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Impacts of supply chain management on company value: benchmarking companies from the fast moving consumer goods industry

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Abstract The research question addressed is to which extent supply chain management (SCM) creates value from cost and working capital. The paper provides an empirical evaluation including insights on important criteria for value creation. In a secondary data analysis, 10 leading fast moving consumer goods (FMCG) companies are benchmarked regarding the value created from cost of goods sold (COGS) and working capital within the time horizon 2003–2008. The study applies benchmarking methodology and a discounted cash flow (DCF) based model for quantifying value contributions. It is shown that SCM is realized in a value-adding way with different emphasis on COGS or working capital. Monetarily working capital components (trade payables, trade receivables) have a high relevance for value creation. Continuous improvements and long lasting developments of value drivers are more appropriate for value creation than alternating improvements and deteriorations. Timing aspects of value driver developments have to be considered for value creation. The value of the paper stems from empirical comparison of value created by working capital and COGS and from evidence of important criteria for value creation. Further analysis based on cost components as well as benchmarking with different or extended content, such as fixed asset performance or cross-industry benchmarking, leave room for future research.

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1 Introduction

During the last decades supply chain management (SCM), which can be seen as the "integration of business processes from end users through original suppliers that provides products, services and information that add value for customers" [11], has gained significant relevance in academic research [25, 43, 44, 56], and it is an accepted insight that SCM has a strong influence on the value of a company [4, 10, 37, 66]. This coherence between SCM and company value, which can be named *value-based SCM*, consists of four drivers of value creation: sales growth, operating cost reduction, and efficiency of (fixed and working) capital [10]. Conceptual frameworks for value-based SCM are proposed by different research papers [4, 37, 66].

The subsequent question in value-based SCM is how to measure, analyze, and compare the overall impacts on company value which arise from changes in these SCM-related value drivers. Sales impacts are mainly substantiated by the influence of SCM on service level [13, 72]. Influences from SCM on cost [34, papers in 60], (working) capital productivity [36, 58, 67] or working capital components (e.g. inventory) [8, 69] can also be evaluated directly in a quantitative way. Furthermore, quantification models are suggested to measure impacts from SC cost and working capital on company value [5].

To shed further light on value-based SCM, this paper focuses two research questions:

Can empirical evidence be found that overall developments of SCM-related value drivers, in particular cost and

working capital, have an impact on company value? What decisive criteria for value creation from these drivers can be identified empirically?

One approach to empirically assess the performance of value drivers is benchmarking [28], particularly if related to SCM [1]. Hence, to answer the research questions a benchmarking study is performed which analyzes the developments of cost of goods sold (COGS) and working capital and the resulting value contributions over a mid-term horizon. This study provides empirical evidence of important criteria for turning value driver developments into value creation and an empirical analysis of value contributions achieved by working capital components. The benchmarking group comprises companies from the same sector in order to increase their comparability regarding structural and operational characteristics. The focus is put on manufacturing companies from the fast moving consumer goods (FMCG) industry. FMCG manufacturers produce a large number of different products in global supply networks consisting of plants with various combinations of make-and-pack processes as well as contract manufacturers and service providers for warehousing and logistics [33]. Despite this complexity, different FMCG manufacturers and their supply chains often show similar characteristics [see e.g. 45].

The remainder of this article is structured as follows. A literature review in Sect. 2 is followed by an introduction of the research methodology in Sect. 3. Section 4 comprises the benchmarking study followed by a summarizing discussion in Sect. 5. The article concludes with findings, limitations and future prospects for further research in Sect. 6. Supplementary tables and a list of acronyms and model parameters are given in the appendix of this paper.

2 Literature review

This section comprises an overview of relevant literature on value-based SCM, SCM in FMCG industry and benchmarking. First, the terminology is clarified by introducing and explaining appropriate definitions for the areas SCM and value-based management (VBM), from which the area value-based SCM is derived. 12 papers on value-based SCM are reviewed to illustrate the variety of research directions in this area. The selected manuscripts also provide a basis for the positioning of this paper to current research, which is discussed in Sect. 5. 14 different papers on SCM in FMCG industry, which adumbrate the status of current research on this topic, are briefly discussed to outline structural and process-related characteristics of FMCG manufacturers and their supply chains. 18 papers on benchmarking are chosen to delineate developments of this methodology and its applications in academic research on SCM.

2.1 Terminology

While the definition of supply chain management is still a hotly discussed topic, here the one given by Mentzer et al. [44] is taken up:

1. "A systems approach to viewing the supply chain as a whole, and to managing the total flow of goods inventory from the supplier to the ultimate customer;
2. a strategic orientation towards cooperative effort to synchronise and converge intra-firm and inter-firm operational and strategic capabilities into a unified whole; and
3. customer focus to create unique and individualised sources of customer value, leading to customer satisfaction."

This definition contains a close link to an operational comprehension of supply chain management, which can be measured by assessing related value components. "VBM is defined as a management accounting system linking value-maximization to strategic objectives, a coherent set of performance measures, and compensation through cause-and-effect-chains" [9, 73]. In this respect, SCM is comprehended to manage operational processes and assess this in value-based measures. This is elaborated further in the literature review section.

2.2 Value-based SCM

A thorough review of academic literature on VBM is given by Lueg and Schäffer [39], hence only selected papers are mentioned here to outline the broadness of this area. Rappaport [54] brought the idea of VBM in context to the term shareholder value, which stipulates all parts of a company to be managed in such a way that the equity value is sustainably increased. A survey and discussion of valuation concepts is provided by Damodaran [14]. Different approaches for valuation, among others Economic Value Added (EVA) [63], Cash Flow Return on Investment (CFROI) [40], Cash Value Added (CVA) [50], Earned Economic Income [24], have been developed and increased the popularity of VBM in academic science and managerial practice [12, 42, 68]. One well known valuation approach is the Discounted Cash Flow (DCF) model, which is broadly accepted in academic research [6, 29, 55].

Existing literature emphasizes that the question of value-based SCM has been of considerable interest for academic research for the last 10 years [43]. A thorough literature

review would exceed the extent of this paper. Hence, an overview of selective literature indicating the heterogeneity of approaches derived from value-based management (VBM) and concepts for value-based SCM is depicted in Table 1 and briefly interpreted: SCM concepts in the reviewed papers vary from functional [36, 62] or company specific [30, 31, 38] perspectives to network considerations [10, 32, 49] (see column "SCM approach" in Table 1). Value-based SCM is most often linked to EVA and shareholder value [4, 5, 10, 32, 37, 38, 49] (see column "VBM approach"). Concepts and value drivers in SCM focused in the reviewed papers range from single functions [36], operational SC activities and processes [32, 37, 49] to SC strategy [10] (see column "Concept, value driver"). Empirical aspects are reflected differently (see column "Empirical aspect")—some rather theoretical papers give no or few references to industrial examples [10, 36, 37, 49, 62], some papers comprise case studies from one or few companies [5, 32], some papers extensively evaluate several hundreds of observations [8, 30, 31, 38].

Although it is taken for granted that SCM influences the cash flow and hence the shareholder value of a company [10, 30], little empirical evidence exists that effective SCM is linked to shareholder value creation [30]. Further research potential addresses the need of cost-effective ways to measure shareholder value impacts [36] and improvements regarding data used for evaluation [32]. To help filling this gap, Brandenburg and Seuring [5] suggest a model based on the discounted cash flow (DCF) method to quantify value impacts of changes of working capital and SC cost. This model is in line with an approach proposed by Otto and Obermaier [49].

2.3 SCM in FMCG industry

SCM in FMCG industry shows a considerable complexity which is driven by a large number of facilities and products as well as the resulting flows through inter-organizational and international networks comprising suppliers, manufacturers, distributors, retailers, and service providers [47].

Table 1 Overview on papers dealing with value-based supply chain management

Paper	SCM approach	VBM approach	Concept, value driver	Empirical aspect
Christopher and Ryals [10]	Company network with internal processes and external interfaces	Shareholder value, mainly EVA	SCM affects revenue, cost, fixed capital, working capital	12 observations from industrial or consulting practice
Lambert and Burduroglu [36]	Functional (logistics)	Different approaches, shareholder value as most comprehensive	Logistics impact on revenue, cost, fixed capital, working capital	None
Lambert and Pohlen [37]	8 Cross-company processes add customer and stakeholder value	Shareholder value, EVA	8 Key processes mapped to shareholder value	None
Hendricks and Singhal [30, 31]	Company-internal SC	Market value of a firm (stock price)	Impacts of production or delivery delays on stock price	519, respectively, 827 observations from industrial practice
Sridharan et al. [62]	Functional (IT for SCM)	Market value of a firm (stock price)	Effects from implementation of IT for SCM on stock price	Three company case studies
Losbichler and Rothböck [38]	Company-internal SC	Shareholder value, EVA	Value-driven SC controlling framework	Working capital performance of 6,925 European firms
Capkun et al. [8]	Company-internal SC	Gross profit, operational profit	Inventory performance	US manufacturing companies 1980–2005
Hofmann and Locker [32]	Inter-organizational management of flows of goods and information	Shareholder value, EVA	SCM processes linked to EVA categories via KPI	Case study from packaging industry
Otto and Obermaier [49]	Inter-organizational network	Shareholder value, DCF	Adjustments of processes, behaviour, resources	None
Brandenburg and Schilling [4]	Dyadic SC	Shareholder value, DCF	Value impacts of dynamics and uncertainties	Case example from FMCG industry
Brandenburg and Seuring [5]	Company-internal SC	Shareholder value, DCF	Value impacts of SC cost and working capital	Illustrative industry example

These flows of information, goods, and financial resources in networks of FMCG industry and the arising complexity are in focus of different research papers. The flow from suppliers to manufacturers is dealt with in a case study from Sandholm et al. [57], who apply an optimization engine to improve strategic sourcing at Procter & Gamble, a major FMCG manufacturer. Dekker et al. [18] evaluate four different distribution concepts to optimize the flow between FMCG manufacturers and retailers' warehouses. The material flow across multiple echelons of a SC is analyzed in a case study by Schilling et al. [59], who identify uncertainty and dynamics as major complexity drivers for FMCG industry. By applying discrete event simulation (DES), they evaluate different options for SC design in new product introduction at a cosmetics manufacturer in order to decide upon the best SC setting with regard to financial aspects and product availability. The importance and impacts of shelf availability and out of stock situations in FMCG industry are evaluated and discussed by Corsten and Gruen [13]. The complexity drivers demand uncertainty and dynamics are analyzed by Wong et al. [70] in a longitudinal SC study of toy manufacturers and retailers. Brandenburg and Schilling [4] integrate DCF and DES to assess value impacts of these complexity drivers in a case example of new product introduction in a SC from FMCG industry. Danne and Häusler [16] evaluate impacts of assortment complexity in consumer goods SC and propose a decision support system to evaluate assortment dependent cost positions for a production and distribution network.

The characteristics of production processes and production plant networks in FMCG industry are analyzed in academic research. Günther et al. [27] propose a block planning approach for optimized scheduling of make-and-pack processes on different facilities of a production plant. They introduce the optimization approach, outline aspects of integration with standard planning systems and give empirical illustration by a case study from a cosmetics manufacturer. Günther [26] describes the application of block planning in a plant at a case study from beverage industry. Tahmassebi [64] focuses on control and management of multiple plants in a SC network and suggests a probabilistic model for strategic redesign and operation of existing chains and new product introduction. Duffy [19] describes approach and impact of reengineering a SC network in a case study from Gillette. Method and benefits of SC optimization are furthermore presented by Camm et al. [7], who apply a mathematical model to restructure the plant network of Procter & Gamble in North America.

2.4 Benchmarking

Since its appearance in the 1980s, benchmarking itself has passed four stages of evolution—from benchmarks to benchmarking, from product performance to process evaluation, from financial analysis to customer satisfaction, and from operational to strategic benchmarking [41]. Benchmarking has developed to a broad field of academic research (see Dattakumar and Jagadeesh [17] for a related literature review). Fong et al. [22] define benchmarking as the "process of continually comparing a company's performance on critical customer requirements against that of the best in industry (direct competitors) or class (companies recognized for their superiority in performing certain functions) to determine what should be improved". The proposed process comprises a planning phase for decision upon benchmarking content and data collection, an analysis phase to determine current performance gaps and future performance levels, an integration phase for target setting and an action phase for development and implementation of optimization actions.

Benchmarking is often applied in the area of SCM [71], and different benchmarking concepts are designed or applied to evaluate and compare SC performance. Hanman [28] for instance applies benchmarking methodology to evaluate the supply chain performance of more than 100 organizations and to identify best practices in logistics, purchasing and supply, inventory management and warehousing as well as customer service. Gilmour [23] proposes a framework for benchmarking operational and strategic aspects of logistics. Many SC benchmarking studies can be found which focus on a certain function, region or industry (e. g. [1, 35, 46, 65]). Blanchard et al. [3] focus one company only to identify Wal-Mart's best practices in SCM.

Benchmarking the working capital performance, which can be measured by the metric cash-to-cash (C2C) cycle [58], has gained particular interest in the context of SCM. Farris and Hutchison [20] discuss the C2C cycle and identify optimization levers. In a longitudinal study based on secondary data from Research Insights database, Farris and Hutchison [21] analyze 5,884 different companies regarding the performance of working capital and working capital components between 1986 and 2001. These firms are clustered to industries which are classified by median performance of each working capital component. Farris and Hutchison [21] observed that in 27 out of 31 industries the working capital performance was improved, mainly by reducing inventory or prolonging payment periods to suppliers, and that inventory reduction offers the highest financial improvement potential in working capital. Randall and Farris [52] provide a method to identify and quantify profitability improvement levers of collaborative working capital management and illustrate the benefits of this collaboration. In another paper, Randall and Farris [53] illustrate the application of C2C cycle for benchmarking by three case studies. In a longitudinal study based on

secondary data from Amadeus database, Losbichler and Rothböck [38] analyze the development of the performance of working capital and its components in 6,925 European companies between 1995 and 2004. They observe that, although individual industries and companies optimized their C2C cycle, on an overall perspective working capital has been moved within European supply chains: The inventory reduction potential is not fully capitalized, and manufacturing companies seem to optimize their working capital at their suppliers' expenses. In an empirical evaluation, Obermaier and Dornhauer [48] benchmark 100 German companies from seven different industry classes regarding their inventory development between 1993 and 2005. They identify improvements in inventory performance in four out of six industry classes and conclude that overall the resulting impact on financial performance of a firm is limited.

3 Research methodology

This section shows how the benchmarking method is applied to answer the two research questions of this paper. The application of the benchmarking approach proposed by Fong et al. [22] is outlined. Furthermore, the definition of the benchmarking content and the procedures for data collection and preparation are described. An emphasis is put on the introduction of the DCF-based model applied for quantifying value impacts and on limitations of the research method.

3.1 Benchmarking method

To empirically evaluate value contributions arising from SCM, benchmarking, defined as "the process of identifying the highest standards of excellence for products, services or processes" [2], is applied in the sense of a performance benchmarking, i. e. "the comparison of performance measures for the purpose of determining how good our company is as compared to others" [2]. The benchmarking study is based on a benchmarking process consisting of four phases proposed by Fong et al. [22]. This paper focuses the planning and analysis phases and omits the integration and action phases, which are rather applicable for managerial purposes in industrial practice.

3.2 Benchmarking content

This external benchmarking study compares 10 leading companies from FMCG industry regarding the value contributions they achieved in the time horizon 2003–2008 from working capital and COGS comprising various costs in the process of transformation from raw material to finished product, e.g. labor costs and manufacturing overhead [29]. The benchmarking group is selected based on an analysts' industry research report [61], which evaluates companies of a significant relevance for FMCG industry.

3.3 Data collection and preparation

This benchmarking study is performed as a secondary data analysis, i. e. based on published data from annual reports of the respective companies and Bloomberg data prepared by and accessible at Stern School of Business, New York University [15].

The value contributions arising from changes in COGS or working capital, defined as the sum of inventories and trade receivables reduced by trade payables, are quantified by a DCF-based model introduced by Brandenburg and Seuring [5]. This model is briefly explained in the following:

The value contribution $\mathrm{VA}_p^{\mathrm{WC}}$ arising from working capital development in a time period p is defined by the difference of working capital WC_p at the end of period p and working capital WC_{p-1} at the beginning of period p adjusted for sales development S_{p-1}/S_p in period p:

$$\mathrm{VA}_p^{\mathrm{WC}} = \mathrm{WC}_{p-1} - S_{p-1}/S_p \cdot \mathrm{WC}_p \tag{1}$$

The value contribution arising from changes of COGS in a period p is defined by the difference of cost COGS_0 of period 0 and cost COGS_p of period p adjusted for sales development S_0/S_p and tax rate T:

$$\mathrm{VA}_p^{\mathrm{COGS}} = \left(\mathrm{COGS}_0 - \mathrm{S}_0/\mathrm{S}_p \cdot \mathrm{COGS}_p\right) \cdot (1 - T) \tag{2}$$

To calculate the value contribution $\mathrm{VA}^{\mathrm{WC}}$ or $\mathrm{VA}^{\mathrm{COGS}}$ generated by the respective value drivers over a time horizon of periods $p = 1,\ldots,P$, the value contributions $\mathrm{VA}_p^{\mathrm{WC}}$ or $\mathrm{VA}_p^{\mathrm{COGS}}$ of each period p are discounted by weighted average cost of capital WACC and the resulting terms $\mathrm{VA}_p^{\mathrm{WC}} \cdot (1 + \mathrm{WACC})^{-p}$, respectively, $\mathrm{VA}_p^{\mathrm{COGS}} \cdot (1 + \mathrm{WACC})^{-p}$ are summed up.

The calculation formula for WACC (see e.g. [6, 29, 55]) comprises ratios of debt D (derived from the respective book values) and equity E (defined as market capitalization) and furthermore cost of debt k_D, cost of equity k_E, and tax rate T:

$$\mathrm{WACC} = k_D \cdot (1 - T) \cdot D \cdot (D + E)^{-1} + k_E \cdot E \cdot (D + E)^{-1} \tag{3}$$

To ensure comparability, all WACC values used for this benchmarking study (see Table 12 in the appendix) were calculated based on Bloomberg data.

To analyze developments of working capital components within the benchmarking group in the considered horizon, Days Sales Outstanding (DSO), Days Sales of Inventory

(*DSI*), and Days Payables Outstanding (*DPO*) are applied. These commonly used metrics (e. g. [20, 37]) are calculated cumulative for all companies of the benchmarking group and aggregated to the cash-to-cash (C2C) cycle, which measures the working capital performance [51]:

$$\text{DSO} = \text{Trade receivables/COGS} \cdot 365 \quad (4)$$

$$\text{DSI} = \text{Inventory/sales} \cdot 365 \quad (5)$$

$$\text{DPO} = \text{Trade payables/COGS} \cdot 365 \quad (6)$$

$$\text{C2C} = \text{DSO} + \text{DSI} - \text{DPO} \quad (7)$$

3.4 Limitations of the benchmarking study

This benchmarking study aims at comparing a larger number of companies regarding the value contributions achieved by SCM. Availability and comparability of data is a crucial factor of such empirical evaluation, because access to comparable data from various firms is often limited to company publications such as annual reports. Hence, this benchmarking study is based on secondary data, which is published by the enterprises and comparably easy to access.

This approach limits the content of the benchmarking study. Assessing the impacts of SCM on the value drivers sales and fixed assets empirically would for instance require detailed information which share of the fixed assets is SCM-related and which sales developments are influenced by SCM. As this information cannot be made available by secondary data, this benchmarking study is limited to COGS, working capital and working capital components. The analysis of SCM-related figures from annual reports does not enable further evaluation of how these figures in turn are influenced by operational SCM activities. Such analysis would require company-internal data. To ensure the comparability of the operational SCM level of the explored firms the benchmarking group focuses manufacturing companies from the same sector: 10 major cosmetics manufacturers from FMCG industry.

Two other aspects have to be considered regarding the level of detail of this benchmarking study. More detailed data would be needed to empirically study conflictive effects of cash and cost aspects, e.g. between cost decrease and trade payables optimization or between inventory reduction and decreasing cost of production or warehousing or to consider impacts of acquisitions or divestments. Besides, accounting figures from annual or quarterly reports could face window dressing effects.

4 Benchmarking study from FMCG industry

This section is structured according to the first two steps of the benchmarking process suggested by Fong et al. [22], benchmarking planning and benchmarking analysis. The first subsection gives information how the definition of the benchmarking content and the data collection and preparation are realized. The second subsection comprises the description and analysis of the empirical results obtained by the benchmarking study. A correlation analysis of developments of COGS and working capital and the resulting value impacts will show that value impacts arising from developments of these value drivers can be verified empirically. A more detailed analysis of the benchmarking results and an example on company level will illustrate two relevant aspects which have to be taken into account for such an empirical verification. Furthermore, four detailed comparisons of value driver developments and resulting value impacts will demonstrate the relevance of timing and continuity for value creation. A benchmarking analysis of working capital components will point out the relevance of working capital for value creation and identify which aspects were emphasized by the FMCG manufacturers. An empirical sensitivity analysis of WACC figures will substantiate that value impacts of WACC changes can be neglected.

4.1 Benchmarking planning

4.1.1 Benchmarking content

Compared to the analysts' research report [61], adjustments were needed in some cases: Due to acquisition by The Procter & Gamble Company in 2005, Gillette Co. had to be excluded from this benchmarking group. Due to limited comparability of their published data, L'Oreal S. A. following French accounting standards until 2004 and Hindustan Lever Ltd. following Indian accounting principles could not be considered in this benchmarking group. Kimberly-Clark Corporation was added to the benchmarking group under consideration of its size and relevance for the FMCG industry to facilitate a representative benchmarking group.

For simplicity reasons, three letter abbreviations will be used for the names of the companies of the benchmarking group: Avon Products Inc. (AVO), Beiersdorf AG (BDF), Colgate-Palmolive Company (CPA), The Estée Lauder Companies Inc. (ELA), Henkel KGaA (HEN), Kao Corporation (KAO), Kimberly-Clark Corporation (KMB), The Procter & Gamble Company (PRG), Reckitt Benckiser Group plc (RCU), and The Unilever Group (UNI).

4.1.2 Data collection and preparation

Working capital figures were calculated from balance sheet data by adding trade receivables and inventory reduced by trade payables. COGS figures are taken from profit & loss

Table 2 Value contributions from COGS and working capital in FMCG industry

Company	Sales 2003	COGS effects			WC effects			Total effects	
		Chg. of ratio (pp)	Value contribution		Chg. of ratio (pp)	Value contribution		Value contribution	
	m EUR		m EUR	% of sales		m EUR	% of sales	m EUR	% of sales
AVO	4,920	−1.1	−48	−1.0	−3.3	158	3.2	111	2.3
BDF	4,435	−2.6	192	4.3	−8.2	330	7.4	522	11.8
CPA	7,085	−1.3	57	0.8	−0.7	51	0.7	108	1.5
ELA	3,661	−0.9	55	1.5	1.4	−52	−1.4	3	0.1
HEN	9,436	5.3	−603	−6.4	−7.9	723	7.7	120	1.3
KAO	6,845	−0.2	−29	−0.4	0.9	−61	−0.9	−89	−1.3
KMB	10,265	4.0	−838	−8.2	−0.2	21	0.2	−817	−8.0
PRG	31,035	−2.3	2,267	7.3	1.1	−328	−1.1	1,938	6.2
RCU	3,868	−6.0	394	10.2	1.7	−64	−1.7	330	8.5
UNI	42,693	3.0	−1,874	−4.4	−2.4	844	2.0	−1,030	−2.4
Avg.	12,424	−0.2	−43	0.4	−1.8	162	1.6	120	2.0

statements. The calculation results for the WACC values of each company are listed in Table 12 in the appendix of this paper. The calculation itself is omitted in this paper, but follows the above outlined approach [29].

National currencies were converted based on official exchange rates as per December 31, 2008 (1 EUR = 1.3977 USD = 0.96 GBP = 126.4 JPY). Exchange rate effects are not considered in this benchmarking study to facilitate like-for-like analysis.

The value contributions of each company are calculated by applying the quantification model described in Sect. 3.3, the calculation results are depicted in Table 2. To ensure comparability, the analysis considers working capital ratio (working capital in percentage of sales) and COGS ratio (COGS in percentage of sales) and furthermore value contributions related to sales. The columns "Chg. of ratio" comprise the changes of working capital ratio or COGS ratio between 2003 and 2008 measured in percentage points (pp), the columns "Value contribution of sales" contain the resulting value contribution effect measured in EUR and as percentage of sales 2003.

4.2 Benchmarking analysis

4.2.1 Correlation between value driver developments and value contribution

An analysis of the correlation between overall[1] development of COGS and working capital (see columns "Chg. of ratio" in Table 2) and the resulting value contribution (see columns "Value contribution" in Table 2) helps to answer the question if it can be shown empirically that overall

[1] Overall development in this context is defined as the change of the figure of 2008 compared to the figure of 2003.

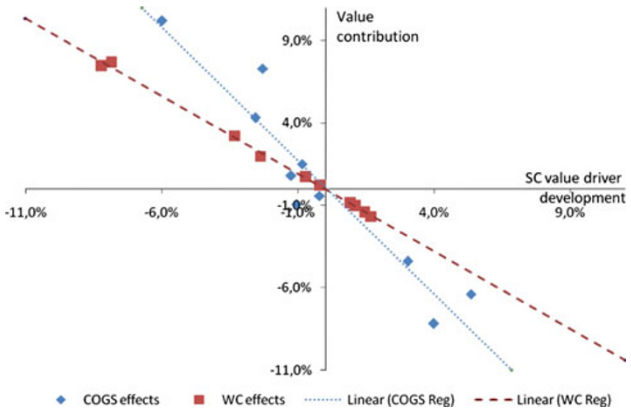

Fig. 1 Scatter plot with regression lines for value driver developments and value contributions

developments of SCM-related value drivers influence the company value. For this purpose, the calculated benchmarking figures are analyzed. Linear regression analysis shows strong correlations between the developments of each value driver and the respective achieved value contribution, which is visualized in the scatter plot depicted in Fig. 1. The *x*-axis depicts the change of value driver development (columns "Chg. of ratio" of Table 2), the *y*-axis depicts the resulting value contribution (columns "Value contribution of sales" of Table 2). The regression coefficient for the correlation between COGS change and value contribution from COGS is −0.948, the regression coefficient for the correlation between working capital change and value contribution is −0.999.

As a first finding, it can be stated that overall developments of SCM-related value drivers are strongly linked to company value.

Although in general this correlation is expected, exceptional cases can be observed and analyzed on

Table 3 Developments of COGS and resulting value contributions at AVO and KAO

Company	UOM	2003	2004	2005	2006	2007	2008
AVO							
COGS ratio	%	38.0	37.6	38.5	39.2	39.7	36.9
VA_p^{COGS}	m EUR	0	14	−15	−39	−54	35
VA^{COGS}	m EUR	0	13	0	−31	−72	−48
KAO							
COGS ratio	%	42.3	41.9	43.2	44.0	40.9	42.0
VA_p^{COGS}	m EUR	0	16	−39	−72	56	9
VA^{COGS}	m EUR	0	15	−20	−84	−36	−29

company level. AVO and KAO both lost value from COGS (−1.0%, respectively, −0.4%, see Table 2), although both companies achieved overall reductions of COGS (−1.1pp, respectively, −0.2pp, see Table 2). An analysis of the developments of the COGS ratios and the resulting value contributions, which are depicted in Table 3 for both companies, helps explaining this observation.

AVO achieved slight reductions of COGS in 2004 which resulted in initial value creation. In the periods 2005–2007, the COGS ratio developed continuously deteriorating above the initial level of 2003. In both cases, this resulted in value loss, the initial value creation from 2004 was already fully compensated in 2005. The additional losses in the subsequent periods 2006 and 2007 were not compensated by the late and comparably slight value creating improvement of COGS ratio in 2008.

KAO achieved an initial value creation from a slight decrease of COGS ratio in 2004. In the subsequent periods 2005 and 2006, the COGS ratio deteriorated considerably and developed above the initial level from 2003. The results were losses of value in both periods 2005 and 2006, which were not fully compensated by later improvements. In 2007 and 2008, the overall value contribution VA^{COGS} was still negative although the value impacts VA_p^{COGS} in these periods were positive.

A second finding is that the development of a value driver in the intermediate periods has an impact on the overall value creation.

Another observation is that all companies of the benchmarking group achieved overall reductions of at least one value driver (see columns "Chg. of ratio" in Table 2), but not all companies achieved overall value contribution from these developments (see columns "Total effects" in Table 2). An analysis of the overall changes and resulting value impacts of both value drivers for each company helps to explain this observation.

BDF and CPA created value from both value drivers. ELA, PRG, and RCU managed to overcompensate value losses resulting from working capital by positive value impacts from COGS. At AVO and HEN, the positive value impacts from working capital improvement outranged value losses resulting from COGS. KAO lost value from both value drivers, COGS and working capital. At KMB and UNI, the value losses resulting from COGS exceeded the value gains obtained by working capital developments.

As a third finding, it can be stated that the combined value impacts resulting from developments of both value drivers have to be taken into account.

A first answer to the research questions can be concluded from these observations and analyses: value contributions from COGS and working capital can be substantiated empirically by the overall developments of these value drivers. The developments of the value drivers in the intermediate periods of the considered time horizon have to be taken into account as well as the combined value impacts stemming from both value drivers.

4.2.2 Relevance of timing and continuity for value contribution

Analyzing the value driver developments and resulting value contributions in greater detail will illustrate the relevance of timing and continuity of value driver developments for value creation. Four examples will provide empirical support for the following two hypotheses:

1. Continuous improvements and long lasting developments of value drivers foster value creation: alternating improvements and deteriorations in value driver developments do not guarantee overall value achievements.
2. Timing aspects have to be considered: Improvements of value drivers achieved in later phases do not guarantee to fully compensate deteriorations from earlier phases.

Example 1 focuses effects from working capital development at HEN and BDF and illustrates the relevance of both timing and continuity of value driver developments. It can be observed (see Table 2) that HEN created more value (+7.7% of sales) from working capital development than

Table 4 Developments of working capital and resulting value contributions at BDF and HEN

Company	UOM	2003	2004	2005	2006	2007	2008
BDF							
Working capital ratio	%	22.3	20.2	18.8	15.4	16.2	14.0
VA_p^{WC}	m EUR	0	90	63	162	−39	119
VA^{WC}	m EUR	0	85	140	274	244	330
HEN							
Working capital ratio	%	19.6	17.4	14.1	13.3	11.5	11.7
VA_p^{WC}	m EUR	0	206	342	96	237	−28
VA^{WC}	m EUR	0	191	487	565	742	723

BDF (+7.4% of sales) despite the fact that the overall reduction of working capital ratio at BDF (−8.2pp) was stronger than at HEN (−7.9pp). An analysis of the developments of the working capital ratio and the resulting value contributions (see Table 4) identifies two explanatory reasons.

- HEN realized a more stable value creation by continuously reducing its working capital ratio with only one minor exception (by +0.2pp increase from 11.5% in 2007 to 11.7% in 2008). BDF on the contrary faced a considerable intermediate increase in working capital ratio (by +0.8pp from 15.4% in 2006 to 16.2% in 2007), by which more value was lost at an earlier point of time.
- HEN created value faster than BDF, because HEN achieved reductions of comparable magnitude one period earlier (by −3.3pp from 17.4% in 2004 to 14.1% in 2005 and by −1.8pp from 13.3% in 2006 to 11.5% in 2007) than BDF (by -3.4pp from 18.8% in 2005 to 15.4% in 2006 and by −2.2pp from 16.2% in 2007 to 14.0% in 2008).

These observations indicate the relevance of continuous and long-lasting working capital developments and the importance of timing aspects for value creation. This finding is illustrated graphically in Fig. 2.

Taking into account that developments of COGS create recurring impacts on company value, the relevance of timing and continuity occur more clearly in the following examples which focus COGS.

In example 2, effects from COGS developments at AVO and ELA are compared to illustrate the relevance of continuous value driver developments. It can be observed (see Table 3) that the reductions of COGS ratio achieved at AVO (−1.1pp) and ELA (−0.9pp) are of the same magnitude. Nevertheless, ELA turned this achievement into value (+1.5% of sales) while at AVO value was lost (−1.0% of sales).

An analysis of the developments of the COGS ratios and the resulting value contributions shows two reasons for this observation (see Table 5).

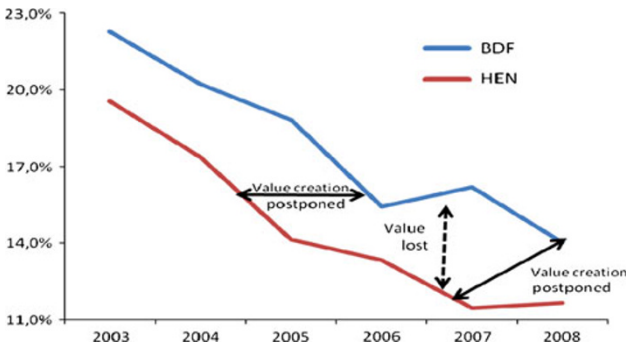

Fig. 2 Development of working capital ratios at BDF and HEN

- ELA achieved a more continuous reduction of its COGS ratio compared to AVO. At ELA, the initial COGS ratio of 26.1% in 2003 was never exceeded in the subsequent periods. Hence, in no period a negative value impact occurred. Opposed to this at AVO, the COGS ratio was significantly higher in the periods 2005–2007 than initially in 2003. This resulted in value losses at AVO which could not be overcompensated by slight achievements in 2004 and 2008.
- Although ELA did not achieve further reductions of COGS ratio in 2005 and 2008, the COGS development resulted in positive value impacts in each period. The reason for this effect is the circumstance that COGS reductions create recurring value impacts. Improvements of the COGS ratio in 2004 (−0.6pp) and 2007 (−0.9pp) resulted in value creation in the respective period and furthermore in the subsequent period (+14 m EUR in 2004 and 2005, +21 m EUR in 2007 and 2008).

The observations of this example illustrate indicate the relevance of continuous and long-lasting COGS developments for value creation and the impacts of recurring value effects stemming from COGS improvements.

In example 3, the relevance of timing effects is illustrated by comparing value creating COGS developments at BDF and PRG. It can be observed (see Table 3) that PRG created more value from COGS (+7.3% of sales) than BDF

Table 5 Developments of COGS and resulting value contributions at AVO and ELA

Company	UOM	2003	2004	2005	2006	2007	2008
AVO							
COGS ratio	%	38.0	37.6	38.5	39.2	39.7	36.9
VA_p^{COGS}	m EUR	0	14	−15	−39	−54	35
VA^{COGS}	m EUR	0	13	0	−31	−72	−48
ELA							
COGS ratio	%	26.1	25.5	25.5	26.1	25.2	25.2
VA_p^{COGS}	m EUR	0	14	14	0	21	21
VA^{COGS}	m EUR	0	13	25	25	41	55

Table 6 Developments of COGS and resulting value contributions at BDF and PRG

Company	UOM	2003	2004	2005	2006	2007	2008
BDF							
COGS ratio	%	35.7	35.5	34.7	33.9	33.2	33.1
VA_p^{COGS}	m EUR	0	7	30	54	75	77
VA^{COGS}	m EUR	0	7	33	78	136	192
PRG							
COGS ratio	%	51.0	48.8	49.0	48.6	48.0	48.7
VA_p^{COGS}	m EUR	0	528	476	580	716	538
VA^{COGS}	m EUR	0	490	900	1.364	1.896	2.267

(+4.3% of sales), although the overall improvement of the COGS ratio at BDF (−2.6pp) was higher than at PRG (−2.3pp).

An analysis of the developments of the COGS ratios and the resulting value contributions helps to explain this observation (see Table 6). Both companies show continuous improvements of the COGS, because in the periods 2004–2008 the COGS ratio never exceeds the initial level from 2003. But in the early periods 2004–2007, PRG achieved higher and earlier reductions of COGS ratio than BDF.

This example indicates the relevance of timing aspects for value creation from COGS developments.

In example 4, the relevance of timing effects is illustrated by comparing value destroying COGS developments at HEN and KMB. It can be observed (see Table 3) that KMB lost more value from COGS (−8.2% of sales) than HEN (−6.4% of sales), although the overall deterioration of the COGS ratio at HEN (+5.3pp) was higher than at KMB (+4.0pp).

An analysis of the developments of the COGS ratios and the resulting value contributions helps to explain this observation (see Table 7). Both companies show continuous COGS deteriorations, because in the periods 2004–2008 the COGS ratio continuously developed above the initial level from 2003. Hence, both companies lost value from COGS in each period. But in the early periods 2004–2007, KMB faced stronger and earlier deteriorations of COGS ratio than HEN. Therefore, the value loss at KMB was higher than at HEN.

This example illustrates the relevance of timing aspects for value creation from COGS developments.

As a second answer to the research questions, the observations from these four company examples indicate the relevance of continuous and long-lasting working capital developments and the importance of timing aspects for value creation. Although the relevance of these criteria can be seen for working capital developments, these effects occur more strongly for COGS developments.

4.2.3 Working capital components

For a detailed analysis and discussion of value contributions from working capital, its components inventory, trade receivables, and trade payables are compared (see Table 8, structure identical to Table 2).

It can be observed that no company deteriorated all of the working capital components. HEN, UNI, and AVO improved all working capital components, but with a focus on monetary value drivers, trade payables, and trade receivables. Nearly all companies, except CPA showing only slight deteriorations, improved trade payables in a value-adding way (see columns "Trade payables" of Table 8). In nearly all cases, only companies belonging to

Table 7 Developments of COGS and resulting value contributions at HEN and KMB

Company	UOM	2003	2004	2005	2006	2007	2008
HEN							
COGS ratio	%	52.6	53.0	54.6	54.7	53.6	58.0
VA_p^{COGS}	m EUR	0	−29	−144	−151	−76	−395
VA^{COGS}	m EUR	0	−27	−151	−272	−329	−603
KMB							
COGS ratio	%	65.8	66.4	68.1	69.7	68.8	69.8
VA_p^{COGS}	m EUR	0	−44	−180	−307	−236	−321
VA^{COGS}	m EUR	0	−41	−196	−442	−617	−838

Table 8 Value contributions from working capital components in FMCG industry

Company	Sales 2003	Trade receivables			Inventory			Trade payables		
		Chg. of ratio (pp)	Value contr.		Chg. of ratio (pp)	Value contr.		Chg. of ratio (pp)	Value contr.	
	m €		m €	% of sales		m €	% of sales		m €	% of sales
AVO	4,920	−2.3	111	2.3	−0.1	6	0.1	1.0	41	0.8
BDF	4,435	0.3	−12	−0.3	−3.6	145	3.3	4.9	197	4.4
CPA	7,085	−2.0	132	1.9	0.6	−35	−0.5	−0.7	−46	−0.7
ELA	3,661	0.7	−27	−0.7	0.8	−28	−0.8	0.1	2	0.1
HEN	9,436	−3.7	344	3.6	−0.7	64	0.7	3.5	315	3.3
KAO	6,845	1.0	−48	−0.7	1.3	−94	−1.4	1.4	81	1.2
KMB	10,265	−0.8	72	0.7	1.9	−175	−1.7	1.3	124	1.2
PRG	31,035	1.1	−307	−1.0	1.7	−589	−1.9	1.7	567	1.8
RCU	3,868	1.5	−54	−1.4	2.4	−92	−2.4	2.3	82	2.1
UNI	42,693	−1.3	431	1.0	−0.2	64	0.2	0.9	348	0.8
Avg.	12,424	−0.5	64	0.5	0.4	−73	−0.4	1.6	171	1.5

top five sales firms[2] optimized their trade receivables, the only exceptions are PRG with deteriorations of this working capital component and AVO, which as a comparably small company achieved value-adding improvements (see columns "Trade receivables" of Table 8). BDF is the only company which significantly created value from inventory optimization, furthermore slight inventory achievements were realized at HEN, UNI, and AVO (see columns "Inventory" of Table 8).

On average of all benchmarking companies (see row "Avg." of Table 8), improvements were achieved at trade payables (+1.6pp improvement, +1.5% value contribution) and trade receivables (−0.5pp improvement, +0.5% value contribution), while the inventory performance has deteriorated (+0.4pp deterioration, −0.4% value loss).

To gain further insight how FMCG companies focused working capital optimization over time, the developments of working capital components within the FMCG company group are analyzed in the considered horizon. Table 9 depicts these developments of Days Sales Outstanding (DSO), Days Sales of Inventory (DSI) and Days Payables Outstanding (DPO), measured in days, and furthermore the aggregated metric of Cash-to-cash (C2C) cycle measured in days expressing working capital performance.

Table 9 Developments of working capital components within FMCG company group

Metric	2003	2004	2005	2006	2007	2008
DSO [d]	36	36	36	37	36	34
DSI [d]	70	70	71	72	73	75
DPO [d]	56	61	61	64	64	65
C2C [d]	50	45	46	45	45	44

The developments of these metrics show that the performance of trade receivables remained nearly constant across the considered horizon, while trade payables were continuously improved and the inventory performance deteriorated.

[2] The top 5 sales firms are CPA, HEN, KMB, PRG, and UNI (see column sales 2003 of Table 8).

These observations can be summarized in three points:

- No company completely ignores the relevance of working capital, which has been continuously improved in FMCG industry.
- Monetary components trade payables and trade receivables are focused in working capital optimization, while the inventory performance is not considered a priority issue.
- Improvements of trade payables seem to be achievable comparably easy, while value contributions from trade receivables are realizable mainly for very large companies.

These findings provide further answers to the research questions of this paper. The observations indicate the importance of working capital as a considerable value contributor and an important criterion of SC performance. In FMCG industry, trade payables seem to be quite easily improvable in a value-adding way, which can be explained by considering the comparably strong position of a customer in the SC. For FMCG manufacturers, the optimization of trade receivables is simplified for companies of a considerable sales volume or applying a specific business model, e. g. AVO which avoids distribution channels comprising strong retailers by distributing products to final consumers via sales representatives only. During the last 5 years, the inventory performance has moved out of focus in the FMCG industry.

4.2.4 Time-dependent WACC

In this benchmarking study, a simplifying assumption is made by keeping WACC of each company constant over time, although WACC components (e.g. book value of dept or market capitalization) of a company and hence WACC itself can change over time. Consequently in a mathematically precise approach, WACC of each company would have to be calculated for every single period of the considered time horizon. Between 2003 and 2008, WACC components of the considered companies did not change to such extent that it would significantly change the findings of the benchmarking study. Thus, the aspect of time-dependent WACC is neglected to keep the balance between simplicity and precision.

An empirical sensitivity analysis indicates the feasibility of this simplification. WACC figures published by companies of the benchmarking group indicate a comparable stable WACC development in the considered horizon, e.g. HEN published the WACC figures ranging from 7.0 to 8.0% in the annual reports 2003–2008. Thus, assuming a variance of ±1.0pp for the WACC figures of the considered companies is a realistic magnitude. Calculating the value contribution for each company and each value driver based on (i) WACC figures reduced by 1.0pp and (ii) WACC figures increased by 1.0pp shows that such variance affects the value contributions of each value driver only to a negligible extent (see Table 10).

This approach is explained at the example of RCU. Assuming WACC of 6.66%, respectively, 8.66% would result in value contributions VA^{COGS} of 10.5%, respectively, 9.9% (in % of sales).

This sensitivity analysis helps answering the research questions of this paper by providing empirical support that value impacts of time-dependent WACC changes are negligible.

5 Summary and discussion

Summarizing the findings of the benchmarking study from the FMCG industry, the research questions of this paper can be answered as follows:

RQ1: Can empirical evidence be found that overall developments of SCM-related value drivers, in particular cost and working capital, have an impact on company value?

Table 10 Impacts of WACC variance (±1.0%p) on value contributions VA^{COGS} and VA^{WC}

Company	VA^{COGS} (% of sales)		Company	VA^{WC} (% of sales)	
	WACC − 1pp (%)	WACC + 1pp (%)		WACC − 1pp (%)	WACC + 1pp (%)
RCU	10.5	9.9	HEN	7.8	7.5
PRG	7.5	7.1	BDF	7.6	7.3
BDF	4.5	4.2	AVO	3.3	3.1
ELA	1.6	1.5	UNI	2.0	1.9
CPA	0.8	0.8	CPA	0.8	0.7
KAO	−0.4	−0.4	KMB	0.2	0.2
AVO	−1.0	−0.9	KAO	−0.9	−0.9
UNI	−4.5	−4.2	PRG	−1.1	−1.0
HEN	−6.6	−6.2	ELA	−1.5	−1.4
KMB	−8.4	−7.9	RCU	−1.8	−1.6

Answer: Value contributions from COGS and working capital can be substantiated empirically by the overall developments of these value drivers under consideration of the developments of the value drivers in the intermediate periods of the time horizon and the combined value impacts of both value drivers.

RQ2: What decisive criteria for value creation from these drivers can be identified empirically?

Answer: This benchmarking study indicates the relevance of continuous and long lasting value driver developments and the importance of timing aspects for value creation. Working capital can be seen as a considerable value contributor for FMCG manufacturers, which focused value creating optimization of monetary working capital components, especially trade payables. Value impacts arising from WACC changes over time were negligible.

The following brief discussion, which is based on the literature reviewed in Sect. 2.1, will point out the positioning of this benchmarking study to existing research on value-based SCM.

The link between SCM and shareholder value is often highlighted in SCM literature (e.g. [36]). Christopher and Ryals [10] point out the relevance of working capital requirements and the potential for operating cost reductions. While benchmarking of value-based SCM is rather rare so far, this paper provides empirical insights on how SCM influences the company value. In contrast to other empirical evaluations (e.g. [21, 38]), this benchmarking study applies a combined analysis of the profit-related value driver COGS and the capital-related value driver working capital. Furthermore, this paper provides an empirical analysis of value impacts of these SC-related value drivers.

According to Lambert and Pohlen [37], many SC metrics fail to identify where opportunities exist to increase shareholder value. An appropriate approach to cover this need is the benchmarking method applied here. Furthermore, it is illustrated in this paper how a model [5] can be applied on secondary data in order to determine and compare value contributions arising from SCM. This is in line with various methods of measuring value impacts of SCM in order to show customers and top management the value which is being created by SCM [36].

The relevance of working capital for business efficiency and enterprise value as stated by Walters [67] is fostered by empirical evidence shown in this paper. The observation that manufacturing companies tend to optimize their working capital at their suppliers' expenses by increasing trade payables [38] is reinforced for the FMCG industry by this benchmarking study. The findings of Farris and Hutchison [20] that inventory reduction has priority in working capital optimization is not fostered by the evaluation presented in this paper, which identifies that FMCG industry did not seem to consider inventory performance as a priority topic. In line with other research papers (e.g. [48]), this benchmarking study provides empirical support for the argument that the performance of working capital or its components is linked to the financial performance of a firm.

Further indication from empirical analysis is provided by this paper to support the finding of Brandenburg and Seuring [5] regarding the relevance of continuity and timing aspects of value driver developments as decisive criteria for value creation.

6 Conclusion

The benchmarking study presented in this paper gives empirical evidence of the value impacts of developments of the value drivers COGS and working capital. Continuity and timing aspects of value driver developments are identified as important criteria for value creation, while effects of time-dependent WACC turned out to be negligible. It is shown that, although with different focus, all considered companies from FMCG industry improved SCM regarding overall cost or capital performance, but not all companies created value from these improvements. Especially, the relevance of the working capital performance is identified empirically with its monetary components being in focus of the FMCG industry, while nearly all considered companies neglect the inventory performance. It is observed that trade payables optimization has been achieved by most companies while improvements of trade receivables seem to require a certain company size or a special business model.

Research in this benchmarking study was limited by availability and comparability of data from annual reports. Structural changes, such as acquisitions or divestments, could be reflected regarding their value impacts only to a limited extent. Furthermore, conflictive effects of SC optimization on cost and capital performance, for e. g., improvements of working capital resulting in cost increases, could not be evaluated thoroughly in this benchmarking study. An evaluation of conflicts, for e. g., between sales growth and trade receivables optimization, cost-effective cash discounts and trade payables improvement or decreasing cost of production or warehousing and inventory performance, would require company-internal data.

Complementary analyses of value-based SCM in FMCG industry as well as cross-industrial benchmarking offer further research potential. A benchmarking of COGS components or other SC cost categories as well as a causal analysis on conflictive effects from cost and capital optimization would create further insights on value creation from SCM. Further empirical analyses would enrich research on value-based SCM. These comprise evaluations

of other value drivers, for e. g., fixed assets or non-financial SC performance issues, or cross-industrial benchmarking to identify trends specific for or independent from certain industries. Beyond this, extending the benchmarking group by suppliers, service providers, retailers, and distributors of the considered companies would help evaluate if value was created in a co-operative or competitive way in SC networks from FMCG industry.

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Appendix

See Tables 11 and 12

Table 11 Acronyms and parameters used in this paper

Acronyms	C2C	Cash-to-cash
	COGS	Cost of goods sold
	DCF	Discounted cash flow
	DES	Discrete-event simulation
	DPO	Days payables outstanding
	DSI	Days sales of inventory
	DSO	Days sales outstanding
	EVA	Economic value added
	FMCG	Fast moving consumer goods
	SCM	Supply chain management
	VBM	Value-based management
Currencies	EUR	Euro
	GBP	British Pound Sterling
	USD	US Dollar
Companies	AVO	Avon Products Inc.
	BDF	Beiersdorf AG
	CPA	Colgate-Palmolive Company
	ELA	The Estée Lauder Companies Inc.
	HEN	Henkel KGaA
	KAO	Kao Corporation
	KMB	Kimberly-Clark Corporation
	PRG	The Procter & Gamble Company
	RCU	Reckitt Benckiser Group plc
	UNI	The Unilever Group
Parameters	$COGS_p$	Cost of goods sold in period p
	D	Debt (derived from book value)
	E	Equity (defined as market capitalization)
	k_D	Cost of debt D
	k_E	Cost of equity E
	S_p	Sales in period p
	T	Tax rate
	VA^{COGS}	Value contribution arising from COGS
	VA_p^{COGS}	Value contribution in period p arising from COGS
	VA^{WC}	Value contribution arising from working capital
	VA_p^{WC}	Value contribution in period p arising from working capital
	WACC	Weighted average cost of capital

Table 12 WACC for each company of the benchmarking group

Company	AVO	BDF	CPA	ELA	HEN	KAO	KMB	PRG	RCU	UNI
WACC (%)	7.58	6.64	7.79	7.57	7.56	4.23	7.70	7.72	7.66	6.26

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