BART DE LANGHE

Contingencies

Learning Numerical and Emotional Associations in an Uncertain World

Contingencies

Learning Numerical and Emotional Associations in an Uncertain World

Contingencies

Learning numerical and emotional associations in an uncertain world

Contingenties

Het leren van numerieke en emotionele associaties in een onzekere wereld

Thesis

to obtain the degree of Doctor from the
Erasmus University Rotterdam
by command of the
rector magnificus

Prof.dr. H.G. Schmidt
and in accordance with the decision of the Doctorate Board.

The public defense shall be held on
Friday June 10, 2011 at 11:30 hours

by
Bart de Langhe

born in
Leuven, Belgium

ERASMUS UNIVERSITEIT ROTTERDAM

Doctoral Committee

Promotors:

Prof.dr.ir. B. Wierenga

Prof.dr. S.M.J. van Osselaer

Other members:

Prof.dr.ir. G.H. van Bruggen

Prof.dr. H. Baumgartner

Prof.dr. D.H.R.V. Smeesters

Erasmus Research Institute of Management – ERIM
The joint research institute of the Rotterdam School of Management (RSM)
and the Erasmus School of Economics (ESE) at the Erasmus University Rotterdam
Internet: http://www.erim.eur.nl

ERIM Electronic Series Portal: http://hdl.handle.net/1765/1

ERIM PhD Series in Research in Management, **236**
ERIM reference number: EPS-2011-236-MKT
ISBN 978-90-5892-278-6

Design: B&T Ontwerp en advies www.b-en-t.nl

This publication (cover and interior) is printed by haveka.nl on recycled paper, Revive®.
The ink used is produced from renewable resources and alcohol free fountain solution.
Certifications for the paper and the printing production process: Recycle, EU Flower, FSC, ISO14001.
More info: http://www.haveka.nl/greening

To Anneleen

Acknowledgements

First of all, I would like to express my deepest gratitude to my advisors, Stijn van Osselaer and Berend Wierenga. I feel blessed to have been their student. I thank Stijn for adivising me to aim high; for being there whenever I needed support; for his no-nonsense approach; and for his sharp and humorous one-liners about rats, s***, and walls. Berend must be one of the nicest people in academia. He has taught me the importance of keeping in mind the bigger picture while looking at things in close-up.

Rotterdam School of Management is a wonderful place to work. Many thanks go to all marketing professors at Rotterdam School of Management. In particular, I would like to thank Stefano Puntoni, for his continuous support, generosity, honesty, and intelligence. Not only have I found the best possible mentor in him, he is also a fantastic co-author and close friend. I love the projects we are working on and feel excited about the road ahead. Warm thanks go to my fellow students in the Ph.D. program. In particular, I would like to thank Steven Sweldens and Daniel Fernandes. Steven has taught me countless things, but I especially appreciate his honest and analytical brain. From Daniel I have learned that everything is possible and that anything can be done if you just try hard enough. A huge thank you to Annette and Jolanda, the secretaries at the marketing department, for helping me with everything and anything. I gratefully acknowledge the financial support from the Erasmus Research Institute of Management and the Erasmus Trustfonds.

Among the many talented and generous people I was lucky to meet in academia, I would like to mention Ann McGill. Her human and intellectual capabilities are a great example for me.

I would like to thank my family and friends in Belgium for their constant love and support. I owe them everything. In particular, a very special thank you goes to my parents for their unconditional love, support, and belief in my abilities.

Finally, I fall short of words to express how grateful I feel to my wife, Anneleen. My time in Rotterdam has had a huge impact on her life. She created space and time to develop and supported me through thick and thin. I love love love her humor and common sense. I feel secure knowing we are walking side by side. I dedicate my dissertation to her and our future together.

Table of Contents

List of Tables

List of Figures

Chapter 1. Introduction

Probably the most fundamental building block of human cognition is the ability to detect and learn systematic associations between variables, between cues an outcomes. For instance, a product manager may learn through experience that there is an association between specific features of an advertisement (e.g., celebrity endorsement) and the effectiveness of the advertisement. Or, after repeated purchase-and-consumption episodes in the marketplace, a consumer may learn that there is an association between selling price and product quality. The accurate assessment of cue-outcome associations in the environment is a key tool of human cognition because it allows us to explain the past, control the present, and predict the future (Crocker 1981).

Besides short introductory and concluding chapters, this dissertation consists of four chapters, each related to different aspects of consumer and managerial learning. Each chapter is based on an article that is either under review, forthcoming, or published in academic journals in marketing and psychology. In the sections below, I briefly introduce each chapter and indicate how they are related.

Chapter 2

Observations are typically understood as a function of a systematic and a random component. For example, variation in stock prices can be decomposed in a part that can be explained based on systematic effects, such as company-specific (e.g., sales, profitability, profit margin) and other (e.g., political stability, competition) indicators (i.e., the systematic component) and a part that is left unexplained by these variables (i.e. the random component). Cognitive scientists studying how human beings learn cue-outcome associations have predominantly focused on the systematic component. Classic findings include that positive functions are easier to detect than negative functions (Brehmer 1974) and that linear patterns are easier to detect than nonlinear patterns (DeLosh, Busemeyer, and McDaniel 1997). In contrast, the random component has been the object of only a limited body of research, mostly focused on how the overall amount of randomness influences function learning or covariation assessment (Hagafors and Brehmer 1983). A standard assumption made in this stream of research is that randomness in the world is homoscedastic (i.e., unexplained variation in the outcome is constant over the whole range of the cue). However, because many (if not most) cue-outcome relationships show obvious patterns of heteroscedasticity, it is hard to maintain this assumption of homoscedastic randomness. This raises the question of whether covariation assessment and cue-outcome inferences are systematically affected by whether uncertainty is homoscedastic versus heteroscedastic. Chapter 2 is the first piece of research addressing this issue.

Chapter 3

Human beings are not created equal nor do they act and learn in a social vacuum. That is, there are huge inter-individual differences in individuals' predispositions (e.g., in terms of intelligence and thinking style) and in the characteristics of the social environment in which individuals operate (e.g., different types of accountability). Both characteristics of the decision maker and the social context may have a strong influence on the learning process and the resulting quality of judgments (Payne, Bettman, and Johnson 1993). In Chapter 3 of this dissertation, I examine how process versus outcome accountability affects cue-outcome learning. Individuals are held accountable whenever their performance is monitored and/or evaluated. Process accountability focuses on the justification of the process used to arrive at a judgment or decision. Outcome accountability focuses solely on the quality of the decision or the accuracy of a judgment. Academic findings suggest that to maximize judgment quality, process accountability is consistently more desirable and uniformly superior to outcome accountability (e.g., Brtek and Motowidlo 2002; Siegel-Jacobs & Yates 1996; Simonson and Staw 1992). The current research challenges the view that it is always better to hold decision makers accountable for their decision process rather than their decision outcomes. I show that the effects of process and outcome accountability on judgment quality depend on (1) the characteristics of the functional relationships that need to be learned and (2) on individuals' cognitive predispositions.

Chapter 4

Whereas Chapters 2 and 3 examine how people detect and learn abstract statistical relationships, Chapter 4 focuses on the more substantive area of language learning. Young children must learn the semantic meaning of words by detecting systematic associations between lexical representations (i.e., initially meaningless words or letter strings) and the objects and events they refer to in the world. Likewise, the emotional connotation and intensity of words is determined by using and hearing words repeatedly in different contexts. As a consequence of globalization, consumers around the world learn to understand and speak multiple languages. This raises the question of whether there are systematic differences in the perceived emotional intensity of people's native versus their second language. Chapter 4 presents five studies showing that advertising messages in consumers' native language tend to be more emotionally intense than when they are presented in consumers' second language. To explain this finding, a language-specific episodic trace theory of language emotionality is introduced. This theory is rooted in associative learning models of human cognition.

Chapter 5

Chapter 5 builds on the finding that words in one's native language are perceived to be more emotionally intense than words in one's second language (see Chapter 4). Aspects of globalization such as the growth of the Internet, the cosmopolitanism of large cities, and cross-national trade imply that, relative to a few decades ago, a much larger share of marketing research data is now collected from multilingual or multicultural respondents. It is common for marketing researchers to collect data from respondents who are not native speakers of the language in which the questions are formulated, typically English. For instance, consumers around the world often provide online customer ratings for products and services (e.g., CDs, books, hotels, etc.) using anchors such as "love", hate", or "happy". Other examples include opinion polls of ethnic minorities and internal surveys in multinationals. This raises the question of whether responses to emotional items are systematically affected by whether the rating scale on which responses are provided is presented in a respondent's native versus second language. This chapter documents the Anchor Contraction Effect (ACE), which is the systematic tendency among bilingual respondents to report more intense emotions when answering questions using rating scales in their second language. In other words, consumers are more likely to say that they love or hate a product or movie when they are asked the question in their second language than when they are asked in their native language. Because of its more substantive focus, the last chapter of this dissertation is somewhat different from the earlier chapters.

Chapter 2. The Effect of Homoscedastic versus Heteroscedastic Uncertainty on Cue-Outcome Learning

Dealing with uncertainty about decision outcomes is a paramount challenge in decision making. Consumers buy products while having imperfect knowledge about product quality. Managers decide between investment options with great uncertainty about future returns. To maximize decision quality, decision makers can reduce outcome uncertainty by relying on cues that are observable and probabilistically related to the outcome to be judged (Karelaia and Hogarth 2008). For example, because price is often correlated with quality, consumers may use price as an indicator for product quality (Rao and Monroe 1989).

The way outcome uncertainty that cannot be explained by a predictive cue "spreads" over the range of the cue can be very different. Although sometimes unexplained variance[1] is constant (i.e., homoscedastic) across different regions of the cue, often residual variance is different (i.e., heteroscedastic) for different cue ranges. For example, a regression of quality on price for the laundry detergents tested by Consumer Reports (2009) yields a mean squared error of 84.34. However, distinguishing between low-priced and high-priced brands based on a median split (price/load < ¢17 vs. price/load ≥ ¢17) reveals a mean squared error of only 25.76 for low-priced brands, whereas the mean squared error for high-priced brands is more than five times larger (139.25), indicating a high level of heteroscedasticity, with unexplained variance increasing over the price range. Similar heteroscedasticity can be observed in many other categories (e.g., kitchen knives, toilet paper, digital cameras, or electric and gas driers). What are the implications of homo- versus heteroscedasticity for consumers' price-quality beliefs? Does the nature of randomness influence anticipated product quality and product valuation? More generally, is cue-

1 In this manuscript, the terms "unexplained variance", "residual variance", and "error variance" are used interchangeably to refer to the mean squared distance of all observations from the least-squares regression line.

outcome learning affected by the homo- versus heteroscedastic nature of unexplained variance in the outcome?

These important question have not been addressed in the vast literature examining how people acquire cue-outcome relationships, including research on contingency learning (Allan 1993; van Osselaer et al. 2004), covariation judgments (Baumgartner 1995; Bettman et al. 1986; Pechmann and Ratneshwar 1992), categorization (Erickson and Kruschke 1998; Medin and Schaffer 1978), and function learning (DeLosh et al. 1997; Juslin et al. 2008). We present six experiments demonstrating that consumers perceive greater cue-outcome covariation (e.g., between price and quality) when error variance is heteroscedastic than when it is homoscedastic. Four additional experiments attest to the managerial importance of this insight by establishing systematic differences in anticipated product quality and product valuation between homo- and heteroscedastic environments.

2.1 Theory

To illustrate how homo- versus heteroscedasticity may impact covariation judgments[2], we turn to a stylized homoscedastic scenario (Figure 1) and a stylized heteroscedastic scenario (Figure 2). Across the two graphs, the variance of the cue S^2_x is the same (674.67), the slope of the least-squares regression of the outcome on the cue is the same (.30), and the overall error variance S^2_e is the same (166.67)[3]. The graphs only differ in the distribution of the error over the range of the cue. In Figure 1, error variance is constant in different regions of the cue (see the white bars in Figure 3), whereas in Figure 2 error variance increases in higher regions of the cue (see the black bars in Figure 3).

The *overall* association strength between a cue and an outcome is traditionally measured using Pearson's correlation coefficient or associated indices (e.g., coefficient of determination). Such measures are based on total error variance and therefore ignore local differences in unexplained variance. The two scenarios in Figure 1 and Figure 2, for instance, yield the same overall correlation (.52). Nevertheless, there are

2 In this manuscript, the terms "covariation", "correlation", and "association strength" will be used interchangeably.

3 $S_x^2 = 1/n \sum (x - \bar{x})^2$ and $S_e^2 = 1/n \sum (y - \hat{y})^2$

important differences between the homo- and heteroscedastic scenarios in the underlying *local* cue-outcome association strength. In the homoscedastic case, the association strength between cue and outcome is identical across the whole range of the cue, whereas in the heteroscedastic case the cue-outcome association becomes weaker with increasing values of the cue, that is, with increasing error variance. This situation was illustrated in the introduction with Consumer Reports' data on laundry detergents, where the price-quality relationship is stronger for low-priced detergents, but weaker for high-priced detergents.

Figure 1: A stylized homoscedastic scenario.

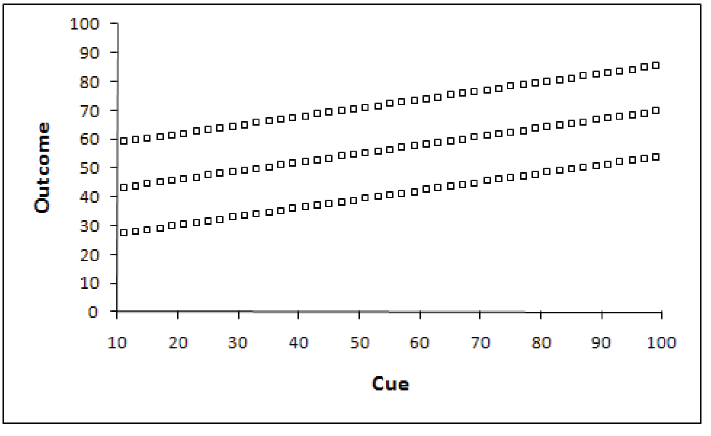
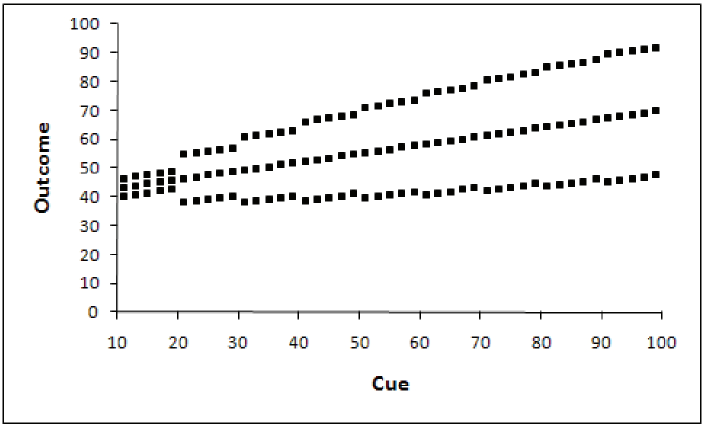


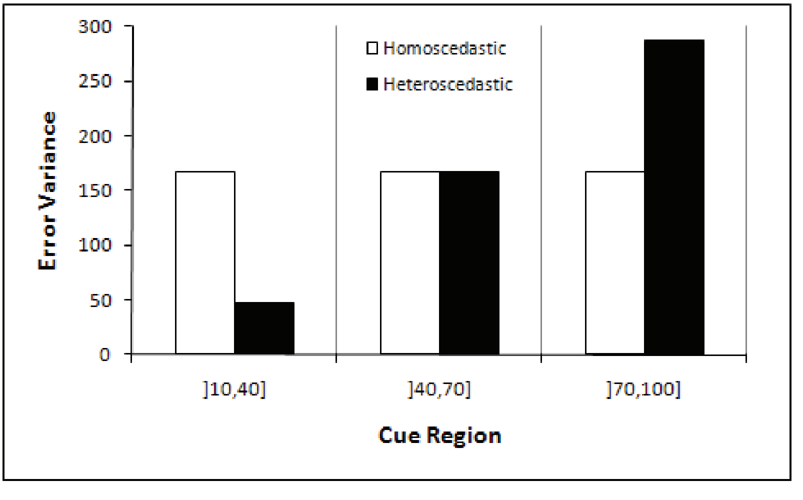
Figure 2: A stylized heteroscedastic scenario.



If the overall cue-outcome association strength is the critical input for covariation inferences, then local differences in uncertainty may not matter, as long as the overall level of uncertainty remains the same. However, if people are in fact sensitive to local variations in cue-outcome association strength, the distinction between homoscedastic and heteroscedastic environments may be crucial.

Are individuals sensitive to local differences in cue-outcome association strength? Some findings in the learning literature may be taken to suggest they are. For example, exemplar-based learning models propose that people attend to specific cue values together with their respective outcome values. In other words, exemplar-based learning implies that specific cue-outcome pairs are stored in long term memory (Juslin et al. 2008). Similarly, recent rule-based learning models propose that individuals partition the cue range into multiple, smaller regions and form region-specific rules concerning the relationship between the cue and the outcome (Kalish et al. 2004). Likewise, the perceptual categorization literature corroborates the idea that humans make sense of continuous variables by sorting them into discrete categories (Harnad 1987). It is therefore surprising that prior research has not considered the possibility that people are sensitive to local correlations. If they are, homo- versus heteroscedastic error may influence covariation learning.

Figure 3: Error variance in different cue regions in the homoscedastic and the heteroscedastic scenario.



In the following sections, we briefly introduce the notion of local correlation from the statistical literature and hypothesize how homo- versus heteroscedastic error variance may affect the perception of local and overall association strength. From this theorizing, we draw implications for marketing practice.

2.1.1 Local Correlation

According to standard linear statistical theory, the *overall* correlation coefficient measures the proportion of the total variance in an outcome that can be explained by a linear regression of that outcome on a cue. More formally, the overall cue-outcome correlation is a function of the variability in the outcome explained by the cue and the variability in the outcome not explained by the cue, that is the variance of the error (Cohen et al. 2003):

$$|r| = [\text{Explained variance}/(\text{Explained variance} + \text{Unexplained variance})]^{1/2}, \text{ or}$$
$$r = bS_x/(b^2S^2_x + S^2_e)^{1/2}, \qquad \text{(Equation 1)}$$

where b is the estimated slope of the regression of the outcome on the cue, S^2_x is the variance of the cue, and S^2_e is the variance of the error (i.e., the average squared distance of the observations from the regression line). Thus, the overall correlation coefficient is a function of overall error variance and does not take into account whether the overall error is distributed homoscedastically or heteroscedastically over the range of the cue.

More recently developed *local* correlations measure the association strength between a cue and an outcome in a specific region or partition of the cue. To study local changes in association strength, the formula for the overall correlation can be adapted by conditioning on the specific partition of the cue (Bjerve and Doksum 1993; Blyth 1994; Doksum et al. 1994). The local correlation (i.e., in partition p of the cue X) can therefore be expressed as:

$$|r(p)| = [\text{Explained variance(p)}/(\text{Explained variance(p)} + \text{Unexplained variance(p)})]^{1/2}, \text{ or}$$
$$r(p) = b(p)S_x/(b^2(p)\, S^2_x + S^2_e(p))^{1/2}, \qquad \text{(Equation 2)}$$

where b(p) is the estimated slope of the regression of the outcome on the cue in partition p of the cue and S^2_e(p) is the variance of the error in partition p of the cue (i.e., the average squared distance of the observations in partition p of the cue from the regression line). Thus, for a given cue, local cue-outcome association strength depends on the local slope and the local error variance.

2.1.2 The Influence of Homo- vs. Heteroscedasticity on Perceived Local Correlation

Consider again the stylized homoscedastic and heteroscedastic scenario in Figure 1 and Figure 2 and refer back to Equation 2.The slope $b(\mathrm{p})$ is the same across the whole range of the cue. This implies that the variance explained by the cue $b^2(\mathrm{p})S^2_{\mathrm{x}}$ remains the same in every region of the cue (i.e., the numerator and the first term of the denominator are constant in all partitions of the cue). In the homoscedastic scenario, error variance $S^2_{\mathrm{e}}(\mathrm{p})$ is also constant in all regions of the cue (i.e., the second term in the denominator is constant in all partitions of the cue). As a consequence, the local correlation in the homoscedastic scenario is identical in all regions of the cue and equal to the overall correlation. Heteroscedasticity implies that, relative to a homoscedastic scenario, error variance is larger in at least one region and smaller in another region of the cue. In the heteroscedastic scenario, explained variance $b^2(\mathrm{p})S^2_{\mathrm{x}}$ is again constant over the whole range of the cue but error variance $S^2_{\mathrm{e}}(\mathrm{p})$, the second term in the denominator, increases with higher cue values. Dividing a constant by the same constant plus a positive variable term implies increasingly small incremental changes, for example (3/(3+1) - 3/(3+2)) > 3/(3+2) - 3/(3+3)). Similarly, the local correlation decreases at a decelerating rate as local variance increases. Stated in another way, the impact of error variance on local correlation is decreasing (i.e., the higher error variance, the lower the correlation) and decelerating (i.e., additional increases in error variance have an increasingly small impact). This implies that in absolute terms the positive impact of a reduction in error variance on the local correlation is larger than the negative impact of a same size increase in error variance. Thus, comparing the heteroscedastic with the homoscedastic scenario, the positive impact of the reduction in error variance on the local correlation in lower partitions of the cue is greater in absolute terms than the negative impact of the increase in error variance on the local correlation in higher partitions of the cue.[4] As a consequence, unlike the homoscedastic

---

4 A similar argument can be made when the cue-outcome relationship is negative. In that case, the negative impact of a reduction in error variance on the local correlation is greater in absolute terms than the positive impact of an increase in error variance on the local correlation. In other words, regardless of the direction of the general cue-outcome relationship (i.e., positive or negative), heteroscedasticity makes the underlying pattern of local correlations more extreme.

scenario, local correlations in the heteroscedastic scenario are different in different regions of the cue, and are on average more extreme than the overall correlation.

Figure 4: Objective local correlation in different cue regions in the homoscedastic and the heteroscedastic scenario.

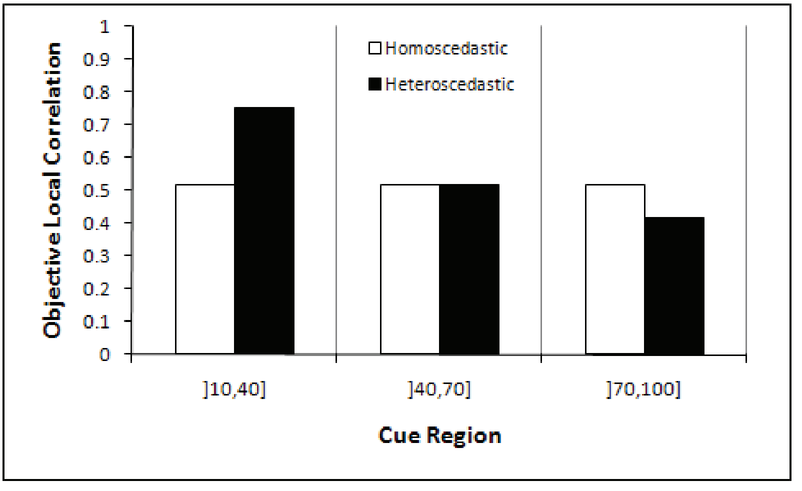


Figure 4 illustrates this effect by plotting the local correlation in the low, medium and high cue range for the homoscedastic scenario (the white bars) and the heteroscedastic scenario (the black bars). Going from Figure 3 to Figure 4 makes apparent that when moving from the homoscedastic to the heteroscedastic scenario in absolute terms a decrease in error variance (in the low cue range) has a larger positive impact on the local correlation than an identical increase in error variance (in the high cue range). Specifically, a decrease in error variance of 120 in the lower range of the cue increases the local correlation from .52 in the homoscedastic scenario to .75 in the heteroscedastic scenario (i.e., an increase of 44%), while an increase in error variance of 120 in the higher range of the cue decreases the local correlation from .52 in the homoscedastic scenario only to .42 in the heteroscedastic scenario (i.e., a decrease of 20%).

So far, our discussion has centered on the statistical relationship between local error variance and local correlations. However, individuals' judgments of cue-outcome associations emerge only after a psychological interpretation of objective correlations. We therefore now turn to the role of psychological factors in determining the consequences of heteroscedasticity for perceived local cue-outcome association strength. A basic law of human psychophysics that underpins much psychological research (e.g., Prospect Theory) is the decreasing sensitivity to sensory stimulation. In the context of inferences of covariation, Jennings et al. (1982) showed that individuals' subjective judgments of correlation become increasingly insensitive to changes in objective correlation as the objective correlation decreases. In particular, based on patterns of association between objective and subjective correlations, Jennings et al. (1982) relate the subjective correlation j(r) to the objective correlation with the following formula: $j(r) = 1 - (1 - r^2)^{1/2}$. Therefore, human psychophysics implies an additional nonlinear transformation to the relationship between error variance and perceived local covariation.

Figure 5: Subjective local correlation in different cue regions in the homoscedastic and the heteroscedastic scenario.

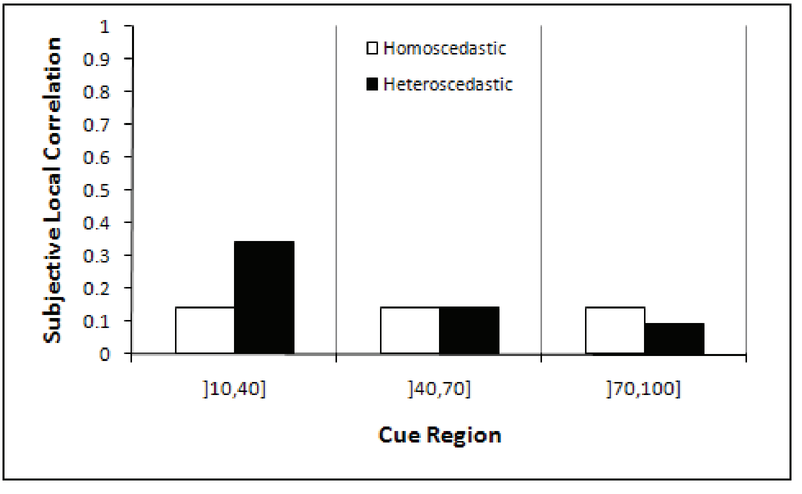


Figure 5 plots the subjective local correlation in the low, the middle, and the high range of the cue. As can be seen when relating Figure 3 to Figure 5, a decrease in error variance of 120 in the lower cue region increases the perceived local correlation from .14 in the homoscedastic scenario to .34 in the heteroscedastic scenario (i.e., an increase of 243%), while an increase in error variance of 120 in the higher cue range decreases the perceived local correlation from .14 in the homoscedastic scenario only to .08 in the heteroscedastic scenario (i.e., a decrease of 37%). Thus, human psychophysics exacerbates the purely statistical disproportional effect of decreases in error variance (relative to increases in error variance) on local correlations.

In sum, heteroscedasticity implies that, relative to a homoscedastic scenario, error variance is larger in at least one region and smaller in another region of the cue. We have argued that, because of the statistical relationship between local error variance and local correlation and the laws of human psychophysics, the positive impact of the reduction in error variance on the perceived local cue-outcome association strength in the first region should be greater in absolute terms than the negative impact of the increase in error variance on the perceived local cue-outcome association strength in the second region. For the laundry detergent category, this implies that the perceived association between price and quality will be somewhat weak for high-priced detergents, but much stronger for low-priced detergents. If unexplained variance in the laundry detergent category were homoscedastic instead of heteroscedastic, the perceived association between price and quality would be relatively weak for both low-priced and high-priced detergents.

2.1.3 The Influence of Homo- vs. Heteroscedasticity on Perceived Overall Correlation

Marketing studies examining consumers' judgments of covariation typically present participants with data about a cue X (e.g., price) and an outcome Y (e.g., quality) and ask them to judge the direction and the strength of the overall relationship between them (Baumgartner 1995). We hypothesize that these judgments are at least partially informed by consumers' perceptions of local correlations. Unless local correlations in the high error ranges are dramatically overweighted, using perceptions of local correlations to inform overall covariation judgments should yield more extreme overall covariation judgments under heteroscedastic than homoscedastic outcome uncertainty. As we outlined above, this is the case because the increase in perceived local correlation in low-error partitions of the cue is larger than the decrease in perceived local correlation in high-error partitions of the cue (relative to the medium-error in a homoscedastic scenario).

2.1.4 The Influence of Homo- vs. Heteroscedasticity on Outcome Predictions

As explained earlier, the correlation coefficient is a function of the proportion of variance that can be explained by a predictive cue. In other words, the cue-outcome correlation reflects the predictability of an outcome based on a cue. From a normative point of view, the predictability of the outcome should not inform predictions about the expected level of the outcome (e.g., in linear regression, the slope of the regression line relating x and y should not be confused with the correlation between x and y). However, prior research using binary cues and outcomes has found that people generate more extreme conditional probability judgments (i.e., the probability that an outcome B occurs when a specific cue A is present) when the cue-outcome association is stronger. In other words, the estimated probability that B is present given that A is present should not depend on instances in which A is not present, yet conditional probability judgments are biased by these instances (De Houwer et al. 2007; Price and Yates 1993). This is because people take into account how well B can be predicted based on A when judging the likelihood that B is present given that A is present (Lagnado and Shanks 2002).

Generalizing to the case of continuous variables, this suggests that, if the perceived cue-outcome correlation (i.e., the perceived predictability of the outcome based on the cue) is higher in heteroscedastic environments than in homoscedastic environments (see above), outcome predictions should also be more extreme under hetero- than homoscedasticity. In other words, for the same mean level of the outcome, we expect more extreme predictions when the perceived overall correlation between cue and outcome is stronger. This should not happen, however, when there is little outcome uncertainty. In this case, people should learn to accurately predict the outcome. For example, if all low-priced laundry detergents a consumer encounters are of low quality, it is likely that consumers will recognize this fact and accurately predict low quality when confronted with a low-priced detergent.

This expectation of prediction accuracy in the low-uncertainty range, together with the dependence on perceived cue-outcome correlation in the high-uncertainty range, yields a specific pattern of over- and underestimation of the outcome depending on the type of heteroscedasticity. If the general relationship between cue and outcome is positive and error variance increases from low to high levels of the cue (cf. opening example about laundry detergents), participants should be accurate for lower cue values but increasingly *overestimate* the outcome for higher cue values. For instance, going back to the laundry detergent example, the heteroscedastic increasing nature of quality uncertainty may lead consumers to accurately predict quality for low-priced detergents but to overestimate the quality of high-priced detergents. If instead the general relationship between cue and outcome is positive and error variance decreases from low to high levels of the cue, participants should be accurate for higher cue values but increasingly *underestimate* the outcome for lower cue values.

2.1.5 Summary of Studies

We conducted a series of studies to test our hypotheses concerning the effect of homo- versus heteroscedasticity on (a) judgments of overall association strength or predictability (Studies 1-4); (b) perceived local association strength (Studies 5-6); and (c) outcome predictions (Studies 7-10). Studies 7 and 8 show that quality predictions are more extreme when the correlation between price and quality is stronger, even when the slope of the least-squares regression line of the outcome on the cue is kept constant. Studies 9 and 10 examine the effect of homo- versus heteroscedasticity in the objective price-quality relationship on price-based quality predictions and product valuation.

2.2 Empirical Studies

Study 1

Study 1 examines the effect of homo-versus heteroscedasticity on overall judgments of covariation. Participants were sequentially presented with price-quality information about several Chilean wine brands. Variance in wine quality not explained by price was either heteroscedastic or homoscedastic. Later, participants were asked to rate the strength of association between price and quality. We predict that participants will judge the association between price and quality to be stronger when outcome uncertainty is heteroscedastic than when it is homoscedastic.

Method

Participants and Design

Thirty-one undergraduate students participated in the study in exchange for extra course credit (11 females; M_{age} = 20.55, SD = 1.88). Error variance (homoscedastic vs. heteroscedastic increasing) was manipulated between-participants. In the homoscedastic condition, error variance was constant over the whole price range. In the heteroscedastic condition, error variance increased at higher prices.

Procedure

We presented participants sequentially with 30 different brands of Chilean wines and their respective selling prices and objective quality ratings. Quality was expressed as a score ranging from 0 to 10. Participants were instructed to observe the price and quality for each brand carefully and were told that objective quality was determined by a panel of wine experts in a blind taste test. In fact, unknown to participants the quality of the wine was predetermined according to the following formula:

$$\text{Quality} = 3.33 + 0.11 * \text{Price} + \textit{Error} \qquad \text{(Equation 3)}$$

Selling prices ranged from €5 to €34[5]. To make sure that participants obtained equal information about wine quality across the whole price range, we divided the price range in 10 blocks of 3 different prices (i.e., block 1 ranged from €5 to €7, block 2 ranged from €8 to €10, …, and block 10 ranged from €32 to €34), and three prices were randomly sampled with replacement from each block.

For each triplet of prices drawn from each of the 10 price blocks, we added a positive error component to the quality score of the first price, a negative error component (equal in absolute value to the positive error component) to the quality score of the second price, and no error component to the quality score of the third price. In the heteroscedastic increasing error variance condition, the error component was 0 in block 1 and increased with 0.33 with every price block. In the homoscedastic error variance condition, the error component was instead set to 1.78 in all 10 price blocks. This procedure ensured that across conditions the variance of price (74.25), the slope of the regression of quality on price (0.11), and overall error variance were identical (2.11), resulting in the same correlation of .55 across the three conditions of the study. See Figure 6 for a graphical representation of the homoscedastic and Figure 7 for a graphical presentation of the heteroscedastic task structure.

After the presentation of all 30 brands, participants were asked to indicate to what extent price was a good predictor of quality for Chilean wines using a slider bar ranging from 0 (not a good predictor at all) to 1 (a perfect predictor).

5 All data were collected in Europe, hence the Euro was the currency students were most familiar with.

Results

A one-way ANOVA on perceived association strength revealed a main effect of error variance ($F(1, 29) = 5.01$, $p < .05$). Participants in the heteroscedastic increasing condition (M = .58, SD = .21) indicated that there was a stronger association between price and quality for Chilean wines than participants in the homoscedastic condition (M = .40, SD = .22). See Table 1.

Figure 6: Graphical representation of the homoscedastic task structure used in Study 1.

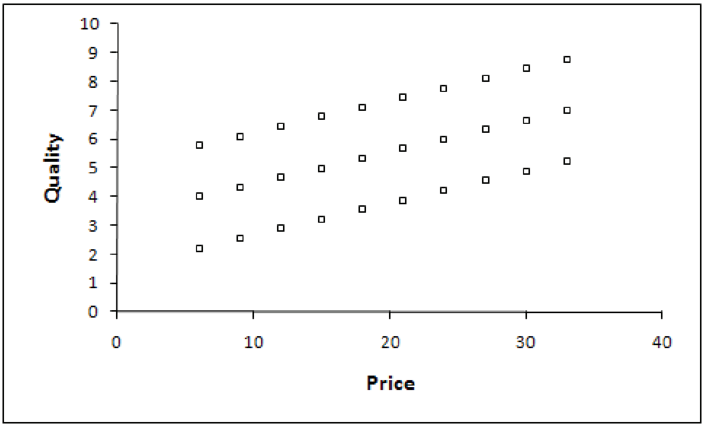


Figure 7: Graphical representation of the heteroscedastic task structure used in Study 1.

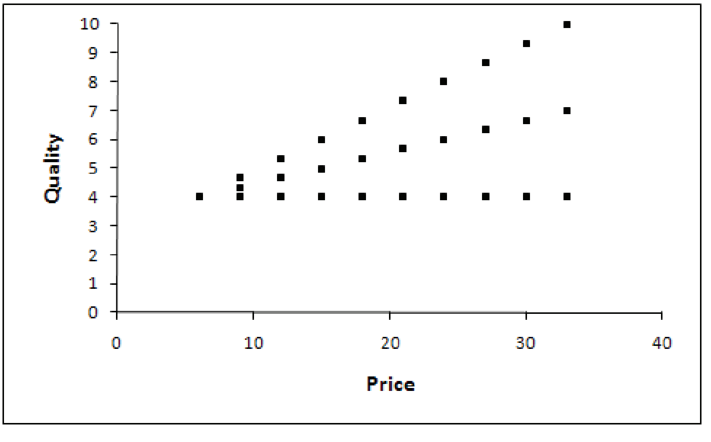


Table 1: Mean ratings and respective standard deviations obtained in Studies 1, 2, 3, and 4.

Study	*Overall r*	Homoscedastic Outcome Uncertainty		Heteroscedastic Outcome Uncertainty	
		M	*SD*	*M*	*SD*
1 (*n* = 31)	.55	.40	.22	.58	.21
2 (*n* = 29)	.62	2.72	1.53	3.13	1.66
3 (*n* = 45)	.62	10.84	24.01	14.53	21.41
	.80	34.44	31.09	45.96	23.13
4 (*n* = 43)	-.60	-21.22	18.50	-28.55	25.42
	-.80	-31.69	22.28	-38.92	1.66

Study 2

Formal judgments of direction and strength of association like the one used in Study 1 are probably not a common occurrence in consumers' everyday life. Therefore, a goal of Study 2 was to replicate the findings of Study 1 using a dependent measure that lies closer to a consumer's intuitive understanding of covariation. Specifically, we asked participants to indicate how confident they felt that they could accurately predict wine quality when informed about the selling price of the bottle. Consistent with Study 1, we predict that participants will feel more confident when error variance is heteroscedastic than when it is homoscedastic.

Another goal of Study 2 was to assess the robustness of the effect in a different setting. In Study 1, participants learned about the price-quality association via a sequential exposure to price-quality pairs. This paradigm mimics consumers' experience of products over time. Sometimes consumers are instead presented with price-quality data in tables. For example, product comparison websites (e.g., Wine Enthusiast) typically report price-quality information for a number of products in a grid. Thus, in Study 2 participants were presented with price-quality information about wines in tabular format.

Method

Participants and Design

Twenty-nine undergraduate students took part in this study in exchange for course credit (7 females; M_{age} = 21.55; SD = 3.41). Error variance (homoscedastic vs. heteroscedastic increasing) was manipulated within-participants. Respondents were presented with two tables containing price-quality information for 18 bottles of champagne. The order of the tables was randomized.

Procedure

To generate the tables, we used the following formula:

$$\text{Quality} = 40 + .30 * \text{Price} + \textit{Error} \qquad \text{(Equation 4)}$$

The 18 prices were generated by randomly drawing two integer numbers from each of nine blocks in the 5-95 range (see Table 2). The error component was generated using a procedure similar to that of Lane, Anderson, and Kellam (1985). In the homoscedastic condition, to generate the error term, we sampled five numbers between 8 and 13. The first of these numbers was added to the first price drawn for the first block used to generate the prices, the same number was then subtracted from the second price drawn from the first block. This procedure was repeated for the subsequent 4 blocks of selling prices. The errors for the remaining prices were obtained by mirroring the errors used in the first four blocks of prices. That is, the error components used in the first block of prices were the same as those used in the last block of prices; the error components used in the second block of prices were the same as those used in the one but last block of prices; and so forth. This procedure was used to avoid that the error component alters the slope (Lane et al. 1985)

In the heteroscedastic error condition, the error components used in the homoscedastic condition were changed to generate an increase in the size of the error with an increase in price. Specifically, the squared error components for the first block of prices in the homoscedastic condition were divided by 16, the squared error components for the second block of prices was divided by eight, those for the third block by four, and those for the fourth block by two. The error components for the fifth block of prices were left unchanged. The squared error components for the remaining four blocks were created by adding the values removed from the first four blocks, such that the reduction in squared errors for the first block were added to the last, the reduction in squared errors for the second block was added to the one but last, and so forth. The objective overall correlation between price and quality was .62 in both the homoscedastic and the heteroscedastic condition, and the data were presented in ascending order of price (see Table 2).

Table 2: Price-quality pairs presented in Study 2

Price	Quality	
	Homoscedastic Outcome Uncertainty	Heteroscedastic Outcome Uncertainty
9	53	45
14	34	42
15	54	48
16	35	41
26	38	43
34	60	55
37	60	57
42	44	46
45	64	64
49	44	44
55	65	67
60	49	47
70	71	74
75	53	50
79	73	77
81	55	51
85	55	51
92	78	82

For each table, participants were asked to indicate on a scale from 1 (not at all confident) to 10 (entirely confident) to what extent they felt confident that they could accurately predict champagne quality when informed about the price of the champagne. The time participants took to respond was measured unobtrusively (M_{time} = 26.06; SD = 12.16). There were no differences in response time across tables (p > .19).

Results

Replicating the findings of Study 1, a within-subjects ANOVA revealed a main effect of error variance ($F(1, 28) = 5.14$, $p < .05$). Participants were more confident about their ability to accurately predict champagne quality in the heteroscedastic error variance condition (M = 3.13; SD = 1.66) than in the homoscedastic error variance condition (M = 2.72; SD = 1.53). See Table 1. Study 2 extends the findings of Study 1 to the case of simultaneous, instead of sequential, presentation of cue-outcome pairs.

Study 3

In Study 1 and 2, participants learned the association between price and quality for wines. To avoid that any effect of homo- versus heteroscedasticity can be attributed to the existence of prior theories about the association between cue and outcome (i.e., price and quality), in Study 3 we used X and Y as cue-outcome labels (Baumgartner 1995; Sniezek 1986). Moreover, for generalizability, we examined the effect of error variance for two different regression slopes.

Method

Participants and Design

Forty-five undergraduate students participated in the study for course credit (18 females; M_{age} = 19.91, SD = 1.88). The study used a 2 (error variance: homoscedastic vs. heteroscedastic) x 2 (regression slope: .30 vs. .50) within-participants design. In other words, respondents saw four tables with 18 X-Y pairs.

Procedure

The tables were generated with the same procedure used in Study 2 and were presented in random order. The only difference was that we manipulated the slope of the regression of the outcome on the cue to be .30 or .50, resulting in an overall correlation between price and quality of .62 and .80, respectively. For each table, participants were asked to estimate the strength of the relationship between X and Y on a scale from -100 (perfect negative relationship) to +100 (perfect positive relationship). The time participants took to respond was measured unobtrusively (M_{time} = 25.26; SD = 8.42). There were no differences in response time across tables (all ps > .66).

Results

Covariation judgments were analyzed with a 2 (error variance: homoscedastic versus heteroscedastic) x 2 (slope: .30 versus .50) within-subjects ANOVA. This analysis revealed a main effect of slope ($F(1, 44) = 41.34$, $p < .0001$) such that judgments of covariation were higher when the slope was .50 (M = 40.20; SD = 23.01) than when it was .30 (M = 12.68; SD = 18.90). This main effect is not surprising given that the former slope resulted in an objective overall cue-outcome correlation of .80 and the latter in a correlation of .62. More interestingly, this analysis also revealed a main effect of error variance ($F(1, 44) = 9.25$, $p < .01$), such that covariation judgments were higher when error variance was heteroscedastic (M = 30.24; SD = 15.63) than when it was homoscedastic (M = 22.64; SD = 19.26). The interaction between regression slope and error variance was not significant ($F(1, 44) = 1.43$, $p > .23$), indicating that heteroscedasticity increases judgments of covariation for different objective cue-outcome association strengths. See Table 1.

Study 4

Study 4 is similar to Study 3, except that (1) the objective overall cue-outcome correlation is negative instead of positive and (2) heteroscedasticity is manipulated by decreasing error variance instead of increasing error variance. These changes were introduced to show (1) that covariation judgments become more extreme, and not simply higher, when introducing heteroscedasticity in the error component[6] and (2) that the effect of heteroscedasticity on overall covariation judgments is not specific to the particular type of heteroscedasticity used in Studies 1-3 (i.e., increasing error variance).

Method

Participants and Design

Forty-three undergraduate students participated for course credits (22 females; M_{age} = 20.12; SD = 2.05). The study used a 2 (error variance: homoscedastic vs. heteroscedastic) x 2 (regression slope: -.30 vs. -.50) within-participants design.

---

6 See footnote 4.

Procedure

Four tables with 18 X-Y pairs were generated with the same procedure used in Studies 2 and 3. The only difference was that (a) negative values of -.30 and -.50 were assigned to the slope, resulting in an overall correlation of -.60 and -.80, and (b) heteroscedasticity was obtained by adding error variance for low X values and subtracting it for high X values. Participants were again presented with 4 tables in random order and the data were presented in ascending order of the X variable. For each table, participants were asked to estimate the strength of the relationship between X and Y on a scale from -100 (perfect negative relationship) to +100 (perfect positive relationship). Response times were recorded (M_{time} = 24.22; SD = 7.88), and we again found no differences across tables (all *p*s > .52).

Results

Covariation judgments were analyzed with a 2 (error variance: homoscedastic vs. heteroscedastic) x 2 (regression slope: -.30 vs. -.50) within-participant ANOVA. This analysis revealed a main effect of regression slope ($F(1, 42) = 9.40$, $p < .01$) such that covariation judgments were lower when the regression slope was -.50 (M = -35.31; SD = 18.82) than when it was -.30 (M = -24.89; SD = 16.07). Replicating the previous studies, this analysis also revealed a main effect of error variance ($F(1, 42) = 6.28$, $p < .05$), such that covariation judgments were more extreme (i.e., lower in this case) when error variance was heteroscedastic (M = -33.73; SD = 17.83) rather than homoscedastic (M = -26.46; SD = 15.08). The interaction between objective correlation and error variance was again not significant ($F(1, 42) = 0.00$, $p > .98$). See Table 1.

Discussion of Studies 1-4

The previous studies establish that overall covariation judgments are more extreme when error variance is heteroscedastic than when it is homoscedastic. Relative to homoscedastic error variance, heteroscedastic error variance leads to higher covariation judgments when the objective cue-outcome association is positive and to lower covariation judgments when the objective cue-outcome association is negative. The effect of heteroscedasticity occurs (a) irrespective of whether heteroscedasticity is manipulated by increasing or by decreasing error variance at higher cue values, (b) for different positive and negative regression slopes, (c) in the case of both sequential and simultaneous presentation of the data, (d) for price-quality associations as well as generic X-Y labels, and (e) for different measures of covariation.

Study 5

Our predictions concerning the effect of homo- versus heteroscedastic error variance on overall judgments of covariation rest on the assumption that people are sensitive to local differences in cue-outcome association strength. Recall that the statistical relationship between local error variance and local correlation, combined with the psychophysical function relating objective to subjective (local) correlation, implies that a reduction in error variance has a larger impact than an identical increase in error variance on the perception of local cue-outcome association strength. Studies 5 and 6 were designed to provide support for this theorizing by testing the effect of homo- versus heteroscedasticity on the perception of local association strength. In particular, based on the theory, we predict that a reduction in error variance will have a positive effect on perceived local covariation that is significantly larger in magnitude than the negative effect of an identical increase in error variance.

Participants in Study 5 first learned the association between price and quality for Chilean wine brands. Uncertainty about quality was either homoscedastic, heteroscedastic increasing or heteroscedastic decreasing. Afterwards, participants were probed for their beliefs about the association strength between price and quality in the low price region and the high price region. A problem with the measurement of perceived local correlation is that, while participants may be sensitive to local correlations, the theoretical notion of local correlation may be quite novel and difficult to grasp for respondents. Therefore, to measure respondents' beliefs about local price-quality association strength, we asked participants to indicate how confident they felt that they could accurately predict quality for a number of new brands for which only the selling price was known.

Method

Participants and Design

One-hundred and twenty undergraduate students participated in this study in exchange for course credit (60 females; M_{age} = 19.96, SD = 2.25). The study used a three-group design in which error variance (homoscedastic vs. heteroscedastic increasing vs. heteroscedastic decreasing) was manipulated between-participants.

Procedure

The study consisted of two phases. The first phase was an experience phase in which participants learned about the relationship between price and quality for Chilean wine brands. The second phase measured perceived local association strength for several new low-priced and high-priced brands. This phase was not mentioned to participants beforehand to ensure that the encoding of local association strength was not an artifact of the procedure.

In the first phase, we presented participants sequentially with 30 different brands of Chilean wines and their respective selling prices. Participants were asked to predict the quality of each brand. Each time, after having made a quality prediction, participants received feedback about the objective quality of the brand. The procedure used to generate the selling prices and quality scores was identical to the one used in Study 1, with the only difference that the formula underlying the quality scores was multiplied by 10. Quality therefore ranged from 0 to 100. The procedure used to generate the error terms in the homoscedastic and the heteroscedastic increasing conditions was the same as in Study 1 (but they were again multiplied by 10). The error terms in the heteroscedastic decreasing condition were obtained by reversing the method used for the heteroscedastic increasing condition.

In a second phase, participants were presented with five low-priced brands (ranging in price between €5 and €19) and five high-priced brands (ranging in price between €20 and €34). For each brand, participants were asked to indicate on a scale from 1 (not at all confident) to 10 (very confident) to what extent they felt confident that they could accurately predict the quality for that specific brand. Confidence judgments for low-priced (high-priced) brands were then averaged to obtain an index of perceived local association strength for the low (high) price region.

Across the three conditions, there are no differences in overall error variance (211). However, there are local differences in error variance. In the low price region, error variance in the homoscedastic condition (211) is 167 higher than in the heteroscedastic increasing condition (44) and 167 lower than in the heteroscedastic decreasing condition (378). This pattern is mirrored in the high price region: error variance in the homoscedastic condition (211) is 167 lower than in the heteroscedastic increasing condition (378) and 167 higher than in the heteroscedastic decreasing condition (44).

Thus, relative to the variance in quality unexplained by price in the low (high) price region in the homoscedastic condition, in absolute terms the reduction in error variance in the heteroscedastic increasing (decreasing) condition is equal to the increase in error variance in the heteroscedastic decreasing (increasing) condition. Based on our theory however, decreases in error variance should have a stronger positive impact on the subjective association strength than increases in error variance have a negative impact. In other words, in the low price region participants should perceive a stronger association between price and quality in the heteroscedastic increasing condition than in the other two conditions, and there should be a smaller or no significant difference between the homoscedastic condition and the heteroscedastic decreasing condition. In the high price region, instead, the perceived association between price and quality should be stronger in the heteroscedastic decreasing condition than in the remaining conditions, and there should be a smaller or no significant difference between the homoscedastic condition and the heteroscedastic increasing condition.

Results

We estimated a 3 (error variance: homoscedastic vs. heteroscedastic increasing vs. heteroscedastic decreasing) x 2 (price range: low vs. high) repeated-measures ANOVA with error variance as a between-participants factor and price range as a within-participant factor. This analysis revealed the predicted two-way interaction between error variance and price range ($F(2, 117) = 13.87$, $p < .001$). This interaction was followed up with planned contrasts. In the low price range, participants in the heteroscedastic increasing condition were more confident that they could accurately predict quality than participants in the homoscedastic condition and the heteroscedastic decreasing condition ($t(117) = 3.89$, $p < .001$), while there was no difference between the homoscedastic and the heteroscedastic decreasing condition ($t(117) = .71$, $p > .48$). In the high price range, participants were more confident that they could accurately predict product quality in the heteroscedastic decreasing condition than in the homoscedastic condition and the heteroscedastic increasing condition ($t(117) = 3.34$, $p < .001$), while there was no difference between the homoscedastic and the heteroscedastic increasing condition ($t(117) = 1.43$, $p > .15$). Table 3 displays the means and standard deviations.

Table 3: Mean ratings and respective standard deviations obtained in Studies 5 and 6.

Study (DV)	Outcome Uncertainty	Price range			
		Low		High	
		M	*SD*	*M*	*SD*
5 (Confidence)	Homoscedastic (n = 40)	5.37	1.25	5.81	1.39
	Heteroscedastic Increasing (n = 37)	6.34	1.18	6.18	1.06
	Heteroscedastic Decreasing (n = 43)	5.54	1.03	6.71	0.89
6 (Difficulty)	Homoscedastic (n = 15)	7.02	1.62	8.07	1.28
	Heteroscedastic Decreasing (n = 14)	6.62	1.95	6.45	1.18

Besides the significant interaction between error variance and price range, the main effects of error variance ($F(2, 117) = 5.10$, $p < .01$) and price range were also significant ($F(1, 217) = 21.85$, $p < .0001$). As a result of the local differences in confidence described above, the main effect of error variance indicates that overall participants were less confident in the homoscedastic condition than in the heteroscedastic conditions ($t(117) = -3.16$, $p < .001$), with no difference between the heteroscedastic conditions ($t(117) = .59$, $p > .55$). This finding is consistent with the main effect of homo- versus heteroscedasticity on overall judgments of covariation found in Studies 1 to 4. The main effect of price range indicates that participants were more confident in the high than in the low price range. We had not anticipated this effect because in the homoscedastic condition the local correlation was objectively identical in the low price range and the high price range and because the heteroscedastic conditions were mirror images in terms of local association strength. It is possible that participants hold the lay belief that it is easier to predict the quality of high-priced wines than it is to predict the quality of low-priced wines. Alternatively, it is possible that the higher prices numerically primed participants, resulting in higher confidence ratings in the high price range (Wilson et al. 1996).

Study 6

Study 6 assesses the robustness of the findings of Study 5 by introducing a number of procedural changes. First, instead of wines, participants learned the price-quality association for an unspecified product category. Second, instead of local confidence judgments, participants provided judgments of local prediction difficulty. Specifically, to probe respondents' beliefs about price-quality associations in different price regions, we asked participants to indicate how difficult they felt it was to predict quality for a number of new products for which only the selling price was known. Third, we used a different objective correlation between price and quality. Finally, in Study 6 we devised a procedure to generate the error term for the homoscedastic condition that allows holding constant between conditions both mean squared error (i.e., error variance) and mean absolute error. This change was implemented to rule out a potential alternative explanation for the findings of Study 5 based on differences in mean absolute error (see details below).

Method

Participants and Design

Twenty-nine undergraduate students participated in the study in exchange for course credit (13 females; M_{age} =20.21, SD = 1.68). Participants were randomly assigned to a homoscedastic condition or a heteroscedastic condition with decreasing error variance.

Procedure

The study consisted of two phases. In the first phase, participants were presented sequentially with 27 different brands from an unspecified product category and their respective selling prices. Participants were asked to predict quality for each brand. Quality was expressed as a score ranging from 0 to 100. After each quality prediction, participants received feedback about the objective quality of the brand. Objective product quality was predetermined according to the following formula:

$$\text{Quality} = 25 + .50 * \text{Price} + \textit{Error} \qquad \text{(Equation 5)}$$

Selling prices ranged from €5 to €95. To make sure that participants obtained equal information about product quality across the whole price range, we divided the price range in 9 blocks (i.e., block 1 ranged from €5 to €15, block 2 ranged from €15 to €25, …, and block 9 ranged from €85 to €95), and three selling prices were randomly selected from each block. Selling prices were presented to participants after rounding them to a multiple of five. For each triplet of prices drawn from each of the 9 price blocks, we added a positive error component to a first price, a negative error component (equal in absolute value to the positive error component) to a second price, and no error component to a third price.

In the heteroscedastic decreasing error variance condition, the error component was 26.67 in block 1 and decreased with 3.33 with every price block to 0 in block 9. In the homoscedastic condition, the error component was identical in magnitude to the heteroscedastic condition, but we switched the error components of block 1 and block 9, and of block 3 and block 7. As a result, in the low price range (blocks 1-3: from €5 to €35) mean squared error and mean absolute error were higher in the heteroscedastic decreasing condition than in the homoscedastic condition (i.e., a difference of 237 and 9 respectively). In the high price range (blocks 7-9: from €65 to €95), mean squared error and mean absolute error were lower in the heteroscedastic decreasing than in the homoscedastic condition (i.e., a difference of 237 and 9 respectively). Thus, this procedure ensures that both the difference in error variance (237) and the difference in mean absolute error (9) between the heteroscedastic decreasing and the homoscedastic condition in the low and the high price range were identical in magnitude (but in opposite direction). If decreases in error variance have a greater impact on the perceived local association strength than increases in error variance, then the difference in perceived association strength between the homoscedastic and the heteroscedastic environment should be larger in the high price region than in the low price region.

In a second phase, participants were presented with 3 low-priced brands (€10, €20, and €30) and 3 high-priced brands (€70, €80, and €90) that had not been presented before. For each brand, participants were asked to indicate on a scale from 1 (not at all difficult) to 10 (very difficult) to what extent they found it difficult to predict product quality for that specific brand. Two indices of local association strength were computed by averaging difficulty judgments for the low-priced brands and the high-priced brands.

Results

The perceived local association strengths were analyzed with a 2 (error variance: homoscedastic vs. heteroscedastic) x 2 (price range: low vs. high) repeated-measures ANOVA, in which error variance was a between-participants factor and price range a within-participant factor. This analysis yielded an interaction between error variance and price ($F(1, 27) = 4.29$, $p < .05$). For low-priced products, there was no significant difference ($F(1, 27) = .37$, $p > .54$) in perceived association strength between the homoscedastic condition (M = 7.02, SD = 1.62) and the heteroscedastic condition (M = 6.62, SD = 1.95). For high-priced products, this difference was instead significant ($F(1, 27) = 12.41$, $p < .01$). In the high price range, participants in the heteroscedastic condition (M = 6.45, SD = 1.18) perceived a stronger association between price and quality than participants in the homoscedastic condition (M = 8.07, SD = 1.18). Besides the significant interaction between error variance and price range, the main effect of error variance was also significant ($F(1, 27) = 4.23$, $p < .05$). As a result of the local differences in perceived difficulty described above, the main effect of error variance indicates that overall participants found it more difficult to predict product quality in the homoscedastic condition (M = 7.54, SD = 1.27) than in the heteroscedastic condition (M = 6.54, SD = 1.37).

Discussion of Studies 5 and 6

Studies 5 and 6 examined differences in perceived local association strength between homoscedastic and heteroscedastic environments. Together, these studies show that decreases in error variance have a greater impact on perceived local association strength than increases in error variance. This effect cannot be explained by underlying differences in mean absolute error (Study 6). Comparing a heteroscedastic environment with a homoscedastic environment, this implies that decreases in error variance have a stronger impact on perceived local association strength than increases in error variance. As a result, the perceived overall cue-outcome association strength is more extreme when error variance is heteroscedastic than when it is homoscedastic.

Study 7

The previous studies have demonstrated that the perceived predictability of the outcome increases when error variance is heteroscedastic. As discussed in the theory, from a normative point of view, the cue-outcome correlation *per se* should not determine the predicted level of the outcome for a specific value of the cue. Such a prediction should instead reflect the expected level of the outcome for that cue value. In general, outcome predictions can be based on the recollection of previously experienced outcomes for a specific cue value and surrounding cue values (i.e., an exemplar-based estimation of expected outcome value), or on the regression slope of the outcome on the cue across cue regions (i.e., a rule-based estimation of expected outcome value). In addition to these inputs, we argued in the Theory section of this manuscript that for uncertain outcome values, outcome predictions are also influenced by the perceived cue-outcome correlation. The goal of Study 7 was to show that, keeping constant the outcome values in the high-error range of the cue experienced during learning as well as the regression slope, outcome predictions become more extreme when the objective cue-outcome correlation is increased. To accomplish this goal, participants were exposed to high and low outcome values in the high range of the cue. Half of the respondents also learned about two low outcome values in the low range of the cue. These additional cue-outcome pairs lay on the least-squares regression line and, although not affecting the regression slope, increased the cue-outcome correlation. We predict that the exposure to those additional cue-outcome pairs will lead to overestimation of the outcome in the high cue range.

Method

Participants and Design

Fifty-six undergraduate students participated in the study in exchange for extra course credit (M_{age} = 21.09, SD = 1.78). Participants were randomly assigned to a low correlation or a high correlation condition.

Procedure

The study consisted of two phases. In the first phase, participants were instructed to pay close attention to price-quality information about several bottles of wine appearing in random order on the computer screen. Participants were informed that selling prices could range between €2 and €10 and that quality scores ranged from 1 to 10. In the low correlation condition, participants were presented with 10 price-quality pairs in the high price region. The 10 price-quality pairs were: (8,1), (8,2), (8,4), (8,6), (8,7), (10,1), (10,3), (10,5), (10,7), and (10,9). In the high correlation condition, participants were presented with 12 price-quality pairs. Ten pairs were identical to the low correlation condition, and two additional price-quality pairs were added in the low price region: (2,1) and (4,2). Adding these two pairs increases the correlation between price and quality from .19 in the low correlation condition to .46 in the high correlation condition.

In the second phase, participants were asked to predict the quality for three bottles of wine with selling prices of €8, €9 and €10. Because the additional price-quality pairs in the high correlation condition lie (1) in the low price region and (2) on the least-squares regression line of quality on price, there should be no difference in outcome predictions in the high price region between the high correlation and the low correlation condition. However, if participants take into account the cue-outcome correlation when generating outcome predictions, predicted quality in the high correlation condition should be higher than predicted quality in the low correlation condition.

Results

The three quality estimations were averaged and subjected to a one-way ANOVA. This analysis revealed a main effect of correlation ($F(1, 54) = 4.56$, $p < .05$). In line with our predictions, estimated quality for high-priced wines was higher in the high correlation condition (M = 6.24, SD = 1.21) than in the low correlation condition (M = 5.32, SD = 1.72).

Study 8

Study 8 was similar to Study 7. The only difference was that participants were exposed to high and low outcome values in the low, instead of the high, range of the cue. Half of the respondents also learned about two high outcome values in the high range of the cue. As in Study 7, these additional cue-outcome pairs lay on the least-squares regression line and increased the cue-outcome correlation. Applying the same logic as in Study 7, we predict that the exposure to those additional cue-outcome pairs will lead to underestimation of the outcome in the low cue range.

Method

Participants and Design

Forty-five undergraduate students participated in the study in exchange for extra course credit (M_{age} = 19.82, SD = 2.38). Participants were randomly assigned to a low or a high correlation group.

Procedure

The procedure was similar to the procedure used in Study 7. The price-quality pairs in the low correlation condition were: (2,1), (2,3), (2,5), (2,7), (2,9), (4,3), (4,4), (4,6), (4,8), and (4,9). The two additional price-quality pairs in the high correlation condition were: (8,8) and (10,9). As in Study 7, adding these two pairs increases the correlation between price and quality from .19 in the low correlation condition to .46 in the high correlation condition.

In the second phase, participants were asked to predict the quality for three bottles of wine with selling prices of €2, €3 and €4. If participants take into account the cue-outcome correlation when estimating quality, predicted quality should be lower in the high than in the low correlation condition.

Results and Discussion

The three quality estimations were averaged and subjected to a one-way ANOVA. This analysis revealed a main effect of correlation ($F(1, 43) = 4.38$, $p < .05$). Participants in the high correlation condition (M = 3.57, SD = 1.08) estimated the product quality of low-priced wines to be lower than participants in the low correlation condition (M = 4.28, SD = 1.17). Together, Studies 7 and 8 show that outcome predictions in a high-error range of the cue are influenced by the overall association strength between cue and outcome. Specifically, outcome predictions in a high-error partition are more extreme when the cue-outcome correlation is high. These findings pave the way for the subsequent studies in which we demonstrate the effect of homo- versus heteroscedasticity on quality predictions and product valuation.

Study 9

Thus far, we have shown that (a) the perceived correlation between price and quality is stronger when error variance is hetero- rather than homoscedastic (Studies 1-4) and

(b) a higher perceived correlation between price and quality triggers more extreme quality predictions in a high-error price range (Studies 7 and 8). In addition, we have argued that people should learn to accurately predict product quality in low-error price regions. The goal of Study 9 was to show that if the price-quality relationship is positive and error variance is heteroscedastic increasing (decreasing), estimated product quality is accurate for lower-priced (higher-priced) brands but overestimated (underestimated) for higher-priced (lower-priced) brands.

Method

Participants and Design

One-hundred fourteen undergraduate students took part in the study in exchange for course credit (54 females; M_{age} = 20.30; SD = 2.29). Participants were randomly assigned to a homoscedastic, an heteroscedastic increasing or a heteroscedastic decreasing error variance condition.

Procedure

The study consisted of two phases. The first phase was identical to the experience phase of Study 5. In the second phase, participants were presented with 5 low-priced (ranging between €5 and €19) and 5 high-priced (ranging between €20 and €34) Chilean wine brands that had not been presented before. For each brand, participants were asked to enter the quality they anticipated it to have.

Results

Anticipated quality was analyzed with a 3 (error variance: homoscedastic vs. heteroscedastic increasing vs. heteroscedastic decreasing) x 2 (price range: low vs. high) repeated measures ANOVA. This analysis revealed a main effect of price ($F(1, 111) = 272.77$, $p < .0001$), indicating that the predicted quality for high-priced brands (M = 63.98, SD = 9.61) was higher than the predicted quality for low-priced brands (M = 46.67, SD = 9.63). Crucially, the interaction between price and error variance was also significant ($F(2, 111) = 4.41$, $p < .05$). We further examined this interaction with follow-up contrast analyses. For low priced brands, participants in the heteroscedastic decreasing condition expected lower quality than participants in the homoscedastic condition ($t(111) = 2.31$, $p < .05$), while there was no significant difference in anticipated quality between participants in the homoscedastic condition and participants in the heteroscedastic increasing condition ($t(111) = .53$, $p > .59$). For high-priced brands instead, participants in the heteroscedastic increasing condition expected higher quality than participants in the homoscedastic condition ($t(111) = 2.17$, $p < .05$), while there was no difference in anticipated quality between the homoscedastic condition and the heteroscedastic decreasing condition ($t(111) = .98$, $p > .32$). See Table 4.

Table 4: Mean predicted quality ratings and respective standard deviations obtained in Study 9.

Outcome Uncertainty	Price range			
	Low		High	
	M	*SD*	*M*	*SD*
Homoscedastic (n = 39)	48.70	11.70	61.74	13.30
Heteroscedastic Increasing (n = 37)	47.55	5.58	66.47	7.29
Heteroscedastic Decreasing (n = 38)	43.72	9.92	63.86	6.08

Study 10

In Study 9, participants estimated product quality based on price. The study shows that when intrinsic product quality is uncertain, people overestimate (underestimate) quality in the high (low) price range if unexplained variance is heteroscedastic increasing (decreasing). Oftentimes, however, consumers have information about product quality, either because of prior experience or because quality can be easily assessed (search goods). The goal of Study 10 is to examine the effect of homo- versus heteroscedastic error variance on product valuation (i.e., value for money judgments), instead of anticipated product quality. Participants were presented with price-quality pairs in an unknown product category during a learning phase. We manipulated between-participants whether outcome uncertainty was heteroscedastic increasing or homoscedastic. Participants were then asked to rate the value for money of a new product for which both quality and price were known. Because the expected product quality for high-priced brands is higher when error variance is heteroscedastic increasing than when it is homoscedastic (see Study 9), we predict that participants in the heteroscedastic increasing environment will rate the value for money of a high-priced product lower than participants in the homoscedastic environment. In other words, from Study 9 we know that participants in the heteroscedastic increasing condition expect more quality from high-priced products than participants in the homoscedastic condition. The result should be that participants in the heteroscedastic increasing condition find the quality of the target product to be lower than expected, leading to a lower value-for-money judgment. Thus, the same offer (with a specific price and quality) should be valued less in the heteroscedastic increasing than in the homoscedastic condition.

Method

Participants and Design

Fifty-seven undergraduate students (27 females; M_{age} = 20.28; SD = 1.67) were randomly assigned to a homoscedastic or a heteroscedastic increasing error condition.

Procedure

The task structure and learning phase were created similar to Study 6, with the only exception that heteroscedasticity was manipulated by increasing (instead of decreasing) error variance. At the end of the learning phase, participants were asked to evaluate a product with a selling price of €80 and a quality rating of 65 on a scale from 1 (bad value for money) to 7 (good value for money). This price-quality combination is positioned on the objective regression line of quality on price at the high end of the price range.

Results

A one-way ANOVA on value for money shows that participants in the heteroscedastic condition (M = 2.72, SD = 0.70) perceive the product to be of lesser value for money than participants in the homoscedastic condition (M = 3.29, SD = 1.12; $F(1, 55) = 5.20$, $p < .05$).

Discussion of Studies 9 and 10

By demonstrating systematic effects on consumer inferences and judgments, Studies 9 and 10 underline the risk of ignoring the nature of uncertainty in the marketplace. Study 9 shows that, when product quality is unknown to the consumer, heteroscedastic uncertainty leads to more extreme quality inferences, relative to a homoscedastic scenario. When price and quality are positively correlated and uncertainty is heteroscedastic increasing, quality expectations are accurate for low prices (i.e., in the low-uncertainty range) but increasingly overestimated for high prices (i.e., in the high-uncertainty range). In contrast, when price and quality are positively correlated and uncertainty is heteroscedastic decreasing, quality expectations are accurate for high prices (i.e., in the low-uncertainty range) but increasingly underestimated for low prices (i.e., in the high-uncertainty range). Study 10 shows that heteroscedasticity influences consumer judgments also when product quality is known to the consumer. Relative to a homoscedastic scenario, a high-priced product is perceived to be of less value for money when price and quality are positively correlated and uncertainty is heteroscedastic increasing. Together, these studies emphasize the managerial importance of investigating structural differences in uncertainty.

2.3 General Discussion

Natural phenomena are typically understood as a function of a systematic and a random component. Cognitive scientists studying judgment under uncertainty have predominantly focused on the former, for instance by investigating how individuals infer different functional forms from a pattern of data. Classic findings include the fact that positive relationships are easier to detect than negative ones (Brehmer 1974), and that linear patterns are easier to detect than nonlinear ones (DeLosh et al. 1997). In contrast, the random component has been the object of a limited body of research, mostly focused on how the amount of uncertainty influences function learning (e.g., Hagafors and Brehmer 1983). Otherwise, learning literature has considered the error component only as a way to enhance the ecological validity of laboratory findings (i.e., the common practice of adding random noise to a function). To the best of our knowledge, no prior research has investigated how changes in the distribution of the error over the range of the cue affect cue-outcome learning.

This manuscript demonstrates that homo- versus heteroscedastic outcome uncertainty systematically affects covariation judgments and outcome predictions. The perceived correlation between a cue and an outcome is stronger when error variance is heteroscedastic than when it is homoscedastic (Studies 1-4). This effect occurs regardless of whether (a) heteroscedasticity is increasing or decreasing, (b) the cue-outcome correlation is positive or negative, (c) cue-outcome pairs are presented sequentially or simultaneously, and (d) cues and outcomes are labeled as price-quality or generically as X-Y. We propose that the effect of the type of uncertainty on perceived *overall* correlations can be traced to the effect of error variance on perceived *local* correlations. Compared to a homoscedastic environment with the same overall correlation, heteroscedastic environments feature (a) a low-error cue range in which the perceived predictability of the outcome is higher and (b) a high-error cue range in which the perceived outcome predictability is similar. This is because reductions in error variance have a greater positive impact on perceived local correlations than equivalent increases in error variance (Studies 5-6). Linking perceived predictability (i.e., perceived correlation) to outcome predictions, the presence of a low-uncertainty cue range leads to more extreme outcome predictions in cue ranges in which the outcome is more uncertain (Studies 7-8). For example, when the price-quality relationship is positive and uncertainty about quality is heteroscedastic and increasing (decreasing), quality is predicted accurately in the low (high) price range but overestimated (underestimated) in the high (low) price range (Study 9). Further demonstrating the importance of the nature of uncertainty, product valuations are also affected by homo- versus heteroscedastic outcome uncertainty (Study 10).

2.3.1 Contributions, implications, and future research

This paper makes a number of contributions to the cue learning literature. First, we demonstrate that the type of uncertainty (instead of the amount) has consequences for human learning. This area of research is rife with opportunities. For example, research is needed to unravel the cognitive processes underlying the effect of homo- versus heteroscedastic outcome uncertainty (e.g., controlled vs. automatic, rule-based vs. exemplar-based, etc.). Second, we show that humans encode local differences in association strength. We examined individuals' sensitivity to changes in local correlations by manipulating homo- versus heteroscedasticity. A promising area for future research is to explore local correlations in other contexts such as nonlinear functions or different types of heteroscedasticity (e.g., diamond-shaped vs. hourglassshaped heteroscedasticity). Third, we established the influence of outcome uncertainty on outcome predictions of continuous variables. That is, when generating outcome predictions individuals conflate outcome predictability (i.e., correlation) with the expected level of the outcome. Building on existing research on contingency learning (Lagnado and Shanks 2002), future research should further examine the consequences of flawed intuitive understanding of statistics and its effects on decision making.

The paper also makes a number of contributions specific to consumer research and marketing. First, at the epistemic level, our research provides a new perspective on the dissociation between the (objective) price-quality relationship observed in the marketplace and (subjective) price-quality beliefs held by consumers. A consistent finding documented in the price-quality literature is that the subjective association is relatively strong, while the objective relationship is weaker (Rao and Monroe 1989; Tellis and Wernerfelt 1987). A consequence of this overestimation of the objective price-quality relationship is that consumers tend to rely too much on price to infer quality, often leading to higher price acceptability and overspending (Lichtenstein et al. 1988; Ofir 2004). Our research suggests that the prevalence of heteroscedasticity in the marketplace may partly explain this finding. When uncertainty is homoscedastic, local correlations in different price segments are equal to each other and equal to the overall correlation. However, when uncertainty is heteroscedastic, local correlations are different in different price segments and, because of the decreasing and decelerating effect of error variance on local correlations, the average of local correlations is higher than the overall correlation. Sensitivity to local correlations, instead of the overall correlation, together with the prevalence of heteroscedasticity in the marketplace, may thus help explaining why the objective correlation between price and quality is oftentimes overestimated.

Second, this paper has consequences for pricing. Two common pricing strategies are price penetration and price signaling (Tellis 1986). Price penetration refers to setting prices below competitors in the same market either to gain market share or to drive competitors out of the market. Price signaling instead refers to the strategic use of price to signal product quality, and therefore entails setting relatively high prices. Our findings suggest that, *ceteris paribus*, price signaling should be a more effective strategy in heteroscedastic than in homoscedastic markets. This is because price signaling relies on consumers believing in a positive association between price and quality. Our research shows that this is more so under heteroscedastic outcome uncertainty. Price penetration, on the other hand, should be relatively more effective in homoscedastic than in heteroscedastic markets. This is because under heteroscedastic outcome uncertainty a decrease in price results in a larger decrease in perceived quality, which may deter consumers from buying low-priced brands.

Third, our studies show that the level of quality that consumers expect from brands in a specific price segment does not only depend on the quality of competing brands within that price segment, but also on the quality of brands in other price segments (Studies 7-8). For example, the confusion between correlation and slope reviewed above implies that the presence of a price range in which quality can be accurately predicted from price (e.g., because of the existence of several low-price, low-quality offerings) will lead consumers to make more extreme predictions of quality for products in other price ranges. This may in turn influence consumers' post-purchase satisfaction for these products (Study 10).

Fourth, because for high-priced brands the expected quality is relatively higher when heteroscedasticity is increasing (Study 9), managers of luxury brands in heteroscedastic increasing product categories should devote extra effort to maintain high quality standards in order to keep customer satisfaction up. Instead, in heteroscedastic decreasing product categories, managers of low-priced brands may get away with lower quality standards because in this case consumers have lower quality expectations. From a substantive point of view, future research should focus on the prevalence of heteroscedasticity in the marketplace, as well as its antecedents (i.e., the factors that explain differences in outcome uncertainty across markets) and consequences (i.e., impact of heteroscedasticity on price quality beliefs or on market shares).

2.3.2 Conclusion

Many, if not most, cue-outcome associations relevant to people's everyday lives display patterns of uncertainty that violate the assumption of homoscedasticity. Besides its relevance for marketing, heteroscedasticity may be important in many other contexts. For instance, the relationship between income and crime rate is heteroscedastic decreasing (more uncertainty when income is low than when income is high) and negative (the higher the income, the less crime; Mladenka and Hill 1976). Based on our theory, one would expect a bias towards overestimating crime among low-income people. In a legal decision making context, this bias may lead judges' and juries' to over-sentence low-income suspects. In a similar vein, heteroscedasticity may bias medical diagnosis (e.g., smoking and tobacco toxin exposure; Joseph et al. 2005), human resource management (e.g., intelligence and job performance; Kahneman and Ghiselli 1962), and policy making (e.g., violence in movies over time; Yokota and Thompson 2000). Heteroscedasticity is thus likely to be an important factor explaining why and how erroneous beliefs and stereotypes come into being in many judgment domains and persist over time.

Chapter 3. The Effects of Process and Outcome Accountability on Judgment Process and Performance[7]

Helping people to make better judgments and decisions is a prime purpose of research in organizational behavior and human decision making. Several authors have documented positive effects of raising the stakes for decision makers by holding them accountable (Arkes, 1991). For example, it has been shown that accountability makes professional auditors more accurate in judging the financial quality of industrial bond issues (Ashton, 1992), reduces primacy effects in person impression formation (Tetlock, 1983), eliminates the fundamental attribution error (Tetlock, 1985), reduces self-enhancement (Sedikides, Herbst, Hardin, & Dardis, 2002), and reduces sunk cost effects (Fennema & Perkins, 2008; Simonson & Nye, 1992). Accountability is a social factor that can be externally imposed and is therefore particularly useful to avoid judgment errors based on suboptimal cognitive predispositions or abilities of the individual decision maker (Payne, Bettman, & Johnson 1993).

Accountability, however, is not a unitary phenomenon and can be implemented in at least two ways (Lerner & Tetlock, 1999). Sometimes people are evaluated based on the outcomes of their decisions (i.e., outcome accountability). For example, many professional investors are evaluated based on the monetary outcomes of their decisions, regardless of whether they came to their decisions based on solid understanding and analysis or not. In other situations, people are evaluated not so much on the outcomes of their decisions, but need to justify the process that underlay those decisions (i.e., process accountability). Thus, under process accountability the investor would be evaluated solely on how an investment portfolio was chosen, regardless of whether it proved to be profitable. Academic research has shown that increasing process accountability leads to superior judgment quality in a variety of

---

7 This chapter is forthcoming in *Organizational Behavior and Human Decision Processes*. Please cite as: de Langhe, Bart, Stijn van Osselaer, and Berend Wierenga (2011), "The Effects of Process and Outcome Accountability on Judgment Process and Performance," *Organizational Behavior and Human Decision Processes*, forthcoming.

tasks (Ashton, 1992; De Dreu, Beersma, Stroebe, & Euwema, 2006; Chaiken, 1980; Hagafors & Brehmer, 1983). In addition, research indicates that outcome accountability, despite its prevalence in managerial practice, can have negative effects on performance (Arkes, Dawes, & Christensen, 1986; Siegel-Jacobs & Yates, 1996). The divergent effects on performance of process accountability versus outcome accountability have been confirmed among students participating in experimental research (Brtek & Motowidlo, 2002; Siegel-Jacobs & Yates, 1996; Simonson & Staw, 1992), but also in real-life settings, for example among purchasing professionals who were members of the National Association of Purchasing Management (Doney & Armstrong, 1996). Thus, empirical findings suggest that to help people make better judgments and decisions, process accountability is consistently more desirable and uniformly superior to outcome accountability (see Slaughter, Bagger, & Li, 2006, for a lone exception).

The origins of a negative effect of outcome accountability on judgmental or decision performance have, to the best of our knowledge, not seen any direct empirical investigation. However, indirect evidence relying on Janis and Mann's (1977) Conflict Theory suggests that outcome accountability's detrimental influence may be due to an increase in decision stress and a narrowing of attention that does not occur with process accountability (Brtek & Motowidlo, 2002; Lerner & Tetlock, 1999; Siegel-Jacobs & Yates, 1996; Simonson & Staw, 1992).

The beneficial effects of process accountability are attributed to greater attention to the problem at hand, better encoding and retrieval of information, and more even-handed and consistent use of available information. For example, Brtek and Motowidlo (2002) found that process accountable participants, relative to outcome accountable participants, gave more accurate judgments of managers' leadership potential based on an interview. This effect was mediated by an attentiveness score reflecting attention to the interview, alertness of posture, note taking, and thoughtfulness after the interview. De Dreu, Beersma, Stroebe, and Euwema (2006) found that process accountable participants recalled more distinct negotiation tactics from a description of a group discussion scenario than participants who were not held accountable. Process accountable participants in a pretest by Scholten, van Knippenberg, Nijstand, and De Dreu (2007) reported that in an upcoming group discussion they would strive for thorough and balanced decisions, would think deeply before reaching a judgment, and thought that thinking through every possibility would be more important than making efficient decisions. Siegel-Jacobs and Yates

(1996) found that process accountable participants were more consistent and better calibrated in their judgments than outcome accountable participants.

Jointly, these prior inquiries suggest that process accountability has a universal and uniform positive effect on cognitive processing and judgment quality relative to outcome accountability. However, it is possible that the effect of process versus outcome accountability is more specific. In this article, we argue that process and outcome accountability do not affect all cognitive processes to the same extent. Specifically, we establish that process accountability (versus outcome accountability) boosts the use of a cue abstraction process but not exemplar-based processing. Because cue abstraction is not equally effective in all situations (Juslin, Karlsson, & Olsson, 2008; Olsson, Enkvist, & Juslin 2006), the superiority of process accountability over outcome accountability is not as uniform as previous results would suggest.

In the next section of this article, we describe two cognitive processes based on different memory representations that can be used to make judgments (i.e., cue abstraction and exemplar-based processing). We then elaborate on the impact of using these processes on judgment quality in different types of tasks. Subsequently, we relate process and outcome accountability to differential use of the two cognitive processes. Finally, we generate predictions regarding the impact of holding people process versus outcome accountable on judgment quality in different types of tasks. These predictions are tested in three experimental studies using a multiple-cue learning paradigm.

3.1 Theory

3.1.1 Judgment Based on Cue Abstraction and Exemplar Memory

Two cognitive processes based on different memory representations have taken a central place in the cognitive science literature over the past few decades, (1) an analytical cue abstraction process based on abstract knowledge about the relationship between individual features of a stimulus and an outcome to be judged and (2) a more holistic exemplar-based process based on concrete representations of previously-encountered stimulus-outcome configurations (e.g., Erickson & Kruschke, 1998; Hahn & Chater, 1998; Juslin et al., 2008; Pothos, 2005; Smith & Sloman, 1994).

To illustrate this distinction, consider the case of two experts (Expert A and Expert B) trying to predict the commercial success of a new type of mobile phone.

Expert A argues that, because the phone has a long battery life (i.e., a positive feature) but the software is not user-friendly (i.e., a negative feature), it is likely to be moderately successful. Expert B agrees with this prediction, because the new phone is similar to a specific phone that was launched a couple of months ago, and that earlier phone has proven to be moderately popular among consumers. Although Expert A and Expert B arrived at the same prediction, their judgments can be traced to informational inputs of a fundamentally different nature. Whereas the prediction of Expert A is based on abstract information relating individual features of the phone to commercialization success (i.e., knowledge about individual cue-outcome relations), the prediction of Expert B is based on the storage and retrieval of previously launched phones together with their respective commercialization success (i.e., knowledge about exemplars made up of a configuration of cues and their relationships with an outcome). Judgments based on cue-outcome information involve the abstraction and representation of "mental rules" that relate individual attributes of a stimulus to an outcome to be judged. At the time of judgment, each cue is selectively attended to, its relation to the outcome is considered, and the judgment results from an additive integration of the independent effects of each cue on the outcome (e.g., Einhorn, Kleinmuntz, & Kleinmuntz, 1979; Juslin, Jones, Olsson, & Winman, 2003; Juslin et al., 2008; Juslin, Olsson, & Olsson, 2003). Judgments based on exemplar-outcome information, on the other hand, depend on the holistic storage of stimuli (i.e., a configural pattern of cues) and their respective outcome values in long term memory. Judgments are constructed by assessing the overall similarity of the stimulus under consideration to the stimuli that are stored in memory, with relatively more similar stimuli having a greater influence on the final judgment (e.g., Juslin et al., 2008; Medin & Schaffer, 1978; Nosofsky, Shin, & Clark, 1989).

3.1.2 Effects of Two Cognitive Processes on Judgment Quality in Different Tasks

Crucially, both types of information are not equally adaptive for judgment in all task environments. Knowledge about individual cue-outcome relations is only useful in *elemental* task structures. These are task structures in which the true outcome can be relatively well approximated by a linear additive combination of cue values, i.e. tasks where individual cues are elementally and linearly related to the outcome to be predicted. For example, cue abstraction should work well when cell phone weight has a consistent negative relationship with the success of cell phones in the market (higher weight means less success and this relationship is constant over the whole range of realistic weights). However, knowledge about individual cue-outcome relations is not useful in *configural* task structures. These are task structures in which cues interact with each other to predict the outcome. In tasks where cues are related to the outcome in a configural way judgments based on cue-outcome relations allow at best only for a linear additive approximation of the outcome values (Juslin et al., 2008; Olsson et al., 2006). For example, cue abstraction should work badly when flashy colors are positively related to market success when combined with MP3 player functionality but negative when combined with more business-like features such as an extra-powerful battery.

Exemplar-based knowledge does not suffer from this constraint and is a useful source of information in any task structure, provided that similar instances have similar outcomes (Juslin et al., 2008). As a result, whereas both reliance on cue-outcome information and reliance on exemplar-outcome information enhance judgment quality in elemental tasks, only reliance on exemplar-outcome information remains equally adaptive in configural tasks. Thus, cue abstraction becomes less beneficial as task structures become more configural.

3.1.3 Accountability and Cue Abstraction

To the best of our knowledge, no previous research has even considered the possibility that process accountable and outcome accountable judges differ in the extent to which judgment is formed based on cue abstraction versus exemplar memory.

Early research using multiple-cue learning paradigms has found that process accountable participants outperform control participants in predicting an outcome value that is related in an elemental (i.e. linear additive) way to some predictive cues (Ashton, 1992), and that relative to a control group, the judgments of process accountable participants in elemental tasks can be better approximated by linear additive regression models (Hagafors & Brehmer, 1983; Weldon & Gargano, 1988). However, since an elemental task structure can also be successfully acquired by an exemplar-based process, it cannot be concluded from these studies that an increase in cue abstraction accounts for the improvement in judgment quality.

De Dreu and his colleagues have argued in an impressive series of social-psychological articles that process accountability increases epistemic motivation which promotes effortful and systematic information processing (De Dreu et al., 2006; De Dreu & Carnevale, 2003; De Dreu, Koole, & Steinel, 2000; De Dreu, Nijstad, & van Knippenberg, 2008; Scholten et al., 2007). To the extent that the abstraction of cue-outcome information requires a more effortful and systematic analysis of a judgment task, this research might be taken to suggest that process accountability promotes cue abstraction. However, the mapping of systematic, effortful processing on cue abstraction versus exemplar-based processing is far from unambiguous. For example, recall is widely used as a measure of systematic information processing (De Dreu et al., 2006; Petty & Cacioppo, 1986) but is evidently also a mainstay of exemplar-based processing (e.g., Juslin & Persson, 2002; van Osselaer, Janiszewski, & Cunha, 2004).

Regarding the association between outcome accountability and cue abstraction, research by Arkes et al. (1986) may be taken to suggest that outcome accountability decreases the likelihood that people consistently base their judgments on linear additive rules. In this research, participants were asked to judge whether a student graduated with or without honors based on information about the student's grades for three randomly selected courses. Participants were told that they would be accurate 70% of the time by guessing "honors" when a student has two or three A's and guessing "not honors" when a student has zero or one A. Participants who were evaluated and incentivized based on the accuracy of their predictions (i.e. those who were held outcome accountable) were more likely to step away from following the linear additive rule, and therefore performed relatively worse than control participants. This study may tell us more about rule compliance and the possibility that outcome accountable participants set out to find new, better rules. Nevertheless, it may also suggest that outcome accountability made participants decrease their reliance on cue abstraction.

Combining insights from these studies, we hypothesize that process accountability (relative to outcome accountability) stimulates cue abstraction.

3.1.4 Accountability and Exemplar-Based Processing

Previous research has also not considered the potential consequences of process and outcome accountability for exemplar-based processing. Because there is no consensus to date about the extent to which exemplar-based reasoning benefits from or is deteriorated by increased attention (Neal, Hesketh, & Andrews, 1995), it is difficult to make unambiguous predictions with regard to this matter. Under the assumption that exemplar-based processing does not just require basic attentiveness to stimuli but also the effortful encoding, storage and retrieval of exemplars (e.g., PROBEX; Juslin & Persson, 2002), process accountability is likely to boost it considerably, as process accountability has been shown to increase attention, encoding and retrieval of information (De Dreu et al., 2006). To the extent that this motivational effect is stronger for process than outcome accountability, this would lead to an exemplar-based processing advantage for process over outcome accountable people. However, even in this case extra effort may have a stronger beneficial effect on the abstraction of rules than on the storage of exemplars as the former is likely to be more cognitively involved than the latter (Patalano, Smith, Jonides, & Koeppe, 2001).

Alternatively, if exemplar-based processing is a largely automatic cognitive process and merely requires basic attention to the stimuli (e.g., MINERVA-DM; Dougherty, Gettys, & Ogden, 1999), neither process nor outcome accountability is likely to boost it significantly. Some research even hints that process accountability may be harmful for exemplar-based processing (Reber, Kassin, Lewis, & Cantor, 1980; Wilson, Dunn, Kraft, & Lisle, 1989). For instance, social-psychological inquiries suggest that introspection in the form of thinking about reasons can reduce (1) attitude-behavior consistency (Wilson, Dunn, Bybee, Hyman, & Rotondo, 1984), (2) agreement with expert opinion (Wilson & Schooler, 1991), and (3) post-choice satisfaction (Wilson et al., 1993). As an instruction to analyze one's reasons is closely related to a justification requirement for one's decision process, these findings imply that process accountability may be detrimental in some circumstances. One of the follow-up papers exploring the mechanism underlying these effects is of particular interest because it benchmarks performance of participants instructed to analyze their reasons against a group of participants instructed merely to remember past instances (Wilson, Hodges, & Lafleur, 1995), the latter closely resembling exemplar-based reasoning instructions (Olsson et al., 2006). In the first study of this paper, participants were asked to form an impression about a target person based on a list of 14 descriptions of that person. Afterwards, participants were primed with positive or negative thoughts about the target person and were instructed either to analyze their reasons for why they liked or disliked the target person, or to recall as many as possible past behaviors of the target person. Whereas participants in the recall condition relied more on the impression they formed initially about the target person, participants in the reasons condition were much more influenced by the thoughts that were made accessible by the priming manipulation. While the conceptual and methodological overlap between this line of research and our research is partial at best, it hints that process accountable participants (like people instructed to analyze reasons in the Wilson studies) may rely less on instances that were previously stored in memory (i.e., initial impression about a person or attitude towards an object in the Wilson studies), but engage in a blind and unsuccessful search for elemental cue-outcome effects.

In sum, it is difficult to make specific predictions regarding the effects of process versus outcome accountability on exemplar-based processing, but most of the admittedly only remotely related research would suggest that the superiority of process over outcome accountability would be smaller or even reversed for exemplar-based processing relative to cue abstraction.

3.1.5 The Resulting Effects of Accountability on Judgment Quality in Different Tasks

Existing research has documented seemingly-universal positive effects of process accountability relative to outcome accountability on judgment quality. However, a more fine-grained analysis of the processes that are likely to drive people's judgments and decisions suggests that the superiority of process over outcome accountability may depend on the nature of the judgment or decision task at hand. We predict that process accountability (relative to outcome accountability) boosts a cue abstraction process whereas it may leave an exemplar-based process unaffected. This cue abstraction process should be beneficial for judgment quality when cues have elemental (i.e., additive, main) effects on an outcome-to-be-judged. However, cue abstraction should not ameliorate judgment performance when cues have configural (i.e., multiplicative, interaction) effects on the outcome-to-be-judged. Thus, we predict that the superiority of process over outcome accountability for judgment quality becomes smaller as judgment tasks become more configural. The main purpose of Study 1 was to empirically verify this prediction.

3.2 Empirical Studies

Study 1

Process or outcome accountable participants engaged in a multiple-cue learning task in which they learned to predict the popularity (i.e., the outcome) of EasyPhones[8] that differed with regard to three binary cues: color (blue vs. red), shape (tall vs. wide), and number of buttons (four vs. five). Over a number of trials participants were presented

8 EasyPhones are mobile phones designed for elderly people and/or people with bad eyesight. With their distinctive big buttons, EasyPhones are easy to grip and simple to use.

with pictures of EasyPhones. In each trial they were asked to predict the popularity among groups of elderly consumers of the phone that was presented to them. After having made a prediction, outcome feedback was provided regarding the "actual" popularity of the presented EasyPhone. This enabled participants to learn from their experience and improve the quality of their predictions over time.

The elemental or configural nature of the task was manipulated by altering, between-participants, the mathematical formula relating the features of the EasyPhones to the popularity scores (i.e., the cue-outcome function). In the elemental task structure, the cue-outcome function was constructed such that the cues had only orthogonal linear effects on the popularity scores, whereas the cue-outcome function in the configural task was set up such that there were no independent but only configural effects of the cues on the popularity scores.

Furthermore, Study 1 explored how accountability type and the resulting judgment quality in elemental and configural tasks are related to a participant's epistemic motivation during the judgment task. Epistemic motivation is the need to achieve a thorough, rich, and accurate understanding of a decision problem and fuels systematic and effortful information processing (De Dreu et al., 2006; Kruglanski, 1989). Earlier research, mostly adopting group paradigms, has consistently shown that process accountability stimulates epistemic motivation (De Dreu et al., 2008). However, as we argued above, the influence of epistemic motivation on cue abstraction and exemplar memory is unclear, making it hard to predict how epistemic motivation is related to judgment quality in elemental and configural tasks. Because epistemic motivation is closely related to an individual's need for cognition (Cacioppo & Petty, 1982; De Dreu et al., 2008), epistemic motivation during the judgment task was assessed by measuring participants' situation-specific rational thinking style or need for cognition with a previously validated questionnaire (Novak & Hoffman, 2009).[9] The effects of process and outcome accountability on epistemic motivation and the subsequent impact on judgment quality in elemental and configural task structures were explored using a mediated moderation analysis (Muller, Judd, & Yzerbyt, 2005).

9 This scale is based on the rationality subscale of the Rational-Experiential Inventory (Pacini & Epstein, 1999), which is in turn adapted from the Need for Cognition scale (Cacioppo, Petty, & Kao, 1984). Whereas the rationality subscale of the Rational-Experiential Inventory is a measure of individual differences in dispositional tendencies to adopt a rational thinking style (i.e., a trait measure), the situation-specific rational thinking style measures an individual's momentary thinking orientation in a specific situation (i.e., a state measure).

Method

Participants and Design

The study used a 2 (accountability type: process vs. outcome) × 2 (task structure: elemental vs. configural) between-participants design. Participants were 131 undergraduate students who received course credits in return for their participation (M_{age} = 20.63, SD_{age} = 1.80; 27 females).

Procedure

Participants were assigned to individual cubicles. Computer-based instructions mentioned that the study investigated how people learn from experience and that participants would have to learn to predict the popularity of several EasyPhones among a group of elderly consumers. To encourage participants to discount pre-existing beliefs about the attractiveness of different mobile phone features, EasyPhones were described as a completely new product category specifically targeting a special population of elderly consumers.

Right before engaging in the prediction task, participants were informed that they would be evaluated. Process accountable participants were told that their evaluation would be based on their judgment strategy rather than on the accuracy of their predictions. They were notified that, to assess the quality of their decision process, upon completion of the prediction task they would be interviewed and asked to justify how they went about making their predictions. Outcome accountable participants were informed that their evaluation would be based only on the accuracy of their predictions. All participants were told that an evaluation score would be computed. Process accountable participants were told that this score would be based on the quality of the justification they provided for their judgment process. Outcome accountable participants were told that the evaluation score would be based on the accuracy of their predictions. To further enhance accountability, all participants were asked to sign a form granting permission to share their evaluation score with other participants and instructors once the entire experiment had been completed. This manipulation of process versus outcome accountability is similar to prior manipulations of process and outcome accountability (Siegel-Jacobs & Yates, 1996; Simonson & Staw, 1992).

The prediction task consisted of 120 trials. On each trial, a picture of an EasyPhone was presented and participants were asked to predict the popularity (expressed as a score ranging from 0 to 8). Upon entering a prediction, feedback about the real popularity of the EasyPhone was provided. The EasyPhones differed with regard to 3 binary cues (color, shape, and number of buttons), leading to a total number of 8 different EasyPhones. Each EasyPhone was presented 15 times, and the presentation order of the EasyPhones was randomized with the restriction that each EasyPhone occurred once within each block of 8 trials.

Task structure (elemental vs. configural) was manipulated between-participants by altering the cue-outcome function form relating the EasyPhone features to the popularity scores. In the elemental task structure, popularity (POP_E) was a linear, additive function of 3 binary cues (C_1, C_2, and C_3), in which the cues can take on values of 0 and 1:

$$POP_E = 1 + 3 \times C_1 + 2 \times C_2 + 1 \times C_3 + \text{Random}, \qquad \text{(Equation 6)}$$

Thus, each individual cue had a positive, linear effect on the popularity scores and the relative weight of each cue was different. Color (blue or red), shape (thick or thin) and number of buttons (four or five) were randomly assigned to the abstract cues, such that the importance of the different EasyPhone features varied across participants. In the configural task structure, there were no independent linear effects of cues on popularity scores. This was achieved by subjecting the outcomes in the elemental task to a quadratic transformation (cf. Olsson et al., 2006):

$$POP_C = -2/3 \times (POP_E - 4)^2 + 7 + \text{Random} \qquad \text{(Equation 7)}$$

Table 5 provides an overview of the task structures. As can be seen, the popularity scores in the elemental task can be produced by summing the independent effects of the cues on the outcome, while this is not possible in the configural task structure. A normally and independently distributed random error component was added to the popularity scores, with a variance chosen such that the multiple correlation between cues and associated popularity scores was around 0.90. In both task structures, the random error component was restricted such that outcome values ranged from 0 to 8.

Epistemic motivation during the prediction task was assessed by administering a questionnaire consisting of 10 statements at the end of the study. The questionnaire was based on Novak and Hoffman's (2009) situation-specific rationality scale. The wording of the items was slightly adapted in order to fit the specifics of the prediction task. Items were for example, "I tackled this task systematically", and "I was very focused on my thinking strategy to arrive at my predictions". Participants indicated on a scale from 1 (definitely false) to 5 (definitely true) to what extent these statements were true or false with regard to their judgment strategy in the prediction task. The scale proved to be reliable (α = .83), hence an overall index of epistemic motivation was computed by averaging a participant's responses over all items.

Table 5: The elemental and configural task structure used in Study 1.

EasyPhone	Cue			Outcome	
#	C_1	C_2	C_3	POP_E	POP_C
1	1	1	1	7	1
2	1	1	0	6	4.3
3	1	0	1	5	6.3
4	1	0	0	4	7.0
5	0	1	1	4	7.0
6	0	1	0	3	6.3
7	0	0	1	2	4.3
8	0	0	0	1	1.0

Note. $POP_E = 1 + 3 \times C_1 + 2 \times C_2 + 1 \times C_3$; $POP_C = -2/3 \times (POP_E-4)^2 + 7$.

As a measure of judgment quality, the Root Mean Square Error (RMSE) between predicted and real popularity scores was computed. This was done for every participant for each of the 15 blocks. An overall index of judgment quality was then computed collapsing the RMSEs over the 15 blocks. Hence, in the analyses below lower scores reflect smaller judgment errors and higher judgment quality.

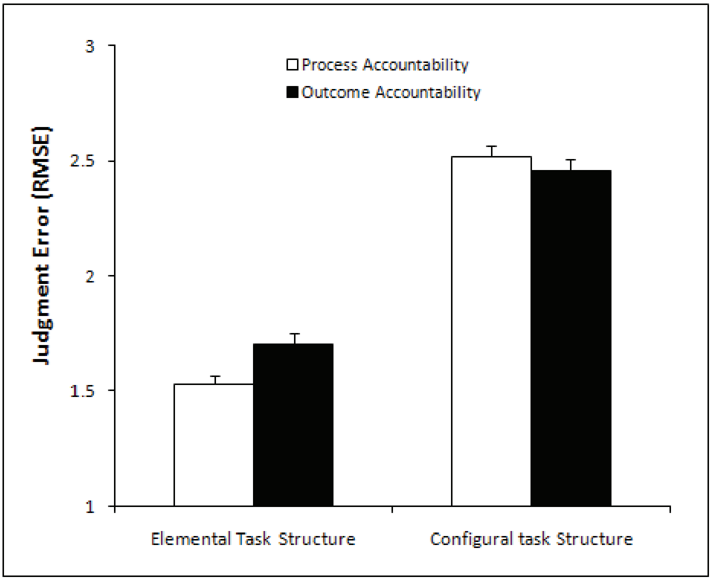
Results and Discussion

To verify that learning occurred over time, a repeated-measures analysis compared judgment error in the first block of trials with judgment error in the last block of trials. This analysis confirmed a significant decrease in judgment error in both the elemental task, $F(1,61) = 169.62$, $p < .01$, and the configural task, $F(1,66) = 10.56$, $p < .01$ (all *p*-values in this article are based on two-sided tests).

The link between accountability type, epistemic motivation and judgment quality, was explored by estimating three regression models (see Table 6). The first model regressed judgment error on accountability type, task structure, and the interaction between both factors. This analysis yielded a main effect of task structure (β_{12}), $F(1,127) = 330.21$, $p < .01$, such that judgment error was smaller in the elemental task (M = 1.37, SD = 0.32) than in the configural task (M = 2.35, SD = 0.31). This finding validates previous research indicating that elemental and linear relations are generally learned more easily than configural and nonlinear relations (Mellers, 1980; Sheets & Miller, 1974). Crucially, the regression also revealed a significant interaction between accountability type and task structure (β_{13}), $F(1,127) = 5.18$, $p < .05$, indicating that the effect of accountability type on judgment error differs across task structures. Follow-up contrasts established that process accountable participants made more accurate predictions than outcome accountable participants in the elemental task, $t(127) = -2.67$, $p < .05$, while there was no difference in judgment accuracy in the configural task, $t(127) = 0.51$, $p > .61$. The overall main effect of accountability type was not significant (β_{11}), $F(1,127) = 2.47$, $p > .11$. Figure 8 illustrates this pattern of results. The manipulation of the elemental versus configural nature of the multiple-cue judgment task used in this study is crucial. Prior research has only considered elemental tasks and documented positive effects of process accountability (Ashton, 1992; Siegel-Jacobs & Yates, 1996). The current study confirms the positive effect of process accountability on judgment performance in an elemental task, but additionally shows that this positive effect cannot be generalized to configural task structures.

Better performance for process accountable than for outcome accountable participants in the elemental task combined with equal performance in the configural task suggests that the difference in judgment error in the elemental task can be traced to superior cue abstraction among process accountable participants. Indeed, if the improved judgment quality in the elemental task had been due to improved exemplar-based processing a significant difference in judgment quality should have been observed in the configural task too, because exemplar-based processing facilitates learning of configural relations (as well as elemental relations). This was not the case, signaling that the improved performance among process accountable participants in the elemental task cannot be explained by superior exemplar-based processing, but is likely due to better cue abstraction among process accountable participants.

Figure 8: Task structure by accountability type interaction effect on judgment error in Study 1.



The second model regressed self-reported epistemic motivation during the prediction task on accountability type, task structure, and their interaction. This analysis revealed a main effect of accountability type (β_{21}), $F(1,127) = 8.72$, $p < .01$, and a main effect of task structure (β_{22}), $F(1,127) = 10.51$, $p < .01$, in the absence of an interaction between the two factors (β_{23}; $p > .26$). As expected based on existing literature (e.g., Scholten et al., 2007), process accountable participants (M = 3.82; SD = 0.49) showed a greater motivation to engage in thorough and systematic information processing relative to outcome accountable participants (M = 3.54; SD = 0.66), regardless of the elemental or configural nature of the task. Moreover, participants in the elemental task structure (M = 3.84; SD = 0.66) showed greater epistemic motivation relative to participants in the configural task structure (M = 3.53; SD = 0.50), irrespective of whether they were held outcome or process accountable.[10]

10 This main effect of task structure suggests that epistemic motivation is closely related to cue abstraction. Indeed, previous research has shown that people adaptively shift from cue abstraction to exemplar memory depending on the structural properties of the task, for instance as tasks become more configural or nonlinear (Juslin et al., 2008; Olsson et al., 2006). The parallel observation that epistemic motivation is lowered in configural tasks therefore suggests that epistemic motivation is more closely related to cue abstraction than it is to exemplar-based processing.

Table 6: Results for the mediated moderation analysis in Study 1.

	Model 1 DV = Judgment Error		Model 2 DV = EM		Model 3 DV = Judgment Error	
Predictors	*β*	*F*	*β*	*F*	*β*	*F*
AT	-0.042 (β_{11})	2.46	0.146 (β_{21})	8.70**	-0.020 (β_{31})	0.56
TS	-0.492 (β_{12})	330.15*	0.160 (β_{22})	10.50**	-0.472 (β_{32})	303.80**
AT x TS	-0.062 (β_{13})	5.20**	0.055 (β_{23})	1.25	-0.041 (β_{33})	2.34
EM					-0.112 (β_{34})	6.10*
EM × TS					-0.095 (β_{35})	3.96*

Note. AT = Accountability Type; TS = Task Structure; EM = Self-Reported Epistemic Motivation; * $p < .05$; ** $p < .01$.

To verify whether the interactive effect of accountability type and task structure on judgment quality was mediated by epistemic motivation, a third model regressed judgment quality on accountability type, task structure, their interaction (see the first regression model), as well as epistemic motivation and the interaction between epistemic motivation and task structure. This analysis showed an interaction effect between epistemic motivation and task structure (β_{35}), $F(1,125) = 3.97$, $p < .05$, indicating that higher epistemic motivation is associated with better judgment quality in elemental task structures, $F(1,61) = 19.30$, $p < .01$, but not in configural task structures, $F(1,66) = 0.04$, $p > .84$. This result supports our reasoning that epistemic motivation drives cue abstraction, but not reliance on exemplar memory. Crucially, unlike in the first regression model, the interactive effect of accountability type and task structure on judgment quality was no longer significant (β_{33}), $F(1,125) = 2.35$, $p >$ .12. Jointly, the results of these three regression models indicate that the differential effect of accountability type on judgment error in elemental and configural task structures is mediated by epistemic motivation (see Table 6; Muller et al., 2005).

In sum, results in Study 1 confirm that the superiority of process over outcome accountability for judgment quality becomes smaller as judgment tasks become more configural. Indeed, we found no significant advantage of process over outcome accountability in a purely configural task. Moreover, three regression analyses revealed a pattern of mediated moderation. Process accountability instructions increase epistemic motivation relative to outcome accountability instructions in both elemental and configural tasks. This increase in epistemic motivation however only enhances judgment quality in elemental tasks. These results substantiate the idea that process accountability and epistemic motivation facilitate cue abstraction but not exemplar-based processing. Because only exemplar-based processing but not cue abstraction is adaptive in configural task structures (Juslin et al., 2008; Olsson et al., 2006), the beneficial impact of process accountability and epistemic motivation on learning is not generalizable to the acquisition of configural cue-outcome relations.

Study 2

The main finding in Study 1 was that the superiority of process accountability over outcome accountability was restricted to the learning of elemental, linear cue-outcome effects. The goal of Study 2 was twofold. First, we wanted to replicate the interaction effect between accountability type and task structure on judgment error and, second, provide additional converging evidence that cue abstraction underlies the learning of elemental but not configural cue-outcome relationships. For this purpose, a shortened version of Raven's Standard Progressive matrices was administered (Raven, 1938). This test was selected because (1) it is widely used as a measure of analytical reasoning ability in both applied and research settings (Prabhakaran, Smith, Desmond, Glover, & Gabrieli, 1997; Raven, 2000), (2) it accounts for performance in a great variety of intellectual tasks (Marshalek, Lohman, & Snow, 1983) , and most importantly (3) the cognitive processes distinguishing higher scoring and lower scoring individuals on the test have been extensively studied (Carpenter, Just, & Shell, 1990). In particular, two key determinants of performance in this test are the ability to abstract rules and the ability to dynamically manage a large set of problem solving goals in working memory. Because these mental operations are quintessential to cue abstraction but not to exemplar-based processing, participants' performance on the Raven matrices should especially predict judgment quality in elemental task structures but not in configural task structures. This argument resonates with recent neuropsychological research indicating that the same brain circuit is underlying problem solving in the Raven matrices and in rule-based categorization tasks (Patalano et al., 2001; Prabhakaran et al., 1997).

It is generally recognized that individual predispositions and social contextual factors jointly determine cognitive processing (Beach & Mitchell, 1978; McAllister, Mitchell, & Beach, 1979; Payne et al. 1993). This suggests that the effect of analytical ability and accountability type on judgment quality in elemental task structures is unlikely to be independent. More specifically, because individuals with a lower analytical ability are less likely to engage in cue abstraction autonomously than individuals with a higher analytical ability, process accountability should especially boost cue abstraction and enhance judgment quality for individuals with a lower analytical ability and less so for individuals with a higher analytical ability. Similarly, process accountability is likely to be a sufficient social contextual cue to engender cue abstraction in elemental tasks regardless of analytical ability. As a result, individual differences in analytical ability should have stronger effects on cue abstraction, and judgment quality, in elemental tasks under outcome than process accountability.

Method

Participants and Design

Eighty-seven undergraduate students participated in exchange for course credits (M_{age} = 21.22, SD_{age} = 2.34), and were randomly assigned to a 2 (accountability type: process vs. outcome) × 2 (task structure: elemental vs. configural) between-participants design.

Procedure

The setup of the prediction task used in Study 2 was similar to Study 1. Popularity scores in the elemental task structure were again determined by a linear additive function of three binary cues:

$$POP_E = 1 + 5 \times C_1 + 3 \times C_2 + 1 \times C_3 + \text{Random}. \qquad \text{(Equation 8)}$$

Again, popularity scores in the configural task resulted from a quadratic transformation of the elemental outcomes, such that there were no consistent independent linear effects of cues on popularity scores:

$$POP_C = -\,2/5 \times (POP_E)^2 + 4 \times POP_E + \text{Random} \qquad \text{(Equation 9)}$$

As in Study 1, a normally and independently distributed error component was added to the outcome values such that the multiple correlation between cues and popularity scores was around .90. The resulting outcome values were constrained between 0 and 10.

After finishing the prediction task, participants completed a short version of Raven's Standard Progressive Matrices Test (Raven, 1938). This test is composed of several visual analogy problems, each consisting of a 3 × 3 matrix, in which eight cells contain figural elements, and the bottom right cell is empty. The test taker is instructed to determine the rules that tie the cells together by looking across the rows and down the columns, and to select the figure that correctly completes the matrix from a set of eight response alternatives presented below the matrix (for an isomorph of a typical standard progressive matrices item, see Carpenter et al., 1990). Six matrices, increasing in difficulty, were selected from Set D and Set E of the test[11], and were presented to participants on computer. The time participants received to solve the puzzles was constrained to 30 seconds for each of the first two matrices, 45 seconds for the third, and 60 seconds for puzzles 4, 5 and 6. One point was awarded per matrix that was solved correctly within the time limit. Hence, analytical intelligence scores could range from 0 to 6 (M = 2.70, SD = 1.31).

Results and Discussion

To verify if learning had occurred in both task structures, a repeated-measures analysis comparing judgment error in the first block and the last block was conducted. This analysis confirmed that judgment error diminished significantly over time in both the elemental task structure, $F(1,41) = 53.08$, $p < .01$, and the configural task structure, $F(1,42) = 7.42$, $p < .01$.

The overall index of judgment quality (RMSE) was regressed on accountability type (process vs. outcome), task structure (elemental vs. configural), and analytical intelligence (mean-centered). Replicating Study 1, this analysis yielded a main effect of task structure, $F(1,79) = 367.49$, $p < .0001$, such that overall judgment quality was better in the elemental task (M = 2.61, SD = 0.47) than in the configural task (M = 3.41, SD = 0.28). The two-way interaction between accountability type and task structure was also significant, $F(1,79) = 4.19$, $p < .05$. Consistent with Study 1, process accountable participants (M = 2.46, SD = 0.37) were more accurate than outcome accountable participants (M = 2.73, SD = 0.51) in the elemental task, $t(79)$ = -

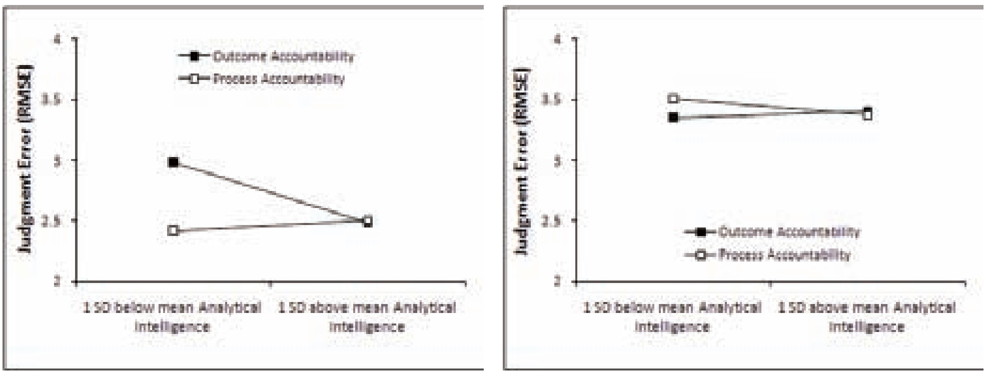
11 The selected matrices were: D4, D9, D11, E7, E8, E9.

2.33, $p < .05$, while there was no significant difference in judgment quality in the configural task, $t(79) = 0.61$, $p > .54$.

Moreover, the two-way interaction between accountability type and task structure was qualified by a three-way interaction with analytical intelligence, $F(1,79) = 4.51$, $p < .05$. Whereas accountability type and analytical intelligence did not alter performance in the configural task (all *p*s > .45), in the elemental task a significant effect of accountability type emerged, $F(1,39) = 3.99$, $p = .05$, together with a marginally significant effect of analytical intelligence, $F(1,39) = 3.52$, $p = .07$, and a significant interaction between accountability type and analytical intelligence, $F(1,39) = 7.05$, $p < .05$. The two-way interaction between accountability type and analytical intelligence in the elemental task was further explored by (1) analyzing the effect of accountability type at low (1 SD below mean) and at high (1 SD above mean) levels of analytical intelligence, and (2) analyzing the effect of analytical intelligence within the outcome accountable and the process accountable group separately (Aiken & West, 1991). The first analysis revealed that, in the elemental task, process accountability instructions improved judgment quality for participants scoring lower on the Raven Matrices, $F(1,39) = 12.29$, $p < .01$, while there was no difference for participants with higher scores on this analytical intelligence measure, $F(1,39) = 0.04$, $p > .84$. The second analysis indicated that higher performance on the Raven matrices was associated with higher judgment quality in the elemental task within the outcome accountable group, $F(1,22) = 8.51$, $p < .01$, while there was no significant relation between analytical ability and judgment quality in the elemental task within the process accountable group, $F(1,17) = 0.39$, $p > .53$.

These results, as illustrated in Figure 9, are interesting in at least two ways. First, we found that performance on the Raven matrices is positively related to judgment quality when elemental cue-outcome relations have to be learned but unrelated to judgment quality when configural relations have to be learned. Because performance on the Raven matrices reflects an individual's ability to analytically abstract rules (Carpenter et al., 1990), it substantiates the idea that analytical thought in the form of cue abstraction is only effective for the learning of elemental, linear cue-outcome relations (Juslin et al., 2008; Olsson et al., 2006). From a practical point of view, the finding that analytical intelligence is uncorrelated with performance in configural tasks is important because it suggests that standard psychometric techniques assessing analytical intelligence are only predictive with regard to the learning of elemental linear relations but may not tell us very much about an individual's performance in more complex, configural environments. Second, with regard to judgment quality in the elemental task we found (a) that process accountability specifically has a positive effect for participants scoring lower on the Raven matrices, and (b) that analytical ability specifically has a positive effect for participants who are held outcome accountable. This pattern of results suggests that process accountability and analytical ability are respectively a social contextual factor and an individual predisposition facilitating a very similar cognitive process that is adaptive in elemental tasks.

Figure 9: Task structure by accountability type by analytical intelligence interaction effect on judgment error in the elemental task structure (left panel) and the configural task structure (right panel) in Study 2.



Study 3

The previous studies established that the superiority of process over outcome accountability depends on the nature of the task. Specifically, we found a significant advantage of holding people process accountable for elemental but not for configural tasks. In addition, the previous studies showed that epistemic motivation as well as analytical intelligence are positively associated with performance in elemental but not configural tasks. These findings are consistent with our claims that (a) process accountability specifically promotes cue abstraction and (b) measures of analytical thinking (i.e., epistemic motivation and analytical intelligence) are associated with cue abstraction but not exemplar-based processing. However, the previous studies do not provide a direct test of these two claims because cue abstraction and exemplar-based processing *per se* were not assessed. Study 3 addresses this concern by probing participants' judgment process using cognitive modeling techniques.

In Study 3, formal representations of the cue abstraction process and the exemplar-based process were fitted to participants' judgments in an elemental task (see Appendix A). Differences in model fit between process and outcome accountable participants reflect differential use of cue abstraction and exemplar memory, and can subsequently be employed to predict judgment quality. If cue abstraction underlies the difference in performance between process and outcome accountable participants in elemental tasks, then (a) the cue abstraction model should fit better for process accountable than for outcome accountable participants, (b) differences in the cue abstraction model fit should mediate differences in judgment quality, and (c) this should not be the case for the model fits of the exemplar-based model.[12]

To avoid problems of overfitting (Campbell & Bolton, 2005), the judgment task used in the previous studies was adapted slightly. The number of cues was increased from three to four (yielding 16 possible EasyPhones instead of eight in the previous studies), and the multiple-cue learning task was divided in a training phase and a test phase. In the training phase, participants learned to predict the popularity of a subsample of 11 EasyPhones, while in the test phase all possible EasyPhones had to

---

12 Note that we did not include configural task conditions in this experiment, because there were no significant performance differences between process and outcome accountable participants in Studies 1 and 2. Hence, a configural task would not lend itself to the process mediation approach in Study 3.

be judged. Thus, in the test phase participants were presented with EasyPhones that were familiar to them (i.e. EasyPhones that were also presented in the training phase) and EasyPhones that were new to them (i.e. EasyPhones that were presented for the first time in the test phase). This modification yields three non-overlapping judgment datasets: (1) judgments in the training phase, (2) judgments of the new EasyPhones in the test phase, and (3) judgments of the familiar EasyPhones in the test phase. These data sets were used for parameter estimation, model validation, and assessment of judgment quality, respectively. Parameters of the cue abstraction and the exemplar-based model (see Appendix A) were estimated based on participants' judgments in the second half of the training phase (parameter estimation sample). These parameter values were consequently cross-validated by predicting judgments for new EasyPhones in the test phase (model validation sample). Differences between process and outcome accountable participants in cue abstraction and exemplar-based model fits for the cross-validation sample reflect differential use of cue abstraction and exemplar-based processing. These model fit statistics were consequently used in a mediation analysis to explain differences in judgment quality for the familiar EasyPhones presented in the test phase.

An additional goal of Study 3 was to examine how individual differences with respect to one of the most widely used self-report measures of rational – analytical thinking style relate to cue-abstraction and exemplar-based processing. Specifically, we administered the rationality subscale of the Rational-Experiential Inventory (Pacini & Epstein, 1999). This subscale consists of two sub-subscales probing (1) rational engagement or motivation to process analytically and (2) rational ability or capacity to process analytically. These sub-subscales are conceptually highly related to epistemic motivation (see Study 1) and analytical intelligence (see Study 2), respectively, allowing us to capture both components from the previous studies with a single measure.[13]

Since its conception this scale has been validated cross-culturally (Witteman, van den Bercken, Claes, & Godoy, 2009; Bjorklund & Backstrom, 2008) and studied extensively in the context of normative versus heuristic decision making (e.g., Bartels, 2006; Pacini & Epstein, 1999; Shiloh, Salton, & Sharabi, 2002). Despite its popularity, to

13 Whereas epistemic motivation was measured as a state in Study 1, the rational engagement sub-subscale is a self-reported trait measure of epistemic motivation. Whereas analytical ability was assessed with an intelligence test in Study 2, the rational ability sub-subscale is a self-report measure of analytical ability.

our knowledge no research to date has related rational thinking style to cue abstraction and exemplar-based processing. Given our findings in Studies 1 and 2, we expected the rationality scale to correlate positively with cue abstraction but not with exemplar-based processing. Thus, hinging on the idea that a rational thinking style signals an individual's motivation and ability to engage in cue abstraction, and process accountability is a contextual factor triggering cue abstraction (cf. Study 2), we predicted that (a) process accountability should have a positive effect on cue abstraction and performance especially for participants scoring lower on the rationality scale, and (b) rational thinking style should be especially predictive of cue abstraction and performance when participants are held outcome accountable.

Method

Participants and Design

Eighty-six undergraduate students (M_{age} = 20.96; SD_{age} = 2.12; 43 females) were paid €10 to participate. Participants were randomly assigned to the process or outcome accountability condition of an elemental learning task.

Procedure

The procedure and accountability manipulation were similar to the previous studies. Participants learned to predict the popularity of EasyPhones that were different with regard to four binary features: color (red or blue), number of buttons (four or five), shape (flat or thick), and presence of an antenna (yes or no). The attributes of the EasyPhones were assigned randomly to four abstract cues related to popularity by the following linear, additive function:

$$POP = 4 \times C_1 + 3 \times C_2 + 2 \times C_3 + 1 \times C_4 + Random \qquad \text{(Equation 10)}$$

The random error component was drawn from a uniform distribution ranging from -0.5 to +0.5. The popularity scores ranged from 0 to 10. Different from the previous study, the learning task consisted of two phases: a training phase and a test phase. The training phase consisted of 110 trials in which only a subset of 11 EasyPhones was presented. Participants received trial-by-trial outcome feedback. The test phase consisted of 32 trials in which participants were presented two times with all possible 16 EasyPhones, including the EasyPhones that were excluded in the training phase. In the test phase, participants were asked to give their best prediction for each of the EasyPhones, and received no feedback about the real popularity of the EasyPhones.

Mathematical representations of the cue abstraction and the exemplar-based process (see Appendix A) were fitted to the judgments of each participant separately in the second half of the training phase. Parameter estimation for the cue abstraction model was done with ordinary least squares (OLS), while the Newton-Raphson method was used for estimating the parameters of the exemplar-based model (see Appendix A). Participant-specific parameters from the training phase were then used to predict each participant's judgments for the completely new EasyPhones in the test phase. Model performance was assessed for each participant separately by the coefficient of determination (r^2) and the root mean square error (RMSE) between model-based (predicted) judgments and the participant's actual judgments.[14] Differences in model fits across participants indicate differences in cognitive processing. The differences in model fit were used in a mediation analysis to explain judgment quality.

When finished with the prediction task, participants completed three items measuring how important it was for them that they would be evaluated (1 = "not important at all"; 10 = "extremely important"), how motivated they were to obtain a positive evaluation score (1 = "not motivated at all"; 10 = "extremely motivated"), and how well they understood the instructions (1 = "not at all"; 10 = "perfectly"). No differences were found between process and outcome accountable participants on these measures (all *p*s > .22), indicating that differences in general motivation cannot account for differences in cognitive processing and judgment quality.

Finally, participants completed the rationality subscale of the Rational-Experiential Inventory (Pacini & Epstein, 1999). The scale consists of 20 items and measures an individual's motivation and ability to process information rationally (α = .86; e.g., "I enjoy intellectual challenges", and "I am much better at figuring things out logically then most people.").

---

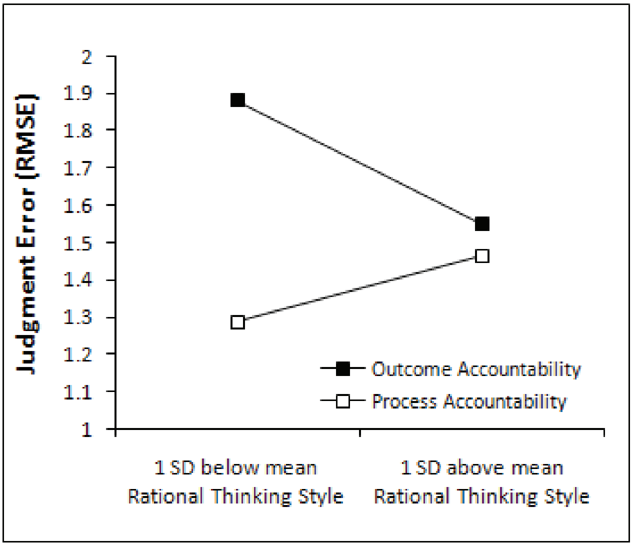
14 Note that the model fit RMSEs should not be confused with the judgment quality RMSE. Whereas the former reflect differences between model-based judgments and participants' judgments, the latter reflects differences between participants' judgments and real popularity scores. Although both the r^2 and model fit RMSE measures capture slightly different aspects of the model fit (Myung, Pitt, & Kim, 2005), the results for both goodness of fit statistics were identical and only the coefficient of determination will be used for exposition purposes. Statistical analyses for the untransformed and Fisher z transformed coefficients of determination yielded identical results. For ease of interpretation, we present only the results for the untransformed coefficients.

Results

Judgment Quality

The overall index of judgment quality (RMSE) was regressed on accountability type (process vs. outcome) and rational thinking style (mean-centered; M = 3.76; SD = 0.53). This analysis yielded a main effect of accountability type, $F(1,82) = 9.06$, $p < .01$, indicating that process accountable participants (M = 1.38, SD = 0.47) were relatively more accurate than outcome accountable participants (M = 1.71, SD = 0.56) in an elemental task (cf. Studies 1 and 2). In addition, a two-way interaction between accountability type and rational thinking style was observed, $F(1,82) = 5.42$, $p < .05$. This interaction was further explored by (1) analyzing the effect of rational thinking style on judgment quality for outcome accountable and process accountable participants separately, and (2) a spotlight analysis exploring the effect of accountability type at low (1 SD below the mean) and at high (1 SD above the mean) levels of rational thinking style (Aiken & West, 1991).

Figure 10: Accountability type by rational thinking style interaction effect on judgment error in Study 3.



As expected, the first analysis revealed that in an elemental task greater rationality is associated with an increase in judgment quality under outcome accountability, $F(1,37) = 3.79$, $p = .06$. The effect of rational thinking style on judgment quality within the process accountable group was however not significant, $F(1,45) = 1.58$, $p > .21$.

Also as expected, the second analysis exposed that the effect of accountability type was significant at low levels of rational thinking style, $F(1,82) = 14.46$, $p < .001$, but not at high levels of rational thinking style, $F(1,82) = 0.23$, $p > .63$. Hence, whereas type of accountability in an elemental task makes little difference for people who have a tendency to tackle problems rationally, process accountability (vs. outcome accountability) instructions significantly improve performance for people with no such predisposition. Figure 10 illustrates this pattern of results.

The finding that in an elemental task rationality significantly predicts judgment quality under outcome accountability but not under process accountability, in combination with the finding that process accountability especially improves judgment quality for low-rational people suggests that process accountability is a contextual factor and rationality a trait that facilitate a very similar cognitive process which improves judgment quality in elemental task structures. The exact nature of this cognitive process is explored next.

Cue abstraction and exemplar-based processing

Relative differences in cue abstraction and exemplar-based processing were explored by analyzing model fits (two r^2s per participant, one indicating the extent to which the cue abstraction model described a participant's popularity predictions and one indicating the extent to which the exemplar-based model described a participant's popularity predictions). These model fits were subjected to a Mixed General Linear Model in which type of cognitive model (cue abstraction vs. exemplar-based) was a within-participants factor, accountability type (process vs. outcome) a between-participants factor, and rational thinking style (mean-centered) a continuous predictor. This analysis revealed the expected three-way interaction, $F(1,82) = 6.08$, $p < .05$, which can be traced to a significant two-way interaction between accountability type and rational thinking style for the cue abstraction model fits, $F(1,82) = 8.54$, $p < .01$, and a non-significant two-way interaction between accountability type and rational thinking style for the exemplar-based model fits, $F(1,82) = 0.34$, $p > .55$. For the exemplar-based model fits, there were no significant effects of accountability type and rationality at all (all *p*s > .15).

The significant two-way interaction for the cue abstraction model fits was further explored by (1) analyzing the effect of rationality on cue abstraction for outcome accountable and process accountable participants separately, and (2) a spotlight analysis verifying the effect of accountability type at low (1 SD below the mean) and at high (1 SD above the mean) levels of rationality (Aiken & West, 1991). The first analysis revealed that among outcome accountable participants the cue abstraction model fits better for high-rationality participants, $F(1,37) = 7.38$, $p = .01$. For process accountable participants, there was no effect of rationality on cue abstraction model fits, $F(1,37) = 1.20$, $p > .27$. Thus, under outcome accountability, high-rationality participants relied more on cue abstraction than low-rationality participants, whereas under process accountability, there was no significant difference in reliance on cue abstraction between high- and low-rationality participants.

The second analysis indicated that low-rationality participants who were held process accountable relied more on cue abstraction than low-rational participants who were held outcome accountable, $F(1,82) = 9.63$, $p < .01$, while there was no significant difference in cue abstraction between process and outcome accountable participants for high-rational participants, $F(1,82) = 1.10$, $p > .29$.

In sum, this pattern of results (see Figure 11) indicates that accountability type and rational thinking style jointly determine cue abstraction, while they do not affect exemplar-based processing. Because there are no significant differences in exemplar-based processing for different accountability types and different levels of rationality, exemplar-based processing cannot underlie the differences in judgment quality. However, the observed patterns of results for cue abstraction model fits and judgment quality suggest that differential reliance on cue abstraction might drive the interactive effect of accountability type and rationality on judgment quality. This is verified by a mediated moderation analysis.

Mediated moderation analysis

In line with the principles outlined by Muller et al. (2005) three regression models were estimated:

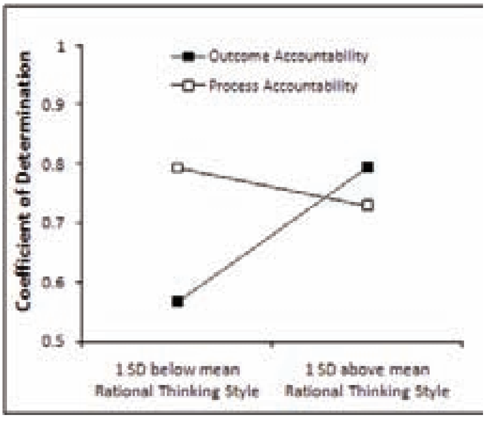
(1): $JE = \beta_{10} + \beta_{11} AT + \beta_{12} RAT + \beta_{13} AT*RAT + \varepsilon_1$

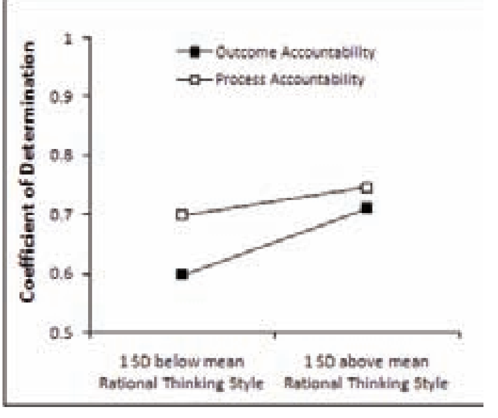
(2): $CA = \beta_{20} + \beta_{21} AT + \beta_{22} RAT + \beta_{23} AT*RAT + \varepsilon_2$

(3): $JE = \beta_{30} + \beta_{31} AT + \beta_{32} RAT + \beta_{33} AT*RAT + \beta_{34}CA + \beta_{35}CA*RAT + \varepsilon_3$

As discussed above, the first regression model established that the effect of accountability type (AT) on judgment error (JE) is moderated by rationality (RAT; $\beta_{13} \neq 0$). The second regression model yielded a similar interaction effect on the cue abstraction model fits (CA; $\beta_{23} \neq 0$). Crucially, the third regression model revealed a significant effect of cue abstraction model fits on judgment error ($\beta_{34} \neq 0$), indicating that higher degrees of cue abstraction are associated with lower judgment error, $F(1,80) = 14.28$, $p < .01$, while the interactive effect of accountability type and rationality turned to non-significance ($\beta_{33} = 0$; $F(1,80) = 1.59$, $p > .21$). Table 7 provides an overview of the parameter estimates and associated F statistics of the regression analyses. A similar analysis for exemplar-based processing revealed that model fits measuring exemplar-based processing were associated with lower judgment error, $F(1,80) = 8.50$, $p < .01$, but were unrelated to both accountability type and rationality.

Figure 11: Accountability type by rational thinking style interaction effect on cue abstraction model fit (left panel) and exemplar-based model fit (right panel) in Study 3.





In sum, our analyses show that (1) process accountability and rationality jointly predict judgment quality, (2) that this effect of process accountability and rationality is mediated by their effect on cue abstraction, (3) that process accountability and rationality do not engender exemplar-based processing, but that (4) although exemplar-based processing is predictive of judgment quality in elemental tasks, it does not explain the effects of accountability type and rationality on performance in elemental tasks.

Table 7: Results for the mediated moderation analysis in Study 3.

	Model 1 DV = Judgment Error		Model 2 DV = CA		Model 3 DV = Judgment Error	
Predictors	*β*	*F*	*β*	*F*	*β*	*F*
AT	-0.164 (β_{11})	9.06**	0.036 (β_{21})	2.04	-0.138 (β_{31})	6.81*
RAT	-0.074 (β_{12})	0.50	0.078 (β_{22})	2.72	-0.009 (β_{32})	0.01
AT x RAT	0.243 (β_{13})	5.43*	-0.139 (β_{23})	8.53**	0.131 (β_{33})	1.59
CA					-0.865 (β_{34})	14.29**
CA × RAT					-0.130 (β_{35})	0.12

Note. AT = Accountability Type; RAT = Rational thinking style; CA = Cue Abstraction model fits; * $p < .05$; ** $p < .01$.

3.3 General discussion

3.3.1 Summary of findings

The goal of this research was to examine the effect of process and outcome accountability (a) on cue abstraction and exemplar-based cognitive processing and (b) on judgment quality in elemental and configural tasks. We made two primary predictions. First, we predicted that process accountability (relative to outcome accountability) boosts cue abstraction but not exemplar-based processing. Second, because cue abstraction is based on knowledge about linear, elemental cue-outcome effects, we predicted that process accountability improves judgment quality in elemental tasks but not in configural tasks. Inspired by a contingency perspective on judgment and decision making, according to which characteristics of the social context, characteristics of the decision maker and characteristics of the decision problem jointly determine cognitive processing and judgment quality (Payne et al., 1993), we additionally explored the role of a decision maker's predispositional analytical ability and rational thinking style. We predicted that, in addition to process accountability, higher analytical ability and a more rational thinking style positively influence cue abstraction, such that when a decision maker is held process accountable and/or has a high analytical ability or rational thinking style, the abstraction of elemental cue-outcome effects is facilitated, resulting in an improved judgment quality in elemental tasks only.

We tested these propositions in a sequence of three multiple-cue learning studies. Study 1 manipulated accountability type and task structure. Judgment quality was higher under process accountability than under outcome accountability in the elemental task but not in the configural task. By assessing participants' epistemic motivation during the specific prediction task (i.e., a state and not a trait measure), Study 1 provides initial insight into the cognitive process underlying differences in judgment quality. Although process accountability heightens epistemic motivation regardless of the elemental or configural nature of the task, the increase in epistemic motivation only results in better judgments in the elemental task. This suggests that process accountability, by increasing epistemic motivation, facilitates a specific cognitive process that is effective in elemental but not in configural tasks. Study 2 explored the interactive effect of accountability type, analytical intelligence and task structure on judgment quality. Analytical intelligence was measured by performance on Raven's Standard Progressive Matrices (Raven, 1938). We found that accountability type and analytical ability jointly determined judgment quality in an elemental task but had no joint nor separate effects on judgment quality in a configural task. Because (1) performance on the Raven Matrices is determined by an individual's ability to abstract and mentally integrate rules (Carpenter et al., 1990), and (b) analytical ability influenced judgment quality in interaction with accountability type in the elemental task, but (c) had no effect on performance in the configural task, Study 2 suggests that process accountability and analytical ability have a positive influence on cue-abstraction. Study 3 examined the interactive effect of accountability type and rational thinking style (i.e., a trait and not a state measure) on judgment quality in an elemental task structure, and directly assessed cue abstraction and exemplar-based processing with cognitive modeling techniques. Consistent with our conceptualization we found that process accountability and rational thinking style stimulate cue abstraction but not exemplar memory, and that the boost in cue abstraction is responsible for the increase in judgment quality in elemental tasks. Figure 12 provides an overview of the theoretical framework relating the variables that were manipulated or measured in the different studies.

3.3.2 Theoretical and managerial implications

The current research is situated at the crossroads of social psychology, management research, and cognitive psychology and contributes to each of these streams of research.

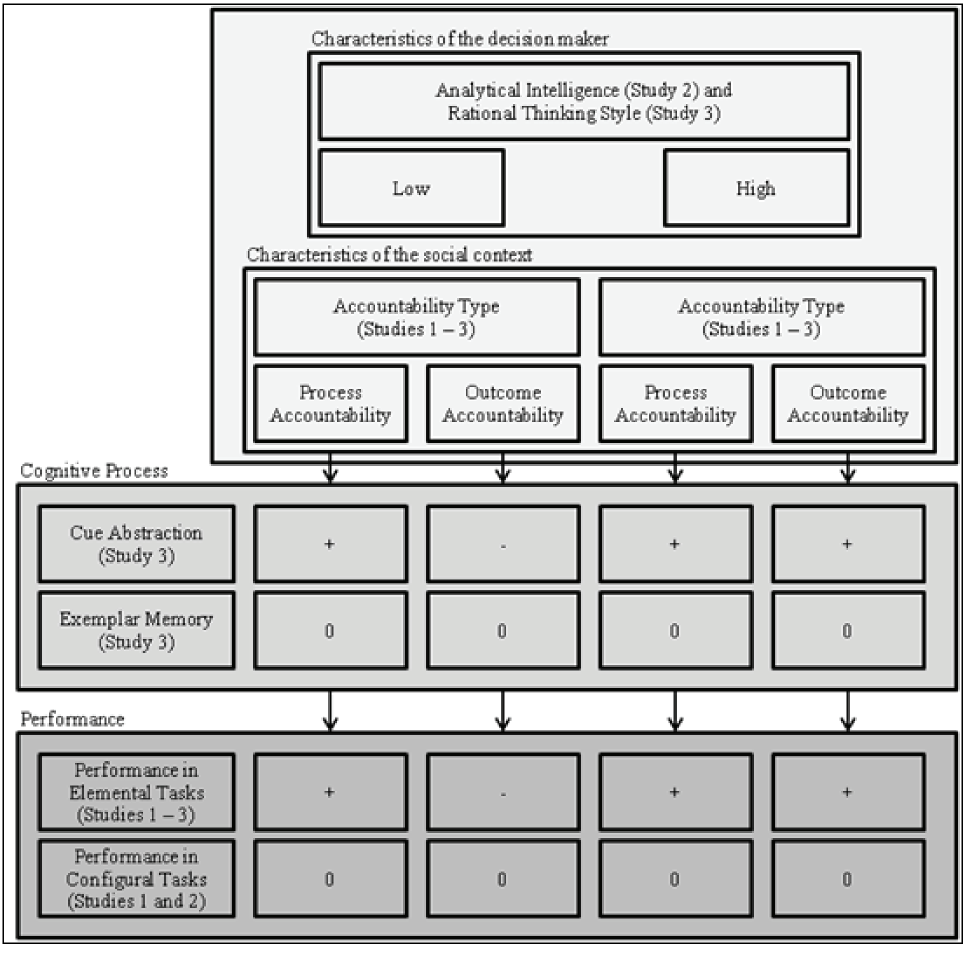
To date, there is a consensus in the social psychological and management literature that in order to optimize judgment quality and performance decision makers should be held process accountable rather than outcome accountable. By pinpointing the exact nature of the cognitive process distinguishing process from outcome accountable decision makers, the current article shows that this insight needs to be qualified. In particular, our research shows that because process accountability promotes cue abstraction but not exemplar memory, and because cue abstraction is only viable in elemental tasks but not in configural tasks, the superiority of process over outcome accountability in terms of judgment quality is limited to tasks that involve the acquisition of elemental relations. This theoretical development may elucidate why, despite the negative effects of outcome accountability documented in the academic literature, outcome-based control systems are so widespread in private-sector institutions (e.g., in salesforce management; Cravens, Ingram, LaForge, & Young, 1993; Challagalla & Shervani, 1996). Business problems are typically nonlinear, stochastic, interactive, and downright difficult (Kotler, 1971), and managerial judgments and solutions are often based only on the recollection of previously experienced cases and similarity-based reasoning processes (Dane & Pratt, 2007; Kolodner, 1992). Our research shows that for these types of problems, process accountability does not yield superior performance compared to outcome accountability. Future research should focus on individual predispositions and/or contextual factors that do facilitate exemplar-based processing and could subsequently improve the learning of configural relations.

Besides fundamentally shifting the nature of the judgment task from elemental to configural, the presence of interactive effects of cues on outcomes also increases the complexity of the judgment task. This raises a question regarding the relative advantage of process over outcome accountability in terms of judgment quality in more complex, elemental tasks. For example, one could make the elemental task structure used in the current set of studies more complex by raising the number of cues determining the outcome, or by increasing the random variation in the outcome, or by forcing participants to make rapid judgments instead of giving them an open response time, and so forth. If more complex environments trigger greater reliance on heuristic processing than on analytic processing, individuals may be less likely to rely on cue abstraction as the complexity of the task increases. This may in turn weaken the positive effect of process accountability on decision accuracy. Although we did not observe a processing advantage for outcome accountable decision makers in terms of exemplar memory, it is possible that outcome accountability has a positive influence on heuristic processing. In real-life settings it is often adaptive to rely on simple heuristic processing (e.g., "Take The Best" heuristic) because it outperforms more complex processing (e.g., multiple regression or cue abstraction) in terms of speed without a considerable loss in terms of accuracy (Gigerenzer & Goldstein, 1996). If future research shows that outcome accountability boosts heuristic processing, outcome accountability may in fact be desirable to optimize judgment speed and accuracy in real-life decision making.

Note that in the current research we have considered the effects of holding decision makers either process accountable or outcome accountable on judgment quality. Managerially it is however possible to simultaneously hold decision makers both process and outcome accountable. This possibility raises several questions for future research. For example, is process accountability sufficient to improve judgment quality regardless of whether outcome accountability is imposed or does outcome accountability negate the positive effect of process accountability in elemental task structures? Could there be any synergetic effects of imposing process and outcome accountability in configural task structures?

In cognitive psychology, great progress has been made in (a) defining cue abstraction and exemplar-based processing in terms of the cognitive operations that are involved (e.g., Hahn & Chater, 1998), and (b) exploring how task characteristics influence reliance on cue abstraction and exemplar memory (e.g., Juslin et al. 2003; Juslin, 2008). However, little or no research has explored how individual predispositions and an individual's social context influence cue abstraction and exemplar memory. Our research shows that process accountability, epistemic motivation, analytical intelligence, and rational thinking style are positively related to cue abstraction, but not to exemplar-based processing. Future research should explore how other social contextual cues and individual predispositions relate to cue abstraction and exemplar-based processing.

Figure 12: Overview of the theoretical framework and manipulated/measured variables in Studies 1 – 3.



Over the last decades, there has been a proliferation of dual-process theories in psychology arguing that judgments can be rational or experiential (Epstein, Lipson, Holstein, & Huh, 1992), systematic or heuristic (Chaiken, 1980), analytical or intuitive (Hammond, 1996), global or local (Navon, 1977), conscious or unconscious (Dijksterhuis, 2004), rule-based or associative (Sloman, 1996), based on cue abstraction or based on exemplars (Juslin, Karlsson, & Olsson, 2008), implicit or explicit (Reber, 1989), etc. Our research shows that, although there are conceptual overlaps between these theories, there is no one-to-one mapping between the processes highlighted by different theories. For instance, previous research has argued that process accountability facilitates systematic processing due to an increase in epistemic motivation whereas outcome accountability facilitates heuristic processing because it decreases epistemic motivation (e.g., Scholten et al., 2007). Equating systematic processing with cue abstraction and heuristic processing with exemplar-based processing would yield the prediction that process accountability facilitates cue abstraction and outcome accountability facilitates exemplar-based processing. Our research shows that this is not the case, as exemplar-based processing was found to be constant across accountability types.

3.3.3 Conclusion

The present research examined how process and outcome accountability in interaction with individual predispositions influence cue abstraction and exemplar memory. We hope that our focus on cognitive processes and contingency stimulates future research and understanding of how judgment quality can be improved for different people under difference circumstances.

Chapter 4. Bilingualism and the Emotional Intensity of Advertising Language[15]

English is the new *lingua franca*. From international business to the Internet, from science to music, English is the language of important aspects of the social life of consumers around the world (Cristal 1997). Indeed, it has become commonplace for commentators to identify the rise of English as a world language as one of the most visible aspects of the process of globalization. No area of media production exemplifies the growing importance of the English language better than advertising. Regardless of their cultural heritage and native language, consumers are routinely addressed by large numbers of marketing messages in English. For example, in the Netherlands over 40% of TV ads contain words in English (Gerritsen et al. 2000) and this phenomenon is by no means limited to Western cultures (e.g., Lee 2006).

Calls for an increased focus on the consequences of globalization for consumers (e.g., Johar, Maheswaran, and Peracchio 2006) emphasize the need to improve current understanding of how the globalization of advertising language influences consumer response to advertising messages. In particular, no previous research has examined the emotional consequences of the use of a foreign language in marketing messages. Generating emotional experiences around a brand is an important goal of brand communication. For instance, French Connection, a British fashion company, adopted the acronym FCUK in all its advertising presumably in the belief that provocative messages such as "FCUK you!" are beneficial to the brand. The globalization of advertising implies that marketing messages are increasingly delivered in a language that is different from consumers' native tongue. For example, the acronym FCUK has been advertised to consumers in over 20 countries where English is not an official language. This raises the question of whether and how language might affect consumer perceptions of ad campaigns aimed at triggering emotional reactions.

---

15 This chapter was published in *Journal of Consumer Research*. Please cite as: Puntoni, Stefano, Bart de Langhe, and Stijn van Osselaer (2009), "Bilingualism and the Emotional Intensity of Advertising Language," *Journal of Consumer Research*, 35 (6), 1013-1026.

The field of linguistics is displaying a growing awareness of the role of emotional processes in bilingualism (Pavlenko 2005, 2006). Extending recent literature on the emotions of bilinguals, this article investigates the perceived emotionality of marketing messages in consumers' native language (henceforth, L1) versus second language (L2). We present five experiments showing (1) that messages expressed in L1 tend to be perceived as more emotional than messages expressed in L2; (2) that this effect is not uniquely due to the activation of stereotypes associated to specific languages or to a lack of comprehension; and (3) that the effect depends on the frequency with which words have been experienced in L1 versus L2 contexts. Together, these experiments provide support for a language-specific episodic trace theory of language emotionality.

4.1 Theory

Consumer research on bilingualism can be broadly categorized in two areas. The first adopts a sociolinguistic approach to examine the signaling functions of language in the context of ethnic minority targeting (e.g., Koslow, Shamdasani, and Touchstone 1994; Luna and Peracchio 2005). The second adopts a psycholinguistic approach to explore the information processing consequences of language (e.g., Luna and Peracchio 2001; Tavassoli and Lee 2003). The present investigation shares with this second stream of research the stress on psycholinguistic processes but differs from existing consumer research in its attention to emotional processes.

4.1.1 Existing Research on the Emotions of Bilinguals

The prediction that one's native language possesses special emotional qualities is probably not surprising to any introspective bilingual. Despite the intuitive appeal of this prediction, the generality of the effect, and the obvious substantive implications, to the best of our knowledge no contribution in marketing has explored the possibility of systematic differences in the emotional intensity of marketing communication as a function of language. In other fields of inquiry, however, it is possible to find some evidence consistent with this intuition.

Linguistic research using introspection, interviews, or literary analysis has in a number of occasions mentioned the special emotionality of one's native language (Pavlenko 2005). Moreover, using both general self-reports (Dewaele 2004) and physiological measures (Harris, Aycicegi, and Gleason 2003), psycholinguistic research on taboo words and swearwords has shown that the perceived emotional intensity of these highly emotional words is greatest in one's native language. Research on code-switching is also relevant to this discussion. In the context of social interaction, Bond and Lai's (1986) participants found it easier to discuss embarrassing topics in L2 than in L1. Bond and Lai argue that in embarrassing situations switching to a second language serves a distancing function. Based on clinical case studies, Javier (1989) similarly concluded that during therapy sessions switching language is a coping mechanism for the patient.

In these studies L1 yielded stronger emotional experiences than L2. These settings, however, are all characterized by a combination of extreme emotionality and self-relevance that makes the extrapolation to the processing of external information of mild emotionality questionable. In addition to the issue of the applicability of results on taboo words and bilingual counseling to a marketing setting, another important open issue is the mechanism responsible for systematic differences in language emotionality.

First, as most research in the area has focused on a specific language comparison (often featuring the language of a "warm" culture such as Spanish or Turkish as L1 and English as L2), it could be argued that most of the work on which evidence for the emotional advantage of L1 rests is open to a possible alternative explanation based on the (perceived) emotionality of specific languages. If country stereotypes influence language emotionality (Leclerc, Schmitt, and Dubé 1994), evidence for the emotional advantage of L1 must be produced in a context that controls for this influence, for example by varying across respondents which of two languages is L1 versus L2 or by demonstrating moderating effects drawn from a theory of language emotionality.

Moreover, it is important to demonstrate that language effects on emotionality cannot only be explained by differences in comprehension between L1 and L2. Linguistic experience is an important determinant of a person's ability to interpret and appraise emotional expression (Harris 2000). For example, native speakers perform better than nonnative speakers when asked to identify verbal emotional expression (Pavlenko 2005). This is an especially important issue when shifting attention from single words and isolated utterances to more complex textual information such as advertising slogans or product descriptions.

Recently, a number of authors have argued that differences in the relative emotionality of L1 and L2 must stem from differences in the context of language learning and use (Altarriba 2003; Harris, Gleason, and Aycicegi 2006; Pavlenko 2005). For example, Dewaele (2004) showed that languages learned in an instructed context are associated to less intense emotional reactions than languages learned in a naturalistic context. Below, we propose a cognitive model of bilingual memory that builds on this literature and on episodic trace theories of memory.

4.1.2 A Language-Specific Episodic Trace Theory of Language Emotionality

Episodic trace models of memory represent one of the most influential theoretical traditions within cognitive psychology (Raaijmakers and Shiffrin 1992). They are founded upon the assumption that every experience leaves a separate episodic trace in memory. Consistent with nonanalytic views of cognition (Jacoby and Brooks 1984), these models posit that perceptual and contextual details of experiences are stored in memory and are integral to later perception. For example, Hintzman's Minerva 2 model (Hintzman 1986, 1988) suggests that each experience is stored as an array of elements. When a stimulus is encountered, all memory traces are activated in proportion to their similarity to the probing stimulus. An aggregate of all activated traces (i.e., an *echo*) is sent to working memory from long term memory. The echo may contain information that is not present in the stimulus, such as previously experienced emotions, thus associating the stimulus to past emotional experiences. For episodic memories to influence emotional reactions, the actual conscious retrieval of such episodes is not necessary. The emotional intensity resulting from the echo content activated by the probing stimulus is experienced as an intuitive impression or gut feeling (Schimmack and Reisenzein 1997; Siemer and Reisenzein 2007).

Similarity to episodic traces

Episodic trace theories propose that "surface" details of experiences are stored in memory as elements of the episodic trace. Consistent with this reasoning, it has been found that auditory details, like intonation contour and vocal pitch (Palmeri, Goldinger, and Pisoni 1993; Schacter and Church 1992), and irrelevant visual information, like typeface (Jacoby and Hayman 1987), are implicitly stored in long term memory. Hence, it seems plausible that these episodic traces also contain L1 or L2 lexical representations depending on the language in which the event was originally experienced. This property of episodic memory can explain language-dependent recall, the finding that memories originally experienced in L1 (L2) are more accessible when triggered by L1 (L2) words (Marian and Kaushanskaya 2004; Marian and

Neisser 2000). This research stream builds on the encoding specificity principle (Tulving and Thomson 1973) and argues that experiences are stored in memory together with their linguistic context. Activating the same linguistic representation that was used at the time of the experience serves as a retrieval cue for memories for that experience. Given the centrality of emotional information in autobiographical memories (Bower 1981), we draw on the idea of language-dependent storage of autobiographical memories. For example, research has shown that individuals tend to express more emotional details and more intense affect when the language of the retrieval cue is consistent with language at encoding (Javier, Barroso, and Munoz 1993; Marian and Kaushanskaya 2004). Our theory embeds the principle of language-dependent recall within a cognitive model and extends this research from the conscious recollection of autobiographical memories to the perception of stimuli in which emotionality is automatically attributed to textual information based on implicit language-specific activation of episodic traces stored in memory. In sum, we propose that textual information such as marketing slogans may function as memory probes which lead to the activation, and feeling, of emotions experienced before in same-language contexts.

Number of episodic traces

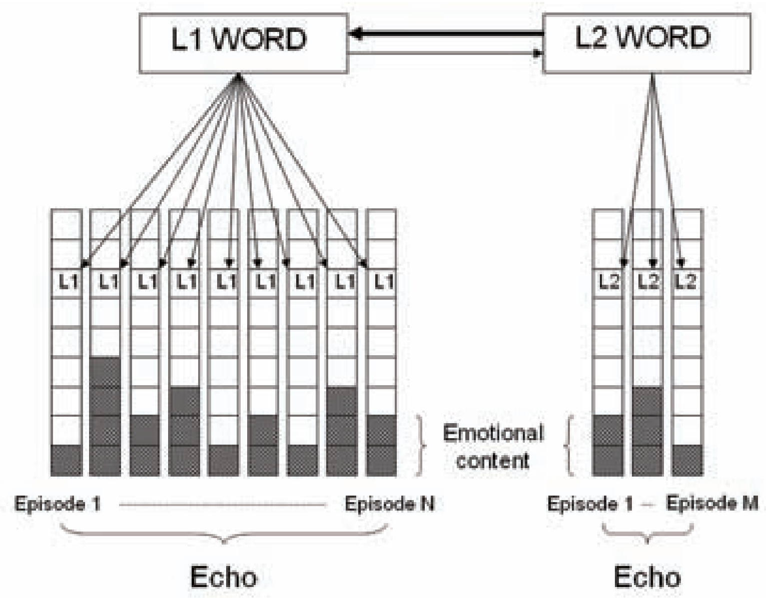
Episodic trace theories suggest that, in general, the activation intensity of an echo is a positive function of the number of relevant episodic traces stored in memory (Hintzman 1986). Words that are encountered more often should be part of a larger number of episodic traces, leading to a stronger echo of emotions that have been experienced during these episodes. As a result, there should be a positive correlation between how often a word is encountered in a particular language and emotionality. In the context of the globalization of advertising language, the number of events experienced by consumers in concomitance with an L1 language context generally outnumbers that of events experienced in an L2 language context. Together with the previous property of episodic traces, this discussion therefore leads to the prediction that marketing communication should in general trigger stronger emotional responses in L1 than in L2. Moreover, our theory predicts an emotional advantage of L2 in the (rare) case of words that are experienced more often in L2 language contexts.

Lexical representations

In addition to separate storage of individual experiences (Hintzman 1986), we adopt the assumption of most psycholinguistic models of bilingual memory, such as the

Revised Hierarchical Model (Kroll and Stewart 1994), of the existence of independent lexical stores for L1 and L2. Lexical stores encode the lexical representation of words (i.e., how they are written and how they sound). Moreover, we adopt the contention of prior psycholinguistic literature (e.g., Kroll and Stewart 1994) that the link between the lexical representation of L1 and L2 words is asymmetric. Specifically, the link from L2 words to their L1 translation is stronger than the link in the opposite direction. In other words, the activation of an L1 word as consequence of exposure to its L2 translation is greater than that of an L2 word as a consequence of exposure to its L1 translation. Thus, consumers may unconsciously translate L2 words into L1 words but will rarely do the opposite.

Figure 13: Language-specific episodic trace theory of language emotionality



Our model incorporates the interaction between episodic memory traces and lexical representations. A prediction of the theory is that the emotional intensity generated by L2 probes benefits to some extent from the association between the L2 probe and its L1 translation. In other words, L2 probes activate emotional echo content from L2 experiences as well as emotional echo content from L1 experiences, proportionally to the level of activation of L1 lexical representations. As corollaries of the theory, this discussion implies that (1) when the accessibility of the L1 translation is increased, L2 words should be perceived as more emotional and, conversely, that (2) when this indirect activation of L1 emotional echo content upon presentation of L2 words is impeded, the emotional advantage of L1 should become larger.

In sum, the language-specific episodic trace theory assumes that there are two routes to perceived emotionality for marketing messages. In the direct route, L1 (L2) words trigger episodic memory traces experienced in an L1 (L2) context. Because there are usually more L1 than L2 traces, marketing messages in L1 tend to be perceived as more emotional than in L2. In the indirect route, words presented in L2 partially activate the corresponding words in the L1 lexical store. Because these L1 words, in turn, function as probes for L1 episodic traces, L2 words can benefit to some extent from the emotionality of the experiences triggered by L1 words. This reduces the difference in the perceived emotionality of L1 and L2 words. Figure 13 presents a summary of the theory.

4.2 Empirical Studies

Study 1

Study 1 was designed to test the prediction of the theory that advertising information in L1 tends to be experienced as more emotional than the same information in L2. As target textual information we used a series of advertising slogans. To establish the emotional advantage of L1 in a context that ensured its validity, we tested the effect of language on perceived emotionality (1) in conjunction with an assessment of an alternative complex appraisal (perceived originality) and (2) in a balanced bilingual design that varied across participants which of two target languages was L1 versus L2. The first aspect above was included to show that the advantage of L1 is not general to all complex appraisals. We chose perceived originality because it is not likely to be a natural part of most consumer experiences. Thus, whereas emotional content is central in episodic memory, most memory traces of previous experiences are unlikely to contain originality judgments. In other words, we predict a two-way interaction between language and appraisal such that L1 stimuli will be rated as more emotional than L2 stimuli in the absence of a similar effect of language on originality.

The second aspect above, varying which of two languages was L1 versus L2, was necessary to rule out a language-specificity explanation that haunts many studies on bilinguals, where the language used as L1 is different across all respondents from the language used as L2. We address this problem by using the same two languages and manipulating the role they played (L1 or L2). Specifically, we used Dutch-French bilinguals, exactly half of whom were French native speakers (L1) who had learned to speak Dutch (L2). The other half were Dutch native speakers (L1) who had learned to speak French (L2). Thus, any difference between the emotionality of messages in L1 and the emotionality of messages in L2 could not be explained by, for example, the greater emotionality of Romance languages such as French over Germanic languages such as Dutch. An additional aspect of the design deserves attention. To obtain the cleanest test of the effect of language on emotionality, the study used trilingual participants. This allowed instructions and experimenter-participant interactions to occur in a language (English) that was different from the target languages used for the stimuli, hence avoiding potential asymmetric effects of these interactions across people with different L1s.

Method

Participants and Design

The study used a 2 (language of slogans: L1 vs. L2) × 2 (type of appraisal: emotional intensity vs. originality) × 2 (L1: native French speakers vs. native Dutch speakers) mixed design, in which language of slogans and type of appraisal were within-subjects factors and respondents' L1 was a between-subjects factor. In addition, the order of the slogans and the language sequence were counterbalanced between-subjects. The experiment was conducted in Brussels, the bilingual French-Dutch capital city of Belgium. Respondents were 64 Dutch-English-French trilinguals who participated in return for a small reward (for age, M = 25.48, SD = 7.06; 25 females).

Stimuli

The slogans had been created using as starting point American slogans unknown in Europe. The slogans were therefore created in English and later translated to Dutch and French by native Dutch and French speakers. The translated slogans were then checked for consistency with the English version by two independent judges. Each slogan was presented together with an indication of the product or service advertised (in English for all respondents). The slogans spanned a variety of product categories:

flowers ("See the face you love light up in a brilliant smile"), hotel ("When you are here you are family. We will leave the light on for you"), amusement park ("Where a kid can be a kid and the magic never ends. The happiest place on Earth"), frozen food ("Nothing comes closer to home. Be happy, be healthy!"), anti-drug campaign ("Parents who use drugs have kids who use drugs"), and construction toys ("Build something together with your child. You will never outgrow our toys"). The six slogans, together with their product category, were presented on one page.

Two slogan orders were randomly created and two additional orders were generated by inverting the first two, resulting in four different slogan orders. For the language sequences, the same procedure was applied. The four slogan orders were then crossed with the four language sequences, resulting in 16 different counterbalancing conditions.

Procedure

The city of Brussels was selected as the setting for the study because of its special linguistic characteristics. Belgium includes four language regions: Dutch-speaking, French-speaking, German-speaking, and the bilingual region of Brussels. Many people living and working in Brussels are fluent in both French and Dutch. Participants were recruited in the three main subway and train stations in Brussels. Train travelers were addressed in English, asked what their native language was (Dutch or French), and asked if they were fluently trilingual (English, Dutch, French). If they indicated they were fluently trilingual, they were invited to participate in an international study on advertising slogans.

Participants were asked to complete a booklet with instructions and questions in English. The second page presented six slogans, three in French and three in Dutch. Participants were asked to rate the emotional intensity of the slogans using a seven-point unipolar scale (anchoring points were "unemotional" and "emotional"). The following page featured again the same slogans and asked participants to rate their perceived originality (anchoring points were "unoriginal" and "original"). We chose single-item measures because they allowed us to include multiple slogans and both emotionality and originality judgments without inducing fatigue or resistance to participate in a public transport setting.

Results

For all participants, the emotionality and originality scores of the slogans in each language were averaged to form four indices. The data were subjected to a repeated-measures ANCOVA with language of the slogan (L1 vs. L2) and type of appraisal (emotionality vs. originality) as within-subjects factors and respondents' L1 as between-subjects factor. Gender has been shown to affect sensitivity to emotional information (Bloise and Johnson 2007) and this variable was therefore added as an additional factor. Slogan order, language sequence, and their interaction were added as covariates. See table 8 for means and figure 14 for a representation of the language by appraisal interaction.

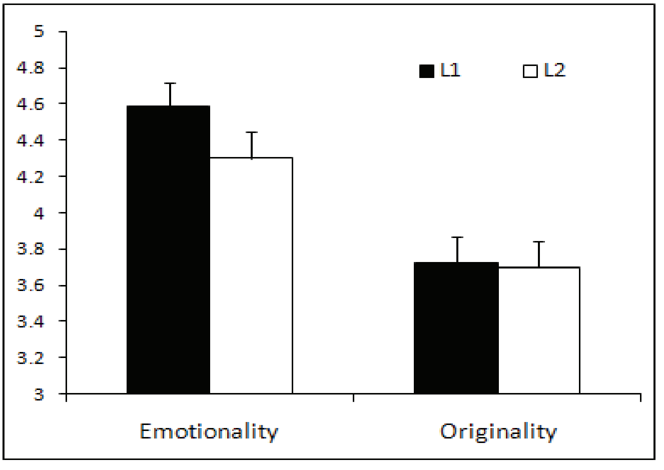
Table 8: Cell means (and standard deviations) in Study 1.

	L1				L2			
	French native speakers		Dutch native speakers		French native speakers		Dutch native speakers	
	F	M	F	M	F	M	F	M
Emotional intensity	4.58	4.48	4.74	4.59	4.14	4.28	4.21	4.48
	(0.87)	(0.98)	(1.24)	(0.90)	(1.14)	(1.08)	(0.96)	(0.89)
Originality	3.55	4.22	3.69	3.30	3.61	3.80	3.62	3.72
	(1.25)	(1.09)	(1.26)	(1.11)	(1.40)	(1.16)	(0.99)	(1.20)

Note. F = Females; M = Males

We observed no main effect of respondents' L1 (p > .74), a marginally significant main effect of language ($F(1, 45) = 3.05$, $p < .09$; ratings of L1 slogans were marginally higher than ratings of L2 slogans), and a significant main effect of type of appraisal ($F(1, 45) = 45.74$, $p < .0001$; emotionality ratings were in general higher than originality ratings). Crucially, the two-way interaction between language of slogans and type of appraisal was significant ($F(1, 45) = 4.15$, $p < .05$). This interaction was in the expected direction. L1 slogans ($M = 4.59$) were rated as more emotional than L2 slogans ($M = 4.30$; $F(1, 45) = 6.86$, $p = .01$). No effect of language was observed on ratings of originality ($p > .9$; for L1, $M = 3.72$; for L2, $M = 3.70$). This two-way interaction was not qualified by the three-way interaction between respondent's L1, language, and type of appraisal ($p > .36$). In particular, the mean emotional advantage of L1 was 0.29 for native speakers of both French (for L1, M = 4.52, and for L2, M = 4.23) and Dutch (M = 4.65 and 4.36, respectively). In other words, regardless of whether the native language of participants was French or Dutch, the emotional advantage of L1 was identical.

Figure 14: Language by appraisal interaction in Study 1.



The three-way interaction between language of the slogan, appraisal, and gender was marginally significant ($F(1, 45) = 2.99$, $p < .1$). The emotional advantage of L1 was more pronounced for women (M = 0.49) than men (M = 0.16; $F(1, 45) = 5.99$, $p = .02$), with no language by gender effect on originality ($p > .78$). Research on autobiographical memories suggests that females have stronger memory for emotional events than males (Davis 1999) and this difference might explain this marginally significant effect. A number of theoretically uninteresting effects related to the counterbalancing covariates (e.g., effects of slogan order) were also significant.

Discussion

In this study, Dutch-English-French trilinguals were addressed in English and rated a series of Dutch and French advertising slogans on emotionality and originality. Half of participants were L1 speakers of French and half were L1 speakers of Dutch. We observed a two-way interaction between language and type of appraisal such that L1 slogans were rated as more emotional than L2 slogans, with no difference between L1 and L2 slogans in perceived originality. The effect on emotionality confirms our hypothesis. The absence of an effect on originality suggests that the L1 advantage is not a universal characteristic of all complex appraisals, but is due to the centrality of affect in episodic memory. The two-way interaction, moreover, was not qualified by a three-way interaction with respondent's L1: the magnitude of the emotional advantage of L1 was exactly the same for Dutch and French native speakers. Thus, the L1 advantage on emotionality could not be due to either of the languages being inherently more emotional.

Study 2

Study 1 provided a stringent test of the difference in the emotionality of L1 and L2. However, L1 and L2 differ in more respects than just the number of previous experiences in which words were paired with emotions. For example, it is possible that consumers often do not (completely) comprehend emotion-related words in L2. If words are not comprehended and do not strongly activate any specific meaning, it is likely that they do not generate high judgments of emotionality. If words are miscomprehended and activate incorrect concepts, it is likely that the activated concepts are not all as emotional as the ones that should have been activated, assuming that most slogans are chosen to be at least somewhat emotional. Thus, miscomprehension could lead to more moderate emotionality judgments in L2.

Study 2 was designed to address this concern. Participants rated the perceived emotionality of either L1 or L2 single words. The critical feature of the study is that all target words are perceptually similar across language conditions and share the same meaning—they are cognates. Cognates (such as the English "emotional" and Dutch "emotioneel") are easy to process and comprehend in L2, a phenomenon often referred to as the cognate facilitation effect (Costa, Caramazza, and Sebastian-Galles 2000). Thus, difficulty comprehending the target words is unlikely to explain differences in emotional intensity.

Method

In this study, we manipulated the language in which eight words were presented in a simple two-cell design. Participants were 79 undergraduate students enrolled in programs taught partially or completely in English at a large Dutch university. They were all native Dutch speakers and participated in return for course credits (for age, $M = 19.87$, SD = 1.94, 33 females). The eight words were selected based of the similarity between L1 and L2. In all cases, no more than two letters differed between the L1 and L2 words and for all target words the L1 and L2 pronunciation matched closely. The L2 stimuli were: "depression," "heroic," "house," "intimate," "mother," "poetic," "relation," and "sick." The L1 stimuli were: "depressie," "heroisch," "huis," "intiem," "moeder," "poetisch," "relatie," "ziek." Participants were randomly assigned to condition and completed this study in individual cubicles as part of a sequence of unrelated experiments. The words were presented on one screen and participants were asked to indicate to what extent each word had emotional connotations (on a seven-point scale, from "no emotional connotations" to "strong emotional connotations").

Results and discussion

We found a significant main effect of language ($F(1, 77) = 4.98$, $p < .05$). Despite the fact that the L1 and L2 words were virtually identical, participants who saw the words in L1 ($M = 4.66$) indicated that the words had stronger emotional connotations than participants who saw the words in L2 ($M = 4.33$). Another model was estimated with gender as an additional factor. The main effect of language remained unchanged and the main effect of gender was significant ($F(1, 75) = 4.46$, $p < .05$; females rated the words as more emotional than males). The interaction between gender and language was however nonsignificant ($p > .56$). Using a different experimental paradigm, study 2 corroborates the evidence in support of the emotional advantage of L1 and against an explanation purely in terms of inability to comprehend the stimuli in L2.

Study 3

Based on the indirect route to the emotionality of L2 words, we predicted that, when the L1 translation of an L2 probe is made more accessible, the emotional intensity of the L2 probe should benefit from the increased activation of emotional echo content from L1 experiences. Study 3 was designed to test the prediction that the emotionality of L2 words increases when the equivalent L1 word is made more accessible. In addition, study 3 adds to the evidence obtained in study 2 against an explanation of language effects on emotionality only based on comprehension differences.

In study 3 we developed a novel experimental paradigm, which allowed assessing the effect of the activation of L1 versus L2 words while holding constant across conditions the language of the stimuli (in this study, single words presented in English). Instead of varying the language of presentation of target words, we exposed all participants to only their L2 version and manipulated the accessibility of the L1 representation of those L2 words. The experiment was presented as a study on the effect of handwriting on the evaluation of words used in advertising. Participants wrote down on a piece of paper a series of target English words and associations with those words using either their native language or English.

In contrast to an explanation based on ability to comprehend, a multiple-trace episodic memory view does predict an L1 advantage in this study. When a word is presented and reproduced in L2, consumers are likely to follow the direct route and use the L2 word as an episodic memory probe. Because consumers have few emotional experiences stored with the L2 word in episodic memory, the emotional echo content will be relatively weak, leading to a moderate judgment of the word's emotionality. However, if consumers are asked to translate the L2 word to L1 and to generate associations in L1, they are likely to use the L1 word to probe their episodic memory, yielding a stronger emotional echo content because more experiences were stored with L1 words than with L2 words. Relative to a control condition, increasing the accessibility of their L1 translation should therefore increase the perceived emotionality of L2 words. This design has the additional advantage of enabling the inclusion of participants with a variety of native languages, hence allowing a strong test of external validity.

Method and results

Accessibility of native language was manipulated between-subjects using two levels. Participants were 60 foreign undergraduate students (30 females) at a large Dutch university who were all nonnative English speakers. In total, 20 different native languages were represented in the sample (e.g., Bulgarian, Mandarin, Croatian, German, Indonesian, Russian, Spanish).

The target words were 12 English words ("birthday," "children," "family," "garden," "loneliness," "pain," "party," "play," "relation," "school," "sick," and "toothbrush"). They had been selected to represent a broad set of notions relating to everyday life (e.g., "toothbrush") and ranging on a number of dimensions, for example from abstract (e.g., "loneliness") to concrete (e.g., "garden") and from positive (e.g., "play") to negative (e.g., "pain"). For each word, participants in the high native language accessibility condition were asked to translate the word into their native language and to write down on a sheet of paper in front of them the translation together with three associations that the word brought to mind, also in their native language. Participants in the control condition went through the same procedure, but instead of translating the English word to their native language, they were instructed to copy the English word and to write down three associations to the word in English. After writing down each word, the English word was presented again on the computer screen. Participants then rated the extent to which this L2 word had emotional connotations for them. Participants indicated their opinion on a scale from 1 to 7, with 1 meaning "no emotional connotations" and 7 meaning "very strong emotional connotations."

The emotionality scores for the 12 words were averaged for each participant to create an emotionality index. The main effect of accessibility of native language was significant and in the predicted direction ($F(1, 58) = 4.92$, $p < .05$). Participants who wrote down the target words in their native language ($M = 5.08$) reported a stronger emotional response than participants who wrote down the words in English ($M = 4.66$). The analyses were repeated adding gender as an additional factor. No coefficient involving gender was significant in this model (ps $> .24$) and the main effect of accessibility of native language was left unchanged.

Discussion

In study 3, all participants rated the emotionality of a series of English words. Before rating its emotionality, half were asked to write down the word in their native language and half in English. Consistent with a multiple-trace memory view of language and emotionality, we observed a significant main effect of this manipulation of L1 accessibility on emotionality ratings of L2 words. Because the target stimuli were always presented in L2, the effect in this experimental paradigm cannot be explained by inability to comprehend words in L2. In addition, participants in study 3 were citizens of a wide range of countries. This feature of the study is important because it allowed the inclusion of a large number of native languages, hence adding to the external validity of the experiment.

Study 4

Studies 1-3 established the emotional advantage of L1 and together demonstrated that an account based on comprehension or language stereotypes cannot be solely responsible for the emotional advantage of L1. The data are consistent with the idea that words in a language are stored together with emotional content in episodic memory traces such that perceiving words in a language activates records of emotional experiences featuring those words in that language.

If this theory is correct, the language context in which emotions tend to be experienced should predict the relative emotionality of L1 versus L2. If the language context is a key determinant of emotionality, it should be possible to reverse the effect of language observed in previous studies for words that are predominantly experienced in an L2 context. In other words, the theory predicts that, for words that have been encountered mostly in an L2 language context, the effect of language should reverse and L2 words should be perceived as more emotional than L1 words. Study 4 was designed to test this contention. As stimuli, we used Dutch (L1) and English (L2) word pairs selected through a pretest. In this experiment we predict no main effect of language but a crossover interaction such that, for words experienced predominantly in L1 language contexts, the L1 words will be perceived as more emotional than their L2 equivalent, with the opposite holding for words experienced predominantly in L2 language contexts.

Method

Participants and design

The design of this study was a 2 (Language: L1 vs. L2) × 2 (Language context: L1 vs. L2) fully within-subjects design. In addition, the order of language presentation was manipulated between-subjects. Four counterbalancing conditions were also added to vary between-subjects the order in which the words were presented, leading to eight different versions of the booklet. Participants were 94 students at a large Dutch university (for age, M = 23.28, SD = 1.85, 41 females) who participated in return for a chocolate bar.

Procedure

At the end of a lecture, students were asked to fill out a booklet in which eight concepts were presented sequentially. For each concept, participants rated the emotionality of the corresponding words in L1 and in L2. For example, for the concept "funeral/begrafenis," they rated the emotionality of both "funeral" and "begrafenis" (on a nine-point scale ranging from "not emotional at all" to "very emotional"). For half of participants, the L1 word preceded and for half it followed the L2 word. After rating all words, a final page asked participants to report if any of the L2 words were unfamiliar (one participant reported low familiarity on at least one word but excluding data from this participant left the results unchanged), some basic demographic questions, and to write a short essay to guess the purpose of the study (no participant raised a suspicion about the purpose of the study and, in particular, none noticed the presence of two sets of concepts).

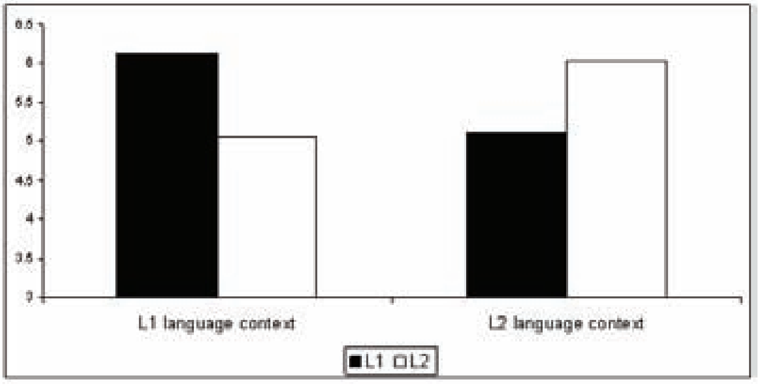
Stimuli

To select the stimuli we conducted a pretest with 50 students (for age, M = 21.38, SD = 1.94). The pretest used a format similar to that of the main study but it asked participants to rate the extent to which, for a given L1/L2 word pair, the word had been experienced more often in an L1 or an L2 language context. Twenty-four L1/L2 word pairs were presented sequentially (the order of the words were varied between-subjects using four different versions of the booklet) and, for each pair, participants answered the following item: "how often have you encountered this concept in a Dutch-language context or an English-language context?" (nine-point scale, from "Much more often in Dutch-language contexts" to "Much more often in English-language contexts"). The pretested concepts had been selected with the goal of ensuring variance in the context of language use. Although the average across all concepts was significantly smaller than the mid-point of the scale (hence indicating on average a predominantly Dutch language context, $p < .0001$), we observed relatively large variance in language context mean ratings across the 24 concepts ($2.62 < M < 6.36$; SD = 1.03). The scores were ranked and the four word pairs that scored lowest (M = 3.10) and the four that scored highest (M = 6.00, $t(49) = -12.97$, $p < .0001$) were selected for the main study as, respectively, L1 and L2 language context word pairs. The L1 language context words are: "funeral"/"begrafenis," "grandma"/"oma," "playground"/"speeltuin," and "resit"/"hertentamen." The L2 language context words are: "airport"/"luchthaven," "career"/"loopbaan," "passion"/"hartstocht," and "world cup"/"wereldbeker."

Results

For all participants, the emotionality scores of the words in each language and language context were averaged to form four indices. These variables were then subjected to a repeated-measures ANOVA that also included the language order and word sequence counterbalancing factors and the interaction between them as between-subjects factors. The main effects of language and of language contexts were nonsignificant ($ps > .33$). The two-way interaction between these factors was significant and in the predicted direction ($F(1, 86) = 84.03$, $p < .0001$). See table 9 and figure 15.

Figure 15: Language by language context interaction for emotional intensity in Study 4.



When the language context was predominantly L1, the L1 words ($M = 6.12$) were perceived as more emotional than the L2 words ($M = 5.04$; $F(1, 86) = 50.90$, $p < .0001$). Conversely, when the language context was predominantly L2, the L1 words ($M = 5.1$) were perceived as less emotional than the L2 words ($M = 6.03$; $F(1, 86) = 76.35$, $p < .0001$). At the word level, the effect of language on emotionality was significant and in the predicted direction for all the words in both language context conditions (all *p*s < .0001). A number of theoretically uninteresting effects related to the counterbalancing factors and gender (e.g., the language context by gender interaction) were also significant.

Table 9: Cell means (and standard deviations) in Studies 4 and 5.

	Study 4		Study 5	
	Language context		Instructions	
Emotional intensity	L1	L2	SLEMF	Control
L1	6.12 (1.11)	5.10 (1.17)	5.44 (0.98)	5.46 (1.11)
L2	5.04 (1.38)	6.03 (1.03)	4.31 (1.18)	5.10 (1.17)

Study 5

Study 5 was designed to provide additional process evidence for the theory by focusing on the indirect route to the emotionality of L2 words. In study 3, we showed that the emotionality of L2 words increases when the indirect route is facilitated. Likewise, the emotionality of L2 words should decrease when the indirect route is inhibited. Study 5 tested this prediction with a procedure similar to that of study 4 but relying only on words for which the context of language use is predominantly L1. Participants rated the emotionality of words in L1 and L2. Half were instructed to focus on personal experiences with each target word (i.e., experiences in L1 contexts for L1 words and experiences in L2 contexts for L2 words; same-language episodic memory focus condition). The remaining read the same instructions used in study 4 (control condition). This instruction manipulation was designed to disentangle the effect of L1 and L2 memories on the subsequent word rating task. In particular, relative to the control condition, the same-language episodic memory focus condition should discourage the indirect route, reducing the perceived emotionality of L2 words and, as a consequence, leading to a larger emotional advantage of L1. The emotionality of L1 words should be unaffected by the same-language episodic memory focus, because the emotionality of L1 words should always be determined by L1 episodic memories, regardless of instructions.

Method

Participants and design

The design of this experiment was a 2 (Language: L1 vs. L2) × 2 (Instructions: Same-language episodic memory focus vs. Control) mixed design with language manipulated within-subjects and instructions between-subjects. As in study 4, we also counterbalanced between-subjects the order of language presentation and word order. A total of 16 different versions of a booklet were randomly distributed across respondents. Participants were 91 undergraduate students at a large Dutch university who were Dutch native speakers and fluent speakers of English (for age, M = 20.02, SD = 1.94, 55 males).

Procedure

The study took place in a behavioral lab where participants were asked to fill out a short booklet within a series of unrelated studies. The procedure was similar to that used in study 4. Eight concepts were presented sequentially and for each of them participants were asked to rate the perceived emotionality of the L1 (Dutch) and L2 (English) words. The first page included the instruction manipulation. In the control condition, the instructions were identical to those administered in study 4. In the same-language episodic memory focus condition, participants were told that "previous research has shown that for people who speak more than one language, whether a word is presented in their native language or in a foreign language can trigger different personal memories" and that, as a consequence, "the English and Dutch words presented in the following pages can bring to mind different memories." They were then instructed to focus on their personal experiences with the words when rating them. The final page of the survey included some demographic questions and an open-ended prompt where participants were asked to guess the purpose of the study.

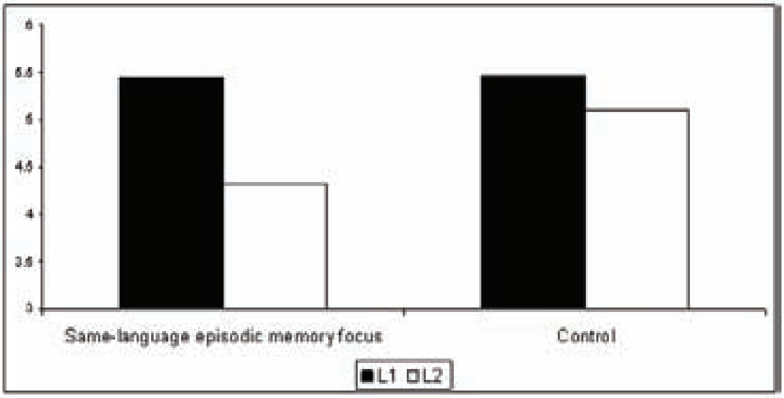
To select the stimuli, we used the ratings of prevalence of L1 versus L2 context of language use obtained in the pre-test of study 4. To the four pairs of words used in study 4, we added four more by selecting the subsequent pairs in the ranked order of 24 concepts ("farewell"/"vaarwel," "immature"/"onvolwassen," "sheep"/"schaap," and "Sunday"/"zondag").

Results

For each respondent, we calculated two scores by averaging the emotionality of the eight L1 and L2 words. These scores were entered in a repeated-measures ANCOVA with language as within-subjects factor and instructions as between-subjects factor. As in study 4, the counterbalancing conditions and their interaction were added as covariates. The results are in line with the research hypotheses (see table 9 and figure 16).

As predicted, we found a main effect of language ($F(1, 82) = 47.91$, $p < .0001$). L1 words ($M = 5.45$) were rated as more emotional than L2 words ($M = 4.71$). Follow-up contrast analyses showed this emotional advantage of L1 over L2 to be statistically significant in both the control condition ($F(1, 82) = 5.69$, $p < .05$; replicating the results in the L1 language context condition of study 4) and the same-language episodic memory focus condition ($F(1, 82) = 53.62$, $p < .0001$). Importantly, we observed a significant language by instructions interaction ($F(1, 82) = 13.30$, $p < .001$). As predicted, the emotional advantage of L1 over L2 was larger when participants were instructed to focus on same-language episodic memories ($M = 1.13$) than in the control condition (M = 0.36). Specifically, the significant interaction was driven by the drop in emotionality of L2 words in the same-language episodic memory focus condition (M = 4.31), compared to the control condition (M = 5.10; $F(1, 82) = 11$, $p < .01$). The instruction manipulation did not affect scores for the L1 words ($p > .85$).

Figure 16: Language by instructions interaction for emotional intensity in Study 5.



As a consequence of the nature of the language by instructions interaction (and, in particular, of the drop in the emotionality of L2 words), the main effect of the instructions manipulation was also significant ($F(1, 82) = 4.44$, $p < .05$). In the same-language episodic memory focus condition (M = 4.87) emotionality ratings were on average lower than in the control condition (M = 5.28). The only other significant coefficient in the model was the theoretically uninteresting main effect of order of language presentation. An alternative model was estimated including gender as an additional between-subjects factor. No coefficient involving this variable was however significant.

The open-ended responses about the purpose of the study were analyzed to assess the possibility of demand effects. Unsurprisingly, given the procedure, a substantial minority of respondents (31 out of 91) made some sort of reference to a link between language and emotionality. If the moderation of instructions was a consequence of demand effects in the same-language episodic memory focus condition, we should expect references to a link between emotions and language to be more prevalent in this than in the control condition. Contrary to this alternative account, the number of such references was directionally larger in the control condition (18 vs. 13), although this difference was nonsignificant ($p > .30$; the language by instructions interaction remains significant when these participants are excluded from the analysis). In addition, none of the participants in the same-language episodic memory focus referred to the same-language episodic memory focus in any way. Thus, it seems highly unlikely that the main effect of language and its interaction with same-language episodic memory focus were due to experimental demand.

Discussion

This experiment employed a procedure similar to that used in study 4. In this study we focused only on words with a predominantly L1 context of use and added a manipulation of the instructions to provide additional evidence for the theory. Half of participants were asked to focus on same-language episodic memories when rating the emotionality of a series of L1 and L2 word pairs. We replicated the main effect of language found in studies 1-3. L1 words were rated as more emotional than L2 words. In this study, moreover, the emotional advantage of L1 was stronger in the presence of instructions asking to focus on personal experiences with the L1 and L2 words.

4.3 General discussion

This article presented a language-specific trace theory of language emotionality that extends episodic trace theories (e.g., Hintzman 1986) to issues of language and emotional intensity. Due to the language specificity of episodic memory and the difference between L1 and L2 in frequency of use, the theory predicts that L1 marketing messages generally tend to be perceived by consumers as more emotional than L2 marketing messages.

Across five experiments, we found converging evidence for the theory. Support for the theory was found while ruling out explanations based on country stereotypes (study 1) and comprehension effects (studies 2-3). In addition, the experiments provide process insight through moderation. The effect of language on perceived emotionality was found to be a function of the context of language use (study 4) and of experimental instructions (study 5). The studies also provide strong evidence of external validity. In study 1, the effect of language was assessed relying on French/Dutch comparisons. It was also assessed using English as L2 and over 20 different L1s (study 3) or Dutch as L1 (studies 2, 4, and 5). Dutch is the language that, from both syntactic and lexical points of view, is closest to English (Finegan 1987). As degree of language overlap determines the activation of the L1 representation in processing L2 words (Sunderman and Kroll 2006), this points to an especially conservative test of the theory. Finally, support for the theory was found using a variety of stimuli.

The language-specific episodic trace theory of language emotionality contributes to current understanding of the emotional intensity of language for bilinguals by integrating and extending psycholinguistic perspectives in this area. The theory draws from the Revised Hierarchical Model (Kroll and Stewart 1994) in its consideration of separate lexical stores for L1 and L2 and in the asymmetric relationship between them. The theory borrows from literature on language-dependent recall and on the emotions of bilinguals (Altarriba 2003; Harris et al. 2006; Marian and Kaushanskaya 2004; Marian and Neisser 2000; Pavlenko 2005) in the emphasis on the role of episodic and autobiographical memories in determining the emotionality of L1 and L2 words.

The theory also adds to the cognitive literature in two main ways. First, it adds to literature on episodic trace models by pointing out the pivotal role played by emotional echo content in episodic traces. Second, while this literature has exclusively focused on memory accessibility, we extend the application of episodic trace models to the issue of emotionality. As such, this theory could be useful to explore issues of emotionality beyond the bilingual setting. For example, the relationship between the frequency of using a word and emotionality should hold also in a monolingual setting. Furthermore, this article makes a number of contributions specific to consumer research. From a substantive point of view, the implication of our findings is that, *ceteris paribus*, it is generally preferable to communicate with consumers using their own native language, as doing so should result in more emotional messages. From a broader point of view, this article is the first to adopt a psycholinguistic perspective on the emotional consequences of the process of globalization for consumers. Bilingualism is a growing area in consumer research (Luna and Peracchio 2001, 2005; Luna, Ringberg, and Peracchio 2008; Tavassoli and Lee 2003) and the article adds a new dimension to this body of literature. We identify two main directions along which the current theorizing and findings could be extended in future research.

4.3.1 Second-Order Consequences of Language Emotionality

The language effects on emotionality explored in this article are likely to have important second-order consequences for consumer behavior. The decision making literature shows that affective and cognitive factors have separate influences on consumer decisions (Epstein 1994; Loewenstein et al. 2001). Our findings suggest that, when emotional factors are important in decision making, the language in which options are framed may exert an important influence on product choice. For example, when products differ in terms of their emotional versus more cognitive benefits (e.g., taste experience versus health consequences in chocolate cake versus fruit salad; Shiv and Fedorikhin 1999), the extent to which the emotional benefits really "hit home" at an emotional level may depend on whether those benefits are described in L1 versus L2. As a result, the impact of emotional benefits relative to more cognitive benefits might be higher in L1 than L2. This might imply that self-control, in the sense of passing up an immediate emotional benefit for a longer-term cognitive benefit, might be more difficult in L1 than L2 contexts.

Furthermore, Rottenstreich and Hsee (2001) showed that small probabilities of obtaining emotional outcomes are overweighted more than small probabilities for less emotional outcomes such as money. This research suggests that the curvature in Prospect Theory's (Kahneman and Tversky 1979) weighting function become more extreme as choice outcomes are processed in a more emotional way. Our results imply that choice outcomes will be experienced in a more emotional manner if they are described in L1 than in L2. Thus, it is possible that consumers' weighting functions show more curvature in consumers' native language than in their second language. To the extent that non-linearity in Prospect Theory's value function is also a function of emotionality (cf. Hsee and Rottenstreich 2004), a similar effect might occur with respect to the value function. That is, consumers may be more risk-averse for gains, more loss-averse, more risk-seeking for losses, and show stronger endowment effects in L1 than in L2.

In sum, consumers' decision processes might be different in L1 versus L2 contexts. "Hot," emotional processes might play a larger role and emotional benefits might weigh more heavily relative to "cold" processes and more cognitive benefits in consumers' native than in their second language, yielding different preferences and choices.

4.3.2 Generalizations Outside the Emotional Domain

Whereas this paper considered the relevance of the language-specific trace theory for emotional appraisals, future research should explore the generality of the theory in the cognitive domain. For example, in line with the finding that a bilingual's native language may activate more thoughts about one's family and friends (Noriega and

Blair 2008), different languages may also trigger different echos of brand names and product categories that are routinely stored as a part of consumption episodes. For example, for a bilingual consumer who has drank, or seen ads, for beers in English- versus Dutch-language contexts, the word "beer" might activate experiences involving different brands of beer (e.g., Budweiser) than the word "bier" (e.g., Hertog Jan). Thus, different brands may be part of a consumer's consideration set in different-language contexts. Future research should investigate under which circumstances this differential memory trace activation influences preferences and behavior (e.g., stimulus-based choice versus memory-based choice), and to what extent this influence is conscious or unconscious in nature.

Consumers may also weight product attributes differently in L1 and L2 contexts. For example, if in a product category, advertisements, personal conversations, and media coverage in one language tend to mention an attribute more often in one language than another, consideration of the product category would yield echos that highlight different attributes in different languages which should impact the weight of these attributes in the different languages. For example, if the word "yoghurt" activates episodes focusing on nutritional benefits in one language but on taste in another language, the same consumer is likely to place a higher weight on healthiness and a lower weight on taste in one language than in the other. Thus, the same consumer in an otherwise similar situation may buy yoghurt containing extra probiotics or "friendly" bacteria in one language context and a more full-flavored yoghurt with extra strawberries in the other language context.

In sum, the language-specific trace theory has broad implications beyond emotionality. Language-specific traces of experiences should contain not only emotions, but also brand names, product attributes, product categories, and behaviors. This allows words in different languages to probe different brand names, product attributes, product categories, and behaviors, leading consumers to consider and choose different products. Whereas these predictions follow directly from the same theory that led to the general recommendation to advertise in consumers' native language, they also suggest additional boundary conditions of the generally positive effect of advertising in L1. If advertising in L2 generates echos that include one's own brand or that highlight attributes that are a strength of one's own brand, advertising in L1 may be a mistake.

4.3.3 Conclusion

Globalization is a defining social trend of our times and "one of the dominant forces in the psychological development of the people in the 21st century" (Arnett 2002, 781). The importance of this process demands that consumer researchers begin to address issues directly related to globalization, such as bilingualism (Johar et al. 2006). This article represents a step in this direction by providing insight into the consequences for emotional processes of the globalization of advertising language and of the increasing use of English in ads from countries that do not have English as their first language.

Chapter 5. The Anchor Contraction Effect in International Marketing Research[16]

Technological, social, and economic changes are linking an ever growing number of individuals around the world into complex patterns of interdependence (Dicken 2007). Aspects of globalization such as the growth of the Internet, the cosmopolitanism of large cities, and cross-national trade imply that, relative to a few decades ago, a much larger share of marketing research data is now collected from multilingual or multicultural respondents. Although marketing research agencies often translate surveys to respondents' native language, there are many instances in which data are collected in a respondent's second language, typically English. This raises the issue of whether providing responses on rating scales in one's native (henceforth, L1) versus second language (L2) may exert a systematic influence on the responses obtained. In this article, we document the Anchor Contraction Effect (ACE) for bilinguals' L2, which is the systematic tendency for individuals to report more intense emotions when answering questions using L2 rating scales than when using L1 rating scales. To underline the substantive importance of this issue, consider the following situations:

- Online customer ratings are an increasingly important and visible feature of online retailers (Chevalier and Mayzlin 2006). For example, Amazon.com offers customers the possibility to rate any product using the emotional statements "I hate it" and "I love it." Regardless of their native language, consumers around the world contribute ratings to the website and language (L1 vs. L2) may exert a significant influence on such ratings.

- Many societies are becoming increasingly multilingual. For example, by the year 2025, more than half of all U.S. families with children will be multicultural (Anderson 2009). For governments and firms, this trend raises the issue of how to interpret answers to questions expressed in the country's

16 This chapter was published in *Journal of Marketing Research*. Please cite as: de Langhe, Bart, Stefano Puntoni, Daniel Fernandes, and Stijn van Osselaer (2011), "The Anchor Contraction Effect in International Marketing Research," *Journal of Marketing Research,* 48 (1), 366-380.

official language by ethnic minorities who are non-native speakers of that language (Richard and Toffoli 2009). For example, in a study by the Pew Research Center for the People and the Press (2001) conducted in the US, Hispanic respondents, many of whom are not English native speakers, expressed greater worry about new terrorist attacks than other respondents. As the survey was in English for all participants, the interpretation of this finding is complicated by the fact that we do not know whether it is due to differences in actual perceptions or to language.

- Another context in which ACE is likely to play a role is customer satisfaction measures in hotels and other sites commonly visited by international travelers. For example, the emotional anchoring point "happy" is often used in customer satisfaction measures (e.g., Bruner, James, and Hensel 2001). In such cases, ACE could lead foreign visitors to express more positive opinions than local residents, possibly misleading managers.

- Multinational corporations that operate across a large number of countries often adopt English as their official language (Marschan-Piekkari, Welch, and Welch 1999). Consider, hypothetically, that a multinational firm conducts a survey of its employees to assess the prevalence of work-related emotional distress and anxiety. The firm's official language is English, the language in which the survey is expressed. Employees from both British and Spanish subsidiaries complete the survey with the consequence that some respondents answer emotional items using L1 and some using L2 rating scales.

In these instances, as in many others, bilingual individuals answer questions probing emotional processes using L2 anchoring points. These responses are then compared to, or averaged with, the responses of individuals who answered the same questions in L1. In these situations, ACE can lead to inflated error terms or, more worryingly, to wrong inferences. For example, consider again the final scenario above. If, when the survey of employee satisfaction in the multinational firm is completed, results show that Spanish employees tend to report more intense aversive emotional states than British employees, management may decide to transfer resources from the personnel department of the British subsidiary to that of the Spanish subsidiary. The importance of ACE in this situation, however, suggests that differences in the answers of Spanish and British employees may not be due to any meaningful disparity in working conditions, but to the fact that, differently from their British colleagues, Spanish respondents answered the survey using L2 rating scales.

In the next section, we review relevant literature on measurement and on bilingualism to derive the central prediction that L2 rating scales yield more extreme responses than L1 rating scales in the case of emotion-laden items. We then present the findings of nine experimental studies with a total of over 1,000 respondents. The experimental approach allows us to (a) establish ACE, test the underlying process, and rule out alternative explanations, (b) examine the generalizability of ACE across a range of situations, measures, and response scale formats, and (c) explore managerially relevant and easily implementable corrective techniques.

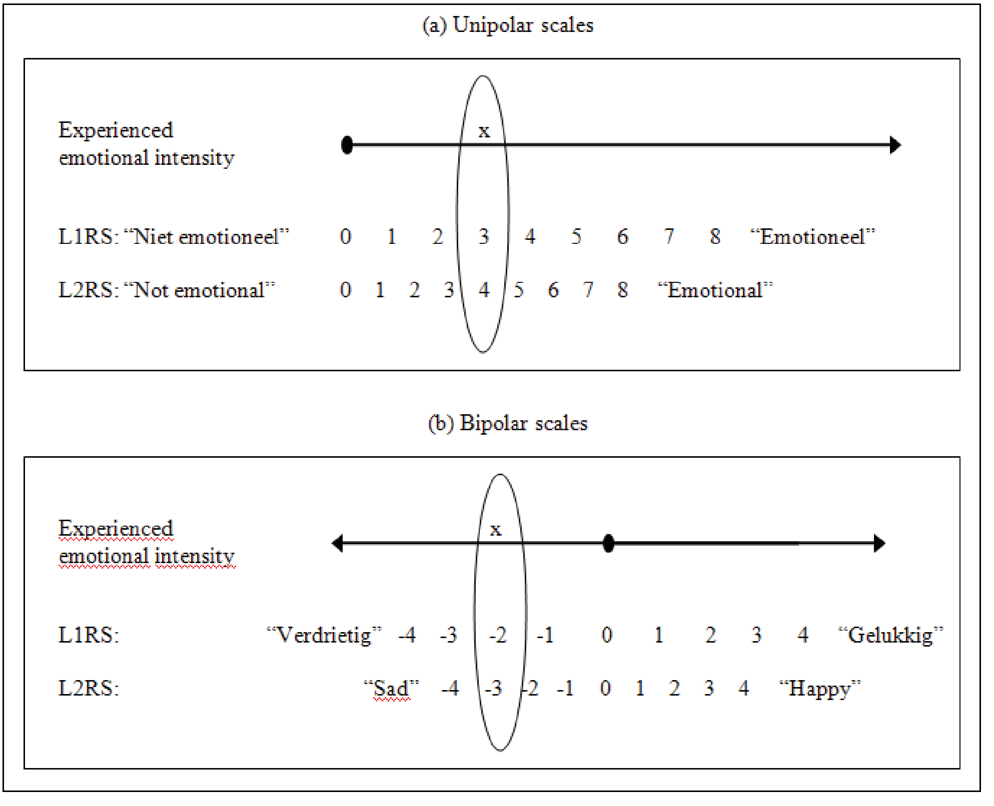
5.1 Theory

Previous research has described several important factors that can explain higher or lower ratings in surveys. A large body of research has studied response styles, which reflect a person's tendency to systematically respond to questions on some basis other than what they were designed to measure (Baumgartner and Steenkamp 2001). For example, people differ in their tendency to give extreme responses (Greenleaf 1992; van Rosmalen, van Herk, and Groenen 2010). In addition to individual differences, responses may also be systematically affected by survey characteristics. For example, de Jong et al. (2008) showed that extreme responding is influenced by the length of the questions. Also, the meaning and location of verbal labels and numeric values accompanying rating scales may cause differential responses to the scales (Baumgartner and Steenkamp 2001; Ostrom 1966; Schwarz et al. 1991; Upshaw 1965; Wildt and Mazis 1978). In particular, stimulus ratings are a function of the interpretation of the scale's anchoring points (Ostrom 1966; Upshaw 1965). *Ceteris paribus*, more intense verbal labels on the anchoring points of a rating scale lead informants to move away from the ends of the scale. For example, the same level of experienced happiness should lead individuals to select a lower number on a seven-point unipolar scale when the extreme anchor is worded as "ecstatic" or "overjoyed" than when it is worded as "pleased" or "glad." The reason for this is that the same experienced happiness is lower relative to the more extreme anchor (e.g., "ecstatic") than relative to the less extreme anchor (e.g., "pleased").

Recent research shows that bilinguals tend to experience L1 words as more emotionally intense than the same words in L2 (Altarriba 2003; Harris, Gleason, and Aycicegi 2006; Pavlenko 2005; Puntoni, de Langhe, and van Osselaer 2009). This literature attributes a key role to autobiographical memories in determining the emotional intensity of words (Marian and Kaushanskaya 2004). Due to the language specificity of autobiographical memory (Marian and Neisser 2000), L1 (L2) words automatically trigger an emotional echo from previous L1 (L2) experiences (Puntoni et al. 2009). Because autobiographical memories in one's native language are typically both more frequent (Puntoni et al. 2009) and more emotional (Harris et al. 2006) than L2 autobiographical memories, L1 stimuli tend to elicit more intense emotional experiences. For example, Puntoni et al. (2009) found that advertising slogans generated stronger emotional reactions when the slogans were expressed in L1 than in L2. This stream of research establishes the influence of the language of the to-be-rated target on its perceived emotional intensity.

Traditional measurement theory posits that an observed score is the result of a true score plus a measurement error. Although prior research on bilingualism has demonstrated the influence of the language of the target on the true score (e.g., Harris, Aycicegi, and Gleason 2003; Puntoni et al. 2009), no research has examined whether the language of the measurement instrument introduces a systematic component into the error term. However, it is likely that, in addition to to-be-rated words, emotion-related words used to anchor a scale may also be experienced as less intense when they are written in L2 than in L1. For example, a non-native speaker of English may experience emotional scale anchors such as "happy" or "sad" as *less* intense in English than in the native language. If to-be-rated stimuli are then judged *relative* to those (less vs. more intensely-experienced) anchors, we should find *more* extreme (i.e., less neutral) answers if the emotional scale anchors are in L2 than in L1. That is, our non-native English speaker should judge the same stimulus as more intense in comparison to the less intensely-experienced English scale anchor (e.g., "happy") than in comparison to its more intensely-experienced L1 equivalent. In sum, we predict that the same stimuli will be rated as emotionally less intense when the scale anchors are labeled in L1 than in L2. Stated differently, emotional anchoring points presented in L2 should contract the scale relative to anchoring points presented in L1. Figure 17 presents a schematic representation of the Anchor Contraction Effect (ACE), in the case of Dutch native speakers confronted with a survey in English.

Figure 17: Schematic representation of the anchor contraction effect for Dutch native speakers answering questions in English on unipolar (top panel) and bipolar scales (bottom panel).



Note. L1RS = L1 rating scales and L2RS = L2 rating scales. (A) If the L1 label (e.g., "emotioneel") is perceived by respondents as more emotional than the corresponding L2 label (e.g., "emotional") then for the same experienced emotional intensity evoked by the target (in the figure, "x") the score in the L1 rating scales condition (e.g., L1RS = 3) should be lower (i.e., less extreme) than the score in the L2 rating scales condition (e.g., L2RS = 4). (B) If the L1 negative label (e.g., "verdrietig") is perceived by respondents as more intense than the corresponding L2 label (e.g., "sad") then for the same experienced sadness ("x") the score in the L1 rating scales condition (e.g., L1RS = -2) should be higher (i.e., less extreme) than the score in the L2 rating scales condition (e.g., L2RS = -3)

5.2 Empirical Studies

Study 1

Study 1 was designed to provide a first demonstration of ACE in a context that controls for the possible effect of language stereotypes (Leclerc, Schmitt, and Dube 1994). If cultures (and associated languages) vary in their perceived or actual warmth and emotional expressiveness (Cuddy et al. 2009), emotional anchoring points in languages associated to more emotionally expressive cultures may be perceived as more intense. For example, it is possible that, due to sociolinguistic processes, unipolar rating scales in French (a language associated with a stereotypically hedonistic or expressive culture) tend to yield lower scores than rating scales in German (a language with a less emotional stereotype; Cuddy et al. 2009). To preclude this alternative explanation, Study 1 adopts a counterbalanced bilingual design that varies across participants which of two target languages is L1 and L2. In particular, the target languages were selected such that for half of respondents stereotype effects were conflicting with ACE and that for the remaining half these influences were instead in the same direction. In a taste test, we asked speakers of French and Dutch to evaluate a chocolate on a number of emotional dimensions using either French or Dutch unipolar rating scales. For half of participants, Dutch was L1 and for half French was L1. French has been used in previous research to generate hedonic associations (Leclerc et al. 1994). In comparison, Germanic languages and associated cultures such as Dutch are typically considered less emotional (Cuddy et al. 2009). To rule out an alternative explanation for ACE based on sociolinguistic processes, we should observe a main effect of language, such that L2 rating scales lead to higher ratings of emotional intensity than L1 ratings, irrespective of which of the two target languages (the stereotypically warmer or the stereotypically colder language) is L1 and L2.

Method

Participants and Design

The study used a 2 (language of the rating scales: L1 vs. L2) × 2 (native language: French vs. Dutch) between-participants design. Data were collected in Brussels, the bilingual capital city of Belgium. Participants were recruited in cafeterias on the campuses of Dutch- and French-speaking sister universities. All participants were addressed in English to avoid asymmetric influences of the language of experimenter-respondent interaction. Participants were 120 proficient Dutch-English-French trilinguals (61 Dutch native speakers, M_{age} = 22.74, SD = 5.58, 56 females).

Procedure

Participants were invited to participate in an international research project on the taste of chocolate. The experimenter asked participants to taste a chocolate. Next, respondents completed a number of questions using seven-point unipolar scales (numbered from 1 to 7). The booklet was first created in English and later translated by native Dutch and French speakers. The translated booklets were then checked for consistency with the English version by two independent judges. Five questions measured participants' emotional responses. First, participants rated happiness, joy, and excitement ("The taste of this chocolate makes me feel …"; Anchoring points were "not at all happy"/"very happy", "not at all joyful"/"very joyful," and "not at all excited"/"very excited."). Next, participants rated surprise and emotionality ("The taste of this chocolate is…"; Anchoring points were "not at all surprising"/"very surprising" and "not at all emotional"/"very emotional"; for the 5 items, α = .78). Finally, respondents provided basic demographic information, including their native language.

Results

A repeated-measures ANOVA with the five items as repeated measures and language of the rating scales and native language as between-participants factors yielded a significant main effect of language of the rating scales ($F(1, 116) = 4.08$, $p < .05$, Cohen's d = .37)[17]. Demonstrating ACE, respondents reported more intense emotional experiences when using L2 (M = 3.36) than L1 rating scales (M = 3.02; see Table 1 for means by emotion). Critically, this effect was not qualified by a two-way interaction between language of the rating scales and native language ($p > .66$). In other words, the magnitude of ACE did not depend on whether the native language of the

17 In all studies, to calculate effect sizes we used Cohen's d for between-group comparisons, η_p^2 for dependent samples, and Cohen's f^2 for continuous predictors (e.g., Meyers-Levy, Zhu, and Jiang 2010). Language of the rating scales was manipulated between-participants in all studies, hence Cohen's d is the measure of effect size for ACE in this article. According to Cohen (1992), a d of .20 represents a small effect size, a d of .50 represents a medium effect size, and a d of .80 represents a large effect size.

respondent was French or Dutch (the main effect of native language was also nonsignificant, $p > .72$).[18]

Discussion

Study 1 demonstrates ACE using a balanced bilingual design. Participants rated the intensity of the emotional reactions generated by tasting a chocolate higher when using L2 than L1 rating scales. This effect was not qualified by an interaction with native language (French vs. Dutch). Although we do not wish to contend that language stereotypes can never exert an influence, this study demonstrates that they alone are unable to explain our results. In addition, the balanced bilingual design in Study 1 shows that ACE cannot be attributed to the selection of non-equivalent words in the L1 versus L2 conditions (i.e., picking inherently more extreme anchor words in L2 than L1).

Study 2

The goals of Study 2 were to replicate ACE in a different setting, with a wider array of emotions, and to test whether ACE occurs similarly for positive and negative emotions. Dutch respondents were asked to rate the intensity of five positive and five negative emotions portrayed in an animated movie using either L1 (Dutch) or L2 (English) rating scales. To control for the possible influence of the language of the target to be evaluated, we used a language-free movie. We predict higher emotional intensity scores when the movie is rated using L2 than L1 rating scales for both positive and negative emotions.

Method

We used a 2 × 2 mixed design, where language of the rating scales (L1 vs. L2) was manipulated between-participants and valence (positive vs. negative) within-participant. Sixty-one students at a large Dutch university who were proficient speakers of English ($M_{age} = 20.23$, $SD = 2.41$, 19 females) participated for extra course

18 Other theoretically uninteresting effects involving the repeated emotion factor were significant, *videlicet* the main effect of emotion ($F(4, 464) = 44.04$, $p < .0001$) and the emotion by native language interaction ($F(4, 464) = 3.21$, $p < .05$). The effect of language of the rating scales was in the predicted direction for all items (see Table 1).

credit. All were enrolled in degree programs partially or entirely taught in English (the same population was used for Studies 3-9). Respondents first saw a short animated movie (Pixar's "Presto," approximately five minutes long) and then rated the intensity of ten emotions (five positive and five negative) as they were portrayed in the movie, using seven-point unipolar scales (numbered from 0 to 6) either in Dutch (L1) or English (L2). The beginning and end of the movie had been edited to hide any textual information. The target emotions were selected based on their relevance to the story and presented in random order. The negative emotions were fear, frustration, hate, sadness, and shame. The positive emotions were happiness, hope, love, pride, and surprise.

Results

A repeated-measures ANOVA with the average emotional intensity of the 5 positive and 5 negative emotions as repeated measures and language as a between-participants factor revealed a main effect of language ($F(1, 59) = 6.96$, $p = .01$, $d = .68$). Replicating ACE, respondents reported more intense scores when rating the movie using L2 ($M = 3.95$, $SD = .72$) than L1 ($M = 3.43$, $SD = .79$) rating scales. This main effect was not qualified by an interaction between emotion valence and language ($p > .46$), indicating that the effect of language was in the same direction for positive ($M_{L2} = 3.96$, $SD_{L2} = .86$, and $M_{L1} = 3.55$, $SD_{L1} = .81$) and negative emotions ($M_{L2} = 3.93$, $SD_{L2} = .87$, and $M_{L1} = 3.32$, $SD_{L1} = 1.15$, see Figure 18).

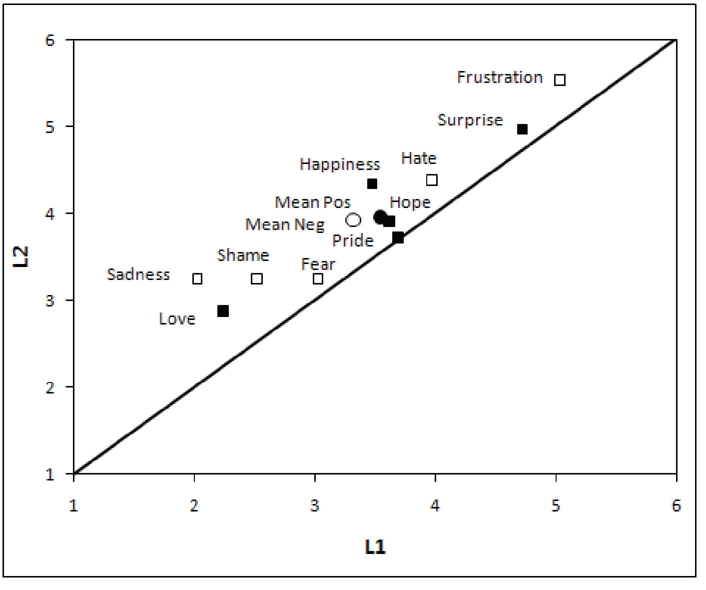
Discussion

Study 2 replicates ACE with a wider set of emotions, both positive and negative. We used English as L2 because English is the language most likely to be implicated in situations where ACE may represent an issue for marketing researchers. Greater similarity between target languages reduces the magnitude of language effects (Sunderman and Kroll 2006), and with the exception of Frisian, Dutch is the language that is closest to English (Finegan 1987). Using Dutch as L1 hence constitutes a conservative test of ACE. Because both positive and negative emotions were rated as more intense, Study 2 also shows that ACE is independent of valence.

It is worth noting that ACE is unlikely to result from a lack of language proficiency in this sample. The emotional anchors were all single words that everybody in our participant population can easily translate. In addition, the effect was not weaker for those emotional anchors that are cognates (i.e., frustration-

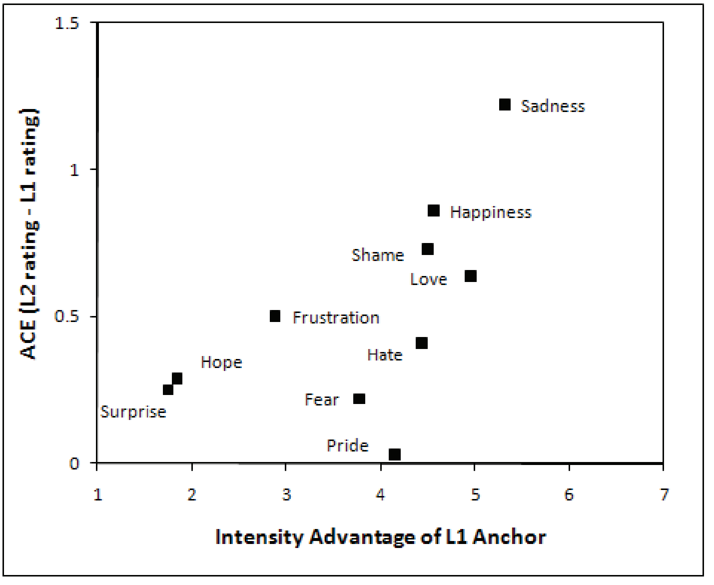
frustratie, hate-*haat*, hope-*hoop*) than for anchors that sound different in Dutch and English and that are, hence, relatively harder to process (Costa, Caramazza, and Sebastián-Gallés 2000). Other findings throughout this article are also irreconcilable with an explanation of ACE in terms of language comprehension.

Figure 18: ACE for 10 specific emotions



Instead, we argue that ACE is driven by a difference in perceived emotional intensity of L1 and L2 rating scale anchors. Because bilinguals perceive emotional anchoring points as more intense in L1 than in L2, the same emotional experience will be expressed with a less extreme rating in L1 than in L2. To provide initial evidence for this process, we invited 88 additional participants to rate the difference in emotional intensity between the L1 and L2 verbal representation of the 10 emotions rated in Study 2 (e.g., hate-*haat*). Ratings were expressed on a scale ranging from 0 ("no difference in emotional intensity at all") to 10 ("much stronger emotional intensity in Dutch"). Because of the small number of emotions considered in Study 2 (N = 10), the nonparametric Spearman rank-order correlation was used to assess the relation between the L1-L2 intensity difference of the emotional anchors and the magnitude of ACE observed in Study 2. Consistent with our reasoning, ACE was larger for emotions with a larger L1-L2 intensity difference (Spearman's rho = .73, $p < .05$; see Figure 19).

Figure 19: ACE by the relative intensity advantage of the L1 emotional anchor



Study 3

Study 2 provided correlational evidence for the mechanism underlying ACE. Emotions that were rated as relatively more intense in L1 than L2 tended to display larger ACE. The goal of Study 3 was to provide further evidence for the role of the perceived emotional intensity of L1 versus L2 scale anchors. Specifically, the study tests whether the perceived emotional intensity of the anchoring points mediates the effect of language on ratings of a target object. A sample of Dutch participants first rated the emotional intensity of the expressions "feeling happy" in Dutch (L1) and English (L2). Subsequently, they were asked to rate the extent to which a specific ad triggered feelings of happiness using either an L1 or an L2 rating scale.

Method

One-hundred and twelve college students were recruited on campus and participated in two allegedly unrelated studies in return for a small reward (M_{age} = 21.39, SD = 3.03, 58 females). They were randomly assigned to one of two language conditions (Language of the booklet: L1 vs. L2). For each participant, all materials were in one language (Dutch or English), with the exception that each participant rated the emotional intensity of "feeling happy" (the mediator) in both L1 and L2.

In the first part of the study, we informed participants that the expression "feeling happy" may be perceived as more or less intense depending on the language in which it is expressed (Dutch or English). All participants were then asked to rate the intensity of both "feeling happy" and its L1 equivalent ("*gelukkig voelen*"). For each of the two items separately, they were presented with a right-pointing arrow next to the to-be-rated expression marked with the words "stronger emotional experience." To simplify coding, the continuous line was divided in 43 equally-spaced sections. The order of the two items was randomized.

Next, an allegedly unrelated study was introduced and respondents were informed that advertisers often use images to deliver emotional messages and that the study investigated the effectiveness of images in conveying emotions. Participants were asked to look at an image from a real advertisement and to indicate to what extent the image made them feel happy. All textual cues were removed from the ad. Participants rated the image either in L1 or in L2 on a seven-point unipolar scale ranging from 0 ("not at all happy") to 6 ("very happy").

Results

To test for mediation, we estimated three regressions (Baron and Kenny 1986). First, a regression of the ad ratings on language of the rating scale (entered as a dummy variable) yielded a significant effect of language (b = .83, t(110) = 3.34, $p < .01$, d = .63). Replicating ACE, happiness ratings were higher with L2 (M = 3.60, SD = 1.31) than L1 rating scales (M = 2.76, SD = 1.33).

Next, we estimated a regression of the perceived emotional intensity of "feeling happy" (the mediator) on language. Because we could not use scale anchors when measuring the intensity of the scale anchors in L1 and L2, we had to control for heterogeneity across participants in the interpretation of the continuous-arrow response scale. For this purpose, perceived emotional intensity was standardized by dividing a participant's rating of "feeling happy" or "*gelukkig voelen*" (depending on the experimental condition) by the average of this participant's ratings of "feeling happy" and "*gelukkig voelen*." Replicating the findings of Puntoni et al. (2009), we found a significant effect of language (b = -.11, t(110) = -3.66, $p < .001$, d = -.69): "feeling happy" (M = .94, SD = .16) was rated as less intense than "*gelukkig voelen*" (M = 1.05, SD = .16).

Finally, a third model regressed the ad ratings on the language of the rating scale and the perceived emotional intensity of the scale anchor. This model yielded a significant effect of the scale anchor's perceived emotional intensity ($b = -1.59$, $t(109) = -2.06$, $p < .05$, Cohen's $f^2 = .06$), such that when the anchor was perceived to be more emotionally intense ad ratings were lower. Moreover, although the effect of rating scale language on the ad ratings remained significant ($b = .66$, $t(109) = 2.52$, $p < .05$), the addition of the perceived emotional intensity of the scale anchor to the model reduced the effect of language (from $d = .63$ to $d = .27$). A bootstrap analysis with 10,000 bootstrap samples (Preacher and Hayes 2004) yielded a mean indirect effect of -.09. The 95% confidence interval ([-.19, -.01]) excludes 0, demonstrating the significance of this partial mediation.

Using both moderation and mediation, Studies 2 and 3 demonstrate the role played by the perceived intensity of the scale anchor in ACE. These studies therefore provide direct evidence that ACE is indeed an Anchor Contraction Effect.

Study 4

The previous studies used nonverbal target stimuli in order to control for the possible influence of target stimulus language. However, assessing whether ACE is contingent on linguistic features of the to-be-rated object is important both substantively and theoretically. Previous research shows that L2 to-be-rated (i.e., target) stimuli (e.g., advertising copy) are systematically rated as less emotionally intense than L1 to-be-rated stimuli (Puntoni et al. 2009). Thus, whereas L2 target stimuli yield less emotionally intense ratings than L1 target stimuli (due to a decrease in the perceived emotional intensity of the target itself going from L1 to L2), L2 rating scales yield more emotionally intense ratings than L1 rating scales (due to a decrease in the perceived emotional intensity of the scale anchors going from L1 to L2 and to the fact that target stimuli are rated relative to anchors). This raises the question whether the two effects are dependent or independent of each other. If ACE is driven by the perceived emotional intensity of scale anchors, measures of emotionality should respond in opposite directions to the language of to-be-rated stimuli and of anchoring points. Emotionality ratings should be lower when rating L2 ads than L1 ads but higher when rating them using L2 rating scales than L1 rating scales. In Study 4 we manipulated both target and rating scale language and predict for emotionality ratings two main effects in opposite directions.

In addition, Study 4 also tests the specificity of ACE to emotional items. According to psycholinguistic accounts for the effect of language on emotional intensity stressing the language-specificity of autobiographical memories (Harris et al. 2006; Puntoni et al. 2009), the intensified response to stimuli in one's native language should be restricted to salient experiential domains such as emotions. Thus, ACE should only occur for emotional items, but not for non-emotional assessments (e.g., informativeness). We also explored whether ACE occurs for quality judgments employing the anchoring points "bad" versus "good," which are not unambiguously emotional or non-emotional.

Method

Design

The experiment used a 3 (Appraisal: Emotional intensity vs. Informativeness vs. Quality) × 2 (Language of the ads: L1 vs. L2) × 2 (Language of the rating scales: L1 vs. L2) mixed design. The first two factors were manipulated within-participant and the third between-participants. Order of ad exposure and language sequence were counterbalanced by randomly varying across participants the order in which the ads appeared in the booklet and the sequence of L1 and L2 ads, leading to eight different versions of the questionnaire.

Procedure

Respondents were recruited on campus and participated in return for a small reward ($N = 155$, $M_{age} = 22.21$, $SD = 4.19$, 78 females). They were given a booklet containing a number of ads and were asked to rate each of them on a series of nine-point scales (numbered from 1 to 9). The opening ad was for all participants an ad for candies (in Dutch) and was included to familiarize participants with the task. For each ad, participants rated four items. The first three were the dependent variables. L2 positive anchors were "emotional," "informative," and "good." The L1 equivalents ("*emotioneel*", "*informatief*", and "*goed*") were highly similar cognates, making this an especially conservative test. The last item was perceived difficulty and was added to confirm that understanding of the L2 advertising copy did not play a role. Finally, participants were asked some demographic questions and to write an essay to guess the purpose of the study.

Stimuli

Six print ads were produced to represent a broad spectrum of advertising appeals and sponsoring organizations. The ads featured a fictitious brand name as well as verbal and visual information and promoted a variety of products and causes (band aids, depression helpline, mountaineering equipment, perfume, toaster, and vitamin supplement). For instance, in the perfume ad the L2 text was "Caution: may increase heart rate and decrease inhibitions" and was accompanied by the photo of a couple. The ads and the booklets were initially created in English. A Dutch native speaker translated the materials to Dutch. The accuracy of the Dutch translation was then assessed by a comparison with the back-translation of the materials to English performed by a second Dutch native speaker. The first ad order was randomly created and the second was generated inverting the first one. The two language sequences were similarly generated. In sum, participants rated three ads with L2 (English) text and three with L1 (Dutch) text. Half of participants read the instruction and rating scales in L2 and the other half in L1.

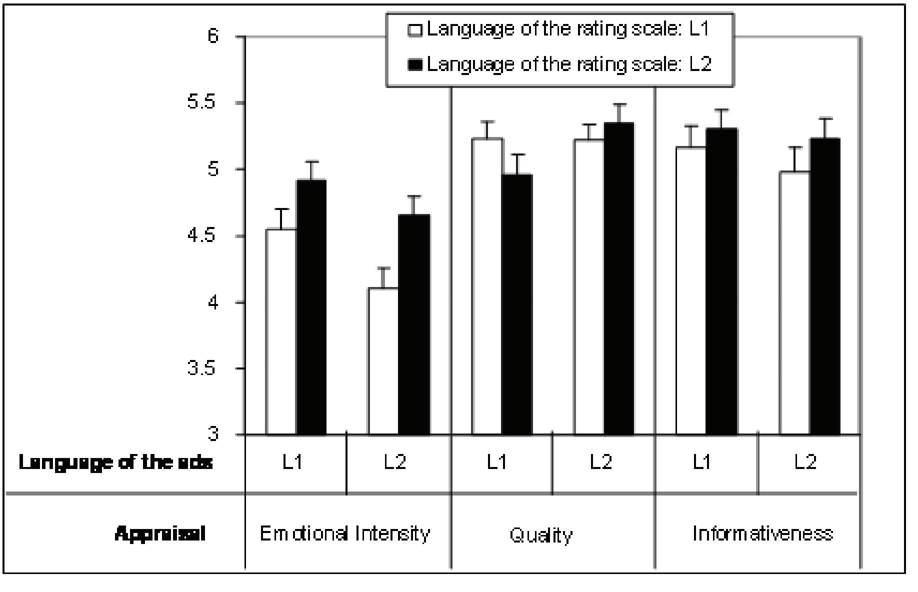
Results

An examination of the essays written by participants at the end of the study revealed that none of them had guessed the purpose of the research. The ratings of emotional intensity, informativeness, and quality were jointly subjected to a repeated-measures ANOVA with language of the ads as an additional within-participant factor and language of the rating scales as a between-participants factor. We make two predictions for this model: (1) the two-way interaction between appraisal and language of the rating scales should be significant, such that ads are rated as more emotional when using L2 rating scales than L1 rating scales, with no such effect for non-emotional appraisals and (2) the two-way interaction between appraisal and language of the ads should be significant, such that L1 ads should be rated as more emotional than L2 ads, with no such effect for non-emotional appraisals. See Table 10 and Figure 20.

Table 10: Cell means (and standard deviations) in Study 4.

	Language of the Rating Scales			
	L1		*L2*	
	Language of the Ads		*Language of the Ads*	
Appraisal	*L1*	*L2*	*L1*	*L2*
Emotional intensity	4.55 (1.32)	4.10 (1.32)	4.91 (1.23)	4.66 (1.27)
Informational value	5.16 (1.40)	4.99 (1.59)	5.30 (1.31)	5.23 (1.32)
Quality	5.23 (1.22)	5.22 (1.05)	4.96 (1.34)	5.35 (1.21)

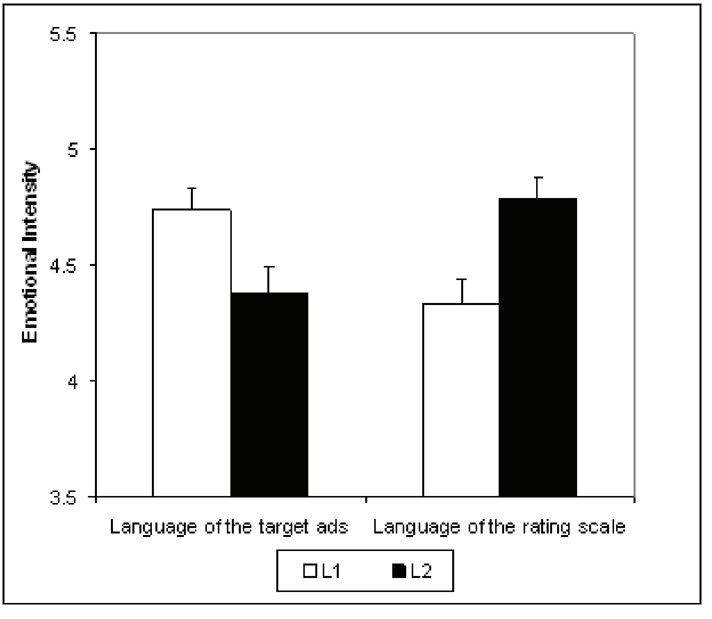
Figure 20: Appraisal by language interactions for language of the ads and language of the rating scales in Study 4



The results provide support for our predictions by showing significant interactions between appraisal and language of the ratings scales (F(2, 306) = 3.08, p < .05, η_p^2 = .02) and between appraisal and language of the ads (F(2, 306) = 4.94, p < .01,

η_p^2 = .03).19 Importantly, these two-way interactions were not qualified by a three-way interaction between appraisal, language of the ads, and language of the rating scales was nonsignificant (p > .67). To explore the nature of the two-way interactions, we performed univariate follow-up analyses for each appraisal.

Figure 21: Main effects of language of the ads and of the rating scales on emotionality in Study 4



Emotional intensity

Replicating ACE, the main effect of the language of the rating scales was significant (F(1, 153) = 9.79, p < .01, d = .36). Ads were rated as more emotional when using L2 (M = 4.79) than L1 rating scales (M = 4.33). Moreover, the main effect of the language of the ads was significant and opposite to that of the language of the rating scales (F(1, 153) = 5.82, p < .05, η_p^2 = .04). Participants rated the emotional intensity of the ads higher when exposed to L1 ads (M = 4.73) than L2 ads (M = 4.38, see Figure 21). The

19 In addition, the main effect of appraisal was significant (F(2, 306) = 22.97, p < .0001, see Table 2). Driven by the effect of language of the rating scales on emotionality ratings, we also found a marginally significant main effect of the language of the rating scales (F(1, 153) = 3.05, p < .09). No other effects were significant in this model. Alternative models including the ad order and language sequence counterbalancing factors lead to the same results.

interaction between the two language manipulations was nonsignificant ($p > .51$). In other words, the two language manipulations influenced emotionality ratings independently.

Alternative appraisals

The manipulations of the language of the rating scales and of the language of the ads did not similarly affect the other two appraisals. With one exception, none of the effects of language was significant at the conventional .05 level (for the critical main effect of the language of the rating scales, for informativeness, $p > .30$, and for quality, $p > .67$). We did observe a significant interaction between language of the ads and language of the rating scales on quality judgments ($F(1, 153) = 4.06$, $p < .05$, $\eta_p^2 = .03$). The shape of this interaction suggests higher quality ratings when language of the ads and language of the rating scales match (see Table 10 and Figure 20). Finally, we found no differences in perceived difficulty of the ads as a function of the language manipulations (all *p*s > .44), suggesting again that L2 proficiency did not exert a major influence.

Discussion

In this study, participants rated L1 and L2 ads using either L1 or L2 rating scales. We predicted opposite effects of ad and scale anchor language for assessments of emotional intensity. As expected, we found higher emotional intensity ratings if the scale was labeled using words in L2 than in L1. Moreover, we observed higher emotionality ratings when the ads were in L1 than in L2. The latter finding extends the effect of language observed by Puntoni et al. (2009) for slogans and single words to the case of print ads. The main effect of language of the rating scales was instead not significant for the informativeness measure nor was there a significant effect of language on a rating scale assessing quality using "good" as a scale anchor, which has affective antecedents but does not probe emotions *per se*. These results may suggest that ACE is limited to words that directly refer to emotions or emotionality.

Study 5

Often, marketing researchers are interested in probing consumers' likes and dislikes of market offerings. Product evaluation measures vary widely in the extent to which they tap into emotional concepts (Voss, Spangenberg, and Grohmann 2003). For example, a commonly used measure is to ask consumers to which extent they love or hate a product (e.g., "I love it" vs. "I hate it"). Other commonly used product evaluation items are much less directly related to emotions or emotionality (e.g., "well-made" vs. "poorly made"). In addition, whereas in previous studies we used unipolar emotional scales, bipolar scales (as in the example above) are also common. For bipolar scales, ACE predicts more intense positive and negative ratings with L2 than L1 rating scales, as measured by the deviation from the scale midpoint (see Figure 17b).

Seventy-four college students were recruited in a university cafeteria and participated in the study in return for a small reward (M_{age} = 22.52, SD = 3.90, 33 females). They were presented with the picture of an armchair and asked to evaluate the product using an emotional rating scale ranging from "I hate it" (-4) to "I love it" (+4), and another largely non-emotional rating scale ranging from "Poorly-made" (-4) to "Well-made" (+4), in English (L2) or in Dutch (L1). Thus, we manipulated product evaluation measure within-participant and language of the rating scales between-participants. We also counterbalanced order of the product evaluation measure across participants. Consistent with the emotion-specificity of ACE found in Study 4, we expect ACE for the former type of measure but not the latter.

The analysis was conducted on the absolute value of the responses, which reflects their extremeness. We ran a repeated-measures ANOVA with the emotional versus non-emotional product evaluation measure as within-participant factor and language of the rating scales and item order as between-participants factors. As expected, we found a significant two-way interaction between appraisal and language ($F(1, 70) = 6.23$, $p = .01$, $\eta_p^2 = .08$). Participants reported more intense scores for the emotional measure using L2 (M = 2.03, SD = 1.03) than L1 rating scales (M = 1.39, SD = .96, $F(1, 70) = 7.48$, $p < .01$, d = .64), whereas no significant differences were found for the non-emotional measure ($M_{L2} = 1.68$, $SD_{L2} = 1.12$, $M_{L1} = 1.75$, $SD_{L1} = 1.10$, $p > .79$). This interaction was not qualified by the three-way interaction with item order ($p > .60$; the main effects of language and product evaluation measure were also nonsignificant, *p*s > .15).

This study replicates ACE for commonly used, bipolar, product evaluation measures using emotional labels ("I love it" vs. "I hate it"). The results confirm that ACE does not extend to product evaluation questions based on "colder" assessments. Finally, the fact that ACE obtained only for the emotional item argues against a comprehension account (see also Study 4).

Study 6

From a substantive point of view, it is important to explore whether ACE occurs across a variety of response scale formats. Studies 1-4 used unipolar response scales and Study 5 a bipolar response scale. However, in all these studies only the end points of the response scales carried a verbal label, leaving the interpretation of the intermediate response options ambiguous. This raises the question whether ACE also occurs when all individual rating scale points carry verbal labels. To test this, we asked 66 participants (M_{age} = 20.00, SD = 1.65, 25 females) to indicate to what extent 6 images from real advertisements made them feel sad or happy. Respondents were undergraduate students taking part in the study in exchange for course credit. We used a 2 (language of the rating scale: L1 vs. L2) × 2 (verbal labels: end points vs. all points) between-participants design with a bipolar rating scale ranging from "very sad" to "very happy" (numbered from -3 to +3). In the only end points labeled condition, these were the only verbal labels used. In the all points labeled condition, all response options carried a verbal label ("very sad", "sad", "a little bit sad", "neither sad nor happy", "a little bit happy", "happy", and "very happy"). An ANOVA on the average of the absolute values of the 6 ratings with language of the rating scale and verbal labels as between-participants factors yielded a significant main effect of language of the rating scale ($F(1, 62) = 5.20$, $p < .05$, d = .57), which was not moderated by the labeling of end points versus all points ($p > .91$). The main effect of verbal labels was also not significant ($p > .57$). Participants deviated more from the midpoint of the scale when using L2 (M = 1.49, SD = .43) than L1 rating scales (M = 1.23, SD = .51), regardless of whether all or none of the intermediate response options were specified.

Study 7

Another substantively important issue is whether ACE obtains when the emotion is not presented in the response scale itself but only in the question preceding the response scale. For example, in the widely used measure for emotional responses developed by Richins (1997), individuals rate the intensity of their emotional experiences in consumption situations by answering the question "To what extent did {situation x} make you feel {emotion y}?" on a four-point scale ("not at all", "a little", "moderately", "strongly"). These anchoring points do not feature emotion words but respondents must impute the emotion label implicitly to answer the question. To explore the generalizability of ACE to such settings, we asked 76 undergraduate students (M_{age} = 19.66, SD = 2.03, 32 females) after completing an experimental session in return for course credit to rate to what extent the session made them feel happy and sad using either L1 or L2 scales from 0 ("not at all") to 6 ("very"). Replicating ACE, a repeated-measures ANOVA with emotion (happy vs. sad) as repeated measures and language of the rating scale as a between-participants factor revealed a main effect of language ($F(1, 74) = 27.23$, $p < .0001$, d = 1.20), in the absence of an interaction between language and emotion ($p > .99$). Participants reported higher levels of happiness (M_{L2} = 4.35, SD_{L2} = 1.25, and M_{L1} = 3.51, SD_{L1}= .72) and higher levels of sadness (M_{L2} = 2.43, SD_{L2} = 1.61, and M_{L1} = 1.59, SD_{L1}= .85) on L2 rating scales than on L1 rating scales (the main effect of emotion was also significant, $F(1, 74) = 83.79$, $p < .0001$). Thus, it is sufficient for the emotion to be presented in the question preceding the rating scale for ACE to emerge.

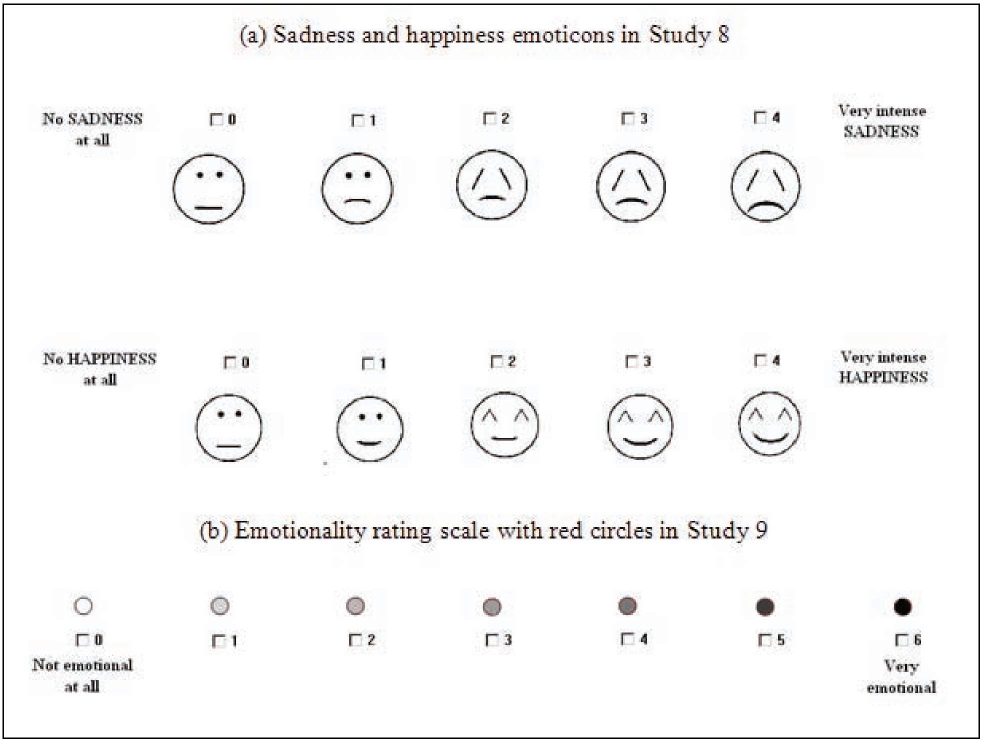
Study 8

Having established ACE for a variety of emotions across a variety of response scale formats, an important open question pertains to what interventions might mitigate or eliminate ACE. In Studies 8 and 9, we explore the effectiveness of corrective techniques.

Besides attending to verbal cues that communicate the meaning of the response options on a rating scale, respondents' interpretation of a scale is also influenced by pictorial cues (e.g., Tourangeau, Couper, and Conrad 2007). The previous studies established that ACE stems from the greater perceived emotionality of L1 verbal labels. One way to mitigate the effect of language of the rating scales could therefore be to provide respondents with an alternative (i.e., nonverbal) basis for interpreting the intensity of the anchoring points. Specifically, language-free cues that provide additional (diagnostic) information about the emotional intensity of scale end points should reduce or eliminate ACE.

In this study, we used emoticons as nonverbal cues. Emoticons are glyphs representing stylized facial expressions used to indicate emotions. In particular, we tested whether adding emoticons to scales measuring specific emotions (happiness and sadness) is sufficient to yield equal intensity ratings on L1 and L2 rating scales. Emoticons were selected for three reasons. First, facial expressions are critical tools for conveying emotions. Representations of facial expressions, even if highly stylized, are hence likely to be powerful cues for emotional intensity (e.g., Walther and D'Addario 2001). Second, emoticons are often used in online environments (Derks, Bos, and von Grumbkow 2008), where ACE is especially likely to occur. Third, from an implementational perspective, emoticons for a wide range of specific emotions are readily available for use.

Figure 22: Corrective techniques used in Studies 8 and 9



Respondents were 132 undergraduate students participating in the study in exchange for course credit (M_{age} = 19.87, SD = 2.07, 68 females). Participants watched the short animated movie from Study 2 and rated to what extent sadness and happiness were portrayed in the movie. Ratings were provided on two five-point unipolar scales ranging from "no sadness/happiness at all" to "very intense sadness/happiness" (numbered from 0 to 4). Participants were randomly assigned to the cells of a 2 (Language of the rating scales: L1 vs. L2) × 2 (Emoticons: present vs.

absent) × 2 (Emotion: sadness vs. happiness) mixed design, in which language of the rating scales and emoticons were manipulated between-participants, and emotion was a repeated factor. In the emoticons present condition, happy and sad emoticons were added to each point of the scales, with a gradual increase in emotional intensity (see Figure 22a).

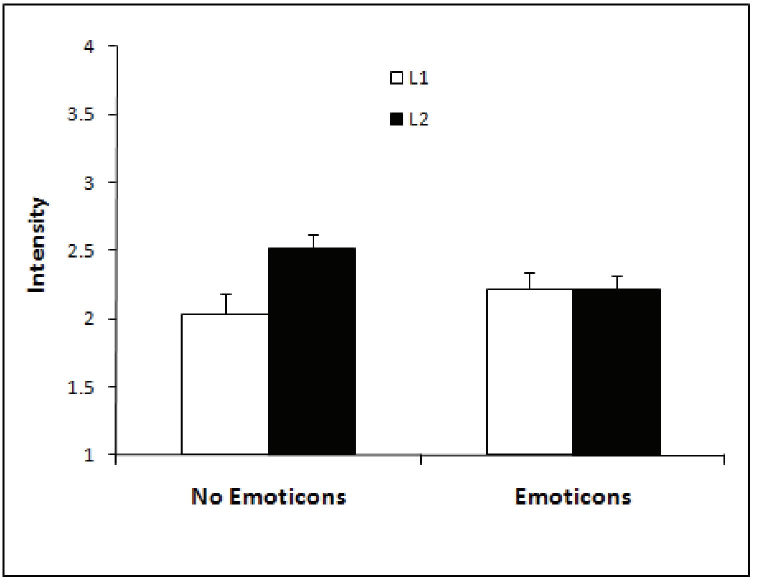
A repeated-measures ANOVA with language of the rating scales and emoticons as between-participants factors and emotion as a within-participant factor (see Table 11) revealed the predicted two-way interaction between language of the rating scales and emoticons ($F(1, 128) = 4.12$, $p < .05$, $\eta_p^2 = .03$).20 Replicating ACE, when no pictorial cues were present, participants provided higher ratings of emotional intensity when rating the items using L2 (M = 2.52) than L1 anchoring points (M = 2.04, $F(1, 128) = 7.59$, $p < .01$, d = .70). Instead, no differences were observed between L2 (M = 2.21) and L1 rating scales (M = 2.22) when emoticons were added ($p > .94$; see Figure 23). This study provides evidence that the concomitant presence of nonverbal cues can eliminate ACE. When emoticons were added to the scale, the effect disappeared.

Table 11: Cell means (and standard deviations) in Studies 8 and 9.

		Language of the Rating Scales	
Study (Factor)	*Levels*	*L1*	*L2*
8 (Emoticons)	Absent	2.04 (.75)	2.52 (.68)
	Present	2.22 (.72)	2.21 (.64)
9 (Colors)	Absent	3.23 (.70)	3.73 (.69)
	Present	3.46 (.76)	3.46 (.67)

20 The three-way interaction between language of the rating scales and emoticons was nonsignificant ($p > .32$). Besides a significant main effect of emotion ($F(1, 128) = 64.57$, $p < .0001$) and a marginally significant main effect of language of the rating scales ($F(1, 128) = 3.70$, $p = .06$), no other effect was significant (*p*s > .14, see Table 3).

Figure 23: Emoticons by language interaction in Study 8



Study 9

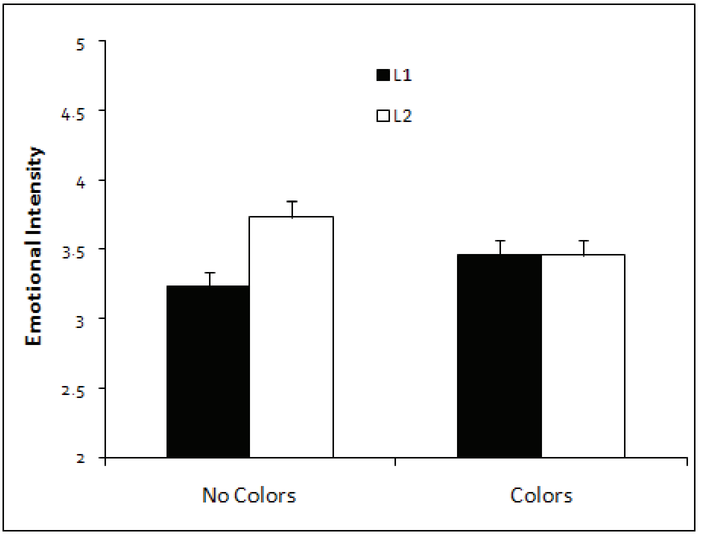
Despite the attractive features of emoticons explored in Study 8, this corrective technique is not applicable to every instance in which ACE could play a role. First, not every emotion can be easily portrayed with emoticons. Second, general indices of emotional intensity (such as the one used in Study 4) are difficult to represent using facial expressions.

Facial expressions are not the only possible vehicle for emotional information. One promising source of emotional information is color. Colors are strongly associated to emotions (Valdez and Mehrabian 1994), as indicated by the common association of, for example, red with love and anger, or of blue with depression. In this study, we test the effectiveness of another corrective technique based on the use of colors as cues for emotional intensity. Finding that simply adding color cues with increasing intensity to the rating scales is sufficient to eliminate ACE would be especially interesting from a practical point of view.

We asked 162 undergraduate students (M_{age} = 19.94, SD = 1.49, 47 females), who participated in the study in return for course credit, to evaluate the emotionality of images used in real skin care advertisements. All participants were sequentially presented with ten images from which all textual elements were removed and were asked to rate each image on a scale ranging from "not emotional at all" to "very emotional" (numbered from 0 to 6). Participants were randomly assigned to the cells of a 2 (Language of rating scale: L1 vs. L2) × 2 (Colors: present vs. absent) between-participants design. For half of respondents, the verbal scale points (either in L1 or L2) were accompanied by small red circles of increasing intensity (see Figure 22b). With a degree of simplification, the level of arousal conveyed by a color is a function of its intensity (Valdez and Mehrabian 1994) and the color red is often associated with excitement, stimulation, and arousal (Wexner 1954).

After averaging across the 10 ads, an ANOVA with language of the rating scales and colors as between-participants factors (see Table 11 and Figure 24) yielded the expected two-way interaction ($F(1, 158) = 4.84$, $p < .05$, $d = .69$). In the absence of color, we replicated ACE. Participants reported higher emotionality ratings with L2 ($M = 3.73$) than L1 items ($M = 3.23$, $F(1, 158) = 9.36$, $p < .01$, $d = .71$). When colors were added to the scale points the effect of language of the rating scales was instead nonsignificant ($p > .96$, $M = 3.46$ for both L1 and L2 conditions). This study demonstrates that nonverbal cues as simple as colors can eliminate ACE. Together, Studies 8 and 9 document the effectiveness of easily implementable corrective techniques applicable to virtually all situations in which ACE may be a concern for marketers.

Figure 24: Color by language interaction in Study 9



5.3 General discussion

One of the most remarkable events of our times is the increasing globalization of a wide range of economic and social phenomena. Globalization raises new important questions for marketing researchers. As a consequence, in recent years marketing scholars have started to explore areas such as information processing in bilingual settings (Luna and Peracchio 2001; Luna, Ringberg, and Peracchio 2008; Noriega and Blair 2008; Puntoni et al. 2009); cross-linguistic issues in marketing communications (Tavassoli and Lee 2003); cross-national logo evaluation (van der Lans et al. 2009); global consumer culture (Alden, Steenkamp, and Batra 2006); and cross-national invariance of marketing instruments (de Jong et al. 2008). We contribute to this growing literature by exploring the effect of using a nonnative language in marketing research instruments.

In a series of studies, we provide converging evidence for the prediction that bilingual respondents tend to report more intense emotional experiences when using L2 than L1 anchoring points (see Table 12 for a summary of the studies). We termed this phenomenon the Anchor Contraction Effect (ACE). Studies 1-7 establish ACE by controlling for a number of factors. Studies 8 and 9 test two easily implementable corrective techniques. Across the series of studies, Cohen's d for ACE ranged between .36 and 1.20. ACE can therefore be characterized as a medium-to-large effect (Cohen 1992). The studies provide strong evidence of external validity. In Study 1, ACE was observed using a sample of trilingual speakers of Dutch, French, and English with Dutch and French as target languages. In the remaining studies, ACE was tested using Dutch and English as, respectively, L1 and L2. The use of English, the *lingua franca* of our time (Crystal 1997), as L2 ensures external validity. The use of Dutch, which is relatively close to English (Finegan 1987), as L1 provides a conservative test that enhances the internal validity of the findings. The effect was probed in a variety of settings—movie interpretation (Study 2 and 8), product evaluation (Study 5), print ad evaluation (Studies 3, 4, 6 and 9), evaluation of an experimental session (Study 7), and taste test (Study 1). We also used several dependent variables—unipolar scales for a range of specific emotions (Studies 1-3 and 7-8), bipolar scales for specific emotions (Studies 5 and 6), and general indices of emotional intensity (Studies 1, 4, and 9). In addition, ACE was independent of linguistic properties of the to-be-rated stimulus (Study 4). ACE also obtained when all points of the scale were labeled (Study 6) and when the emotion words had to be imputed implicitly (Study 7).

5.3.1 Managerial Implications

In recent years, the amount of marketing information collected from nonnative speakers has greatly increased. As an example, online customer ratings for a wide variety of products and services are provided routinely by respondents who are not native speakers of the language in which the question is formulated. For instance, Amazon.com, a global retailer with sales in over 100 countries, asks customers to rate products using the emotion labels "I love it" and "I hate it." Similarly, Barnesandnoble.com allows visitors from anywhere in the world to rate CDs using the anchoring point "emotional."

What steps should marketers take to control for ACE? The most appropriate solution is to make sure that all respondents answer items in their native language (Kotabe and Helsen 2004). However, providing L1 scales to all respondents can sometimes be too costly or impractical. It is also impossible when the number of native languages in the final sample cannot be predicted beforehand or when respondents from a large number of countries submit ratings, for example when polling the inhabitants of multicultural cities such as Chicago, London, or Rotterdam or when a global audience answers questions online.

When the translation approach is not feasible, ACE can be accounted for *a priori* with corrective techniques. We document the effectiveness of two simple corrective techniques based on the concomitant presentation of verbal and nonverbal cues: emoticons (Study 8) and colors (Study 9). Emoticons can be used when measuring specific emotions, in particular basic emotions that can be easily portrayed with stylized facial expressions. Emoticons are also especially appropriate in online settings and whenever poor comprehension is a potential concern—such as in the case of children, low levels of L2 proficiency, or low literacy (Kotabe and Helsen 2004). Their ease of interpretation suggests that emoticons may be particularly useful to address ACE in emerging markets. Colors are instead especially suitable in the case of abstract or complex emotional concepts (e.g., "emotional", "pity"), but they may be vulnerable to cross-cultural differences in interpretation (e.g., Roberson, Davies, and Davidoff 2000). Additional research is needed to explore these techniques (a) in other linguistic and cultural contexts; (b) across different formats (e.g., visually marking all points vs. only end points), colors or emoticons; and (c) across individuals (e.g., differences in reliance on visual vs. textual information).

Table 12: Summary of studies

Study (ACE's d)	*Task and Target*	*Type of Scale Anchor*	*Type of Emotional Scale Anchor*	*Scale Characteristics*			*Corrective Technique*	*Key Results*
				Polarity	*Verbal labels*	*Target Emotion*		
1 (.37)	Chocolate taste test	Emotional	Positive	Unipolar	Only end points	Only in scale	No	L2 > L1
2 (.68)	Movie interpretation	Emotional	Positive and Negative	Unipolar	Only end points	In question and scale	No	L2 > L1
3 (.63)	Ad evaluation	Emotional	Positive	Unipolar	Only end points	Only in scale	No	L2 > L1
4 (.36)	Ad evaluation	Emotional and Cognitive	Overall emotional intensity	Unipolar	Only end points	Only in scale	No	Emotional: L2 > L1 Cognitive: L2 = L1
5 (.64)	Product evaluation	Emotional and Cognitive	Positive and Negative	Bipolar	Only end points	Only in scale	No	Emotional: |L2| > |L1| Cognitive: |L2| = |L1|
6 (.57)	Ad evaluation	Emotional	Positive and Negative	Bipolar	All points	Only in scale	No	|L2| > |L1|
7 (1.20)	Task evaluation	Emotional	Positive and Negative	Unipolar	Only end points	Only in question	No	L2 > L1
8 (.70)	Movie interpretation	Emotional	Positive and Negative	Unipolar	Only end points	In question and scale	Emoticons	Emoticons: L2 = L1 Control: L2 > L1
9 (.71)	Ad evaluation	Emotional	Overall emotional intensity	Unipolar	Only end points	In question and scale	Colors	Colors: L2 = L1 Control: L2 > L1

If none of the measures to avoid ACE reviewed above were implemented at the time of data collection, researchers can adopt an *a posteriori* approach and use information about respondents' L1 as a control variable (e.g., adding a dummy variable in regression models). The main drawback of accounting for ACE statistically is that it assumes the magnitude of ACE to be the same for all respondents within a language group. This is unlikely to be the case. For example, ACE may depend on the L2 proficiency of the respondent, or on the intensity and frequency of prior L2 experiences (Harris et al. 2006; Puntoni et al. 2009). Additionally, this technique (1) imposes additional, and often likely impractical, burdens on data interpretation for firms, and (2) it may be difficult or impossible to obtain data about respondents' native language.

5.3.2 Theoretical Implications

This article contributes to the growing body of work on bilingualism in marketing and consumer research (e.g., Luna et al. 2008; Noriega and Blair 2008) by highlighting the importance of considering bilingualism in the context of international marketing research. The article also contributes to recent research on the emotions of bilinguals (Harris et al. 2006; Pavlenko 2005; Puntoni et al. 2009) by uncovering a novel consequence of the influence of language on the emotionality of textual information. In particular, our studies provide strong support for the notion that the effect of language of the rating scales on emotionality ratings is driven by a contraction of the scale range at the emotional scale-ends of L2 items. Our studies provide process evidence in support of this account (Study 2 and 3) and rule out alternative explanations, such as language stereotypes (Study 1) and general response tendencies (Studies 4-5). In addition, it is worth noting that alternative accounts based on translation issues (i.e., a lack of equivalence between the anchoring points used in the L1 and L2 language conditions) cannot explain results from a balanced bilingual design (Study 1) or from studies using proficient L2 speakers and simple (i.e., easy) words as anchoring points—especially in the case of virtually identical cognates (Studies 1, 2, 4, and 9). Furthermore, the findings for cognates, the interaction effects in Studies 4 and 5, and the perceived difficulty findings in Study 4 rule out an explanation in terms of lack of comprehension of L2 labels. Finally, our results cannot be explained in terms of code switching, or switching between languages, which has been shown to affect responses of bilinguals (Costa, Santesteban, and Ivanova 2006). In Studies 1, 3, and 4, there was equal code switching for all participants. Moreover, in Study 4 the interaction between the language of the to-be-rated stimuli and of the anchoring points was not significant. In the remaining studies there was no code switching, because all materials were either in L1 or in L2

The present studies add to the literature on response styles (e.g., Baumgartner and Steenkamp 2001; de Jong et al. 2008) by highlighting language (L1 vs. L2) as a determinant of stylistic factors, as well as the content domain (emotional vs. non-emotional) in which this effect occurs. A setting in which these considerations are particularly relevant is cross-cultural research. A standard way to assess cultural influences is to conduct quasi-experiments and compare the answers of respondents with different cultural backgrounds. It is not uncommon for researchers in this area to administer materials in the same language to all participants. In these situations, our studies highlight a threat to the interpretability of data. In addition, information about the language used in the materials is often underreported, making it impossible to assess whether ACE may have played a role in the findings. Thus, we advise researchers interested in measuring emotional constructs across language groups to (1) translate the stimuli into the respondents' native language or use one of the proposed corrective techniques and (2) report the language of the materials.

More research is needed to further explore the boundaries of ACE. In particular, what is an emotional anchor? There is a longstanding debate in the literature about what is an emotion (Frijda 2000). As a result, inventories of emotions tend to differ in both length and content. For a list of consumption-related emotions, we refer to Richins (1997). A larger emotion lexicon is provided by Clore, Ortony, and Foss (1987). One reason for the lack of agreement on what is an emotion is that many words are considered emotions in some contexts but not in others (Clore et al. 1987). For example, in Study 4 we found that judgments of an ad on a "bad" to "good" scale were not affected by ACE. However, it is possible that, if we would ask about how respondents feel about an ad instead of judging the ad *per se*, ACE may arise with the same scale anchors. Similarly, ACE may emerge for "satisfied" in some contexts but not in others, depending on whether the question probes respondents' emotional versus cognitive processes (e.g., "being satisfied" vs. "feeling satisfied"; Clore et al. 1987).

Another area for future research concerns possible individual-level moderators of ACE. For example, greater L2 proficiency has been shown to reduce the magnitude of language effects on emotional responses (Harris et al. 2006). Effect sizes for ACE may, hence, come down as L2 proficiency approaches that of L1. Finally, we showed that ACE occurs also when emotion words are only implicitly featured in an anchoring point but future research should explore the relevance of ACE in other common response formats, such as Likert scales.

5.3.3 Conclusion

Already today, there are more L2 than L1 speakers of English and the number of nonnative English speakers will grow at a rapid pace over the coming decades (Crystal 1997). As information technology enables more and more people to interact, the amount of data collected from individuals who are not native speakers of the language of the questions can only increase. Thus, awareness of ACE and of its remedies is important today and may be critical tomorrow.

Chapter 6. Conclusion

The final chapter of this dissertation reviews the main findings of each individual chapter.

In Chapter 2, we examined the effect of homoscedastic versus heteroscedastic uncertainty on cue-outcome learning. We find that, when variation in the outcome that cannot be explained by the cue is heteroscedastic rather than homoscedastic, (1) the perceived correlation between the cue and the outcome is more extreme and (2) outcome predictions in cue ranges in which the outcome is more uncertain are more extreme. These effects occur regardless of whether (a) unexplained variance increases or decreases with higher cue values, (b) the association between the cue and the outcome is positive or negative, (c) learning is sequential (i.e., cue-outcome pairs are presented one by one) or simultaneous (i.e., cue-outcome pairs are presented all at once), and (d) cues and outcomes are labeled as price-quality or generically as X-Y. Although these findings have important implications for any type of cue-outcome learning, for marketing the implications with respect to consumers' price-quality inferences are particularly noteworthy. The price-quality association is one of the most studied cue-outcome associations in marketing. A typical finding in the price-quality literature is that consumers overestimate the relationship that exists between price and quality in the market place. This implies that consumers (1) think that price is a better predictor of quality than it really is, (2) underestimate the quality of low-priced brands, and (3) overestimate the quality of high-priced brands. Our research suggests that the prevalence of product categories in which uncertainty is heteroscedastic contributes to this overestimation. Chapter 2 shows that (1) price is seen as a better predictor of product quality when uncertainty in quality is heteroscedastic, (2) quality for low-priced brands is underestimated when uncertainty in quality is heteroscedastic and decreases with price, and (3) quality for high-priced brands is overestimated when uncertainty in quality is heteroscedastic and increases with price. From a managerial point of view, heteroscedastic uncertainty about product quality provides the opportunity to raise price and thereby signal a higher quality level.

In Chapter 3, we examined the effect of process and outcome accountability on cue-outcome learning. To date, there is a consensus in the social psychological and management literature that in order to optimize judgment quality and performance decision makers should be held process accountable rather than outcome accountable. By pinpointing the exact nature of the cognitive process distinguishing process from outcome accountable decision makers, the current article shows that this insight needs to be qualified. In particular, we find that process accountability facilitates learning of relatively simple, elemental cue-outcome effects but does not improve learning of more complex, configural cue-outcome effects. This is because process accountability improves an analytical rule-based cognitive process based on cue abstraction while it does not change a holistic process based on cue abstraction. This theoretical development may elucidate why, despite the negative effects of outcome accountability documented in the academic literature, outcome-based control systems are so widespread in private-sector institutions (e.g., in salesforce management). Business problems are typically nonlinear, stochastic, interactive, and downright difficult, and managerial judgments and solutions are often based only on the recollection of previously experienced cases and similarity-based reasoning processes. Our research shows that for these types of problems, process accountability does not yield superior performance compared to outcome accountability.

In Chapter 4, we examined the effect of advertising in consumers' native versus second language on the emotional appraisal of advertising messages. Our findings show that, in general, messages expressed in consumers' native language tend to be perceived as more emotional than messages expressed in their second language. Moreover, this effect is not due to stereotypes associated with specific languages (e.g., Italian culture and language may generally be perceived as more emotional than Dutch culture and language). The effect is also not due to consumers having difficulty understanding the content of advertising copy in the foreign language. Building on associative models of memory, we propose a language-specific episodic trace theory explaining the emotional advantage of consumers' native language. We find that this effect depends on personal memories and the language context in which those memories were generated. Thus, reading or hearing a word (unconsciously) triggers personal memories of situations in which that word played a role. These personal memories evoke emotions, making the words in advertisements feel more emotional. Because (1) consumers usually have more personal memories with words in their native language than in their second language and (2) memories in one's native language are typically more emotional than memories in one's second language, marketing messages in their native language tend to be perceived as more emotional. Across a series of five experiments, we found support for the theory. For example, for one study we went to Brussels, the bilingual capital city of Belgium, and asked Dutch-French bilinguals to read a series of advertising slogans, some in Dutch and some in French. For half of our volunteers, the native language was French and for half it was Dutch. We found that, regardless of whether their native language was French or Dutch, native language slogans were perceived as more emotional than second language slogans. The implication of our findings is that, all else being equal, it is generally preferable to communicate with consumers using their own native language, as doing so should result in more emotional messages.

Chapter 5 examined the effect of greater emotionality in consumers' native language in the context of international marketing research. In an increasingly globalized marketplace, it is common for marketing researchers to collect data from respondents who are not native speakers of the language in which the questions are formulated, typically English. We documented the Anchor Contraction Effect (ACE), which is the systematic tendency among bilingual respondents to report more intense emotions when answering questions using rating scales in their second language. In other words, consumers are more likely to say that they love or hate a product or movie when they are asked the question in their second language than when they are asked in their native language. At first sight, this effect may seem to be contradicting the findings presented in Chapter 4. However, ACE is perfectly consistent with Chapter 4 because the effect stems from differences in the inherent emotional power of one's first and second languages. Bilinguals perceive emotion words, including scale anchors, as less intense in their second language than in their native language. For example, scale anchors such as "love" or "hate" do not feel as strong in the second as in the first language. Because ratings are typically provided relative to those scale anchors, non-native rating scales yield more extreme ratings. What steps should marketers take to control for ACE? The most appropriate solution is to make sure that all respondents answer items in their native language. However, providing native-language scales to all respondents can sometimes be too costly, impractical, or simply impossible (e.g., when polling the inhabitants of multicultural cities such as New York or London or when a global audience answers questions online). In these situations, we demonstrated that ACE can be eliminated by simply adding nonverbal cues, such as emoticons or colors, to scale anchors. Emoticons are especially suitable when measuring specific emotions (e.g., basic emotions such as happiness or sadness) and whenever poor comprehension is a potential concern—such as in the case of children, low levels of proficiency in the second language, or low literacy. Colors are instead recommended in the case of abstract or complex emotional concepts (e.g., “emotional” or “concerned”).

Appendix

Appendix A. Mathematical representation of the cognitive models estimated in Chapter 3

Cue Abstraction Model (Juslin et al., 2008; Olsson et al., 2006)

The cue abstraction process can be formally represented by a multiple linear regression model in which the regression parameters b_I represent the weights attached to each cue (C_I). The predicted outcome ($\hat{o}$) is based on summing the weighted cue values:

$$\hat{o} = a + b_1 \times C_1 + \ldots + b_I \times C_I \qquad \text{(A.1)}$$

Two constraints are imposed on the parameters of the cue abstraction model. First, the sum of the linear weights ($\Sigma\ b_I$) should be equal to the range of possible outcome values. The outcome values in Study 3 are bounded between 0 and 10, yielding a range of 10. Second, the intercept a is constrained such that:

$$a = .5 \times (10 - \Sigma\ b_I) \qquad \text{(A.2)}$$

This restriction is imposed because it reduces the number of parameters of the cue abstraction model from 5 to 4, which makes it more easily comparable to the exemplar-based model that also contains 4 parameters. The parameters of the cue abstraction model are estimated with ordinary least squares based on the judgments of participants in the second half of the training phase.

Exemplar-Based model

The exemplar-based process is modeled by the context model (Medin & Schaffer, 1978) applied to a situation with continuous outcome values (Juslin et al., 2008; Juslin et al., 2003; Olsson et al., 2006). The predicted outcome ($\hat{o}$) is the average of the outcome values (o_n) of previously encountered exemplars, in which the outcomes are weighted according to their similarity (S_n) to the stimulus to be judged:

$$\hat{o} = \frac{\sum_{N} S_n \times o_n}{\sum_{N} S_n} \qquad \text{(A.3)}$$

The similarity (S_n) is obtained by the multiplicative e similarity rule of the original context model[21] (Medin & Schaffer, 1978):

$$S_n = \prod_{i=1}^{I} d_i \qquad \text{(A.4)}$$

where index d_i equals 1 if both exemplars coincide on feature i, and s_i if they deviate. The 4 similarity parameters (s_i) lie in the interval [0, 1] and capture the impact of deviating features on the overall similarity S_n. The closer s_i is to 1, the less important the feature is for determining the similarity between the exemplars. The similarity parameters are obtained with the Newton-Raphson algorithm for maximum likelihood estimation based on the judgments of participants in the second half of the training phase.

21 In case of binary-valued stimulus dimensions, the multiplicative similarity rule of the original context model is a special case of the multidimensional scaling solution proposed by the Generalized Context Model (Nosofsky, 1986).

References

Aiken, Leona S. and Stephen G. West (1991), *Multiple Regression: Testing and Interpreting Interactions*. Thousand Oaks, CA: Sage.

Alden, Dana L., Jan-Benedict E. M. Steenkamp, and Rajeev Batra (2006), "Consumer Attitudes Toward Marketplace Globalization: Structure, Antecedents and Consequences," *International Journal of Research in Marketing*, 23 (3), 227-239.

Allan, Lorraine G. (1993), "Human Contingency Judgments - Rule-Based or Associative," *Psychological Bulletin*, 114 (3), 435-448.

Altarriba, Jeanette (2003), "Does Carino Equal 'Liking'? A Theoretical Approach to Conceptual Nonequivalence Between Languages," *International Journal of Bilingualism*, 7 (3), 305-322.

Anderson, Doug (2009), "Below the Topline: The United States in 2020: A Very Different Place," *SVP Report*, The Nielsen Company, http://en-us.nielsen.com/main/insights/consumer_insight/July_2009/the_united_states.

Arkes, Hal R. (1991), "Costs and Benefits of Judgment Errors – Implications for Debiasing," *Psychological Bulletin,* 110 (3), 486-498.

Arkes, Hal R., Robyn M. Dawes, and Caryn Christensen (1986), "Factors Influencing the Use of a Decision Rule in a Probabilistic Task.," *Organizational Behavior and Human Decision Processes,* 37 (1), 93-110.

Arnett, Jeffrey J. (2002), "The Psychology of Globalization," *American Psychologist*, 57 (10), 774-783.

Ashton, Robert H. (1992), "Effects of Justification and a Mechanical Aid on Judgment Performance," *Organizational Behavior and Human Decision Processes,* 52 (2), 292-306.

Baron, Reuben M. and David A. Kenny (1986), "The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic and Statistical Considerations," *Journal of Personality and Social Psychology,* 51 (6), 1173-1182.

Bartels, Daniel M. (2006), "Proportion Dominance: The Generality and Variability of Favoring Relative Savings over Absolute Savings," *Organizational Behavior and Human Decision Processes,* 100 (1), 76-95.

Beach, Lee R. and Terence R. Mitchell (1978), "A Contingency Model for the Selection of Decision Strategies," *Academy of Management Review,* 3, 439-449.

Baumgartner, Hans (1995), "On the Utility of Consumers Theories in Judgments of Covariation," *Journal of Consumer Research*, 21 (4), 634-643.

Baumgartner, Hans and Jan-Benedict E. M. Steenkamp (2001), "Response Styles in Marketing Research: A Cross-National Investigation," *Journal of Marketing Research*, 38 (2), 143-156.

Bettman, James R., Deborah Roedder John, and Carol A. Scott (1986), "Covariation Assessment by Consumers," *Journal of Consumer Research*, 13 (3), 316-326.

Bjerve, Steinar and Kjell Doksum (1993), "Correlation Curves - Measures of Association as Functions of Covariate Values," *Annals of Statistics*, 21 (2), 890-902.

Bjorklund, Frederik and Martin Backstrom (2008), "Individual Differences in Processing Styles: Validity of the Rational-Experiential Inventory," *Scandinavian Journal of Psychology,* 49 (5), 439-446.

Bloise, Suzanne M. and Marcia K. Johnson (2007), "Memory for Emotional and Neutral Information: Gender and Individual Differences in Emotional Sensitivity," *Memory*, 15 (2), 192-204.

Blyth, Stephen J. (1994), "Measuring Local Association - an Introduction to the Correlation Curve," *Sociological Methodology*, 24, 171-197.

Bond, Michael H. and Tat-Ming Lai (1986), "Embarrassment and Code-Switching into a Second Language," *Journal of Social Psychology*, 126 (2), 179-186.

Bower, Gordon H. (1981), "Mood and Memory," *American Psychologist*, 36 (2), 129-48.

Brehmer, Berndt (1974), "Hypotheses About Relations Between Scaled Variables in the Learning of Probabilistic Inference Tasks," *Organizational Behavior and Human Performance*, 11, 1-27.

Brtek, Mary D. and Stephan J. Motowidlo (2002), "Effects of Procedure and Outcome Accountability on Interview Validity, " *Journal of Applied Psychology,* 87 (1), 185-191.

Bruner, Gordon II, Karen E. James, and Paul J. Hensen (2001), *Marketing Scales Handbook: A Compilation of Multi-Item Measures, Vol. III,* Chicago: American Marketing Association.

Cacioppo, John T. and Richard E. Petty (1982), "The Need for Cognition," *Journal of Personality and Social Psychology,* 42 (1), 116-131.

Cacioppo, John T., Richard E. Petty, and Chuan F. Kao (1984), "The Efficient Assessment of Need for Cognition," *Journal of Personality Assessment,* 48, 306-307.

Campbell, Gwendolyn E. and Amy E. Bolton (2005), "HBR Validation: Integrating Lessons Learned From Multiple Academic Disciplines, Applied Communities, and the AMBR Project," In K. A. Gluck & R. W. Pew (Eds.), *Modeling Human Behavior with Integrated Cognitive Architectures: Comparison, Evaluation and Validation*. Mahwah, NJ: Lawrence Erlbaum Associates.

Carpenter, Patricia A., Marcel A. Just, and Peter Shell (1990), "What One Intelligence-Test Measures: A Theoretical Account of the Processing in the Raven Progressive Matrices Test," *Psychological Review,* 97 (3), 404-431.

Chaiken, Shelly (1980), "Heuristic Versus Systematic Information Processing and the Use of Source Versus Message Cues in Persuasion." *Journal of Personality and Social Psychology,* 39 (5), 752-766.

Challagalla, Goutam N. and Tasadduq A. Shervani (1996), "Dimensions and Types of Supervisory Control: Effects on Salesperson Performance and Satisfaction," *Journal of Marketing,* 60 (1), 89-105.

Chevalier, Judith A. and Dina Mayzlin (2006), "The Effect of Word of Mouth on Sales: Online Book Reviews," *Journal of Marketing Research*, 43 (August), 345-354.

Clore, Gerald L., Andrew Ortony, and Mark A. Foss (1987), "The Psychological Foundations of the Affective Lexicon," *Journal of Personality and Social Psychology,* 53 (4), 751-766.

Cohen, Jacob (1992), "A Power Primer," *Psychological Bulletin,* 112 (1), 155-159.

Cohen, Jacob, Patricia Cohen, Stephen G. West, and Leona S. Aiken (2003), *Applied Multiple Regression / Correlation Analysis for the Behavioral Sciences (3rd ed.)*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Costa, Albert, Alfonso Caramazza, and Nuria Sebastian-Galles (2000), "The Cognate Facilitation Effect: Implications for Models of Lexical Access," *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 26 (5), 1283-96.

Costa, Albert, Mikel Santesteban, and Iva Ivanova (2006), "How Do Highly Proficient Bilinguals Control Their Lexicalization Process? Inhibitory and Language-Specific Selection Mechanisms are Both Functional," *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 32 (5), 1057-1074.

Cravens, David W., Thomas N. Ingram, Raymond W. Laforge, and Clifford E. Young (1993), "Behavior-based and Outcome-based Salesforce Control-Systems," *Journal of Marketing,* 57 (4), 47-59.

Crocker, Jennifer (1981), "Judgment of Covariation by Social Perceivers, " *Psychological Bulletin,* 90 (2), 272-292.

Crystal, David (1997), *English as a Global Language*, Cambridge, UK: Cambridge University Press.

Cuddy, Amy J. C., Susan T. Fiske, Virginia S. Y. Kwan, Peter Glick, Stephanie Demoulin, Jacques-Philippe Leyens, Michael Harris Bond, Jean-Claude Croizet, Naomi Ellemers, Ed Sleebos, Tin Tin Htun, Hyun-Jeong Kim, Greg Maio, Judi Perry, Kristina Petkova, Valery Todorov, Rosa Rodriguez-Bailon, Elena Morales, Miguel Moya, Marisol Palacios, Vanessa Smith, Rolando Perez, Jorge Vala, and Rene Ziegler (2009), "Stereotype Content Model Across Cultures: Towards Universal Similarities and Some Differences," *British Journal of Social Psychology*, 48 (1), 1-33.

Dane, Erik and Michael G. Pratt (2007), "Exploring Intuition and its Role in Managerial Decision Making," *Academy of Management Review,* 32 (1), 33-54.

Davis, Penelope J. (1999), "Gender Differences in Autobiographical Memory for Childhood Emotional Experiences," *Journal of Personality and Social Psychology*, 76 (3), 498-510.

De Dreu, Carsten K. W., Bianca Beersma, Katherine Stroebe, and Martin C. Euwema (2006), "Motivated Information Processing, Strategic Choice, and the Quality of Negotiated Agreement," *Journal of Personality and Social Psychology,* 90 (6), 927-943.

De Dreu, Carsten K. W. and Peter J. Carnevale (2003), "Motivational Bases for Information Processing and Strategic Choice in Conflict and Negotiation," In

M. P. Zanna (Ed.), *Advances in Experimental Social Psychology* (Vol. 35, pp. 235-291). New York: Academic Press.

De Dreu, Carsten K. W., Sander L. Koole, and Wolfgang Steinel (2000), "Unfixing the Fixed pie: A Motivated Information-Processing Approach to Integrative Negotiation," *Journal of Personality and Social Psychology,* 79 (6), 975-987.

De Dreu, Carsten K. W., Bernard A. Nijstad, and Daan van Knippenberg (2008), "Motivated Information Processing in Group Judgment and Decision Making," *Personality and Social Psychology Review,* 12 (1), 22-49.

De Houwer, Jan, Stefaan Vandorpe, and Tom Beckers (2007), "Statistical Contingency Has a Different Impact on Preparation Judgements than on Causal Judgements," *Quarterly Journal of Experimental Psychology*, 60 (3), 418-32.

de Jong, Martijn G., Jan-Benedict E. M. Steenkamp, Jean-Paul Fox, and Hans Baumgartner (2008), "Using Item Response Theory to Measure Extreme Response Style in Marketing Research: A Global Investigation," *Journal of Marketing Research*, 45 (1), 104-115.

DeLosh, Edward L., Jerome R. Busemeyer, and Mark A. McDaniel (1997), "Extrapolation: The sine qua non for abstraction in function learning," *Journal of Experimental Psychology: Learning Memory and Cognition*, 23 (4), 968-86.

Derks, Daantje, Arjan E. R. Bos, and Jasper von Grumbkow (2008), "Emoticons and Online Message Interpretation," *Social Science Computer Review*, 26 (3), 379-388.

Dewaele, Jean-Marc (2004), "The Emotional Force of Swearwords and Taboo Words in the Speech of Multilinguals," *Journal of Multilingual and Multicultural Development*, 25 (2-3), 204-22.

Dicken, Peter (2007), *Global Shift: Mapping the Changing Contours of the World Economy,* London, UK: Sage.

Dijksterhuis, Ap (2004), "Think Different: The Merits of Unconscious Thought in Preference Development and Decision Making," *Journal of Personality and Social Psychology,* 87 (5), 586-598.

Doksum, Kjell, Stephen Blyth, Eric Bradlow, Xiao-Li Meng, and Hongyu Zhao (1994), "Correlation Curves as Local Measures of Variance Explained by Regression," *Journal of the American Statistical Association*, 89 (426), 571-82.

Doney, Patricia M., and Gary M. Armstrong (1996), "Effects of Accountability on Symbolic Information Search and Information Analysis by Organizational Buyers," *Academy of Marketing Science,* 24 (1), 57-65.

Dougherty, Michael R. P., Charles F. Gettys, and Eve E. Ogden (1999), "MINERVA-DM: A Memory Processes Model for Judgments of Likelihood," *Psychological Review,* 106 (1), 180-209.

Einhorn, Hillel J., Don N. Kleinmuntz, and Benjamin Kleinmuntz (1979), "Linear Regression and Process-Tracing Models of Judgment," *Psychological Review,* 86 (5), 465-485.

Epstein, Seymour (1994), "Integration of the Cognitive and the Psychodynamic Unconscious," *American Psychologist,* 49 (8), 709-724.

Epstein, Seymour, Abigail Lipson, Carolyn Holstein, and Eileen Huh (1992), "Irrational Reactions to Negative Outcomes - Evidence for 2 Conceptual Systems," *Journal of Personality and Social Psychology,* 62 (2), 328-339.

Erickson, Michael A. and John K. Kruschke (1998), "Rules and Exemplars in Category Learning," *Journal of Experimental Psychology: General*, 127 (2), 107-40.

Fennema, M. G. and Jon D. Perkins (2008), "Mental Budgeting versus Marginal Decision Making: Training, Experience and Justification Effects on Decisions Involving Sunk Costs," *Journal of Behavioral Decision Making,* 21 (3), 225-239.

Finegan, Edward (1987), "English," in *The World's Major Languages*, ed. Bernard Comrie, Beckenham, UK: Croom Helm, 77-109.

Frijda, Nico H. (2000), "The Psychologists' Point of View," in *Handbook of Emotions*, ed. Michael Lewis and Jeannette M. Haviland-Jones. New York: Guilford, 59-74.

Gerritsen, Marinel, Hubert Korzilius, Frank van Meurs, and Inge Gijsbers (2000), "English in Dutch Commercials: Not Understood and Not Appreciated," *Journal of Advertising Research*, 40 (4), 17-31.

Gigerenzer, Gerd and Daniel G. Goldstein (1996), "Reasoning the Fast and Frugal Way: Models of Bounded Rationality," *Psychological Review, 103*(4), 650-669.

Greenleaf, Eric A. (1992), "Measuring Extreme Response Style," *Public Opinion Quarterly*, 56, 328-351.

Hagafors, Roger and Berndt Brehmer (1983), "Does Having to Justify One's Judgments Change the Nature of the Judgment Process?," *Organizational Behavior and Human Decision Processes*, 31, 223-32.

Hahn, Ulrike and Nick Chater (1998), "Similarity and Rules: Distinct? Exhaustive? Empirically Distinguishable?" *Cognition,* 65 (2-3), 197-230.

Hammond, Kenneth R. (1996), *Human Judgment and Social Policy: Irreducible Uncertainty, Inevitable Error, Unavoidable Injustice*. New York: Oxford University Press.

Harnad, Stevan (1987), *Categorical Perception: The Groundwork of Cognition*. New York: Cambridge University Press.

Harris, Catherine L., Ayse Aycicegi, and Jean Berko Gleason (2003), "Taboo Words and Reprimands Elicit Greater Autonomic Reactivity in a First Language than in a Second Language," *Applied Psycholinguistics*, 24 (4), 561-79.

Harris, Catherine L., Jean Berko Gleason, and Ayse Aycicegi (2006), "When is a First Language More Emotional? Psychophysiological Evidence from Bilingual Speakers," in *Bilingual Minds: Emotional Experience, Expression, and Representation*, ed. Aneta Pavlenko, Clevedon, UK: Multilingual Matters, 257-311.

Harris, Paul L. (2000), "Understanding Emotion, " in *Handbook of Emotions*, ed. Michael Lewis and Jeanette M. Haviland-Jones, New York: Guilford, 281-92.

Hintzman, Douglas L. (1986), "Schema Abstraction" in a Multiple-Trace Memory Model," *Psychological Review*, 93 (4), 411-28.

Hintzman, Douglas L. (1988), "Judgments of Frequency and Recognition Memory in a Multiple-Trace Memory Model," *Psychological Review*, 95 (4), 528-51.

Hsee, Christopher K. and Yuval Rottenstreich (2004), "Music, Pandas, and Muggers: On the Affective Psychology of Value," *Journal of Experimental Psychology: General*, 133 (1), 23-30.

Jacoby, Larry L. and Lee R. Brooks (1984), "Nonanalytic Cognition: Memory, Perception, and Concept Learning," in *The Psychology of Learning and Motivation*, ed. Gordon H. Bower, New York: Academic Press, 1-47.

Jacoby, Larry L. and C. A. Gordon Hayman (1987), "Specific Visual Transfer in Word Identification," *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 13 (3), 456-63.

Janis, Irving L. and Leon Mann (1977), *Decision Making: A Psychological Analysis of Conflict, Choice, and Commitment*. New York: Free Press.

Javier, Rafael A. (1989), "Linguistic Considerations in the Treatment of Bilinguals," *Psychoanalytic Psychology*, 6 (1), 87-96.

Javier, Rafael A., Felix Barroso, and Michele A. Munoz (1993), "Autobiographical Memory in Bilinguals," *Journal of Psycholinguistic Research*, 22 (3), 319-38.

Jennings, Dennis L., Teresa M. Amabile, and Lee Ross (1982), "Informal Covariation Assessment: Data-based versus Theory-based Judgments," in *Judgment under Uncertainty: Heuristics and Biases*, Daniel Kahneman and Paul Slovic and Amos Tversky, Eds. New York: Cambridge University Press.

Johar, Gita V., Durairaj Maheswaran, and Laura A. Peracchio (2006), "MAPping the Frontiers: Theoretical Advances in Consumer Research on Memory, Affect, and Persuasion," *Journal of Consumer Research*, 33 (1), 139-49.

Joseph, Anne M., Stephen S. Hecht, Sharon E. Murphy, Steven G. Carmella, Chap T. Le, Yan Zhang, Shaomei M. Han, and Dorothy K. Hatsukami (2005), "Relationships Between Cigarette Consumption and Biomarkers of Tobacco Toxin Exposure," *Cancer Epidemiology Biomarkers & Prevention*, 14 (12), 2963-68.

Juslin, Peter, Sari Jones, Henrik Olsson, and Anders Winman (2003), "Cue Abstraction and Exemplar Memory in Categorization," *Journal of Experimental Psychology: Learning Memory and Cognition,* 29 (5), 924-941.

Juslin, Peter, Linnea Karlsson, and Henrik Olsson (2008), "Information Integration in Multiple Cue Judgment: A Division of Labor Hypothesis," *Cognition*, 106 (1), 259-98.

Juslin, Peter, Henrik Olsson, and Anna-Carin Olsson (2003), "Exemplar Effects in Categorization and Multiple-Cue Judgment," *Journal of Experimental Psychology: General,* 132 (1), 133-156.

Juslin, Peter and Magnus Persson (2002), "PROBabilities from EXemplars (PROBEX): A "Lazy" Algorithm for Probabilistic Inference from Generic Knowledge," *Cognitive Science,* 26 (5), 563-607.

Kahneman, Daniel and Edwin E. Ghiselli (1962), "Validity and Nonlinear Heteroscedastic Models," *Personnel Psychology*, 15 (1), 1-11.

Kahneman, Daniel and Amos Tversky (1979), "Prospect Theory: An Analysis of Decision under Risk," *Econometrica,* 47 (2), 263-91.

Kalish, Michael L., Stephan Lewandowsky, and John K. Kruschke (2004), "Population of Linear Experts: Knowledge Partitioning and Function Learning," *Psychological Review*, 111 (4), 1072-1099.

Karelaia, Natalia and Robin M. Hogarth (2008), "Determinants of Linear Judgment: A Meta-Analysis of Lens Model Studies," *Psychological Bulletin*, 134 (3), 404-426.

Kolodner, Janet L. (1992), "An introduction to Case-Based Reasoning," *Artificial Intelligence Review,* 6 (1), 3-34.

Koslow, Scott, Prem N. Shamdasani, and Ellen E. Touchstone (1994), "Exploring Language Effects in Ethnic Advertising: A Sociolinguistic Perspective," *Journal of Consumer Research*, 20 (4), 575-85.

Kotabe, Masaaki and Kristiaan Helsen (2004), *Global Marketing Management, 3rd ed*. Hoboken, NJ: Wiley.

Kotler, Philip (1971), *Marketing Decision Making – A Model Building Approach.* New York: Holt, Rinehart and Winston.

Kroll, Judith F. and Erika Stewart (1994), "Category Interference in Translation and Picture Naming: Evidence for Asymmetric Connections between Bilingual Memory Representations," *Journal of Memory and Language*, 33 (2), 149-74.

Kruglanski, Arie W. (1989), "The Psychology of Being Right - the Problem of Accuracy in Social-Perception and Cognition," *Psychological Bulletin,* 106 (3), 395-409.

Lagnado, David A. and David R. Shanks (2002), "Probability Judgment in Hierarchical Learning: A Conflict Between Predictiveness and Coherence," *Cognition*, 83 (1), 81-112.

Lane, David M., Craig A. Anderson, and Kathryn L. Kellam (1985), "Judging the Relatedness of Variables: The Psychophysics of Covariation Detection," *Journal of Experimental Psychology: Human Perception and Performance*, 11 (5), 640-49.

Leclerc, France, Bernd H. Schmitt, and Laurette Dubé (1994), "Foreign Branding and Its Effects on Product Perceptions and Attitudes," *Journal of Marketing Research*, 31 (2), 263-70.

Lee, Jamie S. (2006), "Linguistic Constructions of Modernity: English Mixing in Korean Television Commercials," *Language in Society*, 35 (1), 59-91.

Lerner, Jennifer S. and Philip E. Tetlock (1999), "Accounting for the Effects of Accountability," *Psychological Bulletin,* 125 (2), 255-275.

Lichtenstein, Donald R., Peter H. Bloch, and William C. Black (1988), "Correlates of Price Acceptability," *Journal of Consumer Research*, 15 (2), 243-52.

Loewenstein, George F., Elke U. Weber, Christopher K. Hsee, Ned Welch (2001), "Risk as Feelings," *Psychological Bulletin,* 127 (2), 267-286.

Luna, David and Laura A. Peracchio (2001), "Moderators of Language Effects in Advertising to Bilinguals: A Psycholinguistic Approach," *Journal of Consumer Research*, 28 (2), 284-95.

Luna, David (2005), "Advertising to Bilingual Consumers: The Impact of Code-Switching on Persuasion," *Journal of Consumer Research*, 31 (4), 760-65.

Luna, David, Torsten Ringberg, and Laura A. Peracchio (2008), "One Individual, Two Identities: Frame Switching among Biculturals," *Journal of Consumer Research*, 35 (2), 279-93.

Marian, Viorica and Margarita Kaushanskaya (2004), "Self-Construal and Emotion in Bicultural Bilinguals," *Journal of Memory and Language*, 51 (2), 190-201.

Marian, Viorica and Ulric Neisser (2000), "Language-Dependent Recall of Autobiographical Memories," *Journal of Experimental Psychology: General*, 129 (3), 361-68.

Marschan-Piekkari, Rebecca, Denice Welch, and Lawrence Welch (1999), "Adopting a Common Corporate Language: IHRM Implications," *International Journal of Human Resource Management*, 10 (3), 377-390.

Marshalek, Brachia, David F. Lohman, and Richard E. Snow (1983), "The Complexity Continuum in the Radex and the Hierarchical Models of Intelligence," *Intelligence,* 7, 107-127.

McAllister, Daniel W., Terence R. Mitchell, and Lee R. Beach (1979), "The Contingency Model for the Selection of Decision Strategies: An Empirical Test of the Effects of Significance, Accountability, and Reversibility," *Organizational Behavior and Human Performance,* 24, 228-244.

Medin, Douglas L. and Marguerite M. Schaffer (1978), "Context Theory of Classification Learning," *Psychological Review*, 85 (3), 207-38.

Mellers, Barbara A. (1980), "Configurality in Multiple-Cue Probability Learning," *American Journal of Psychology,* 93 (3), 429-443.

Meyers-Levy, Joan, Rui Zhu, and Lan Jiang (2010), "Context Effects from Bodily Sensations: Examining Bodily Sensations Induced by Flooring and the Moderating Role of Product Viewing Distance," *Journal of Consumer Research,* forthcoming.

Mladenka, Kenneth R. and Kim Quaile Hill (1976), "A Re-examination of the Etiology of Urban Crime," *Criminology*, 13 (4), 491-506.

Muller, Dominique, Charles M. Judd, and Vincent Y. Yzerbyt (2005), "When Moderation is Mediated and Mediation is Moderated," *Journal of Personality and Social Psychology,* 89 (6), 852-863.

Myung, J., Mark A. Pitt, and Woojae Kim (2005), "Model Evaluation, Testing and Selection," In K. Lamberts & R. Goldstone (Eds.), *Handbook of Cognition* (pp. 422-437). London: Sage.

Navon, David (1977), "Forest Before Trees: The Precedence of Global Features in Visual Perception," *Cognitive Psychology,* 9, 353-383.

Neal, Andrew, Beryl Hesketh, and Sally Andrews (1995), "Instance-Based Categorization: Automatic Versus Intentional Forms of Retrieval," *Memory & Cognition,* 23 (2), 227-242.

Noriega, Jaime and Edward Blair (2008), "Advertising to Bilinguals: Does the Language of Advertising Influence the Nature of Thoughts?" *Journal of Marketing,* 72 (5), 69-83.

Nosofsky, Robert M. (1986), "Attention, Similarity, and the Identification-Categorization Relationship," *Journal of Experimental Psychology: General,* 115 (1), 39-57.

Nosofsky, Robert M., Hyun Jung Shin, and Steven E. Clark (1989), "Rules and Exemplars in Categorization, Identification, and Recognition," *Journal of Experimental Psychology: Learning Memory and Cognition,* 15 (2), 282-304.

Novak, Thomas P. and Donna L. Hoffman (2009), "The Fit of Thinking Style and Situation: New Measures of Situation-Specific Experiential and Rational Cognition," *Journal of Consumer Research,* 36 (1), 56-72.

Ofir, Chezy (2004), "Reexamining latitude of price acceptability and price thresholds: Predicting basic consumer reaction to price," *Journal of Consumer Research*, 30 (4), 612-21.

Olsson, Anna-Carin, Tommy Enkvist, and Peter Juslin (2006), "Go with the Flow: How to Master a Nonlinear Multiple-Cue Judgment Task," *Journal of Experimental Psychology: Learning Memory and Cognition,* 32 (6), 1371-1384.

Ostrom, Thomas M. (1966), "Perspective as an Intervening Construct in the Judgment of Attitude Statements," *Journal of Personality and Social Psychology*, 3 (2), 135-144.

Pacini, Rosemary and Seymour Epstein (1999), "The Relation of Rational and Experiential Information Processing Styles to Personality, Basic Beliefs, and the Ratio-Bias Phenomenon," *Journal of Personality and Social Psychology,* 76 (6), 972-987.

Palmeri, Thomas J., Stephen D. Goldinger, and David B. Pisoni (1993), "Episodic Encoding of Voice Attributes and Recognition Memory for Spoken Words," *Journal of Experimental Psychology: Learning Memory and Cognition*, 19 (2), 309-28.

Patalano, Andrea L., Edward E. Smith, John Jonides, and Robert A. Koeppe (2001), "PET Evidence for Multiple Strategies of Categorization." *Cognitive, Affective, & Behavioral Neuroscience,* 1 (4), 360-370.

Pavlenko, Aneta (2005), *Emotions and Multilingualism*. Cambridge, UK: Cambridge University Press.

Pavlenko, Aneta, ed. (2006), *Bilingual Minds: Emotional Experience, Expression and Representation*, Clevedon, UK: Multilingual Matters.

Payne, John W., James R. Bettman, and Eric J. Johnson (1993), *The Adaptive Decision Maker*. Cambridge, England: Cambridge University Press.

Pechmann, Cornelia and S. Ratneshwar (1992), "Consumer Covariation Judgments - Theory or Data Driven," *Journal of Consumer Research*, 19 (3), 373-86.

Petty, Richard E. and JohnT. Cacioppo (1986), "The Elaboration Likelihood Model of Persuasion," In L. Berkowitz (Ed.), *Advances in Experimental Social Psychology* (Vol. 19, pp. 123-205). New York: Academic Press.

Pew Research Center for the People and the Press (2001), "October 2001 News Interest Update," (accessed January 11, 2010), [available at http://people-press.org].

Pothos, Emmanuel M. (2005), "The Rules versus Similarity Distinction," *Behavioral and Brain Sciences,* 28 (1), 1-49.

Prabhakaran, Vivek, Jennifer A. L. Smith, John E. Desmond, Gary H. Glover, and John D. E. Gabrieli (1997), "Neural Substrates of Fluid Reasoning: An fMRI Study of Neocortical Activation during Performance of the Raven's Progressive Matrices Test," *Cognitive Psychology,* 33 (1), 43-63.

Preacher, Kristopher J. and Andrew F. Hayes (2004), “SPSS and SAS Procedures for Estimating Indirect Effects in Simple Mediation Models,” *Behavior Research Methods Instruments & Computers,* 36 (4), 717-731.

Price, Paul C. and J. Frank Yates (1993), "Judgmental Overshadowing - Further Evidence of Cue Interaction in Contingency Judgment," *Memory & Cognition*, 21 (5), 561-72.

Puntoni, Stefano, Bart de Langhe, and Stijn M. J. van Osselaer (2009), "Bilingualism and the Emotional Intensity of Advertising Language" *Journal of Consumer Research*, 35 (6), 1012-1025.

Raaijmakers, Jeroen G. W. and Richard M. Shiffrin (1992), "Models for Recall and Recognition," *Annual Review of Psychology*, 43, 205-34.

Rao, Akshay R. and Kent B. Monroe (1989), "The Effect of Price, Brand Name, and Store Name on Buyers Perceptions of Product Quality - an Integrative Review," *Journal of Marketing Research*, 26 (3), 351-57.

Raven, John (2000), "The Raven's Progressive Matrices: Change and stability over culture and time," *Cognitive Psychology,* 41 (1), 1-48.

Raven, John C. (1938), *Progressive Matrices: A Perceptual Test of Intelligence*, London: H. K. Lewis.

Reber, Arthur S. (1989), "Implicit Learning and Tacit Knowledge," *Journal of Experimental Psychology: General,* 118 (3), 219-235.

Reber, Arthur S., Saul M. Kassin, Selma Lewis, and Gary Cantor (1980), "On the Relationship Between Implicit and Explicit Modes in the Learning of a Complex Rule Structure," *Journal of Experimental Psychology: Human Learning and Memory,* 6 (5), 492-502.

Richard, Marie-Odile and Roy Toffoli (2009), "Language Influence in Response to Questionnaires by Bilingual Respondents: A Test of the Whorfian Hypothesis," *Journal of Business Research*, 62 (10), 987-994.

Richins, Marsha L. (1997), "Measuring Emotions in the Consumption Experience," *Journal of Consumer Research*, 24 (September), 127-146.

Roberson, Debi, Ian Davies, and Jules Davidoff (2000), "Color Categories Are Not Universal: Replications and New Evidence From a Stone-Age Culture," *Journal of Experimental Psychology: General,* 129 (3), 369-398.

Rottenschreich, Yuval and Christopher K. Hsee (2001), "Money, Kisses, and Electric Shocks: On the Affective Psychology of Risk, " *Psychological Science,* 12, 185-90.

Schacter, Daniel L. and Barbara A. Church (1992), "Auditory Priming: Implicit and Explicit Memory for Words and Voices," *Journal of Experimental Psychology: Learning Memory and Cognition*, 18 (5), 915-30.

Schimmack, Ulrich and Rainer Reisenzein (1997), "Cognitive Processes Involved in Similarity Judgments of Emotions," *Journal of Personality and Social Psychology*, 73 (4), 645-61.

Scholten, Lotte, Daan van Knippenberg, Bernard A. Nijstad, and Carsten K. W. De Dreu (2007), "Motivated Information Processing and Group Decision-Making: Effects of Process Accountability on Information Processing and Decision Quality," *Journal of Experimental Social Psychology,* 43 (4), 539-552.

Schwarz, Norbert, Bärbel Knauper, Hans J. Hippler, Elisabeth Noelle-Neumann, and Leslie Clark (1991), "Rating-Scales: Numeric Values May Change the Meaning of Scale Labels," *Public Opinion Quarterly*, 55 (4), 570-582.

Sedikides, Constantine, Kenneth C. Herbst, Deletha P. Hardin, and Gregory J. Dardis (2002), "Accountability as a Deterrent to Self-Enhancement: The Search for Mechanisms," *Journal of Personality and Social Psychology,* 83 (3), 592-605.

Sheets, Charles A. and Monroe J. Miller (1974), "The Effect of Cue-Criterion Function Form on Multiple-Cue Probability Learning," *American Journal of Psychology,* 87 (4), 629-641.

Shiloh, Shoshana, Efrat Salton, and Dana Sharabi (2002), "Individual Differences in Rational and Intuitive Thinking Styles as Predictors of Heuristic Responses and Framing Effects," *Personality and Individual Differences,* 32 (2), 415-429.

Shiv, Baba and Alexander Fedorikhin (1999), "Heart and Mind in Conflict: The Interplay of Affect and Cognition in Consumer Decision Making," *Journal of Consumer Research,* 26 (3), 278-92.

Siegel-Jacobs, Karen and J. Frank Yates (1996), "Effects of Procedural and Outcome Accountability on Judgment Quality," *Organizational Behavior and Human Decision Processes,* 65 (1), 1-17.

Siemer, Matthias and Rainer Reisenzein (2007), "The Process of Emotion Inference," *Emotion*, 7 (1), 1-20.

Simonson, Itamar and Peter Nye (1992), "The Effect of Accountability on Susceptibility to Decision Errors," *Organizational Behavior and Human Decision Processes,* 51 (3), 416-446.

Simonson, Itamar and Barry M. Staw (1992), "De-escalation Strategies: A Comparison of Techniques for Reducing Commitment to Losing Courses of Action," *Journal of Applied Psychology,* 77 (4), 419-426.

Slaughter, Jerel E., Jessica Bagger, and Andrew Li (2006), "Context Effects on Group-Based Employee Selection Decisions," *Organizational Behavior and Human Decision Processes,* 100 (1), 47-59.

Sloman, Steven A. (1996), "The Empirical Case for Two Systems of Reasoning," *Psychological Bulletin,* 119 (1), 3-22.

Smith, Edward E. and Steven A. Sloman (1994), "Similarity-Based Versus Rule-Based Categorization," *Memory & Cognition,* 22 (4), 377-386.

Sniezek, Janet A. (1986), "The Role of Variable Labels in Cue Probability Learning Tasks," *Organizational Behavior and Human Decision Performance*, 38, 141-61.

Sunderman, Gretchen and Judith F. Kroll (2006), "First Language Activation during Second Language Lexical Processing: An Investigation of Lexical Form, Meaning, and Grammatical Class," *Studies in Second Language Acquisition*, 28 (3), 387-422.

Tavassoli, Nader T. and Yih Hwai Lee (2003), "The Differential Interaction of Auditory and Visual Advertising Elements with Chinese and English," *Journal of Marketing Research*, 40 (4), 468-80.

Tellis, Gerard J. (1986), "Beyond the Many Faces of Price: An Integration of Pricing Strategies," *Journal of Marketing*, 50 (4), 146-60.

Tellis, Gerard J. and Birger Wernerfelt (1987), "Competitive Price and Quality under Asymmetric Information," *Marketing Science*, 6 (3), 240-53.

Tetlock, Philip E. (1983), "Accountability and the Perseverance of First Impressions," *Social Psychology Quarterly,* 46 (4), 285-292.

Tetlock, Philip E. (1985), "Accountability: A Social Check on the Fundamental Attribution Error," *Social Psychology Quarterly,* 48 (3), 227-236.

Tourangeau, Roger, Mick P. Couper, and Frederick Conrad (2007), "Color, Labels, and Interpretive Heuristics for Response Scales," *Public Opinion Quarterly*, 71 (1), 91-112.

Tulving, Endel and Donald M. Thomson (1973), "Encoding Specificity and Retrieval Processes in Episodic Memory," *Psychological Review*, 80 (5), 352-73.

Upshaw, Harry S. (1965), "The Effect of Variable Perspectives on Judgments of Opinion Statements for Thurstone Scales: Equal-Appearing Intervals," *Journal of Personality and Social Psychology*, 2 (1), 60-69.

Valdez, Patricia and Albert Mehrabian (1994), "Effects of Color on Emotions," *Journal of Experimental Psychology-General*, 123 (4), 394-409.

van der Lans, Ralf, Joseph A., Cote, Catherine A. Cole, Siew Meng Leong, Ale Smidts, Pamela W. Henderson, Christian Bluemelhuber, Paul Bottomley, John R. Doyle, Alexandr Fedorikhin, Janakiraman Moorthy, B. Ramaseshan, and Bernd H. Schmitt (2009), "Cros-National Logo Evaluation Analysis: An Individual-Level Analysis," *Marketing Science*, 28 (September-October), 968-985.

van Osselaer, Stijn M. J., Chris Janiszewski, and Marcus Cunha (2004), "Stimulus Generalization in Two Associative Learning Processes," *Journal of Experimental Psychology: Learning Memory and Cognition*, 30 (3), 626-38.

van Rosmalen, Joost, Hester van Herk, and Patrick J.F. Groenen (2010), “Identifying Response Styles: A Latent-Class Bilinear Multinomial Logit Model,” *Journal of Marketing Research*, 47 (1), 157-172.

Voss, Kevin E., Eric R. Spangenberg, and Bianca Grohmann (2003), "Measuring the Hedonic and Utilitarian Dimensions of Consumer Attitude," *Journal of Marketing Research,* 40 (3), 310-320.

Walther, Joseph B. and Kyle P. D'Addario (2001), "The Impacts of Emoticons on Message Interpretation in Computer-Mediated Communication," *Social Science Computer Review*, 19 (3), 324-347.

Weldon, Elizabeth and Gina M. Gargano (1988), "Cognitive Loafing: The Effects of Accountability and Shared Responsibility on Cognitive Effort," *Personality and Social Psychology Bulletin,* 14 (1), 159-171.

Wexner, Louis B. (1954), "The Degree to Which Colors (Hues) Are Associated with Mood-Tones," *Journal of Applied Psychology*, 38 (6), 432-436.

Wildt, Albert R. and Michael B. Mazis (1978), "Determinants of Scale Response: Label Versus Position," *Journal of Marketing Research*, 15 (2), 261-267.

Wilson, Timothy D., Dana S. Dunn, Jane A. Bybee, Diane B. Hyman, and John A. Rotondo (1984), "Effects of Analyzing Reasons on Attitude-Behavior Consistency," *Journal of Personality and Social Psychology, 47*(1), 5-16.

Wilson, Timothy D., Dana S. Dunn, Dolores Kraft, and Douglas J. Lisle (1989), "Introspection, Attitude Change, and Attitude-Behavior Consistency: The Disruptive Effects of Explaining Why We Feel the Way We Do," In L. Berkowitz (ed.), *Advances in Experimental Social Psycholgy* (Vol. 22, pp. 287-343). New York: Academic Press.

Wilson, Timothy D., Sara D. Hodges, and Suzanne J. Lafleur (1995), "Effects of Introspecting About Reasons - Inferring Attitudes from Accessible Thoughts," *Journal of Personality and Social Psychology,* 69 (1), 16-28.

Wilson, Timothy D., Christopher E. Houston, Kathryn M. Etling, and Nancy Brekke (1996), "A New Look at Anchoring Effects: Basic Anchoring and Its Antecedents," *Journal of Experimental Psychology: General*, 125 (4), 387-402.

Wilson, Timothy D., Douglas J. Lisle, Jonathan W. Schooler, Sara D. Hodges, Kristen J. Klaaren, and Suzanne J. Lafleur (1993), "Introspecting About Reasons Can Reduce Post-Choice Satisfaction," *Personality and Social Psychology Bulletin,* 19 (3), 331-339.

Wilson, Timothy D. and Jonathan W. Schooler (1991), "Thinking Too Much: Introspection Can Reduce the Quality of Preferences and Decisions," *Journal of Personality and Social Psychology,* 60 (2), 181-192.

Witteman, Cilia, John van den Bercken, Laurence Claes, and Antonio Godoy (2009), "Assessing Rational and Intuitive Thinking Styles," *European Journal of Psychological Assessment,* 25 (1), 39-47.

Yokota, Fumie and Kimberly M. Thompson (2000), "Violence in G-rated animated films," *Journal of the American Medical Association*, 283 (20), 2716-20.

Summary (English)

Chapter 2

Consumers typically overestimate the association that exists between price and quality in the marketplace. We show that one of the underlying reasons for this overestimation lies in the heteroscedastic nature of the price-quality relationship found in many product categories. The price-quality relationship in a product category can be characterized as heteroscedastic (homoscedastic) if the amount of unexplained variation in quality is different (constant) in different price segments. That is, in heteroscedastic product categories there is more uncertainty about product quality in some price segments than in others, while in homoscedastic product categories uncertainty about product quality is constant in all price segments. In a sequence of studies we show that, compared to a homoscedastic environment with the same overall correlation, (a) the perceived correlation in heteroscedastic environments is stronger and (b) outcome expectations are more extreme. When the price-quality relationship is positive and uncertainty about quality is heteroscedastic and increasing (i.e., quality becomes more variable as price increases), quality is predicted accurately in the low price range but overestimated in the high price range. When the price-quality relationship is positive and uncertainty about quality is heteroscedastic and decreasing (i.e., quality becomes less variable as price increases), quality is predicted accurately in the high price range but underestimated in the low price range. Further demonstrating the managerial importance of accounting for the type of uncertainty, we show that the homo- versus heteroscedastic nature of the price-quality relationship systematically affects value-for-money assessments.

Chapter 3

This chapter challenges the view that it is always better to hold decision makers accountable for their decision process rather than their decision outcomes. In three multiple-cue judgment studies, we show that process accountability, relative to outcome accountability, consistently improves judgment quality in relatively simple elemental tasks. However, this performance advantage of process accountability does not generalize to more complex configural tasks. This is because process accountability improves an analytical process based on cue abstraction, while it does not change a

holistic process based on exemplar memory. Cue abstraction is only effective in elemental tasks (in which outcomes are a linear additive combination of cues) but not in configural tasks (in which outcomes depend on interactions between the cues). In addition, Studies 2 and 3 show that the extent to which process and outcome accountability affect judgment quality depends on individual differences in analytical intelligence and rational thinking style.

Chapter 4

This research contributes to current understanding of language effects in advertising by uncovering a previously ignored mechanism shaping consumer response to an increasingly globalized marketplace. We propose a language-specific episodic trace theory of language emotionality to explain how language influences the perceived emotionality of marketing communications. Five experiments with bilingual consumers show (1) that textual information (e.g., marketing slogans) expressed in consumers' native language tend to be perceived as more emotional than messages expressed in their second language; (2) that this effect is not uniquely due to the activation of stereotypes associated to specific languages or to a lack of comprehension; and (3) that the effect depends on the frequency with which words have been experienced in native- versus second-language contexts.

Chapter 5

In an increasingly globalized marketplace, it is common for marketing researchers to collect data from respondents who are not native speakers of the language in which the questions are formulated. Examples include online customer ratings and internal marketing initiatives in multinationals. This raises the issue of whether providing responses on rating scales in one's native versus second language exerts a systematic influence on the responses obtained. This article documents the Anchor Contraction Effect (ACE), the systematic tendency to report more intense emotions when answering questions using rating scales in a non-native language than in the native language. Nine studies (a) establish ACE, test the underlying process, and rule out alternative explanations, (b) examine the generalizability of ACE across a range of situations, measures, and response scale formats, and (c) explore managerially relevant and easily implementable corrective techniques..

Summary (Dutch)

Chapter 2

Consumenten overschatten vaak de sterkte van het verband tussen prijs en kwaliteit in de marktplaats. Wij tonen aan dat de heteroscedastische aard van de prijs-kwaliteit relatie in vele product categorieën een van de onderliggende redenen voor deze overschatting is. De prijs-kwaliteit relatie in een product categorie kan getypeerd worden als heteroscedastisch (homoscedastisch) als de onverklaarde variatie in kwaliteit verschillend (constant) is in andere prijssegmenten. Met andere woorden, in heteroscedastische product categorieën is er meer onzekerheid over de kwaliteit van producten in sommige prijssegmenten dan in andere, terwijl in homoscedastische product categorieën onzekerheid constant is in verschillende prijssegmenten. In een opeenvolging van studies tonen wij aan dat, in vergelijking met een homoscedastische omgeving met dezelfde correlatie, (a) de gepercipieerde correlatie in heteroscedastische omgevingen sterker is en (b) verwachtingen over de uitkomst (i.e., kwaliteit) meer extreem zijn. Als de prijs-kwaliteit relatie positief is en onzekerheid over kwaliteit heteroscedastisch en stijgend is (i.e., kwaliteit wordt meer variabel als de prijs stijgt) wordt kwaliteit accuraat voorspeld in het laagste prijssegment maar overschat in het hoogste prijssegment. Als de prijs-kwaliteit relatie positief is en onzekerheid over kwaliteit heteroscedastisch en dalend is (i.e., kwaliteit wordt minder variabel als de prijs stijgt) wordt kwaliteit accuraat voorspeld in het hoogste prijssegment maar onderschat in het laagste prijssegment. We illustreren verder het belang van rekening te houden met het type van onzekerheid door aan te tonen dat de homo- versus heteroscedastische aard van de prijs-kwaliteit relatie een systematische invloed heeft op value-for-money inschattingen.

Chapter 3

Dit hoofdstuk zet de aanname onder druk dat het altijd beter is om besluitvormers verantwoordelijk te houden voor hun beslissingsproces in plaats van enkel voor de uitkomsten van hun beslissingen. In drie multiple-cue leerstudies tonen we aan dat verantwoordelijkheid voor het beslissingsproces, relatief ten op zichte van verantwoordelijkheid voor de beslissingsuitkomtsten, een consistent positief effect heeft op de beslissingskwaliteit in relatief eenvoudige elementaire taken. Dit voordeel van verantwoordlijkheid voor het beslissingsproces is echter niet veralgemeenbaar naar complexe configurele taken. Dit is omdat verantwoordelijkheid voor het beslissingsproces een analytisch cognitief proces verbetert dat gebaseerd is op het abstraheren van cue-outcome relaties, terwijl het geen effect heeft op een holistisch cognitief proces gebaseerd op memorisatie van specifieke exemplars. Het abstraheren van cue-outcome relaties is enkel effectief in elementaire taken (waarbij uitkomsten een lineair additieve combinatie zijn van cues) maar niet in configurele taken (waarbij uitkomsten afhangen van interacties tussen cues). Studies 2 en 3 tonen aan dat de mate waarin verantwoordelijkheid voor het proces versus de uitkomst van invloed is op de beslissingskwaliteit afhangt van inter-individuele verschillen in analytische intelligentie en rationele denkstijl.

Chapter 4

Dit onderzoek draagt bij aan ons begrip over de effecten van taal in reclame. Wij stellen een taal-specifieke episodische spoor theorie voor om te verklaren hoe taal de gepercipieerde emotionaliteit van marketing boodschappen beïnvloed. Vijf experimenten met tweetalige consumenten tonen aan (1) dat textuele informatie (e.g., marketing slogans) in de moedertaal van consumenten worden gepercipieerd als meer emotioneel intens dan boodschappen in de tweede taal van consumenten; (2) dat dit effect niet enkel te verklaren valt door de activatie van stereotypes die geassocieerd zijn met specifieke talen of door een gebrek aan begrip; en (3) dat het effect afhangt van de frequentie waarmee men woorden ervaren heeft in een context waarin de modertaal dan wel de tweede taal gebruikt werd.

Chapter 5

In een steeds toenemend globaliserende marktplaats komt het vaak voor dat marktonderzoekers data verzamelen van respondenten die de taal waarin de vragen worden geformuleerd niet als moedertaal hebben. Voorbeelden hiervan zijn online beoordelingen van consumenten en interne marketing initiatieven van multinationals. Dit roept de vraag op of het beantwoorden van vragen op antwoordschalen in iemands moedertaal versus tweede taal een systematisch effect heeft op de verkregen antwoorden. Dit artkel introduceert het Anker Contractie Effect (ACE), de systematische tendens om meer intense emoties te rapporteren op antwoordschalen in de moedertaal dan in de tweede taal. In negen studies (a) tonen we ACE aan, testen we het onderliggende proces, en verwerpen we alternatieve verklaringen, (b) onderzoeken we de veralgemeenbaarheid van ACE in verschillende situaties, voor verschillende metingen, en verschillende types van antwoordschalen, en (c) exploreren we technieken die gemakkelijk aangewend kunnen worden om te corrigeren voor ACE.

About the author

Bart de Langhe was born in Leuven, Belgium on December 21st, 1982. He received his Bachelor's (cum laude) and Master's degree (summa cum laude) in Psychology from the Catholic University of Louvain in Belgium. In 2006, he started his Ph.D. research in Marketing at the Erasmus Research Institute of Management. His main research interests concern the influence of learning, memory, and emotion on consumer and managerial decision making. Bart's work has appeared in leading academic journals such as the *Journal of Consumer Research*, the *Journal of Marketing Research*, and *Organizational Behavior and Human Decision Processes*. He has presented his research at several international conferences and universities (for example, Columbia, NYU, Johns Hopkins, London Business School, INSEAD). He was a visiting research scholar at the University of Chicago Booth School of Business in 2009. From August 2011 he will start as an Assistant Professor in Marketing at the University of Colorado at Boulder.

ERIM PhD Series

ERASMUS RESEARCH INSTITUTE OF MANAGEMENT (ERIM)

ERIM PH.D. SERIES
RESEARCH IN MANAGEMENT

ERIM Electronic Series Portal: http://hdl.handle.net/1765/1

Acciaro, M., *Bundling Strategies in Global Supply Chains,* Promotor: Prof.dr. H.E. Haralambides, EPS-2010-197-LIS, ISBN: 978-90-5892-240-3, http://hdl.handle.net/1765/19742

Agatz, N.A.H., *Demand Management in E-Fulfillment*, Promotor: Prof.dr.ir. J.A.E.E. van Nunen, EPS-2009-163-LIS, ISBN: 978-90-5892-200-7, http://hdl.handle.net/1765/15425

Alexiev, A., *Exploratory Innovation: The Role of Organizational and Top Management Team Social Capital,* Promotors: Prof.dr. F.A.J. van den Bosch & Prof.dr. H.W. Volberda, EPS-2010-208-STR, ISBN: 978-90-5892-249-6, http://hdl.handle.net/1765/20632

Althuizen, N.A.P., *Analogical Reasoning as a Decision Support Principle for Weakly Structured Marketing Problems*, Promotor: Prof.dr.ir. B. Wierenga, EPS-2006-095-MKT, ISBN: 90-5892-129-8, http://hdl.handle.net/1765/8190

Alvarez, H.L., *Distributed Collaborative Learning Communities Enabled by Information Communication Technology*, Promotor: Prof.dr. K. Kumar, EPS-2006-080-LIS, ISBN: 90-5892-112-3, http://hdl.handle.net/1765/7830

Appelman, J.H., *Governance of Global Interorganizational Tourism Networks: Changing Forms of Co-ordination between the Travel Agency and Aviation Sector*, Promotors: Prof.dr. F.M. Go & Prof.dr. B. Nooteboom, EPS-2004-036-MKT, ISBN: 90-5892-060-7, http://hdl.handle.net/1765/1199

Asperen, E. van, *Essays on Port, Container, and Bulk Chemical Logistics Optimization*, **Pr**omotor: Prof.dr.ir. R. Dekker, EPS-2009-181-LIS, ISBN: 978-90-5892-222-9, http://hdl.handle.net/1765/17626

Assem, M.J. van den, *Deal or No Deal? Decision Making under Risk in a Large-Stake TV Game Show and Related Experiments*, **Pr**omotor: Prof.dr. J. Spronk, EPS-2008-138-F&A, ISBN: 978-90-5892-173-4, http://hdl.handle.net/1765/13566

Baquero, G, *On Hedge Fund Performance, Capital Flows and Investor Psychology*, **Pr**omotor: Prof.dr. M.J.C.M. Verbeek, EPS-2006-094-F&A, ISBN: 90-5892-131-X, http://hdl.handle.net/1765/8192

Berens, G., *Corporate Branding: The Development of Corporate Associations and their Influence on Stakeholder Reactions*, Promotor: Prof.dr. C.B.M. van Riel, EPS-2004-039-ORG, ISBN: 90-5892-065-8, http://hdl.handle.net/1765/1273

Berghe, D.A.F. van den, *Working Across Borders: Multinational Enterprises and the Internationalization of Employment*, Promotors: Prof.dr. R.J.M. van Tulder & Prof.dr. E.J.J. Schenk, EPS-2003-029-ORG, ISBN: 90-5892-05-34, http://hdl.handle.net/1765/1041

Berghman, L.A., *Strategic Innovation Capacity: A Mixed Method Study on Deliberate Strategic Learning Mechanisms*, Promotor: Prof.dr. P. Mattyssens, EPS-2006-087-MKT, ISBN: 90-5892-120-4, http://hdl.handle.net/1765/7991

Bezemer, P.J., *Diffusion of Corporate Governance Beliefs: Board Independence and the Emergence of a Shareholder Value Orientation in the Netherlands,* Promotors: Prof.dr.ing. F.A.J. van den Bosch & Prof.dr. H.W. Volberda, EPS-2009-192-STR, ISBN: 978-90-5892-232-8, http://hdl.handle.net/1765/18458

Bijman, W.J.J., *Essays on Agricultural Co-operatives: Governance Structure in Fruit and Vegetable Chains*, Promotor: Prof.dr. G.W.J. Hendrikse, EPS-2002-015-ORG, ISBN: 90-5892-024-0, http://hdl.handle.net/1765/867

Binken, J.L.G., *System Markets: Indirect Network Effects in Action, or Inaction?,* Promotor: Prof.dr. S. Stremersch, EPS-2010-213-MKT, ISBN: 978-90-5892-260-1, http://hdl.handle.net/1765/21186

Blitz, D.C., *Benchmarking Benchmarks,* Promotors: Prof.dr. A.G.Z. Kemna & Prof.dr. W.F.C. Verschoor, EPS-2011-225-F&A, ISBN: 978-90-5892-268-7, http://hdl.handle.net/1765/22624

Bispo, A., *Labour Market Segmentation: An investigation into the Dutch hospitality industry*, Promotors: Prof.dr. G.H.M. Evers & Prof.dr. A.R. Thurik, EPS-2007-108-ORG, ISBN: 90-5892-136-9, http://hdl.handle.net/1765/10283

Blindenbach-Driessen, F., *Innovation Management in Project-Based Firms*, Promotor: Prof.dr. S.L. van de Velde, EPS-2006-082-LIS, ISBN: 90-5892-110-7, http://hdl.handle.net/1765/7828

Boer, C.A., *Distributed Simulation in Industry,* Promotors: Prof.dr. A. de Bruin & Prof.dr.ir. A. Verbraeck, EPS-2005-065-LIS, ISBN: 90-5892-093-3, http://hdl.handle.net/1765/6925

Boer, N.I., *Knowledge Sharing within Organizations: A situated and Relational Perspective,* Promotor: Prof.dr. K. Kumar, EPS-2005-060-LIS, ISBN: 90-5892-086-0, http://hdl.handle.net/1765/6770

Boer-Sorbán, K., *Agent-Based Simulation of Financial Markets: A modular, Continuous-Time Approach,* Promotor: Prof.dr. A. de Bruin, EPS-2008-119-LIS, ISBN: 90-5892-155-0, http://hdl.handle.net/1765/10870

Boon, C.T., *HRM and Fit: Survival of the Fittest!?,* Promotors: Prof.dr. J. Paauwe & Prof.dr. D.N. den Hartog, EPS-2008-129-ORG, ISBN: 978-90-5892-162-8, http://hdl.handle.net/1765/12606

Borst, W.A.M., *Understanding Crowdsourcing: Effects of Motivation and Rewards on Participation and Performance in Voluntary Online Activities,* Promotors: Prof.dr.ir. J.C.M. van den Ende & Prof.dr.ir. H.W.G.M. van Heck, EPS-2010-221-LIS, ISBN: 978-90-5892-262-5, http://hdl.handle.net/1765/ 21914

Braun, E., *City Marketing: Towards an Integrated Approach,* Promotor: Prof.dr. L. van den Berg, EPS-2008-142-MKT, ISBN: 978-90-5892-180-2, http://hdl.handle.net/1765/13694

Brito, M.P. de, *Managing Reverse Logistics or Reversing Logistics Management?* Promotors: Prof.dr.ir. R. Dekker & Prof.dr. M. B. M. de Koster, EPS-2004-035-LIS, ISBN: 90-5892-058-5, http://hdl.handle.net/1765/1132

Brohm, R., *Polycentric Order in Organizations: A Dialogue between Michael Polanyi and IT-Consultants on Knowledge, Morality, and Organization,* Promotors: Prof.dr. G. W. J. Hendrikse & Prof.dr. H. K. Letiche, EPS-2005-063-ORG, ISBN: 90-5892-095-X, http://hdl.handle.net/1765/6911

Brumme, W.-H., *Manufacturing Capability Switching in the High-Tech Electronics Technology Life Cycle,* Promotors: Prof.dr.ir. J.A.E.E. van Nunen & Prof.dr.ir. L.N. Van Wassenhove, EPS-2008-126-LIS, ISBN: 978-90-5892-150-5, http://hdl.handle.net/1765/12103

Budiono, D.P., *The Analysis of Mutual Fund Performance: Evidence from U.S. Equity Mutual Funds,* Promotor: Prof.dr.ir. M.J.C.M. Verbeek, EPS-2010-185-F&A, ISBN: 978-90-5892-224-3, http://hdl.handle.net/1765/18126

Burgers, J.H., *Managing Corporate Venturing: Multilevel Studies on Project Autonomy, Integration, Knowledge Relatedness, and Phases in the New Business Development Process,* Promotors: Prof.dr.ir. F.A.J. Van den Bosch & Prof.dr. H.W. Volberda, EPS-2008-136-STR, ISBN: 978-90-5892-174-1, http://hdl.handle.net/1765/13484

Campbell, R.A.J., *Rethinking Risk in International Financial Markets*, Promotor: Prof.dr. C.G. Koedijk, EPS-2001-005-F&A, ISBN: 90-5892-008-9, http://hdl.handle.net/1765/306

Carvalho de Mesquita Ferreira, L., *Attention Mosaics: Studies of Organizational Attention*, Promotors: Prof.dr. P.M.A.R. Heugens & Prof.dr. J. van Oosterhout, EPS-2010-205-ORG, ISBN: 978-90-5892-242-7, http://hdl.handle.net/1765/19882

Chen, C.-M., *Evaluation and Design of Supply Chain Operations Using DEA*, Promotor: Prof.dr. J.A.E.E. van Nunen, EPS-2009-172-LIS, ISBN: 978-90-5892-209-0, http://hdl.handle.net/1765/16181

Chen, H., *Individual Mobile Communication Services and Tariffs*, Promotor: Prof.dr. L.F.J.M. Pau, EPS-2008-123-LIS, ISBN: 90-5892-158-1, http://hdl.handle.net/1765/11141

Chen, Y., *Labour Flexibility in China's Companies: An Empirical Study*, Promotors: Prof.dr. A. Buitendam & Prof.dr. B. Krug, EPS-2001-006-ORG, ISBN: 90-5892-012-7, http://hdl.handle.net/1765/307

Damen, F.J.A., *Taking the Lead: The Role of Affect in Leadership Effectiveness*, Promotor: Prof.dr. D.L. van Knippenberg, EPS-2007-107-ORG, http://hdl.handle.net/1765/10282

Daniševská, P., *Empirical Studies on Financial Intermediation and Corporate Policies*, Promotor: Prof.dr. C.G. Koedijk, EPS-2004-044-F&A, ISBN: 90-5892-070-4, http://hdl.handle.net/1765/1518

Defilippi Angeldonis, E.F., *Access Regulation for Naturally Monopolistic Port Terminals: Lessons from Regulated Network Industries,* Promotor: Prof.dr. H.E. Haralambides, EPS-2010-204-LIS, ISBN:
978-90-5892-245-8, http://hdl.handle.net/1765/19881

Delporte-Vermeiren, D.J.E., *Improving the Flexibility and Profitability of ICT-enabled Business Networks: An Assessment Method and Tool*, Promotors: Prof. mr. dr. P.H.M. Vervest & Prof.dr.ir. H.W.G.M. van Heck, EPS-2003-020-LIS, ISBN: 90-5892-040-2, http://hdl.handle.net/1765/359

Derwall, J.M.M., *The Economic Virtues of SRI and CSR*, Promotor: Prof.dr. C.G. Koedijk, EPS-2007-101-F&A, ISBN: 90-5892-132-8, http://hdl.handle.net/1765/8986

Diepen, M. van, *Dynamics and Competition in Charitable Giving*, Promotor: Prof.dr. Ph.H.B.F. Franses, EPS-2009-159-MKT, ISBN: 978-90-5892-188-8, http://hdl.handle.net/1765/14526

Dietvorst, R.C., *Neural Mechanisms Underlying Social Intelligence and Their Relationship with the Performance of Sales Managers,* Promotor: Prof.dr. W.J.M.I. Verbeke, EPS-2010-215-MKT, ISBN: 978-90-5892-257-1, http://hdl.handle.net/1765/21188

Dietz, H.M.S., *Managing (Sales)People towards Perfomance: HR Strategy, Leadership & Teamwork*, Promotor: Prof.dr. G.W.J. Hendrikse, EPS-2009-168-ORG, ISBN: 978-90-5892-210-6, http://hdl.handle.net/1765/16081

Dijksterhuis, M., *Organizational Dynamics of Cognition and Action in the Changing Dutch and US Banking Industries*, Promotors: Prof.dr.ir. F.A.J. van den Bosch & Prof.dr. H.W. Volberda, EPS-2003-026-STR, ISBN: 90-5892-048-8, http://hdl.handle.net/1765/1037

Eijk, A.R. van der, *Behind Networks: Knowledge Transfer, Favor Exchange and Performance*, Promotors: Prof.dr. S.L. van de Velde & Prof.dr.drs. W.A. Dolfsma, EPS-2009-161-LIS, ISBN: 978-90-5892-190-1, http://hdl.handle.net/1765/14613

Elstak, M.N., *Flipping the Identity Coin: The Comparative Effect of Perceived, Projected and Desired Organizational Identity on Organizational Identification and Desired Behavior*, Promotor: Prof.dr. C.B.M. van Riel, EPS-2008-117-ORG, ISBN: 90-5892-148-2, http://hdl.handle.net/1765/10723

Erken, H.P.G., *Productivity, R&D and Entrepreneurship*, Promotor: Prof.dr. A.R. Thurik, EPS-2008-147-ORG, ISBN: 978-90-5892-179-6, http://hdl.handle.net/1765/14004

Essen, M. van, *An Institution-Based View of Ownership*, Promotos: Prof.dr. J. van Oosterhout & Prof.dr. G.M.H. Mertens, EPS-2011-226-ORG, ISBN: 978-90-5892-269-4, http://hdl.handle.net/1765/22643

Fenema, P.C. van, *Coordination and Control of Globally Distributed Software Projects*, Promotor: Prof.dr. K. Kumar, EPS-2002-019-LIS, ISBN: 90-5892-030-5, http://hdl.handle.net/1765/360

Feng, L., *Motivation, Coordination and Cognition in Cooperatives,* Promotor: Prof.dr. G.W.J. Hendrikse, EPS-2010-220-ORG, ISBN: 90-5892-261-8, http://hdl.handle.net/1765/21680

Fleischmann, M., *Quantitative Models for Reverse Logistics*, Promotors: Prof.dr.ir. J.A.E.E. van Nunen & Prof.dr.ir. R. Dekker, EPS-2000-002-LIS, ISBN: 35-4041-711-7, http://hdl.handle.net/1765/1044

Flier, B., *Strategic Renewal of European Financial Incumbents: Coevolution of Environmental Selection, Institutional Effects, and Managerial Intentionality*, Promotors: Prof.dr.ir. F.A.J. van den Bosch & Prof.dr. H.W. Volberda, EPS-2003-033-STR, ISBN: 90-5892-055-0, http://hdl.handle.net/1765/1071

Fok, D., *Advanced Econometric Marketing Models*, Promotor: Prof.dr. Ph.H.B.F. Franses, EPS-2003-027-MKT, ISBN: 90-5892-049-6, http://hdl.handle.net/1765/1035

Ganzaroli, A., *Creating Trust between Local and Global Systems*, Promotors: Prof.dr. K. Kumar & Prof.dr. R.M. Lee, EPS-2002-018-LIS, ISBN: 90-5892-031-3, http://hdl.handle.net/1765/361

Gertsen, H.F.M., *Riding a Tiger without Being Eaten: How Companies and Analysts Tame Financial Restatements and Influence Corporate Reputation*, Promotor: Prof.dr. C.B.M. van Riel, EPS-2009-171-ORG, ISBN: 90-5892-214-4, http://hdl.handle.net/1765/16098

Gilsing, V.A., *Exploration, Exploitation and Co-evolution in Innovation Networks*, Promotors: Prof.dr. B. Nooteboom & Prof.dr. J.P.M. Groenewegen, EPS-2003-032-ORG, ISBN: 90-5892-054-2, http://hdl.handle.net/1765/1040

Gijsbers, G.W., *Agricultural Innovation in Asia: Drivers, Paradigms and Performance,* Promotor: Prof.dr. R.J.M. van Tulder, EPS-2009-156-ORG, ISBN: 978-90-5892-191-8, http://hdl.handle.net/1765/14524

Gong, Y., *Stochastic Modelling and Analysis of Warehouse Operations*, Promotors: Prof.dr. M.B.M. de Koster & Prof.dr. S.L. van de Velde, EPS-2009-180-LIS, ISBN: 978-90-5892-219-9, http://hdl.handle.net/1765/16724

Govers, R., *Virtual Tourism Destination Image: Glocal Identities Constructed, Perceived and Experienced*, Promotors: Prof.dr. F.M. Go & Prof.dr. K. Kumar, EPS-2005-069-MKT, ISBN: 90-5892-107-7, http://hdl.handle.net/1765/6981

Graaf, G. de, *Tractable Morality: Customer Discourses of Bankers, Veterinarians and Charity Workers*, Promotors: Prof.dr. F. Leijnse & Prof.dr. T. van Willigenburg, EPS-2003-031-ORG, ISBN: 90-5892-051-8, http://hdl.handle.net/1765/1038

Greeven, M.J., *Innovation in an Uncertain Institutional Environment: Private Software Entrepreneurs in Hangzhou, China*, Promotor: Prof.dr. B. Krug, EPS-2009-164-ORG, ISBN: 978-90-5892-202-1, http://hdl.handle.net/1765/15426

Groot, E.A. de, *Essays on Economic Cycles*, Promotors: Prof.dr. Ph.H.B.F. Franses & Prof.dr. H.R. Commandeur, EPS-2006-091-MKT, ISBN: 90-5892-123-9, http://hdl.handle.net/1765/8216

Guenster, N.K., *Investment Strategies Based on Social Responsibility and Bubbles*, Promotor: Prof.dr. C.G. Koedijk, EPS-2008-175-F&A, ISBN: 978-90-5892-206-9, http://hdl.handle.net/1765/1

Gutkowska, A.B., *Essays on the Dynamic Portfolio Choice*, Promotor: Prof.dr. A.C.F. Vorst, EPS-2006-085-F&A, ISBN: 90-5892-118-2, http://hdl.handle.net/1765/7994

Hagemeijer, R.E., *The Unmasking of the Other*, Promotors: Prof.dr. S.J. Magala & Prof.dr. H.K. Letiche, EPS-2005-068-ORG, ISBN: 90-5892-097-6, http://hdl.handle.net/1765/6963

Hakimi, N.A, *Leader Empowering Behaviour: The Leader's Perspective: Understanding the Motivation behind Leader Empowering Behaviour*, Promotor: Prof.dr. D.L. van Knippenberg, EPS-2010-184-ORG, http://hdl.handle.net/1765/17701

Halderen, M.D. van, *Organizational Identity Expressiveness and Perception Management: Principles for Expressing the Organizational Identity in Order to Manage the Perceptions and Behavioral Reactions of External Stakeholders*, Promotor: Prof.dr. S.B.M. van Riel, EPS-2008-122-ORG, ISBN: 90-5892-153-6, http://hdl.handle.net/1765/10872

Hartigh, E. den, *Increasing Returns and Firm Performance: An Empirical Study*, Promotor: Prof.dr. H.R. Commandeur, EPS-2005-067-STR, ISBN: 90-5892-098-4, http://hdl.handle.net/1765/6939

Hensmans, M., *A Republican Settlement Theory of the Firm: Applied to Retail Banks in England and the Netherlands (1830-2007)*, Promotors: Prof.dr. A. Jolink& Prof.dr. S.J. Magala, EPS-2010-193-ORG, ISBN 90-5892-235-9, http://hdl.handle.net/1765/19494

Hermans. J.M., *ICT in Information Services; Use and Deployment of the Dutch Securities Trade, 1860-1970,* Promotor: Prof.dr. drs. F.H.A. Janszen, EPS-2004-046-ORG, ISBN 90-5892-072-0, http://hdl.handle.net/1765/1793

Hernandez Mireles, C., *Marketing Modeling for New Products,* Promotor: Prof.dr. P.H. Franses, EPS-2010-202-MKT, ISBN 90-5892-237-3, http://hdl.handle.net/1765/19878

Hessels, S.J.A., *International Entrepreneurship: Value Creation Across National Borders*, Promotor: Prof.dr. A.R. Thurik, EPS-2008-144-ORG, ISBN: 978-90-5892-181-9, http://hdl.handle.net/1765/13942

Heugens, P.P.M.A.R., *Strategic Issues Management: Implications for Corporate Performance*, Promotors: Prof.dr.ir. F.A.J. van den Bosch & Prof.dr. C.B.M. van Riel, EPS-2001-007-STR, ISBN: 90-5892-009-9, http://hdl.handle.net/1765/358

Heuvel, W. van den, *The Economic Lot-Sizing Problem: New Results and Extensions*, Promotor: Prof.dr. A.P.L. Wagelmans, EPS-2006-093-LIS, ISBN: 90-5892-124-7, http://hdl.handle.net/1765/1805

Hoedemaekers, C.M.W., *Performance, Pinned down: A Lacanian Analysis of Subjectivity at Work*, Promotors: Prof.dr. S. Magala & Prof.dr. D.H. den Hartog, EPS-2008-121-ORG, ISBN: 90-5892-156-7, http://hdl.handle.net/1765/10871

Hooghiemstra, R., *The Construction of Reality: Cultural Differences in Self-serving Behaviour in Accounting Narratives*, Promotors: Prof.dr. L.G. van der Tas RA & Prof.dr. A.Th.H. Pruyn, EPS-2003-025-F&A, ISBN: 90-5892-047-X, http://hdl.handle.net/1765/871

Hu, Y., *Essays on the Governance of Agricultural Products: Cooperatives and Contract Farming*, Promotors: Prof.dr. G.W.J. Hendrkse & Prof.dr. B. Krug, EPS-2007-113-ORG, ISBN: 90-5892-145-1, http://hdl.handle.net/1765/10535

Huang, X., *An Analysis of Occupational Pension Provision: From Evaluation to Redesigh,* Promotors: Prof.dr. M.J.C.M. Verbeek & Prof.dr. R.J. Mahieu, EPS-2010-196-F&A, ISBN: 90-5892-239-7, http://hdl.handle.net/1765/19674

Huij, J.J., *New Insights into Mutual Funds: Performance and Family Strategies*, Promotor: Prof.dr. M.C.J.M. Verbeek, EPS-2007-099-F&A, ISBN: 90-5892-134-4, http://hdl.handle.net/1765/9398

Huurman, C.I., *Dealing with Electricity Prices*, Promotor: Prof.dr. C.D. Koedijk, EPS-2007-098-F&A, ISBN: 90-5892-130-1, http://hdl.handle.net/1765/9399

Iastrebova, K, *Manager's Information Overload: The Impact of Coping Strategies on Decision-Making Performance*, Promotor: Prof.dr. H.G. van Dissel, EPS-2006-077-LIS, ISBN: 90-5892-111-5, http://hdl.handle.net/1765/7329

Iwaarden, J.D. van, *Changing Quality Controls: The Effects of Increasing Product Variety and Shortening Product Life Cycles,* Promotors: Prof.dr. B.G. Dale & Prof.dr. A.R.T. Williams, EPS-2006-084-ORG, ISBN: 90-5892-117-4, http://hdl.handle.net/1765/7992

Jalil, M.N., *Customer Information Driven After Sales Service Management: Lessons from Spare Parts Logistics,* Promotor: Prof.dr. L.G. Kroon, EPS-2011-222-LIS, ISBN: 978-90-5892-264-9, http://hdl.handle.net/1765/22156

Jansen, J.J.P., *Ambidextrous Organizations*, Promotors: Prof.dr.ir. F.A.J. Van den Bosch & Prof.dr. H.W. Volberda, EPS-2005-055-STR, ISBN: 90-5892-081-X, http://hdl.handle.net/1765/6774

Jaspers, F.P.H., *Organizing Systemic Innovation*, Promotor: Prof.dr.ir. J.C.M. van den Ende, EPS-2009-160-ORG, ISBN: 978-90-5892-197-), http://hdl.handle.net/1765/14974

Jennen, M.G.J., *Empirical Essays on Office Market Dynamics*, Promotors: Prof.dr. C.G. Koedijk & Prof.dr. D. Brounen, EPS-2008-140-F&A, ISBN: 978-90-5892-176-5, http://hdl.handle.net/1765/13692

Jiang, T., *Capital Structure Determinants and Governance Structure Variety in Franchising*, Promotors: Prof.dr. G. Hendrikse & Prof.dr. A. de Jong, EPS-2009-158-F&A, ISBN: 978-90-5892-199-4, http://hdl.handle.net/1765/14975

Jiao, T., *Essays in Financial Accounting*, Promotor: Prof.dr. G.M.H. Mertens, EPS-2009-176-F&A, ISBN: 978-90-5892-211-3, http://hdl.handle.net/1765/16097

Jong, C. de, *Dealing with Derivatives: Studies on the Role, Informational Content and Pricing of Financial Derivatives*, Promotor: Prof.dr. C.G. Koedijk, EPS-2003-023-F&A, ISBN: 90-5892-043-7, http://hdl.handle.net/1765/1043

Kaa, G. van, *Standard Battles for Complex Systems: Empirical Research on the Home Network,* Promotors: Prof.dr.ir. J. van den Ende & Prof.dr.ir. H.W.G.M. van Heck, EPS-2009-166-ORG, ISBN: 978-90-5892-205-2, http://hdl.handle.net/1765/16011

Kagie, M., *Advances in Online Shopping Interfaces: Product Catalog Maps and Recommender Systems,* Promotor: Prof.dr. P.J.F. Groenen, EPS-2010-195-MKT, ISBN: 978-90-5892-233-5, http://hdl.handle.net/1765/19532

Karreman, B., *Financial Services and Emerging Markets,* Promotors: Prof.dr. G.A. van der Knaap & Prof.dr. H.P.G. Pennings, EPS-2011-223-ORG, ISBN: 978-90-5892-266-3, http://hdl.handle.net/1765/ 22280

Keizer, A.B., *The Changing Logic of Japanese Employment Practices: A Firm-Level Analysis of Four Industries,* Promotors: Prof.dr. J.A. Stam & Prof.dr. J.P.M. Groenewegen, EPS-2005-057-ORG, ISBN: 90-5892-087-9, http://hdl.handle.net/1765/6667

Kijkuit, R.C., *Social Networks in the Front End: The Organizational Life of an Idea,* Promotor: Prof.dr. B. Nooteboom, EPS-2007-104-ORG, ISBN: 90-5892-137-6, http://hdl.handle.net/1765/10074

Kippers, J., *Empirical Studies on Cash Payments,* Promotor: Prof.dr. Ph.H.B.F. Franses, EPS-2004-043-F&A, ISBN: 90-5892-069-0, http://hdl.handle.net/1765/1520

Klein, M.H., *Poverty Alleviation through Sustainable Strategic Business Models: Essays on Poverty Alleviation as a Business Strategy,* Promotor: Prof.dr. H.R. Commandeur, EPS-2008-135-STR, ISBN: 978-90-5892-168-0, http://hdl.handle.net/1765/13482

Knapp, S., *The Econometrics of Maritime Safety: Recommendations to Enhance Safety at Sea*, Promotor: Prof.dr. Ph.H.B.F. Franses, EPS-2007-096-ORG, ISBN: 90-5892-127-1, http://hdl.handle.net/1765/7913

Kole, E., *On Crises, Crashes and Comovements*, Promotors: Prof.dr. C.G. Koedijk & Prof.dr. M.J.C.M. Verbeek, EPS-2006-083-F&A, ISBN: 90-5892-114-X, http://hdl.handle.net/1765/7829

Kooij-de Bode, J.M., *Distributed Information and Group Decision-Making: Effects of Diversity and Affect*, Promotor: Prof.dr. D.L. van Knippenberg, EPS-2007-115-ORG, http://hdl.handle.net/1765/10722

Koppius, O.R., *Information Architecture and Electronic Market Performance*, Promotors: Prof.dr. P.H.M. Vervest & Prof.dr.ir. H.W.G.M. van Heck, EPS-2002-013-LIS, ISBN: 90-5892-023-2, http://hdl.handle.net/1765/921

Kotlarsky, J., *Management of Globally Distributed Component-Based Software Development Projects,* Promotor: Prof.dr. K. Kumar, EPS-2005-059-LIS, ISBN: 90-5892-088-7, http://hdl.handle.net/1765/6772

Krauth, E.I., *Real-Time Planning Support: A Task-Technology Fit Perspective,* Promotors: Prof.dr. S.L. van de Velde & Prof.dr. J. van Hillegersberg, EPS-2008-155-LIS, ISBN: 978-90-5892-193-2, http://hdl.handle.net/1765/14521

Kuilman, J., *The Re-Emergence of Foreign Banks in Shanghai: An Ecological Analysis,* Promotor: Prof.dr. B. Krug, EPS-2005-066-ORG, ISBN: 90-5892-096-8, http://hdl.handle.net/1765/6926

Kwee, Z., *Investigating Three Key Principles of Sustained Strategic Renewal: A Longitudinal Study of Long-Lived Firms,* Promotors: Prof.dr.ir. F.A.J. Van den Bosch & Prof.dr. H.W. Volberda, EPS-2009-174-STR, ISBN: 90-5892-212-0, http://hdl.handle.net/1765/16207

Lam, K.Y., *Reliability and Rankings*, Promotor: Prof.dr. P.H.B.F. Franses, EPS-2011-230-MKT, ISBN: 978-90-5892-272-4, http://hdl.handle.net/1765/1

Langen, P.W. de, *The Performance of Seaport Clusters: A Framework to Analyze Cluster Performance and an Application to the Seaport Clusters of Durban, Rotterdam and the Lower Mississippi*, Promotors: Prof.dr. B. Nooteboom & Prof. drs. H.W.H. Welters, EPS-2004-034-LIS, ISBN: 90-5892-056-9, http://hdl.handle.net/1765/1133

Larco Martinelli, J.A., *Incorporating Worker-Specific Factors in Operations Management Models,* Promotors: Prof.dr.ir. J. Dul & Prof.dr. M.B.M. de Koster, EPS-2010-217-LIS, ISBN: 90-5892-263-2, http://hdl.handle.net/1765/21527

Le Anh, T., *Intelligent Control of Vehicle-Based Internal Transport Systems*, Promotors: Prof.dr. M.B.M. de Koster & Prof.dr.ir. R. Dekker, EPS-2005-051-LIS, ISBN: 90-5892-079-8, http://hdl.handle.net/1765/6554

Le-Duc, T., *Design and Control of Efficient Order Picking Processes*, Promotor: Prof.dr. M.B.M. de Koster, EPS-2005-064-LIS, ISBN: 90-5892-094-1, http://hdl.handle.net/1765/6910

Leeuwen, E.P. van, *Recovered-Resource Dependent Industries and the Strategic Renewal of Incumbent Firm: A Multi-Level Study of Recovered Resource Dependence Management and Strategic Renewal in the European Paper and Board Industry*, Promotors: Prof.dr.ir. F.A.J. Van den Bosch & Prof.dr. H.W. Volberda, EPS-2007-109-STR, ISBN: 90-5892-140-6, http://hdl.handle.net/1765/10183

Lentink, R.M., *Algorithmic Decision Support for Shunt Planning*, Promotors: Prof.dr. L.G. Kroon & Prof.dr.ir. J.A.E.E. van Nunen, EPS-2006-073-LIS, ISBN: 90-5892-104-2, http://hdl.handle.net/1765/7328

Li, T., *Informedness and Customer-Centric Revenue Management,* Promotors: Prof.dr. P.H.M. Vervest & Prof.dr.ir. H.W.G.M. van Heck, EPS-2009-146-LIS, ISBN: 978-90-5892-195-6, http://hdl.handle.net/1765/14525

Liang, G., *New Competition: Foreign Direct Investment and Industrial Development in China,* Promotor: Prof.dr. R.J.M. van Tulder, EPS-2004-047-ORG, ISBN: 90-5892-073-9, http://hdl.handle.net/1765/1795

Liere, D.W. van, *Network Horizon and the Dynamics of Network Positions: A Multi-Method Multi-Level Longitudinal Study of Interfirm Networks,* Promotor: Prof.dr. P.H.M. Vervest, EPS-2007-105-LIS, ISBN: 90-5892-139-0, http://hdl.handle.net/1765/10181

Loef, J., *Incongruity between Ads and Consumer Expectations of Advertising*, Promotors: Prof.dr. W.F. van Raaij & Prof.dr. G. Antonides, EPS-2002-017-MKT, ISBN: 90-5892-028-3, http://hdl.handle.net/1765/869

Londoño, M. del Pilar, *Institutional Arrangements that Affect Free Trade Agreements: Economic Rationality Versus Interest Groups*, Promotors: Prof.dr. H.E. Haralambides & Prof.dr. J.F. Francois, EPS-2006-078-LIS, ISBN: 90-5892-108-5, http://hdl.handle.net/1765/7578

Lovric, M., *Behavioral Finance and Agent-Based Artificial Markets*, Promotors: Prof.dr. J. Spronk & Prof.dr.ir. U. Kaymak, EPS-2011-229-F&A, ISBN: 978-90-5892-258-8, http://hdl.handle.net/1765/ 22814

Maas, A.A., van der, *Strategy Implementation in a Small Island Context: An Integrative Framework,* Promotor: Prof.dr. H.G. van Dissel, EPS-2008-127-LIS, ISBN: 978-90-5892-160-4, http://hdl.handle.net/1765/12278

Maas, K.E.G., *Corporate Social Performance: From Output Measurement to Impact Measurement*, Promotor: Prof.dr. H.R. Commandeur, EPS-2009-182-STR, ISBN: 978-90-5892-225-0, http://hdl.handle.net/1765/17627

Maeseneire, W., de, *Essays on Firm Valuation and Value Appropriation,* Promotor: Prof.dr. J.T.J. Smit, EPS-2005-053-F&A, ISBN: 90-5892-082-8, http://hdl.handle.net/1765/6768

Mandele, L.M., van der, *Leadership and the Inflection Point: A Longitudinal Perspective*, Promotors: Prof.dr. H.W. Volberda & Prof.dr. H.R. Commandeur, EPS-2004-042-STR, ISBN: 90-5892-067-4, http://hdl.handle.net/1765/1302

Markwat, T.D., *Extreme Dependence in Asset Markets Around the Globe*, Promotor: Prof.dr. D.J.C. van Dijk, EPS-2011-227-F&A, ISBN: 978-90-5892-270-0, http://hdl.handle.net/1765/22744

Meer, J.R. van der, *Operational Control of Internal Transport*, Promotors: Prof.dr. M.B.M. de Koster & Prof.dr.ir. R. Dekker, EPS-2000-001-LIS, ISBN: 90-5892-004-6, http://hdl.handle.net/1765/859

Mentink, A., *Essays on Corporate Bonds*, Promotor: Prof.dr. A.C.F. Vorst, EPS-2005-070-F&A, ISBN: 90-5892-100-X, http://hdl.handle.net/1765/7121

Meuer, J., *Configurations of Inter-Firm Relations in Management Innovation: A Study in China's Biopharmaceutical Industry*, Promotor: Prof.dr. B. Krug, EPS-2011-228-ORG, ISBN: 978-90-5892-271-1, http://hdl.handle.net/1765/22745

Meyer, R.J.H., *Mapping the Mind of the Strategist: A Quantitative Methodology for Measuring the Strategic Beliefs of Executives*, Promotor: Prof.dr. R.J.M. van Tulder, EPS-2007-106-ORG, ISBN: 978-90-5892-141-3, http://hdl.handle.net/1765/10182

Miltenburg, P.R., *Effects of Modular Sourcing on Manufacturing Flexibility in the Automotive Industry: A Study among German OEMs*, Promotors: Prof.dr. J. Paauwe & Prof.dr. H.R. Commandeur, EPS-2003-030-ORG, ISBN: 90-5892-052-6, http://hdl.handle.net/1765/1039

Moerman, G.A., *Empirical Studies on Asset Pricing and Banking in the Euro Area,* Promotor: Prof.dr. C.G. Koedijk, EPS-2005-058-F&A, ISBN: 90-5892-090-9, http://hdl.handle.net/1765/6666

Moitra, D., *Globalization of R&D: Leveraging Offshoring for Innovative Capability and Organizational Flexibility,* Promotor: Prof.dr. K. Kumar, EPS-2008-150-LIS, ISBN: 978-90-5892-184-0, http://hdl.handle.net/1765/14081

Mol, M.M., *Outsourcing, Supplier-relations and Internationalisation: Global Source Strategy as a Chinese Puzzle*, Promotor: Prof.dr. R.J.M. van Tulder, EPS-2001-010-ORG, ISBN: 90-5892-014-3, http://hdl.handle.net/1765/355

Mom, T.J.M., *Managers' Exploration and Exploitation Activities: The Influence of Organizational Factors and Knowledge Inflows*, Promotors: Prof.dr.ir. F.A.J. Van den Bosch & Prof.dr. H.W. Volberda, EPS-2006-079-STR, ISBN: 90-5892-116-6, http://hdl.handle.net/1765

Moonen, J.M., *Multi-Agent Systems for Transportation Planning and Coordination*, Promotors: Prof.dr. J. van Hillegersberg & Prof.dr. S.L. van de Velde, EPS-2009-177-LIS, ISBN: 978-90-5892-216-8, http://hdl.handle.net/1765/16208

Mulder, A., *Government Dilemmas in the Private Provision of Public Goods*, Promotor: Prof.dr. R.J.M. van Tulder, EPS-2004-045-ORG, ISBN: 90-5892-071-2, http://hdl.handle.net/1765/1790

Muller, A.R., *The Rise of Regionalism: Core Company Strategies Under The Second Wave of Integration*, Promotor: Prof.dr. R.J.M. van Tulder, EPS-2004-038-ORG, ISBN: 90-5892-062-3, http://hdl.handle.net/1765/1272

Nalbantov G.I., *Essays on Some Recent Penalization Methods with Applications in Finance and Marketing*, Promotor: Prof. dr P.J.F. Groenen, EPS-2008-132-F&A, ISBN: 978-90-5892-166-6, http://hdl.handle.net/1765/13319

Nederveen Pieterse, A., *Goal Orientation in Teams: The Role of Diversity*, Promotor: Prof.dr. D.L. van Knippenberg, EPS-2009-162-ORG, http://hdl.handle.net/1765/15240

Nguyen, T.T., *Capital Structure, Strategic Competition, and Governance*, Promotor: Prof.dr. A. de Jong, EPS-2008-148-F&A, ISBN: 90-5892-178-9, http://hdl.handle.net/1765/14005

Nielsen, L.K., *Rolling Stock Rescheduling in Passenger Railways: Applications in Short-term Planning and in Disruption Management*, Promotor: Prof.dr. L.G. Kroon, EPS-2011-224-LIS, ISBN: 978-90-5892-267-0, http://hdl.handle.net/1765/22444

Niesten, E.M.M.I., *Regulation, Governance and Adaptation: Governance Transformations in the Dutch and French Liberalizing Electricity Industries*, Promotors: Prof.dr. A. Jolink & Prof.dr. J.P.M. Groenewegen, EPS-2009-170-ORG, ISBN: 978-90-5892-208-3, http://hdl.handle.net/1765/16096

Nieuwenboer, N.A. den, *Seeing the Shadow of the Self*, Promotor: Prof.dr. S.P. Kaptein, EPS-2008-151-ORG, ISBN: 978-90-5892-182-6, http://hdl.handle.net/1765/14223

Nijdam, M.H., *Leader Firms: The Value of Companies for the Competitiveness of the Rotterdam Seaport Cluster,* Promotor: Prof.dr. R.J.M. van Tulder, EPS-2010-216-ORG, ISBN: 978-90-5892-256-4, http://hdl.handle.net/1765/21405

Ning, H., *Hierarchical Portfolio Management: Theory and Applications*, Promotor: Prof.dr. J. Spronk, EPS-2007-118-F&A, ISBN: 90-5892-152-9, http://hdl.handle.net/1765/10868

Noeverman, J., *Management Control Systems, Evaluative Style, and Behaviour: Exploring the Concept and Behavioural Consequences of Evaluative Style*, Promotors: Prof.dr. E.G.J. Vosselman & Prof.dr. A.R.T. Williams, EPS-2007-120-F&A, ISBN: 90-5892-151-2, http://hdl.handle.net/1765/10869

Noordegraaf-Eelens, L.H.J., *Contested Communication: A Critical Analysis of Central Bank Speech,* Promotor: Prof.dr. Ph.H.B.F. Franses, EPS-2010-209-MKT, ISBN: 978-90-5892-254-0, http://hdl.handle.net/1765/21061

Nuijten, I., *Servant Leadership: Paradox or Diamond in the Rough? A Multidimensional Measure and Empirical Evidence*, Promotor: Prof.dr. D.L. van Knippenberg, EPS-2009-183-ORG, http://hdl.handle.net/1765/21405

Oosterhout, J., van, *The Quest for Legitimacy: On Authority and Responsibility in Governance*, Promotors: Prof.dr. T. van Willigenburg & Prof.mr. H.R. van Gunsteren, EPS-2002-012-ORG, ISBN: 90-5892-022-4, http://hdl.handle.net/1765/362

Oosterhout, M., van, *Business Agility and Information Technology in Service Organizations,* Promotor: Prof,dr.ir. H.W.G.M. van Heck, EPS-2010-198-LIS, ISBN: 90-5092-236-6, http://hdl.handle.net/1765/19805

Oostrum, J.M., van, *Applying Mathematical Models to Surgical Patient Planning*, Promotor: Prof.dr. A.P.M. Wagelmans, EPS-2009-179-LIS, ISBN: 978-90-5892-217-5, http://hdl.handle.net/1765/16728

Otgaar, A.H.J., *Industrial Tourism: Where the Public Meets the Private,* Promotor: Prof.dr. L. van den Berg, EPS-2010-219-ORG, ISBN: 90-5892-259-5, http://hdl.handle.net/1765/21585

Paape, L., *Corporate Governance: The Impact on the Role, Position, and Scope of Services of the Internal Audit Function*, Promotors: Prof.dr. G.J. van der Pijl & Prof.dr. H. Commandeur, EPS-2007-111-MKT, ISBN: 90-5892-143-7, http://hdl.handle.net/1765/10417

Pak, K., *Revenue Management: New Features and Models*, Promotor: Prof.dr.ir. R. Dekker, EPS-2005-061-LIS, ISBN: 90-5892-092-5, http://hdl.handle.net/1765/362/6771

Pattikawa, L.H, *Innovation in the Pharmaceutical Industry: Evidence from Drug Introduction in the U.S.*, Promotors: Prof.dr. H.R.Commandeur, EPS-2007-102-MKT, ISBN: 90-5892-135-2, http://hdl.handle.net/1765/9626

Peeters, L.W.P., *Cyclic Railway Timetable Optimization*, Promotors: Prof.dr. L.G. Kroon & Prof.dr.ir. J.A.E.E. van Nunen, EPS-2003-022-LIS, ISBN: 90-5892-042-9, http://hdl.handle.net/1765/429

Pietersz, R., *Pricing Models for Bermudan-style Interest Rate Derivatives*, Promotors: Prof.dr. A.A.J. Pelsser & Prof.dr. A.C.F. Vorst, EPS-2005-071-F&A, ISBN: 90-5892-099-2, http://hdl.handle.net/1765/7122

Pince, C., *Advances in Inventory Management: Dynamic Models,* Promotor: Prof.dr.ir. R. Dekker, EPS-2010-199-LIS, ISBN: 978-90-5892-243-4, http://hdl.handle.net/1765/19867

Poel, A.M. van der, *Empirical Essays in Corporate Finance and Financial Reporting*, Promotors: Prof.dr. A. de Jong & Prof.dr. G.M.H. Mertens, EPS-2007-133-F&A, ISBN: 978-90-5892-165-9, http://hdl.handle.net/1765/13320

Popova, V., *Knowledge Discovery and Monotonicity*, Promotor: Prof.dr. A. de Bruin, EPS-2004-037-LIS, ISBN: 90-5892-061-5, http://hdl.handle.net/1765/1201

Potthoff, D., *Railway Crew Rescheduling: Novel Approaches and Extensions,* Promotors: Prof.dr. A.P.M. Wagelmans & Prof.dr. L.G. Kroon, EPS-2010-210-LIS, ISBN: 90-5892-250-2, http://hdl.handle.net/1765/21084

Pouchkarev, I., *Performance Evaluation of Constrained Portfolios*, Promotors: Prof.dr. J. Spronk & Dr. W.G.P.M. Hallerbach, EPS-2005-052-F&A, ISBN: 90-5892-083-6, http://hdl.handle.net/1765/6731

Prins, R., *Modeling Consumer Adoption and Usage of Value-Added Mobile Services*, Promotors: Prof.dr. Ph.H.B.F. Franses & Prof.dr. P.C. Verhoef, EPS-2008-128-MKT, ISBN: 978/90-5892-161-1, http://hdl.handle.net/1765/12461

Puvanasvari Ratnasingam, P., *Interorganizational Trust in Business to Business E-Commerce*, Promotors: Prof.dr. K. Kumar & Prof.dr. H.G. van Dissel, EPS-2001-009-LIS, ISBN: 90-5892-017-8, http://hdl.handle.net/1765/356

Quak, H.J., *Sustainability of Urban Freight Transport: Retail Distribution and Local Regulation in Cities*, Promotor: Prof.dr. M.B.M. de Koster, EPS-2008-124-LIS, ISBN: 978-90-5892-154-3, http://hdl.handle.net/1765/11990

Quariguasi Frota Neto, J., *Eco-efficient Supply Chains for Electrical and Electronic Products*, Promotors: Prof.dr.ir. J.A.E.E. van Nunen & Prof.dr.ir. H.W.G.M. van Heck, EPS-2008-152-LIS, ISBN: 978-90-5892-192-5, http://hdl.handle.net/1765/14785

Radkevitch, U.L, *Online Reverse Auction for Procurement of Services*, Promotor: Prof.dr.ir. H.W.G.M. van Heck, EPS-2008-137-LIS, ISBN: 978-90-5892-171-0, http://hdl.handle.net/1765/13497

Rinsum, M. van, *Performance Measurement and Managerial Time Orientation*, Promotor: Prof.dr. F.G.H. Hartmann, EPS-2006-088-F&A, ISBN: 90-5892-121-2, http://hdl.handle.net/1765/7993

Roelofsen, E.M., *The Role of Analyst Conference Calls in Capital Markets*, Promotors: Prof.dr. G.M.H. Mertens & Prof.dr. L.G. van der Tas RA, EPS-2010-190-F&A, ISBN: 978-90-5892-228-1, http://hdl.handle.net/1765/18013

Romero Morales, D., *Optimization Problems in Supply Chain Management*, Promotors: Prof.dr.ir. J.A.E.E. van Nunen & Dr. H.E. Romeijn, EPS-2000-003-LIS, ISBN: 90-9014078-6, http://hdl.handle.net/1765/865

Roodbergen, K.J., *Layout and Routing Methods for Warehouses*, Promotors: Prof.dr. M.B.M. de Koster & Prof.dr.ir. J.A.E.E. van Nunen, EPS-2001-004-LIS, ISBN: 90-5892-005-4, http://hdl.handle.net/1765/861

Rook, L., *Imitation in Creative Task Performance*, Promotor: Prof.dr. D.L. van Knippenberg, EPS-2008-125-ORG, http://hdl.handle.net/1765/11555

Rosmalen, J. van, *Segmentation and Dimension Reduction: Exploratory and Model-Based Approaches*, Promotor: Prof.dr. P.J.F. Groenen, EPS-2009-165-MKT, ISBN: 978-90-5892-201-4, http://hdl.handle.net/1765/15536

Roza, M.W., *The Relationship between Offshoring Strategies and Firm Performance: Impact of Innovation, Absorptive Capacity and Firm Size,* Promotors: Prof.dr. H.W. Volberda & Prof.dr.ing. F.A.J. van den Bosch, EPS-2011-214-STR, ISBN: 978-90-5892-265-6, http://hdl.handle.net/1765/22155

Rus, D., *The Dark Side of Leadership: Exploring the Psychology of Leader Self-serving Behavior*, Promotor: Prof.dr. D.L. van Knippenberg, EPS-2009-178-ORG, http://hdl.handle.net/1765/16726

Samii, R., *Leveraging Logistics Partnerships: Lessons from Humanitarian Organizations,* Promotors: Prof.dr.ir. J.A.E.E. van Nunen & Prof.dr.ir. L.N. Van Wassenhove, EPS-2008-153-LIS, ISBN: 978-90-5892-186-4, http://hdl.handle.net/1765/14519

Schaik, D. van, *M&A in Japan: An Analysis of Merger Waves and Hostile Takeovers,* Promotors: Prof.dr. J. Spronk & Prof.dr. J.P.M. Groenewegen, EPS-2008-141-F&A, ISBN: 978-90-5892-169-7, http://hdl.handle.net/1765/13693

Schauten, M.B.J., *Valuation, Capital Structure Decisions and the Cost of Capital,* Promotors: Prof.dr. J. Spronk & Prof.dr. D. van Dijk, EPS-2008-134-F&A, ISBN: 978-90-5892-172-7, http://hdl.handle.net/1765/13480

Schellekens, G.A.C., *Language Abstraction in Word of Mouth,* Promotor: Prof.dr.ir. A. Smidts, EPS-2010-218-MKT, ISBN: 978-90-5892-252-6, http://hdl.handle.net/1765/21580

Schramade, W.L.J., *Corporate Bonds Issuers,* Promotor: Prof.dr. A. De Jong, EPS-2006-092-F&A, ISBN: 90-5892-125-5, http://hdl.handle.net/1765/8191

Schweizer, T.S., *An Individual Psychology of Novelty-Seeking, Creativity and Innovation,* Promotor: Prof.dr. R.J.M. van Tulder, EPS-2004-048-ORG, ISBN: 90-5892-077-1, http://hdl.handle.net/1765/1818

Six, F.E., *Trust and Trouble: Building Interpersonal Trust Within Organizations*, Promotors: Prof.dr. B. Nooteboom & Prof.dr. A.M. Sorge, EPS-2004-040-ORG, ISBN: 90-5892-064-X, http://hdl.handle.net/1765/1271

Slager, A.M.H., *Banking across Borders*, Promotors: Prof.dr. R.J.M. van Tulder & Prof.dr. D.M.N. van Wensveen, EPS-2004-041-ORG, ISBN: 90-5892-066–6, http://hdl.handle.net/1765/1301

Sloot, L., *Understanding Consumer Reactions to Assortment Unavailability*, Promotors: Prof.dr. H.R. Commandeur, Prof.dr. E. Peelen & Prof.dr. P.C. Verhoef, EPS-2006-074-MKT, ISBN: 90-5892-102-6, http://hdl.handle.net/1765/7438

Smit, W., *Market Information Sharing in Channel Relationships: Its Nature, Antecedents and Consequences*, Promotors: Prof.dr.ir. G.H. van Bruggen & Prof.dr.ir. B. Wierenga, EPS-2006-076-MKT, ISBN: 90-5892-106-9, http://hdl.handle.net/1765/7327

Sonnenberg, M., *The Signalling Effect of HRM on Psychological Contracts of Employees: A Multi-level Perspective*, Promotor: Prof.dr. J. Paauwe, EPS-2006-086-ORG, ISBN: 90-5892-119-0, http://hdl.handle.net/1765/7995

Sotgiu, F., *Not All Promotions are Made Equal: From the Effects of a Price War to Cross-chain Cannibalization,* Promotors: Prof.dr. M.G. Dekimpe & Prof.dr.ir. B. Wierenga, EPS-2010-203-MKT, ISBN: 978-90-5892-238-0, http://hdl.handle.net/1765/19714

Speklé, R.F., *Beyond Generics: A closer Look at Hybrid and Hierarchical Governance*, Promotor: Prof.dr. M.A. van Hoepen RA, EPS-2001-008-F&A, ISBN: 90-5892-011-9, http://hdl.handle.net/1765/357

Srour, F.J., *Dissecting Drayage: An Examination of Structure, Information, and Control in Drayage Operations*, Promotor: Prof.dr. S.L. van de Velde, EPS-2010-186-LIS, http://hdl.handle.net/1765/18231

Stam, D.A., *Managing Dreams and Ambitions: A Psychological Analysis of Vision Communication*, Promotor: Prof.dr. D.L. van Knippenberg, EPS-2008-149-ORG, http://hdl.handle.net/1765/14080

Stienstra, M., *Strategic Renewal in Regulatory Environments: How Inter- and Intra-organisational Institutional Forces Influence European Energy Incumbent Firms,* Promotors: Prof.dr.ir. F.A.J. Van den Bosch & Prof.dr. H.W. Volberda, EPS-2008-145-STR, ISBN: 978-90-5892-184-0, http://hdl.handle.net/1765/13943

Sweldens, S.T.L.R., *Evaluative Conditioning 2.0: Direct versus Associative Transfer of Affect to Brands,* Promotor: Prof.dr. S.M.J. van Osselaer, EPS-2009-167-MKT, ISBN: 978-90-5892-204-5, http://hdl.handle.net/1765/16012

Szkudlarek, B.A., *Spinning the Web of Reentry: [Re]connecting reentry training theory and practice*, Promotor: Prof.dr. S.J. Magala, EPS-2008-143-ORG, ISBN: 978-90-5892-177-2, http://hdl.handle.net/1765/13695

Tempelaar, M.P., *Organizing for Ambidexterity: Studies on the Pursuit of Exploration and Exploitation through Differentiation, Integration, Contextual and Individual Attributes,* Promotors: Prof.dr.ing. F.A.J. van den Bosch & Prof.dr. H.W. Volberda, EPS-2010-191-STR, ISBN: 978-90-5892-231-1, http://hdl.handle.net/1765/18457

Teunter, L.H., *Analysis of Sales Promotion Effects on Household Purchase Behavior*, Promotors: Prof.dr.ir. B. Wierenga & Prof.dr. T. Kloek, EPS-2002-016-MKT, ISBN: 90-5892-029-1, http://hdl.handle.net/1765/868

Tims, B., *Empirical Studies on Exchange Rate Puzzles and Volatility*, Promotor: Prof.dr. C.G. Koedijk, EPS-2006-089-F&A, ISBN: 90-5892-113-1, http://hdl.handle.net/1765/8066

Tiwari, V., *Transition Process and Performance in IT Outsourcing: Evidence from a Field Study and Laboratory Experiments,* Promotors: Prof.dr.ir. H.W.G.M. van Heck & Prof.dr. P.H.M. Vervest, EPS-2010-201-LIS, ISBN: 978-90-5892-241-0, http://hdl.handle.net/1765/19868

Tuk, M.A., *Is Friendship Silent When Money Talks? How Consumers Respond to Word-of-Mouth Marketing*, Promotors: Prof.dr.ir. A. Smidts & Prof.dr. D.H.J. Wigboldus, EPS-2008-130-MKT, ISBN: 978-90-5892-164-2, http://hdl.handle.net/1765/12702

Tzioti, S., *Let Me Give You a Piece of Advice: Empirical Papers about Advice Taking in Marketing,* Promotors: Prof.dr. S.M.J. van Osselaer & Prof.dr.ir. B. Wierenga, EPS-2010-211-MKT, ISBN: 978-90-5892-251-9, hdl.handle.net/1765/21149

Vaccaro, I.G., *Management Innovation: Studies on the Role of Internal Change Agents,* Promotors: Prof.dr. F.A.J. van den Bosch & Prof.dr. H.W. Volberda, EPS-2010-212-STR, ISBN: 978-90-5892-253-3, hdl.handle.net/1765/21150

Valck, K. de, *Virtual Communities of Consumption: Networks of Consumer Knowledge and Companionship*, Promotors: Prof.dr.ir. G.H. van Bruggen & Prof.dr.ir. B. Wierenga, EPS-2005-050-MKT, ISBN: 90-5892-078-X, http://hdl.handle.net/1765/6663

Valk, W. van der, *Buyer-Seller Interaction Patterns During Ongoing Service Exchange*, Promotors: Prof.dr. J.Y.F. Wynstra & Prof.dr.ir. B. Axelsson, EPS-2007-116-MKT, ISBN: 90-5892-146-8, http://hdl.handle.net/1765/10856

Verheijen, H.J.J., *Vendor-Buyer Coordination in Supply Chains,* Promotor: Prof.dr.ir. J.A.E.E. van Nunen, EPS-2010-194-LIS, ISBN: 90-5892-234-2, http://hdl.handle.net/1765/19594

Verheul, I., *Is There a (Fe)male Approach? Understanding Gender Differences in Entrepreneurship*, Promotor: Prof.dr. A.R. Thurik, EPS-2005-054-ORG, ISBN: 90-5892-080-1, http://hdl.handle.net/1765/2005

Verwijmeren, P., *Empirical Essays on Debt, Equity, and Convertible Securities*, Promotors: Prof.dr. A. de Jong & Prof.dr. M.J.C.M. Verbeek, EPS-2009-154-F&A, ISBN: 978-90-5892-187-1, http://hdl.handle.net/1765/14312

Vis, I.F.A., *Planning and Control Concepts for Material Handling Systems*, Promotors: Prof.dr. M.B.M. de Koster & Prof.dr.ir. R. Dekker, EPS-2002-014-LIS, ISBN: 90-5892-021-6, http://hdl.handle.net/1765/866

Vlaar, P.W.L., *Making Sense of Formalization in Interorganizational Relationships: Beyond Coordination and Control,* Promotors: Prof.dr.ir. F.A.J. Van den Bosch & Prof.dr. H.W. Volberda, EPS-2006-075-STR, ISBN 90-5892-103-4, http://hdl.handle.net/1765/7326

Vliet, P. van, *Downside Risk and Empirical Asset Pricing*, Promotor: Prof.dr. G.T. Post, EPS-2004-049-F&A, ISBN: 90-5892-07-55, http://hdl.handle.net/1765/1819

Vlist, P. van der, *Synchronizing the Retail Supply Chain*, Promotors: Prof.dr.ir. J.A.E.E. van Nunen & Prof.dr. A.G. de Kok, EPS-2007-110-LIS, ISBN: 90-5892-142-0, http://hdl.handle.net/1765/10418

Vries-van Ketel E. de, *How Assortment Variety Affects Assortment Attractiveness: A Consumer Perspective*, Promotors: Prof.dr. G.H. van Bruggen & Prof.dr.ir. A. Smidts, EPS-2006-072-MKT, ISBN: 90-5892-101-8, http://hdl.handle.net/1765/7193

Vromans, M.J.C.M., *Reliability of Railway Systems*, Promotors: Prof.dr. L.G. Kroon, Prof.dr.ir. R. Dekker & Prof.dr.ir. J.A.E.E. van Nunen, EPS-2005-062-LIS, ISBN: 90-5892-089-5, http://hdl.handle.net/1765/6773

Vroomen, B.L.K., *The Effects of the Internet, Recommendation Quality and Decision Strategies on Consumer Choice*, Promotor: Prof.dr. Ph.H.B.F. Franses, EPS-2006-090-MKT, ISBN: 90-5892-122-0, http://hdl.handle.net/1765/8067

Waal, T. de, *Processing of Erroneous and Unsafe Data*, Promotor: Prof.dr.ir. R. Dekker, EPS-2003-024-LIS, ISBN: 90-5892-045-3, http://hdl.handle.net/1765/870

Waard, E.J. de, *Engaging Environmental Turbulence: Organizational Determinants for Repetitive Quick and Adequate Responses*, Promotors: Prof.dr. H.W. Volberda & Prof.dr. J. Soeters, EPS-2010-189-STR, ISBN: 978-90-5892-229-8, http://hdl.handle.net/1765/18012

Wall, R.S., *Netscape: Cities and Global Corporate Networks,* Promotor: Prof.dr. G.A. van der Knaap, EPS-2009-169-ORG, ISBN: 978-90-5892-207-6, http://hdl.handle.net/1765/16013

Watkins Fassler, K., *Macroeconomic Crisis and Firm Performance,* Promotors: Prof.dr. J. Spronk & Prof.dr. D.J. van Dijk, EPS-2007-103-F&A, ISBN: 90-5892-138-3, http://hdl.handle.net/1765/10065

Weerdt, N.P. van der, *Organizational Flexibility for Hypercompetitive Markets: Empirical Evidence of the Composition and Context Specificity of Dynamic Capabilities and Organization Design Parameters,* Promotor: Prof.dr. H.W. Volberda, EPS-2009-173-STR, ISBN: 978-90-5892-215-1, http://hdl.handle.net/1765/16182

Wennekers, A.R.M., *Entrepreneurship at Country Level: Economic and Non-Economic Determinants,* Promotor: Prof.dr. A.R. Thurik, EPS-2006-81-ORG, ISBN: 90-5892-115-8, http://hdl.handle.net/1765/7982

Wielemaker, M.W., *Managing Initiatives: A Synthesis of the Conditioning and Knowledge-Creating View*, Promotors: Prof.dr. H.W. Volberda & Prof.dr. C.W.F. Baden-Fuller, EPS-2003-28-STR, ISBN: 90-5892-050-X, http://hdl.handle.net/1765/1042

Wijk, R.A.J.L. van, *Organizing Knowledge in Internal Networks: A Multilevel Study*, Promotor: Prof.dr.ir. F.A.J. van den Bosch, EPS-2003-021-STR, ISBN: 90-5892-039-9, http://hdl.handle.net/1765/347

Wolters, M.J.J., *The Business of Modularity and the Modularity of Business*, Promotors: Prof. mr. dr. P.H.M. Vervest & Prof.dr.ir. H.W.G.M. van Heck, EPS-2002-011-LIS, ISBN: 90-5892-020-8, http://hdl.handle.net/1765/920

Wubben, M.J.J., *Social Functions of Emotions in Social Dilemmas*, Promotors: Prof.dr. D. De Cremer & Prof.dr. E. van Dijk, EPS-2009-187-ORG, http://hdl.handle.net/1765/18228

Xu, Y., *Empirical Essays on the Stock Returns, Risk Management, and Liquidity Creation of Banks*, Promotor: Prof.dr. M.J.C.M. Verbeek, EPS-2010-188-F&A, http://hdl.handle.net/1765/18125

Yang, J., *Towards the Restructuring and Co-ordination Mechanisms for the Architecture of Chinese Transport Logistics*, Promotor: Prof.dr. H.E. Harlambides, EPS-2009-157-LIS, ISBN: 978-90-5892-198-7, http://hdl.handle.net/1765/14527

Yu, M., *Enhancing Warehouse Perfromance by Efficient Order Picking*, Promotor: Prof.dr. M.B.M. de Koster, EPS-2008-139-LIS, ISBN: 978-90-5892-167-3, http://hdl.handle.net/1765/13691

Zhang, X., *Strategizing of Foreign Firms in China: An Institution-based Perspective*, Promotor: Prof.dr. B. Krug, EPS-2007-114-ORG, ISBN: 90-5892-147-5, http://hdl.handle.net/1765/10721

Zhang, X., *Scheduling with Time Lags,* Promotor: Prof.dr. S.L. van de Velde, EPS-2010-206-LIS, ISBN: 978-90-5892-244-1, http://hdl.handle.net/1765/19928

Zhou, H., *Knowledge, Entrepreneurship and Performance: Evidence from Country-level and Firm-level Studies,* Promotors: Prof.dr. A.R. Thurik & Prof.dr. L.M. Uhlaner, EPS-2010-207-ORG, ISBN: 90-5892-248-9, http://hdl.handle.net/1765/20634

Zhu, Z., *Essays on China's Tax System*, Promotors: Prof.dr. B. Krug & Prof.dr. G.W.J. Hendrikse, EPS-2007-112-ORG, ISBN: 90-5892-144-4, http://hdl.handle.net/1765/10502

Zwart, G.J. de, *Empirical Studies on Financial Markets: Private Equity, Corporate Bonds and Emerging Markets*, Promotors: Prof.dr. M.J.C.M. Verbeek & Prof.dr. D.J.C. van Dijk, EPS-2008-131-F&A, ISBN: 978-90-5892-163-5, http://hdl.handle.net/1765/12703

Erasmus Research Institute of Management - ERIM

CONTINGENCIES

LEARNING NUMERICAL AND EMOTIONAL ASSOCIATIONS IN AN UNCERTAIN WORLD

The ability to learn about the relation or covariation between events happening in the world is probably the most critical aspect of human cognition. This dissertation examines how the human mind learns numerical and emotional relations and explores consequences for managerial and consumer decision making.

First, we study how uncertainty in the environment affects covariation learning and explore the consequences for consumers' price-quality inferences and product valuation. Second, we examine how different types of accountability (process versus outcome) and analytical intelligence affect learning and judgment. We highlight the implications for employee performance management. Third, building on associative models of memory, we show that bilingual consumers perceive advertising messages in their native language (L1) to be more emotionally intense than advertising messages in their second language (L2). Finally, we explore the consequences of a greater perceived emotionality in L1 for international marketing research.

The practical implications of this dissertation are of interest for professionals working in the area of pricing, branding, marketing research, and human resources. From a theoretical point of view, this dissertation relates to the fields of judgment and decision making under uncertainty and cognitive psychology.

ERIM

The Erasmus Research Institute of Management (ERIM) is the Research School (Onderzoekschool) in the field of management of the Erasmus University Rotterdam. The founding participants of ERIM are Rotterdam School of Management (RSM), and the Erasmus School of Economics (ESE). ERIM was founded in 1999 and is officially accredited by the Royal Netherlands Academy of Arts and Sciences (KNAW). The research undertaken by ERIM is focused on the management of the firm in its environment, its intra- and interfirm relations, and its business processes in their interdependent connections.

The objective of ERIM is to carry out first rate research in management, and to offer an advanced doctoral programme in Research in Management. Within ERIM, over three hundred senior researchers and PhD candidates are active in the different research programmes. From a variety of academic backgrounds and expertises, the ERIM community is united in striving for excellence and working at the forefront of creating new business knowledge.

ERIM PhD Series

Research in Management

Erasmus Research Institute of Management - **ERIM**
Rotterdam School of Management (RSM)
Erasmus School of Economics (ESE)
P.O. Box 1738, 3000 DR Rotterdam
The Netherlands

Tel. +31 10 408 11 82
Fax +31 10 408 96 40
E-mail info@erim.eur.nl
Internet www.erim.eur.nl

Design & layout: B&T Ontwerp en advies (www.b-en-t.nl) Print: Haveka (www.haveka.nl)