Short-Term Planning Sophistication in SMEs:
The Relationship with Strategy and Perceived Environmental Uncertainty

Ann Jorissen
Department of Accounting and Finance, Faculty of Applied Economics, University of Antwerp
Prinsstraat 13 (B331), 2000 Antwerp, Belgium
Ann.Jorissen@ua.ac.be, phone office: 32-3-220 40 92, fax: 32-3-220 40 64

Anne-Mie Reheul
Department of Accounting and Finance, Faculty of Applied Economics, University of Antwerp
Prinsstraat 13 (B330), 2000 Antwerp, Belgium
Anne-Mie.Reheul@ua.ac.be, phone office: 32-3-220 40 45, fax: 32-3-220 40 64

Eddy Laveren
Department of Accounting and Finance, Faculty of Applied Economics, University of Antwerp
Prinsstraat 13 (B320), 2000 Antwerp, Belgium
Eddy.Laveren@ua.ac.be, phone office: 32-3-220 40 86, fax: 32-3-220 40 64

Rudy Martens
Department of Management, Faculty of Applied Economics, University of Antwerp
Prinsstraat 13 (S.Z. 404), 2000 Antwerp, Belgium
Rudy.Martens@ua.ac.be, phone office: 32-3-275 50 56, fax: 32-3-275 50 79

Article
Keywords: planning sophistication, strategy, environmental uncertainty, contingency research
Topic: Management practices in small enterprises

Authors' biographical statements

Dr. Jorissen is professor of accounting in the department of accounting and finance at the University of Antwerp, Belgium. Her research interests focus on financial reporting and management accounting and control systems.

Drs. Reheul is assistant in accounting for the department of accounting and finance at the University of Antwerp, Belgium. Her current research interests are contingency research on management accounting systems and comparative family/nonfamily business research.

Dr. Laveren is professor of finance and entrepreneurship in the department of accounting and finance at the University of Antwerp, Belgium. His research interests include financial management and growth management of small firms and family businesses.

Dr. Martens is professor of strategic management in the department of management at the University of Antwerp, Belgium. His research interests include strategic decision making processes, knowledge management and competitive strategies.

Short-Term Planning Sophistication in SMEs:
The Relationship with Strategy and Perceived Environmental Uncertainty*

A. Jorissen, A. Reheul, E. Laveren and R. Martens

Despite the many contingency studies that investigated how perceived environmental uncertainty (PEU) and strategy relate to the level of planning sophistication, this relationship remains unclear. To gain a better insight into this relationship in SMEs, we investigate the interactive effect of PEU and strategy on short-term planning sophistication, simultaneously controlling for multiple firm and CEO characteristics. The regression results reveal that PEU and strategy are interactively related to short-term planning sophistication and not in isolation. The data provide evidence that the relationship between PEU and short-term planning sophistication is negative and statistically significant among prospectors, whereas this relationship is positive, though not statistically significant, among analyzers and defenders. Further, our results indicate that prospectors plan more sophisticatedly than defenders and analyzers at low to average PEU levels, but that they plan less sophisticatedly than analyzers and defenders at high PEU levels. Given that our results are based on a sample of firms that exist for at least 13 years, the revealed relationships can be considered as "good" fits of long-term survivors, and as such are of interest to practitioners. From an academic perspective, we believe that many conflicting findings in the prior contingency literature can be explained by taking into account this interaction effect.

Introduction

Planning is a tool designed to assist managers in decision making and control. It is regarded as one of the basic managerial tasks that contribute to the success of a firm (Drucker 1973; Schwenk, and Shrader 1993; Gibson 1997). Planning is not only important for large firms, it is

* We thank the Fund for Scientific Research Flanders for its financial assistance (project number G.0186.00N)

essential for small firms as well (Rue, and Ibrahim 1998). Both practitioners and academics are interested in determining the appropriate design of planning systems in order to enable a firm to achieve a "good" performance. The design of planning systems has been studied through different theoretical lenses. Among those lenses, contingency theory is the most widely adopted theoretical framework. This theoretical paradigm assumes that management accounting systems (MAS), including planning systems, are adopted to assist managers in achieving some desired organizational outcome, and of which the appropriate design is influenced by the context in which the firm operates.

Contingency theory has resulted in a continuing stream of studies seeking to explore the contingent nature of MAS. Within the contingency literature two research streams can be distinguished. The first stream investigates the relation between planning systems design and firm performance. The second stream investigates the alignment between planning systems design and several contextual variables. Empirical results indicate that the relation between planning systems design and performance is difficult to qualify: the first research stream produced conflicting results (O' Neil, Saunders, and Hofman 1987; Bernan, Gordon, and Sussman 1997; Chenhall 2003). Not only the first, but also the second research stream produced mixed results. These mixed results particularly relate to the alignment of planning systems design with the contextual variables perceived environmental uncertainty (PEU) and strategy (Risseeuw, and Masurel 1994; McGee, and Sawyerr 2003; Collins, Holzmann, and Mendoza; Matthews, and Scott 1995).

A number of review articles have been produced (Otley 1980; Dent 1990; Langfield Smith 1997; Chenhall 2003), all pointing at an increasing body of conflicting results. The main criticism is that in most areas of MAS research, studies have not developed sufficient "critical

mass" to confirm findings (Chenhall 2003). Further, Matthews and Scott (1995) and Shrader, Mulford and Blackburn (1989) claim that the antecedent conditions of planning remain poorly understood and need further investigation, particularly in SMEs. Also Rue and Ibrahim (1998) and Gibson and Cassar (2002) launched a plea for more studies on planning practices using samples and research populations in different country settings.

With our study we want to improve the understanding of the design of short-term planning systems in SMEs. From an academic perspective, we want to provide an explanation for the existing conflicting results with regard to how planning systems design relates to PEU and strategy. We argue in the paper that the design of planning systems is not only dependent on PEU and strategy in isolation, but also on the interaction between PEU and strategy. This argument is based on the work of Miller (1988) and Matthews and Scott (1995), which is discussed in the literature and hypothesis development section. Our empirical analyses reveal that introducing this interaction effect in a regression model explaining short-term planning sophistication significantly enhances the model's explanatory power and moreover, provides an explanation for the prior conflicting empirical findings.

The degree of short-term planning sophistication is investigated by looking at the scope (the number of plans that are used) and the degree of formality (absent, intuitive, informal and formal) applied to several short-term plans. Firms with sophisticated short-term planning have several short-term plans that are formally drawn up. The prior literature revealed a number of other contingent variables besides PEU and strategy that are important in relation to the design of planning systems. These variables are included as control variables.

In our research design the sophistication of short-term planning systems is the dependent variable and the contingent variables are the independent variables. With this research design,

our study adopts a "selection" model of fit. This framework of analysis is to be situated in the structural contingency theory (Gerdin, and Greve 2004; Chenhall 2003). Through the choice of a "selection" model, the structural contingency theory assumes that a fit is the result of a natural selection process and that only organizations with a "good" fit survive and therefore can be observed (Drazin, and Van De Ven 1985). "According to the *selection* concept of 'fit', MAS design or use is predicted and explained as a response to the MAS context. Typically, these studies thus seek causal relationships between contextual variables and MAS design or use. […] According to this fit concept, theory predicts optimisation through selection, and theory therefore does not predict performance differences" (Hartmann 2005, 330). This implies that the observed context-MAS relationships reflect equilibrium conditions or optimal solutions. Given that the fits between context and short-term planning sophistication revealed in our study represent fits for long-term survivors (the respondents are firms that exist for at least 13 years), these fits can be considered as "good" fits. As a consequence, this study is relevant to practitioners who look for the appropriate planning systems design given a specific context.

The paper proceeds as follows. First, we present a literature review and develop research hypotheses. Second, we describe the research data and the methodology used. Third, we present the research results and discuss the implications for academics and practitioners.

Literature Review and Hypothesis development

In this section we provide a literature review of prior studies exploring the relation between several elements of context and the design of short-term planning systems. Most attention is directed at studies investigating the contextual variables strategy and PEU in relation to short-term planning systems design, as these studies produced most conflicting results.

The Relationship between the Environment and Planning Systems Design

The external environment is often characterized by its degree of uncertainty. According to Milliken (1987), uncertainty can be defined in terms of an individual's perceived inability to understand the direction in which an environment might be changing, the potential impact of those changes on that individual's organization, and whether or not particular responses to the environment might be successful.

Since environmental uncertainty has an impact on information processing (Bergh 1998), it is assumed that environmental uncertainty influences the design of planning systems. High levels of PEU go together with a need for more information processing (Galbraith 1973; Chenhall 2003) and a need to reduce ambiguity (Hartmann 2000), which might encourage firms to use formal planning systems. On the other hand, high levels of PEU make information processing and planning more difficult (Mintzberg 1972; Chenhall, and Morris 1995; Bergh 1998). PEU causes formal planning systems to provide incomplete information and results in a need for rapid reformulation.

These contradictory arguments on the basis of the information processing theory are reflected in the prior empirical literature. Empirical studies found conflicting results regarding the alignment of planning systems design and PEU in both SMEs and in large firms. Some studies revealed that in SMEs high PEU levels are positively associated with the sophistication of operational planning (Schrader, Mulford, and Blackburn 1989; Risseeuw, and Masurel 1994). Further, environmental hostility has been associated with a strong emphasis on meeting budgets (Otley 1978). Other studies provided evidence that high levels of PEU decrease the sophistication of operational planning (Matthews, and Scott 1995) and decrease the use of "impersonal" sources of information such as the output of MAS (McGee, and Sawyerr 2003). In

relation to budgets, Brownell (1985) found that environmental uncertainty is associated with a reduced emphasis on budgets. Until now, empirical research produced conflicting results and no unambiguous relationship between PEU and planning systems design has been found.

When SMEs face high levels of uncertainty and as a consequence planning becomes more difficult, we believe that SMEs will decrease their level of planning sophistication due to their lack of financial resources, time and personnel (Patterson 1986). SMEs in the face of increasing PEU will therefore focus on doing instead of thinking, with action largely based on intuition (Bhide 1994). For this reason we hypothesize that

H1: Perceived environmental uncertainty is negatively related to short-term planning sophistication

The Relationship between Strategy and Planning Systems Design

There are two opposing views regarding the influence of strategy on planning systems. One group of academics (among others Rogers, Miller, and Judge 1999) state that firms pursuing growth and innovation have greater information needs and adopt more formal planning systems than firms following defensive or reactive strategies and sticking to routines. Other academics like Chenhall and Morris (1995), Dent (1990) and Miller (1988) claim the opposite. Firms pursuing growth and innovation adopt flexible, informal planning systems to encourage innovation. Firms sticking to routines like defenders have formal planning systems to encourage efficiency.

Empirical studies performed in large firms found evidence of both views. Simons (1987) provided evidence that defenders find cost control and budgets more appropriate than prospectors. Collins, Holzmann, and Mendoza (1997) on the other hand found that prospector-

like firms use budgeting to a much greater extent than the other Miles and Snow archetypes. Empirical studies using SME data reveal that strategies of dynamism and innovation go together with higher levels of data gathering, higher planning intensity, and more written plans (Piëst 1994; Matthews, and Scott 1995).

The decision making process of prospectors, adopting explicit and proactive strategies, is more complex than the decision making process of defenders, adopting routine strategies. Given the vulnerability of small firms to poor decision-making (Covin, and Slevin 1989), and in line with the prior empirical studies using SME data, we expect that prospector SMEs need more sophisticated planning systems to support decision making than defender SMEs. As the analyzer strategy contains characteristics of both the defender and the prospector strategy (Miles, Snow, and Meyer 2003), we expect that the level of planning sophistication among analyzers will lie in between. The following hypotheses result from the above analysis.

H2a Prospectors demonstrate a higher short-term planning sophistication than defenders

H2b Prospectors demonstrate a higher short-term planning sophistication than analyzers

H2c Analyzers demonstrate a higher short-term planning sophistication than defenders

The Relationship between the Interaction "PEU x Strategy" and Planning Systems Design

The existing empirical research only investigates strategy and PEU as main effect variables in relation to planning systems design, not as interaction variables (except from Matthews, and Scott 1995). Together with Matthews and Scott (1995) we believe that this omission may have led to the conflicting results in prior research. According to Matthews and Scott (1995) there is a strong need for additional research on the contingent conditions of planning, particularly in SMEs. To fill this gap and to provide an explanation for the prior conflicting findings we

explicitly consider how the interaction between PEU and strategy relates to short-term planning sophistication in this research.

Already in 1988 Miller pointed to the interaction between PEU and strategy in a theoretical article, in which he stated that different strategies with very different structural requisites may thrive in very similar environments. In other words, the interaction between strategy and environment determines the appropriate structure (among others the planning system) that can best fulfil a firm's information needs.

As mentioned before, also Matthews and Scott (1995) argue that PEU and strategy are interactively related to the sophistication of operational planning. They tested this interaction effect by means of four moderated regression analyses, each accounting for another type of PEU. Even though the interaction term was not significant, the sign of its coefficient in each of the four analyses was consistent. The analyses reflected the sensitivity of prospectors to the perishable nature of opportunities in highly uncertain environments. Prospectors that take the time to plan sophisticatedly under conditions of high PEU may lose that opportunity (Bhide 1994). Therefore, we hypothesize that prospectors decrease planning sophistication in highly uncertain environments. By definition, defenders interact less proactively with their environment and focus more on their internal processes and on routines. Consequently, response time to opportunities in the environment is less important to defenders. Another implication is that external information is less important to defenders compared to prospectors. As such, a lower quality of external information that is inevitable at high PEU levels hardly affects the appropriateness of planning systems among defenders, but decreases their appropriateness among prospectors. Consequently, we hypothesize that prospectors are more likely to reduce short-term planning sophistication than defenders at increasing PEU levels. As the analyzer

strategy contains characteristics of both the defender and the prospector strategy (Miles, Snow, and Meyer 2003) we expect that the impact of increasing PEU levels among analyzers holds the middle between the impact among prospectors and defenders.

H3a Prospectors are more likely to reduce short-term planning sophistication than defenders at increasing PEU levels.

H3b Prospectors are more likely to reduce short-term planning sophistication than analyzers at increasing PEU levels.

H3c Analyzers are more likely to reduce short-term planning sophistication than defenders at increasing PEU levels.

The Relationship between Other Contingent Variables and Planning Systems Design

In prior research several variables have been related to management processes in general and the design of planning systems more specifically. We include these variables as control variables.

CEO Experience and Education. Building on Cyert and March's "theory of bounded rationality" Hambrick and Mason (1984) presented the upper echelons theory, which states that organizations become a reflection of their top managers. The upper-echelons theory suggests that the demographic traits of top managers (tenure, age, functional and educational background) are systematically related to their underlying cognitive orientations and knowledge base, and as such are systematically related to their decision-making (Hambrick, and Mason 1984; Finkelstein, and Hambrick 1996). As CEOs in SMEs are often in a position to be the sole decision-makers and have a lot of discretion, the impact of their demographic traits on the organization is even more important compared to CEOs in large firms (Miller, Kets de Vries, and Toulouse 1982).

In this article we control for two demographic traits: the CEO's experience and the CEO's education. Both the upper echelons literature (Miller 1991) and the small business literature (Gibbons, and O'Connor 2005) reveal that the perceived need for formalized planning and information processing decreases as CEO experience increases. This finding is attributed to the executive establishment of routines, policies and practices (Hambrick, Geletkancyz, and Fredrickson 1993), to the establishment of more reliable internal networks and to the development of predictable repertoires for dealing with information (Katz 1982; Miller 1991). The upper-echelons literature and the small business literature (Gibson, and Cassar 2002) also provide evidence that CEO education encourages documented business planning.

Firm Size. According to Khandwalla (1977) size is the most consistent explanation of organization structures such as planning systems. Formal planning systems are more critical in large firms as more information is required to ensure integration and control (Miller, and Cardinal 1994). Moreover, large firms have greater internal resources and therefore are more able to invest in formal planning systems (Fredrickson, and Mitchell 1984). These assertions are empirically confirmed by Lyles et al. (1993), Masurel and Smith (2000), Risseeuw and Masurel (1994) and Gibson and Cassar (2002).

Firm age. Several studies revealed that the intensity of planning decreases as firm age increases (Risseeuw, and Masurel 1994; Bernan, Gordon, and Sussman 1997). Firms that exist longer have a better understanding of their environment and are more involved in networks. Consequently, they have more informal channels for information gathering and processing (Moores, and Yuen 2001) and less need for formal planning systems (Gibson, and Cassar 2002).

Family Versus Nonfamily Firm. Family firms are often dominated by a strong CEO who wants to maintain control. This autocratic rule (Kets de Vries 1993) causes family firms to

prefer social methods of planning. Also agency theory (Jensen, and Meckling 1976) suggests that family firms need less sophisticated planning systems because of overlapping owner/manager relationships, which reduce information needs for integration and control.

Subsidiary versus Independent Firm. In SMEs that are subsidiaries it is more likely that the planning systems are imposed by the investor company. Budgets are a tool for the investor to guide the subsidiary's operational activities and to control the outcome. Therefore, subsidiary SMEs are believed to have higher levels of planning sophistication than independent SMEs.

Industry. Finally, industry has empirically been proven to influence planning practices (Jones 1985; Foster, and Gupta 1994; Williams, and Seaman 2001; Schrader, Mulford, and Blackburn 1989).

Research Method

Sample Selection and Data Collection

A large-scale survey was sent to the CEOs of 8,367 companies in the Flemish region (northern part of Belgium) of Western Europe. The survey population was constructed along the following lines. Based on the size, industry and location (province) of all firms that have published financial statements over the years 1993-1999 (all Belgian companies, private as well as public, with limited liability of the shareholders have to publish financial statements) a three dimensional matrix was designed. According to the percentages of the matrix 10 percent of this population was chosen at random (21,640 firms) and within this group those firms with at least five full time employees received a questionnaire (8,367 firms). Start-ups and micro-firms are thus excluded from the study. A total of 839 usable responses were received immediately. Due to the large initial survey population, it was too expensive to send a follow-up survey to all non-

respondent firms. Therefore, we addressed the follow-up survey to a random selection of 10 percent of the non-respondents (750 firms). This resulted in an additional 83 usable questionnaires. In total 922 responses were obtained, representing a response rate of 11.02 percent. We checked for dissimilarity between the immediate respondents and the respondents to the follow-up survey. The statistical tests for the variables short-term planning sophistication, PEU, strategy, firm size and industry did not reveal significant differences between the two groups of respondents. We conclude that non-response bias is absent.

Of the 922 respondents, 82 percent identified themselves as CEOs. We are aware of the potential variance among managers' perceptions of organizational characteristics within the same firm (Snow and Hambrick 1980). However, in relation to this research project, we have arguments to source the assessment of strategy and PEU from one person in the firm, being the CEO. A number of researchers have argued that CEOs have the most realistic understanding (and control) of a firm's strategic orientation and environmental uncertainty (Andrews 1971). Rogers and Bamford (2002) state that this is especially true in smaller organizations. Our research population consists only of SMEs, with 90 percent being small firms. Further, a study by Crampton and Wagner (1994) suggests that the common method bias problem may be overstated, at least for the types of variables considered in this study. Crampton and Wagner (1994) did not specifically address the concepts of planning, strategy or PEU, but revealed that concepts that are external referents to the focal individual (for example organizational structure, job scope, organizational culture, goal characteristics) are not seriously affected by common method bias. This is in contrast to variables whose referents are internal states or attributes. Consequently, the problem of common method bias is negligible in our study.

Profile of Respondents

In this study we restrict the initial population of the responding firms (922) to SMEs that employ between 5 and 250 full time equivalent (FTE) employees and that are active in the manufacturing and the trade industry. Applying the size constraint to our initial population of respondents eliminates 63 firms with more than 250 FTE employees. Second, the industry criterion eliminates 93 firms from the dataset. We omitted the service firms because a number of them mentioned that the survey questions about planning sophistication were inapplicable to their firms. These constraints reduce the population of respondents of 922 firms to a dataset of 766 firms. We further reduce this population of 766 firms for the following reasons. 59 cases are lost due to our stringent definition of a (non)family firm (see variable measurement). Because of mixed ownership/perception patterns 59 firms cannot be identified as family or non-family firms. 77 cases are lost due to incomplete responses for one or more of the research variables (mostly strategy and perceived environmental uncertainty). These further eliminations reduce the research population to 630 firms.

Table 1 presents the characteristics of these 630 firms. The largest proportion of firms is active in the manufacturing industry (57 percent). Almost 90 percent of the firms count less than 50 FTE employees. About 34 percent of the firms follow a defender strategy and about 29 percent follow a prospector strategy.

< Insert table 1 >

Variable Measurement

In this section we describe the measurement of the dependent and independent variables.

Planning Sophistication. The degree of planning sophistication is arrived at by combining information on the planning system's scope and formality. We asked the respondents to indicate which of the five short-term plans or budgets they kept (sales, production, costs, investments and liquidity). In a next step, the respondents had to indicate for each short-term plan the degree of formality being applied to it. Four levels of planning sophistication (derived from Matthews, and Scott 1995) were distinguished: "formal plans" or plans being fully written out (coded 3)**,** "informal plans" or plans being partly written out (coded 2), "intuitive plans" or plans only existing in the minds of the managers (coded 1), and "no planning at all" (coded 0). The average sophistication over the five short-term plans is our measure for short-term planning sophistication. Table 2 presents the descriptive statistics with regard to the sophistication of the five individual short-term plans and the average sophistication over the five short-term plans.

<insert table 2>

The mean value of our measure of short-term planning sophistication is comparable with the figures found in other small business studies (Wijewardena, De Zoysa, Fonseka, and Perera 2004; Gibson, and Cassar 2002; Perry 2001; Masurel, and Smit 2000; Rue, and Ibrahim 1998). The inter-term reliability (Cronbach alpha) coefficient amounts to 0,90. This implies that a low (vs. medium / vs. high) score for the average short-term planning sophistication means that quasi each of the five individual short-term plans demonstrates a low (vs. medium / vs. high) sophistication level. The high Cronbach alpha coefficient reveals that firms do not differentiate between the level of formality applied to these individual short-term plans: either they use all of the individual plans in a formal way, or they use all of them in an informal or intuitive way.

Environmental Uncertainty. To capture environmental uncertainty a three-item scale developed by Khandwalla (1976/77) is used (benevolent/hostile, opportunity oriented/stressful,

controllable/uncontrollable). In order to determine the first item, the respondents had to indicate on a five-point scale the extent to which their environment is safe and presents little threat for the firms' survival *versus* whether the environment is very risky and prone to false steps leading to the firm's failure. In response to the second item, they had to indicate the extent to which their environment is either rich in opportunities *versus* very stressful, exacting and hostile. In relation to the third item, they had to indicate the extent to which their environment can be controlled and manipulated to their own advantage *versus* whether the environment is a dominating environment in which the firm's initiatives count for very little against tremendous other forces. The respondents' ratings are averaged to arrive at a single environmental uncertainty index (mean of 1.69, standard deviation of 0.70, range from 0 to 4 and inter-term reliability of 0.59). A higher index refers to a more uncertain environment.

Strategy. Respondents were asked to identify the firm's strategy relating to its most important product. They had to select one of the four descriptions, derived from Daily and Dollinger (1992), each representing a Miles and Snow strategy type. For the prospector strategy: we innovate and take the necessary risks of providing new products and services. With regard to the analyzer strategy: we do not want to be the first in our industry to offer an unproven product or service, but we try to be close behind with a similar competitive product or service. In relation to a defender strategy: we stick to what we know how to do and do it as well as or better than anyone else. Finally for a reactor strategy: we do not follow a specific program to make us more competitive, but if we face strong opportunities or threats we make changes. The adopted strategy is measured with the use of four strategy dummies.

CEO experience. To capture CEO experience we use the CEO's tenure in the industry. This is calculated by adding together the number of years that the CEO works in the current firm and the number of years he or she worked in other firms in the same industry.

CEO education. Respondents had to select one of the following education levels measured on an ordinal scale: lower/secondary education (coded 1), higher education (three year program) (coded 2), higher education (four year program) (coded 3) and university education (coded 4).

Firm size. Firm size is captured by the number of full time equivalent employees.

Firm age. Firm age is calculated as the number of years that the firm is in operation since the date of start-up.

Family versus Nonfamily Firm. In line with de definition of Westhead (1997) family firms (coded 1) are firms that perceive themselves as family firms, and in which a family possesses the majority of the shares. Nonfamily firms (coded 0) are firms that do not perceive themselves as family firms, and in which a family does not own the majority of the shares.

Subsidiary versus Independent Firm. To capture firm (in)dependence we asked whether the firm is a subsidiary of a parent company (coded 0) or not (coded 1).

Industry. Industry is captured using NACE codes (equivalent of SIC codes). Manufacturing (coded 1) is represented by the NACE codes ranging from one to five. Trade (coded 0) is represented by the NACE codes six and seven.

Method of analysis

The sophistication of short-term planning systems is investigated with the use of the two regression models presented below. Both models include all the control variables derived from

the prior literature. In the first model PEU and strategy are included separately, as main effect variables only.

$$\textit{Short-term planning sophistication} = ß_0 + ß_1 PEU + ß_2 \ Strategy + ß_3 \ CEO \ education + ß_4 \ Ln(CEO \ experience) + ß_5 \ Ln(Firm \ size) + ß_6 \ Ln(Firm \ age) + ß_7 \ (Non)family \ firm \ (0/1) + ß_8 \ (In)dependence + ß_9 \ Industry$$

In the second model we also consider the interaction effect of PEU and strategy.

$$\textit{Short-term planning sophistication} = ß_0 + ß_1 PEU + ß_2 \ Strategy + ß_3 \ (Strategy \times PEU) + ß_4 \ CEO \ education + ß_5 \ Ln(CEO \ experience) + ß_6 \ Ln(Firm \ size) + ß_7 \ Ln(Firm \ age) + ß_8 \ (Non)family \ firm \ (0/1) + ß_9 \ (In)dependence + ß_{10} \ Industry$$

"Strategy" is a vector of strategy dummies (prospector, analyzer, defender and reactor) with the reactor as strategy of reference. If the inclusion of the interaction variables significantly increases the model's power to explain the variance in the dependent variable, then we may state that PEU and strategy are interactively related to the degree of planning sophistication.

To solve the multicollinearity problem associated with the interaction terms and the strategy dummies, we use a centered PEU variable (PEU_c) derived by subtracting the mean PEU (1.69) from each case. This makes sure that the bivariate correlation between a certain strategy dummy (if 1) and its interaction term is not automatically positive, but can be positive or negative. The method is successful since the values of the variance inflation factors (not shown) no longer exceed the cutoff value of 10 (Bowerman, and O'Connell 1990). The centered PEU variable should be interpreted as follows. Lower than average PEU levels are represented by a negative PEU_c, average PEU levels by a PEU_c equal to zero, and higher than average PEU levels by a positive PEU_c. Thus, in the regression model the main effects of the strategy dummies

should be interpreted as the effects of the strategy dummies at average PEU levels (PEU_c =0). To facilitate comparisons between both models, we also use a centered PEU variable in model 1.

Table 3 presents the descriptive statistics of the research variables. Table 4 shows the correlations between these research variables.

<Insert table 3 and table 4>

Results

Table 5 shows the results of both regression models explaining the degree of short-term planning sophistication.

<Insert table 5>

The F test shows that model 2 has a significantly higher adjusted R^2 than model 1. Consequently, model 2 explains a higher proportion of the variance in the level of short-term planning sophistication than model 1. The regression results of model 2 provide evidence that PEU and strategy are interactively related to short-term planning sophistication.

Looking at the individual strategy dummies, we notice that at average PEU levels (PEU_c = 0) short-term planning sophistication is significantly higher for prospectors (0.416) than for analyzers (0.172), reactors (reference) and defenders (-0.140). The coefficients of the interaction variables, however, reveal that increasing PEU levels significantly discourage short-term planning sophistication among prospectors (-0.583), but encourage short-term planning sophistication, in a statistically non significant manner though, among analyzers (0.176) and defenders (0.004). Taking into account the strategy dummies and the interaction variables together, the following result is revealed. At increasing PEU levels the level of short-term planning sophistication among prospectors decreases from the highest to the lowest position in comparison with analyzers, defenders and reactors. In other words, at low to average PEU levels

prospectors demonstrate higher levels of short-term planning sophistication than analyzers (PEU < 2.01), defenders (PEU < 2.638) and reactors (PEU < 2.405). At high PEU levels, however, prospectors have less sophisticated planning systems than analyzers (PEU > 2.01), defenders (PEU > 2.638) and reactors (PEU > 2.405). Although statistically not significant, it seems that at all PEU levels analyzers plan more sophisticatedly than defenders. Our findings thus only support the hypotheses H3a en H3b.

Our findings thus reveal that among defenders and analyzers the level of PEU does not significantly contribute to the explanation of the variance in the degree of short-term planning sophistication. Only among prospectors the level of short-term planning sophistication is significantly related to the level of PEU. An explanation for this finding might be found in the difference in information requirements between these strategies combined with the availability of information, which is influenced by the environmental uncertainty. Prospectors, by definition, need to take advantage relatively quickly of new opportunities to stay ahead of competitors. Therefore, prospectors need to collect much more external information from the environment than the other strategy types. As a consequence, at low or average PEU levels prospectors invest in formal planning systems to collect the external information that is necessary to plan the near future. At high PEU levels the external information is less reliable or does not exist. So, at high PEU levels formal planning is inevitably based on an input of less reliable or even unavailable external information, and as such is not appropriate for prospectors. Prospectors that take the time to plan formally in these circumstances may loose the identified opportunities. Among defenders and analyzers the level of short-term planning sophistication is not significantly related to the PEU level. The defender strategy is characterized by routine and a primary focus on the cost efficiency of internal processes. Defenders do not really have to take advantage (quickly) of

new opportunities in the environment and their need for external information is therefore less. Given that the information requirements of defenders are different from those of prospectors, the unreliability or unavailability of external information does not affect defenders to the same extent as prospectors. At high PEU levels defenders do not lose all the vital information that is necessary to plan the near future and as such, at high PEU levels defenders are able to continue with the existing planning systems. Similarly, unlike prospectors, analyzers do not want to be the first in the market to launch a new product, but try to be close behind. Consequently, analyzers do not have to respond to the environment as quickly as prospectors and can continue planning in the face of increasing uncertainty.

With regard to the control variables, measuring several CEO and firm characteristics, both models show consistent results. Concerning the CEO characteristics our results indicate that CEOs with higher education levels rely more on sophisticated planning, which is in line with the prior literature. With regard to the CEO's experience in the industry, however, the results reveal that a longer tenure in the industry does not influence the level of short-term planning sophistication. Concerning the firm characteristics, firm size is found to be positively related to short-term planning sophistication and being a family firm is found to be negatively related to short-term planning sophistication. These findings are consistent with the prior literature. Next, we find that the degree of short-term planning sophistication is dependent on the industry as well. The results show that manufacturing firms can thrive with lower levels of short-term planning sophistication than trade firms. Further, our findings indicate that subsidiary SMEs have more sophisticated short-term planning systems than independent SMEs. This implies that contingency studies trying to explain planning systems design suffer from an omitted variable problem if they dot not control for firm (in)dependence. Finally, the control variable firm age

shows the expected negative coefficient, but is not significant. So, firm age and CEO experience do not seem to play a role in short-term planning practices.

Conclusion

The aim of this empirical contingency study was to gain more insight into the conflicting findings of the prior contingency literature investigating how PEU and strategy relate to planning systems design. Based on prior theoretical and empirical studies we investigated the interactive effect of PEU and strategy on short-term planning sophistication, simultaneously controlling for several CEO and firm characteristics. Our main conclusion is that PEU and strategy must be considered in interaction to understand their relationship with short-term planning sophistication. We find that increasing PEU levels go together with decreasing short-term planning sophistication among prospectors. Among analyzers and defenders, however, increasing PEU levels go together with increasing short-term planning sophistication, but not in a statistically significant way. Further, we find that prospectors plan more sophisticatedly than analyzers and defenders at low PEU levels, whereas at high PEU levels analyzers and defenders plan more sophisticatedly than prospectors.

The existence of this interaction effect is incompatible with a straightforward relationship between planning systems design and PEU (considered separately), nor with a straightforward relationship between planning systems design and strategy (considered separately). These findings show thus that the lack of straightforward results in the prior literature with regard to how PEU and strategy relate to planning systems design can be attributed to the fact that strategy and PEU have always been considered as separate, main effect variables and that their interaction has never been studied (except for Matthews, and Scott 1995).

Finally, our paper attempted to bridge the gap between practice and research. We provide practitioners with research results that aid in the development of planning techniques aimed at helping managers in their decision making and control process. This study, situated in the structural contingency framework, adopted a "selection" approach assuming that fit is the result of an evolutionary process of adaptation that ensures that only organizations with a "good" fit survive (Drazin, and Van De Ven 1985). Given that the respondent firms existed for at least 13 years, the revealed relationships between the contingent variables and short-term planning sophistication can be considered as "good" fits of long-term survivors. We can thus conclude that at low and average PEU levels prospectors need more sophisticated planning systems to survive and to be successful than defenders, analyzers and reactors. At high PEU levels, however, prospectors can thrive with less sophisticated planning systems.

References

Andrews, K.R. (1971). *The Concept of Corporate Strategy*. Homewood, IL: Dow Jones-Irwin.

Baybrooke, D., and C.E. Lindblom (1970). *A Strategy of Decision: Policy Evaluation as a Social Process*. New York: Free Press.

Bergh, D.D. (1998). "Product-Market Uncertainty, Portfolio Restructuring, and Performance: an Information-Processing and Resource-Based View," *Journal of Management* 24(2), 135-155.

Berman, Jeffrey A., Daniel D. Gordon, and Gerald A. Sussman (1997). "A Study to Determine the Benefits Small Business Firms Derive from Sophisticated Planning versus Less Sophisticated Planning,". *Journal of Business & Economic Studies*, 3 (3), 1-10.

Bhide, A. (1994). "How Entrepreneurs Craft Strategies That Work," *Harvard Business Review* 72, 150-163.

Bowerman, B.L., and R.T. O'Connell (1990). *Linear Statistical Models: an Applied Approach*. 2nd edn. Duxbury, Belmont, CA: International Thompson Publishing.

Brownell, Peter (1985). "Budgetary Systems and the Control of Functionally Differentiated Organizational Activities," *Journal of Accounting Research*, 23 (2), 502-512.

Chapman, Christopher S. (1997). "Reflections on a Contingent View of accounting," *Accounting, Organizations & Society*, 22 (2), 189-205.

Chenhall, R.H. (2003). "Management Control Systems Design within its Organizational Context: Findings from Contingency-Based Research and Directions for the Future," *Accounting, Organizations and Society* 28(2-3) , 127-168.

Chenhall, R.H., and D. Morris (1995). "Organic Decision and Communication Processes and Management Accounting Systems in Entrepreneurial and Conservative Business Organizations," *Omega, International Journal of Management Science* 23(5), 485-497.

Collins, F., O. Holzmann, and R. Mendoza (1997). "Strategy, Budgeting, and Crisis in Latin America," *Accounting, Organizations & Society*, 22 (7), 669-689.

Covin, J.G., and D.P. Slevin (1989). "Strategic Management of Small Firms in Hostile and Benign Environments," *Strategic Management Journal* 10 (1), 75-87.

Crampton, Suzanne M., and John A. Wagner III (1994). "Percept-Percept Inflation in Microorganizational Research: An Investigation of Prevalence and Effect," *Journal of Applied Psychology*, 79 (1), 67-76.

Cyert, R. M., and J.G. March (1963). *A behavioral Theory of the Firm*. Englewood Cliffs, N.J.: Prentice Hall.

Daily, C. M., and M. J. Dollinger (1992). "An Empirical Examination of Ownership Structure in Family Managed and Professionally Managed Firms," *Family Business Review* 5(2), 117-136.

Dent, J.F. (1990). "Strategy, Organisation and Control: Some Possibilities for Accounting Research," *Accounting, Organisations and Society* 15(1-2), 3-26.

Drazin, Robert, Andrew H. Van de Ven (1985). "Alternative Forms of Fit in Contingency Theory," *Administrative Science Quarterly*, 30 (4), 514-540.

Drucker, Peter F. (1973). "The Performance Gap in Management Science: Reasons and Remedies," *Organizational Dynamics*, 73 (2), 19-29.

Finkelstein, Sidney, and Donald C. Hambrick (1996). *Strategic Leadership: Top Executives and their Effects on Organizations.* St. Paul, Minn.: West Publishing.

Foster, G., and M. Gupta (1994). "Marketing, Cost Management and Management Accounting," *Journal of Management Accounting Research* 6, 43-77.

Fredrickson, J. W., and T. R. Mitchell (1984). "Strategic Decision Processes: Comprehensiveness and Performance in an Industry with an Unstable Environment," *Academy of Management Journal* 27(2), 399-423.
Galbraith, Jay R. (1973). *Designing Complex Organizations*. Reading, Mass.: Addison-Wesley Publishing Company.
Gerdin, Jonas, and Jan Greve (2004). "Forms of Contingency Fit in Management Accounting Research — a Critical Review," *Accounting, Organizations & Society*, 29 (3/4), 303-327.
Gerdin, Jonas (2005). "Management Accounting System Design in Manufacturing Departments: an Empirical Investigation using a Multiple Contingencies Approach," *Accounting, Organizations & Society*, 30 (2), 99-126.
Gibbons, P. T., and T. O'Connor (2005). "Influences on Strategic Planning Processes among Irish SMEs," *Journal of Small Business Management* 43 (2), 170-186.
Gibson, B., and G. Cassar (2002). "Planning Behaviour Variables in Small Firms," *Journal of Small Business Management* 40(3), 171-186.
Hambrick, D.C., M. Geletkancyz, and J.W. Fredrickson (1993). "Top Executive Commitment to the Status Quo: Some Tests of its Determinants," *Strategic Management Journal* 14, 401-418.
Hambrick, D.C., and P. Mason (1984). "Upper Echelons: The Organization as a Reflection of its Top Managers," *Academy of Management Review* 9, 193-206.
Hartmann, F. (2000). "The Appropriateness of RAPM: Towards the Further Development of Theory," *Accounting, Organizations and Society* 25(4-5), 451-482.
Hartmann, F. (2005). "The Impact of Departmental Interdependencies and Management Accounting System Use on Subunit Performance: A Comment," *European Accounting Review* 14(2), 329-334.
Jensen, M.C., and W.H. Meckling, (1976). "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," *Journal of Financial Economics* 3, 303-360.
Jones, C.S. (1985). "An Empirical Study of the Evidence for Contingency Theories of Management Accounting Systems in Conditions of Rapid Change," *Accounting, Organizations and Society* 10(3), 303-329.
Katz, R. (1982). "The Effects of Group Longevity on Project Communication and Performance," *Administrative Science Quarterly* 27, 81-104.
Kets de Vries, M.F.R. (1993). "The Dynamics of Family Controlled Firms: the Good and the Bad News," *Organization Dynamics* 21(3), 59-72.
Khandwalla, P.N. (1976/77). "Some Top Mannagament Styles, Their Context and Performance," *Organization and Administrative Sciences* 7(4), 21-51.
Langfield-Smith, Kim (1997). "Management Control Systems and Strategy: a Critical Review" *Accounting, Organizations* & *Society*, 22 (2), 207-232.
Lyles, M. A., I. S. Baird, J. B. Orris, and D. F. Kuratko (1993). "Formalised Planning in Small Business: Increasing Strategic Choices," *Journal of Small Business Management* 31(2), 38-50.
Masurel, E., and H. P. Smit (2000). "Planning Behaviour of Small Firms in Central Vietnam," *Journal of Small Business Management* 38(2), 95-102.
Matthews, C. H., and S. G. Scott (1995). "Uncertainty and Planning in Small and Entrepreneurial Firms," *Journal of Small Business Management* 33(4), 34-65.
McGee, J.E., and O.O. Sawyerr (2003). "Uncertainty and Information Search Activities: a Study of Owner-Managers of Small High Technology Manufacturing Firms," *Journal of Small Business Management* 41(4), 385-401.
Miles, E.E., C.C. Snow, and A.D. Meyer (2003). *Organisational Strategy, Structure and*

Process. Stanford, Calif.: Stanford Business Books.
Miller, C.C., and L.B. Cardinal (1994). "Strategic Planning and Firm Performance: a Synthesis of More than Two Decades of Research," *Academy of Management Journal* 37(6), 1649-1665.
Miller, Danny (1991). "Stale in the Saddle: CEO Tenure and the Match between Organization and Environment," *Management Science*, 37 (1), 34-52.
Miller, D. (1988). "Relating Porter's Business Strategies to Environment and Structure: Analysis and Performance Implications," *Academy of Management Journal* 31(2), 280-308.
Miller, D., M.F.R. Kets de Vries, and J.M. Toulouse (1982). "Top Executive Locus of Control and its Relationship to Strategy Making, Structure and Environment," *Academy of Management Journal* 25(2), 237-253.
Milliken, F.J. (1987). "Three Types of Perceived Environmental Uncertainty about the Environment: State, Effect and Response Uncertainty," *Academy of management Review* 12, 133-143.
Mintzberg, Henry (1972). "The Myths of MIS," *California Management Review*, 15 (1), 92-98.
Moores, K., and S. Yuen (2001). "Management Accounting Systems and Organisational Configuration: a Life-Cycle Perspective," *Accounting, Organisations and Society* 26(4-5), 351-390.
O'Neill, Hugh M., Charles B. Saunders, and Alan N. Hoffman (1987). "Beyond the Entrepreneur: Planning as the Organization Grows," *Business Forum*, 12 (4), 38-41.
Otley, David T. (1980). "The Contingency Theory of Management Accounting: Achievement and Prognosis," *Accounting, Organizations & Society*, 5 (4), 413-428.
Otley, David T. (1978). "Budget Use and Managerial Performance," *Journal of Accounting Research* 16(1), 122-149.
Patterson, R. (1986). "Strategic Planning for Small Business," *Handbook of Strategic Planning*. Ed. J.R. Gardner, R. Rachlin, and A. Sweeny. New York, N.Y.: John Wiley, 242-251.
Piëst, B. (1994). "Planning Comprehensiveness and Strategy in SMEs," *Small Business Economics* 6(5), 387-395.
Perry, S.C. (2001). "The Relationship Between Written Business Plans and the Failure of Small Businesses in the U.S.," *Journal of Small Business Management* 39(3), 201-208.
Rajagopalan, Nandini, and Deepak K. Datta (1996). "CEO Characteristics: Does Industry Matter?," *Academy of Management Journal*, 39 (1), 197-215.
Risseeuw, P., and E. Masurel (1994). "The Role of Planning in Small Firms: Empirical Evidence from a Service Industry," *Small Business Economics* 6(4), 313-332.
Rogers, P.R., A. Miller, and W.Q. Judge (1999). "Using Information-Processing Theory to Understand Planning/Performance Relationships in the Context of Strategy," *Strategic Management Journal* 20(6), 567-577.
Rogers, P.R., and C.E. Bamford (2002). "Information Planning Process and Strategic Orientation. The Importance of Fit in High-Performing Organizations," *Accounting, Organizations and Society* 55, 205-215.
Rue L.W., and N.A. Ibrahim (1998). "The Relationship Between Planning Sophistication and Performance in Small Businesses," *Journal of Small Business Management* 36(4), 24-32.
Schrader, C. B., C. L. Mulford, and V.L. Blackburn (1989). "Strategic and Operational Planning, Uncertainty, and Performance in Small Firms," *Journal of Small Business Management* 27(4), 45-60.

Schwenk, Charles B., and Charles B. Shrader (1993). "Effects of Formal Strategic Planning on Financial Performance in Small Firms: A Meta-Analysis," *Entrepreneurship: Theory & Practice*, 17 (3), 53-64.
Simons, Robert (1987). "Accounting Control Systems and Business Strategy: an Empirical Analysis," *Accounting, Organizations & Society*, 12 (4), 357-374.
Snow, C.C, and D.C. Hambrick (1980). "Measuring Organizational Strategies: Some Theoretical and Methodological Problems," *Academy of Management Review* 5(4), 527-538.
Tushman, M.L., and E. Romanelli (1985). Organizational Evolution: A Metamorphosis Model of Convergence and Reorientation. In *Research in Organizational Behavior*, ed. L.L. Cummings and B.M. Staw 7, 171-222. Greenwhich, Conn.: JAI Press.
Westhead, P. (1997). "Ambitions, External Environment and Strategic Factor Differences between Family and Non-Family Companies," *Entrepreneurship and Regional Development* 9(2), 127-158.
Wijewardena, H.; A. De Zoysa, T. Fonseka, and B. Perera (2004). "The Impact of Planning and Control Sophistication on Performance of Small and Medium-Sized Enterprises: Evidence from Sri Lanka," *Journal of Small Business Management* 42(4), 209-217.
Williams, J.J., and A.E. Seaman (2001)0. "Predicting Change in Management Accounting Systems: National Culture and Industry Effects," *Accounting, Organizations and Society* 26(4-5), 443-460.

Table 1
Profile of Respondents

Industry	**Manufacturing**	**Trade**			**Total**
firms	359	271			630
percent	57	43			100
Firm size	**Micro 5-10 FTEs[a]**	**Small 10- 50 FTEs**	**Medium-Sized 50- 250 FTEs**		**Total**
firms	191	362	77		630
percent	30.3	57.5	12.2		100
Strategy type	**Prospector**	**Analyzer**	**Defender**	**Reactor**	**Total**
firms	183	115	217	115	630
percent	29.0	18.3	34.4	18.3	100

[a] FTEs: full time equivalent employees

Table 2
Short-Term Planning Sophistication: Descriptives

	Mean	***Std.***	***Range (theoretical = actual)***
Short-term sales plan sophistication	1.38	1.29	0-3
Short-term production plan sophistication	0.97	1.23	0-3
Short-term cost plan sophistication	1.60	1.24	0-3
Short-term investment plan sophistication	1.63	1.18	0-3
Short-term liquidity plan sophistication	1.31	1.18	0-3
Short-term planning sophistication (DV)	1.38	1.05	0-3

Table 3
Research Variables: Descriptives

	Mean	*Std.*	*Min*	*Max*
1. Short-term planning sophistication	1.38	1.05	0	3
2. [a]PEU_c	0.00	0.70	-1.69	2.31
3. Prospector (0/1)	0.29	0.45	0	1
4. Analyzer (0/1)	0.18	0.39	0	1
5. Defender (0/1)	0.34	0.48	0	1
6. CEO education	2.32	1.17	1	4
7. Ln (CEO experience)	2.86	0.67	-0.29	4.16
8. Family firm (1) / nonfamily firm (0)	0.86	0.35	0	1
9. Ln (firm age)	3.04	0.60	0.40	4.74
10. Ln (firm size)	2.90	0.88	1.61	5.46
11. Manufacturing (1) / trade (0)	0.57	0.50	0	1
12. Independent firm (1) / subsidiary (0)	0.87	0.34	0	1

[a] $PEU_c = PEU - 1.6918$ (rounded 1.69)

Table 4
Research Variables: Spearman's Rho Correlations

	1.	**2.**	**3.**	**4.**	**5.**	**6.**	**7.**	**8.**	**9.**	**10.**	**11.**	**12.**
1.	1.00											
2.	-.06	1.00										
3.	.32**	-.15**	1.00									
4.	.01	.02	-.30**	1.00								
5.	-.24**	.10*	-.47**	-.34**	1.00							
6.	.27**	.05	.12**	.09*	-.17**	1.00						
7.	-.12**	-.04	-.05	-.04	.08	-.34**	1.00					
8.	-.25**	-.02	-.07	.05	.00	-.15**	.15**	1.00				
9.	.05	.08	.01	-.05	.02	.12**	.16**	.02	1.00			
10.	.34**	.03	.17**	-.00	-.11**	.30**	-.00	-.20**	.19**	1.00		
11.	-.08*	-.02	-.05	.06	-.05	.04	-.01	.04	-.02	.16**	1.00	
12.	-.27**	-.06	-.17**	.05	.09*	-.16**	.08*	.42**	-.02	-.25**	-.02	1.00

For the meaning of the numbers 1 to 12: see table 3
** p<0.05, ** p<0.01*

Table 5
Hierarchical OLS Regressions Explaining Short-Term Planning Sophistication

Predictors	**Model 1**		**Model 2**	
	Unstandardized Coefficients		*Unstandardized Coefficients*	
	Beta	*Std. Error*	*Beta*	*Std. Error*
Constant	1.092	0.307	1.023	0.301
[a] PEU_c (c: centered)	- 0.064	0.053	0.052	0.138
Prospector (0/1)	0.487***	0.112	0.416***	0.110
Analyzer (0/1)	0.175	0.121	0.172	0.119
Defender (0/1)	- 0.133	0.106	- 0.140	0.104
Reactor (0/1)	reference		reference	
Prospector x PEU_c			- 0.583***	0.172
Analyzer x PEU_c			0.176	0.191
Defender x PEU_c			0.004	0.158
Reactor x PEU_c			reference	
CEO education	0.107***	0.036	0.107***	0.035
CEO experience (ln)	- 0.034	0.060	- 0.025	0.059
(Non)family firm	- 0.355***	0.116	- 0.351***	0.114
Firm Size (ln)	0.262***	0.047	0.267***	0.047
Firm Age (ln)	- 0.007	0.063	- 0.010	0.062
Industry	- 0.247***	0.075	- 0.250***	0.074
(In)dependence	- 0.366***	0.120	- 0.355***	0.003
F (Full Model)	20.145***		18.473***	
R^2	0.264		0.296	
Adj. R^2	0.251		0.280	
df	11		14	
F test of change in adj.R^2	8.257***			

[a] $PEU_c = PEU - 1.6918$
****p < 0.01, **p < 0.05, *p < 0.1*