Advances in Accounting, incorporating Advances in International Accounting xxx (2014) xxx–xxx

Contents lists available at ScienceDirect

Advances in Accounting, incorporating Advances in International Accounting

journal homepage: www.elsevier.com/locate/adiac

Influence of cost accounting change on performance of manufacturing firms

Erkki K. Laitinen *

ACA research Group, University of Vaasa, POB 700, FIN-65101 Vaasa, Finland

ARTICLE INFO

Available online xxxx

Keywords:
Cost accounting change
Pricing system change
Effect on performance
PEU
Finnish firms
Manufacturing firms
Survey
PLS

ABSTRACT

The purpose is to analyze the influence of cost accounting change (CAC) on the financial performance of Finnish firms. Empirical data are based on a survey responded by 121 manufacturing firms. PLS is used to extract the influence of CAC on performance. The general expectation is that CAC should have a positive lagged effect of performance. However, prior empirical evidence is mixed and usually only a weak influence is found, if any. This study shows that CAC is closely associated with a simultaneous pricing system change (PSC). CAC and PSC are interrelated because product cost usually plays an important role in pricing. PLS shows that CAC has a weak positive lagged main effect on performance whereas PSC has a strong negative effect. The total effect of CAC is insignificant because the positive direct effect is offset by the negative mediation indirect effect through PSC. The result indicates that when assessing the influence of CAC on performance it is important also to take account of the corresponding indirect influence through PSC. The study also shows that perceived environmental uncertainty (PEU) has a strong negative moderating effect on the influence of PSC on performance. Thus, the influence of PSC on performance is more negative when PEU is high.

1. Introduction

Management accounting changes (MAC) are made for many reasons. It can be based on reasoning for efficiency-choice, forced selection, or fad and fashion (Malmi, 1999). However, as a final outcome it is usually expected that MAC leads to improvement in the performance of the firm (Arnold, 2006; Merchant & Otley, 2006). Unfortunately, the influence of MAC or any information system change (ISC) especially on financial performance is not straightforward. In fact, empirical evidence on this influence is mixed (Jänkälä & Silvola, 2012; Maiga & Jacobs, 2008; Rom & Rohde, 2007). It has been reported as positive, insignificant, or even negative. There are several reasons for mixed results. First, the positive and negative effects of MAC may offset each other making the net influence weak or non-existent (productivity paradox). Second, the effect of a specific MAC can be difficult to identify because it may be associated with broader management system change (MSC). Third, the influence of MAC is difficult to measure or recognize immediately after change because it has lagging effects for several years (Chenhall, 2004; Jänkälä & Silvola, 2012; Luft & Shields, 2003). Fourth, the relationship of MAC to performance may be bidirectional making performance part of the context variables (Jänkälä & Silvola, 2012; Rom & Rohde, 2007). This is the case especially when performance is measured in the same time period when MAC is made.

Cost accounting (CA) is one of the most important management accounting systems (MAS). In general, the expectations for the influence of cost accounting change (CAC) on performance are positive as for any MAC. It is expected that CAC helps the management to make operational improvements and redirect strategic decisions (Jänkälä & Silvola, 2012; Maiga & Jacobs, 2008). Then, financial performance related to operational improvements can be visible in the form of improved profitability and sales increase (Kaplan & Cooper, 1998). CAC can be expected to improve financial performance through cost reductions, better resource utilization, and cost avoidance. In most cases, CAC leads to changes in product cost information that may play a key role in determining selling prices (Guilding, Drury, & Tayles, 2005; Lucas & Rafferty, 2007). In general, a great majority of firms use costing techniques and practices for product pricing (Govindarajan & Anthony, 1983; Guilding et al., 2005; Shim & Sudit, 1995). Especially in larger firms cost accounting system (CAS) can be closely related to pricing system (PS). In these kinds of firms, CAS generates a report of product costs for marketing staff taking account of demand conditions and setting prices (Banker & Hughes, 1994). Even the way in which costs are here reported may affect pricing decisions (Cardinaels, 2008).

Thus, it can be expected that in most firms MAC is associated with a simultaneous pricing system change (PSC). Pricing is one of the most important decisions made by the management (Skouras, Avlonitis, & Indounas, 2005). The pricing decision may influence the demand of the product in the market, the pricing strategy of the competitors, and

* Tel.: +358 29 449 8443.
E-mail address: ekla@uva.fi.

http://dx.doi.org/10.1016/j.adiac.2014.03.003
0882-6110/

the growth and profitability of the firm having thus potentially a strong effect on financial performance. In fact, pricing is the only marketing plan variable that generates revenues and is therefore a significant factor of profitability and growth. The effect of pricing on profitability and sales has been shown in many analytical studies (Banker & Hughes, 1994) or experiments (Balakrishnan & Sivaramakrishnan, 2001) contrasting marginal and full-cost pricing. The positive effect of PSC has also been shown by management science scholars (Gallego & van Ryzin, 1997) and by consultants (Simon, Butscher, & Sebastian, 2003). In MAC studies, the simultaneous effects of CAC and PSC on financial performance have not been earlier analyzed in spite of their obvious relationship.

In conclusion, research on the link between financial performance and CAC is still a controversial issue and many questions remain. Empirical evidence on this link is mixed suggesting on the one hand a strong direct positive relationship and on the other hand no relationship (Foster & Swenson, 1997; Innes, Mitchell, & Sinclair, 2000; Maiga & Jacobs, 2008; Malmi, 1999). Many reasons have been suggested for the inconclusive results as discussed above. In addition, Chenhall and Langfield-Smith (1998) suggest potential intervening effects of organizational variables as a reason while Kennedy and Affleck-Graves (2001) suggest that CA is only correlated with the true drivers of financial performance. The objective of this research is to extend CAC research to these directions taking account of the moderating effect of perceived environmental uncertainty (PEU) on this relationship and considering PSC as a mediator. In this way, it is possible to consider both the direct effect and the indirect effect of CAC through PSC, moderated by PEU. This modeling is based on hypotheses that CAC is related to PSC, and that a large part of the total effect is mediated by PSC. It is also hypothesized that these effects are not straightforward but moderated by PEU. This moderation is based on the argument that CAC and PSC are regarded as a response to PEU to construct a buffer against the uncertainty in the market (Chenhall, 2003). It is said that in this way there is found a fit or match with the environment which is expected to lead to improved performance. Thus, it is argued here that research on the effects of CAC is too limited when only concentrating on the direct effect and paying no attention on the effects of PSC and PEU.

In this study, CAC is not specified as an implementation or an extent of use of any particular CAS (such as activity-based costing (ABC)) but as a general long-term evolutionary CAC. In this way, the study provides us with a more general framework than most previous studies. The financial performance of the firm is measured by profitability and growth one and two years after the survey period to take account of lagged effects and to avoid the bidirectional relationship between CAC and performance. It will be shown that CAC has a positive direct effect on financial performance but a strong negative indirect effect through PSC. These positive and negative effects largely offset each other leading to an existence of a productivity paradox and suggesting reasons for mixed results in previous CAC studies.

2. Research hypotheses

Fig. 1 shows the research model of the study. It is based on five research hypotheses about the influence of CAC on the financial performance of the firm. It is proposed that both CAC (H_1) and PSC (H_2) have a significant direct or main effect on performance. The research model also assumes that there is a direct link from CAC to PSC (H_3) showing that PSC as a mediator mediates the influence of CAC on performance. The research model thus emphasizes the importance of taking account of indirect effects of CAC in addition to direct effects, in order to assess the total effect of CAC. It is also assumed that the influence of both CAC (H_4) and PSC (H_5) on performance is moderated by PEU. PEU is an important variable to create a fit between MAS and environment. MAS are used as a buffer against uncertainty and therefore the influence of MAC depends on the degree of PEU. These research hypotheses are discussed in the following text in detail.

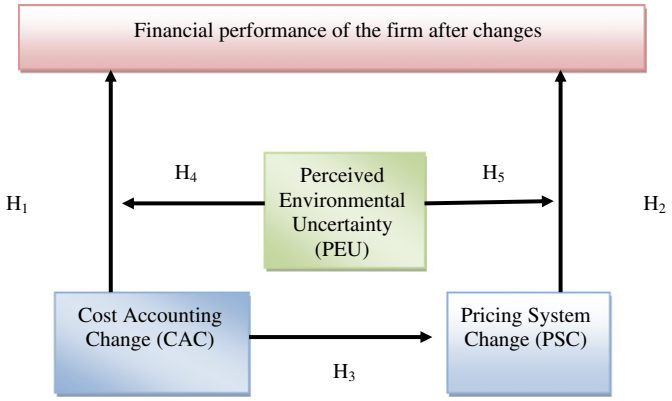


Fig. 1. The research model of the study.

2.1. Cost accounting change (CAC)

Cost is usually defined as a resource sacrificed to achieve a specific objective, usually expressed in monetary terms (Horngren, Foster, & Datar, 2000: 28). The purpose of cost accounting (CA) is to provide key cost information to managers for their decision making. It provides information for both management accounting and financial accounting. In general, the objective of CA is to act as a decision-support system for management to improve performance. In manufacturing firms, CA provides information for achieving and sustaining a competitive advantage through manufacturing excellence which requires attention to all aspects of performance (Turney, 1989). Thus, CAC is expected to result as a more efficient use of resources and better information for decision-making assisting in this way firms to achieve a better cost-efficiency, competitiveness, and overall performance in their business activities (Gosselin, 1997; Kaplan & Cooper, 1998). Especially in the context of activity-based costing (ABC), the potential influences of CAC are widely discussed and accepted (Gosselin, 1997). However, there is found an ABC paradox, since only a part of firms have adopted it, in spite of demonstrated positive influences. In addition, empirical evidence on the influence of CAC on performance is conflicting (Gosselin, 1997; Jänkälä & Silvola, 2012; Kennedy & Affleck-Graves, 2001; Maiga & Jacobs, 2008). These conflicting results may be due to the use of different measures for performance, different models and control variables, and inability to assess lagging effects. In general, the literature however suggests that CAC is expected to lead to increases in sales and decreases in cost implying improvement of performance in terms of growth and profitability (Kennedy & Affleck-Graves, 2001). Thus, the following research hypothesis will be presented:

H1. There is a positive association between CAC and financial performance.

2.2. Pricing system change (PSC)

Price is one of the four key elements of traditional product marketing mix (price, product, promotion, and place) but the only element that generates revenues (McCarthy, 1975). The four elements form a planned mix of the controllable elements of marketing plan. Pricing is one of the most important decisions made by management (Skouras et al., 2005). Pricing decisions are management decisions about what to charge for the products and services that the firm delivers. These

Please cite this article as: Laitinen, E.K., Influence of cost accounting change on performance of manufacturing firms, *Advances in Accounting, incorporating Advances in International Accounting* (2014), http://dx.doi.org/10.1016/j.adiac.2014.03.003

decisions, together with other elements of the marketing mix, affect the quantity of products to be sold and hence product revenues (Horngren et al., 2000: 422). If the firm tries to maximize profit, it produces and sells units of products as long the revenue from the additional unit exceeds the product unit cost (as long as marginal profit is positive). Thus, pricing is at the same time affected by cost and demand conditions which are not parallel and are difficult to align as an efficient decision leading to improvement in performance (Laitinen, 2011). In this decision-making, the price elasticity of demand plays the key role. If the price of the product is set to be too high under elastic demand, the demand will be low and lead to low profitability and slow growth. If the price is however too low, it may in the longer term lead to a high growth rate but at the same time to low profitability (because of insufficient profit margin). Thus, PSC generally deals with a target to improve the ability of management to utilize cost information, estimate demand conditions, to take account of demand uncertainty, and to find a good solution for price leading to improved performance in terms of growth and profitability.

In general, it can be expected that PSC leads to improved performance when it is carried out effectively. In MAC surveys, the effects of PSC on financial performance are usually considered only implicitly as an item of the multi-item MAC construct (Laitinen, 2001). However, these effects have been shown by many experimental and simulation studies contrasting marginal and full-cost pricing (Balakrishnan & Sivaramakrishnan, 2001, 2002; Banker & Hansen, 2002; Baumol & Quandt;, 1964; Burgstahler & Noreen, 1997; Hilton, Swieringa, & Turner, 1988; Lere, 1986; Tishlias & Chalos, 1988). The positive effects of CAC on financial performance are emphasized also by many management consultants. Marn, Roegner, and Zawada (2003) argued that pricing right is the fastest and most effective way for managers to increase profits. For a simple example, they showed that a price rise of 1% (if volumes remained stable), generates an 8% increase in operating profits. Simon et al. (2003) argue that firms are able to increase their profit margin by up to 2 percentage points by making their pricing process more effective. This estimate is valid for firms of all sizes and industries (including manufacturing). They emphasize however that achieving higher profits is not a simple matter of raising or lowering prices but considerably more complex and strongly driven by data analysis (Simon et al., 2003). Therefore, positive influences of PSC on performance have usually been reported by management science scholars applying advanced analytical techniques for pricing decisions (Gallego & van Ryzin, 1997; Heching, Gallego, & van Ryzin, 2002; Kopalle, Mela, & Marsh, 1999; McGill & van Ryzin, 1999). In summary, the following research hypothesis is proposed:

H2. There is a positive association between PSC and financial performance.

2.3. Relationship between CAC and PSC

The relationship between CAC and PSC is not straightforward. Empirical evidence shows that cost-based pricing where the price is determined mainly on the basis of cost, is the most popular pricing method (Avlonitis & Indounas, 2006; Laitinen, 2009; Shim & Sudit, 1995). In Finland, nearly 90% of the firms use cost-plus pricing where a markup (margin) is added to the product cost (Laitinen, 2009). In normative literature, cost information is also widely noted as playing a key role in determining selling prices (Guilding et al., 2005). Thus, on the one hand the popularity of cost-based pricing implies that CAC and PSC may be closely related with each other. However, on the other hand it is obvious that not all CAC will lead to PSC. Especially in large firms, the association between cost accounting, production and pricing decision typically follows the following six steps (Banker & Hughes, 1994): 1. Product costing system is designed and installed; 2. Production manager learns current production and cost parameters; 3. Product costing system generates report of product costs for marketing; 4. Marketing manager learns demand parameters, receives product cost report and sets prices; 5. Production manager receives report of expected demand from marketing and sets support activity capabilities; and 6. Demand is realized and met, with additional resources for support activities added if needed. Thus, in this simplified process the marketing manager makes use of the product cost report together with demand information to make the pricing decision. It shows that the product costing system and PS are separate management systems so that CAC does not always mean PSC and that PSC can occur without PSC. The interaction between CAC and PSC depends on the form of CAC.

CAC can take several different forms. CAC can be one of the following types (Sulaiman & Mitchell, 2005): addition (introduction of new techniques as extensions of existing MAS); replacement (introduction of new techniques as replacements for an existing part of MAS); output modification (modification of the information output of MAS); operational modification (modification of the technical operation of MAS); and reduction (the removal of a management accounting technique with no replacement). In CAC framework, replacement (for example replacement of traditional CA with ABC) and operational modification (for example, using new cost drivers) are considered as typical changes. These changes may lead to modified cost estimates but they do not always lead to a modification of cost report used in setting prices. However, often they affect reporting of cost information (for example, ABC can provide new information about customer cost) also leading to CAC in a form of output modification. It is also possible that CAC is made purely as an output modification. Cardinaels (2008) has shown that even presentation format of cost report (tabular or graphical format) can affect pricing decision. Specifically, decision makers with a low level of cost accounting knowledge (such as marketing managers) attain higher profits when they use a graphical format in comparison to a tabular format. However, it is important to note that even if a modification of cost report can affect the outcome of PS (price), it does not necessarily lead to PSC (change in system). In addition, it is possible that PSC will occur without any change in CAS.

In this study, CAC and PSC will be considered rather as long-term processes than instant changes of CAS and PS. Thus, CAC and PSC are merely regarded as evolutionary processes described typically by small and gradual, often slow changes in these systems. This evolutionary perspective implies that the development of MAS is explained as the interaction between the evolutionary sub-processes of retention (inheritance), variation, and selection (Johansson & Siverbo, 2009). These three sub-processes can be used to explain why even a significant change of CAC is not always followed by PSC. First, retention means that there is a discrepancy between the expected PSC and the actual PSC because mechanisms in the organization oppose the change in order to maintain continuity in pricing decision making. Because of this opposition, PS can be left unchanged and existing routines are followed. Second, variation must exist in order for an organization to change its PS. It is one explanation of why change does not occur in an organization, that there is simply no alternative (Brorström & Siverbo, 2004; Johansson & Siverbo, 2009). It may be that existence of variation is a key question for PSC in a large organization with taken-for-granted institutions and routines. Third, selection may also be a critical question especially when the organization is relatively incapable of adapting to the environment. Many organizations also have routines that in many instances cannot be changed because they are outside the control or expertise of those who carry out them, and the routines are taken-for-granted (Johansson & Siverbo, 2009).

In practice, especially in large firms PS often consists of complicated institutionalized routines which may be vulnerable for problems of retention, variation, and selection leading to the continuation of existing routines (Lucas & Rafferty, 2007). Even if a significant PSC occurred, it is not guaranteed that it is effective because of the complexity of routines. The routines in PS may include parameters of information, knowledge, competencies, price structures, multidimensional or non-linear

Please cite this article as: Laitinen, E.K., Influence of cost accounting change on performance of manufacturing firms, *Advances in Accounting, incorporating Advances in International Accounting* (2014), http://dx.doi.org/10.1016/j.adiac.2014.03.003

prices, price bundling, multi-person pricing, differentiation, responsibilities, and incentives, which make the change too complicated to be always effective (Simon et al., 2003). It is a real challenge to the management to change these kinds of routines and make them more effective. This kind of change in that kind of complicated context can be outside the expertise of marketing management and lead to a negative result in terms of loss of customers and decrease in profitability. In summary, it is possible that CAC occurs without any PSC or that PSC occurs without any CAC. However, it is expected that these changes are positively associated with each other leading to the following research hypothesis:

H3. There is a positive association between CAC and PSC.

2.4. Effect of perceived environmental uncertainty (PEU)

The external environment of the firm is an important contextual factor that can be expected to affect MAC and its relationship with performance. The central variable of an external environment in MAS contingency research is PEU that quantifies the lack of information about the environment around the firm as perceived by its decision-makers (Chenhall, 2003). Managers need detailed information about the environment for their decision-making but that information is never complete. PEU is a seminal variable in this context because MAS are regarded as a response to PEU to construct a buffer against the uncertainty in the market. It is said that in this way there is found a fit (match) with the environment leading to improved effectiveness and performance. The measurement of PEU should represent the perceptions of top managers of the level of uncertainty regarding the relevant items of external environment, including for example demand, competition, raw materials, regulation, and technology (Tymon, Stout, & Shaw, 1998). Thus, PEU operationally refers to the perceived inaccuracy of the predictions on different items (Burns & Stalker, 1961; Lawrence & Lorsch, 1967; Miles & Snow, 1978). In general, these items are classified as to describe uncertainty in the general environment (government, socio-cultural and economic conditions, and technology) and in the task environment (industry, raw materials, markets, and the finance sector).

In this study, MAS is split into two parts, CAC and PSC which may be associated with different items of PEU. It is probable that CAC in manufacturing firms is associated with uncertainty in raw materials (cost component) whereas PSC is mainly related to uncertainty of demand (behavior of customers). It is expected that the higher the level of PEU, the more positive is the relation of CAC and PSC to the performance of the firm. This kind of relationship assumes that CAC and PSC are in an evolutionary change process made on an efficient-selection basis and successful so that there are no serious problems with retention, variation, and selection. Especially for PS where the routines are complicated by many parameters, PEU may create an opposite effect when the change is not successful. If the management fails in PSC, the consequences on growth and profitability can be worse when PEU is greater. As a conclusion, the following two hypotheses are suggested for successful CAC and PSC:

H4. The positive association between CAC and financial performance is more positive when PEU (raw materials) is higher.

H5. The positive association between PSC and financial performance is more positive when PEU (demand) is higher.

3. Empirical data and methods

3.1. Empirical sample

The empirical part of the study is based on an internet survey sent to 800 randomly selected Finnish manufacturing firms. The letter (email) that included a description of the survey and a request to fulfill the questionnaire in the internet was sent by email to the manager responsible for or well acquainted with cost accounting and pricing decisions within the organization. The questionnaire was pre-tested by several pilot respondents before the sending of the final version. The size of the sample firms was restricted to exceed 20 employees. This restriction is made because small firms, especially operating in manufacturing will often have little influence over the prices of their products so that there may be minimal scope for discretion in PS (Guilding et al., 2005). Small firms with less than 20 employees may not apply systematic routines in PS although actively exploiting their own market niche as a means of exercising more control over their prices (Cunningham & Hornby, 1993). The email did not reach all target respondents because of incorrect email address (18.7%), automatic absence replies (3.0%), wrong respondent (0.6%), and technical reasons (1.1%). Thus, the final sample was 613 firms and 140 (22.8%) of them responded to the survey. However, a full-filled questionnaire without any missing information was replied only by 121 (19.7%) respondents. In this study, only observations without missing information ($N = 121$) were used in the statistical estimations because of inability of algorithms to cope with missing values in a data set (Parwoll & Wagner, 2012).

It was emphasized to the respondents that survey data is confidential and the results will be published only in statistical combinations. Each respondent got a password for filling the survey to ensure that the right person is responding. This password made it possible later to connect the response with lagged financial statement information. The response was motivated by organizing a lottery for the respondents with 50 financial textbooks as prizes. In addition, two follow-up letters were sent. No bias with respect to the time of response was found based on correlation between response time and the key variables. The respondents are mainly managing directors (39.0%), financial managers or business controllers (42.9%), and other (for example, sales) managers (6.3%). The average size of firms is 375 employees but the median is only 82 employees, which refers to a skew size distribution. These sample characteristics are directly consistent with those of the target population (larger Finnish manufacturing firms). However, the results of this study are vulnerable to errors typical of any survey, such as sampling error, instrumentation bias and response bias (Alreck & Settle, 1995).

3.2. Variables

The research model is only based on four constructs. First, CAC is measured by the total change in the product cost accounting system assessed by the respondent on a 7-point Likert scale from 1 (product costing is not used) to 7 (totally new product costing system). On this scale, 2 refers to no change, 3 to a small change, 4 to a moderate change, 5 to a significant change, and 6 to a very significant change. Four of the sample firms did not use product costing at all. Second, PSC is measured on a similar Likert scale and it is assessed by the respondent. However, in this case the scale begins from 1 (no change) and ends with 6 (totally new pricing practices or routines), since all firms made pricing decisions. Because in this study the focus is set on a long-term, evolutionary change, the period of total change considered in this question was the five last years that is two years longer than the period used by Libby and Waterhouse (1996). Because the effects of MAC are usually lagged for several years, a longer period was applied. The longer period is justified because the new cost and pricing information has to be produced before it can be used in decision-making (Chenhall, 2004; Jänkälä & Silvola, 2012). The consequences of decisions based on new cost accounting and pricing systems will then be realized in the following periods depending upon the learning curve of the management. The constructs for CAC and PSC as they are used in the questionnaire are presented in Appendix A.

Third, financial performance is measured by four items based on profitability and growth which should be reflected by CAC and SPC (Kennedy & Affleck-Graves, 2001). Profitability is measured by the

Please cite this article as: Laitinen, E.K., Influence of cost accounting change on performance of manufacturing firms, *Advances in Accounting, incorporating Advances in International Accounting* (2014), http://dx.doi.org/10.1016/j.adiac.2014.03.003

return on investment ratio (ROI) that reflects the ability of the capital invested in the firm to generate profits. It is the most widely used measure of profitability. This ratio is calculated following the instructions given in The Guide to the Analysis of Financial Statements of Finnish Companies (2006). It is based on the ratio of profit before extraordinary items plus expenses of liabilities (converted to 12 months) divided by the average balance sheet total that does not include interest-free debts. The growth of the firms is measured according to the same guide as the percentage change of turnover or net sales converted to 12 months. Profitability and growth are measured using these measures for the first year (t + 1) and the second year (t + 2) after the survey year. In this way it is guaranteed that the lagged effects of the total changes in CAC and PSC from the research period can be reflected by the model. If the average change in CAC or PSC is located in the middle of the five-year change period, the time lag between this change and the periods of performance measurement is 3.5–4.5 years.

Fourth, PEU is measured using several items of perceived uncertainty. In MAS research, PEU is usually considered as a multidimensional construction that includes different types of uncertainty perceived by top management (Milliken, 1987). These dimensions can be measured separately or by using a composite measure of dimensions (Tymon et al., 1998). In the study, PEU is originally measured on seven different dimensions reflecting the perceived inaccuracy to predict supplier behavior, competitor behavior, customer behavior, technology development, financial market development, labor union behavior, and regulation development. Each of the seven items was accompanied with a couple of exemplary attributes. For example, supplier behavior included the price, quality, and availability of raw materials. Customer behavior included customer preferences and demand behavior. This kind measure is based on prior constructs (for example, Hoque, 2000) but it is converted to fit with the purposes of this study. PEU is measured on the seven dimensions using a 5-point Likert scale from 1 (can be predicted with a very high accuracy) to 5 (can be predicted only with a very low accuracy). The period for prediction was defined in this context to be 2–3 years. Thus, the measure reflects the perceived inaccuracy of the management to predict the seven phenomena for a period of 2–3 years ahead. The construct of PEU used in the questionnaire is presented in Appendix A.

Fifth, the lagged effect of CAC and PSC on the financial performance of the firm is controlled for four control variables to avoid omitted-variable bias. The constructs of these control variables used in the questionnaire are presented in Appendix A. The first control measure is the size of the firm reflected by the logarithm of the number of employees. Larger firms tend to have more market power in controlling the operational environment and more resources to develop MAS (Chenhall, 2003; Libby & Waterhouse, 1996). They can also benefit in terms of performance from scale economies. The second variable measures competition on a five-point Likert scale. Competition creates turbulence and risk for the markets, affects performance, and makes firms continually revise MAS (Guilding et al., 2005; Mia & Clarke, 1999). The third variable is the use of the cost-leadership general strategy measured by a dummy variable describing a strategy to produce products at lowest cost. Strategy is a way in which management can affect the external environment, technology, structural arrangements, and MAS (Chenhall, 2003; Chenhall & Langfield-Smith, 1998; Langfield-Smith, 1997). Generic strategies are used to improve performance in order to achieve and maintain competitive advantage (Porter, 1980, 1985). The fourth control variable measures the use of prospector market strategy as a dummy variable. Prospector market strategy is based on the first mover advantage to improve performance by providing the firm with premium pricing opportunities, whereas defenders either try to keep prices low or offer better quality or service (Langfield-Smith, 1997; Miles & Snow, 1978).

3.3. Statistical methods

The four hypotheses drawn from the research model (Fig. 1) are tested by the structural equation modeling (SEM) based on the partial least squares (PLS) method (Stage, Carter, & Nora, 2004). This method has been used frequently in management accounting and social science research (Baines & Langfield-Smith, 2003; Luft & Shields, 2003; Smith & Langfield-Smith, 2004). PLS is preferred for the covariance-based methods (like LISREL) especially when the sample size is limited, the variables are not strictly normally distributed, and the theory is not strong (Chin, 1995). In addition, PLS is able to accommodate non-normal data due to less rigorous assumptions underpinning the technique (Smith & Langfield-Smith, 2004). It can handle many independent variables, even when there are more predictors than cases and even when predictors display multicollinearity (Temme, Kreis, & Hildebrandt, 2006). In this study, PLS is useful also because it optimizes the model parameters to maximize the coefficient of determination of financial performance. Fig. 1 illustrates that the model has different variables with direct and indirect effects on dependent variables. PLS is also useful in this kind of situation when the theory sets out to explain the

Table 1
Descriptive statistics.

Variable	Mean	Standard deviation	Skewness	Kurtosis
Return on investment ratio (t + 1)	16.360	24.046	−1.231	9.816
Return on investment ratio (t + 2)	11.640	21.059	−1.907	11.619
Percent of growth in net sales (t + 1)	5.840	23.654	−1.685	6.426
Percent of growth in net sales (t + 2)	3.980	35.875	4.032	31.720
CAC	3.400	1.595	0.790	0.089
PSC	2.460	1.432	1.219	0.841
PEU in supplier behavior	4.100	0.952	−1.614	3.325
PEU in competitor behavior	3.930	0.808	−1.020	2.547
PEU in customer behavior	3.910	0.730	−0.119	−0.494
PEU in technology development	3.260	0.739	0.163	0.498
PEU in financial markets	3.500	0.787	−0.014	0.163
PEU in labor union behavior	3.600	0.747	0.310	−0.489
PEU in regulations	3.740	0.804	0.127	−0.788
Logarithm of number of employees	4.666	1.253	1.338	2.419
Level of competition	3.920	0.791	−0.364	−0.266
Cost-leadership generic strategy	0.240	0.429	1.235	−0.483
Prospector market strategy	0.210	0.407	1.468	0.156

Please cite this article as: Laitinen, E.K., Influence of cost accounting change on performance of manufacturing firms, *Advances in Accounting, incorporating Advances in International Accounting* (2014), http://dx.doi.org/10.1016/j.adiac.2014.03.003

Table 2
Pearson correlation coefficients.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Return on investment ratio (t + 1)	1.000																
2. Return on investment ratio (t + 2)	0.422	1.000															
3. % of growth in net sales (t + 1)	0.437	0.397	1.000														
4. % of growth in net sales (t + 2)	0.068	0.283	0.079	1.000													
5. CAC	−0.048	0.084	0.033	0.170	1.000												
6. PSC	−0.255	−0.077	−0.190	0.009	0.538	1.000											
7. PEU in supplier behavior	−0.004	−0.126	0.111	0.053	0.067	0.009	1.000										
8. PEU in competitor behavior	−0.078	−0.044	−0.040	−0.028	−0.132	−0.020	0.096	1.000									
9. PEU in customer behavior	−0.172	−0.181	0.044	0.029	0.068	0.200	0.073	0.200	1.000								
10. PEU in technology development	0.041	0.066	0.015	0.012	0.078	0.033	0.199	0.382	0.246	1.000							
11. PEU in financial markets	−0.026	0.018	0.210	0.097	0.175	0.176	0.077	0.138	0.255	0.084	1.000						
12. PEU in labor union behavior	−0.087	0.012	0.081	0.143	0.143	0.150	0.220	0.158	0.315	0.207	0.556	1.000					
13. PEU in regulation development	0.016	0.102	0.005	0.042	0.097	0.049	0.165	0.085	0.044	0.175	0.371	0.559	1.000				
14. Log of number of employees	−0.067	−0.006	−0.065	−0.100	0.017	0.095	−0.028	0.053	−0.088	−0.182	−0.023	−0.005	0.103	1.000			
15. Level of competition	−0.142	−0.110	−0.223	−0.142	−0.039	0.225	−0.011	0.121	0.275	−0.076	−0.066	−0.042	−0.074	0.129	1.000		
16. Cost-leadership generic strategy	0.029	0.073	0.005	−0.031	−0.180	−0.101	−0.161	−0.044	−0.036	−0.018	−0.114	−0.065	0.113	0.043	−0.015	1.000	
17. Prospector market strategy	0.010	0.045	0.113	0.031	−0.066	0.006	0.011	−0.004	−0.189	−0.156	0.036	−0.085	−0.214	0.193	−0.128	−0.191	1.000

role of variables that intervene in relationships between input variables and outcome variables (Chenhall, 2005). In this study, CAC and PSC are input variables while the investigated outcome is the effect on financial performance. However, the path model also includes relationships between CAC and PSC leading to a mediation effect. The model also includes effects moderated by PEU.

The PLS model is estimated by the SMARTPLS 2.0 (M3) software (http://www.smartpls.de). The t-values of the parameters are calculated by bootstrapping (2000 sub-samples). The present PLS model will include latent variables (financial performance and PEU) with reflective indicators, since it is expected that the items are strongly correlated. The standard model quality assessment methods are developed for these kinds of latent variables (Henseler, Ringle, & Sinkovics, 2009). For these variables, the reliability is measured by the Cronbach Alpha (CA) and the composite reliability (CR). Convergent validity measures that a set of indicators represents one and the same underlying construct indicated by their unidimensionality. It can be measured by the average variance extracted (AVE). The discriminant validity can be assessed by the Fornell and Larcker (1981) criterion. The structural (outer) PLS model can be assessed by the coefficient of determination (R^2) of the endogenous latent variables. The significance of the individual path coefficients can be used to assess the empirical validity of the theoretically assumed relationships using the *t*-test based on bootstrapping. In addition, (average) communality can be used to assess how much (on average) the latent variable can reproduce of the variance of its indicators.

4. Empirical results

4.1. Univariate results

Table 1 shows descriptive statistics for the model variables. The descriptive statistics show that the growth of firms after the research period has been on average 5.84% in the first year but it is remarkably diminished in the second period. The distribution of growth in both years is skewed and shows a very high kurtosis. The average investment rate of return for the first year is 16.36% but is also diminishes then significantly in the same way as the growth rate. The distribution of the ratio is in both years negatively skewed and shows a very high kurtosis. The significant decline in growth and profitability of sample firms is largely due to the downturn in business cycles that started in April of the year t + 2. Table 1 shows that the average CAC is 3.40, referring to

Table 3
Factor analysis results for the multidimensional variables.

Variable	Loadings		
	Factor 1	Factor 2	Communality
Panel A: financial performance			
Return on investment ratio (t + 1)	0.763	−0.241	0.640
Return on investment ratio (t + 2)	0.811	0.165	0.686
Percent of growth in net sales (t + 1)	0.586	−0.494	0.587
Percent of growth in net sales (t + 2)	0.409	0.830	0.856
Extraction Sums of Squared Loadings (%)	43.756	25.469	69.225
Panel B: perceived environmental uncertainty (PEU)			
PEU in supplier behavior	0.383	0.238	0.203
PEU in competitor behavior	0.459	0.595	0.564
PEU in customer behavior	0.476	0.228	0.278
PEU in technology development	0.502	0.593	0.604
PEU in financial markets	0.687	−0.376	0.613
PEU in labor union behavior	0.811	−0.291	0.742
PEU in regulations	0.602	−0.459	0.573
Extraction sums of squared loadings (%)	33.241	17.852	51.093

Please cite this article as: Laitinen, E.K., Influence of cost accounting change on performance of manufacturing firms, *Advances in Accounting, incorporating Advances in International Accounting* (2014), http://dx.doi.org/10.1016/j.adiac.2014.03.003

Table 4
Statistical properties of the performance measure.

Panel A: outer loadings of the performance measure				
Item of performance	Loading	Standard deviation	t-Statistic	p-Value
Return on investment ratio (t + 1)	0.8508	0.1071	7.9445	0.0000
Return on investment ratio (t + 2)	0.7447	0.1521	4.8957	0.0000
Percent of growth in net sales (t + 1)	0.7394	0.1772	4.1719	0.0000

Panel B: statistical criteria for the performance measure	
Criterion	Value
Cronbach alpha	0.6836
R^2	0.1725
Communality	0.6084
Composite reliability	0.8227
AVE	0.6084
Redundancy	0.0166

a value between a small change (3) and a moderate change (4). The average PSC is 2.46 that refers to a change of a similar strength (small–moderate change) since the scale is different than for CAC. The average values of the PEU items, vary from 3.3 (moderate inaccuracy) to 4.1 (high inaccuracy). The highest inaccuracy (4.1) is perceived in supplier behavior followed by competitor behavior (3.93) and customer behavior (3.91). Is spite of the logarithmic transformation, the size variable refers to positively skewed distribution. The average level of competition is 3.9 being nearly at a high level (4). More than twenty percent of the firms use cost-leadership strategy (24%) or prospector strategy (21%).

Table 2 shows the Pearson correlation coefficients between the model variables. The items of the financial performance construct are strongly correlated except for the growth rate in t + 2 correlating only with the profitability ratio in t + 2. These figures show that the downturn has a remarkable effect especially on the behavior of the growth rate in t + 2. CAC is slightly negatively correlated with profitability t + 1 but positively with other items. PSC is quite strongly negatively correlated with the items except for growth t + 2. Obviously, these univariate results support H_1 but contradict with H_2. The correlation between CAC and PSC is +0.54 reflecting a very strong positive association conforming to H_3. In general, the correlations between the PEU and performance items are low. However, PEU in customer behavior is strongly negatively associated with profitability in t + 1 and t + 2. PEU in financial market is positively correlated with growth in t + 1 while PEU in labor union behavior is positively related to growth in t + 2. PEU items for financial markets and labor union behavior has a high positive correlation with both CAC and SPC. PEU in customer behavior is also positively correlated with PSC. In general, the correlations between the items of PEU are not high indicating low reliability for a composite variable. The Cronbach alpha for this composite measure is 0.636 and the value does not increase remarkably if any of the items is deleted. The level of competition is the only control variable that is significantly (negatively) correlated with the financial performance items. It is also strongly positively correlated with PSC showing the effect of competition on CAS (Guilding et al., 2005; Hoeberichts & Stokman, 2010). Cost-leadership generic strategy is negatively correlated with CAC. Thus, cost leaders may invest more on improving manufacturing systems and concentrate on traditional MAS (Chenhall & Langfield-Smith, 1998). Prospector market strategy is positively correlated with size and negatively with cost-leadership strategy. It is also negatively correlated with several items of PEU. Prospectors are described as continually searching for market opportunities and as being creators of uncertainty to which their competitors must respond (Langfield-Smith, 1997). The present evidence however shows that prospector strategy itself is more popular when PEU is low.

4.2. Multivariate results

The correlations between the items of both financial performance and PEU indicate that the items do not reflect only one latent dimension so that the constructs may not be one-dimensional. Table 3 presents the factor solutions for these constructs. Panel A shows that the financial performance construct is based on two latent dimensions. The growth rate in t + 2 has a high loading only on the second factor. The growth rate in t + 1 and the return on investment ratio in t + 1 have negative loadings on this factor showing that the second dimension is strongly associated with the effect of downturn beginning in t + 1. Therefore, the growth rate in t + 2 is dropped from the construct. Panel B shows the factor solution for the items of PEU. This solution has also two factors based on the scree test. PEU in labor union behavior has the highest loading on the first factor but in general the loadings are low. For the second factor, all loadings are quite low and some of them are negative. This result obviously indicates that the reliability of the composite construct of PEU is not good. The items of PEU do not behave in a consistent manner as a one-dimensional measure. Therefore, the construct was split to two parts on theoretical grounds expecting that supplier and customer behaviors are associated with CAC and PSC, respectively. The first part is based on PEU in supplier behavior (raw materials, services) and it is used to moderate the effect of CAC. The second part is drawn from PEU in customer behavior (tastes, preferences) to be used as a moderator for PSC. Several experiments (not reported here) showed that this procedure also led to the best statistical solution.

Table 5
Path coefficients of the PLS model.

Path	Coefficient	Standard deviation	t-Statistic	p-Value (1-tailed)
CAC → PSC	0.5376	0.0715	7.5177	0.0000
CAC → financial performance	0.1604	0.1530	1.0485	0.1482
CAC * PEU (supplier behavior) → financial performance	0.1324	0.1184	1.1180	0.1329
PEU (customer behavior) → financial performance	−0.0570	0.1185	0.4809	0.3157
PEU (supplier behavior) → financial performance	−0.0116	0.1156	0.1006	0.4600
PSC → financial performance	−0.1925	0.1404	1.3707	0.0865
PSC * PEU (customer behavior) → financial performance	−0.2349	0.1384	1.6975	0.0461
Logarithmic size → financial performance	−0.0589	0.0741	0.7945	0.2142
Competition → financial performance	−0.0866	0.0955	0.9075	0.1830
Cost leadership generic strategy → financial performance	0.0447	0.0843	0.5295	0.2987
Prospector market strategy → financial performance	0.0634	0.0847	0.7477	0.2280

Please cite this article as: Laitinen, E.K., Influence of cost accounting change on performance of manufacturing firms, *Advances in Accounting, incorporating Advances in International Accounting* (2014), http://dx.doi.org/10.1016/j.adiac.2014.03.003

Because the construct of PEU was split to two one-dimensional parts, the resulted final PLS model only includes one latent variable (financial performance). The estimated outer loadings in PLS are presented in Panel A of Table 4. The loadings are all high and statistically very significant. Thus, the measure of financial performance is a composite variable of lagged profitability and growth emphasizing however more profitability than growth. Panel B shows the values of the statistical criteria for the resulted performance measure in the PLS model. These figures refer to sufficient reliability and validity. However, the coefficient of determination (R^2) is only 17.3% referring to a weak effect (Chin, 1998). The strength of the effect is anyway consistent with expectations on the grounds of prior studies on the lagged effects of MAC (Jänkälä & Silvola, 2012; Maiga & Jacobs, 2008). It is obvious that only a small part of profitability and growth can be explained by past CAC and PSC.

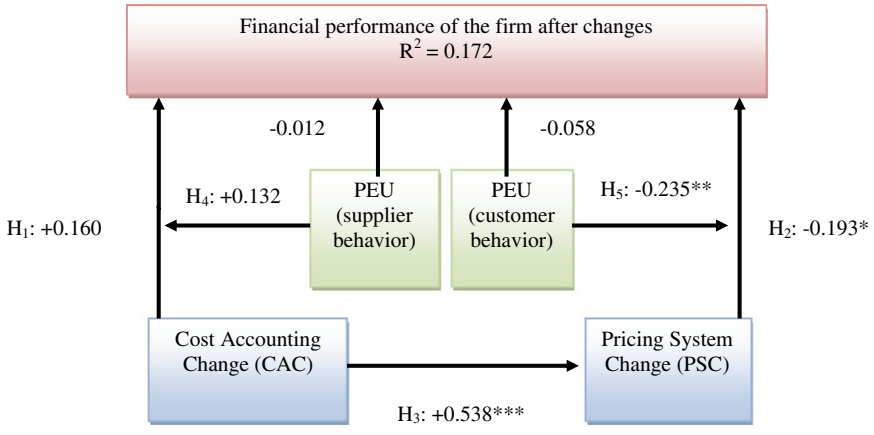
Table 5 presents the path coefficients for the estimated PLS model. The path from CAC to financial performance is positive but not statistically significant (p-value 0.15) giving only weak support to H_1. This effect is also positively moderated by PEU (in supplier behavior) which is consistent with H_4 although the effect is not significant (p-value 0.13). The effect of PSC on financial performance is statistically significant (p-value 0.09) but negative conflicting with H_2. In addition, this effect is negatively moderated by PEU (in customer behavior) which contradicts with H_5 (p-value 0.05). Empirical evidence strongly supports H_3 since the association between CAC and PSC is positive and statistically very significant (p-value 0.00). The PEU measures in supplier and customer behavior are not significantly linked to financial performance (p-value 0.46 and 0.32). The four control measures do not show any significant effect on financial performance in the PLS model. Several experiments (not reported here) showed that size, cost leadership strategy and prospector strategy as control measures lead to a PLS model with similar parameters than the model without any control variables. In these models, the coefficients of CAC, PSC, and their moderators were as high as in the controlled model but the standard deviations of these coefficients were small leading to statistical significance of all parameters. However, when also competition is used as a control variable, the levels of the parameters are largely unchanged but their standard deviations are remarkably increased resulting in less significant coefficients in bootstrapping. This evidence again shows the important effect of competition on this kind of context (Guilding et al., 2005; Hoeberichts & Stokman, 2010).

5. Summary

Fig. 2 shows a summary of the estimated PLS model. Empirical evidence strongly supports H_3 on the positive relationship between CAC and PSC but gives only weak support to H_1 and H_4 on the direct effect of CAC and the moderating effect of PEU. In spite of significant effects, the empirical results strongly contradict with H_2 and H_5 on the effect of PSC and the moderating effect of PEU, because the relationships are negative. Thus, in conclusion, the lagged effect of CAC on performance is weak and positive while that of PSC is strong but negative. Appendix B shows the total effects of the PLS model. The total effect of CAC on lagged financial performance taking account of the main (direct) effect and the indirect effect (mediated through PSC) is only 0.06 with a t-value of 0.47. This effect is not statistically significant (p-value is 0.32) indicating that the negative effect of PSC offsets totally the positive effect of CAC on performance. The strong negative indirect effect through PSC may be one explanation for prior empirical evidence on the very weak effect of CAC on performance (Jänkälä & Silvola, 2012; Maiga & Jacobs, 2008). The negative effect of PSC on performance is unexpected because of the central role of pricing decision in performance (Kasper, Helsdingen, & Vries, 2000; Marn et al., 2003; Simon et al., 2003). This negative effect may be a result of the complexity of pricing decisions (routines) in large manufacturing firms. These pricing routines may deal with parameters of information, knowledge, competencies, price structures, etc. (Simon et al., 2003). In this context, the complexity of routines may lead to problems with retention, variation and selection especially when the coercive pressure from CAC is pushing (Johansson & Siverbo, 2009). It is obvious that the existence of high PEU makes this complex change context even more difficult which explains the negative moderating effect of PEU.

6. Summary of the findings

The objective of this study was to investigate the lagged influence of CAC on financial performance. The empirical data are based on a survey responded by 121 Finnish manufacturing firms. The purpose was to present CAC in a wider framework associated with PSC. Five research hypotheses were drawn to describe the relationship between CAC and financial performance, CAC and PSC, PSC and financial performance, and to test the moderating effects of PEU. The starting point for the



Note:
1-way significance:
* = p-value less than 0.10
** = p-value less than 0.05
*** = p-value less than 0.01

Fig. 2. The path coefficients of the estimated PLS model.

Please cite this article as: Laitinen, E.K., Influence of cost accounting change on performance of manufacturing firms, *Advances in Accounting, incorporating Advances in International Accounting* (2014), http://dx.doi.org/10.1016/j.adiac.2014.03.003

analysis was the expectation that CAC is closely associated with PSC that mediates the effect of CAC on financial performance. Thus, it was assumed that CAC has both a direct effect and an indirect effect through PSC on performance. The research model was estimated by PLS to test the five hypotheses. The analysis of the data showed that the downturn beginning of the second year after the research period especially affects the rate of growth. Therefore, performance was measured by a composite measure of profitability in the first and second year and of growth in the first year after the end of the survey period. CAC and PSC were measured as a long-term evolutionary change over a period of five years. The seven items of PEU did not form a reliable composite measure so that PEU was on theoretical grounds split to two parts: PEU of supplier behavior and PEU of customer behavior. CAC and PSC were moderated by these PEU measures respectively.

The results only weakly supported hypotheses about the positive direct effect of CAC on performance and the positive moderating effect of PEU (in supplier behavior). However, the results showed that PSC has a strong negative direct effect on performance which contradicts with a hypothesis. PEU (in customer behavior) had a negative moderating effect on this relationship which also conflicted with expectations. Finally, the results showed that CAC and PSC are very closely associated with each other conforming to a research hypothesis on their positive relationship. Thus, evidence supports three of the five research hypotheses and conflicts with two of them. For practice of management accounting, the results have obvious implications. The very close relationship between CAC and PSC can mean that PSC is often made under a coercive pressure of CAC due to the central role of cost in pricing. In this kind of context, when the pricing routines are highly complicated, evolutionary PSC may seriously suffer from problems with retention, variation, and selection. These problems can lead to failure in PSC resulting in decreased lagged financial performance. When uncertainty on demand is high, these problems may be even worse explaining the negative moderating effect of PEU. The results obviously imply that in practice PSC should be planned and carried out very carefully in spite of potential coercive pressure from CAC. The success of PSC largely depends on how (marketing) managers are able to deal with potential retention, variation, and selection problems emerging in PSC changing the complicated routines of pricing under pressure of high uncertainty. The results on PEU also indicate that it is important to develop methods to diminish the inaccuracy associated with predictions of demand behavior.

This study has a number of limitations which should be relaxed in the further studies. First, the sample of the study only includes 121 full responses without missing values. In further studies, larger samples should be used to generalize the results. Second, this study is based on a simple construct of evolutionary CAC and PSC. In further studies, more detailed constructs should be used. It would be interesting to see what kinds of changes in CA have been made and how they have affected pricing routines and finally financial performance. Third, the basis of the change processes should be investigated to see how PSC is especially associated with retention, variation, and selection problems in a complicated environment with high PEU. Fourth, the lagged influence of CAC and PSC are in this study analyzed only for two years after the end of the research period due to the downturn (that strongly affected performance in later years). In further studies, a longer period can be used to show the time-series of lagged effects. It could be interesting to see whether the effects follow a systematic function of distributed lags.

Appendix A. Constructs of the survey variables used in the questionnaire

1. CAC
   How much your product costing practices or routines have been changed during the last five years (circle one)?
   1. Does not use product costing at all
   2. No change
   3. A small change
   4. A moderate change
   5. A significant change
   6. A very significant change
   7. Totally new practices or routines started less than 5 years ago.
2. PSC
   How much your pricing practices or routines have been changed during the last five years (circle one)?
   1. No change
   2. A small change
   3. A moderate change
   4. A significant change
   5. A very significant change
   6. Totally new practices or routines started less than 5 years ago.
3. PEU
   How well you are able to predict the following phenomena in the longer (2–3 years) view (circle one) (scale: 1 = with a very high accuracy, 2 = with a high accuracy, 3 = with a moderate accuracy, 4 = with a weak accuracy, 5 = with a very weak accuracy):
   1. Supplier behavior (raw material)
   2. Competitor behavior
   3. Customer behavior (demand)
   4. Technology development
   5. Financial market development
   6. Labor union behavior
   7. Regulation development.
4. Control variables
   a. Size of the firm
      Logarithm of the number of employees in the survey period
   b. Level of competition in the market.
      How would you describe the degree of competition in the market (circle one)? (Competition is here an external factor that affects the growth and profitability of the firm.)
      1. Very low level of competition
      2. Low level of competition
      3. Moderate level of competition
      4. High level of competition
      5. Very high level of competition.
   c. Cost-leadership generic strategy
      What is the main generic strategy of your firm (circle one)?
      1. Cost leadership (to produce products at lowest costs)
      2. Differentiation (to produce unique or clearly differentiated products)
      3. Focus (to concentrate on a niche with respect to narrow range of customers, narrow range of products, or limited geographical area).
      If the first alternative (1) is circled, then the variable = 1, otherwise it is 0.
   d. Prospector market strategy
      What is the main market strategy of your firm (circle one)?
      1. Prospector: involves active programs to expand into new markets and stimulate new opportunities and products
      2. Defender: entails finding, and maintaining a secure and relatively stable market and invests on existing products
      3. Analyzer: shares the characteristics of the prospector and the analyzer.
      If the first alternative (1) is circled, then the variable = 1, otherwise it is 0.

Please cite this article as: Laitinen, E.K., Influence of cost accounting change on performance of manufacturing firms, *Advances in Accounting, incorporating Advances in International Accounting* (2014), http://dx.doi.org/10.1016/j.adiac.2014.03.003

Appendix B. Total effects of the PLS model

Path	Coefficient	Std. dev.	t-Statistic	p-Value (1-tailed)
CAC → PSC	0.5376	0.0715	7.5177	0.0000
CAC → Financial performance	0.0569	0.1211	0.4700	0.3196
CAC * PEU (supplier behavior) → financial performance	0.1324	0.1184	1.1180	0.1329
PEU (customer behavior) → financial performance	−0.0570	0.1185	0.4809	0.3157
PEU (supplier behavior) → financial performance	−0.0116	0.1156	0.1006	0.4600
PSC → Financial performance	−0.1925	0.1404	1.3707	0.0865
PSC * PEU (customer behavior) → financial performance	−0.2349	0.1384	1.6975	0.0461
Logarithmic size → financial performance	−0.0589	0.0741	0.7945	0.2142
Competition → financial performance	−0.0866	0.0955	0.9075	0.1830
Cost leadership generic strategy → financial performance	0.0447	0.0843	0.5295	0.2987
Prospector market strategy → financial performance	0.0634	0.0847	0.7477	0.2280

References

Alreck, P. L., & Settle, R. B. (1995). *The survey research handbook (2E)*. Boston, Massachusetts: Irwin/McGraw-Hill.

Arnold, V. (2006). Behavioral research opportunities: understanding the impact of enterprise systems. *International Journal of Accounting Information Systems*, *7*(1), 7–17.

Avlonitis, G., & Indounas, K. (2006). How are prices set? An exploratory investigation in the Greek services. *The Journal of Product and Brand Management*, *15*(3), 203–213.

Baines, A., & Langfield-Smith, K. (2003). Antecedents to management accounting change: A structural equation approach. *Accounting, Organizations and Society*, *28*(7/8), 675–698.

Balakrishnan, B. V., & Sivaramakrishnan, K. (2001). Sequential decomposition of capacity planning and pricing decision. *Contemporary Accounting Research*, *18*(1), 1–27.

Balakrishnan, R., & Sivaramakrishnan, K. (2002). A critical overview of the use of full-cost data for planning and pricing. *Journal of Management Accounting Research*, *14*(1), 3–31.

Banker, R. D., & Hansen, S. C. (2002). The adequacy of full-cost pricing heuristics. *Journal of Management Accounting Research*, *14*(1), 33–58.

Banker, R. D., & Hughes, J. S. (1994). Product costing and pricing. *The Accounting Review*, *69*(3), 479–494.

Baumol, W. J., & Quandt, R. E. (1964). Rules of thumb and optimally imperfect decisions. *American Economic Review*, *54*(4), 23–46.

Brorström, B., & Siverbo, S. (2004). Deeply rooted traditions and the will to change — Problematic conflicts in three Swedish health care organizations. *Journal of Economic Issues*, *38*(4), 939–952.

Burgstahler, D., & Noreen, E. (1997). Full-cost pricing and the illusion of satisficing. *Journal of Management Accounting Research*, *9*(1), 239–263.

Burns, T., & Stalker, G. M. (1961). *The management of innovation*. London: Tavistock.

Cardinaels, E. (2008). The interplay between cost accounting knowledge and presentation formats in cost-based decision-making. *Accounting, Organizations and Society*, *33*(6), 582–602.

Chenhall, R. H. (2003). Management control system design within its organizational context: Findings from the contingency-based research and directions for the future. *Accounting, Organizations and Society*, *28*(1), 127–168.

Chenhall, R. H. (2004). The role of conflict in early implementation of activity cost management. *Behavioral Research in Accounting*, *16*(1), 19–44.

Chenhall, R. H. (2005). Integrative strategic performance measurement systems: Strategy, strategic alignment of manufacturing, learning and strategic outcomes: An exploratory study. *Accounting, Organizations and Society*, *30*(5), 395–422.

Chenhall, R. H., & Langfield-Smith, K. (1998). The relationship between strategic priorities, management techniques and management accounting: An empirical investigation using system approach. *Accounting, Organizations and Society*, *23*(3), 243–264.

Chin, W. W. (1995). Partial least squares is to LISREL as principal components analysis is to common factor analysis. *Technology Studies*, *2*(2), 315–319.

Chin, W. W. (1998). The partial least squares approach for structural equation modeling. In G. A. Marcoulides (Ed.), *Modern methods for business research* (pp. 295–336). London: Lawrence Erlbaum Associates.

Cunningham, D., & Hornby, W. (1993). Pricing decision in small firms: Theory and practice. *Management Decision*, *31*(7), 46–55.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39–50.

Foster, G., & Swenson, D. W. (1997). Measuring the success of activity- based cost management and its determinants. *Journal of Management Accounting Research*, *9*, 109–141.

Gallego, G., & van Ryzin, G. (1997). A multiproduct dynamic pricing problem and its applications to network yield management. *Operations Research*, *45*(1), 24–41.

Gosselin, M. (1997). The effect of strategy and organizational structure on the adoption and implementation of activity-based costing. *Accounting, Organizations and Society*, *22*(2), 105–122.

Govindarajan, V., & Anthony, R. N. (1983). How firms use cost data in price decisions. *Management Accounting*, *65*, 30–36 (July).

Guilding, C., Drury, C., & Tayles, M. (2005). An empirical investigation of the importance of cost-plus pricing. *Managerial Auditing Journal*, *20*(2), 125–137.

Heching, A., Gallego, G., & van Ryzin, G. (2002). Mark-down pricing: An empirical analysis of policies and revenue potential at one apparel retailer. *Journal of Revenue and Pricing*, *1*(2), 139–160.

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modelling in international marketing. *Advances in International Marketing*, *20*, 277–319.

Hilton, R. W., Swieringa, R. J., & Turner, M. J. (1988). Product pricing, accounting costs and use of product costing systems. *The Accounting Review*, *53*, 195–218 (April).

Hoeberichts, M., & Stokman, A. (2010). Price setting behaviour in the Netherlands: Results of a survey. *Managerial and Decision Economics*, *31*(2/3), 135–149.

Hoque, Z. (2000). Linking environmental uncertainty to non-financial performance measures and performance: a research note. *The British Accounting Review*, *37*(4), 471–481.

Horngren, C. T., Foster, G., & Datar, S. M. (2000). *Cost accounting. A managerial emphasis (10E)*. New Jersey: Prentice Hall International.

Innes, J., Mitchell, F., & Sinclair, D. (2000). Activity-based costing in the UK's largest companies: A comparison of 1994 and 1999 survey results. *Management Accounting Research*, *11*(3), 349–362.

Jänkälä, S., & Silvola, H. (2012). Lagging effects of the use of activity-based costing on the financial performance of small firms. *Journal of Small Business Management*, *50*(3), 498–523.

Johansson, T., & Siverbo, S. (2009). Why is research on management accounting change not explicitly evolutionary? Taking the next step in the conceptualisation of management accounting change. *Management Accounting Research*, *20*(2), 146–162.

Kaplan, R. S., & Cooper, R. (1998). *Cost & effect. Using integrated cost systems to drive profitability and performance*. Boston, MA: Harvard Business School Press.

Kasper, H., Helsdingen, P. V., & Vries, W. D. J. (2000). *Services marketing management: An international perspective*. Sussex: Wiley.

Kennedy, T., & Affleck-Graves, J. (2001). The impact of activity-based costing techniques on firm performance. *Journal of Management Accounting Research*, *13*, 19–45.

Kopalle, P. K., Mela, C. F., & Marsh, L. (1999). The dynamic effect of discounting on sales, empirical analysis and normative pricing implications. *Marketing Science*, *18*(3), 317–332.

Laitinen, E. K. (2001). Management accounting change in small technology companies: Towards a mathematical model of a technology firm. *Management Accounting Research*, *12*(4), 507–541.

Laitinen, E. K. (2009). From complexities to the rules of thumb: Towards optimization in pricing decisions. *International Journal of Applied Management Science*, *1*(4), 340–366.

Laitinen, E. K. (2011). Management accounting in pricing decisions. In M. Abdel–Kader (Ed.), *Review of management accounting research*. UK: Palgrave Macmillan.

Langfield-Smith, K. (1997). Management control systems and strategy: A critical review. *Accounting, Organizations and Society*, *22*(2), 207–232.

Lawrence, P. R., & Lorsch, J. W. (1967). *Organization and environment: Managing differentiation and integration*. Homewood, IL: Irwin.

Lere, J. C. (1986). Product pricing based on accounting cost. *The Accounting Review*, *61*(2), 318–324.

Libby, T., & Waterhouse, J. H. (1996). Predicting change in management accounting systems. *Journal of Management Accounting Systems*, *8*, 137–150.

Lucas, M., & Rafferty, J. (2007). Cost analysis for pricing: Exploring the gap between theory and practice. *British Accounting Review*, *40*(2), 148–160.

Luft, J., & Shields, M. D. (2003). Mapping management accounting: Graphics and guidelines for theory-consistent empirical research. *Accounting, Organizations and Society*, *28*(2–3), 169–249.

Maiga, A. S., & Jacobs, F. A. (2008). Extent of ABC use and its consequences. *Contemporary Accounting Research*, *25*(2), 533–566.

Malmi, T. (1999). Activity-based costing diffusion across organizations: An exploratory empirical analysis of Finnish firms. *Accounting, Organizations and Society*, *24*(8), 649–672.

Marn, M. V., Roegner, E. V., & Zawada, C. C. (2003). The power of pricing. *McKinsey Quarterly*, *1*, 27–39.

McCarthy, J. (1975). *Basic marketing: A managerial approach (5E)*. Homewood, IL: Richard D. Irwin, Inc.

Please cite this article as: Laitinen, E.K., Influence of cost accounting change on performance of manufacturing firms, *Advances in Accounting, incorporating Advances in International Accounting* (2014), http://dx.doi.org/10.1016/j.adiac.2014.03.003

McGill, J. I., & van Ryzin, G. J. (1999). Revenue management: Research overview and prospects. *Transportation Science*, *33*(2), 233–256.
Merchant, K. A., & Otley, D. (2006). A review of the literature on control and accountability. In C. Chapman, A. Hopwood, & M. Shields (Eds.), *The handbook of management accounting research*. Oxford: Elsevier Press.
Mia, L., & Clarke, B. (1999). Market competition, management accounting systems and business unit performance. *Management Accounting Research*, *10*(2), 137–158.
Miles, R., & Snow, C. (1978). *Organizational strategy, structure and process*. New York, NY: McGraw-Hill.
Milliken, F. J. (1987). Three types of perceived uncertainty about the environment: State, effect, and response uncertainty. *Academy of Management Review*, *12*(1), 133–143.
Parwoll, M., & Wagner, R. (2012). *The impact of missing values on PLS model fitting*. Challenges at the interface of data analysis, computer science, and optimization*Studies in classification, data analysis, and knowledge organization*. (pp. 537–544). Berlin: Springer, 537–544.
Porter, M. E. (1980). *Competitive strategy: Techniques for analyzing industries and competition*. New York: Free Press.
Porter, M. E. (1985). *Competitive advantage: Creating and sustaining superior performance*. New York: Free Press.
Rom, A., & Rohde, C. (2007). Management accounting and integrated information systems: A literature review. *International Journal of Accounting Information Systems*, *8*(1), 40–68.
Shim, E., & Sudit, E. F. (1995). How manufacturers price products. *Management Accounting*, *8*(1), 37–39.
Simon, H., Butscher, S. T., & Sebastian, K. -H. (2003). Better pricing processes for higher profits. *Business Strategy Review*, *14*(2), 53–67.
Skouras, T., Avlonitis, G. J., & Indounas, K. A. (2005). Economics and marketing on pricing. *Journal of Product & Brand Management*, *14*(6), 362–374.
Smith, D., & Langfield-Smith, K. (2004). Structural equation modelling in management accounting research: Critical analysis and opportunities. *Journal of Accounting Literature*, *23*, 49–86.
Stage, F. K., Carter, H., & Nora, A. (2004). Path analysis: An introduction and analysis of a decade of research. *Journal of Educational Research*, *98*(1), 5–12.
Sulaiman, S., & Mitchell, F. (2005). Utilising a typology of management accounting change: An empirical analysis. *Management Accounting Research*, *16*(4), 422–435.
Temme, D., Kreis, H., & Hildebrandt, L. (2006). PLS path modelling — A software review. *SFB 649 discussion papers SFB649DP2006-084. Sonderforschungsbereich*, *649*, Berlin: Humboldt University.
Tishlias, D. P., & Chalos, P. (1988). Product pricing behaviour under different costing systems. *Accounting and Business Research*, *18*(71), 257–265.
Turney, P. B. (1989). Activity-based costing: A tool for manufacturing excellence. *Journal of Cost Management*, *3*(2), 23–31.
Tymon, W. C., Stout, D. E., & Shaw, K. N. (1998). Critical analysis and recommendations regarding the role of perceived environmental uncertainty in behavioral accounting research. *Behavioral Research in Accounting*, *10*, 23–46 (supplement).

Please cite this article as: Laitinen, E.K., Influence of cost accounting change on performance of manufacturing firms, *Advances in Accounting, incorporating Advances in International Accounting* (2014), http://dx.doi.org/10.1016/j.adiac.2014.03.003