long-run strength and sales impact of both types of competitive actions, and provide insight on factors moderating reaction strength.

Our findings suggest that not reacting is the most common behavior in the short-run for both types of actions, while significant long-term reactions are almost completely absent. Both findings are in accordance with prior research on advertising and promotions (e.g. Leeflang and Wittink 1996; Steenkamp et al. 2005). When reactions are retaliatory in nature, we find that both in the short- and long-run, strategic actions tend to elicit stronger reactions than tactical actions. This is consistent with Dutton and Jackson (1987) who posit that the higher threat of strategic actions provokes stronger responses from competitors. In contrast, as tactical actions have less far-reaching consequences, their threat is lower and accordingly we find that the strength of competitive responses is also lower.

Knowledge about the effectiveness of past actions can assist in decisions to implement new actions. If we consider the sales impact of strategic and tactical actions, we find that not reacting was a sound decision in all of the cases for strategic actions and in 94% of the cases for tactical actions. In the cases where a firm opts for retaliation in response to a strategic action, we find that warranted retaliatory behavior occurs in all of the cases, and the strength of the reaction is strong enough to offset the sales loss due to the competitive attack. However, we also find that 43% of the retaliatory tactical actions are spoiled arms (Leeflang and Wittink 1996), as they have a negative effect on own sales. Hence, while the decision to retaliate taken by higher management is always justified, this is not the case in almost half the cases for decisions taken by junior management.

Accommodating actions are absent for strategic actions. We attribute this to the fact that accommodation in this setting would be akin to category withdrawal, which we do not observe in our data. In 59% of the cases for tactical actions accommodation is unnecessary because the own-sales elasticity is positive. While in 58% of these cases the loss of sales is compensated by primary category growth due to competitive detailing (e.g. Fischer and Albers 2010), an opportunity to create competitive advantage is foregone and a more justified course of action would have been possible. In the next section we detail some remedies for this.

We also provide insights on when to expect stronger and weaker reactions in response to strategic and tactical actions. For strategic actions, we find that reactions by the defending firm are *stronger* when actions are more noticeable or threatening due to the attacker being a major player in the category (both in terms of market share and sales force size). Reactions to strategic actions are *weaker* when the attacking or defending brand is a generic, when the effectiveness of attacker's detailing is larger and when the category is less concentrated. Tactical actions are *stronger* when the attacking or defending brand is a generic, when the

difference in effectiveness of detailing is larger, when the category concentration is lower, when the category growth is higher, when there are more physicians in an area and when the population level in an area is higher. When the education level in an area is higher, reactions to tactical actions are *weaker*. These results illustrate that there are clear differences in the drivers of decision making between strategic and tactical actions. Strategic actions are driven by a mix of awareness, motivational and capability factors, while tactical actions are almost exclusively driven by motivational factors and do not take into account capabilities (Chen 1996). These different drivers lead to moderators showing opposite signs depending on the firm level investigated, i.e. strategic actions are weaker when the attacking or defending brand is a generic, when the difference in effectiveness of detailing is larger and when category concentration is lower, while tactical actions in these cases show stronger responses. While our findings for strategic actions largely agree with our expectations, the findings for tactical actions often run counter to expectations, and we observe stronger reactions even when this does not seem logical from a rational long-term firm performance perspective. We attribute these findings to the sales objectives that junior management tries to achieve, stimulating a short-term orientation (e.g. Zoltners, Sinha and Lorimer 2012). The implications hereof will be discussed in the next section.

6. Managerial Implications

Our study highlights the presence of strong reaction effects to competitive actions at different organizational levels. At the higher management level, given the importance of strategic actions for firms as indicated by the strong competitor responses we find, careful strategic planning is required to be successful in the competitive game. However, this planning is usually absent from manager's minds due to lack of competitor information and uncertainties when predicting behavior of competitors (Montgomery, Moore and Urbany 2005). Managers

can use the findings in this paper on factors influencing competitive reactions to obtain expectations of reactions given their market situation. In addition, model-based decision support tools can assist in the strategic planning process by making the effects of competition and its consequences explicit (e.g. Dong, Manchanda and Chintagunta 2009; Manchanda, Rossi and Chintagunta 2004; Montoya, Netzer and Jedidi 2010).

At the junior management level, we find that retaliatory and accommodating reactions to competing tactical actions are frequently unwarranted. To improve decision making, additional training and coaching of regional managers can be an effective tool (Armstrong and Collopy 1996; Zoltners, Sinha and Lorimer 2012). Expanding the information available upon which to base decisions could be another way to assist junior managers make better decisions (Leeftang and Wittink 1996). For example, firms could make the same decision support tools that higher management uses available across the firm (Zoltners, Sinha and Lorimer 2012). Our finding that the use of sales goals as incentive structure for junior managers can negatively influence the decision making process by stimulating a short-term orientation suggests that an alternative incentive structure might be required as well. Moving away from the outcome-based control system implied by setting sales objectives and moving towards a behavior-based control system that emphasizes the selling process instead of its outcomes can be an effective way to do so and improve sales force performance (Anderson & Oliver 1987; Cravens et al. 1993).

7. Limitations and Future Research

Our research has some limitations that could not be addressed within the scope of this study. First, our data are limited to 14 categories with 2-4 brands per category, while studies with comparable methodology (e.g. Frison et al. 2014; Nijs et al. 2001; Steenkamp et al. 2005; Van Heerde et al. 2013) relied on the data richness of scanner data in the consumer packaged

goods setting to obtain their results with a number of brands exceeding 200. Additionally, as data for other industries than the pharmaceutical industry was unavailable to us, we are unable to generalize our findings to other settings where personal selling is used, such as military recruiting and industrial and media selling (Albers, Mantrala and Shridhar 2010). Future research that expands our work using a larger sample over varying industries could provide more comprehensive generalizations of our findings.

Second, we only have data available on detailing activity by pharmaceutical firms. Other instruments such as sampling, journal advertising, symposium meetings and direct-to-consumer advertising⁷ have all been shown to affect prescriptions (e.g. Janakiraman et al. 2008; Osinga, Leeflang and Wieringa 2010; Stremersch, Landsman and Venkataraman 2013), and controlling for these additional instruments could influence our findings. However, given that detailing accounts for a large share of marketing activities in Great Britain in this period (90%, Janakiraman et al. 2008), the effects of this omission are likely to be small.

Third, we do not observe drug prices, which are a major differentiator between generic and branded drugs and can affect their prescription behavior. However, Gonzalez et al. (2008) show that only 17% of physicians switch their prescriptions to generic drugs due to price, and other studies suggest that physicians are not price sensitive (Leeflang and Wieringa 2010) and/or generally unaware of prices (Kolassa 1995). Additionally, in Great-Britain agreements between the National Health Service (NHS) and the pharmaceutical industry fix prices for most drugs, effectively eliminating most price competition between manufacturers (*National Health Service*, 2014).

Finally, we only focus on reactions within the same molecule category. However, pharmaceutical firms often have a portfolio of drugs that are simultaneously promoted (e.g. Zoltners and Sinha 2005). Increased competitive activity in one category could lead a firm to

⁷ We note that direct-to-consumer advertising (DTCA) is not allowed in Great-Britain, the market we study. However, it is allowed in the United States and New Zealand, and could therefore influence prescriptions and spending on other marketing instruments in these markets

shift focus to a different category, foregoing a reaction in the same category. Alternatively, retaliation could take place in a different category where the defending firm has a stronger presence. Within the scope of this study we are not able to investigate such multicategory competition as we do not observe the same firms competing in multiple categories in our dataset. However, given the strategic implications of such multicategory actions (e.g. Jayachandran, Gimeno and Varadarajan 1999; Yu and Cannella 2013), this seems a promising avenue for future research.

References

- Aaker DA, Day GS (1986) The Perils of High-Growth Markets. *Strategic Management Journal* 7(5): 409-421.
- Anderson, E, Oliver, RL (1987) Perspectives on Behavior-Based versus Outcome-Based Salesforce Control Systems. *Journal of Marketing* 51(4): 76-88.
- Ariño, MA, Franses PH (2000) Forecasting the Levels of Vector Autoregressive Log-transformed Time Series. *International Journal of Forecasting* 16:111-116.
- Armstrong JS, Collopy F (1996) Competitor Orientation: Effects of Objectives and Information on Managerial Decisions and Profitability. *Journal of Marketing Research* 33 (2): 188-199.
- Basu AK, Lal R, Srinivasan V, Staelin R (1985) Salesforce Compensation Plans: An Agency Theoretic Perspective. *Marketing Science* 4(4): 267-291.
- Berndt ER, Kyle M, Ling D (2003) The Long Shadow of Patent Expiration. Generic Entry and Rx-to-OTC Switches. Feenstra RC, Shapiro MD (eds.) *Scanner Data and Price Indexes*, University of Chicago Press: Chicago 229-274.
- Bronnenberg NJ, Mela CF, Boulding W (2006) The Periodicity of Pricing. *Journal of Marketing Research* 43(4): 477-493
- Camacho N, Donkers B, Stremersch S (2011) Predictably Non-Bayesian: Quantifying Salience Effects in Physician Learning About Drug Quality. *Marketing Science* 30(2): 305-320.
- Chen MJ, Smith KG, Grimm CM (1992) Action Characteristics as Predictors of Competitive Responses. *Management Science* 38(3): 439-455.
- Chen MJ (1996) Competitor Analysis and Interfirm Rivalry: Toward a Theoretical Integration. *Academy of Management Review*. 21(1): 100-134.

- Ching AT, Ishihara M (2012) Measuring the Informative and Persuasive Roles of Detailing on Prescribing Decisions. *Management Science* 58(7): 1374-1387
- Cravens, DW, Ingram TN, LaForge RW, Young CE (1993) Behavior-Based and Outcome-Based Salesforce Control Systems. *Journal of Marketing* 57(4): 47-59.
- Dekimpe MG, Hanssens DM (1999) Sustained Spending and Persistent Response: A New Look at Long Term Marketing Profitability. *Journal of Marketing Research* 36: 397-412.
- Dong X, Janakiramanan R, Xie Y (2014) The Effect of Survey Participation on Consumer Behavior: The Moderating Role of Marketing Communication. *Marketing Science* 33: 567-585.
- Dong X, Manchanda P, Chintagunta PK (2009) Quantifying the Benefits of Individual-Level Targeting in the Presence of Firm Strategic Behavior. *Journal of Marketing Research* 46: 207-221.
- Dorfman R, Steiner PO (1954) Optimal Advertising and Optimal Quality. *American Economic Review* 44: 826-836.
- Dutton JE, Jackson SE (1987) Categorizing Strategic Issues: Links to Organizational Action. *Academy of Management Review* 12(1): 76-90.
- Eurostat (2014) Nomenclature of Territorial Units for Statistics. Available at http://epp.eurostat.ec.europa.eu/portal/page/portal/nuts_nomenclature/introduction [Accessed July 30 2014].
- Ferrier, WJ (2001) Navigating the Competitive Landscape: The Drivers and Consequences of Competitive Aggressiveness. *Academy of Management Journal* 44: 858-877.
- Fischer M, Albers S (2010) Patient- or Physician-Oriented Marketing: What Drives Primary Demand for Prescription Drugs?. *Journal of Marketing Research* 47: 103-121.

- Frison S, Dekimpe MG, Croux C, De Maeyer P (2014) Billboard and Cinema Advertising: Missed Opportunity or Spoiled Arms?. *International Journal of Research in Marketing* 31(4): 425-433.
- Gatignon H, Weitz B, Bansal P (1990) Brand Introduction Strategies and Competitive Environments. *Journal of Marketing Research* 27(4): 390-401.
- Gatignon H, Reibstein DJ (1997) Creative Strategies for Responding to Competitive Actions. Day GS, Reibstein DJ (eds.) *Wharton on Dynamic Competitive Strategy*, Wiley: New York 237-255.
- Geronimus AT, Bound J (1998) Use of Census-based Aggregate Variables to Proxy for Socioeconomic Group: Evidence from National Samples. *American Journal of Epidemiology* 148(5): 475-486.
- Gonül FF, Carter F, Petrova E and Srinivasan K (2001) Promotion of Prescription Drugs and Its Impact on Physicians' Choice Behavior. *Journal of Marketing Research* 65(3): 79-90.
- Gonzalez J, Sismeiro C, Dutta S, Stern P (2008), Can Branded Drugs Benefit from Generic Entry? The Role of Detailing and Price in Switching to Non-Bioequivalent Molecules. *International Journal of Research in Marketing* 25(4): 247-260.
- Harvey AC (1975) Spectral Analysis in Economics. *Journal of the Royal Statistical Society Series D (The Statistician)* 24(1): 1-36.
- Janakiraman R, Dutta S, Sismeiro C, Stern P (2008) Physicians' Persistence and Its Implications for Their Response to Promotion of Prescription Drugs. *Management Science* 54(6) 1080-1093
- Jayachandran S, Gimeno J, Varadarajan PR (1999) The Theory of Multimarket Competition: A Synthesis and Implications for Marketing Strategy. *Journal of Marketing* 63: 49-65.

- Kolassa EM (1995), Physicians' Perceptions of Prescription Drug Prices: Their Accuracy and Effect on the Prescribing Decision. *Journal of Research in Pharmaceutical Economics*, 6(1): 23–37.
- Kremer STM, Bijmolt THA, Leeflang PSH, Wieringa JE (2008) Generalizations on the Effectiveness of Pharmaceutical Promotional Expenditures. *International Journal of Research in Marketing* 25: 234-246.
- Kumar N, Scheer LK, Steenkamp (1998) Interdependence, Punitive Capability, and Reciprocation of Punitive Actions in Channel Relationships. *Journal of Marketing Research* 35: 225-235.
- Lal R, Staelin R (1986) Salesforce Compensation Plans in Environments with Asymmetric Information. *Marketing Science* 5(3): 179-198.
- Leeflang PSH, Wieringa JE (2010), Modeling the Effects of Pharmaceutical Marketing. *Marketing Letters*, 21(2): 121–133.
- Leeflang PSH, Wittink DR (1992) Diagnosing Competitive Reactions Using (Aggregated) Scanner Data *International Journal of Research in Marketing* 9:39-57.
- Leeflang PSH, Wittink DR (1996) Competitive Reaction versus Consumer Response: Do Managers Overreact?. *International Journal of Research in Marketing*, 13: 103-119.
- Leeflang PSH, Wittink DR, Wedel M, Naert PA (2000) *Building Models for Marketing Decisions*. Kluwer Academic Publishers: Boston, MA.
- Leeflang PSH, Wittink DR (2001) Explaining Competitive Reaction Effects. *International Journal of Research in Marketing* 18: 119-137.
- Lipczynski J, Wilson J (2001) *Industrial Organization: An Analysis of Competitive Markets*. Pearson: Reading, MA.
- Manchanda P, Rossi PE, Chintagunta PK (2004) Response Modeling with Nonrandom Marketing-Mix Variables. *Journal of Marketing Research* 41: 467-478.

- Manchanda P, Xie Y, Youn N (2008) The Role of Targeted Communication and Contagion in Product Adoption. *Marketing Science* 27(6): 961-976.
- Metwally MM (1978) Escalation Tendencies of Advertising. *Oxford Bulletin of Economics and Statistics* 40(2): 153-163.
- Miller D, Chen MJ (1994) Sources and Consequences of Competitive Inertia: A Study of the U.S. Airline Industry. *Administrative Science Quarterly* 39(1): 1-23.
- Mizik N, Jacobson R (2004) Are Physicians “Easy Marks”? Quantifying the Effects of Detailing and Sampling on New Prescriptions. *Management Science* 50(12): 1704-1715.
- Montgomery DB, Moore MC, Urbany JE (2005) Reasoning about Competitive Reactions: Evidence from Executives. *Marketing Science* 24 (1): 138-149.
- Montoya R, Netzer O, Jedidi K (2010) Dynamic Allocation of Pharmaceutical Detailing and Sampling for Long-Term Profitability. *Marketing Science* 29 (5): 909-924.
- National Health Service (2014), Question and Answer Document for the NHS on the Pharmaceutical Price Regulation Scheme. Available at <http://www.england.nhs.uk/wp-content/uploads/2014/05/pharm-price-reg-qa.pdf> [Accessed December 4 2014]
- Nijs VR, Dekimpe MG, Steenkamp JBEM, Hanssens DM (2001) The Category-Demand Effect of Price Promotions. *Marketing Science* 20(1): 1-22.
- Osinga E, Leeflang PSH, Wieringa JE (2010) Early Marketing Matters: A Time-Varying Parameter Approach to Persistence Modeling. *Journal of Marketing Research* 47: 173-185.
- Osinga E, Leeflang PSH, Wieringa JE (2011) How Generic Drugs Affect Brands Before and After Entry. Working Paper.

- Porter ME (1980) *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. Free Press: New York.
- Ramaswamy V, Gatignon H, Reibstein DJ (1994) Competitive Marketing Behavior in Industrial Markets. *Journal of Marketing* 58: 45-55.
- Román, S, Munuera JS (2005) Determinants and Consequences of Ethical Behaviour: An Empirical Study of Salespeople. *European Journal of Marketing* 39(5-6): 473-495.
- Saunders J, Stern P, Wensley R, Forrester R (2000) In Search of the Lemmus Lemmus: An Investigation into Convergent Competition. *British Journal of Management* 11: S81-S95.
- Saxonhouse GR (1976) Estimated Parameters as Dependent Variables. *American Economic Review* 66(1): 178-183.
- Schwarz G (1978) Estimating the dimension of a model. *Annals of Statistics* 6(2):461-464.
- Smith KG, Grimm CM, Gannon MJ, Chen MJ (1991) Organizational Information Processing, Competitive Responses, and Performance in the U.S. Domestic Airline Industry. *Academy of Management Journal* 34(1): 60-85.
- Smith KG, Grimm CM, Gannon MJ (1992) *Dynamics of Competitive Strategy*. Sage: Newbury Park.
- Srinivasan S, Pauwels K, Hanssens DM, Dekimpe MG (2002) Do Promotions Benefit Manufacturers, Retailers or Both?. *Management Science* 50(5): 617-629.
- Stan Development Team (2014) Stan: A C++ Library for Probability and Sampling. Version 2.4. <http://mc-stan.org>.
- Steenkamp JBEM, Nijs VR, Hanssens DM, Dekimpe MG (2005) Competitive Reactions to Advertising and Promotion Attacks. *Marketing Science* 24(1): 35-54.

- Stremersch S, Landsman V, Venkataraman S (2013) The Relationship Between DTCA, Drug Requests, and Prescriptions: Uncovering Variation in Specialty and Space. *Marketing Science* 32(1): 89-110.
- Trusov, M, Bucklin RE, Pauwels K (2009) Effects of Word-of-Mouth Versus Traditional Marketing: Findings from an Internet Social Networking Site. *Journal of Marketing* 73: 90-102.
- Van Heerde, HJ (2005) The Proper Interpretation of Sales Promotion Effects: Supplement Elasticities with Absolute Sales Effects. *Applied Stochastic Models in Business and Industry* 21: 397-402.
- Van Heerde HJ, Gijzenberg MJ, Dekimpe MG, Steenkamp JBEM (2013) Price and Advertising Effectiveness over the Business Cycle. *Journal of Marketing Research* 50:177-193.
- Wernerfelt B, Karnani A (1987) Competitive Strategy Under Uncertainty. *Strategic Management Journal* 8: 187-194.
- Wieringa, JE, Horváth C (2005) Computing Level-impulse Responses of Log-specified VAR Systems. *International Journal of Forecasting* 21: 279-289.
- Yu T, Cannella AA (2013) A Comprehensive Review of Multimarket Competition Research. *Journal of Management* 39(1): 76-109.
- Zoltners AA, Sinha P (2005) Sales Territory Design: Thirty Years of Modeling and Implementation. *Marketing Science* 24(3): 313-331.
- Zoltners AA, Sinha P, Lorimer SE (2006) Match Your Sales Force Structure to Your Business Lifecycle. *Harvard Business Review* 84: 81-89.
- Zoltners AA, Sinha P, Lorimer SE (2008) Sales Force Effectiveness: A Framework for Researchers and Practitioners. *Journal of Personal Selling & Sales Management* 28(2): 115-131.

Zoltners, AA, Sinha P, Lorimer SE (2012) Breaking the Sales Force Incentive Addiction: A
Balanced Approach to Sales Force Effectiveness. *Journal of Personal Selling & Sales
Management* 32(2): 171-186.

Appendix A Detailed Overview of Categories

Table A1 Overview of Molecule Categories Included in the Study

Molecule	Drug Names	Therapeutic Class	Molecule Prescriptions	Molecule Detaling Calls
Amlodipine	Istin, Generic	Hypertension	17,114	7,209
Bisoprolol	Monacor, Emcor, Generic	Hypertension	4,084	3,372
Captopril	Acepril, Capoten, Generic	Hypertension	9,607	5,686
Cimetidine	Tagamet, Dyspamet, Galenamet, Generic	Stomach ulcers	31,096	3,123
Diltiazem	Tildiem, Caldicard, Adizem, Generic	Hypertension	6,763	3,123
Felodipine	Plendil, Generic	Hypertension	5,001	1,548
Indomethacin	Indocid, Flexin, Imbrilon, Generic	Analgesics	13,745	1,661
Isosorbide	Coronitro, Elantan, Cedocard, Generic	Hypertension	5,385	2,236
Ismn	Ismo, Monit, Imdur, Generic	Hypertension	13,756	3,859
Lisinopril	Zestril, Carace, Generic	Hypertension	15,606	6,189
Naproxen	Naprosyn, Synflex, Nycopren, Generic	Analgesics	45,879	2,059
Nifedipine	Adalat, Coracten, Generic	Hypertension	21,800	5,730
Omeprasole	Losec, Generic	Stomach ulcers	30,851	6,150
Ranitidine	Zantac, Generic	Stomach ulcers	33,593	5,480

Appendix B Computing Elasticities Based on Level-IRFs for Log-specified VAR Models

Our approach to obtain elasticities differs from earlier work in this field (e.g. Nijs et al. 2001; Steenkamp et al. 2005). In these prior studies, elasticities are calculated by accumulating the values of the impulse response function (IRF) applied to a log-specified vector autoregressive (VAR) model, and reporting the resulting values as elasticities. However, Wieringa and Horváth (2005) show that the results of this method do not agree with the definition of elasticity, and propose an alternative method based on work by Ariño and Franses (2000). In particular, their method relies on a log-specified *structural* VAR specification for which level-IRFs are computed (e.g. instead of giving the change in log-sales in response to a shock, the method gives the level sales change). We apply their method in the following way: Let X denote the variable being shocked (i.e. the detailing series of the attacking brand), and let Y denote the variable for which we want to analyze the effect of the shock (e.g. the detailing series of the defending brand if we want to compute reaction elasticities). The method of Wieringa and Horváth (2005) yields two simulated time-series over the period for which we compute the IRF: Y^u denotes the level series had the shock not occurred, and Y^s denotes the level series for which the shock did occur. The IRF is normally computed as the difference between those series. We use these two series to compute the following arc elasticity (e.g. Trusov, Bucklin and Pauwels 2009):

$$\eta_{arc} = \left(\frac{\sum Y^s - \sum Y^u}{\sum Y^u} \right) \left(\frac{\bar{X}}{\Delta X} \right),$$

where \bar{X} denotes the mean level of X , and ΔX denotes the change in X (i.e. the size of the shock, one unit in this case). The first part of this equation reflects the percentage change in Y over a period (i.e. the dust-settling period for short-term elasticities or the entire period for which we compute the IRF for long-term elasticities), while the second part reflects the percentage change in X . This way, we obtain elasticities that are consistent with the definition of elasticity.

Appendix C Operationalization of Moderating Variables

Table C1 Operationalization of Moderating Variables

	Operationalization
<i>Brand Specific Factors:</i>	
Market Power Attacking Brand	Average share of prescriptions of the attacking brand (Gatignon, Weitz, Bansal 1990)
Power Asymmetry	Difference in average detailing calls between attacking and defending brand (Steenkamp et al. 2005)
Attacker Generic Brand	Dummy variable, 1 if the attacking brand is a generic brand, 0 otherwise
Defender Generic Brand	Dummy variable, 1 if the defending brand is generic brand, 0 otherwise
Sales Response Asymmetry	Difference in standardized own sales response parameters between attacking and defending brand, based on sales response model (see Appendix D)
Competitive Sales Response Attacker	Standardized competitive sales response parameter of attacking brand, based on sales response model (see Appendix D)
Physician Persistence	Standardized persistence parameter of the attacking brand, based on sales response model (see Appendix D)
<i>Category-Specific Factors:</i>	
Category Concentration	Number of brands in category (Nijs et al. 2001; Steenkamp et al. 2005)
Category Growth	Mean of the first difference of log-transformed quarterly prescriptions (Steenkamp et al. 2005)
Detailing Intensity	Proportion of detailing calls relative to the number of prescriptions in the category (Lipczynski and Wilson 2001)
<i>Region-Specific Factors</i>	
Physician Concentration	Average number of physicians per 1000 inhabitants over the sample period, based on NHS data
Population Level	Average number of inhabitants per km ² over the sample period, based on Eurostat data
Income	Average income in euros over the sample period, based on Eurostat data
Education Level	Average percentage of inhabitants with tertiary education over the sample period, based on Eurostat data

Appendix D Sales Response Model Description

As firms have knowledge on the response of physicians to their own own (e.g. Zoltners and Sinha 2005) and competitive (e.g. Dong, Manchanda and Chintagunta 2009) marketing effectiveness, the decision to react and the subsequent strength of the reaction is influenced by this knowledge. To capture these sales response effects, we calibrate a brand-level choice model to obtain the own- and competitive-sales response of a brand, as well as the physician persistence of that brand (e.g. Janakiraman et al. 2008). Following Gonül et al. (2001) and Manchanda, Xie and Youn (2008), we assume that the utility of physician i to subscribe brand k at prescription occasion t is given as

$$U_{itk} = x'_{itk}\beta_k + \epsilon_{itk}$$

We allow β_k to vary over brands only, as we are interested in the average brand effect and not in the individual physician effect which is used to assign detailing calls (e.g. Manchanda, Rossi and Chintagunta 2004). We assume that ϵ_{itk} follows a type 1 extreme value distribution, which yields a prescription probability for brand k at prescription occasion t of

$$P_{itk} = \frac{\exp(x'_{itk}\beta_k)}{1 + \sum_{j=i}^J \exp(x'_{itj}\beta_j)}$$

The model is cast in a hierarchical Bayesian framework (e.g. Manchanda, Xie and Youn 2008), and we specify

$$\beta_k = \beta_0 + \nu_k$$

where $\nu_k \sim N(0, V_\beta)$. The model is estimated using the Stan software package (*Stan Development Team* 2014). We use several variables to explain physician choice behavior, specifying the utility of physician i as follows:

$$\begin{aligned}
U_{itk} = & \beta_{0k} + \beta_{1k}Det_{itk} + \beta_{2k}Comp.Det_{itk} + \beta_{3k}Pres.Share_{itk} + \beta_{4k}Days.Last.Call_{itk} \\
& + \beta_{5k}No.Call_{itk} + \beta_{6k}Days.Last.Comp.Call_{itk} + \beta_{7k}No.Comp.Call_{itk} \\
& + \epsilon_{itk}
\end{aligned}$$

Here, Det_{itk} represents the logarithm of the number of detailing calls⁸ received for brand k , and measures the response to the focal brands marketing efforts. We specify the variable in logarithms to capture diminishing returns to scale (e.g. Dong, Manchanda and Chintagunta 2009). Similarly, $Comp.Det_{itk}$ captures the logarithm of the number of detailing calls for all competing brands in the category, which measures the sensitivity of the focal brand to marketing efforts by other brands. $Pres.Share_{itk}$ measures the share of prescriptions a physician has written for brand k . We use this as our measure of physician persistence, capturing the loyalty a physician has towards a brand. As the timing of detailing calls is also important (see e.g. Mizik and Jacobson 2004), – a detailing call made further in the past will have less influence than a more recent detailing call – we control for the timing of calls using the variables $Days.Last.Call_{itk}$ and $Days.Last.Comp.Call_{itk}$. These variables represent the number of days that have passed since the last focal and competitive detailing call, respectively. In case no detailing calls have been made (yet) to the physician, the indicator variables $No.Call_{itk}$ and $No.Comp.Call_{itk}$ capture this for the focal and competing brands respectively.

As the attribution of detailing calls to physicians is not random, but for example based on the past number of prescriptions written by a physician, endogeneity of detailing calls could be an issue (e.g. Manchanda, Rossi and Chintagunta 2004). We therefore check for endogeneity following the procedure in the Web Appendix of Montoya, Netzer and Jedidi (2010) by dividing physicians into deciles according to their total number of prescriptions, and comparing the average number of detailing calls received for three groups consisting of

⁸ We add a 1 to the number of detailing calls made to avoid taking the logarithm of 0 in case a physician has not received any detailing calls at that prescription occasion.

deciles 1-4, 5-7 and 8-10 respectively. We find no evidence that physicians in higher groups receive more detailing calls than those in lower groups, in contrast with the findings of e.g. Manchanda, Rossi and Chintaguna (2004) and Montoya, Netzer and Jedidi (2010). As an additional robustness check, for the first category we also implemented a model based on Manchanda, Rossi and Chintagunta (2004), where the number of detailing calls received is explicitly linked to the past number of prescriptions written. The results hereof showed very little differences compared to our model specification. We therefore do not think that endogeneity is an issue in our model specification. In case endogeneity is present, its effects are likely to be small based on our findings for the two categories, and the gain in accuracy we would get in our parameter estimates would be outweighed by the prohibitively long computation time involved in estimating a model with a correction for endogeneity for all our categories.



List of research reports

12001-HRM&OB: Veltrop, D.B., C.L.M. Hermes, T.J.B.M. Postma and J. de Haan, A Tale of Two Factions: Exploring the Relationship between Factional Faultlines and Conflict Management in Pension Fund Boards

12002-EEF: Angelini, V. and J.O. Mierau, Social and Economic Aspects of Childhood Health: Evidence from Western-Europe

12003-Other: Valkenhoef, G.H.M. van, T. Tervonen, E.O. de Brock and H. Hillege, Clinical trials information in drug development and regulation: existing systems and standards

12004-EEF: Toolsema, L.A. and M.A. Allers, Welfare financing: Grant allocation and efficiency

12005-EEF: Boonman, T.M., J.P.A.M. Jacobs and G.H. Kuper, The Global Financial Crisis and currency crises in Latin America

12006-EEF: Kuper, G.H. and E. Sterken, Participation and Performance at the London 2012 Olympics

12007-Other: Zhao, J., G.H.M. van Valkenhoef, E.O. de Brock and H. Hillege, ADDIS: an automated way to do network meta-analysis

12008-GEM: Hoorn, A.A.J. van, Individualism and the cultural roots of management practices

12009-EEF: Dungey, M., J.P.A.M. Jacobs, J. Tian and S. van Norden, On trend-cycle decomposition and data revision

12010-EEF: Jong-A-Pin, R., J-E. Sturm and J. de Haan, Using real-time data to test for political budget cycles

12011-EEF: Samarina, A., Monetary targeting and financial system characteristics: An empirical analysis

12012-EEF: Alessie, R., V. Angelini and P. van Santen, Pension wealth and household savings in Europe: Evidence from SHARELIFE

13001-EEF: Kuper, G.H. and M. Mulder, Cross-border infrastructure constraints, regulatory measures and economic integration of the Dutch – German gas market

13002-EEF: Klein Goldewijk, G.M. and J.P.A.M. Jacobs, The relation between stature and long bone length in the Roman Empire

13003-EEF: Mulder, M. and L. Schoonbeek, Decomposing changes in competition in the Dutch electricity market through the Residual Supply Index

13004-EEF: Kuper, G.H. and M. Mulder, Cross-border constraints, institutional changes and integration of the Dutch – German gas market



13005-EEF: Wiese, R., Do political or economic factors drive healthcare financing privatisations? Empirical evidence from OECD countries

13006-EEF: Elhorst, J.P., P. Heijnen, A. Samarina and J.P.A.M. Jacobs, State transfers at different moments in time: A spatial probit approach

13007-EEF: Mierau, J.O., The activity and lethality of militant groups: Ideology, capacity, and environment

13008-EEF: Dijkstra, P.T., M.A. Haan and M. Mulder, The effect of industry structure and yardstick design on strategic behavior with yardstick competition: an experimental study

13009-GEM: Hoorn, A.A.J. van, Values of financial services professionals and the global financial crisis as a crisis of ethics

13010-EEF: Boonman, T.M., Sovereign defaults, business cycles and economic growth in Latin America, 1870-2012

13011-EEF: He, X., J.P.A.M Jacobs, G.H. Kuper and J.E. Ligthart, On the impact of the global financial crisis on the euro area

13012-GEM: Hoorn, A.A.J. van, Generational shifts in managerial values and the coming of a global business culture

13013-EEF: Samarina, A. and J.E. Sturm, Factors leading to inflation targeting – The impact of adoption

13014-EEF: Allers, M.A. and E. Merkus, Soft budget constraint but no moral hazard? The Dutch local government bailout puzzle

13015-GEM: Hoorn, A.A.J. van, Trust and management: Explaining cross-national differences in work autonomy

13016-EEF: Boonman, T.M., J.P.A.M. Jacobs and G.H. Kuper, Sovereign debt crises in Latin America: A market pressure approach

13017-GEM: Oosterhaven, J., M.C. Bouwmeester and M. Nozaki, The impact of production and infrastructure shocks: A non-linear input-output programming approach, tested on an hypothetical economy

13018-EEF: Cavapozzi, D., W. Han and R. Miniaci, Alternative weighting structures for multidimensional poverty assessment

14001-OPERA: Germs, R. and N.D. van Foreest, Optimal control of production-inventory systems with constant and compound poisson demand

14002-EEF: Bao, T. and J. Duffy, Adaptive vs. educative learning: Theory and evidence

14003-OPERA: Syntetos, A.A. and R.H. Teunter, On the calculation of safety stocks

14004-EEF: Bouwmeester, M.C., J. Oosterhaven and J.M. Rueda-Cantuche, Measuring the EU value added embodied in EU foreign exports by consolidating 27 national supply and use tables for 2000-2007



- 14005-OPERA: Prak, D.R.J., R.H. Teunter and J. Riezebos, Periodic review and continuous ordering
- 14006-EEF: Reijnders, L.S.M., The college gender gap reversal: Insights from a life-cycle perspective
- 14007-EEF: Reijnders, L.S.M., Child care subsidies with endogenous education and fertility
- 14008-EEF: Otter, P.W., J.P.A.M. Jacobs and A.H.J. den Reijer, A criterion for the number of factors in a data-rich environment
- 14009-EEF: Mierau, J.O. and E. Suari Andreu, Fiscal rules and government size in the European Union
- 14010-EEF: Dijkstra, P.T., M.A. Haan and M. Mulder, Industry structure and collusion with uniform yardstick competition: theory and experiments
- 14011-EEF: Huizingh, E. and M. Mulder, Effectiveness of regulatory interventions on firm behavior: a randomized field experiment with e-commerce firms
- 14012-GEM: Bressand, A., Proving the old spell wrong: New African hydrocarbon producers and the 'resource curse'
- 14013-EEF: Dijkstra P.T., Price leadership and unequal market sharing: Collusion in experimental markets
- 14014-EEF: Angelini, V., M. Bertoni, and L. Corazzini, Unpacking the determinants of life satisfaction: A survey experiment
- 14015-EEF: Heijdra, B.J., J.O. Mierau, and T. Trimborn, Stimulating annuity markets
- 14016-GEM: Bezemer, D., M. Grydaki, and L. Zhang, Is financial development bad for growth?
- 14017-EEF: De Cao, E. and C. Lutz, Sensitive survey questions: measuring attitudes regarding female circumcision through a list experiment
- 14018-EEF: De Cao, E., The height production function from birth to maturity
- 14019-EEF: Allers, M.A. and J.B. Geertsema, The effects of local government amalgamation on public spending and service levels. Evidence from 15 years of municipal boundary reform
- 14020-EEF: Kuper, G.H. and J.H. Veurink, Central bank independence and political pressure in the Greenspan era
- 14021-GEM: Samarina, A. and D. Bezemer, Do Capital Flows Change Domestic Credit Allocation?
- 14022-EEF: Soetevent, A.R. and L. Zhou, Loss Modification Incentives for Insurers Under Expected Utility and Loss Aversion



14023-EEF: Allers, M.A. and W. Vermeulen, Fiscal Equalization, Capitalization and the Flypaper Effect.

14024-GEM: Hoorn, A.A.J. van, Trust, Workplace Organization, and Comparative Economic Development.

14025-GEM: Bezemer, D., and L. Zhang, From Boom to Bust in de Credit Cycle: The Role of Mortgage Credit.

14026-GEM: Zhang, L., and D. Bezemer, How the Credit Cycle Affects Growth: The Role of Bank Balance Sheets.

14027-EEF: Bružikas, T., and A.R. Soetevent, Detailed Data and Changes in Market Structure: The Move to Unmanned Gasoline Service Stations.

14028-EEF: Bouwmeester, M.C., and B. Scholtens, Cross-border Spillovers from European Gas Infrastructure Investments.

14029-EEF: Lestano, and G.H. Kuper, Correlation Dynamics in East Asian Financial Markets.

14030-GEM: Bezemer, D.J., and M. Grydaki, Nonfinancial Sectors Debt and the U.S. Great Moderation.

14031-EEF: Hermes, N., and R. Lensink, Financial Liberalization and Capital Flight: Evidence from the African Continent.

14032-OPERA: Blok, C. de, A. Seepma, I. Roukema, D.P. van Donk, B. Keulen, and R. Otte, Digitalisering in Strafrechtketens: Ervaringen in Denemarken, Engeland, Oostenrijk en Estland vanuit een Supply Chain Perspectief.

14033-OPERA: Olde Keizer, M.C.A., and R.H. Teunter, Opportunistic condition-based maintenance and aperiodic inspections for a two-unit series system.

14034-EEF: Kuper, G.H., G. Sierksma, and F.C.R. Spieksma, Using Tennis Rankings to Predict Performance in Upcoming Tournaments

15001-EEF: Bao, T., X. Tian, X. Yu, Dictator Game with Indivisibility of Money

15002-GEM: Chen, Q., E. Dietzenbacher, and B. Los, The Effects of Ageing and Urbanization on China's Future Population and Labor Force

15003-EEF: Allers, M., B. van Ommeren, and B. Geertsema, Does intermunicipal cooperation create inefficiency? A comparison of interest rates paid by intermunicipal organizations, amalgamated municipalities and not recently amalgamated municipalities

15004-EEF: Dijkstra, P.T., M.A. Haan, and M. Mulder, Design of Yardstick Competition and Consumer Prices: Experimental Evidence

15005-EEF: Dijkstra, P.T., Price Leadership and Unequal Market Sharing: Collusion in Experimental Markets



15006-EEF: Anufriev, M., T. Bao, A. Sutin, and J. Tuinstra, Fee Structure, Return Chasing and Mutual Fund Choice: An Experiment

15007-EEF: Lamers, M., Depositor Discipline and Bank Failures in Local Markets During the Financial Crisis

15008-EEF: Oosterhaven, J., On de Doubtful Usability of the Inoperability IO Model

15009-GEM: Zhang, L. and D. Bezemer, A Global House of Debt Effect? Mortgages and Post-Crisis Recessions in Fifty Economies

15010-I&O: Hooghiemstra, R., N. Hermes, L. Oxelheim, and T. Randøy, The Impact of Board Internationalization on Earnings Management

15011-EEF: Haan, M.A., and W.H. Siekman, Winning Back the Unfaithful while Exploiting the Loyal: Retention Offers and Heterogeneous Switching Costs

15012-EEF: Haan, M.A., J.L. Moraga-González, and V. Petrikaite, Price and Match-Value Advertising with Directed Consumer Search

15013-EEF: Wiese, R., and S. Eriksen, Do Healthcare Financing Privatisations Curb Total Healthcare Expenditures? Evidence from OECD Countries

15014-EEF: Siekman, W.H., Directed Consumer Search

15015-GEM: Hoorn, A.A.J. van, Organizational Culture in the Financial Sector: Evidence from a Cross-Industry Analysis of Employee Personal Values and Career Success

15016-EEF: Te Bao, and C. Hommes, When Speculators Meet Constructors: Positive and Negative Feedback in Experimental Housing Markets

15017-EEF: Te Bao, and Xiaohua Yu, Memory and Discounting: Theory and Evidence

15018-EEF: Suari-Andreu, E., The Effect of House Price Changes on Household Saving Behaviour: A Theoretical and Empirical Study of the Dutch Case

15019-EEF: Bijlsma, M., J. Boone, and G. Zwart, Community Rating in Health Insurance: Trade-off between Coverage and Selection

15020-EEF: Mulder, M., and B. Scholtens, A Plant-level Analysis of the Spill-over Effects of the German *Energiewende*

15021-GEM: Samarina, A., L. Zhang, and D. Bezemer, Mortgages and Credit Cycle Divergence in Eurozone Economies

16001-GEM: Hoorn, A. van, How Are Migrant Employees Managed? An Integrated Analysis

16002-EEF: Soetevent, A.R., Te Bao, A.L. Schippers, A Commercial Gift for Charity

16003-GEM: Bouwmeester, M.C., and J. Oosterhaven, Economic Impacts of Natural Gas Flow Disruptions



16004-MARK: Holtrop, N., J.E. Wieringa, M.J. Gijzenberg, and P. Stern, Competitive Reactions to Personal Selling: The Difference between Strategic and Tactical Actions



www.rug.nl/feb