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Abstract
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Keywords
absolute forecast error, budgeting, forecasting, internal reporting

Disciplines
Accounting

Budgets, Internal Reports and Manager Forecast Accuracy*

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ABSTRACT: This study investigates the association between the accuracy of revenue forecasts and the accounting activities of budget preparation and internal accounting report preparation. While both budgets and internal reports are widely used, empirical evidence concerning their influence on the prediction of future performance is extremely limited. Consistent with the availability of formal accounting information improving predictive performance, we observe that internal accounting report preparation significantly improves forecast accuracy. However, partitioning firms by forecasting difficulty reveals that the accuracy benefits from internal reports preparation are only observed for firms with high uncertainty. Further, the results provide limited support for linkages between budget preparation and forecast accuracy. While we observe that the use of budget preparation and internal accounting report preparation is a function of firms' structural and environmental characteristics, firms do not appear to adopt these activities as a function of forecasting difficulty, but rather as a function of predicted changes in future growth.

JEL Classification Codes: M10; M41.

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1. Introduction

This paper investigates the association between manager's forecast accuracy and two aspects of accounting systems: budget preparation and internal accounting report preparation. Forecasts, especially revenue prediction, have a vital influence upon many commercial decisions and subsequent firm growth, profitability and survival. Revenue prediction represents an initial and fundamental step in determining all expected incomes, expenses, cash flows and balance sheet positions. Consequently, accurate revenue forecasts are pivotal in relation to the orderly planning of management functions such as input acquisition, scheduling, processing, inventory replenishment, and financing decisions. Higher costs of obsolescence and inventory holding (Lee and Adam 1986; Watson 1987) and lower returns on capital investments may result from optimistic forecasts, while stock out costs and reputation damage are likely consequences of pessimistic forecasts (Durand, 2003; Ittner and Larcker, 1998).

Accounting activities that incorporate the planning of outcomes through budget preparation, and the monitoring of actual activities through the preparation of internal accounting reports occur frequently in many firms (Emmanuel, Otley, and Merchant 1990). Accounting textbooks provide schematics of these accounting processes, and suggest strong linkages between their use and accurate prediction (Horngren, Foster, and Datar 1997; Pratt 2000). This linkage exists whether the role of the accounting process is regarded as being to facilitate decision making (Chenhall 2003) or to provide effective monitoring to reduce agency costs (Davila and Foster, 2005; Emmanuel et al. 1990; Zimmerman 2000).

Given the importance of forecasting and the various roles of accounting systems it is critical to understand whether accounting activities have the capacity to reduce forecast inaccuracy. The

analysis presented in this paper seeks to address the research question, do managers with access to accounting information through budget preparation and/or internal accounting report preparation make more accurate forecasts? Evidence of predictive benefits from such accounting activities is effectively non-existent and has received limited attention compared with other accounting influenced outcomes such as goal congruence and performance measurement (Fisher, Frederickson, and Peffer 2000; Fisher, Maines, Peffer, and Sprinkle 2002; Zimmerman 2001, 419). An explanation for the dearth of evidence is the extant research focus on large mature firms where most, if not all, utilize both budget preparation and internal accounting report preparation (Emmanuel et al. 1990; Horngren et al. 1997; Chenhall and Langfield-Smith 1998). The consequent limited variation in observed adoption of these activities in large firms is exacerbated by the absence of cross-sectional data sets of firms' budgeting systems.

To investigate the influence of accounting activities upon forecast accuracy we utilize data from the Australian Bureau of Statistics' (ABS) *Business Growth and Performance Survey* (*BGPS*). This data set enables us to overcome a number of problems often experienced in accounting research (Ittner and Larcker 2001, 388; Zimmerman 2001, 420). First, the sample, by accessing data from small privately held firms, has sufficient variation in the respondent firms' utilization of both budget preparation and accounting report preparation to facilitate the detection of accuracy effects. Second, we utilize a cross-sectional data set of firms' budgeting systems. Third, the large sample frame we utilize avoids problems of generalizibility due to small sample size or narrow sample focus. Fourth, the longitudinal nature of the study and the ability to track "hard" responses at both the point of forecast and the point of actual performance avoids problems with recall biases and avoids the need to resort to subjective or perceptual measures such as perceived

forecast accuracy or usefulness (Ittner and Larcker 2001, 395). Finally, this study's use of mandatory and proprietary forecasts minimizes the influence of non-response bias and other biases often associated with public forecasts.

We also perform analyses to further explore linkages between budgeting, reports, and forecast accuracy. First, to investigate the possibility that the relationship between accounting activity use and forecast accuracy is non-linear, we partition the sample based on forecasting difficulty. Second, we consider the influence of the demand for accounting practices by analyzing the role of the firms' structural and environmental characteristics upon the utilization of budget preparation and internal accounting report preparation.

This paper proceeds as follows. The next section discusses potential explanations of why budget preparation and internal accounting report preparation affect forecast accuracy. Section 3 reviews the sample and the method used for the analysis while section 4 reports the main findings and section 5 concludes.

2. Literature review and hypotheses development

Forecasts and expectations are an integral aspect of many commercial decisions that influence subsequent firm growth, profitability and survival. While accurate forecasting of all decision inputs is essential to effective planning, the critical importance of an accurate revenue forecast cannot be overstressed (Horngren, Sundem, and Stratton 1999, 263).

A revenue forecast is a simple prediction. It reflects the manager's estimate of future sales and can be based upon simple perceptions that represent the prior of the manager in the absence of any information. However, in making a forecast the manager usually has a wide set of information available and the manager's estimate of future firm revenues is updated through these information sources. The set of information likely to be available to managers to assist in making revenue forecasts includes: past patterns of sales, current period sales, economic conditions, strategic changes in firm activities, and planned changes in firm prices and product mix. Accounting activities generate part, but not all of this information set. Managers may also incorporate influences gained from their business experiences. These alternative influences may reduce the extent to which accounting activities improve the forecast accuracy of managers.

The interaction of planning and control functions, especially in a principal agent framework, often gives rise to competing interpretations of the usefulness of accounting information (Arya et al. 1997). One interpretation is that accounting information facilitates decision-making (Baiman 1982; Chenhall 2003) and informs predictive planning (Cooper, Crowther, and Carter 2001; Pratt 2000, 3). The second interpretation is that accounting activities have a decision influencing or control role (Gjesdal 1981) that provides effective monitoring to reduce agency costs (Davila and Foster, 2005; Arya et al., 1997). Large firms with significant complexity appear to achieve positive net benefits from accounting activities (Chenhall and Langfield-Smith 1998) but this may not be so for the majority of firms where reduced complexity means benefits concerned with communication and feedback formality are lower (Horngren et al. 1999, 251; Perren and Grant 2000). Evidence suggests there is a transition point at which companies recognise the need for more formal management tools and that the transition point is most likely to be visible in

smaller, possibly growing, firms (Davila 2005, 224). Accordingly we argue that in less complex firms even if the accounting activity exists for control rather than planning, its existence generates information that has the potential to improve forecast accuracy.

Irrespective of role, accounting activities represent information sources that help make sense of complexity differentiation and uncertainty (Emmanuel et al. 1990, 5) and provide the capacity for firms' managers to update their expectations both before and during the forecasting period. As firms refine their accounting systems and the use they make of the outputs, the capacity to make more accurate forecasts should be enhanced. For example, a firm that directly compares actual outcomes against planned outcomes through a variance report would expect to be in a better position to adjust priors. Regardless of the fineness of the accounting system or whether the principal focus is decision-facilitating or decision-influencing, the utilization of accounting activities is expected to provide incremental information beyond the set of other available information for the manager, and we should expect that managers who have access to the outputs from accounting activities have greater forecast accuracy than those managers who do not.

The budget preparation process generally involves the integration of inputs (Bailes and Assanda 1991) whereby management quantifies its expectations concerning the organizations' operating and financial performance and positions. The involvement of many participants and information sources within the firm also assists in the coordination of the firm's functions and the creation and refinement of strategic and operational goals (Hopwood, 1976; Horngren et al. 1999, 252). Given the importance of this process, information external to the firm is also often gathered and assessed (Anthony and Young 2003, 19). The presence in a firm of a budget preparation activity

should result in improved forecast accuracy because the systematic collection of a broad range of information should allow for a more accurate assessment of future performance. However, budgeting in itself may not improve forecasting accuracy, as budgeting without internal reporting is a meaningless formal control system. Consequently, we also anticipate the existence of a budget preparation activity alone will not result in the same degree of improvement in forecast accuracy as should exist if both budget preparation and internal reporting activities exist.

Importantly budget preparation and revenue forecasts are not identical constructs. It is recognized that budgets are not simply a forecasting device, but are used for many other purposes such as to communicate objectives and motivate employees. In this spirit, Horngren et al. (1999, 262) define a sales forecast as a prediction of sales under given conditions, while a sales budget is the outcome of decisions to create the conditions that will generate a desired level of sales. Therefore the budgeted value of future revenue may diverge from the best estimate due to considerations beyond simple forecasting. However, by involvement in the budget preparation process, managers have further information to assist in the formulation of their best estimates, and consequently the managers' best estimates should be improved.

The use of internal accounting reports should also improve forecast accuracy as it allows managers to access summarized financial information of the firms' recent activities. Reports from the internal accounting system are a principal source of useful feedback (Chenhall 2003) and accounting is seen to be an integral aspect of the integration of diverse activities (Collier 2005, 323). Internal accounts preparation involves a systematic collection of accounting information as part of a routine accounting cycle. Generally this includes transactions being

verified, data errors identified, and totals reviewed, all resulting in information that is more reliable (Brownlee, Ferris, and Haskins 2001, 51). The aggregation and reporting of such information allows the manager to observe and process the content more succinctly. Therefore internal accounting report preparation should allow managers to update their prior beliefs about firm performance and to make more accurate forecasts with greater confidence. The notions of information embedded in externally released interim reports improving forecast accuracy among the users of financial statements is common in the literature that examines publicly traded firms, but is rarely empirically documented in relation to internal users (Leftwich, Watts, and Zimmerman 1981; Bradbury 1992).

In the light of these expectations concerning the potential accuracy benefits from undertaking the above accounting activities the following hypotheses are analyzed:

HYPOTHESIS 1. *The existence of a budget preparation activity will result in greater revenue forecast accuracy.*

HYPOTHESIS 2. *The existence of an internal accounting report preparation activity will result in greater revenue forecast accuracy.*

We also anticipate that the relationship between improved forecast accuracy and the existence of the accounting practices identified above may be non-linear, as firms operating in more volatile environments may benefit more from budget and financial report preparation. There are many environmental variables that might influence both the forecasting process and accounting activities including economic turbulence, market hostility, and operational diversity and

complexity. These variables are often represented in a single measure of environmental uncertainty which is perhaps the most widely used research construct to represent a volatile environment (Chenhall 2003, 137). Higher uncertainty has been generally found to be associated with a need for more information and greater use of accounting activities (Gordon and Narayanan, 1984; Haka and Krishnan, 2005). Davila and Foster (2005) also indicate the greater uncertainty associated with growing firms results in such firms being more likely to use management accounting systems. These results suggest that the use of accounting activities and the consequent improvement in forecast accuracy may be more evident in firms experiencing greater environmental uncertainty. To investigate this potential non-linearity, we partition the sample based on forecasting difficulty and suggest the following:

HYPOTHESIS 3. *Improved revenue forecast accuracy associated with the presence of budget preparation will be higher in firms with greater uncertainty*.

HYPOTHESIS 4. *Improved revenue forecast accuracy associated with the presence of internal accounting report preparation will be higher in firms with greater uncertainty.*

Finally, while both budget preparation and internal accounting report preparation may provide benefits such as improved forecast accuracy, the choice by firms to adopt such activities is not an automatic one as the implementation of accounting activities is not costless. The weighing of estimated costs against probable benefits is a key consideration in choosing accounting systems and methods (Horngren et al. 1999, 9), and the use of budget preparation and internal accounting report preparation by firms will only occur if the benefits from undertaking such activities equal or exceed their costs. New, small and less complex firms may believe the benefits do not

outweigh the costs and choose to operate with limited management accounting processes (Collier 2005, 325). The introduction of more formal accounting system developments is often related to contingent events such as shortfalls of finance, cash flow crises or innovations in the firm (Reid and Smith, 2000). Similar cost-benefit considerations will apply in determining the extent of sophistication of the activities. At the most primitive level the firm has the choice of whether to undertake either or both of these activities. Given this adoption choice we also investigate the factors associated with the use of the accounting activities and how this choice influences the associations observed between forecast accuracy, budget preparation and internal accounting report preparation.

3. Research design

Sample

The data on forecasted and actual results utilized for the analysis in this paper was obtained from the *Business Growth and Performance Survey* (*BGPS*) developed by the Australian Bureau of Statistics (ABS). This survey was administered once a year over a four-year period. The survey's primary goals were to investigate economic and structural characteristics associated with firm growth and performance, but several other aspects including forecasting were covered. For this study we focus upon the second year of the survey, as it provides all the required independent variables for the subsequent analyses, and utilize comparable actual results from the third year of the survey.

The sampling frame of the *BGPS* was all employing Australian firms, with the exception of some industry groups (ABS 1998). While this sampling frame resulted in a wide range of firm sizes,

for confidentiality reasons the firm survey data available (without perturbation) was restricted to firms with less than 200 full-time equivalent employees. It is generally accepted that all large firms fully utilize both budget preparation and internal accounting reports due to statutory requirements and performance measurement concerns while not all privately held firms will consider there are positive net benefits associated with these activities. (Emmanuel et al. 1990; Horngren et al. 1997; Chenhall and Langfield-Smith 1998). The sampled firms were expected to provide sufficient variation in their utilization of both budget preparation and internal accounting report preparation to facilitate the detection of differences in forecast accuracy associated with the use of these activities. The sampling frame was deliberately broad and, due to the high response rate achieved (almost 100%) because of the compulsory nature of surveys administered by the ABS, the results are not affected by problematic non-response biases.

Where more detailed information was not available the survey was generically addressed to 'The Manager/Owner'. However, where information was available or once the correct person to complete the form was identified from prior years, the survey was personally addressed. Responses to the survey were made approximately four to five months into each financial year. Therefore, respondents all had extra contextual information at their disposal that undoubtedly influenced their forecasts. This suggests that the minimum temporal uncertainty incorporated into the respondents' forecasts was around seven months.

For a firm to be included in the analysis it had to give responses in consecutive years to obtain both the forecast data and the subsequent actual performance of the firm; and have positive sales for those two years. In addition, we removed two firms with forecasts more extreme than 5,000

percent of the previous year's revenue. These criteria ensured that only operating firms with reliable data were used in the final sample. Applying the above criteria resulted in 3,758 firms being available for the initial analyses.

The Dependent Variable: Forecast Accuracy

To measure the accuracy of forecasts by firms we used absolute forecast error (*AFE*), calculated as:

$$AFE = | ACTUAL - FORECAST | / | FORECAST | \quad (1)$$

where *FORECAST* is the annual revenue forecast made by the firm and *ACTUAL* is the actual annual revenue subsequently achieved by the firm.

The forecast question in the survey asked the principal of the business to provide a prediction of the total (gross) revenues for the financial year ending June 30.[1] This prediction of revenue, as with all responses in the survey, was confidential and respondents could therefore report their best prediction of total revenue knowing that their prediction would not be disclosed to any other parties either inside or outside the organisation. Consequently, respondents could submit predictions without related gaming concerns such as budgeting slack, bonus incentives, and motivation purposes which may provide incentives for the respondent not to report the most accurate revenue forecast (Chow, Cooper, and Waller 1988; Walker and McClelland 1991; Fisher et al. 2000; Fisher et al. 2002). This absence of contextual influences meant that the revenue forecast provided did not have to represent budgeted revenue, but rather the respondent's best prediction of revenue for the period. Actual revenue was self-reported in the subsequent year's survey. Following firms longitudinally over two periods and obtaining directly

comparable forecast and actual measures, overcomes reliance upon self-assessed or perceptual measures of forecast accuracy that is present in most of the limited extant research (Ittner and Larcker 2001, 395; Winklhofer, Diamantopoulos, and Witt 1996; Chenhall and Langfield-Smith 1998). Descriptive statistics for the forecast error and absolute forecast error are reported in Table 1 and discussed in the results section.

Analysis was also restricted to observations for which the AFE is less than or equal to 100 percent. This trimming was performed to reduce the influence of outliers that may be caused by data entry errors or inappropriate responses and is consistent with previous research (O'Brien 1988; Walther 1997). This reduced the number of firms by 140 to 3,618. To ensure that the trimming did not influence the results, we re-performed the analysis as part of a series of sensitivity tests that are reported at the end of the results section of this paper.

To evaluate the quality of the survey data, and the care the respondents took in completing the forecasting responses, we examined the forecast errors and correspondence between predicted growth and actual growth. We observed that the average signed forecast errors are zero and that the spearman correlation between predicted growth and actual growth for the sample is 0.47, suggesting that respondents did appear to take care in answering forecasting questions.

Independent Variables: The Use of Budget Preparation and Internal Accounting Report Preparation

As for the dependent variables, descriptive statistics for the independent variables are reported in Table 1 and additional information about the sample is provided in the following discussion.

The use of budget preparation (represented by the variable *BUDGET*) is based upon the question "Did this business use any of the following business practices: budget forecasting?" (1 = yes and 0 = no). This question had other stems that related to different planning constructs and we have used budget preparation to distinguish from both the revenue forecasting process and other planning related activities. In our sample, 62.1 percent (*n* = 2,247) of firms used budget forecasting. A criticism of the use of this dichotomous measure is that it does not capture the richness of budgeting or the variability of budgeting processes. However, there is no simple mechanism to determine a more refined indication from the available data and the use of a dichotomous measure provides a clear distinction in firm behavior to detect the presence of accounting activity accuracy effects. The use of dichotomous measures to represent other accounting activities, such as activity based costing (*ABC*) and just-in-time (*JIT*) has been commonly applied in other research (Ittner, Lanen, and Larcker, 2002; Kinney and Wempe, 2002).

The use of internal accounting report preparation (represented by *REPORT*) is based upon the question "Did this business use any of the following business practices: income/expenditure reports (more than once a year)?" (1 = yes and 0 = no). Again, the dichotomous nature of the reporting variable does not completely capture the potential variation in reporting behavior by firms. For example, a firm could report on a quarterly or monthly basis. The ideal response would provide detail of when the last report with total revenue information was given to the decision maker, however, this response is not provided by the survey. Nevertheless, this dichotomous measure should differentiate firms that prepare reports with revenue and expense

information (income statements or derivations thereof) from those firms that do not. In our sample, 75.1 percent (n = 2,716) of firms had income/expenditure reports.

To facilitate interpretation of the findings we also create dichotomous variables that represent the situation where firms undertake budget preparation and not internal accounting reports preparation (*ONLY BUDGET*) and vice versa (*ONLY REPORT*). In our sample 3.8 percent (n = 139) of firms only prepared budgets and 16.8 percent (n = 608) only prepared internal accounts. Finally, 58.3 percent (n = 2,108) of firms both prepared budgets and undertook internal reporting (represented by *BOTH*). Table 4 (discussed in the results section of the paper) provides further detail on these separations.

Control Variables

There are several characteristics of the firm that might have an affect upon forecast accuracy. Explanations for the controls used and descriptive statistics are discussed below and reported in Table 1.

Both firm size and age may be associated with forecast accuracy and the presence of accounting activities because they represent a proxy for variability in revenue streams. Davila (2005, 243) indicates that both size and age are primary drivers of the emergence of management control systems, and there is increasing evidence that the need for internal accounting information increases with scale (Chenhall, 2003). Budget preparation has been specifically identified to be associated with company growth (Davila and Foster, 2005) and is most likely to be adopted before financial monitoring activities such as internal accounting report preparation (Moores and

Yuen, 2001). Forecast accuracy has also been shown to be influenced by firm size, with larger firms being more accurate than smaller firms. Several authors posit that the larger firms' abilities to commit more resources to forecasting may contribute to the association between forecast accuracy and firm size (Winklhofer et al. 1996; Jelic, Saadouni and Briston 1998; Diamantopoulos and Winklhofer 1999; Cheng and Firth 2000). We represent size (denoted by *ASSET*) by the base 10 logarithm of the value of total assets.

Firm age has also been shown to influence forecast accuracy, with older firms having greater accuracy. Previous research has posited that this relationship is most likely due to older firms having a greater history of trends and time series behavior, and greater knowledge of the business environment (Winklhofer et al. 1996; Jelic et al. 1998; Diamantopoulos and Winklhofer 1999; Cheng and Firth 2000). We represent age (denoted *AGE*) as the number of years the firm has been in operation. For confidentiality purposes the *BGPS* categorizes age into a series of two-year age groups with an upper bound of 32 years. Therefore *AGE* is a continuous variable, defined as the mid-point of the two-year interval in which the firm lies. The mean (median) value of *AGE* in our sample is 13.291 (11.000) years.

The number of business locations is another indicator of scale and complexity that may also influence forecasting accuracy. The greater the number of locations, the more likely the possibility that forecasts and realizations are exposed to idiosyncratic factors related to each distinct location and the more likely it is that more contextual knowledge is required to make accurate forecasts. Number of business locations (represented by *LOCAT*) is an indicator

variable that equals 1 if the firm has more than one business location and 0 otherwise. In our sample, 24.1 percent (n = 871) of firms operated in more than one business location.

Also, changes within the firm, such as in the range of products or services offered or the markets targeted, may result in differences in forecasting difficulty that will affect accuracy. Three variables related to changes in the firm were utilized for this study. Respondents who indicated there had been major changes in the business range of products and services (represented by *CRANGE*) were coded 1, and those that did not indicate a major change were coded 0. In our sample, 26.5 percent (n = 959) of firms reported major changes in their range of products or services. Similar coding was used for firms that indicated major changes in targeting domestic or export markets (represented by *CMARKET*). Thirty percent (n = 1,086) of firms in our sample reported major changes in the markets targeted. Finally changes in product development and processes (represented by *CDEVELOP*) identified firms that developed any new products, introduced any substantially changed products, or developed or introduced any new or substantially changed processes. The 23.9 percent (n = 865) of firms in the sample involved in these changes were coded 1, and the remainder were coded 0.

The use of management practices within firms such as formal planning, formal networking, and performance comparisons with peers, is also likely to be related to budget preparation and internal accounting report preparation, as formalized accounting and management practices are often correlated. By including these management practices in our analysis we can observe if the results observed from budget preparation and internal accounting report preparation are potentially caused by correlation with other formal activities that are associated with better

management (Gibson and Cassar 2005). In addition, these management practices can be considered another type of feed-forward process to assist with prediction (Durand 2003, 833). Again, for each of these management practice variables, firms that provided a positive response were coded 1 and 0 otherwise. The use of formal planning (represented by *PLAN*) identifies firms that indicated they used a documented formal strategic plan and/or a formal business plan. In our sample, 37.5 percent (n = 1,355) of firms undertook formal planning. Also in our sample, 24.9 percent (n = 902) of firms undertook formal networking with other businesses (represented by *NETWORK*). Finally, 27.3 percent (n = 987) of firms undertook the practice of comparing performance with other businesses (represented by *COMP*).

Industry membership may also influence forecast accuracy as different industries experience differing levels of variability in revenue and earnings streams, and also have varying control over such streams (Winklhofer et al. 1996; Jelic, et al. 1998). We control for industry effects through a series of indicator variables for each major Australia and New Zealand Standard Industry Classification (*ANZSIC*) code. The indicator variables for each ANZSIC code, with manufacturing as the reference industry, are included, but not reported, for all multivariate analyses presented.

The data set also allows the inclusion of a variable based upon the experience of the major decision maker. Experience has been shown to be a significant explanatory variable of forecast accuracy for several groups outside the firm, such as security analysts (Mikhail, Walther, and Willis 1997, Clement, 1999). However, questions related to experience were not considered compulsory, and therefore were only completed for 63.8% (n = 2,310) of the sample. The mean

(median) experience as a business proprietor or director for those that responded was 14 (13) years. All the multivariate analyses undertaken and reported below were also performed with a variable representing the number of years experience of the major decision maker. At no stage was this experience variable a significant predictor of forecast accuracy. Given the substantial reduction in sample size as a result of inclusion of this variable, we exclude the experience variable and use the largest sample available for the reported analysis.

We also create a direct measure of forecasting difficulty, related to variability of revenue, for both hypotheses testing and control purposes. *UNPRED* is a measure of forecasting difficulty, determined as the mean absolute value of the residual from a model that regresses year t+1 sales on year t sales for each firm. To control for heterogeneity across sample firms, the mean absolute residuals are deflated by the mean of the firm's revenues over the period. Therefore a higher value suggests that a firm has high growth variability and it should be more difficult to forecast revenue than for firms with lower values. Given the inclusion of a direct forecasting difficulty measure, variables such as firm size and age that are normally associated with forecast accuracy may have lower predictive power to explain forecast accuracy differences due to the correlation between size, age and variability of revenue.

4. Results

Descriptive Statistics

Descriptive statistics for the dependent variables are reported in Table 1. The mean (median) absolute forecast error is 15.05 (9.48) percent of forecasted revenue. The level of the error is greater than that observed from forecasts by inside management and financial analysts of large

firms (Schreuder and Klaassen 1984).[2] Informally this supports the belief that smaller firms are less accurate in their forecasts than larger firms. The mean (median) signed forecast error is 0.43 (0.02) percent for forecasted revenue, suggesting that the forecasting errors of the sample firms are symmetrically distributed, and on average, neither pessimistically nor optimistically biased.

Table 2 provides the correlations of the variables in the study. Absolute forecast error is observed to be significantly associated with the majority of independent and control variables in the predicted direction, with budget preparation (ρ = -0.082), internal accounting report preparation (ρ = -0.098), firm size (ρ = -0.119), firm age (ρ = -0.071), business planning (ρ = -0.058), performance comparisons (ρ = -0.069), and multiple business locations (ρ = -0.077) all negatively correlated with absolute forecast error at $p < 0.001$. Budget preparation and internal accounting report preparation are also positively correlated (at $p < 0.001$) with most of the other variables reported in the table. To allay potential concerns regarding multicollinearity we examined the variance inflation index (VIF) when performing our multivariate analyses. All reported analyses have VIFs below three, suggesting collinearity is not harmful.

There are several industry differences between our sample and the population of firms, as indicated in Table 3. Our sample has an over representation of manufacturing and wholesale firms and an under representation of construction, retail, and property and business service firms. These differences exist because of a deliberate *BGPS* sampling preference towards firms that have higher growth, more innovation and greater export potential. To address the generalizability of the results to the population of firms we re-performed the analysis using population weights provided by the *ABS*. The results are consistent with our main findings and consequently not

reported. The results in Table 3 indicate that there is some variance in revenue forecast accuracy across industry groups. The finance and insurance group has the greatest absolute forecast errors of approximately 23.6 percent, while the wholesale and retail groups have the most accurate forecasts with a mean absolute forecast error of 12.1 percent and 12.3 percent respectively. To further assess the influence of industry we report, in the sensitivity analysis section later in this paper, results of a more homogenous industry group, namely manufacturing.

Results for the Determinants of Forecast Accuracy

The first two hypotheses posit that firms that undertake budget preparation or internal accounting report preparation will have greater revenue forecast accuracy. Table 4 provides the mean absolute forecast errors for firms according to whether they undertake budget preparation, undertake internal accounting report preparation, or undertake combinations of both activities. Firms that undertake budget preparation have significantly lower absolute forecast errors, with an absolute difference of 2.85 percent (0.1682 - 0.1397). This is equivalent to saying that firms that use budget forecasting having an *AFE* approximately 17.0 percent lower (2.9/16.8) than firms that do not undertake budget forecasting. Firms that undertake internal accounting report preparation also have significantly lower absolute forecast errors than firms who do not, with an absolute difference of 3.82 percent (0.1791 - 0.1409). This indicates firms that undertake internal accounts reporting have absolute forecast errors approximately 21.3 percent lower than firms that do not undertake internal accounts reporting. In addition, firms that undertake both activities, have the lowest mean absolute forecast errors of the sample firms (0.1381). These univariate results are consistent with the conjecture reflected in the hypotheses, that firms utilizing budget

preparation and internal accounting report preparation are more accurate in forecasting performance.

The multivariate results from the OLS regressions modeling the determinants of forecast accuracy, as measured by absolute forecast error (*AFE*), and providing specific tests of H1 and H2 are reported in Table 5. The first two models differ by the use of dichotomous variables for budget preparation and internal accounts reporting in model 1, whereas model 2 uses variables representing the use of these accounting activities jointly. From model 2, the use of budget preparation only appears to improve forecast accuracy by 0.277 percent of the forecast made. Comparing this to the mean forecast accuracy reported in Table 1 (0.1505) suggests approximately a 1.84 percent (0.00277/0.1505) improvement in forecast accuracy as a result of budget preparation. However, this improvement in forecast accuracy is not statistically significant. Model 2 also shows that the improvement in forecast accuracy as a result of the firm only preparing internal accounting reports is 1.289 percent of the forecast made. Based upon the mean *AFE* this equates to an average improvement of 8.56 percent. Firms that utilized both budget and report preparation had an improved forecast accuracy of 1.777 percent of the forecast made (statistically significant at $p < 0.05$). At the mean this equates to forecasts approximately 11.8 percent more accurate. Collectively these results suggest that internal accounting report preparation improves forecast accuracy and, although the accuracy benefits from budget preparation appear limited, the improvement is greater when both budget preparation and internal account reporting is used.

In models 1 and 2 only forecast difficulty (*UNPRED*) and firm size (*ASSET*) were statistically significant ($p < 0.001$). None of the other control variables of firm age (*AGE*), multiple locations (*LOCAT*), major changes (*CRANGE*, *CMARKET* and *CDEVELOP*), or management practices (*PLAN*, *NETWORK* and *COMP*) are statistically associated with forecast accuracy. The lack of significance associated with these control variables is inconsistent with previous empirical evidence that has utilized smaller sample sizes. However, previous empirical research investigating forecast accuracy issues have also not utilized a more direct measure of revenue variability or forecast difficulty. To investigate the role that the inclusion of our direct measure of forecasting difficulty had upon the predictive power of the other control variables, we excluded *UNPRED*, and repeated the above analysis. The results in Model 3 show that after the removal of *UNPRED* both firm size and firm age were found to be significantly associated with forecast accuracy. This suggests that the firm age effects observed in previous research may be caused by the strong negative correlation between these variables and revenue variability or forecasting difficulty. The exclusion of *UNPRED* does not alter the main results in regard to associations between budget preparation and forecasting accuracy but the result between report preparation and forecasting accuracy is now statistically significant ($p < 0.05$). On the basis of these results we reject H1 and accept H2.

Forecast Difficulty and the Determinants of Forecast Accuracy

Hypotheses 3 and 4 posit that the benefit in the form of improved forecast accuracy associated with budget report preparation and internal report preparation will be higher in firms with greater uncertainty. Table 6 presents the multivariate results including an interaction variable between forecasting difficulty and accounting behaviors. Specifically, we created a dummy variable

HI_UNPRED, which is coded 1 (0) of the firm is above (below) the sample median for the *UNPRED* variable. The coefficients for the firms with low uncertainty indicate that neither budget preparation nor internal report preparation are of benefit to firms. In fact, the two variables incorporating budget preparation (*ONLY BUDGET* and *BOTH*) have positive, albeit insignificant, coefficients suggesting that budgeting is negatively related to forecast accuracy. Examining the high uncertainty firms reveals an association between internal accounting report preparation and lower forecast errors with improvements of 2.956 percent (-.02893 - .00063) of the absolute forecast error made if only report preparation occurs and 3.624 percent (-.04109 - .00485) when budget preparation is also used. However, only the latter improvement is statistically significant at conventional levels. This suggests that the benefits of internal accounting report preparation are greater for firms with greater uncertainty. The coefficient on budget preparation is again insignificant, suggesting that even in settings of greater uncertainty, the benefits of budget preparation on forecasting accuracy are trivial.[3]

Determinants of Accounting Activity Use

The previous analysis relies on the assumption that the use of budget preparation and internal accounting report preparation is equally applicable across all firms. The potential exists that the demand for budget preparation and internal accounts reporting within firms could influence the previously discussed associations. For example, there is limited understanding of what factors cause firms to engage in budget preparation or to undertake internal accounting report preparation, or of how these activities emerge in response to differing levels of environmental or predictive uncertainty (Chenhall and Morris 1986; Kren 1992). The endogenous choice of budget preparation and internal reporting may confound linkages between accounting activities and

forecasting accuracy if these accounting activities are themselves a function of forecasting difficulty.

We determine the probability of the existence of budget preparation and internal accounting report preparation in the firm, through a probit model presented as a function of possible determinants of budget preparation and/or internal accounting report preparation related to accuracy and control concerns. We include the same variables in the probit model as in our model to predict forecast accuracy, as defined in the previous sections.

The initial probit model results are displayed in Models 1 and 2 of Table 7. For both dependent variables (*BUDGET* and *REPORT*), the probit model is statistically significant ($p < 0.001$). The coefficients from the probit models show the importance of firm size, multiple locations, and changes in products and services upon the choice to undertake budget preparation and internal reporting. All these variables are positively associated with the adoption of these accounting activities, suggesting that both structural characteristics, such as size or number of locations, and operational characteristics such as changes to products offered and management practices, influence accounting activity use.

As previously indicated, the variability measure *UNPRED* (as it is empirically applied in this study) captures observed forecasting difficulty and revenue variation. Interestingly, *UNPRED* was not associated positively or negatively with either accounting activity (models 1 and 2 in Table 7).[3] This suggests that budget preparation and internal accounting report preparation are not undertaken as a consequence of forecasting difficulty. Therefore, differences between the

perceived forecasting difficulty or revenue variation and ex-post observed revenue variation could explain why we do not find an association between forecasting difficulty and accounting activity use. To further investigate this issue, we replace the *UNPRED* measure with the absolute predicted change in revenue as reported by the firm. This alternative measure (*CPRED*) is shown in models 3 and 4 in Table 7 to be positively related to these accounting activities. These results suggest that anticipated changes rather than observed variability leads to the adoption of these activities. Overall, the results modelling determinants of accounting activity use indicate that although budget preparation and internal accounting report preparation are a function of firms' structural and environmental characteristics, firms do not appear to adopt these activities as a function of forecasting difficulty, but rather as a function of predicted changes in future growth.

To formally investigate potential self-selection of budget forecasts and internal accounting reporting on the study findings, we conduct a two-stage self-selection analysis in the spirit of Maddala (1977, 1991), and as applied by Kinney and Wempe (2002). Specifically, if the factors associated with budgeting and reporting are also correlated with better forecasting accuracy, then the findings observed may be spuriously driven by adoption choice factors rather than by the actual activities. Using the probit model results reported in Table 7 and focusing only on internal accounting report preparation we obtain a variable to control for self-selection and include this variable in the forecast accuracy model separately for accounting report preparers (M_R) and non-preparers (M_N).[4] Specifically, for preparers M_R is $-f(\beta'Z) \div F(\beta'Z)$ and for non-preparers M_N is $f(\beta'Z) \div (1-F(\beta'Z))$, where $\beta'Z$ is the prediction from the probit model and $f(\bullet)$ and $F(\bullet)$ are the standard normal density and distribution functions, respectively.

Selection bias is observed if the coefficients on the selectivity variable is negative in both equations, because forecast accuracy is overstated in the reporters sample and understated for the non-reporters sample. Neither of the coefficients of M_R and M_N reported at the bottom of Table 8 are statistically significant, suggesting that self-selection is not affecting the earlier findings. In unreported results, we replicated these analyses for budgeting, and again found no evidence of self-selection bias.

Two other measures were performed to capture forecasting difficulty. These measures were: 1) the coefficient of variation of firm revenues, and 2) the mean of the absolute growth rates over the three years of available growth data from the sample firms. The Pearson (Spearman) correlation between the measure reported in this study (*UNPRED*) and these two alternative measures were 0.607 (0.535) and 0.311 (0.647), respectively. This suggests that a substantial proportion of the variation identified by these alternative measures of forecasting difficulty is being captured by the *UNPRED* measure. Also, results from an analysis using these two alternative measures, while not reported here, are consistent across all three forecast difficulty measures.

Additional sensitivity analyses

In addition to the alternatives identified above, several sensitivity analyses were undertaken to examine the influence of alternative specifications on the reported findings. To ensure robustness, we employed several deflators as alternatives to forecast revenue. These deflators include actual revenue, the average of actual and forecast revenue, and total assets. The results are not influenced by the use of these alternative deflators and are therefore not reported. Further,

we replaced *AFE* with squared forecast error to determine if the results are robust to using squared as opposed to absolute errors. The study results are consistent using this alternative dependent variable. Also, to ensure that the trimming of 140 observations for which the *AFE* is less than or equal to 100 percent did not influence the results, we also performed the analysis without the *AFE* restrictions and log transformed the dependent *AFE* variables. Again, these alternate results are consistent with the trimmed sample findings and are consequently not reported.

To examine the affect of specification on the reported findings, in particular those assumptions that underlie OLS regression, the regressions presented in Tables 5 and 6 were also re-performed using ranks of the dependent and independent variables, and also, using generalized method of moments (GMM). Again, we find the reported results are robust to these alternative specifications. The above analyses were also replicated including past absolute forecast error, as an additional control variable and in place of the existing firm characteristic variables. Inclusion of past absolute forecast error resulted in a reduced number of firms available for the analysis, due to the additional data requirements. Importantly, the findings involving budget preparation, internal accounting report preparation and forecasting accuracy are invariant to the inclusion of past forecast accuracy for this smaller sample.

Finally, we investigated if the study findings applied to a more homogenous group of firms. To achieve this, we re-performed the analyses from Tables 5 and 6 using only manufacturing firms. The unreported results for the full sub-set of 1,354 manufacturing firms are generally consistent with the full sample findings, with firms that budget and report generally having lower absolute

forecast errors than those that do not. Further, firm size and firm age are again negatively associated with the magnitude of forecast error. We partition manufacturing firms into low and high variability using the *UNPRED* classifications from Table 6, and again observe that the benefits from reporting are only observed for high variability firms, with little support for budget preparation being associated with more accurate forecasting.

5. Conclusions

This study investigates the association between budget preparation and internal accounting report preparation and the accuracy of revenue forecasts. Consistent with the conjecture that formal accounting system feedback improves predictive performance, we observe that internal accounting report preparation significantly improves forecast accuracy. However, inconsistent with arguments concerning feed-forward predictive benefits, the results provide only limited support for linkages between budget preparation and forecast accuracy. Partitioning firms by forecasting difficulty reveals that the accuracy benefits from internal accounting report preparation are primarily observed for firms with high uncertainty, suggesting a non-linear relationship between internal accounting report preparation and forecast accuracy. Hence this study provides previously unavailable empirical evidence for the predictive benefits of accounting activities in firms. While the results also indicate that the use of budget preparation and internal accounting reports are a function of firms' structural and environmental characteristics, firms do not appear to adopt these activities as a function of forecasting difficulty, but rather as a function of predicted changes in future growth.

An important aspect of this research is the ability to obtain carefully reflected forecasts from respondents. Several authors have raised shortcomings with respect to this aspect of similar

research and our ability to in part overcome these shortcomings is crucial to the validity of the findings (Levine, 1993). Obviously the failure of the survey to effectively capture the "true" forecast based upon the actual expectations of the respondents is a limitation of the research. However, the observed correspondence between predicted and actual growth and the mean signed forecast error being zero suggests that respondents were careful in answering forecasting questions. Further, unlike public forecasts released by listed companies, the forecasts from this study are free of potential biases such as reputation effects, signaling, and exposure to legal liability. In addition, the forecasts from this study do not suffer from problems associated with gaming influences where there are incentives to alter forecasts from the most unbiased estimate.

There are a number of limitations in the data that have influenced our ability to develop more rigorous analysis procedures. First, while the survey elicits respondents' years of experience in the firm, the survey is silent regarding the respondents experience with forecasting. Second, there is potential that the choice to employ budget preparation or internal accounting report preparation may be an indicator of 'better' management, whereby better managers choose to use these accounting activities. We have attempted to empirically address this concern by including variables that proxy for better management, namely formal networking and the use of comparisons. However, the extent to which these proxies do not capture better management is a limitation of the research. Third, it is not possible to identify the influence of other purposes for the accounting data, such as motivating managers to be better forecasters, as our data lacks fineness in respect of its information content. However, we are confident that any information from accounting activities will facilitate the revision of priors and provide circumstances that should lead to improved forecast accuracy.

The use of a large sample size from a broad sampling frame suggests that the results from this study can be generalized to the broader population of smaller privately held firms. However, it is an empirical question as to whether this study's findings can be generalized to larger firms, in particular those with over 200 employees that were not available from the utilized dataset due to confidentially restrictions. As stated earlier, however, it appears very large firms all effectively undertake both budget preparation and internal accounting report preparation whether for voluntary contracting, planning and controlling purposes, or in response to mandatory requirements of regulatory bodies.

While this study has provided some insights into the forecast accuracy of firms, future research could examine other dimensions of both budgeting and reporting to determine cross-sectional differences in accuracy. For example, what particular budgeting activities, level of participation, or environmental scanning is more effective at reducing uncertainties? In regard to internal reporting, does accounting system sophistication assist management prediction, and how does variation in the frequency of reporting influence the findings determined in this study? More generally, future research should examine other accounting behaviors of firms and how that impacts firm operating decisions. How accounting practices and behaviors are applied in the firm, and their observed benefits have important implications to the management of firms and to the accountants that support them.

ENDNOTES

[1] Terminology across different countries vary as to the meaning of total income, with some countries defining total income to represent all revenues and gains, while others define total income as all revenues and gains less expenses. To avoid confusion the term revenues is used throughout the paper. While earnings has generally been used to investigate aspects of forecasting by insiders of the firm, the use of revenues does offer several advantages, particularly given the sample firms utilized in this study. In particular, how earnings are determined is not homogenous across firms, while revenue is less ambiguous and less open to misinterpretation. Such issues are important, as many of the firms in the sample are not required to be audited. In addition, unforeseen adjustments to earnings due to changes in accounting treatments such as depreciation, while having a significant effect upon earnings, are most likely beyond the scope of the original earnings forecasts made by insiders of these firms. Therefore, these earnings adjustments reduce the ability of the study to capture the accuracy of forecasts made by firm insiders. Using revenue forecasts reduces the influence of such events, and has been applied in previous research including Schreuder and Klaassen (1984) and Trueman, Wong and Zhang (2001).

[2] Schreuder and Klaasen (1984) examining 53 internal revenues forecasts of listed firms, found a mean absolute prediction error of 7.2 percent using actual revenues as a deflator. These forecasts were made before the annual report of the previous year was approved, suggesting a longer forecasting uncertainty period than the seven months in our study.

[3] The lack of significance of forecasting difficulty on budget preparation or internal accounting report preparation is also observed if *UNPRED* is transformed into deciles, or ranks.

[4] The results are quantitatively the same if budget forecasting is also included in the model.

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TABLE 1
Descriptive statistics of dependent and independent variables*

	Mean	s.d.	25%	Median	75%
AFE	.1505	.1686	.0379	.0948	.1960
FE	.0043	.2259	-.0942	.0002	.0951
BUDGET	0.621	0.485	0.000	1.000	1.000
REPORT	0.751	0.433	1.000	1.000	1.000
ONLY BUDGET	0.038	0.192	0.000	0.000	0.000
ONLY REPORT	0.168	0.374	0.000	0.000	0.000
BOTH	0.583	0.493	0.000	1.000	1.000
ASSET	8.842	0.908	8.245	8.835	9.471
AGE	13.291	9.291	5.000	11.000	19.000
LOCAT	0.241	0.428	0.000	1.000	1.000
CRANGE	0.265	0.441	0.000	0.000	1.000
CMARKET	0.300	0.458	0.000	1.000	1.000
CDEVELOP	0.239	0.427	0.000	0.000	0.000
PLAN	0.375	0.484	0.000	0.000	1.000
NETWORK	0.249	0.433	0.000	0.000	0.000
COMP	0.273	0.445	0.000	0.000	1.000
UNPRED	0.093	0.125	0.022	0.053	0.113
CPRED	0.118	0.195	0.150	0.060	0.020

* *AFE* is the absolute value of the difference between the revenue forecast and the actual revenue divided by the revenue forecast. *FE* is the value of the difference between the revenue forecast and the actual revenue divided by the revenue forecast. *ASSET* is defined as the log 10 of total firm assets. *AGE* is a continuous variable, defined as the mid-point of the two-year interval in which the firm age lies. *BUDGET* is an indicator variable equal to one if the firm undertook budget preparation, and zero otherwise. *REPORT* is an indicator variable equal to one if the firm used income/expenditure reports, and zero otherwise. *ONLY BUDGET* is an indicator variable equal to one if the firm undertook budget preparation and did not use income/expenditure reports, and zero otherwise. *ONLY REPORT* is an indicator variable equal to one if the firm used income/expenditure reports and did not undertake budget preparation and zero otherwise. *BOTH* is an indicator variable equal to one if the firm undertook budget preparation and income/expenditure reports, and zero otherwise. *PLAN* is an indicator variable equal to one if the firm has a formal business or strategic plan, and zero otherwise. *NETWORK* is an indicator variable equal to one if the firm undertook formal networking with other businesses, and zero otherwise. *COMP* is an indicator variable equal to one if the firm uses comparisons of performance with other businesses, and zero otherwise. *LOCAT* is an indicator variable equal to one if the firm has more than one business location, and zero otherwise. *CRANGE* is an indicator variable equal to one if the firm has had a major change to the range of products or services, and zero otherwise. *CMARKET* is an indicator variable equal to one if the firm has had a major change to the domestic or export markets targeted, and zero otherwise. *CDEVELOP* is an indicator variable equal to one if the firm has developed new or substantially changed products, or substantially changed processes, and zero otherwise. *UNPRED* is a measure of forecasting difficulty, determined as the mean absolute value of the residual from a model that regresses year t+1 sales on year t sales for each firm, where the residuals are scaled by mean firm sales. *CPRED* is the absolute value of the predicted percentage change in income.

TABLE 2
Correlation coefficients between dependent and independent variables

	AFE	*BUDGET*	*REPORT*	*ASSET*	*AGE*	*PLAN*
AFE	-					
BUDGET	-0.082	-				
REPORT	-0.098	0.555	-			
ASSET	-0.119	0.415	0.414	-		
AGE	-0.071	0.046	0.081	0.308	-	
PLAN	-0.058	0.456	0.339	0.331	0.017	-
NETWORK	0.039	0.287	0.272	0.244	-0.005	0.277
COMP	-0.069	0.299	0.258	0.252	0.014	0.267
LOCAT	-0.077	0.208	0.209	0.379	0.123	0.172
CRANGE	-0.029	0.144	0.139	0.109	0.002	0.146
CMARKET	-0.023	0.232	0.207	0.214	0.033	0.236
CDEVELOP	-0.039	0.176	0.149	0.120	0.011	0.155
UNPRED	0.364	-0.019	-0.047	-0.082	-0.108	0.007

	NETWORK	*COMP*	*LOCAT*	*CRANGE*	*CMARKET*	*CDEVELOP*
AFE						
BUDGET						
REPORT						
ASSET						
AGE						
PLAN						
NETWORK	-					
COMP	0.347	-				
LOCAT	0.151	0.130	-			
CRANGE	0.114	0.105	0.088	-		
CMARKET	0.131	0.107	0.116	0.384	-	
CDEVELOP	0.113	0.105	0.047	0.393	0.285	-
UNPRED	-0.009	-0.020	-0.054	-0.009	-0.002	-0.016

n = 3,618 for all correlations. Values displayed are Pearson correlation coefficients. Coefficients with absolute values greater than 0.0326, 0.0428, and 0.0547 are significant in two-tailed tests at 0.05, 0.01, and 0.001, respectively. See Table 1 for definitions of the variables.

TABLE 3
Industry distribution of AFE by major ANZSIC code

Industry Description	*ANZSIC*	*N*	*Percent of Sample*	*Percent of Australian firms*[*]	*Percent that BUDGET*	*Percent that REPORT*	*AFE*[†]	*FE*[‡]
Manufacturing	2	1,354	37.42	10.08	64.18	78.29	.1456	-.0050
Construction	3	208	5.75	14.30	39.42	62.50	.2059	.0319
Wholesale	4	591	16.33	8.48	72.42	85.28	.1209	-.0087
Retail	5	382	10.56	21.75	60.21	72.51	.1234	.0116
Accommodation & Restaurants	6	150	4.15	6.30	50.00	62.00	.1466	-.0003
Transportation & Storage	7	139	3.84	5.19	56.83	66.91	.1729	.0330
Finance & Insurance	8	146	4.04	3.49	61.64	69.18	.2355	-.0405
Property & Business Services	9	501	13.85	23.22	61.28	72.65	.1722	.0337
Cultural & Recreational Services	10	68	1.88	2.89	75.00	76.47	.1367	.0099
Personal & Other Services	11	79	2.18	4.30	45.57	53.16	.1248	-.0094
Total		3,618			62.11	75.11	.1505	.0043
Chi-square for industry differences					100.37	102.53		
F-values for industry differences							11.63	2.86
p-values for industry differences					(0.000)	(0.000)	(0.000)	(0.002)

[*] Source: Australian Bureau of Statistics. 1998. *1996-97 Small and Medium Enterprises Business Growth and Performance Survey*. Canberra, Australia: ABS.

[†] AFE is the absolute value of the difference between the revenue forecast and the actual revenue divided by the revenue forecast.

[‡] FE is the value of the difference between the revenue forecast and the actual revenue divided by the revenue forecast.

TABLE 4
Forecast accuracy (AFE) by budget preparation and internal accounting report preparation [*]

	Internal Accounting Report Preparation		
	No	*Yes*	*Overall*
Budget Preparation			
No	.1819 *.1230* n = 763	.1509 *.0982* n = 608	.1682 *.1122* n = 1,371
Yes	.1640 *.0938* n = 139	.1381 *.0851* n = 2,108	.1397***[†] *.0852****[‡] n = 2,247
Overall	.1791 *.1191* n = 902	.1409***[†] *.0873****[‡] n = 2,716	.1505 *.0948* n = 3,618

[*] AFE is the absolute value of the difference between the revenue forecast and the actual revenue divided by the revenue forecast.
Medians are presented in italics under the means
***[†] Denotes the difference between "yes" and "no" firms is significant at the 0.001 level (two-tailed) from a t-test that does not assume equality of variance.
***[‡] Denotes the difference between "yes" and "no" firms is significant at the 0.001 level (two-tailed) from a non-parametric Wilcoxon test.

TABLE 5
Regression results for the determinants of forecast accuracy (AFE)

Model 1: $AFE = \alpha_0 + \alpha_1 ASSET + \alpha_2 AGE + \alpha_3 UNPRED + \alpha_4 BUDGET + \alpha_5 REPORT + \alpha_6 PLAN + \alpha_7 NETWORK + \alpha_8 COMP + \alpha_9 LOCAT + \alpha_{10} CRANGE + \alpha_{11} CMARKET + \alpha_{12} CDEVELOP + \varepsilon$

Model 2: $AFE = \beta_0 + \beta_1 ASSET + \beta_2 AGE + \beta_3 UNPRED + \beta_4 ONLY\ BUDGET + \beta_5 ONLY\ REPORT + \beta_6 BOTH + \beta_7 PLAN + \beta_8 NETWORK + \beta_9 COMP + \beta_{10} LOCAT + \beta_{11} CRANGE + \beta_{12} CMARKET + \beta_{13} CDEVELOP + \nu$

Model 3: $AFE = \gamma_0 + \gamma_1 ASSET + \gamma_2 AGE + \gamma_3 ONLY\ BUDGET + \gamma_4 ONLY\ REPORT + \gamma_5 BOTH + \gamma_6 PLAN + \gamma_7 NETWORK + \gamma_8 COMP + \gamma_9 LOCAT + \gamma_{10} CRANGE + \gamma_{11} CMARKET + \gamma_{12} CDEVELOP + \pi$

	Model 1:		Model 2:		Model 3:	
	Co-Eff	Std. Error	Co-Eff	Std. Error	Co-Eff	Std. Error
Independent Variables‡						
ASSET	-.00758*	.00376	-.00756*	.00296	-.01030*	.00400
AGE	.00024	.00030	.00024	.00023	-.00079*	.00031
UNPRED	.45817***	.02108	.45824***	.01139		
BUDGET	-.00443	.00705				
REPORT	-.01346	.00751				
ONLY BUDGET			-.00277	.01142	-.00744	.01543
ONLY REPORT			-.01289	.00682	-.01922*	.00921
BOTH			-.01777*	.00640	-.01975*	.00864
PLAN	-.00758	.00627	-.00729	.00494	-.00441	.00667
NETWORK	.00070	.00669	-.00073	.00527	.00000	.00712
COMP	-.01023	.00655	-.01022	.00516	-.01108	.00696
LOCAT	-.00689	.00663	-.00689	.00522	-.00979	.00704
CRANGE	.00166	.00684	.00166	.00539	.00258	.00728
CMARKET	.00611	.00645	.00611	.00508	.00877	.00685
CDEVELOP	-.00692	.00684	-.00693	.00538	-.00843	.00727
Intercept	.19606**	.03099	.19560**	.02467	.26944***	.03298
Industry controls	Yes		Yes		Yes	
N	3,618		3,618		3,618	
Regression R^2	.156		.156		.045	
F-stat	31.57***		30.12***		8.03***	

‡Variables are as defined in Table 1.
* Denotes the result is significant at the 0.050 level.
** Denotes the result is significant at the 0.010 level.
*** Denotes the result is significant at the 0.001 level.

TABLE 6
Regression results for determinants of forecast accuracy partitioned by uncertainty*

Model 1: $AFE = \alpha_0 + \alpha_1 ASSET + \alpha_2 AGE + \alpha_3 HI\_UNPRED + \alpha_4 ONLY\ BUDGET + \alpha_5 ONLY\ REPORT + \alpha_6 BOTH + \alpha_7 HI\_UNPRED*ONLY\ BUDGET + \alpha_8 HI\_UNPRED*ONLY\ REPORT + \alpha_9 HI\_UNPRED*\ BOTH + \alpha_{10} PLAN + \alpha_{11} NETWORK + \alpha_{12} COMP + \alpha_{13} LOCAT + \alpha_{14} CRANGE + \alpha_{15} CMARKET + \alpha_{16} CDEVELOP + \varepsilon$

Independent Variables‡	Co-Eff	Std. Error
ASSET	-.00774*	.00382
AGE	-.00041	.00030
HI_UNPRED	.12866***	.01156
ONLY BUDGET	.00485	.02073
ONLY REPORT	-.00063	.01261
BOTH	.00485	.01092
HI_UNPRED * ONLY BUDGET	-.01325	.02921
HI_UNPRED * ONLY REPORT	-.02893	.01725
HI_UNPRED * BOTH	-.04109**	.01346
PLAN	-.00583	.00638
NETWORK	.00011	.00679
COMP	-.00986	.00665
LOCAT	-.00701	.00673
CRANGE	.00151	.00695
CMARKET	.00571	.00654
CDEVELOP	-.00665	.00694
Intercept	.17188***	.03234
Industry controls	Yes	
N	3,618	
Regression R^2	.131	
F-stat	21.62**	

‡ *HI_UNPRED* is coded 1(0) for firms above (below) the sample median of *UNPRED*. *UNPRED* is a measure of forecasting difficulty, determined as the mean absolute value of the residual from a model that regresses year t+1 sales on year t sales for each firm, where the residuals are scaled by mean firm sales. All other variables are as defined in Table 1

* Denotes the result is significant at the 0.050 level.

** Denotes the result is significant at the 0.010 level.

*** Denotes the result is significant at the 0.001 level.

TABLE 7
Probit regression results for the determinants of budget preparation and internal accounting report preparation*

Model 1: $BUDGET = \alpha_0 + \alpha_1 UNPRED + \alpha_2 ASSET + \alpha_3 AGE + \alpha_4 PLAN + \alpha_5 NETWORK + \alpha_6 COMP + \alpha_7 LOCAT + \alpha_8 CRANGE + \alpha_9 CMARKET + \alpha_{10} CDEVELOP + \varepsilon$

Model 2: $REPORT = \beta_0 + \beta_1 UNPRED + \beta_2 ASSET + \beta_3 AGE + \beta_4 PLAN + \beta_5 NETWORK + \beta_6 COMP + \beta_7 LOCAT + \beta_8 CRANGE + \beta_9 CMARKET + \beta_{10} CDEVELOP + \nu$

Model 3: $BUDGET = \gamma_0 + \gamma_1 CPRED + \gamma_2 ASSET + \gamma_3 AGE + \gamma_4 PLAN + \gamma_5 NETWORK + \gamma_6 COMP + \gamma_7 LOCAT + \gamma_8 CRANGE + \gamma_9 CMARKET + \gamma_{10} CDEVELOP + \pi$

Model 4: $REPORT = \delta_0 + \delta_1 CPRED + \delta_2 ASSET + \delta_3 AGE + \delta_4 PLAN + \delta_5 NETWORK + \delta_6 COMP + \delta_7 LOCAT + \delta_8 CRANGE + \delta_9 CMARKET + \delta_{10} CDEVELOP + \varsigma$

	Model 1: BUDGET		Model 2: REPORT		Model 3: BUDGET		Model 4: REPORT	
	Co-Eff	Std. Error	Co-Eff	Std. Error	Co-Eff	Std. Error	Co-Eff	Std. Error
Independent Variables‡								
UNPRED	.095	.205	-.205	.210				
CPRED					.588***	.167	.630***	.180
ASSET	.519***	.038	.577***	.041	.520***	.037	.581***	.039
AGE	-.011***	.003	-.006	.003	-.010***	.003	-.005	.003
PLAN	1.080***	.061	.757***	.071	1.079***	.061	.754***	.071
NETWORK	.426***	.070	.783***	.094	.422***	.070	.777***	.094
COMP	.538***	.067	.584***	.081	.553***	.067	.598***	.081
LOCAT	.148*	.068	.289***	.081	.142*	.068	.285***	.081
CRANGE	-.024	.068	.042	.077	-.033	.068	.035	.077
CMARKET	.257***	.064	.246**	.073	.236***	.065	.219**	.074
CDEVELOP	.231*	.069	.156*	.079	.233***	.069	.157*	.079
Intercept	-4.786***	.319	-4.736***	.339	-4.862***	.319	-4.861***	.339
Industry controls	Yes		Yes		Yes		Yes	
-2 Log likelihood	3319.86		2862.05		3307.35		2850.27	
Pseudo R^2	0.309		0.296		0.311		0.299	
N	3,618		3,618		3,618		3,618	

‡ Variables are as defined in Table 1.
* Denotes the result is significant at the 0.050 level.
** Denotes the result is significant at the 0.010 level.
*** Denotes the result is significant at the 0.001 level.

TABLE 8
Regression results for the determinants of forecast accuracy incorporating selectivity variables*

Model 1: $AFE = \alpha_0 + \alpha_1 UNPRED + \alpha_2 ASSET + \alpha_3 AGE + \alpha_4 PLAN + \alpha_5 NETWORK + \alpha_6 COMP + \alpha_7 LOCAT + \alpha_8 CRANGE + \alpha_9 CMARKET + \alpha_{10} CDEVELOP + \alpha_{11} M_R + \varepsilon$

Model 2: $AFE = \beta_0 + \beta_1 UNPRED + \beta_2 ASSET + \beta_3 AGE + \beta_4 PLAN + \beta_5 NETWORK + \beta_6 COMP + \beta_7 LOCAT + \beta_8 CRANGE + \beta_9 CMARKET + \beta_{10} CDEVELOP + \beta_{11} M_N + \nu$

	Model 1: REPORT = 1		Model 2: REPORT = 0	
	Co-Eff	Std. Error	Co-Eff	Std. Error
Independent Variables‡				
UNPRED	.42346***	.02401	.54128***	.04640
ASSET	-.00133	.00545	-.01772	.04396
AGE	-.00035	.00032	.00003	.00083
PLAN	-.00737	.00757	.00693	.07092
NETWORK	-.00111	.00754	.05041	.07337
COMP	-.00902	.00718	-.01578	.05591
LOCAT	-.00687	.00696	-.01296	.03410
CRANGE	-.00143	.00725	.01901	.01899
CMARKET	.00456	.00690	-.01929	.02769
CDEVELOP	-.00184	.00722	-.03241	.02325
M	-.01539	.02109	-.00018	.11915
Intercept	.12142*	.05616	.26531	.26609
Industry controls	Yes		Yes	
N	2,716		902	
Regression R^2	.134		.200	
$\beta = 0$	20.79***		10.98***	

‡ M is defined as $-f(\beta'Z) \div F(\beta'Z)$ for reporters sample and $f(\beta'Z) \div (1-F(\beta'Z))$ for the non-reporters sample, where $\beta'Z$ is the prediction from the probit model presented in Table 7 Model 2, and $f(\bullet)$ and $F(\bullet)$ are the standard normal density and distribution functions, respectively. All other variables are as defined in Table 1.

* Denotes the result is significant at the 0.050 level.

** Denotes the result is significant at the 0.010 level.

*** Denotes the result is significant at the 0.001 level.