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Factors Associated with the Year-End Decline in Working Capital

Richard Frankel,[a] Hagit Levy,[b] Ron Shalev [c]

[a] Olin School of Business, Washington University in St. Louis, St. Louis, Missouri 63130; [b] Zicklin School of Business, Baruch College, City University of New York, New York, New York 10010; [c] Stern School of Business, New York University, New York, New York 10012

Contact: frankel@olin.wustl.edu (RF); hagit.levy@baruch.cuny.edu (HL); rshalev@stern.nyu.edu (RS)

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Abstract. Working capital is an important indicator of firm operational efficiency. All else being equal, lower levels signal greater efficiency. Managers are thus likely to be motivated to report lower levels of working capital at times of greater external attention. We find that working capital levels decrease in the fourth fiscal quarter significantly more than expected, conditional on seasonal changes in economic activity. The decrease subsequently reverses in the following first fiscal quarter. Evidence indicates that firms manage down year-end working capital through transactions that increase year-end operating cash flow and that firms spread this activity over all working capital accounts. Finally, the temporary decrease in year-end working capital is correlated with compensation benchmarks and analysts' annual cash flow forecasts. The temporary drop is also more pronounced for firms with industry dominance.

History: Accepted by Mary Barth, accounting.

Keywords: working capital • year-end management • real activities management • cash flow

1. Introduction

Working capital accounts constitute a meaningful portion of firms' investment (Fazzari et al. 2000). Firms hold working capital for operating objectives such as smoothing production, reducing stockouts, and supporting credit sales. All else being equal, a lower level of working capital indicates greater operating efficiency. Analysts monitor working capital levels and use working capital to predict future profitability (Pulliam 2004). This attention likely motivates managers to exert effort to reduce working capital at times when working capital levels draw the most attention. Given that academic and anecdotal evidence suggest an emphasis on fiscal year over quarterly measurement (e.g., Jacob and Jorgensen 2007, Das et al. 2009, Givoly and Ronen 1981, Fan et al. 2010), attention to working capital levels is likely to be higher at fiscal year-end than at any other fiscal quarter-end.

Our study highlights the importance of working capital and firms' incentives to manipulate its components. Our findings suggest that year-end working capital understatement is substantial. The observed 8% deviations from predicted levels of working capital, spread across all major working capital accounts (e.g., accounts receivable, inventory, accounts payable), suggest that year-end levels can be significantly manipulated.

Downward working capital management can be achieved by actions that reduce income through accruals (accrual-based working capital management), such as inventory write-downs or overstatement of bad debt expense, or by actions that increase operating cash flow (cash flow–based working capital management), such as additional efforts to collect accounts receivable from customers or to delay payments to suppliers. We focus on these latter actions, as they are more consistent with perceived increased efficiency. Cash flow–based reduction in working capital shifts dollars from working capital to the cash account but does not reduce total assets. Accrual-based reduction in working capital reduces shareholder equity and total assets.[1]

The observed cash-based year-end temporary decrease in working capital can also be motivated by the desire to report higher year-end operating cash flows. Therefore, we predict that downward management of fourth fiscal quarter working capital is related to cross-sectional variation in managers' incentives to increase year-end operating cash flow. We analyze two sources for such incentives: compensation contracts and the horizon (annual or quarterly) of analysts' cash flow forecasts.

We search proxy statements for descriptions of chief executive officer (CEO) bonus schemes that report a positive weight on cash flow– or working capital–based performance measures. These schemes tend to rely on annual rather than quarterly performances (Holthausen et al. 1995). Thirty-five percent of the firms that disclose performance measures and their weights on CEO bonus plans place a positive weight on a cash flow– or working capital–based performance measure.[2] Firms that disclose a positive weight on a cash flow or a working capital performance measure experience a 75% larger drop in fourth fiscal quarter working capital than firms that disclose no such weight.

The number of firms with analyst cash flow forecasts has increased over the years (DeFond and Hung 2003). Lee (2012) shows that the existence of cash flow forecasts is related to manipulation of operating cash flow. We conjecture that a quarterly forecast horizon mitigates the incentive for year-end overstatement, whereas an annual forecast horizon accentuates it. We find that when the number of analysts issuing annual cash flow forecasts is equal to or greater than the number of analysts issuing quarterly cash flow forecasts, the fourth fiscal quarter temporary decrease in working capital is more pronounced.

Shrinking working capital without reducing earnings requires actions such as accelerating customer collections or delaying supplier payments; these actions are costly to the firms' business partners. The ability to force business partners to bear these costs varies with a firm's dominance in its industry—that is, its market power. We define *market power* as the share of firm sales to industry sales and test whether the fourth fiscal quarter temporary decline in working capital correlates with market power. We find that the magnitude of the temporary fourth fiscal quarter decrease in working capital increases when a firm dominates its industry.

Finally, we connect incentives directly with the fourth-to-first-quarter working capital level temporary decrease by distinguishing between four sequences of fourth-to-first-quarter working capital changes (decrease-increase, decrease-decrease, increase-increase, increase-decrease). Decrease-increase (i.e., a "reversal") is the sequence consistent with a temporary decrease in working capital. We find that the likelihood of a reversal increases with compensation and analyst annual cash flow forecast incentives and with market power.

We perform a battery of tests (see Section 4.6) to discount the possibility that the documented fourth-quarter working capital temporary decrease (a) merely reflects seasonal changes in activity level or (b) reflects accrual-based working capital management. In all tests and sample partitions, we find a significant *abnormal* decrease in fourth-quarter noncash working capital and an increase in the first quarter of the following fiscal year.

Although the literature suggests that firms manage reported numbers beyond earnings, we lack evidence on the extent to which they manage working capital accounts. Studies documenting management of reported financial figures through real activities (Roychowdhury 2006, Bushee 1998, Baber et al. 1991, Cohen et al. 2008, Cohen and Zarowin 2010, Lemayian 2013, Levy and Shalev 2016) link potentially inefficient actions to achieving earnings goals. More closely related to our study is research documenting management of reported cash flows (e.g., Lee 2012, Gordon et al. 2013, Brown and Caylor 2005). In particular, Lee (2012) investigates incentives for managers to manipulate operating cash flows (distress, debt near the investment-grade cutoff, existence of analysts' cash flow forecasts, high association between operating cash flows and stock returns) and documents that stronger incentives are correlated with more operating cash flow management.

The remainder of the paper is organized as follows. Section 2 develops the hypotheses. Section 3 describes the data and presents descriptive statistics. Section 4 contains the empirical analysis and results. Section 5 concludes.

2. Hypotheses Development

2.1. Year-End Working Capital Management

Although researchers have long identified instances of earnings manipulation using accruals (DeFond and Jiambalvo 1994, McNichols and Wilson 1988, Jones 1991, Healy 1985) and real activities (Cohen and Zarowin 2010, Cohen et al. 2008, Roychowdhury 2006, Bushee 1998, Baber et al. 1991, Lemayian 2013, Levy and Shalev 2016), recent literature has shown that firms also manipulate reported numbers beyond earnings. Firms' manipulation of operating cash flow is directly investigated in recent studies, such as those by Lee (2012) and Gordon et al. (2013), who show that firms manage reported cash flow levels when incentives to do so exist.

Research and anecdotal evidence reinforce the importance of working capital to firm operations. Holding working capital allows a firm to support its sales by providing credit to its customers, smoothing production, and avoiding stockouts. Fazzari et al. (2000) include changes in inventory and accounts receivable as part of their measure of a firm's total investment. But if working capital does not return the required cost of capital, managers who invest in it destroy shareholder value. Kieschnick et al. (2013) provide evidence that a dollar invested in perpetuity in working capital is worth less than a dollar invested in other assets. Their results suggest the existence of overinvestment in working capital.

Shin and Sonen (1998) compare the cash-conversion cycle of Walmart stores (40 days) to Kmart (61 days) to assess investment efficiency, thereby illustrating the relevance of working capital levels to firm performance. For any given activity level of a firm, lower levels of working capital signal greater operating efficiency and are therefore desirable. This notion has been emphasized by managers, who closely monitor working capital levels, and analysts, who use working capital to predict future profitability (Pulliam 2004). Consequently, managers may be motivated to artificially reduce working capital levels when analysts and investors are likely to be paying more attention to them.

The literature suggests that quarterly reported numbers, especially earnings, are very important. Graham et al. (2005), among others, show that managers care about meeting analyst earnings expectations on a quarterly basis. (See also Brown and Caylor 2005 and Brown and Pinnelo 2007.) But literature and anecdotal evidence also suggest that annual benchmarks matter more than quarterly ones. Jacob and Jorgensen (2007) show that benchmark beating is more pronounced for fiscal year earnings than annual earnings resulting from the sum of any other four contiguous quarters. Das et al. (2009) find that fourth-quarter earnings tend to smooth performance of the first three quarters. (See also Givoly and Ronen 1981.) Fan et al. (2010) find increased classification shifting in fourth fiscal quarters compared with the first three quarters. Further evidence of the importance of full fiscal year data is found in the preponderance of annual financial statement data provided by Yahoo! Finance, Standard & Poor's, and Value Line. It can also be seen in the examples and problems presented in popular financial statement analysis texts, such as Penman (2010), Palepu and Healy (2008), and White et al. (2003); these rarely use quarterly numbers. Green (1964, p. 36) notes, "It appears that business and economic affairs are organized on the basis of an annual planning period."

The following conference call exchange between Ed Pliner, the chief financial officer and senior vice president of Raytheon Company, and George Shapiro, an analyst at Salomon Smith Barney, illustrates both analysts' and managers' focus on working capital components for evaluating firm performance. The exchange also highlights a special emphasis on the fiscal year-end:

> *Shapiro*: On the cash flow, which was talked about earlier, if you look at the comparison of a lot of the balance sheet items from Q3 to Q4, you had receivables down $58 million [m], CIP [construction in progress] up $490 million, inventories down $87 m, payables up $47 m, advances up $30 m. How much of this is ongoing improvement versus just *fourth quarter balance sheet window-dressing*?
> *Pliner*: I wouldn't classify any of it as window-dressing, but I will say that we have, at the end of every month and every quarter, a focus on getting your billed receivables collected and getting your unbilled billed. That's happened in the past, and that will continue. What was very pleasing to me is that, *in past years when we've overdriven our 4Q cash performance*, our businesses have basically dollar for dollar backed off their next year cash forecast, and that hasn't happened at all this year. So *there's certainly a timing aspect to it. There's no question about that.* I don't think this was an unusual quarter in terms of getting unusual acceleration. So I wouldn't characterize it as unusual or window-dressing. (*FD Wire* 2004, emphasis added)

Though Pliner rejects Shapiro's characterization of Raytheon's activities as window dressing of working capital accounts, he acknowledges a recurring focus on year-end accounts receivable balances and also that one of the reasons for this is to improve fourth-quarter cash flow performance.

Their back-and-forth highlights one form of year-end downward-working capital management—the type that also increases year-end operating cash flow by accelerating collection from customers or delaying payment to suppliers. Downward-working capital management can also be achieved by accrual-based transactions that reduce reported income, such as writing down inventory or recording excessive bad debt. However, the accrual working capital management effect on perceived efficiency is mechanically weaker than that of cash flow–based working capital management. Unlike cash flow–based working capital management, which shifts dollars from working capital to cash accounts and does not affect total assets, accrual-based working capital management is accompanied by a decline in reported shareholder equity and thus in total assets, the denominator in operating efficiency measurement. Because of this, as well as the fact that changes in income components are strongly correlated with variation in economic activity, which has to be controlled for to identify abnormal changes in working capital, this study focuses on actions of downward-working capital management that also increase operating cash flow.

To the extent that the fiscal year-end is indeed emphasized when evaluating working capital levels, managers have an incentive to shift dollars from working capital accounts to the cash account at fiscal year-end. If such shifting is inefficient, it should reverse in the future. The above discussion forms the basis for our first hypothesis.

Hypothesis 1 (H1). *Noncash working capital decreases significantly between the third and fourth quarters and subsequently increases significantly between the fourth quarter of a fiscal year and the first quarter of the following fiscal year.*

2.2. Cross-Sectional Predictions

The observed cash-based year-end temporary decline in working capital levels can also be motivated by the desire to report higher year-end operating cash flows. Therefore, we predict that downward management of fourth fiscal quarter working capital is related to cross-sectional variation in managers' incentive to increase year-end operating cash flow. We focus on two factors likely to be related to the weight placed on fiscal year outcomes: compensation contracts and the horizon (annual or quarterly) of analysts' cash flow forecasts. Below we discuss each incentive.

2.2.1. Compensation Contracts. Descriptions of executive compensation plans suggest the importance of annual results: pay is typically a function of full fiscal-year performance (Holthausen et al. 1995). Research finds that bonus plans affect accounting choices. Healy (1985) and numerous subsequent studies (Holthausen et al. 1995, Gaver et al. 1995, Guidry et al. 1999) connect bonus plan characteristics with accounting choices, particularly abnormal accruals. More recently, Larcker et al. (2007) find a positive association between the weight of accounting-based pay and abnormal accruals, suggesting that this kind of pay provides stronger incentives for earnings manipulation than equity-based pay. Performance measures used in bonus plans extend beyond earnings. Studies (Murphy 2000, Perry and Zenner 2001, Huang et al. 2014, Shalev et al. 2013) report the growing use of cash flow–based performance measures in CEO bonus plans. In some firms, management compensation is related to changes in annual noncash working capital.[3]

We predict that intertemporal management of working capital accounts will be more pronounced when compensation is based on working capital/cash flow performance measures. This prediction assumes managers can maximize their pay by temporarily reducing fourth fiscal quarter working capital. Such actions seem to borrow from future periods and may therefore reduce compensation in future periods. However, the data we collect on weights assigned to different performance measures in CEOs' compensation contracts indicate that, conditional on a positive weight on cash flow/working capital in a given year, the weight in the following year is more likely to decrease than to increase. This can provide managers with the incentive to be myopic and borrow from the future. Other possible incentives for myopia are uncertainty about continued employment in the next fiscal year and the time value of bonus payments.

A deeper question is how these wealth transfers between managers and owners (or other parties) can exist in equilibrium. Two answers suggest themselves. The first is that incomplete contracts and transaction costs prevent manipulation from being eliminated, even when contracting parties are fully rational and seek to optimize efficiency. The second answer, which relies on the opportunistic behavior perspective (Holthausen 1990), holds that parties take contracts as given and do not explicitly consider future periods.

In either case, because bonus plans and payments are contracted and made based on annual performance, managers can have an incentive to reduce working capital in the fourth fiscal quarter, because this can lead to lower (higher) working capital (operating cash flows) and higher current pay. Therefore our hypothesis is formally stated as follows.

Hypothesis 2 (H2A). *The temporary fourth-quarter decrease in noncash working capital is accentuated for firms that use cash flow/working capital–based measures to evaluate managers' performance for compensation.*

2.2.2. Analysts Cash Flow Forecast Horizon. The growing use of operating cash flow for evaluation of firm performance is reflected in the increase in the number of analysts issuing cash flow forecasts (DeFond and Hung 2003). In our sample, this number grows from 0% of the sample firms in year 1992 to 29% in year 2010. Research on the economic substance of cash flow forecasts provides mixed evidence. Givoly et al. (2009) find that cash flow forecasts are a naïve extension of the earnings forecasts, whereas Collins and McInnis (2011) suggest that earnings management tends to decline when analysts begin to provide cash flow forecasts; Mohanram (2014) suggests that the negative relation between accruals and future returns weakens when analysts issue a cash flow forecast for the firm. Lee (2012) shows a tendency to manage operating cash flow upward when analysts issue cash flow forecasts for the firm.

If analysts' cash flow forecasts provide an incentive to manage operating cash flow, we conjecture that annual cash flow forecasts give managers stronger incentives to focus on the fiscal year-end (versus quarterly cash flow forecasts, where each quarter receives equal attention). Thus, when analysts predominantly issue annual cash flow forecasts, firms are more likely to try to increase fourth fiscal quarter operating cash flows. These efforts to increase fourth fiscal quarter operating cash flow result in a temporary decrease in fourth fiscal quarter working capital. We formally state the second part of the second hypothesis as follows.

Hypothesis 2 (H2B). *The temporary fourth-quarter decrease in working capital is larger when the number of analysts issuing annual cash flow forecasts is greater than the number of analysts issuing quarterly cash flow forecasts for the firm.*

2.2.3. Firm Market Power. To gain insight into cross-sectional differences in the ability of firms to manage year-end working capital, we test whether a firm's market power is associated with the magnitude of temporary year-end working capital reductions. Activities that reduce working capital without affecting income can include accelerating customer collections, delaying inventory purchases, postponing payments to suppliers, or all of these. These actions impose costs on business partners by reducing their cash flows, delaying product deliveries, or forcing changes to production schedules. Firms with greater market power are more likely to be able to inconvenience business partners in these ways. Thus, we expect the fourth fiscal quarter temporary decrease in working capital to be more pronounced in such firms. We formally state the third part of the second hypothesis as follows.

Hypothesis 2 (H2C). *The temporary fourth-quarter decrease in working capital increases with the market power of the firm.*

3. Data and Descriptive Statistics

3.1. Data

We begin with all firm quarters in Compustat between 1990 and 2010 with working capital data. We measure *WC* as (current assets − cash) − (current liabilities − current portion of long-term debt).[4] The rationale behind this broad measure of working capital is that managers attempting to convince investors that they are maximizing value creation seek to minimize "excess" reported invested capital and maximize operating cash flow. This measure resembles the working capital measure used by Sloan (1996), but our measure is not pretax. Therefore, we do not subtract taxes payable, which represent a form of noninterest-bearing debt. We deflate working capital by total assets. We obtain data on analysts issuing cash flow forecasts from I/B/E/S.

We collect data on performance measures in bonus plans from firms' proxy statements. To identify firms that disclose performance-measure weights, we use 10K Wizard to search for all firm-years where the string "weight" appears in the proxy statement. For every firm year in the file, we read the proxy statement to record the performance measures used and the weight assigned to each. We analyze year-to-year changes in performance benchmarks by firm, to understand whether managers have a reason, beyond the time value of money, to "borrow" cash flows from future years, a seemingly myopic behavior.

3.2. Descriptive Statistics

Panel A of Table 1 reports descriptive statistics of quarterly working capital changes and components, quarterly changes in sales, operating cash flow, income changes, and profitability. We hypothesize that working capital decreases in the fourth fiscal quarter and increases in the first quarter. Statistics support this hypothesis. Recall that we expect the change in working capital to be lower than average in Q4 and higher than average in Q1. Average quarterly change in working capital is −0.003 of total assets. Working capital displays an average decrease of 1.4% of total assets in the fourth quarter and an increase of 0.6% in the first quarter. Operating cash flow exhibits a pattern consistent with working capital, increasing in the fourth quarter and decreasing in the first quarter.

Sales tend to grow more rapidly in the fourth fiscal quarter than in the first. Profitability is also seasonal, but its pattern differs from sales. Firms' profits grow most in the first fiscal quarter and tend to shrink in the fourth fiscal quarter. Untabulated results show a similar pattern for operating income, suggesting that the drop in fourth fiscal quarter profitability is not solely due to negative special items (Francis et al. 1996).

Panel B of Table 1 reports interquartile changes in working capital for 10 industries based on single-digit Department of Labor industry codes. Statistics suggest that the temporary decrease in fourth fiscal quarter working capital is widespread and is not concentrated in a few industries.

Panel C of Table 1 reports statistics on working capital levels and working capital components. On average, working capital is 10% of firms' total assets. Three of the five working capital components (accounts receivable, inventory, and other current liabilities) are, on average, larger than working capital. This suggests that relatively small changes in each component of working capital could result in a relatively sizable change in working capital. For example, a 2% change in each component in the direction that reduces working capital (increases operating cash flow) results in a 10% change in working capital.

Table 2 summarizes the pairwise correlations between changes in noncash working capital, net income, and operating cash flow. All correlations reported in the table are significant at the 1% level. Statistics link changes in working capital, net income, and operating cash flow. The Pearson correlation between the changes in working capital and net income is 0.22. Whereas operating cash flow and net income exhibit a strong positive correlation (0.61), the correlation between changes in working capital and operating cash flow is relatively weaker (−0.22).

Table 3 reports the proportion of observations that exhibit a temporary decrease in fourth fiscal quarter working capital (a fourth-quarter decrease in working capital followed by a first-quarter increase), as well as the proportion of observations showing other sequences of changes in noncash working capital (decrease-decrease, increase-increase, and increase-decrease). Forty percent of our sample firms experience a drop in working capital in the fourth fiscal quarter and an increase in the first fiscal quarter of the following year. This percentage is significantly higher than would be expected by chance (25%). A chi-square test for the difference between the size of the decrease-increase group and the groups displaying the three other sequences is significant at the 1% level.

4. Regression Analysis

4.1. Research Design

To test the hypotheses, we estimate the following baseline regression:

$$\begin{aligned}\Delta WC_q = {} & \beta_0 + \beta_1 Q4_q + \beta_2 Q1_q + \beta_3 NI_q \\ & + \beta_{4\text{–}10}\,\Delta SALES_{q-4,\,q+2} + \beta_{11\text{–}17}\,\Delta NI_{q-4,\,q+2} \\ & + \beta_{18\text{–}20} WC_{q-4,\,q-2}, + \varepsilon_q, \end{aligned} \quad (1)$$

Table 1. Summary Statistics

Panel A: Summary statistics of fiscal quarter changes

	Mean	25th percentile	50th percentile	75th percentile	Standard deviation
ΔWC_q					
$Q1$	0.0060	−0.0120	0.0060	0.0270	0.0610
$Q4$	−0.0140	−0.0330	−0.0070	0.0120	0.0720
$Q2+Q3$	−0.0010	−0.0170	0.0000	0.0170	0.0570
All obs.	−0.0030	−0.0200	0.0000	0.0190	0.0620
$\Delta SALES_q$					
$Q1$	−0.0120	−0.0310	−0.0030	0.0120	0.0640
$Q4$	0.0050	−0.0160	0.0020	0.0250	0.0630
$Q2+Q3$	0.0040	−0.0130	0.0020	0.0210	0.0550
All obs.	0.0000	−0.0170	0.0000	0.0200	0.0600
ΔNI_q					
$Q1$	0.0130	−0.0100	0.0010	0.0160	0.0920
$Q4$	−0.0170	−0.0200	−0.0020	0.0070	0.0950
$Q2+Q3$	−0.0020	−0.0080	0.0000	0.0080	0.0660
All obs.	−0.0020	−0.0110	0.0000	0.0090	0.0820
ΔINV_q					
$Q1$	0.0030	−0.0014	0.0000	0.0067	0.0199
$Q4$	−0.0030	−0.0068	0.0000	0.0020	0.0225
$Q2+Q3$	0.0000	−0.0029	0.0000	0.0039	0.0196
All obs.	0.0000	−0.0033	0.0000	0.0040	0.0205
ΔAR_q					
$Q1$	−0.0010	−0.0118	0.0000	0.0121	0.0339
$Q4$	−0.0020	−0.0146	0.0000	0.0123	0.0368
$Q2+Q3$	0.0010	−0.0091	0.0000	0.0115	0.0321
All obs.	0.0000	−0.0111	0.0000	0.0118	0.0338
$\Delta OTCA_q$					
$Q1$	0.0013	−0.0025	0.0004	0.0047	0.0135
$Q4$	−0.0005	−0.0054	−0.0002	0.0047	0.0167
$Q2+Q3$	−0.0001	−0.0033	−0.0001	0.0031	0.0127
All obs.	0.0002	−0.0035	0.0000	0.0038	0.0140
ΔAP_q					
$Q1$	−0.0010	−0.0106	−0.0013	0.0077	0.0295
$Q4$	0.0029	−0.0070	0.0021	0.0126	0.0318
$Q2+Q3$	0.0004	−0.0075	0.0000	0.0078	0.0269
All obs.	0.0007	−0.0082	0.0001	0.0090	0.0289
$\Delta OTCL_q$					
$Q1$	−0.0013	−0.0122	−0.0012	0.0084	0.0351
$Q4$	0.0044	−0.0095	0.0013	0.0141	0.0407
$Q2+Q3$	0.0021	−0.0076	0.0010	0.0102	0.0328
All obs.	0.0018	−0.0092	0.0005	0.0105	0.0355
OCF_q					
$Q1$	−0.0070	−0.0260	0.0050	0.0290	0.0710
$Q4$	0.0100	−0.0100	0.0210	0.0480	0.0760
$Q2+Q3$	0.0020	−0.0150	0.0150	0.0370	0.0700
All obs.	0.0020	−0.0170	0.0140	0.0380	0.0720

Panel B: Industry breakdown of descriptive statistics

		Industry									
		1	2	3	4	5	6	7	8	9	10
No. of observations		1,826	41,481	3,207	207,676	59,169	16,651	27,670	15,500	79,893	5,268
ΔWC_q											
$Q1$	Mean	0.0087	0.0016	0.0113	0.0080	0.0012	0.0082	0.0123	0.0027	0.0042	−0.0041
	Median	0.0113	0.0017	0.0116	0.0088	0.0007	0.0073	0.0091	0.0031	0.0052	0.0000
$Q4$	Mean	−0.0094	−0.0086	−0.0181	−0.0161	−0.0053	−0.0133	−0.0179	−0.0150	−0.0161	−0.0260
	Median	−0.0045	−0.0040	−0.0117	−0.0100	−0.0015	−0.0088	−0.0117	−0.0047	−0.0074	−0.0077
$Q2+Q3$	Mean	−0.0008	−0.0006	−0.0010	−0.0013	−0.0004	−0.002	0.0003	−0.0022	−0.0022	−0.0121
	Median	−0.0011	0.0001	0.0002	0.0000	0.0003	0.0001	0.0006	0.0000	0.0000	−0.0009

Table 1. (Continued)

Panel B: Industry breakdown of descriptive statistics (continued)

		Industry									
		1	2	3	4	5	6	7	8	9	10
No. of observations		1,826	41,481	3,207	207,676	59,169	16,651	27,670	15,500	79,893	5,268
ΔINV_q											
$Q1$	Mean	0.0038	0.0003	0.0039	0.0047	−0.0013	0.0018	0.0076	0.0008	0.0008	0.0014
	Median	0.0007	0.0000	0.0007	0.0021	0.0000	0.0003	0.0021	0.0000	0.0000	0.0000
$Q4$	Mean	0.0016	−0.0004	−0.0028	−0.0037	−0.0003	−0.0011	−0.0134	−0.0009	−0.0014	−0.0020
	Median	0.0002	0.0000	0.0000	−0.0010	0.0000	0.0000	−0.0025	0.0000	0.0000	0.0000
$Q2+Q3$	Mean	−0.0041	0.0002	−0.0006	−0.0001	0.0007	−0.0018	0.0034	−0.0001	0.0000	0.0005
	Median	−0.0006	0.0000	0.0000	0.0000	0.0000	0.0000	0.0004	0.0000	0.0000	0.0000
ΔAR_q											
$Q1$	Mean	0.0007	−0.0013	−0.0012	−0.0006	0.0018	0.0012	−0.0014	−0.0008	−0.0017	−0.0008
	Median	0.0001	0.0000	−0.0003	0.0000	0.0000	0.0009	−0.0001	0.0000	0.0000	0.0000
$Q4$	Mean	−0.0069	0.0015	−0.0097	−0.0034	−0.0006	−0.0066	0.0005	−0.0001	−0.0001	−0.0019
	Median	−0.0030	0.0005	−0.0049	−0.0011	−0.0005	−0.0047	0.0000	0.0000	0.0004	0.0000
$Q2+Q3$	Mean	0.0028	−0.0009	0.0035	0.0015	−0.0007	0.0023	0.0002	0.0001	0.0011	0.0006
	Median	0.0002	0.0000	0.0040	0.0007	0.0004	0.0023	0.0000	0.0000	0.0006	0.0000
$\Delta OTCA_q$											
$Q1$	Mean	0.0023	0.0001	0.0021	0.0015	−0.0001	0.0013	0.0013	0.0008	0.0024	0.0025
	Median	0.0005	0.0000	0.0009	0.0007	0.0000	0.0004	0.0006	0.0000	0.0012	0.0000
$Q4$	Mean	−0.0012	−0.0003	−0.0006	−0.0004	0.0011	−0.0003	−0.0012	−0.0001	−0.0017	−0.0010
	Median	−0.0004	0.0000	−0.0006	−0.0003	0.0000	0.0000	−0.0005	0.0000	−0.0009	0.0000
$Q2+Q3$	Mean	−0.0001	−0.0001	−0.0004	−0.0001	−0.0003	−0.0001	0.0001	0.0000	0.0002	0.0002
	Median	−0.0001	0.0000	−0.0004	−0.0001	−0.0002	−0.0001	0.0000	0.0000	0.0000	0.0000
ΔAP_q											
$Q1$	Mean	0.0022	−0.0039	−0.0039	−0.0005	−0.0031	0.0008	0.0017	0.0008	−0.0019	0.0009
	Median	−0.0002	−0.0022	−0.004	−0.0009	−0.0027	0.0000	−0.0003	0.0000	−0.0013	0.0000
$Q4$	Mean	0.0073	0.0051	0.0039	0.0031	0.0044	0.0009	−0.0069	0.0038	0.0043	0.0070
	Median	0.0026	0.0029	0.0028	0.0024	0.0028	0.0009	−0.0020	0.0005	0.0021	0.0004
$Q2+Q3$	Mean	−0.0033	−0.0002	0.0017	0.0003	−0.0001	0.0004	0.0030	−0.0002	0.0001	0.0042
	Median	−0.0011	0.0000	0.0012	0.0001	0.0000	0.0003	0.0012	0.0000	−0.0001	0.0000
$\Delta OTCL_q$											
$Q1$	Mean	−0.0035	0.0004	−0.0024	−0.0021	0.0028	−0.0029	−0.0051	−0.0013	−0.0011	0.0079
	Median	−0.0032	0.0000	−0.0028	−0.0021	0.0018	−0.0027	−0.0041	−0.0009	−0.0014	0.0004
$Q4$	Mean	0.0025	0.0027	0.0014	0.0041	0.0003	0.0036	0.0075	0.0066	0.0072	0.0117
	Median	0.0015	0.0000	0.0001	0.0015	−0.0012	0.0017	0.0043	0.0018	0.0030	0.0010
$Q2+Q3$	Mean	0.0039	0.0009	0.0029	0.0024	0.0000	0.0011	0.0009	0.0029	0.0033	0.0064
	Median	0.0017	0.0000	0.0024	0.0015	0.0001	0.0008	0.0003	0.0005	0.0014	0.0011

Panel C: Summary statistics—Levels

	Mean	25th percentile	50th percentile	75th percentile	Standard deviation
WC_q	0.099	−0.014	0.072	0.223	0.220
INV_q	0.115	0.003	0.061	0.187	0.135
AR_q	0.154	0.052	0.129	0.223	0.129
AP_q	0.087	0.032	0.062	0.110	0.090
$OTCA_q$	0.032	0.011	0.024	0.043	0.031
$OTCL_q$	0.117	0.051	0.088	0.144	0.117

Notes. This table reports summary statistics for sample firms over the period 1990–2010. Panel A reports changes between fiscal quarters in working capital, sales, net income, operating cash flow, and the components of working capital. $Q1$ is the first fiscal quarter. $Q4$ is the fourth fiscal quarter. $Q2+Q3$ are the second and third fiscal quarters. Panel B reports statistics on the level of working capital and working capital components. Extreme 1% observations are excluded from the analysis. Industry key: (1) agriculture, forestry, and fishing; (2) mining; (3) construction; (4) manufacturing; (5) transportation, communication, electric, gas, and sanitary services; (6) wholesale trade; (7) retail trade; (8) finance; insurance, and real estate; (9) services; (10) public administration. Panel C reports average levels of working capital and working capital components as a proportion of balance sheet total assets.

where

WC_q is working capital in quarter q and is computed as quarterly Compustat $CTQ - CHEQ - LCTQ + DLCQ$ (i.e., current assets − cash − current liabilities + current portion of long-term debt), deflated by total assets (Compustat item $ASSETS_q$);

ΔWC_q is the change in the ratio of working capital to total assets between quarter $q-1$ and quarter q;

Table 2. Pairwise Correlations Among Working Capital, Net Income, and Operating Cash Flow

	ΔWC_q	NI_q	OCF_q
ΔWC_q		0.22	−0.22
		(458,341)	(432,616)
NI_q	0.10		0.61
	(458,341)		(432,616)
OCF_q	−0.41	0.54	
	(432,616)	(432,616)	

Notes. This table presents Spearman (below diagonal) and Pearson (above diagonal) correlations computed on available firm quarters between 1990 and 2010. The number of observations is reported in parentheses. All correlations are significant at the 1% level in a two-tailed test.

$Q4_q$ is an indicator variable equal to 1 when the quarter is the fourth fiscal quarter, 0 otherwise;
$Q1_q$ is an indicator variable equal to 1 when the quarter is the first fiscal quarter, 0 otherwise;
NI_q is net income (Compustat item *NIQ*) in quarter q deflated by total assets;
$\Delta SALES_q$ is the change in the ratio of sales (Compustat item *SELQ*) to total assets between quarter $q-1$ and quarter q; and
ΔNI_q is the change in the ratio of net income (*NIQ*) to total assets between quarter $q-1$ and quarter q.

Our objective is to identify abnormal changes in working capital levels at fiscal year-end. Working capital levels vary throughout the fiscal year with activity level. Therefore, it is imperative to isolate changes in working capital around fiscal year-end that are unrelated to seasonal variation in firms' activity levels. For example, firms that have sales concentrated in the fourth quarter are likely to show increased inventory levels at the end of the third quarter and decreased levels at the end of the fourth quarter. Holding all else constant, these inventory changes imply increases in working capital from the end of the second quarter to the end of the third quarter and decreases in working capital from the end of the third quarter to the end of the fourth quarter. Because working capital can vary as a result of past changes in activity level or in anticipation of future changes, we include variables for lead and lagged changes in sales and net income and lagged levels of working capital. The link between income levels and activities that precipitate working capital changes is less clear than the link with sales changes. But our objective in modeling working capital changes is to exclude a broad range of plausible seasonal effects; therefore, it is imperative to include the effect of variation in activity levels on all components of earnings.

Table 3. Sequence of Changes in Q4 and Q1 Working Capital

	Fourth quarter	
	Increase	Decrease
First quarter		
Increase	22,332	44,996
	19.7%	39.7%
Decrease	22,895	23,273
	20.2%	20.5%

Note. This table reports the number and percentage of observations that exhibit each of four sequences of changes in noncash working capital in the fourth quarter and the first quarter of the following fiscal year (increase-increase, decrease-increase, increase-decrease, and decrease-decrease).

As discussed in the development of H1, controlling for variation in activity levels using income and components of income implies that working capital manipulation through transactions such as inventory write-downs or overstatement of bad debt expense is effectively, though imperfectly, controlled for.

Finally, our variables of interest indicate when a firm-fiscal quarter is the first or fourth. Each observation is a firm-quarter. Temporary decreases in noncash working capital imply that (1) the fourth-quarter indicator variable will be significantly negative, as firms cut working capital in the fourth fiscal quarter, and (2) the first-quarter indicator variable will be significantly positive, as these cuts reverse in the following fiscal quarter. We include fixed effects for two-digit Standard Industrial Classification (SIC) codes and for adjusted fiscal years—fiscal year t is defined as $Q2_t - Q1_{t+1}$—and cluster standard errors by firm and by quarter throughout the analyses.

4.2. Empirical Results

4.2.1. Working Capital Changes Regression. Column 1 of Table 4 reports coefficients, t-statistics, and the R^2-values produced from a pooled regression for the years 1990–2010.[5] The fourth fiscal quarter indicator variable is significantly negative, and the first-quarter indicator is significantly positive, suggesting that noncash working capital temporarily decreases in the fourth fiscal quarter and that the decrease is reversed in the subsequent quarter. The economic magnitude of the fourth-quarter temporary decrease is approximately 8% of working capital. (The coefficient of the $Q4$ indicator equals 0.008 of total assets, and the average working capital is 0.1 of total assets.) Results in column 1 also suggest a strong relation between working capital changes and lead/contemporaneous/lag activity levels. Sales changes in current and subsequent periods are positively associated with working capital changes in the current quarter, whereas sales changes that occur in

the prior quarter are negatively associated with current working capital changes. Thus seasonal variation in working capital is, at least in this respect, consistent with what one might expect from value-maximizing managers. Such managers increase inventories in the current quarter in anticipation of sales in future quarters.

In contrast to sales changes, the sign of the association between net income changes and working capital changes is negative in lead quarters, suggesting that increases in working capital in the current quarter are associated with profitability declines. Working capital increases are positively correlated with accruals. This result is consistent with the work of Sloan (1996), who finds that the profitability of high-accrual firms reverts more quickly than that of low-accrual (i.e., high cash flow) firms.

4.2.2. Decomposing Working Capital to Its Components. To support the hypothesis that managers seek to manage year-end working capital, we analyze changes in working capital components. The reasoning is that, if managers wish to obscure these actions, they are likely to diffuse adjustments across the working capital accounts. Small changes in each working capital account that subsequently reverse can elude detection by investors and may be perceived as inconsequential by managers. We decompose working capital into its components—that is, accounts receivable, inventory, other noncash current assets, accounts payable, and other current liabilities (excluding the current portion of long-term debt), and we estimate five regressions. We regress the change in each working capital account on the right-hand-side variables of model (1). Expected signs for the coefficients on $Q1_q$ and $Q4_q$ differ depending on whether the dependent variable is a change in an asset or in a liability. An increase in an asset increases working capital, whereas an increase in a liability reduces working capital. For example, accounts payable is expected to increase in the fourth fiscal quarter and decrease in the first, and accounts receivable is expected to decrease in the fourth and increase in the first.[6]

Columns 2–6 of Table 4 report coefficients from regressions using the change in the working capital accounts as dependent variables. The coefficients on $Q1$ and $Q4$ for each account, with the exception of other current liabilities, are significant in the expected direction. In the fourth fiscal quarter, firms appear to devote additional effort to collecting receivables while delaying payments to suppliers. Using the coefficients produced by these regressions and the average magnitude for each working capital account, we can compare the relative intensity of the "fourth-quarter effect" in each account. "$\Delta OTCA_q$" exhibits the smallest relative effect as a proportion of total assets. The coefficient on the fourth quarter (column 4) is 0.05% of total assets, and the average level of other current asset is 2.5% of total assets, suggesting that fourth-quarter effect is 2% of other current assets. The fourth-quarter effects on accounts payable, inventory, and accounts receivable are 0.2% of total assets (3.2% of accounts payable), 0.3% of total assets (2.7% of inventory), and 0.2% of total assets (1.3% of accounts receivable). Because working capital nets three asset and two liabilities accounts, the fourth-quarter effect of each account of working capital is smaller than the overall effect on working capital. Thus, small adjustments to working capital accounts sum to a significant effect.

Results on accounts payable are of particular interest for two reasons: (1) delaying payments to suppliers is arguably the most aggressive and most costly to counterparties, and (2) accounts payable cannot be managed strictly through accruals, thus providing clear evidence that firms manage working capital downward through transactions that also increase operating cash flow.

4.3. Incentives to Overstate Fourth Fiscal Quarter Operating Cash Flow

In this section, we identify specific incentives that can augment managers' incentives to engage in activities that would result in a temporary decrease in fourth fiscal quarter working capital. These cross-sectional analyses also serve as evidence against the story that seasonality alone explains the temporary fourth fiscal quarter decrease in working capital or that firms manage working capital strictly through accruals. We focus on two types of incentives: one that originates in CEO bonus plans and another that arises from the horizon of analysts' cash flow forecasts.

4.3.1. Compensation Contracts. To analyze whether performance measures in bonus contracts motivate managers to increase year-end operating cash flows through the reduction of fourth fiscal quarter working capital, we analyze a subsample of firms that disclose the weights assigned to various performance measures in their bonus plans. Table 5 reports descriptive statistics of firms' use of cash flow– and working capital–based performance measures in bonus plans. Panel A reports the propensity of use of cash flow– and working capital–based performance measures and the average weight assigned to these measures over time.[7] The number of firms that disclose weights assigned to performance measures increases steadily over time, from 33 firms in 1994 to 669 firms in 2010. The increase is marked after 2007, following the 2006 U.S. Securities and Exchange Commission executive compensation disclosure requirements. Though the percentage of sample firms reporting inclusion of cash flow–based performance in bonus plans (between 20% and 30% of firms) and the average weight assigned to the measures (between 30% and 40%) fluctuates over time, there are no apparent time trends in the data. Similarly, working

Table 4. Quarterly Noncash Working Capital Regressions

		Dependent variables					
Independent variables	Expected sign	1 ΔWC_q	2 ΔAR_q	3 ΔINV_q	4 $\Delta OTCA_q$	5 ΔAP_q	6 $\Delta OTCL_q$
$Q4$	−/+	−0.008***	−0.002***	−0.003***	−0.000***	0.002***	0.000
		(−13.6)	(−5.58)	(−14.40)	(−3.68)	(9.53)	(−1.38)
$Q1$	+/−	0.008***	0.002***	0.002***	0.001***	−0.001**	−0.003***
		(15.17)	(5.99)	(7.46)	(13.19)	(−2.10)	(−7.17)
NI_q	+/−	0.094***	0.003***	−0.002**	0.000	−0.028***	−0.059***
		(17.52)	(3.06)	(−2.07)	(0.04)	(−11.04)	(−17.81)
$\Delta SALES_{q-4}$	?	−0.026***	0.003	−0.020***	−0.006***	−0.003*	0.004**
		(−8.40)	(1.6)	(−16.78)	(−9.43)	(−1.83)	(2.08)
$\Delta SALES_{q-3}$	?	0.028***	0.020***	0.026***	0.004***	0.024***	−0.001
		(7.77)	(9.28)	(17.53)	(5.56)	(13.78)	(−0.79)
$\Delta SALES_{q-2}$	?	0.001	0.000	0.016***	0.001*	0.005***	0.013***
		(0.44)	(0.12)	(13.70)	(1.84)	(3.26)	(7.67)
$\Delta SALES_{q-1}$	?	−0.026***	0.022***	0.013***	0.000	0.026***	0.041***
		(−7.00)	(11.39)	(10.21)	(0.19)	(14.30)	(20.30)
$\Delta SALES_q$	?	0.062***	0.233***	−0.018***	0.003***	0.082***	0.090***
		(11.20)	(55.61)	(−9.39)	(3.04)	(31.19)	(27.71)
$\Delta SALES_{q+1}$	?	0.021***	0.030***	0.059***	0.008***	0.062***	0.033***
		(5.74)	(13.13)	(37.51)	(11.76)	(27.87)	(14.37)
$\Delta SALES_{q+2}$	?	0.002	−0.006***	0.015***	0.005***	0.003*	0.011***
		(0.63)	(−3.24)	(12.19)	(8.66)	(1.93)	(5.88)
ΔNI_{q-4}	?	0.019***	0.006***	0.001**	−0.000	−0.006***	−0.006***
		(6.83)	(5.99)	(2.19)	(−0.31)	(−4.69)	(−3.29)
ΔNI_{q-3}	?	0.036***	0.004***	0.001**	−0.003***	−0.013***	−0.020***
		(10.63)	(2.96)	(2.09)	(−5.19)	(−8.50)	(−9.00)
ΔNI_{q-2}	?	0.044***	−0.001	−0.001	−0.005***	−0.022***	−0.028***
		(11.84)	(−0.44)	(−1.61)	(−8.40)	(−12.44)	(−10.22)
ΔNI_{q-1}	?	0.057***	−0.006***	−0.007***	−0.009***	−0.034***	−0.049***
		(10.31)	(−3.91)	(−7.68)	(−14.36)	(−14.87)	(−13.49)
ΔNI_q	?	0.094***	−0.005***	−0.018***	−0.016***	−0.054***	−0.078***
		(12.12)	(−3.32)	(−17.97)	(−18.17)	(−16.00)	(−15.21)
ΔNI_{q+1}	?	−0.013***	0.000	−0.005***	−0.004***	−0.006***	0.018***
		(−2.81)	(0.21)	(−4.89)	(−7.70)	(−3.78)	(6.99)
ΔNI_{q+2}	?	−0.011***	−0.003***	−0.004***	−0.002***	−0.003**	0.007***
		(−3.89)	(−2.99)	(−6.00)	(−4.55)	(−2.36)	(4.01)
WC_{q-4}	?	0.039***	0.016***	0.001	0.001**	−0.008***	−0.006**
		(8.11)	(10.49)	(1.47)	(2.14)	(−5.26)	(−2.06)
WC_{q-3}	?	−0.013**	−0.006***	0.000	0.001*	0.007***	0.005*
		(−2.63)	(−3.18)	(0.28)	(1.69)	(3.61)	(1.70)
WC_{q-2}	?	−0.033***	−0.014***	−0.004***	−0.003***	0.001	−0.002
		(−5.08)	(−9.65)	(−5.64)	(−4.97)	(0.74)	(−0.55)
Constant		0.002	−0.002**	0.000	0.001	−0.003**	0.000
		(0.89)	(−2.09)	(−0.62)	(1.45)	(−2.56)	(−0.17)
R^2		0.07	0.15	0.08	0.01	0.07	0.10
No. of obs.		409,138	397,453	396,366	388,614	301,849	301,774

Notes.

$$\text{Dependent variable}_q = \beta_0 + \beta_1 Q4_q + \beta_2 Q1_q + \beta_3 NI_q + \beta_4 \Delta SALES_{q-4} + \beta_5 \Delta SALES_{q-3} + \beta_6 \Delta SALES_{q-2} + \beta_7 \Delta_{q-1} + \beta_8 \Delta SALES_q + \beta_9 \Delta SALES_{q+1} + \beta_{10} \Delta SALES_{q+2} + \beta_{11} \Delta NI_{q-4} + \beta_{12} \Delta NI_{q-3} + \beta_{13} \Delta NI_{q-2} + \beta_{14} \Delta NI_{q-1} + \beta_{15} \Delta NI_q + \beta_{16} \Delta NI_{q+1} + \beta_{17} \Delta NI_{q+2} + \beta_{18} WC_{q-4} + \beta_{19} WC_{q-3} + \beta_{20} WC_{q-2} + \varepsilon_q. \quad (1)$$

This table presents coefficients and R^2 values produced by pooled regressions using the regression model (1). Column 1 reports results from estimating model (1) with changes in working capital as the dependent variable. Columns 2–6 present results of the model estimated using components of working capital as dependent variables. Industry and year fixed effects are included and suppressed. Standard errors are clustered by firm and quarter. *t*-Statistics are reported in parentheses. The sample period is 1990–2010. Extreme 1% observations for each variable are excluded.

***, **, and * denote two-tailed significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 5. Descriptive Statistics for Observations Disclosing Compensation Incentive Weights

Panel A: Number of firms including cash flow/working capital–based performance measures in bonus plans and the weight assigned to these measures

		Cash flow incentives			Working capital incentives			Cash flow or working capital incentives		
Year	No. of obs.	% of obs. positive weight	Mean weight if positive (%)	Median weight if positive (%)	% of obs. positive weight	Mean weight if positive (%)	Median weight if positive (%)	% of obs. positive weight	Mean weight if positive (%)	Median weight if positive (%)
1994	33	39	35	33	0	NA	NA	39	35	33
1995	52	40	34	33	12	20	20	48	34	33
1996	67	31	30	25	6	14	15	36	28	25
1997	88	27	31	30	11	21	20	38	30	25
1998	98	30	36	30	6	28	25	35	35	30
1999	79	24	31	30	8	22	23	29	32	30
2000	71	20	32	30	6	12	13	21	33	30
2001	84	20	36	33	5	21	20	25	33	30
2002	88	24	38	30	2	25	25	26	37	30
2003	91	26	36	30	3	32	25	30	37	30
2004	98	27	32	30	4	28	23	30	33	30
2005	144	27	37	33	5	25	20	31	36	33
2006	196	23	34	30	4	25	29	28	33	30
2007	490	22	31	25	6	19	20	27	30	25
2008	600	24	30	25	7	20	20	30	29	25
2009	673	25	31	28	6	21	20	31	30	25
2010	669	31	32	30	8	22	20	38	31	28

Panel B: Year-over-year changes in cash flow/working capital–based weights in bonus contracts

	No. of obs.	% of total
Observations with positive weight on cash flow/working capital in year t and weight disclosure in year $t+1$	874	100
Decrease in weight	246	28
Decrease to zero	121	14
Decrease to greater than zero	125	14
Increase in weight	118	13
Equal weight	510	61

Notes. This table reports statistics of firms' proxy statement disclosures of weights placed on various factors used to determine CEO bonus pay. The sample period is 1994–2010. Panel A provides statistics on the number of firms disclosing positive weights on cash flows and working capital incentives as well as the median and mean weight conditional on a positive weight. Panel B provides statistics on the change between year t and year $t+1$ in the weight assigned to cash flow or working capital conditional on positive weight on cash flow/working capital in year t. This panel requires at least two years of consecutive disclosure.

capital–based performance measures are included in between 0% and 12% of the sample firms, and the average weight assigned to these measures ranges between 12% and 32%.

Panel B of Table 5 reports within-firm changes in the weight assigned to cash flow– and working capital–based performance measures over time. As the fourth fiscal quarter decrease in working capital reverses in the following first fiscal quarter, managers who actively increase cash flow at year-end t simply borrow cash from year $t+1$. An incentive to borrow from the future exists because of the time value of money or because the manager may lose her job. The purpose of this analysis is to evaluate whether changes in weights assigned to performance measures over time increase or decrease the incentive to borrow from the future. Evidence that, conditional on a positive weight on cash flow/working capital at year t, the weight is more likely to go down (up) than up (down) at year $t+1$ would suggest an increased (reduced) incentive to borrow cash from the following year.

To compute this statistic, we require that a firm disclose at least two consecutive years of weights and that, at year 1, the firm assigns a positive weight to cash flow/working capital measures. These requirements yield 874 observations. Of the 874 occurrences of two consecutive years of weight on performance-measures disclosure, 246 (28%) reduce the weight on cash flow/working capital, approximately 50% of the 246 (121 firms) reduce the weight to 0, and 118 (13%) increase the weight; 510 firms report no weight change. Therefore, the likelihood that the weight on cash flow/working capital performance measures in bonus plans will decrease in the subsequent year is more than double the likelihood that it will increase. The high probability of a weight decrease and the disparity

in magnitude between the decreases and increases in weight can encourage managers to shift future cash flows to the current period.

For the regression analysis, we construct a binary variable equal to 1 if the bonus plan includes a positive weight on a cash flow/working capital–based measure to evaluate CEO performance and 0 otherwise.[8] We interact this binary variable with the first- and fourth-quarter variables and add these to model (1). Column 1 of Table 6 reports results consistent with our prediction in H2A. Specifically, the inclusion of cash flow/working capital performance measures in the CEO bonus plan explains a nontrivial portion of the fourth-quarter decline. When a cash flow/working capital performance measure is included in the bonus plan, the fourth-quarter temporary decline is 75% greater than when it is not included. In other words, the inclusion of cash flow/working capital performance measures in a bonus plan explains 43% of the temporary fourth-quarter decrease in working capital ($0.003/(0.003+0.004)$) in this subset of firms (35% of the subsample of firms with performance-measure weights disclosure).

Because performance measures in bonus plans can be a function of firm characteristics that may be correlated with intertemporal changes in working capital components, we also use propensity-score matching (PSM) to match each firm reporting a positive weight on the cash flow/working capital performance measure with a firm reporting a zero weight. We use one-to-one nearest-neighbor matching without replacement (Heckman et al. 1997). The variables included in our first-stage regression are firm size, leverage, market-to-book ratio, industry, earnings volatility, and cash flow volatility. The first four variables are general firm characteristics that have been documented in compensation literature (e.g., De Angelis and Grinstein 2015) to explain variation in compensation schemes. The last two variables are included to capture the noise in earnings and cash flow. Compensation theory suggests that optimal weights on performance measures should reflect the relative signal-to-noise ratio (Holmstrom 1979, Banker and Datar 1989, Lambert 2001, Ittner et al. 2003). Volatility of earnings and cash flow is also likely to be associated with change in working capital levels. The treatment group is the subset of firms that disclose a positive weight on cash flow/working capital measures in bonus plans. The control group is composed of matched firms chosen from the subset of firms that disclose zero weight on cash flow/working capital measures in a bonus plan. This process results in a total sample of 3,992 observations.[9] Untabulated results suggest that, consistent with the finding in column 1, the coefficients of both the interaction with Q4 and Q1 are statistically significant in the predicted direction.

4.3.2. Analysts' Cash Flow Forecast Horizon.

In this analysis, we use the subset of firms with cash flow forecasts. To gauge the working capital management incentives created by analysts' forecast horizon, we construct an indicator variable that takes the value 1 if the number of analysts issuing annual forecasts for the firm is equal to or greater than the number of analysts only issuing quarterly forecasts and 0 otherwise. This variable is expected to be positively associated with the importance of year-end operating cash flow. We interact this variable with the $Q1$ and $Q4$ variables and expect the temporary decrease in fourth fiscal quarter working capital to be more pronounced for the interaction variables.[10] Table 6, column 2 reports results consistent with the prediction in H2B. The interaction with $Q4$ is negative and significant, and the interaction with $Q1$ is positive and significant, suggesting that the temporary drop in fourth fiscal quarter working capital is diminished when cash flow forecasts are tilted toward a quarterly horizon.

4.4. Firm Market Power

To test whether a firm's market dominance in its industry (market power) affects its ability to impose the cost of managing of working capital on business partners and thus reduce its own costs, we measure firms' relative dominance in their industry as the share in the total sales of the firm's four-digit Standard Industrial Classification (SIC) code industry.[11] We then interact this variable with the $Q1$ and $Q4$ variables and predict that firm market power will accentuate the temporary decrease in fourth fiscal quarter working capital. Results reported in column 3 of Table 6 are consistent with our prediction. The fourth-quarter temporary decrease in working capital is accentuated in firms with higher market power.

4.5. Additional Analysis

To corroborate the cross-sectional findings and further connect managerial incentives and a firm's characteristics to the temporary decrease in year-end working capital, we exploit the pattern of changes in working capital in the fourth quarter and in the first quarter of the following fiscal year. A decrease in fourth fiscal quarter working capital, which reverses in the first fiscal quarter of the following year (denoted by reversal), is consistent with a temporary decrease in working capital. The three other sequences (decrease-decrease, increase-decrease, and increase-increase) are inconsistent with temporary minimization of year-end working capital. We create an indicator variable that takes the value 1 if we observe reversal and 0 otherwise and estimate the following annual logit regression:

$$\Pr(Reversal)_t = \beta_0 + \beta_{1\text{–}2}\, Incentive_t + \beta_3\, Market\ Power_t + \beta_{4\text{–}12}\, Controls_t + \varepsilon_t. \quad (2)$$

Table 6. Cross-Sectional Predictions

		Dependent variable is ΔWC_q		
Independent variables	Expected sign	1 Compensation	2 Forecast horizon	3 Firm market power
$Q4$	–	−0.004**	−0.006***	−0.007***
		(−2.34)	(−9.48)	(−12.87)
$Q1$	+	0.010***	0.009***	0.007***
		(5.54)	(13.90)	(13.18)
Incentive		0.001	0.000	−0.005***
		(0.63)	(0.54)	(−5.00)
Incentive × $Q4$		−0.004*	0.002**	−0.007**
		(−1.70)	(2.32)	(−2.51)
Incentive × $Q1$		0.004*	−0.003***	0.016***
		(1.71)	(−2.86)	(6.86)
NI_q	+	0.048**	0.037***	0.094***
		(2.13)	(4.88)	(17.32)
$\Delta SALES_{q-4}$	?	−0.025	−0.037***	−0.026***
		(−1.48)	(−6.16)	(−8.27)
$\Delta SALES_{q-3}$	?	0.072***	0.039***	0.027***
		(5.48)	(5.43)	(7.70)
$\Delta SALES_{q-2}$	?	0.019	0.012*	0.001
		(1.22)	(1.91)	(0.43)
$\Delta SALES_{q-1}$	?	−0.009	−0.019**	−0.027***
		(−0.49)	(−2.40)	(−7.00)
$\Delta SALES_q$	?	0.056**	0.057***	0.062***
		(2.44)	(5.72)	(11.32)
$\Delta SALES_{q+1}$	?	0.027*	0.030***	0.021***
		(1.65)	(4.49)	(5.65)
$\Delta SALES_{q+2}$	?	0.003	−0.004	0.002
		(0.22)	(−0.68)	(0.54)
ΔNI_{q-4}	?	0.013	−0.002	0.019***
		(1.50)	(−0.29)	(6.99)
ΔNI_{q-3}	?	0.034**	0.012**	0.036***
		(2.58)	(1.99)	(10.55)
ΔNI_{q-2}	?	0.001	0.006	0.044***
		(0.06)	(0.74)	(11.77)
ΔNI_{q-1}	?	−0.011	0.006	0.057***
		(−0.59)	(0.58)	(10.23)
ΔNI_q	?	−0.018	0.017	0.094***
		(−0.64)	(1.29)	(12.17)
ΔNI_{q+1}	?	0.001	−0.000	−0.013***
		(0.05)	(−0.02)	(−2.79)
ΔNI_{q+2}	?	0.007	−0.005	−0.010***
		(0.53)	(−0.90)	(−3.81)
WC_{q-4}	?	0.152***	0.101***	0.039***
		(8.34)	(7.28)	(8.18)
WC_{q-3}	?	−0.024	−0.018	−0.013***
		(−0.86)	(−1.34)	(−2.69)
WC_{q-2}	?	−0.145***	−0.103***	−0.033***
		(−8.00)	(−9.58)	(−5.06)
Constant	?	0.002	0.000	0.002
		(−1.14)	(−0.42)	(0.84)
R^2		0.08	0.06	0.08
No. of obs.		10,543	67,308	408,927

Notes. This table presents coefficients and R^2 values produced by pooled regressions using the regression model (1) adjusted for the inclusion of incentive and market power variables. Column 1 reports results from estimating model (1) with compensation incentives. Column 2 reports results of including analyst forecast horizon incentives, and column 3 reports results when the model includes market power as an explanatory variable. Standard errors are clustered by firm and quarter. t-Statistics are reported in parentheses. Extreme 1% observations for each variable are excluded.

***, **, and * denote two-tailed significance at the 0.01, 0.05, and 0.10 levels, respectively.

$Incentive_t$ is an indicator equal to 1 if a firm has an incentive to manipulate year-end working capital, stemming either from a bonus plan (a positive weight on a cash flow/working capital performance measure) or from analysts' cash flow forecast horizons (more analysts issuing only annual cash flow forecast than analysts issuing quarterly forecasts), and 0 otherwise. $Market\ Power_t$ is the share of firm i in the total sales of the firm's four-digit SIC code industry. We control for firm size ($LNTA_{it}$), the ratio of book value of equity to market value of equity (BM_{it}), three-year-average sales-growth rate ($GROWTH_{it}$), three-year-average profitability (that is, the ratio of operating income to sales; $PROF_{it}$), and three-year-average asset turnover (ATO_{it}) to account for firm-specific characteristics that can affect working capital changes. We further control for whether the firm experienced a "big bath" in the fourth fiscal quarter of year t (abnormal accruals in the fourth quarter are negative and more than 10% of past quarter total assets; $BIGBATH_{it}$), because recording excessive negative accruals in the fourth fiscal quarter can lead to noncash working capital reversals between the fourth and first fiscal quarters. The last two variables, $SEASON1_{it}$ (an indicator variable equal to 1 if change in sales between the third and fourth fiscal quarters is negative and between the fourth and subsequent first fiscal quarter is positive and 0 otherwise) and $SEASON2_{it}$ (an indicator variable equal to 1 if the change in sales between the third and fourth fiscal quarters is positive and between the fourth and subsequent first fiscal quarter is negative and 0 otherwise), control for the effect of seasonal variation in activity level. The idea behind the inclusion of both variables is that the relation between sales seasonality and noncash working capital seasonality is unclear. For example, an increase in current quarter sales can increase accounts receivable and simultaneously reduce inventory. $SEASON1_{it}$ and $SEASON2_{it}$ control for reversals in sales growth rates between the fourth fiscal quarter and the following first fiscal quarter regardless of the direction (i.e., increase-decrease and decrease-increase).

Results are reported in Table 7. Column 1 reports results for cash flow/working capital performance measures as the incentive variable. Column 2 reports results for the analysts' cash flow forecast horizon as the incentive variable. Column 3 reports results for firm market power, and column 4 reports results for a regression that includes all explanatory variables (both incentives and market power), where the incentive variable takes the value 1 if either of the above incentives exists. Consistent with evidence of the main analysis, the likelihood of a reversal increases if either of the incentives to increase year-end operating cash flow exists. Also consistent with the main analysis, the likelihood of a reversal increases a firm's market power in its industry.

4.6. Sensitivity Analyses

4.6.1. Seasonality in Activity Level. When analyzing quarterly changes in working capital, special attention should be given to the effect of seasonal changes in the business cycle, as these can drive changes in working capital captured by the $Q1$ and $Q4$ indicator variables. Therefore, we conduct a series of sensitivity analyses, at both the industry and the firm levels, to address the possibility that the model (Equation (1)) used in this study does not adequately control for seasonal changes in economic activity.

Industry-level analysis. To more carefully model the relation between leads and lags of activity levels and working capital and better control for activity-level effects, we allow our model to vary with the significance of the *industry* change in activity level across fiscal quarters. Because the fiscal quarter of highest activity level can differ across industries, sample firms within each fiscal quarter can be heterogeneous with respect to the nature of their fiscal-quarter seasonality. To reduce heterogeneity in activity level within each fiscal quarter and provide a more precise control for seasonal variation in activity level, we partition our sample before estimating quarterly regressions. Specifically, we divide industries into groups based on their highest sales growth fiscal quarter and estimate model (1) within each group. We follow Keim's (1983) technique to identify the fiscal quarter with the strongest sales growth for each firm in our sample. For each firm, we estimate the coefficients of the following regression: $\Delta SALES_{qi} = \beta_0 + \beta_1 Q2_i + \beta_2 Q3_i + \beta_3 Q4_i + \varepsilon_i$, where $\Delta SALES_{qi}$ is the change in sales between quarter q and quarter $q-1$; $Q2$, $Q3$, and $Q4$ are indicator variables for the second, third, and fourth fiscal quarters, respectively. We then compute the average coefficients for each two-digit SIC code and categorize industries into four portfolios based on the fiscal quarter that displays the largest sales growth. This procedure produces estimates for 63 two-digit SIC codes.[12] In five industries (3% of the sample firms), the first fiscal quarter exhibits the largest increase in sales; in 33 industries (49% of the sample firms), the second fiscal quarter exhibits the largest increase in sales; in four industries (8% of the sample firms), the third fiscal quarter exhibits the largest increase in sales; and in 21 industries (40% of the sample firms), the fourth fiscal quarter exhibits the largest increase in sales. Table 8 reports coefficients and t-statistics produced from the estimation of model (1) for firms within each portfolio. Column 1 (respectively, 2, 3, and 4) reports results for the group of industries in which the first (respectively, second, third, and fourth) quarter exhibits the largest increase in sales. All estimations across four portfolios yield similar results. Specifically, there is a statistically significant decrease in fourth fiscal quarter noncash working capital, followed by an increase in the first quarter of the following fiscal year.

Table 7. Logit Regressions: Factors Explaining the Temporary Decrease in Q4 Working Capital

	Cash flow/working capital performance measures	Analysts' cash flow forecast horizon	Market power	Incentive and market power
Incentive	0.251**	0.109**		0.088**
	(2.30)	(2.30)		(2.31)
Market Power			0.587***	0.402**
			(5.63)	(2.42)
LNTA	0.162***	0.093***	0.074***	0.078***
	(4.97)	(5.84)	(11.65)	(5.22)
BM	−0.072	−0.012	0.017	0.012
	(−0.76)	(−0.26)	(1.38)	(0.35)
GROWTH	−0.482*	−0.063*	−0.005	−0.085**
	(−1.89)	(−1.76)	(−0.64)	(−2.47)
PROF	0.013*	−0.003*	0	−0.002*
	(1.85)	(−1.83)	(−1.47)	(−1.86)
ATO	0.139	0.138***	0.045**	0.083**
	(1.34)	(2.77)	(2.63)	(1.96)
BIGBATH	−0.384	−0.254	0.371***	−0.013
	(−0.83)	(−1.24)	(7.35)	(−0.08)
SEASON1	−0.012	0.164***	0.217***	0.148***
	(−0.09)	(3.14)	(9.67)	(3.2)
SEASON2	−0.217**	−0.076	−0.129***	−0.11***
	(−2.03)	(−1.59)	(−6.2)	(−2.66)
Constant	−1.41***	−1.943***	−1.048***	−1.928***
	(−3.16)	(−8.97)	(−4.83)	(−9.06)
Pseudo R^2	0.09	0.04	0.02	0.04
No. of obs.	2,242	13,988	75,037	17,887

Notes.

$$Reversal_{it} = \alpha + \beta_1 Incentive + \beta_2 Market\ Power_{it} + \beta_3 LNTA_{it} + \beta_4 MB_{it} + \beta_5 GROWTH_{i-2-t} + \beta_6 PROF_{it-2-t} + \beta_7 ATO_{it-2-t} + \beta_8 BIGBATH_{it} + \beta_9 SEASON1_{it} + \beta_{10} SEASON2_{it} + \varepsilon_{it}.$$

This table presents the coefficients and pseudo R^2 values produced by pooled annual logit regressions of the model above. Column 1 reports results for cash flow/working capital performance measures in bonus plans as the incentive variable. Column 2 reports results for analysts' cash flow forecast horizon as the incentive variable. Column 3 reports results for firm market power, and column 4 reports results for both incentives and market power. t-Statistics are reported in the parentheses. Extreme 1% observations for each variable are deleted. Please see the appendix for variable definitions.

***, **, and * denote two-tailed significance at the 0.01, 0.05, and 0.1 levels, respectively.

Firm-level analyses. We perform two sensitivity analyses focusing on inventory. First, as inventory level leads sales, firms with a strong fourth quarter and a weak first quarter are likely to experience a rise in inventory in the third quarter and a decrease in the fourth quarter. To rule out the possibility that our results are driven by inventory seasonality, we remove from the sample firms for which the strongest fiscal quarter measured by sales is the fourth and the weakest is the first. Results reported in column 1 of Table 9 suggest that the temporary fourth-quarter decrease in working capital remains statistically significant. Second, we identify a subsample of firms for which inventory, the component of working capital most sensitive to seasonal changes in activity levels, is not a significant asset (lower than 2% of total assets) and estimate the model for this subset of firms. The idea is to obtain a subsample in which working capital is less subject to seasonality. Results reported in column 2 of Table 9 suggest that the temporary fourth-quarter drop in working capital remains statistically significant in firms with almost no balance of inventory.

In the third firm-level sensitivity analysis, we identify firm years in which sales in each fiscal quarter are approximately 25% of annual sales. For this subset of firm years, the standard deviation of the change in sales is 1/10 of that of the full sample. This subset of firms does not experience seasonality in the activity level. Results reported in column 3 of Table 9 suggest the temporary fourth-quarter decrease in working capital remains statistically significant in firms with virtually no seasonal variation in activity level.

Taken together, the sensitivity analyses suggest that it is unlikely that the evidence provided in this study is exclusively an artifact of seasonal changes in activity levels.

4.6.2. Accrual-Based Working Capital Management.

Throughout the study, we argue that including income and change of income and its components effectively, though imperfectly, controls for downward working

Table 8. Sample Partitioned by Highest Activity-Level Quarter

Independent variables	Expected sign	Fiscal $Q1$ activity highest	Fiscal $Q2$ activity highest	Fiscal $Q3$ activity highest	Fiscal $Q4$ activity highest
$Q4$	–	−0.004**	−0.008***	−0.004***	−0.009***
		(−2.35)	(−12.48)	(−5.14)	(−11.37)
$Q1$	+	0.008***	0.008***	0.003***	0.008***
		(5.62)	(13.83)	(2.75)	(12.22)
NI_q	+	0.130***	0.093***	0.131***	0.092***
		(6.71)	(14.29)	(4.00)	(13.45)
$\Delta SALES_{q-4}$	?	−0.005	−0.019***	0.003	−0.037***
		(−0.52)	(−4.84)	(0.27)	(−7.57)
$\Delta SALES_{q-3}$	?	−0.001	0.026***	0.082***	0.017***
		(−0.10)	(6.12)	(5.73)	(3.21)
$\Delta SALES_{q-2}$	?	−0.006	0.002	0.033**	0.001
		(−0.47)	(0.46)	(2.24)	(0.26)
$\Delta SALES_{q-1}$	?	−0.042**	−0.030***	−0.066***	−0.007
		(−2.25)	(−6.20)	(−4.33)	(−1.34)
$\Delta SALES_q$	?	0.116***	0.069***	0.053***	0.053***
		(5.33)	(11.70)	(3.69)	(6.63)
$\Delta SALES_{q+1}$	?	0.023	0.022***	0.064***	0.005
		(1.28)	(4.78)	(4.86)	(0.94)
$\Delta SALES_{q+2}$	?	−0.001	0.011**	0.009	−0.008*
		(−0.09)	(2.63)	(0.74)	(−1.76)
ΔNI_{q-4}	?	0.024*	0.014***	0.035**	0.022***
		(1.90)	(3.39)	(2.21)	(6.43)
ΔNI_{q-3}	?	0.016	0.039***	0.038**	0.035***
		(1.12)	(6.99)	(2.55)	(8.14)
ΔNI_{q-2}	?	0.018	0.046***	0.035	0.045***
		(1.06)	(8.10)	(1.58)	(8.71)
ΔNI_{q-1}	?	0.029	0.058***	0.030	0.057***
		(1.60)	(8.48)	(0.87)	(8.04)
ΔNI_q	?	0.065***	0.098***	0.051	0.090***
		(2.76)	(11.05)	(1.23)	(9.47)
ΔNI_{q+1}	?	−0.013	−0.007	−0.032*	−0.019***
		(−0.60)	(−1.06)	(−1.76)	(−3.56)
ΔNI_{q+2}	?	−0.015	−0.004	−0.015	−0.017***
		(−1.26)	(−1.13)	(−1.15)	(−4.29)
ΔWC_{q-4}	?	0.079***	0.033***	0.134***	0.038***
		(4.43)	(6.00)	(6.32)	(6.37)
ΔWC_{q-3}	?	−0.022	−0.005	−0.093***	−0.016**
		(−0.80)	(−0.77)	(−3.27)	(−2.46)
ΔWC_{q-2}	?	−0.082***	−0.040***	−0.043	−0.023**
		(−3.47)	(−5.27)	(−1.60)	(−2.62)
Constant		−0.000	0.000	0.001	0.000
		(−0.27)	(0.75)	(0.89)	(0.56)
R^2 (%)		10.2	7.7	11.3	7.4
No. of obs.		11,515	199,347	33,037	163,465

Notes.

$$\Delta WC_q = \alpha + \beta_1 Q4_q + \beta_2 Q1_q + \beta_3 NI_q + \beta_4 \Delta SALES_{q-4} + \beta_5 \Delta SALES_{q-3} + \beta_6 \Delta SALES_{q-2} + \beta_7 \Delta SALES_{q-1} + \beta_8 \Delta SALES_q + \beta_9 \Delta SALES_{q+1} + \beta_{10} \Delta SALES_{q+2} + \beta_{11} \Delta NI_{q-4} + \beta_{12} \Delta NI_{q-3} + \beta_{13} \Delta NI_{q-2} + \beta_{14} \Delta NI_{q-1} + \beta_{15} \Delta NI_q + \beta_{16} \Delta NI_{q+1} + \beta_{17} \Delta NI_{q+2} + \beta_{18} WC_{q-4} + \beta_{19} WC_{q-3} + \beta_{20} WC_{q-2} + \varepsilon_q.$$

This table reports coefficients and R^2 values produced by pooled regressions using the regression model (1) for four mutually exclusive subsamples. Firms are divided into four groups based on the quarter of highest sales increase for their two-digit SIC code industry. This quarter with the highest sales growth is determined from firm-specific coefficient estimates from the following regression: $\Delta SALES_{qi} = \alpha + \beta_1 Q2_i + \beta_2 Q3_i + \beta_3 Q4_i + \varepsilon_i$, where $\Delta SALES_{qi}$ is the change in sales between quarter q and quarter $q-1$; $Q2$, $Q3$, and $Q4$ are indicator variables for the second, third, and fourth fiscal quarters, respectively. We average coefficients for each two-digit SIC code and categorize industries into four portfolios based on the fiscal quarter that displays the largest sales growth. Standard errors are clustered by firm and quarter. t-Statistics are reported in the parentheses. Extreme 1% observations for each variable are excluded.

***, **, and * denote two-tailed significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 9. Quarterly Noncash Working Capital Regressions—Sensitivity Tests for Seasonality

Independent variables	Expected sign	(1) Q4 not the strongest and Q1 not the weakest	(2) Low inventory subsample	(3) Low seasonality subsample
$Q4$	−	−0.007***	−0.003***	−0.004***
		(−10.29)	(−5.37)	(−7.19)
$Q1$	+	0.007***	0.003***	0.005***
		(13.60)	(4.77)	(9.87)
NI_q	+	0.098***	0.087***	0.060***
		(12.9)	(8.72)	(9.01)
$\Delta SALES_{q-4}$	?	−0.018***	−0.007	0.012*
		(−4.40)	(−0.78)	(1.69)
$\Delta SALES_{q-3}$	?	0.027***	−0.025**	0.003
		(5.73)	(−2.49)	(0.31)
$\Delta SALES_{q-2}$	?	−0.005	0.000	−0.029***
		(−1.04)	(−0.02)	(−3.31)
$\Delta SALES_{q-1}$	?	−0.035***	−0.024**	−0.035**
		(−6.39)	(−2.37)	(−2.52)
$\Delta SALES_q$	?	0.078***	0.039***	0.139***
		(11.02)	(3.49)	(7.21)
$\Delta SALES_{q+1}$	?	0.002	−0.033***	−0.002
		(0.42)	(−2.85)	(−0.14)
$\Delta SALES_{q+2}$	?	−0.003	−0.003	−0.009
		(−0.51)	(−0.35)	(−1.14)
ΔNI_{q-4}	?	0.020***	0.023***	0.016***
		(5.47)	(3.44)	(3.20)
ΔNI_{q-3}	?	0.038***	0.020***	0.024***
		(7.31)	(2.64)	(3.94)
ΔNI_{q-2}	?	0.047***	0.029***	0.036***
		(8.17)	(3.24)	(4.93)
ΔNI_{q-1}	?	0.060***	0.040***	0.054***
		(8.25)	(3.43)	(5.63)
ΔNI_q	?	0.094***	0.074***	0.087***
		(9.56)	(4.62)	(6.55)
ΔNI_{q+1}	?	−0.017***	−0.023**	−0.007
		(−3.03)	(−2.42)	(−0.86)
ΔNI_{q+2}	?	−0.012***	−0.018***	−0.014**
		(−3.03)	(−3.00)	(−2.45)
ΔWC_{q-4}	?	0.042***	0.028***	0.027***
		(7.35)	(3.08)	(3.27)
ΔWC_{q-3}	?	−0.023***	0.001	−0.008
		(−3.04)	(0.08)	(−0.85)
ΔWC_{q-2}	?	−0.030***	−0.054***	−0.032***
		(−3.53)	(−4.26)	(−3.01)
Constant		−0.001	−0.001	−0.001
		(−1.13)	(−0.001)	(−0.90)
R^2 (%)		8.7	6.5	5.4
No. of obs.		185,185	53,517	67,895

Notes.

$$\Delta WC_q = \alpha + \beta_1 Q4_q + \beta_2 Q1_q + \beta_3 NI_q + \beta_4 \Delta SALES_{q-4} + \beta_5 \Delta SALES_{q-3} + \beta_6 \Delta SALES_{q-2} + \beta_7 \Delta SALES_{q-1} + \beta_8 \Delta SALES_q + \beta_9 \Delta SALES_{q+1} + \beta_{10} \Delta SALES_{q+2} + \beta_{11} \Delta NI_{q-4} + \beta_{12} \Delta NI_{q-3} + \beta_{13} \Delta NI_{q-2} + \beta_{14} \Delta NI_{q-1} + \beta_{15} \Delta NI_q + \beta_{16} \Delta NI_{q+1} + \beta_{17} \Delta NI_{q+2} + \beta_{18} WC_{q-4} + \beta_{19} WC_{q-3} + \beta_{20} WC_{q-2} + \varepsilon_q. \quad (1)$$

This table presents coefficients and R^2 values produced by pooled regressions using the regression model (1). Column 1 contains only those firms where the fourth quarter is not the highest sales quarter and the first quarter is not the lowest sales quarter. Column 2 contains only firms with inventory levels below 2% of total assets. Column 3 reports results from estimating model (1) for a subsample of firms with no seasonality. (Average standard deviation of sales is 1/10 of the whole sample.) Industry and year fixed effects are included and suppressed. Standard errors are clustered by firm and quarter. t-Statistics are reported in parentheses. The sample period is 1990–2010. Extreme 1% observations for each variable are excluded.

***, **, and * denote two-tailed significance at the 0.01, 0.05, and 0.10 levels, respectively.

Table 10. Quarterly Noncash Working Capital Regressions—Sensitivity Tests for Accrual-Based Working Capital Management

Independent variables	Expected sign	1 Zero special items	2 Decrease or no change in doubtful allowance for receivables	3 Decrease or no change in doubtful allowance for receivables and zero special items
$Q4$	–	−0.007***	−0.008***	−0.008***
		(−12.89)	(−7.14)	(−5.46)
$Q1$	+	0.007***	0.007***	0.008***
		(13.55)	(5.98)	(5.92)
NI_q	+	0.090***	0.116***	0.132***
		(14.46)	(5.61)	(5.02)
$\Delta SALES_{q-4}$	?	−0.027***	−0.004	−0.011
		(−7.41)	(−0.41)	(−0.78)
$\Delta SALES_{q-3}$	?	0.021***	0.042***	0.029*
		(4.84)	(3.24)	(1.69)
$\Delta SALES_{q-2}$	?	−0.003	0.005	−0.004
		(−0.92)	(0.35)	(−0.25)
$\Delta SALES_{q-1}$	?	−0.034***	−0.043**	−0.057***
		(−7.54)	(−2.51)	(−2.81)
$\Delta SALES_q$	?	0.050***	0.080***	0.057***
		(7.97)	(4.39)	(3.55)
$\Delta SALES_{q+1}$	?	0.028***	0.006	0.003
		(5.89)	(0.40)	(0.13)
$\Delta SALES_{q+2}$	?	0.005	−0.003	−0.007
		(1.25)	(−0.24)	(−0.42)
ΔNI_{q-4}	?	0.019***	0.024**	0.031**
		(5.49)	(2.47)	(2.39)
ΔNI_{q-3}	?	0.04***	0.041***	0.045**
		(9.66)	(2.64)	(2.31)
ΔNI_{q-2}	?	0.048***	0.035	0.065**
		(9.61)	(1.56)	(2.55)
ΔNI_{q-1}	?	0.068***	0.040	0.068**
		(10.6)	(1.52)	(2.14)
ΔNI_q	?	0.124***	0.080**	0.141***
		(15.69)	(2.37)	(3.26)
ΔNI_{q+1}	?	−0.022***	0.019	0.004
		(−3.62)	(0.94)	(0.13)
ΔNI_{q+2}	?	−0.011***	0.007	0.004
		(−2.64)	(0.56)	(0.18)
ΔWC_{q-4}	?	0.037***	0.054***	0.050**
		(7.71)	(3.12)	(2.14)
ΔWC_{q-3}	?	−0.008	−0.016	−0.016
		(−1.40)	(−1.07)	(−0.70)
ΔWC_{q-2}	?	−0.033***	−0.037**	−0.041**
		(−4.59)	(−2.49)	(−2.27)
Constant		0.00	0.00	0.00
		(0.46)	(−0.19)	(0.48)
R^2 (%)		7.3	7.6	9.5
No. of obs.		244,245	25,347	12,417

Notes.

$$\Delta WC_q = \alpha + \beta_1 Q4_q + \beta_2 Q1_q + \beta_3 NI_q + \beta_4 \Delta SALES_{q-4} + \beta_5 \Delta SALES_{q-3} + \beta_6 \Delta SALES_{q-2} + \beta_7 \Delta SALES_{q-1} + \beta_8 \Delta SALES_q + \beta_9 \Delta SALES_{q+1} + \beta_{10} \Delta SALES_{q+2} + \beta_{11} \Delta NI_{q-4} + \beta_{12} \Delta NI_{q-3} + \beta_{13} \Delta NI_{q-2} + \beta_{14} \Delta NI_{q-1} + \beta_{15} \Delta NI_q + \beta_{16} \Delta NI_{q+1} + \beta_{17} \Delta NI_{q+2} + \beta_{18} WC_{q-4} + \beta_{19} WC_{q-3} + \beta_{20} WC_{q-2} + \varepsilon_q. \quad (1)$$

This table presents coefficients and R^2 values produced by pooled regressions using the regression model (1). Column 1 contains only those firms for which the fourth quarter is not the highest sales quarter and the first quarter is not the lowest sales quarter. Column 2 contains only firms with inventory levels below 2% of total assets. Column 3 reports results from estimating model (1) for a subsample of firms with no seasonality. (Average standard deviation of sales is 1/10 of the whole sample.) Industry and year fixed effects are included and suppressed. Standard errors are clustered by firm and quarter. t-Statistics are reported in parentheses. The sample period is 1990–2010. Extreme 1% observations for each variable are excluded.

***, **, and * denote two-tailed significance at the 0.01, 0.05, and 0.10 levels, respectively.

capital management that is accrual based. However, controlling for income and components of income does not directly deal with accrual-based working capital management. To do that, we focus on two ways to temporarily reduce working capital through two of the major working capital accounts: inventory and accounts receivable. Because firms can reduce working capital by overstating inventory write-downs or by overstating bad debt expense, we estimate our model for a subset of firms for which these two transactions likely have not occurred. Specifically, because inventory write-downs are typically classified as "special items" in the income statement, we reestimate the model for firms that recorded no special items in the year. Because the overstatement of bad debt expense is likely to increase the allowance for doubtful accounts, we reestimate the model for firms that reported no increase in the allowance between the third and fourth fiscal quarters. Results are reported in Table 10. Column 1 reports results for the firms that reported no special items during the year. Column 2 reports results for the firms that reported no increase in the allowance for doubtful accounts between the third and fourth fiscal quarters.[13] Column 3 reports results for firms with no special items and no increase in allowance for doubtful accounts. The fourth and first quarter effects remain significant in all three data subsets.

4.6.3. Firms' Choice of Fiscal Year-End. Firms can choose their fiscal year-end to coincide with a period of relatively low activity levels rather than taking extraordinary actions to minimize working capital in an exogenously specified fourth quarter. This choice can lead to a decrease in the level of working capital from the third fiscal quarter and an increase in the subsequent first quarter when activity levels pick up again. We perform two additional sensitivity analyses (untabulted) to reduce the likelihood that the results are driven exclusively by the choice of fiscal year-end. First, we reestimate the main regression for a subsample of firms in which the fourth fiscal quarter does not exhibit the lowest activity level (measured by sales levels). In this subsample, the choice of fiscal year-end is less likely to drive results. Second, we reestimate the regression for firms with a December 31 fiscal year-end. For firms for which fiscal year-end coincides with calendar year-end, the choice of fiscal year-end is more likely random and not driven by firm activity level. Both results are consistent with our full sample evidence and suggest that choice of fiscal year-end is unlikely to be a meaningful driver of the evidence in this study.

5. Conclusions

We investigate quarterly changes in noncash working capital to provide evidence of the causes for the temporary year-end decrease in working capital levels. We find that working capital decreases significantly in the fourth fiscal quarter, beyond what might be explained by seasonal changes in firm activity. This decrease is subsequently reversed in the first quarter of the following fiscal year.

A nontrivial portion of the temporary decrease and the subsequent reversal is explained by incentives originating in bonus contracts and the horizon of analyst cash flow forecasts and by firms' ability to extract the concessions from business partners. Although prior research suggests firms manage operating cash flow, our study highlights how and when this management happens. Finally, the relatively small temporary decrease exhibited by the major assets and liabilities composing a firm's working capital (inventory, accounts receivable, accounts payable, other current assets, and other current liabilities) suggests that working capital management can go undetected by investors, even though the aggregate effect of the changes on working capital and operating cash flow can be significant.

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Appendix. Definitions of Variables

Variable name	Definition
WC_q	Working capital in quarter q, computed quarterly by Compustat $CTQ - CHEQ - LCTQ + DLCQ$ (current assets − cash − current liabilities + current portion of long-term debt), deflated by total assets (ATQ).
ΔWC_q	Change in the ratio of working capital to total assets between quarter $q-1$ and quarter q.
$Q4_q$	Indicator variable equal to 1 when the quarter is the fourth quarter, 0 otherwise.
$Q1_q$	Indicator variable equal to 1 when the quarter is the first quarter, 0 otherwise.
$ASSETS_q$	Total assets in firm-quarter q (quarterly Compustat ATQ).

Appendix. (Continued)

Variable name	Definition
NI_q	Net income (quarterly Compustat *NIQ*) in quarter q deflated by total assets (*ATQ*).
$SALES_q$	Ratio of sales (*SELQ*) to total assets (*ATQ*).
$\Delta SALES_q$	Change in the ratio of sales (*SELQ*) to total assets (*ATQ*) between quarter $q-1$ and quarter q.
ΔNI_q	Change in the ratio of net income (*NIQ*) to total assets (*ATQ*) between quarter $q-1$ and quarter q.
OCF_q	Quarterly operating cash flow (Compustat *OANCFY*) deflated by $ASSETS_q$. Compustat reports *OANCFY* on a cumulative basis (e.g., *OANCFY* for fiscal *Q*2 is cumulative operating cash flow for *Q*1 and *Q*2). Therefore we use the change in *OANCFY* in *Q*2–*Q*4.
INV_q	Inventory in quarter q (*INVTQ*) deflated by total assets (*ATQ*).
AR_q	Accounts receivable in quarter q (quarterly Compustat *RECTQ*) deflated by total assets (*ATQ*).
AP_q	Accounts payable in quarter q (quarterly Compustat *APQ*) deflated by total assets (*ATQ*).
$OTCA_q$	Other current assets in firm-quarter q (quarterly Compustat *ACOQ*) deflated by total assets (*ATQ*).
$OTCL_q$	Other current liabilities in firm-quarter q (quarterly Compustat (*LCOQ-DLCQ*) deflated by total assets (*ATQ*).
ΔINV_q	Change in the ratio of inventory (*INVTQ*) to total assets (*ATQ*) between quarter $q-1$ and quarter q.
ΔAR_q	Change in the ratio of accounts receivable (*RECTQ*) to total assets (*ATQ*) between quarter $q-1$ and quarter q.
ΔAP_q	Change in the ratio of accounts payable (*APQ*) to total assets (*ATQ*) between quarter $q-1$ and quarter q.
$\Delta OTCA_q$	Change in the ratio of other current assets (*ACOQ*) to total assets (*ATQ*) between quarter $q-1$ and quarter q.
$\Delta OTCL_q$	Change in the ratio of other current liabilities (*LCOQ-DLCQ*) to total assets (*ATQ*) between quarter $q-1$ and quarter q.
Reversal	Indicator variable that takes the value of 1 if working capital decreases in fourth fiscal quarter and increases in first fiscal quarter of the following year, 0 otherwise.
Incentive (compensation)	Indicator variable that takes the value 1 if the bonus plan includes cash flow/working capital–based measure to evaluate CEO performance, 0 otherwise.
Incentive (forecast horizon)	Indicator variable that takes the value 1 if the number of analysts issuing annual forecasts for the firm is greater than the number of analysts issuing quarterly forecasts, 0 otherwise.
Market Power	Ratio of firm's sales to the aggregate sales of the four-digit SIC industry code firms.
$LNTA_{it}$	Natural logarithm of firm total assets.
BM_{it}	Ratio of firm book value of equity to its market value of equity.
$GROWTH_{it}$	Three-year average of firm sales-growth rate.
$PROF_{it}$	Three-year-average ratio of firm operating income to sales.
ATO_{it}	Three-year average of firm asset turnover computed as the ratio of sales to firm's net property, plant, and equipment.
$BIGBATH_{it}$	"Big bath" in the fourth fiscal quarter of year t computed as an indicator variable that takes the value of 1 if abnormal accruals in the fourth fiscal quarter are negative and more than 10% of past quarter total assets, 0 otherwise.
$SEASON1_{it}$	Indicator variable equal to 1 if change in sales between the third and the fourth fiscal quarters is negative and between the fourth and the subsequent first fiscal quarter is positive, 0 otherwise.
$SEASON2_{it}$	Indicator variable equal to 1 if change in sales between the third and the fourth fiscal quarters is positive and between the fourth and the subsequent first fiscal quarter is negative, 0 otherwise.

Endnotes

[1] The choice to focus on cash flow–based working capital is also motivated by the model specification. In particular, we control for seasonal variation in activity level using interquarter changes in net income and its components, which likely obscure accrual-based working capital management.

[2] Our examination of proxy statements via 10K Wizard indicates that quarterly bonuses are rare. After reviewing the "hits" produced by a search of proxy statements between 1994 and 2010, we find five firms disclosing this practice (seven firm-year observations).

[3] Banker et al. (2009) suggest that the relation between operating cash flow and compensation is stronger when cash flows are more value relevant.

[4] Cash, to the extent that it does not earn a sufficient risk-adjusted return, should be included as a noninterest-bearing asset (Copeland et al. 1994, Bamoul 1952). Determining this transaction-required balance is complicated by the fact that the Compustat item CHEQ does not distinguish between cash and short-term (i.e., interest bearing) investments. Given the problem of measuring this portion of the cash balance and our interest in a measure of working capital that is linked to cash flow from operations, we subtract the entire cash balance.

[5] We also run the regression using a Fama–MacBeth procedure. Results are qualitatively and quantitatively similar.

[6] For 25% of the sample, the value provided for accounts payable by Compustat in the first three fiscal quarters is the sum of accrued liabilities and accounts payable, because it is reported as such in quarterly financial reports. By contrast, values recorded for the fourth quarters are based on the annual reports and do not include accrued liabilities. This quarterly inconsistency in the Compustat definition of the data item prevents us from correctly computing the fourth-quarter change in accounts payable for these observations.

[7] Working capital–based performance measures include performance measures based on a single working capital account (e.g., inventory).

[8] Results are qualitatively similar if we replace the indicator variable with a continuous variable equal to the weight assigned to cash flow/working capital–based performance measures.

[9] To be included in the first stage of the PSM, firms must report weights on performance measures in bonus plans. The selection process is highly restrictive, and finding adequate matches is less likely than if the full set of Compustat firms is available. Our findings in these tests are subject to this caveat.

[10] Results are qualitatively similar if we replace the indicator variable with a continuous variable of the number of analysts issuing quarterly cash flow forecasts divided by the number analysts issuing annual cash flow forecasts.

[11] Although firms with high market power are likely larger firms in their industry, the correlation between the market power variable and size is only 0.3. Results do not change if we include size as an additional control variable in the regression.

[12] We only use industries with at least 10 firms.

[13] The number of observations in this analysis is significantly lower because Compustat reports that there are many missing values for

the allowance for doubtful accounts. The portion of the sample with no increase in allowance for doubtful accounts out of the available data is 50%.

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