The long-term effect of economic value added adoption on the firm's business decision

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Abstract

Purpose – This study aims to examine the long-term effects of adopting economic value added (EVA) as a compensation tool on managers' behaviour.

Design/methodology/approach – The authors extend the sample used in prior studies both in the time and the cross-section dimensions.

Findings – The study conclusions are distinct from those offered by existing studies. The authors show that EVA adopters, relative to non-EVA adopters, increase the working capital cycle, use their assets less intensively and decrease their payouts to shareholders via a decrease in dividends and share repurchases. In investing decisions, the authors find a decrease in new investments, but no change in asset dispositions after the adoption of EVA compensation plans.

Originality/value – The study results highlight that the EVA adoption provides more incentives to reduce the total cost for capital rather than increasing operations and maximising shareholder wealth. The results also have implication for corporate management, particularly in the area of management compensation scheme design.

Keywords Business decision, Economic value added, Residual income

Paper type Research paper

1. Introduction

The agency problem has long been recognised as one of the major issues in management and finance. A rational manager maximises his/her own utility and cares about the shareholders' interest only as long as his/her interest and theirs coincide. Thus, aligning those potentially conflicting interests has been subject to considerable debate.

The expected role of the executive manager is to maximise the firm's value (Wallace, 1997) and, hence, shareholder wealth. This maximisation is achieved through optimal management decisions; particularly investment, financing and operating decisions. Traditionally, shareholders try to achieve this through managerial ownership. However, theoretical and empirical arguments show that share ownership can have both an alignment and entrenchment effects (Khan and Mather, 2013). The quality and independence of remuneration committees have also been argued to help align executive compensation with firm financial performance (Cybinski and Windsor, 2013; Gray and Nowland, 2019).

One principle that has long been recognised is that, for a company to create value and to generate wealth, a firm must earn a rate greater than its cost of capital (Drucker, 1995). This is historically referred to as residual income (henceforth RI). One variant of RI is the economic value added (EVA) introduced by Stern Stewart and Co, US-based consulting firm, in 1991, as an alternative performance measurement to traditional earnings and cash flows-

based metrics. EVA is similar to RI but includes additional adjustments to accounting values suggested by Stewart (1991) and Stern *et al.* (1995). However, EVA has been criticised as simply "re-labelling the resultant residual income concept" (O'Hanlon and Peasnell, 1998, p. 425). According to O'Hanlon and Peasnell (1998), the adjustments are based on consulting experiences that are not clearly underpinned by a theoretical framework. Although 120 aspects of conventional generally accepted accounting principles (GAAP) are identified to adjust the financial accounts for EVA, the basic adjustments include the capitalisation of all intangible investments, such as goodwill and research and development expenditure, and general provision for bad debts and inventory obsolescence (Stewart, 1991; O'Hanlon and Peasnell, 1998).

The EVA metric has received considerable attention in the literature as the best performance measure with the ability to align managers' interests with those of the shareholders (Wallace, 1997; Balachandran, 2006).

In a seminal paper, Wallace (1997) investigated whether the use of RI bonus plans leads to the making of decisions consistent with the economic incentives embedded in those plans. He concluded that, with regard to operating decisions, executive managers of a firm adopting the RI method as a compensation metric will make decisions that would increase assets disposition and decrease new investments.

While our aim is similar, we extend Wallace's (1997) work in three distinct directions. First, we modify the statistical model to directly control for the firms that did not adopt EVA. Second, we extend the time horizon of the study to cover the period from 1981 to 2012. More importantly, the number of sample firms is more than double that of Wallace (1997). Extending the sample in both the time and cross-section dimensions will remove doubt that previous results may have been due to data limitations. Third, we focus exclusively on EVA adopters, while Wallace (1997) uses a mixture of EVA and RI adopters. We, therefore, remove the possibility that results may be contaminated by the presence of RI adopters. Contrary to Wallace's (1997) findings, our paper argues that relative to non-EVA adopters, EVA adopters decrease their payouts to shareholders, increase the working capital cycle and use their assets less intensively. We also examine the firm's investment policies through asset dispositions and new investments. Our results confirm Wallace's (1997) finding that EVA adopters decrease their new investments after the adoption of an EVA performance measure. However, we find no relationship between asset dispositions and an EVA-based executive compensation plan. Overall, our research indicates that EVA adopters tend to utilise more net working capital, but are more reluctant to use free cash flows for dividend payouts, repurchases and capital expenditure relative to non-EVA adopters. As a result of our findings, we can say that following the adoption of EVA, the conflict of interest between shareholders and managers may take place again. This is more likely due to managers' own utility maximisation through incentive compensation plans rather than shareholders' value by reducing share repurchases and dividend payouts.

The structure of the paper is as follows. Section 2 offers a review of the existing literature. Section 3 describes the data sources, sample selection and variable definitions. Section 4 describes the methodology, and Section 5 discusses the empirical results. The final section summarises the results and offers some concluding remarks.

2. Literature review
The vast majority of the existing research has examined whether the adoption of EVA incentive compensation plan has any impact on managers' investment behaviour (Wallace, 1997; Kleiman, 1999; Balachandran, 2006). All of this empirical research has the common assumption that the adoption of the EVA compensation system will rationalise a firm's

investment decision and will lead to it using the existing assets more efficiently to generate more RI and, hence, to maximise shareholders' wealth as well.

One major strand in the EVA literature focuses on the usefulness of EVA in explaining the variation of stock price performance. Biddle *et al.* (1997) find that EVA actually has poorer explanatory power of US stock return than other simpler performance metrics. Worthington and West (2004), in their study of Australian firms, reached different conclusions, arguing that the divergence may be at least partly explained by the difference between the US and Australian accounting systems.

In this paper, we focus on manager and firm behaviour as a result of adopting EVA as a reward system. Pham *et al.* (2011) investigated the impact of EVA on firms' corporate governance using a sample of 136 Australian listed firms. Chiwamit *et al.* (2017) discussed the mediating role of regulators imposing EVA to support the privatisation of state-owned enterprises in Thailand. McLaren *et al.* (2016) presented a case study and discussed the reasons for the implementation, evolution and abandonment of EVA based on three firms in New Zealand. However, the most important study in this field is Wallace (1997). The study focuses on the firm's behaviour directly by looking at changes in a number of accounting fundamentals following the adoption of value-added measures. Similar work has been carried out by Kleiman (1999) and Balachandran (2006). Wallace (1997) compared a group of 40 companies adopting RI and EVA as compensation plans with the same number of carefully matched control firms. He examined the impact of the adoption of RI-based compensation on investing, finance and operating decisions within the three-year post-adoption period compared to the five-year pre-adoption period.

Kleiman (1999) extended the sample to 71 US firms adopting EVA as an incentive compensation system. One important finding is that firms monitor their working capital regardless of the compensation plan they adopt. Kleiman (1999) also fails to confirm some of Wallace's conclusions. Balachandran (2006) investigated whether switching from traditional accounting-based performance plans to an RI-based compensation incentive would affect the investment motive. His results show strong support for the view that RI-adopting firms do actually deliver higher RI after adoption. However, the results also show no significant change in the investment pattern.

In their study of how managers perform under an EVA bonus scheme, Riceman *et al.* (2002) examine whether the managers who are compensated using EVA-based bonus plans outperform the managers who are compensated on traditional accounting-based bonus plans. This system, they claim, can change managerial behaviour at the firm level. Riceman *et al.* (2002) contend that "one reason to expect better performance for managers on EVA bonus plans is that an EVA-based reward system better aligns the interests of the manager and the firm" (p. 543).

Riceman *et al.* (2002) used a sample of 117 managers in major international New Zealand companies, focusing on whether the relationship between the compensation type and performance depends on the understanding of EVA. Their results show a positive and dramatic effect of EVA understanding on the performance of EVA-adopting managers. An important finding by Riceman *et al.* (2002) is that EVA understanding is not always high.

3. Research design and methodology
EVA is defined as the profit earned by the firm less the cost of financing the firm's capital. It is similar to RI but adjusted for net operating profit after tax (NOPAT) and invested capital where needed. It is also referred to as net operating profit less a charge for the opportunity cost of invested capital (Worthington and West, 2001).

RI is defined as follows (Biddle *et al.*, 1997):

$$\text{RI} = \text{NOPAT} - (\text{IC}_{t-1} \times W\text{ACC})$$

where NOPAT is the net operating profit after tax, IC_{t-1} is lagged book value of net assets and WACC is the company's weighted average cost of capital. This basic formula in fact represents the value created in excess of the required return to the company's shareholders. EVA is obtained by making a number of adjustments to NOPAT and the invested capital (*IC*) (Stewart, 1991). Additional details on EVA components can be found in Worthington and West (2004).

3.1 Data

Our sample consists of US firms that have chosen to adopt the EVA compensation system. Consistent with Wallace (1997) and Kleiman (1999), the first year of the company announcing its adoption of EVA is defined as the event year. As it can take several months for the company to fully adopt EVA, we follow standard practice and consider the month of December of that year as the event date ($t = 0$)[1]. We started initially with Wallace's (1997) 23 firms that adopted the EVA compensation plan. This list of adopter firms was then updated by Kleiman (1999) and the number of EVA adopter was increased to 71 firms. Then, we began our search using various databases where the EVA-implementing firms may be identified. These comprise the Stern Stewart and Co brochure, Lexis-Nexis, the Proxy Statement, the 10-Q report and the Wall Street Journal. The majority of firms that adopted EVA disclose such information in their official releases. For example, RR Donnelley and Sons Co states in its 10-Q report:

> Over the past three years, the company has adopted the principles of Economic Value Added (EVA) as its primary financial framework. The objective of this system is to put in place a system of value-based metrics that measures periodic progress toward improved shareholder value creation. To enhance value [. . .].

> Over time, the application of the EVA financial framework to the company's decision-making process is likely to produce slower revenue growth, enhanced free cash flow, a stronger competitive position and improved return on invested capital[2].

We identify an initial list of 101 firms adopting EVA in the period 1987-2001; these represent different US market sectors. A total of 12 EVA adopters were then excluded from the sample because of the unavailability of price/return information and accounting data, leaving a final sample of 89 EVA adopters on NASDAQ, NYSE and American Stock Exchange markets.

Table I shows the pattern of EVA adoption and reveals that most EVA adoption took place in the period 1993-1997. The frequency of adoption increased up to 1996 and then started decreasing afterwards. This decline may be indicative of market saturation in the demand for EVA-based compensation contracts. The Appendix provides the full list of EVA-adopting firms, the year of adoption, the matching control firms and the Standard Industrial Classification (SIC) codes of these firms.

Financial and accounting data on these firms were then collected from the Centre for Research in Security Prices (CRSP) and COMPUSTAT databases. The firm data used in this paper were extracted from balance sheets, income statements and cash flow statements. The dependent variables are similar to those of Wallace (1997) and are defined as follows:

- Dispositions: sale of plant, property and equipment (SPPE)[3];
- New investment: acquisitions (AQC) plus capital expenditures (CAPX);

Year	No. of adopters	% of sample	Cumulative % of sample
1987	1	1.12	1.12
1988	1	1.12	2.25
1989	1	1.12	3.37
1990	2	2.25	5.62
1991	1	1.12	6.74
1992	4	4.49	11.24
1993	10	11.24	22.47
1994	18	20.22	42.70
1995	13	14.61	57.30
1996	17	19.10	76.40
1997	8	8.99	85.39
1998	7	7.87	93.26
1999	4	4.49	97.75
2000	1	1.12	98.88
2001	1	1.12	100.00
Total	89	100	100

Table I.
EVA adoption over time

- Repurchases per share: repurchases of common stock (PRSTKCC) divided by common shares outstanding (CSHO);
- Dividends per share: dividend available to common shareholders (DVC) divided by common shares outstanding (CSHO);
- Assets turnover: revenue (REVT) divided by average total assets (TA);
- Inventory turnover: cost of goods sold (COGS) divided by average inventory (INVT);
- Accounts receivable turnover: REVT divided by average accounts receivable (AR);
- Accounts payable turnover: cost of goods sold (COGS) divided by average accounts payable (AP), and
- ΔLeverage: changes in debt for firms between periods to total assets.

To control for the size effects through the analysis process, all the dependent variables of this research are deflated by the initial TA and used in levels rather than differences.

3.2 Model considerations
Empirical results are sensitive to the choice of the econometric model and variable measurement. In an event study, where the interest lies in assessing the impact of a particular event (in our case, the event is the adoption of EVA), three critical questions need to be answered:

Q1. How do we measure abnormal performance?

Q2. What metric should we use for the empirical model?

Q3. What is the appropriate statistical model?

Assessing abnormal performance is tricky, and care should be taken in adopting definitions of abnormal performance that avoid misspecification. Wallace (1997) and Balachandran (2006), for example, define abnormal performance as the difference of an accounting variable before and after adoption. This implicitly uses the firm as its own benchmark or control firm. However, this would lead to the omission of relevant firm, market or industry effects, and

this in turn can confound the interpretation of empirical results. Barber and Lyon (1997) favour the use of control firms in calculating abnormal performance. The use of a control firm alleviates the problems of the misspecification because a similar firm provides good proxies for the firm, industry and market effects. Although Wallace (1997) does use control firms, he does not contrast them with the treatment (or adopter) firms. Instead, he uses the control firms alongside the treatment firms. Below, we rectify this shortcoming by modifying Wallace's model to contrast each treatment firm with its own control firm.

Control firms as selected similar to Wallace (1997). We first determine the SIC code of adopter companies using the CRSP and COMPUSTAT databases. We then select a sample of the best matched control firms that closely resemble the adopter firm. The selection processes for control firms are based on the following criteria:

- Same industry sector: the sample firm should have the same four-digit SIC code. If not, we chose the best matched firm with three-digit SIC code;
- Same firm size: we use total assets and number of outstanding common shares in the year prior to the year of adoption to match adopters and control firms;
- Data availability: the control firm should have sufficient annual data to match that of the adopting firm; and
- Crosscheck: once the above conditions have been met, we check Lexis-Nexis, the Proxy Statement, the 10-Q report and the Wall Street Journal to ensure that the firm in question has not adopted EVA or RI compensation scheme. Otherwise, we select the next available firm.

The second question relating to the choice of metric for the empirical model is more controversial. Various papers have analysed the conceptual advantages and disadvantages of price and return models. Gonedes and Dopuch (1974) claim that return models theoretically outperform price models in the absence of well-developed theories of valuation. Lev and Ohlson (1982) consider the two methods as complementary, whereas Landsman and Magliolo (1988) argue that for specific applications, price models are superior to return models. Christie (1987) concludes that while return and price models are economically the same, return models are econometrically less problematic.

The empirical results of Kothari and Zimmerman (1995) confirm that the earnings' response coefficients of the price models are less biased. However, return models have less serious econometric difficulties than price models. In some research contexts, the combined use of both price and return models may be useful and seems to be the best course of action to take.

In our context, the question is whether we should use levels or differences of financial variables. In principle, the empirical model should reflect an underlying true or theoretical model. If a model or a hypothesis predicts an effect on value (price; level), then the most logical conclusion would be to model value as a dependent variable rather than growth (return; difference). While sometimes statistical considerations such as stationarity make it impossible to model levels directly, this is usually true for time-series regressions and not cross-sectional regressions. Thus, we contend that whenever there are no statistical impediments, an empirical model should reflect the basic theoretical models or hypothesis. Below, we argue that a model in levels better reflects the basic hypothesis and produces more robust statistical results.

The third question on the appropriate statistical model is also important, in that it helps us avoid spurious results. We do not wish to find "significant" effects when in fact there are none, and vice versa. Thus, it is important that the empirical model is properly specified.

Apart from the variables of interest (the dependent and independent variables), the model should also include other relevant control variables. Ignoring these control variables biases estimation results and may lead to spurious statistical conclusions. One important modification to Wallace's model we propose is to replace the change in stock ownership of the top management and board of directors by a stock market return index. We argue that the former is an endogenous variable and is therefore correlated with the error term, which biases the estimated coefficients. We also use an alternative specification that uses abnormal measures of both dependent and independent variables.

To address the above questions, we start from Wallace (1997) as a base model. Wallace (1997) used a sample of 40 firms that adopted RI-based compensation plans to test whether the adoption of the RI metric would influence the action of these firms compared to the action of other selected firms using traditional accounting-based compensation plans. His approach is therefore based on contrasting the adopters, which he calls the treatment firms, with the non-adopters, which he calls the control firms. The period of investigation extends to five years prior to the adoption, and up to three years following the adoption date (event date).

In the next subsection, we present an alternative model that can more sensibly capture potential differences between adopters and non-adopters.

3.3 An alternative model
Wallace (1997) uses the difference in variables between the pre- and post-adoption years for all firms. To test for potential adoption effect, he runs the following regression:

$$\Delta Dependent_i = \alpha + \beta_1 Type_i + \beta_2 \Delta Owner_i + \beta_3 \ \Delta Leverage_i + \varepsilon_i \quad (1)$$

where Δ refers to the difference between the average of a particular variable before the adoption date and the average of the same variables after (and including) the adoption year, and the index i refers to both treatment and control firms. $\Delta Dependent_i$ is the change in the variable of interest (e.g. share repurchases and residual income) for firm i between periods. $Type_i$ is an indicator variable that is set equal to 1 for RI-based compensation adopting firms, and 0 for non-adopting matching firms. $Leverage_i$ is defined as debt divided by TA in each period. Finally, $Owner_i$ refers to stock ownership of the top management and board of directors. Adoption of RI-based compensation is deemed to have an effect if β_1 is significantly different from zero (the average adopter and non-adopter have different means).

While the above regression appears to make sense, its main drawback is the implicit assumption that both adopters and non-adopters have identical sensitivity to the control variables. For example, treatment firms may have a different sensitivity to leverage (for instance, because they have a different size) and, thus, their coefficient may be different from β_3. Thus, the above model is potentially misspecified and could consequently lead to a biased estimate of β_1.

We propose an alternative model which directly contrasts the treatment and control firms' performances. Define the average abnormal performance (Abn) in the post-adoption period as:

$$AbnP_i^+ = Dep_i^+ - Dep_{i,Control}^+$$

and the pre-adoption period as:

$$AbnP_i^- = Dep_i^- - Dep_{i,Control}^-$$

The pre-adoption (post) period is referred to by superscripting variables with a minus (plus) sign. $Dep_i^{+/-}$ is some performance or accounting variable for treatment firm i, whereas $Dep_{i,Control}^{+/-}$ is the same variable for a matching firm for treatment firm i.

There are two main advantages to this approach. First, this specification allows both difference (return) and level (price) measures. The reason for this advantage is that what matters here is the difference between a treatment firm and a matching firm. Assuming the control firm is a perfect match, the difference before the event ($AbnP_i^-$) should be close to zero, while the difference after the event ($AbnP_i^+$) should be different from zero under the hypothesis that the event has a significant effect.

The second advantage is more important. For less than perfect control firms, there are differences in performance both before and after. For example, if the closest matching firm to a given treatment firm is half its size, we would expect, for example, its value to be roughly half. So, the abnormal measure before adoption ($AbnP_i^-$) should be positive. However, adoption effect can still be identified, because in the absence of any effect, there should be no difference between $AbnP_i^-$ and $AbnP_i^+$ regardless of whether each of them is different from zero.

The basic model that captures the adoption effect is given by:

$$AbnP_i^+ = \alpha + \beta_1 AbnP_i^- + \varepsilon_i$$

The parameter of interest is β_1, and the null hypothesis of no effect is H_0: $\beta_1 = 1$ (i.e. the difference between treatment and control firm is unchanged).

As abnormal performance could also be the result of changes in other firm characteristics, we need additional control variables to improve the specification of the regression model.

We use TA and debt as control variables. Define abnormal assets and abnormal debt as the difference between the assets and debts between the treatment and control firms, respectively. That is:

$$AbnTA_i^+ = TA_i^+ - TA_{i,Control}^+$$

and

$$AbnDebt_i^+ = Debt_i^+ - Debt_{i,Control}^+$$

The full model is then given by:

$$AbnP_i^+ = \alpha + \beta_1 AbnP_i^- + \beta_2 AbnTA_i^+ + \beta_3 AbnDebt_i^+ + \varepsilon_i$$

If there is no effect resulting from the adoption, then the abnormal performance before the event should be equal on average to the abnormal performance after the event. Any possible change in abnormal performance could be due to the control variables (abnormal TA and abnormal debt). under the null hypothesis of no effect $\beta_1 = 1$. However, we can operationalise testing this hypothesis by subtracting $AbnP_i^-$ from both sides of the equation to obtain:

$$AbnP_i^+ - AbnP_i^- = \alpha + \delta_1 AbnP_i^- + \beta_2 AbnTA_i^+ + \beta_3 AbnDebt_i^+ + \varepsilon_i \qquad (2)$$

where $\delta_1 = \beta_1 - 1$. Thus, testing $H_0: \beta_1 = 1$ is equivalent to testing $H_0: \delta_1 = 0$.

4. Empirical results

Table II presents the summary statistics of the investigated potential investment decisions (the dependent and independent/control variables used in Model (2)). All dependent variables have been winsorised at the 99th percentile to remove outliers. The mean values of disposition per share are US$26.191m and US$21.596m for firms adopting EVA-based compensation and control firms, respectively. Reflecting overall expectations of negative disposition per share after EVA adoption, in particular standard deviation, for matching firms (control firms) is higher than the corresponding adopting firms. Interestingly, the mean new investment is US$285.998m for adopting firms, whereas the mean new investment is US$251.002m for matching firms, which indicates that adopting firms operate with a considerably greater balance of new investment. Both adopter firms and matched firms operate with considerable leverage levels, although adopters have, again, greater levels. Moreover, all dependent variables appear to have a highly right-skewed distribution, as indicated by the large standard deviations. Overall, except for inventory turnover, the average level of both dependent and independent variables is greater for our sample of adopting firms.

Table III shows the results obtained for two investing decisions. The models explain a fairly good proportion of variability in abnormal dispositions and abnormal new investments (the adjusted R^2 are 34.01 and 51.04 per cent, respectively). As discussed earlier, δ_1, the coefficient of lagged performance ($AbnP_i^-$) is the parameter of interest, and we are testing for the null hypothesis that there is no effect ($H_0: \delta_1 = 0$) of adoption on firm performance. The result shows that we fail to reject the null hypothesis for dispositions, so the adoption of EVA-based compensation, contrary to Wallace (1997), has not changed the

Variables	Adopter (treatment) firms			Control firms		
	N	Mean	SD	N	Mean	SD
Disposition*	1,933	26.191	83.678	2,083	21.596	81.719
New investment*	3,411	285.998	698.578	3,453	251.002	632.354
Repurchases per share	3,464	0.477	1.204	3,585	0.453	1.268
Dividends per share	3,441	0.89	1.061	3,573	0.857	1.466
Asset turnover	3,331	1.298	0.808	3,555	1.199	0.763
Inventory turnover	3,206	9.148	13.164	3,417	9.784	14.041
AR turnover	3,245	10.022	12.165	3,425	9.895	14.035
AP turnover	2,886	11.551	7.483	3,186	11.119	6.729
Debt*	3,423	1,930.364	5,704.894	3,628	1,846.283	5,582.607

Notes: *These variables are in US$m. Statistics are based on annual accounting data available from 1960 to 2012. Sample sizes represent firm-years. *Disposition* is the sale of plant, property and equipment. *New investment* is acquisitions plus capital expenditures. *Purchases* per share are (US$) purchases of common stock divided by common shares outstanding. *Dividends* are dividends (in US$) available to common shareholders divided by common shares outstanding. *Assets turnover* is REVT divided by average TA. *Inventory turnover* is calculated as cost of goods sold divided by average inventory. *AR turnover* is defined as revenue divided by average AR. *AP turnover* is the cost of goods sold divided by average AP, and Debt is the company's total debt. All dependent variables are winsorised at the 99% percentile to remove potential outlier effect

Table II.
Selected descriptive statistics on the dependent and independent variables

$AbnP_i^+ - AbnP_i^-$	Constant	$AbnP_i^-$	Independent variables $AbnTA_i^+$	$AbnDebt_i^+$	Adjusted R^2(%)
Dispositions					34.01
Coefficient	−6.154	−0.009	0.003	−0.024	
t-statistics	−0.878	−0.088	2.988	−4.653	
p-value	0.385	0.929	0.005	0.000	
New investment					51.04
Coefficient	43.192	−0.679	0.017	0.055	
t-statistics	2.112	−8.177	4.375	3.935	
p-value	0.038	0.000	0.000	0.000	

Notes: Results reported for the regression: $AbnP_i^+ - AbnP_i^- = \alpha + \delta_1 AbnP_i^- + \beta_2 AbnTA_i^+ + \beta_3 AbnDebt_i^+ + \varepsilon_i$, where $AbnP_i^+$ is the abnormal performance after the adoption, $AbnP_i^-$ is the abnormal performance before the adoption, $AbnTA_i^+$ is the abnormal total asset after the adoption, $AbnDebt_i^+$ is the abnormal debt after the adoption and ε_i is the error terms. Asset disposition and new investment are the dependent variables

Table III.
Investing decisions

disposition of assets. The growth or decline in abnormal dispositions is mostly explained by the differential size and differential leverage. In the first case, the coefficient of $AbnTA_i^+$ equals 0.003 and is highly significant, implying that the increase (decrease) in dispositions is partly explained by the greater (smaller) size of the treatment firm relative to the control firm. On the other hand, more (less) leveraged firms have decreased (increased) their dispositions relative to non-adopters (the coefficient of $AbnDebt_i^+$ is –0.024 and significant at the 1 per cent level).

On the other hand, we reject the null hypothesis that there are no effects of adoption on new investment decisions. The coefficient of lagged abnormal new investment, δ_1 equals –0.679 and is highly significant at a *p*-value of less than 0.001. This is clear evidence showing that new investment has decreased significantly after adoption. This result is much stronger statistically than Wallace's negative impact which is found to be weakly significant with a *p*-value of 0.09. Our results are also contrary to Balachandran (2006) and Kleiman (1999) who find no significant change in investment patterns. The control variables are also significant. First, like dispositions, abnormal size has a positive impact on new investments. This is expected because larger firms have greater ability to invest in absolute terms. However, unlike dispositions, abnormal leverage has a significant but positive coefficient. This implies that high leverage firms have a greater increase in new investments compared with lower leverage firms.

Table IV shows the results for financing decision. The adjusted R^2 is very high for dividends (=75 per cent) and reasonably high for repurchases (=20.12 per cent)[4]. Thus, the models explain a good proportion of variability in abnormal repurchases and abnormal dividends. The coefficient of lagged performance, δ_1, is the parameter of interest. Contrary to Wallace (1997), the results show a fall in abnormal repurchases and dividends. The null hypotheses (H_0: $\delta_1 \neq 0$) for repurchases and dividends are strongly rejected; both coefficients (−0.591 and −0.568, respectively) are significant and negative, implying a reversal of the effect found in Wallace (1997). Thus, contrary to Wallace, our results suggest managers decrease share repurchases following adoption. Furthermore, while EVA–RI adoption has no effect on dividends in Wallace (1997), this study finds a strong and negative effect. This implies that managers of EVA-adopted firms are reluctant to use free cash flows for both repurchases and dividend payouts relative to non-EVA adopters. There is no size or leverage effect as both control variables are insignificant in repurchases and dividends.

$AbnP_i^+ - AbnP_i^-$	Constant	$AbnP_i^-$	$AbnTA_i^+$	$AbnDebt_i^+$	Adjusted $R2$(%)
			Independent variables		
Share repurchases					20.12%
Coefficient	0.111	−0.591	−0.000	0.000	
t-statistics	0.925	−4.635	−0.174	0.368	
p-value	0.358	0.000	0.862	0.714	
Dividends					75.00%
Coefficient	0.037	−0.568	−0.000	0.000	
t-statistics	0.705	−14.854	−0.363	0.475	
p-value	0.483	0.000	0.717	0.636	

Table IV.
Financing decisions

Notes: Results reported for the regression: $AbnP_i^+ - AbnP_i^- = \alpha + \delta_1 AbnP_i^- + \beta_2 AbnTA_i^+ + \beta_3 AbnDebt_i^+ + \varepsilon_i$, where $AbnP_i^+$ is the abnormal performance after the adoption, $AbnP_i^-$ is the abnormal performance before the adoption, $AbnTA_i^+$ is the abnormal total asset after the adoption, $AbnDebt_i^+$ is the abnormal debt after the adoption and ε_i is the error terms. Share repurchases and dividends are the dependent variables

Table V shows the results for four operating decisions, namely, asset turnover, inventory turnover, AR turnover and AP turnover. Three of the four estimated models explain a high proportion of variability in abnormal asset turnover, inventory turnover and AP turnover (the adjusted R^2 are 52.23, 11.66 and 29.34 per cent, respectively). The AR turnover has a lower adjusted R^2 (5.30 per cent). As discussed earlier, δ_1, the coefficient of lagged performance ($AbnP_i^-$) is the parameter of interest, and we are testing for the null hypothesis

$AbnP_i^+ - AbnP_i^-$	Constant	$AbnP_i^-$	$AbnTA_i^+$	$AbnDebt_i^+$	Adjusted R^2(%)
			Independent variables		
Asset turnover					52.23
Coefficient	0.046	−0.474	−0.000	−0.000	
t-statistics	1.232	−9.139	−0.054	−0.062	
p-value	0.222	0.000	0.957	0.537	
Inventory turnover					11.66
Coefficient	0.992	−0.450	−0.0002	−0.0001	
t-statistics	0.691	−2.927	−1.115	−0.0727	
p-value	0.491	0.004	0.268	0.942	
AR turnover					5.30
Coefficient	0.005	−0.199	−0.0000	0.0005	
t-statistics	−0.006	−2.412	−0.351	0.893	
p-value	0.995	0.018	0.726	0.374	
AP turnover					29.34
Coefficient	−1.073	−0.453	−0.00002	0.0001	
t-statistics	−1.582	−5.687	−0.319	0.220	
p-value	0.118	0.000	0.750	0.826	

Table V.
Operating decisions
(new model)

Notes: Results reported for the regression: $AbnP_i^+ - AbnP_i^- = \alpha + \delta_1 AbnP_i^- + \beta_2 AbnTA_i^+ + \beta_3 AbnDebt_i^+ + \varepsilon_i$, where $AbnP_i^+$ is the abnormal performance after the adoption, $AbnP_i^-$ is the abnormal performance before the adoption, $AbnTA_i^+$ is the abnormal total asset after the adoption, $AbnDebt_i^+$ is the abnormal debt after the adoption and ε_i is the error terms. Turnovers are the dependent variables

that there is no effect (H_0: $\delta_1 = 0$) of EVA adoption on firm performance. The results suggest strong rejection of the null hypotheses for all turnovers. So, the adoption of EVA has affected the operating decisions the managers take in regard of turnovers. The effects are similar for all turnovers. In these operating decision variables, none of the control variables is significant. The coefficients of the lagged performance (AP_i^-) in all cases are negative and highly significant. This suggests that these turnovers are significantly reduced after the adoption of EVA compared with matching control firms. The biggest reduction is in asset turnover (coefficient = −0.474). Wallace (1997), on the other hand, finds a small positive, but significant, impact on asset turnover. The smallest, but still highly significant, impact we find is on AR turnover (coefficient = −0.199). Wallace (1997) finds a large and positive effect of EVA adoption on AR turnover. However, this effect in his study is only significant at the 10 per cent level. The turnover reductions in inventory and AP are important and highly significant. This is in contrast to Wallace (1997) who finds no effect on these two turnovers. Overall, our results show a significant increase in the working capital cycle after adoption of EVA, implying that firm managers tend to increase profitability following adoption of an EVA-based compensation plan under Wallace's assumption focusing on denominators of turnover ratios.

5. Discussion and conclusions
In this paper we have re-examined the long-term effects of adopting EVA as a compensation tool. Our starting point is the seminal work of Wallace (1997) who uses a set of decisions that are expected to increase firm value and shareholder wealth. These are investing decisions (asset disposition and new investment decisions), financing decisions (share repurchase and dividends decisions) and operating decisions (asset turnover, inventory turnover, AR turnover and AP turnover). In theory, managers in adopting firms would increase asset disposition and turnover, share repurchases, dividends, inventory turnover and accounts receivable turnover and decrease new investment and accounts payable turnover (Wallace, 1997).

Our findings are summarised in Table VI. The table shows two sets of results. The first set summarises Wallace's results. Although Wallace (1997) claims that five out of the eight performances are significant, only three are significant at the 5 per cent level (and only one is significant at the 1 per cent level). More importantly, all results in Wallace (1997) have low or even negative adjusted R^2. This casts doubt on the inferential validity of his results, as the regressions explain little or no variation. For example, although repurchases are found to increase after adoption with a highly significant coefficient, the R^2 suggests that only 8 per cent of the variability of repurchases is explained by the model.

Variable (predicted sign)	Wallace model (p-value, adjusted R^2)	Our Model (p-value, adjusted R^2)
Dispositions (+)	Positive (0.02,0.09)	Nr (0.93,0.34)
New investment (−)	Negative (0.09,0.01)	Negative (0.00,0.51)
Repurchases (+)	Positive (0.00,0.08)	Negative (0.00,0.20)
Dividends (+)	Nr (0.26,–0.00)	Negative (0.00,0.75)
Asset turnover (+)	Positive (0.05,0.11)	Negative (0.00,0.52)
Inventory turnover (+)	Nr (0.26,–0.03)	Negative (0.00,0.11)
AR turnover (+)	Positive (0.08,–0.01)	Negative (0.02,0.05)
AP turnover (−)	Nr(0.38,–0.04)	Negative (0.00,0.29)

Note: (Nr) means no significant relationship

Table VI.
Summary of results

Our proposed model offers mostly different conclusions. First, we note the strength of our results. All our test results indicating a strong impact of EVA adoption are significant at the 1 per cent level, and all but two results are associated with high adjusted R^2. Only one of Wallace's conclusions is consistent with our results, i.e. the new investment (although the significance level in Wallace (1997) is only 9 per cent and matched with an adjusted R^2 of 1 per cent). The new investment was predicted and found to be negative by Wallace (1997), and this study is in line with that finding. An explanation of the strong and negative impact of EVA adoption on new investment might include the possibility that, when adopting EVA as a compensation plan and management tool, the criterion managers use to choose among alternative investments (projects) change, in such a way that the selected new investments have the ability to earn more than the embedded cost of debt financing. Thus, to increase firm value by generating more (above normal) earnings, managers will avoid over-investing, particularly in those investments that might earn less than the opportunity cost of capital and become reluctant to use free cash flows for new investments after adoption of EVA. However, we can also argue that a reduction in the new investment may lead to generating less revenue in the long term, and therefore, reducing AR turnover, which is evident from our results in Table VI.

In the remaining seven variables, there is no agreement with Wallace (1997). While he finds a positive effect for dispositions, this study finds no significant effect. A possible reason for this discrepancy might be referred to the nature of the assets adopter firm owned and to the attractiveness of these assets to other companies. Some outside firms may believe that the adopter firm assets are in the most efficient user's hand and may be willing to offer a price that is high enough to tempt the adopter firm to sell the asset. However, it is also possible that other firms may believe the opposite. One other possibility could be that EVA adopters are reluctant to make investments, and therefore, there is no incentive for managers to dispose existing assets because disposals without replacement might damage the ability of profit generation. The result of this study is consistent with a mixed response by firms such that some adopter firms increased their dispositions, while others decreased them. The insignificant results suggest that the two effects cancel out.

Wallace (1997) finds a positive effect for repurchases and no effect for dividends. We find a negative impact for both variables. A possible reason is that managers, to maximise their own utility, start retaining free cash flows. The retention is possibly used as a means to insulate the firm from capital market scrutiny by avoiding extra capital needs. To avoid capital market monitoring, manager will only use the existing cash reserves that have been accumulated to finance new projects rather than paying it out to shareholders (Jensen, 1993). A possibly more interesting reason for managers to avoid paying out cash flow is the desire to maximise the firm size[5]. Further, managers have more tendencies towards preventing shareholders from getting more cash to refrain them from redirecting capital to a more productive use. Moreover, firms are reluctant to increase dividend payment, particularly when they are unsure about the availability of future free cash flows and whether they can sustain the same payout ratio (dividends are sticky). Firms are also more likely to prefer to finance share repurchases from the excess cash they generate from non-recurring items rather than using the free cash flow they generate from core activities (Miller and Rock, 1985). However, the stated purpose of the long-term incentives scheme is to align the interests of managers with that of the shareholders. To the extent that these long-term compensation plans encourage managers to develop growth opportunities, a significant fall in dividends (relative to control firms) can only be accepted if it is accompanied by a significant increase in new investments. Unfortunately, this is not the case. Both new investments and dividends/repurchases have fallen in relative terms. However, there can be

a contrary argument that managers are highly motivated to reduce payouts after the adoption of EVA, because retained free cash flow would increase shareholders' equity of the firm and may lead to decrease in WACC. This strategy would reduce the total cost for capital and maximise managers' own interest.

The measures of turnovers (asset, inventory, accounts receivable and accounts payable) are all highly significant and negative, suggesting potential increase in the working capital cycle. All turnovers decline after the adoption of EVA as a performance measure. Wallace (1997) found two positive (asset turnover and accounts payable turnover) and two insignificant (inventory turnover and accounts payable turnover) effects. Thus, our results disagree with Wallace (1997) in all four cases.

We find that total assets turnover is significant and negative, which is consistent with the payout and new investment policies of EVA adopters. Lower revenue due to less new investments and higher total assets from retaining free cash flow would lead to slowing down the asset turnover ratio. If we focus on the denominator in each turnover ratio, we expect a decrease in assets, inventory and AR, but an increase in AP following adoption; which helps the manager to increase operating cash flows as well as the utilisation level of net working capital. Our results provide a strong support for the expectations in AP turnover, which implies a possible increase in AP after the adoption of EVA. However, we find significant but negative signs in inventory turnover and AR turnover, which are contrary to the expected direction. Our empirical findings imply that the results are ambiguous, which can be observed from the adjusted R^2 statistic. Whenever effects are predicted to be ambiguous (e.g. inventory turnover and AR turnover) the adjusted R^2 is low. Our test results suggest that inventory may go down slower than cost of sales after the adoption of EVA. Furthermore, revenue may decrease faster than AR according to our test results. These negative results highlight that the EVA adoption provides more incentives to reduce the total cost for capital through retention of free cash flow, rather than increasing operations and maximising shareholder wealth.

Overall, our results show that EVA adopters relative to non-EVA adopters increase the working capital cycle, use their assets less intensively and decrease their payouts to shareholders via a decrease in dividends and share repurchases. We only agree with Wallace (1997) on one case, namely, that EVA adopters decrease their new investments. His significant and positive effect on dispositions is insignificant in our model. In the remaining six business decisions, Wallace finds three significant positive effects and three insignificant effects. All six decisions are significant but negative in our case.

While our proposed model seems more appropriate in terms of specification, the results it offers are mostly contrary to expectation. Thus, our study re-opens the debate as to whether EVA adoption leads to better or worse performance.

Our study has both empirical and practical implications. Empirically, more elaborate simulation studies may be required to establish the performance of matching and non-matching models. Empirically, the results may be sensitive to several factors. First, it is possible that an important factor is missing from the model. The models in this study use size and leverage as firm characteristics and stock market return as a market wide control factor. Other characteristics such as firm age and industry may be influential. Second, the matching procedure may not produce accurate benchmarks. Following previous studies, the SIC code was used here to match treatment and control firms. This can possibly be improved by increasing the number of matching characteristics to include firm characteristics such as size, leverage and systematic risk.

One obvious practical implication of this study is that tying managers with one particular performance metric may not necessarily lead to a single outcome. This is similar to the

conflicting alignment–entrenchment effect of executive share ownership discussed by Khan and Mather (2013). Another implication of the above results is that the adoption of EVA, at least in our US sample, does not generally lead to its desired effect. In particular, managers who are compensated on an EVA basis tend to maximise cash flow rather than shareholder wealth. Firms should, therefore, focus more on the quality of the remuneration committee (Cybinski and Windsor, 2013) as well as the characteristics of the board of directors (Gray and Nowland, 2019).

Notes

1. This approach is also adopted by Wallace (1997), Kleiman (1999) and Balachandran (2006).

2. Source: US Securities and Exchange Commission, Washington, D.C. 2059. RR Donnelley and Sons Co, FORM 10-Q, 7 May 1997.

3. Abbreviation between brackets stands for COMPUSTAT mnemonic.

4. Wallace (1997) models exhibit very low adjusted R^2. For example, he finds an adjusted R^2 of 8 per cent for repurchases and a negative one for dividends.

5. Murphy (1985) documents a positive correlation between total management compensation and firm size.

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Appendix

No.	Sample company	Adoption year	Control company	SIC code
1	COCA COLA	1987	PEPSICO INC	2080
2	CSX CORPORATION	1988	SANTA FE FINANCIAL CORP	6711
3	CILCORP	1989	ALLETE INC	4931
4	CRANE CO	1990	WHITTAKER CORP	3490/3494
5	BRIGGS and STRATTON	1990	STEWART and STEVENSON SVCS INC	3510/3519
6	QUAKER OATS	1991	RALSTON PURINA CO	2040/2043
7	BALL CORP	1992	CROWN HOLDINGS INC	3221
8	WHIRLPOOL CORP	1992	AKTIEBOLAGET ELECTROLUX	3630
9	AT&T	1992	G T E CORP	4813
10	Scherer, R.P.	1992	FOREST LABS INC	2834
11	WELLMAN	1993	ASHLAND INC NEW	2824
12	Grainger, W.W.	1993	WAXMAN INDUSTRIES INC	5063
13	MANITOWOC CO	1993	ASTEC INDUSTRIES INC	3531
14	Digital Equipment Corp.	1993	APPLE INC	3573
15	FURON CORP.	1993	WYNNS INTERNATIONAL INC	3079
16	Harnischfeger Ind. Inc	1993	APPLIED MATERIALS INC	3536
17	Hewlett Packard Co	1993	HITACHI LIMITED	3571
18	Ruby Tuesday Inc	1993	WORLDWIDE RESTAURANT CNCPTS INC	5812
19	Smith International Inc	1993	CABOT CORP	3533
20	Transamerica Corp.	1993	LOEWS CORP	6711
21	ACXIOM CORP	1994	MCGRAW HILL COS INC	7370
22	BOISE CASCADE CORP	1994	BT OFFICE PRODUCTS INTL INC	2421
23	FLEMING COMPANIES INC	1994	NASH FINCH COMPANY	5141
24	GEORGIAPACIFIC GROUP	1994	WEYERHAEUSER CO	2435
25	LILLY (ELI) and CO	1994	WYETH	2834
26	SPRINT FON GROUP	1994	CENTEL CORP	4813
27	CENTURA BANKS INC	1994	AMERICAN FLETCHER CORP	6036
28	Core Industries Inc	1994	WHITTAKER CORP	3429
29	Deere and Co	1994	KUBOTA CORP	3523
30	Eastman Chemical Co	1994	ROHM and HAAS CO	3861
31	Gencorp Inc	1994	LOCKHEED MARTIN CORP	3011
32	Incstar Corp	1994	A M A G PHARMACEUTICALS INC	2830
33	Insteel Industries	1994	NATIONAL STANDARD CO	3310
34	Ohio Edison Co	1994	NORTHEAST UTILITIES	4911
35	Reynolds Metals Co	1994	KAISERTECH LTD	3353
36	Tenneco Inc	1994	CHAMPION PARTS INC	3714
37	Wallace Computer Services	1994	MOORE WALLACE INC	2761
38	ZOLTEK INC	1994	WOODWARD INC	3620
39	ARMSTRONG HOLDINGS INC	1995	NEWELL RUBBERMAID INC	2511
40	BARD (C.R.)	1995	TELEFLEX INC	5086
41	PERKINELMER INC	1995	BIO RAD LABORATORIES INC	3823
42	SPX CORP	1995	GIDDINGS and LEWIS INC WIS	3540
43	American Precision Ind.	1995	FRANKLIN ELECTRIC INC	3443
44	Armstrong World Industries Inc	1995	E G and G INC (VISKASE COMPANIES)	2511
45	Beckman Instruments Inc	1995	PERKINELMER INC	5311
46	Emerson Electric Co	1995	PANASONIC CORP	3621/3823
47	IPALCO Enterprises Inc	1995	Tucson/U N S ENERGY CORP	4911
48	KAISER ALUMINUM Corp.	1995	MAXXAM INC	3334
49	Knight–Ridder Inc	1995	NEW YORK TIMES CO	2711
50	New Jersey Resources	1995	ATMOS ENERGY CORP	4924
51	Sequent Computer	1995	STRATUS COMPUTER INC	3570
52	ADC TELECOMMUNICATIONS INC	1996	TELLABS INC	3679
53	BAUSCH and LOMB INC	1996	CHIRON CORP	3861

(*continued*)

Table AI.
EVA adopting
companies 1987-2001
(USA)

No.	Sample company	Adoption year	Control company	SIC code
54	BECTON DICKINSON and CO	1996	BARD C R INC	3841
55	DONNELLEY (R R) and SONS CO	1996	BOWNE and CO INC	3229
56	GUIDANT CORP	1996	MEDTRONIC INC	3841
57	KANSAS CITY POWER and LIGHT	1996	C M P GROUP INC	4911
58	OLIN CORP	1996	F M C CORP	2810
59	SILICON VY BANCSHARES	1996	AMSOUTH BANCORPORATION	6022/6710
60	TUPPERWARE CORP	1996	ENVIRODYNE INDUSTRIES INC	3089
61	MILLER HERMAN	1996	H N I CORP	2531
62	Cincinnati Milacron	1996	KENNAMETAL INC	3541
63	HACH Co	1996	COHERENT INC	3820
64	KLLM Transport Services	1996	MATLACK SYSTEMS INC	4210
65	NEW ENGLAND BUSINESS SERVICES	1996	ENNIS INC	2761
66	Quaker State	1996	TESORO CORP	2911
67	STRATTEC SECURITY CORP	1996	F M C CORP	8740
68	TEKTRONIX	1996	SNAP ON INC	3825
69	CDI CORP	1997	ROBERT HALF INTL INC	3269
70	GC COMPANIES INC	1997	MARCUS CORP	7830
71	JOHNSON OUTDOORS INC	1997	ELECTRO SCIENTIFIC INDS INC	3940
72	MILLENNIUM CHEMICALS INC	1997	BIG THREE INDS INC	2813
73	PHARMACIA CORP	1997	BAUSCH and LOMB INC	2823
74	RYDER SYSTEM INC	1997	ROLLINS TRUCK LEASING CORP	6159
75	TENET HEALTHCARE CORP	1997	UNIVERSAL HEALTH SERVICES INC	8062
76	WEBSTER FINL CRP WATERBURY	1997	AMSOUTH BANCORPORATION	6035
77	FEDERALMOGUL CORP	1998	DANA HOLDING CORP	3562
78	MATERIAL SCIENCES CORP	1998	SHAW GROUP INC	3470
79	MONTANA POWER CO	1998	C H ENERGY GROUP INC	4911
80	PENNEY (J C) CO	1998	DILLARDS INC	5311
81	STANDARD MOTOR PRODS	1998	HARBINGER GROUP INC	3694
82	BRADLEY PHARMACEUTICALS	1998	BALCHEM CORP	2830/5120
83	BEST BUY CO INC	1998	RADIOSHACK CORP	5732
84	INTERNATIONAL MULTIFOODS	1999	RALSTON PURINA CO	2041
85	TOYS R US INC	1999	MICHAELS STORES INC	6711
86	GENESCO	1999	FOOT LOCKER INC	2341
87	MOLSON COORS	1999	ANHEUSER BUSCH COS INC	2082
88	SCHNITZER STEEL	2000	ENVIROSOURCE INC	3310
89	HARSCO	2001	DYNAMIC MATERIALS CORP	3446

Sources: Wallace (1997); Kleiman (1999); Stern Stewart and Co brochure, Lexis-Nexis, Proxy Statement and 10-Q report and Wall Street Journal

Table AI.

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