Do diversified firms allocate capital inefficiently? Evidence from equity carve-outs

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Abstract

Many corporate finance scholars have argued, with supporting evidence, that the internal capital markets (ICM) operated by diversified firms allocate capital inefficiently, deviating from the principle of investing in the most efficient segments of their businesses. But this evidence has recently been challenged on both conceptual and methodological grounds. One set of studies has sought to overcome the measurement errors in previous studies by examining whether following corporate restructuring the parent firms improve their investment efficiency. The rationale for this approach is that if the parent firms had been inefficient due to the diversified nature of their businesses, restructuring and refocusing should improve their allocational efficiency. Many studies using corporate spin-offs as the setting for this analysis have reported significant improvement in investment efficiency of parent firms. In a recent paper, Colak and Whited (CW) (2007) re-evaluate this approach, arguing that the decisions to restructure and to improve the ICM are endogenous decisions and that any assessment of the impact of restructuring on ICM efficiency should address the self-selection bias. With this methodological refinement, CW report no improvement in the ICM following spin-offs and sell-offs. We adopt CW's methodology and extend the analysis to cover carve-outs in addition to spin-offs and sell-offs. Carve-outs, unlike spin-offs and sell-offs, leave the parent ICM intact but subject it to greater external market scrutiny following their floatation. This presents an interesting contrast to spin-offs and sell-offs and allows us to assess whether the parent's ICM improves when it is not downsized but is subject to greater monitoring by the investors. We find that following carve-outs the investment efficiency and valuation of parents improve suggesting inefficiency in the parents' ICM prior to such restructuring.

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1. Introduction

One of the rationales for the conglomerate or diversified business portfolio held by companies is that it allows them to allocate their scarce capital among their portfolio businesses more efficiently than less diversified firms. The conglomerate head office (HO) thus functions as a capital market playing this allocating role and this market is known as the internal capital market (ICM). Such a market is said to have information advantage over investors in the conventional external capital market (ECM) in being able to assess the strategic and value creation potential of the different portfolio businesses using internally generated information that is not accessible to ECM investors. Moreover, this information advantage allows the conglomerate HO to pick potential winners and allocate capital to the highest valued investment opportunities thereby maximising the returns to the conglomerate's shareholders.

This benign view of the efficiency of the ICM has been challenged by several scholars who have identified a range of impediments to the putative efficiency of the ICM (Rajan et al 2000; Scharfstein, 1998). Some studies have provided evidence that conglomerates are valued in the stock market at less than the sum of the values at which the portfolio businesses would be valued were they traded as stand-alone (or pure play) entities (e.g. Berger and Ofek, 1995). This undervaluation is known as conglomeration or diversification discount (DD). Several explanations have been offered for the DD (Milgrom and Roberts, 1990). Among them is that conglomerates have failed in their ICM role and do not always allocate capital to the highest valued portfolio businesses. Complexity of the conglomerate business portfolio, complexity of the administrative structure, internal politics of the capital allocation process, agency conflicts between the top managers and divisional managers and between the top management and the shareholders are some of the factors that have been examined as sources of dysfunctionality of the ICM (Scharfstein and Stein, 2000). These are factors that are, if not created, at least exacerbated by the diversity of the conglomerate portfolio. A corollary to this argument is that any restructuring of the conglomerate portfolio which results in greater focus should improve the efficiency

of the ICM. One should therefore observe a significant improvement in the investment efficiency of the parent following such re-focusing. By the same token any observed improvement may warrant the inference that the pre-restructuring parent was suffering from ICM inefficiency.

Many studies have empirically tested for the inefficiency of pre-restructuring parent ICM using data from the post-restructuring parent and its offspring such as the spun-off business (see, for example, Ahn and Denis, 2004; Gertner, Powers, and Scharfstein, 2002; Dittmar and Shivdasani, 2003; and Burch and Nanda, 2003). This approach has also been held to be methodologically superior to the prior approach of using a stand-alone single segment investment opportunity as a proxy for the unobservable investment opportunity of the segments of the diversified firm (see, for example, Lang and Stulz, 1994; and Berger and Ofek, 1995). It was based on such proxies that many early empirical studies concluded that the ICM was dysfunctional or estimated significant DD.

Critics of this approach to measuring the segment's investment opportunity set have argued that such a proxy may not capture the real investment opportunity set faced by a segment. This gives rise to a measurement error which may render conclusions regarding significant DD or investment inefficiency quite suspect. A second problem with the above empirical approach is the self-selection or endogeneity bias. A conglomerate's acquisition of a segment may be driven by its poor investment performance relative to a stand-alone business. This may be because of the conglomerate's strategic decision. Given this decision, the conglomerate's underperformance implied by the DD is very much an artefact of its strategy. Some studies have also shown, consistent with this argument, that the conglomerate segments which underperform their pure-play counterparts had done so even prior to their being acquired by the conglomerate. Thus conglomerate acquisition is the cause of its underperformance and not the consequence (see, for example, Hyland, 1999; and Campa and Kedia, 1999).

A parallel self-selection bias argument arises in the context of restructuring. Any observed improvement in investment efficiency following restructuring may be due to the idiosyncratic characteristics of the restructuring parents which allow them to benefit from restructuring rather than to the restructuring *per se*. This calls into question studies that have observed post spin-off investment efficiency and concluded that the parent was suffering pre-restructuring from an inefficient ICM. Colak

and Whited (2007), following this reasoning, advocate correcting for endogeneity in their assessment of post-restructuring investment efficiency performance of a sample of US diversified firms. Colak and Whited (2007) examine two samples of US firms that undertook spin-offs and sell-offs and assess whether, post such restructuring, the investment efficiency of the parent firms in their samples significantly improves. They employ three alternative methodologies to control for the endogeneity bias (see the methodology section below for a discussion). The authors report that there is no significant improvement and conclude that any improvement reported by prior studies was likely to be the artefact of a flawed methodology that ignored the self-selection bias.

Colak and Whited (2007) study two types of restructuring i.e. spin-off and sell-off. Both result in a truncation of the size and complexity of the parent business portfolio. Depending on which segments are spun-off or sold-off, and how they are related to the other segments in the parent portfolio, such restructuring may increase the business focus of the parent's residual portfolio. To the extent that a spin-off or sell-off increases the focus and reduces the complexity of the residual portfolio, one can expect an improved ICM and observe an enhanced investment efficiency. Any observed post-restructuring enhancement is consistent with an inefficient ICM pre-restructuring.

In contrast to a spin-off or sell-off that truncates the ICM of the parent, a carve-out preserves its size and complexity because the carved-out segment does not leave the control and ownership of the parent unlike a spun-off or sold-off segment. The carved-out business is floated on a stock exchange and now is capable of being independently valued. It is now part owned by shareholders other than the parent's and is subject to independent monitoring by analysts and investors in the ECM. In addition, in using the post spin-off or sell-off data to assess whether the pre-restructuring parent's ICM was inefficient, as done in previous studies including Colak and Whited (2007), we have to assume that the relationship between the spun-off or sold-off business and the rest of the parent's business portfolio is not relevant. We need to make assumptions as to whether this relationship had a positive or negative effect on the other businesses and hence on the portfolio performance. Such assumptions are redundant when one considers carve-outs since the carved-out segments continue to be part of the parental portfolio. Whatever relations had existed between them and the remaining segments would be

unimpaired by the carving out. Given this continuity, assessment of the parent's pre-carve-out investment efficiency using the post-carve-out investment efficiency is a methodologically superior approach since it dispenses with the need to make assumptions concerning the relationship between the carved-out segment and the residual segments.

Further, the advantage of using the carve-out event for assessing the pre-carve-out ICM efficiency of the diversified parent is that the carve-out directly addresses some of the causes of ICM inefficiency in the parent. The introduction of independent monitoring of the carved-out segment by analysts and investors can mitigate the agency conflict between different managerial levels and between the top management and the parent shareholders. In contrast, a sold-off segment becomes part of the buyer's portfolio and is shielded from any independent monitoring. While a spun-off segment becomes a listed entity and is therefore subject to independent monitoring this has no implication for the efficiency of the residual portfolio of the parent and does not provide any indication of the source of any improvement in the post-spin-off investment efficiency of the parent.

For the above reasons, we believe that any assessment of the pre-restructuring efficiency of the parent's ICM is likely to be less ambiguous as to its source and more robust when based on a carve-out sample than when based on either a spin-off or sell-off sample. Despite these advantages of basing the analysis on carve-outs, they have not been examined in previous studies.

In this study, we, therefore, examine a carve-out sample. For comparison with prior studies we also examine a spin-off sample and a sell-off sample. These are samples of US firms carrying out the restructuring transactions. We compare the investment efficiency of the parent firms post- and pre-restructuring and assess the statistical significance of any improvement. We follow Colak and Whited's (2007) methodology to control for the self-selection bias. We also construct investment performance variables along the lines employed by them.

We employ three different metrics that are expected to reflect the efficiency of ICM. Two are direct measures of capital allocation based on relative value creation potential of segments (relative investment ratio (RINV) and relative value added (RVA)) and one is an indirect measure i.e. change in

parent company valuation (Excess value).[1] We also control for the self-selection bias using the following alternative methodologies to assess the impact of restructuring on investment efficiency and relative valuation:

- Propensity score matching (PSM) following Dahejia and Wahba (2002)
- Heckman procedure to correct for endogeneity and
- The Abadie and Imbens (AI) estimator that corrects for asymptotic bias in simple matching estimators such as the PSM estimator

Colak and Whited (2007) argue that the AI estimator is the most robust among the three as it corrects for asymptotic bias and results in the best matching of the test and control samples.

Our results, based on the AI estimator, show that

- either no significant improvement or deterioration in the investment efficiency of the refocusing firms following spin-offs and sell-offs occurs;
- there is an increase in investment efficiency after the completion of carve-outs; and
- there is evidence in support of our a priori expectation that carve-outs present a more effective mechanism to improve the functioning of the conglomerate's ICM by exposing the given carved-out segment to greater stock market scrutiny and imposing greater transparency in the functioning of the ICM of the parent.

Results based on the Heckman procedures are mixed. While there is a significant improvement in the RINV (over a two-year window) and RVA (over a three-year window) following carve-outs, investment efficiency appears to either deteriorate or not change significantly following sell-offs and spin-offs (over two- and three-year windows). The results suggest that the valuation of parents following carve-outs is improved when we consider a two-year window after the event announcement. There is evidence of value erosion following spin-offs over a three-year window. From the PSM-based analyses, we find some limited evidence of improvement in investment efficiency following spin-offs

[1] Please refer to the sample and methodology section for definitions and construction of these variables.

and sell-offs (positive and significant change in RINV after spin-offs over a three-year window and positive and significant change in RINV and RVA after sell-offs both over two- and three-year windows). Finally, we find that the level of Excess Value is significantly eroded following each of the three types of refocusing over a three-year event window). Thus the PSM approach does not provide consistent evidence of improvement across all the metrics. Our results based on the AI estimator conform to those reported by Colak and Whited (2007) as regards the impact of spin-offs and sell-offs, however, we find that carve-outs improve investment efficiency (in terms of both RINV and RVA over two- and three-year windows) suggesting ICM inefficiency in the parents prior to carve-outs.

2. Prior Literature Review

The question of whether a conglomerate is an efficient organisational form for the purpose of efficient allocation of scarce capital has engaged scholars since the 1980s, triggered by the increasing trend among diversified firms to sell-off many of their component businesses. This trend was attributed to the realisation of failure of the capital allocation function of the conglomerate firms (Shleifer and Vishny, 1991) which undermined the financial rationale for conglomerates (Fluck and Lynch, 1999). Lang and Stulz (1994) and Berger and Ofek (1995) provide empirical evidence that the stock market valuation of conglomerate firms in the US was significantly less than the sum of the values that could be assigned to the component businesses of those conglomerates. Their methodology involved estimating the value of each component business by comparison with the valuation of an independent, stand-alone or single segment firms with stock market valuation based on the assumption that such a pure-play was a reliable proxy for the conglomerate's component segment. This undervaluation of a conglomerate when benchmarked against the synthetic portfolio of pure-plays is known as conglomerate or diversification discount (DD). Other studies e.g. Lamont (1997) and Shin and Stulz (1998) have reported supporting evidence.

As noted by Stein (2003), DD was generally attributed to the failure of the ICM of conglomerates. The existence of DD has however been challenged by several recent studies e.g. Whited (2001), Chevalier (2000). Their criticism rests on both conceptual and methodological grounds. Conceptually,

a conglomerate's business portfolio is not a simple aggregation of the corresponding pure-plays. A conglomerate's investment in a segment may have been driven by its business and value creation logic and, therefore, it may differ systematically from a pure-play. The latter's performance or investment opportunity set is therefore an inappropriate benchmark to assess the valuation or growth opportunity set of the conglomerate. In addition, Hyland (1999) demonstrates that conglomerate firms were underperformers even before they became conglomerates. Campa and Kedia (1999) find that companies with relatively lower valuation have a higher tendency to diversify, and that if the analysis controls for the diversification decision, the conglomerate discount becomes negligible.

A second criticism is that the performance metrics, such as Tobin's Q or market to book value or market capitalisation to sales (all used extensively in empirical research), of the pure-plays may be a flawed measure of the performance of the conglomerate segment because of its systematic difference from the pure-play. This means that any inference concerning the conglomerate's underperformance or undervaluation based on analyses that employ these flawed proxies would be questionable. Several recent studies have therefore used alternative measures as proxies for segment performance or valuation (Villalonga, 2004 ; Maksimovic and Phillips, 2002, 2008; Khanna and Tice, 2001). They find that the conglomerate discount is no longer observed when more appropriate business data and/ or performance metrics are used e.g. plant level investment or productivity.

The latter conceptual problem leads to another methodological issue. The investment in the conglomerate segment and its performance are endogenous variables. In assessing the performance of such a segment, this endogeneity bias has to be accounted for. Villalonga (2004) uses the propensity score matching (see for a discussion Section 3 below) to control for the self-selection bias and reaches the conclusion that there is no significant DD.

Several researchers have circumvented the use of stand-alone pure-plays as benchmarks by examining the data relating to spun-off businesses which prior to the spin-off were conglomerate segments. They use the data relating to the pre-spin-off parent, the spun-off offspring and the residual parent for constructing investment and valuation metrics before and after the spin-of event. A comparison of the pre-spin-off parent and the post-spin-off parent or the proforma portfolio of the

residual parent and the offspring then allows inferences concerning the pre-spin-off investment efficiency and DD of the conglomerate. This approach has the merit of addressing the deficiency of benchmarks based on pure-plays (Ahn and Denis, 2004; Gertner, Powers and Scharfstein, 2002; Dittmar and Shivdasani, 2003; and Burch and Nanada, 2003).

Colak and Whited (2007), however contend that while this approach is a solution to the pure-play benchmark problem, it does not solve the endogeneity problem. They therefore adopt three alternative procedures to control for any endogeneity bias. They compare the pre- and post-restructuring investment efficiency and valuation metrics to draw inferences concerning the ICM inefficiency and valuation discount of the pre-structuring parent. They use sell-off and spin-off samples for this purpose. But as noted the introduction section above, they have not used an equity carve-out sample which has superior conceptual and methodological properties over sell-off and spin-off samples.

The use of carve-outs to evaluate the change in the investment efficiency of the parent entity allows us to also examine the conditions under which the functioning of the ICM can be value-enhancing. The ICM can be beneficial when a given business segment would be unable to raise investment capital as a stand-alone entity. In such cases one segment's assets can serve as a collateral which enables another business segment to obtain funding. As a result, the larger asset base of the diversified parent can provide access to cheaper debt financing than one or both of the segments would be able to access if they were completely independent because of the co-insurance effects of diversification. In this context, Billett and Mauer (1999) show that the conglomerate discount is negatively associated with the size of cross-subsidies to the divisions of the parent that are likely to have restricted access to the capital markets as a separate entity. Moreover, in most cases the carve-out is structured in a way which preserves some joint tax advantages. If any of the parent's subsidiaries incurs losses, these can be used to provide a tax shield for the parent, thereby reducing the aggregate tax expenses of the combined entity.

In addition, carve-outs enable the conglomerate to establish the carved-out segment's value in a more transparent manner, namely, by reducing the information gap that may exist between company insiders and the capital market participants (i.e. the company outsiders). However, the carved-out entity

can still enjoy most of the synergistic benefits arising from joint operation with the parent company. Thus, by separating the business division from the parent entity through an equity carve-out the diversified firm can successfully unlock hidden value and at the same time reap the potential benefits from preserving the ICM, thereby increasing the combined value of the parent. The hidden value is expected to be more transparently reflected in the stock price of the carved-out entity because of the likely boost in the number of analysts following the given company and the associated enhanced quality of the information that is disseminated to the ECM about the business segment. The carve-out may lead to a reduction in the analysts' cost of research which could increase the analyst following of the given company and augment the accuracy of the information that the analysts generate. When the offspring and the parent operate in businesses which are significantly unrelated to each other but the cash flows of the two entities belong to a single issue of equity, then the analyst following the parent will need to produce information for each business unit in order to assess the value of the combined entity accurately. Dividing the cash flows of the company into two parts results in a lower cost of valuing the equity of the underlying business. In addition, the carve-out allows the different business segments of the parent to be valued by analysts who have developed expertise in their respective industries. Since equity research houses typically assign one analyst per company, the analyst tends to specialise in the industry of the parent. Thus, the analyst may not possess enough expertise to accurately assess the value of a segment which belongs to a different industry. There is some evidence that both the number and the specialisation of analysts are improved following carve-outs (Gilson, Healy, Noe, and Palepu, 1998).

Myers and Majluf (1984) demonstrate that companies tend to forgo positive net present value (NPV) projects in the presence of asymmetric information, thereby leading to underinvestment. Carve-outs can help augment the market value of both the parent and carved-out entity in the cases when there is significant discrepancy in the amount and quality of private information that division managers possess about their respective business segments. For simplicity, and without any loss of generality, consider a parent which consists of two business segments - A and B. The managers of segment A possess considerably more private information about their own business segment compared to the private information that is possessed by segment B's managers. By carving-out one of the business

segments the parent can significantly decrease the likelihood that segment B forgoes a positive NPV project since this business segment will be able to raise capital without any value dilution that could result from the presence of asymmetric information. Consequently, we can expect the value of both the parent and the carved-out entity to be augmented due to the reduction in the aggregate level of underinvestment in the parent company.

Moreover, carve-outs as a mechanism for restructuring a given diversified business have management incentive-related advantages. Prior to the completion of the carve-out, the parent's share price reflects the performance of both the parent and the offspring. Thus, if the offspring's management are awarded stock in the consolidated company, they may not be motivated to maximise the value of the offspring. For example, the compensation of the carved-out entity's management could be based on the performance of that business's share price, thereby resulting in a more efficient alignment of the interests of shareholders and managers. There is empirical evidence that most carved-out businesses base the compensation plans of management to the share price performance of the carved-out offspring (Shipper and Smith, 1986). In addition, there is some evidence that the adoption of segment-based incentive plans could exert a positive influence on the quality of employees that either the offspring or the parent can hire (Kumar and Sopariwala, 1992).

Since the governance structure of the parent and the carved-out entity change following completion, it is possible that the quality of corporate governance of the parent and offspring also change as a result of the carve-out. Because of the potential decrease in information asymmetry and improved management incentive plans following carve-outs, we expect that the quality of corporate governance of both parent and offspring would improve following the restructuring event. Any changes in the quality of corporate governance following carve-outs could be the driver of any observed changes in the functioning of the ICM. We seek to extend the analysis presented in this paper to investigate the relationship between changes in governance and changes in the functioning of the ICM following carve-outs.

The discussion presented in this section motivates the primary hypotheses of our study:

H1: The functioning of the conglomerate's ICM is improved following carve-outs.

The investment efficiency and valuation of the conglomerate are enhanced following carve-outs.

3. Sample and Methodology

To investigate the impact of refocusing on investment efficiency and firm valuation we construct four different samples of companies: a sample of companies which sell-off divisions, a sample of companies which spin-off divisions, another sample of companies which carve-out divisions and a fourth sample that does not perform any refocusing activities. The samples of spin-offs and sell-offs are obtained from the Security Data Corporation's (SDC) Mergers and Acquisitions Database. We exclude parent companies for which company- and segment-level data is not available. Following the sample construction methodology in Colak and Whited (2007) we exclude companies which operate in industries with Standard Industry Classification (SIC) codes between 6000 and 6999. Our final sample of spin-offs consists of 125 transactions completed. In order to identify a sample of sell-offs which lead to substantial changes in the company's operational structure we impose a minimum transaction value restriction of $100 million. Our final sample of sell-offs consists of 714 transactions.

We obtain the sample of carve-outs from the SDC Global New Issues Database and impose the same restrictions as the ones used for the construction of the spin-off sample. Our final sample of carve-outs consists of 75 transactions. In line with the sample selection criteria used in Colak and Whited (2007), we obtain our sample of control companies from the most recent Compustat business information file. We exclude the firm-year observations which lack any of the financial information necessary to perform the different matching procedures. We also remove the companies with a changing number of segments during the sample period from the control group. Finally, we require that each control observation has more than one business segments. The final sample of control firms consists of 1, 358 companies and 5, 838 company-year observations. The sample period for all four samples of conglomerate companies covers the period 2002-2013.

The methodology of our study accounts for the possible problem of endogeneity that can arise when analysing the change in investment efficiency of firms that decide to refocus. If the decision to downsize

business operations is endogenous, companies which opt for downsizing would have systematically different characteristics from those that decide not to. If the investment efficiency of companies does improve following a sell-off, spin-off or carve-out, then this effect must be observable after controlling for the systematically different characteristics of companies which embark on downsizing. In order to achieve this it is necessary to estimate a so-called average treatment effect, where the treatment itself is the performance/completion of a given restructuring event. This 'treatment effect' is statistically estimated by building a control sample of companies and then averaging the disparity in investment efficiency between the treatment and matched control samples.

We use the matching estimator developed by Abadie and Imbens (AI hereafter, 2006). The sample matching technique used by AI provides an adjustment for the asymptotic bias present in simple matching estimators. A detailed description of the implementation of the AI estimation procedure with the Stata software is provided by Abadie, Drukker, Herr and Imbens (2004). In addition to the above described method for correcting for endogeneity problems, there are two alternatives: a) the Heckman (1979) correction for sample selection bias and b) matching based on estimated propensity score following Dahejia and Wahba (1999, 2002).

Each of the above mentioned matching procedures requires the development of a probability model which estimates the likelihood of embarking on a given restructuring type. The probit regression which we estimate is of the form:

$$\text{Probit (Restructuring Event)}=\alpha+\beta_i\text{Controls}+\varepsilon_i \quad (1)$$

where the bank of control variables is presented in Table 1.

To control for the measurement errors associated with the variables which proxy for investment efficiency this study adopts a number of correlation-based measures, namely, the relative investment ratio (RINV), relative value added (RVA) and Excess Value. Given a company with n segments the procedure for measuring the RINV can be described in two steps. The first step is to calculate the median q (market to book ratio) of the pure play (i.e. single-segment) companies operating in the same three-digit SIC industry, the second step is to arrange the segments on the basis of the size of these q's. In

addition, and for illustrative purposes assume that the first k segments have industry median q's greater than the sales-weighted average of all the segments' industry median q's. Let S_j be the sales of segment j, w_j be the proportion of company sales made by segment j, I_j be the capital expenditures of segment j, and $\left(\frac{I}{S}\right)_j^{SS}$ be the capital expenditure to sales ratio of the median pure play company operating in the same three-digit SIC industry as segment j. Then, RINV can be calculated as:

$$RINV_S \equiv \sum_{j=1}^{k} w_j * \left\{\frac{I_j}{S_j} - \left(\frac{I}{S}\right)_j^{SS} - \sum_{i=1}^{n} w_i * \left[\frac{I_i}{S_i} - \left(\frac{I}{S}\right)_i^{SS}\right]\right\} - \sum_{j=n-k+i}^{n} w_j * \left\{\frac{I_j}{S_j} - \left(\frac{I}{S}\right)_j^{SS} - \sum_{i=1}^{n} w_i * \left[\frac{I_i}{S_i} - \left(\frac{I}{S}\right)_i^{SS}\right]\right\} \quad (2)$$

It should be noted that:

$$\left[\frac{I_j}{S_j} - \left(\frac{I}{S}\right)_j^{SS}\right] \quad (3)$$

represents investment to sales ratio of segment j adjusted by its industry median

$$\frac{I_j}{S_j} - \left(\frac{I}{S}\right)_j^{SS} - \sum_{i=1}^{n} w_i * \left[\frac{I_i}{S_i} - \left(\frac{I}{S}\right)_i^{SS}\right] \quad (4)$$

represents the industry- and firm-adjusted investment to sales ratio. Equation (2) demonstrates that, after adjusting for industry- and firm-investment levels, $RINV_S$ will be higher when companies invest more in their high-q segments, i.e. when they are more efficient.

The second measure that we use to capture the change in investment efficiency of companies which embark on any of the three restructuring types is the RVA. If q_j is the industry median q of segment j, the relative value added measure which uses sales as the denominator of each ratio, RVA is:

$$RVA = \sum_{j=1}^{n} w_j (q_j - \bar{q}) * \left\{\frac{I_j}{S_j} - \left(\frac{I}{S}\right)_j^{SS} - \sum_{i=1}^{n} w_i * \left[\frac{I_i}{S_i} - \left(\frac{I}{S}\right)_i^{SS}\right]\right\} \quad (5)$$

where $\bar{q}$ is the sales-weighted average of all of the segment industry median q's.

We also include a measures of the change in company valuation following each of the three types of restructuring which has been used by previous studies, namely, the change in the Excess Value of the conglomerate. Excess Value is calculated following the methodology in Ahn and Denis (2004).

This variable captures the value of a conglomerate relative to a collection of single-segment companies in the industries corresponding to the conglomerate's segments. This variable is defined as:

$$\text{Excess Value} = \left(\frac{V}{S}\right)_i - \sum_{j=1}^{n} w_j \left(\frac{V}{S}\right)_j^{SS} \quad (6)$$

where w_j is the proportion of company sales made by segment j, $\left(\frac{V}{S}\right)_j^{SS}$ is the median market value to sales ratio for the three digit SIC-industry in which segment j operates, and $\left(\frac{V}{S}\right)_i$ is the market value to sales ratio for the entire conglomerate.

Finally, to examine whether the quality of corporate governance of the parent and offspring changes following carve-outs in our sample of carve-outs we match the carved-out entity and their parent firm with the BoardEx database using each company's name and location. Corporate governance characteristics are measured by board duality, board size and board composition following Brickley et al. (1994), Coles et al. (2001) and Florackis and Ozkan (2009).

4. Results of Empirical Analysis

4.1 Descriptive Statistics

Table 2 presents some of the key financial characteristics of the three sub-samples of companies which embark on refocusing and the control sample of multi-segment companies which do not perform any restructuring activities during the sample period. The table demonstrates several interesting differences between the sample of companies which perform a carve-out, spin-off or sell-off and the control firms. First, companies which perform a carve-out, spin-off or sell-off are substantially larger in terms of asset size ($11.8, $3.2 and, $11.6 million median value respectively) relative to their non-refocusing counterparts ($1.9 million median value). Second, companies which sell-off or spin-off assets appear to be exposed to better investment opportunities (2.03 and 2.37 median market to book ratio respectively) relative to the control firms (1.76 median market to book). Interestingly, companies which embark on carve-outs seem to be faced with lower investment opportunities relative to their non-refocusing counterparts (1.36 vs 1.76 median market to book ratio respectively).

Third, the companies which refocus during the sample period are considerably more leveraged, with a median debt ratio of 0.27, 0.16, 0.26 for the firms which perform a carve-out, spin-off or sell-off respectively relative to a median 0.07 debt ratio for the firms in the control group. Fourth, the three sub-samples of restructuring firms are characterised with a higher number of segments (degree of diversification) relative to the control sample, with a median number of segments for carve-outs, spin-offs and sell-offs equal to 4, 5 and 6 respectively relative to a median number of segments of 3 for the non-restructuring counterparts. There appear to be no substantial differences between the rate of investment and level of operating income across the four samples.

These findings support our a priori expectation that the companies which perform a given restructuring activity differ systematically from the control sub-sample and that these differences could account for the improvements in investment efficiency reported in previous studies which examine the impact of sell-offs and spin-offs (see, for example Burch and Nanda, 2003; Ahn and Denis, 2004; and Gertner, Powers, and Scharfstein, 2002). Table 2 also reveals that there are some systematic differences across the three sub-samples of companies which embark on refocusing activities. Specifically, companies which perform carve-outs or sell-offs appear to be considerably larger and more leveraged compared to companies which perform spin-offs (with median asset size equal to 11,812; 11,625; and 3,231 thousand of US $ and median leverage ratio equal to 0.27; 0.26; and 0.16 for carve-outs, sell-offs and spin-offs respectively). In addition, the companies which perform sell-offs or spin-offs seem to be exposed to higher growth opportunities relative to their counterparts which perform carve-outs as indicated by the differences in the median Q ratios (2.03; 2.37; and 1.36 for sell-offs, spin-offs and carve-outs respectively). These results suggest that the impact on investment efficiency could also vary significantly across the three types of refocusing events.

4.2 Probit Models

A preliminary step in performing any matching procedure involves the identification of the variables which are important predictors of the likelihood of a company belonging to either the treated (restructuring) or control samples (non-restructuring). First, we estimate probit regression of the

likelihood of performing a given type of restructuring activity by including a number of variables which have been identified as relevant by previous studies. The full list of variables used to estimate the probit models along with variable definitions are presented in Table 1. Following Desai and Jain (1999) and Krishnaswami and Subramaniam (1999) we include the entropy measure (variable '*Relative Entropy*') as an explanatory variable of the likelihood to restructure. The entropy measure captures the degree of diversity of the industries in which a given conglomerate operates. Purrino (1997) argues that a potential motive for restructuring is the transfer of wealth from debtholders to stockholders. To account for this we include the ratio of debt to sales (variable '*Debt*') in our probit regressions. According to Haynes, Thomson, and Wright (2003) larger companies and companies with considerable market shares could gain more from the focus provided by restructuring. To account for this effect we include a measure of company size (log of sales, variable '*Log Sales*') and market share (ratio of company sales to industry sales, variable '*Market share*') in our probit regressions. Following Lang, Poulsen and Stulz (1995) we also incorporate measures of liquidity and financing needs (ratio of cash flow to sales, variable '*Cash flow*', and ratio of financing gap to sales respectively, variable '*Financing gap*') in our analysis. We also control for the presence of demand shocks in the firm's main industry (company's largest segment profits divided by that segment's sales, variable '*Largest segment profit*') in line with Maksimovic and Phillips (2002). We also incorporate variables that control for the timing of restructuring following Colak and Whited (2007). These variables capture the effects of industry sales growth, the demand for corporate assets in the conglomerate's main industry (variable '*Control Activity*') and the market value of IPO activity (variable '*IPO Activity*'). Table 3 presents the results from the probit regressions. Finally, and in line with Colak and Whited (2007), we include the levels of RINV, RVA, Excess Value in our probit regressions since we expect that low levels of investment efficiency or value should increase the propensity to refocusing. Table 3, Model 1 (Models 2 and 3) display the results from the analysis of the likelihood to perform a carve-out (spin-off and sell-off respectively).

Table 3 demonstrates that the drivers of the propensity to perform a carve-out, spin-off or sell-off are different for each type of restructuring thus highlighting the need to control for endogeneity issues separately for each of the three refocusing events analysed in this study. In line with the incentive to expropriate bondholders the degree of indebtedness of companies is positively and significantly

associated with the likelihood of carving-out or selling-off a subsidiary. Interestingly, and in contrast to the findings in Colak and Whited (2007), the measures of firm value and profitability are not identified as significant determinants of the propensity to refocus with the exception of the level of excess value and market to book, which are significant in the model for spin-offs and the profitability of the largest segment, which is significant in the models for carve-outs and spin-offs.

The analysis also suggests that companies which operate in a large number of industries are likely to perform a sell-off, as indicated by the positive and significant value of the coefficient corresponding to the '*Relative entropy*' variable, but that this variable is not an important driver of the propensity to carve-out or spin-off a given segment. Not surprisingly, a larger financing gap is associated with a higher likelihood to perform a sell-off owing to the fact that this type of refocusing has the highest cash-generating capacity out of the three restructuring types. The results also reveal that different industry-level factors matter for the different types of restructuring. Specifically, control activity is an important determinant of the propensity to carve-out assets, IPO activity is an important driver of the decisions to carve-out or sell-off assets, and unanticipated shocks in industry prospects, as indicated by the sales growth of the given industry, are an important factor for the decision to sell-off assets.

4.3 Analysis of change in investment efficiency and valuation with the use of the Abadie Imbens (2006) matching procedure

Having identified a relevant vector of control variables for each refocusing type, we use a number of different control sample matching techniques to evaluate the 'average treatment effect' from embarking on a carve-out, spin-off or sell-off on the investment efficiency and valuation of conglomerates. First, we perform the sample matching procedure developed in Abadie and Imbens (2006). According to Colak and Whited (2007), this technique is arguably superior to the Dehejia and Wahba (2002) PSM and the Heckman bias adjustment methods since it does not involve any parametric assumptions regarding the distributions of the variables. Relaxing such assumptions is particularly important when using data from Compustat as the imposition of these distributional assumptions could result in biased standard errors. In addition, the distributions of many income and balance-sheet statement items is not accurately captured by the logistic or normal distributions which are the two distributions used by the other estimation procedures. The results of the analysis are presented in Table 6. The results from the analysis are presented in Table 4, Panels A, B and C for the sub-samples of companies that perform carve-outs, spin-offs and sell-offs respectively. The first section of each Panel shows the 'raw' average values of RVA, RINV and Excess Value before and after the announcement of each type of restructuring event without any adjustment for endogeneity. The values corresponding to the variable *'Before'* are calculated as an average for each conglomerate company over a time period starting two years before and ending one year before the announcement of a given refocusing event. Similarly, the values corresponding to the variable *'After'* are calculated as an average for each conglomerate company over a time period starting one year after and ending two years after the announcement of a refocusing event. Following Colak and Whited (2007), the variable '*Change*' is measured as the difference between the variables *'After'* and *'Before'*. The second section of each Panel - '*Treatment Effects*' - presents the control sample-adjusted results. The variable '*After*' show the difference between average investment efficiency and valuation in the samples of restructuring and control firms. Using RINV as an example, the variable '*After*' shows the average value of:

(RINV for each restructuring company – RINV for each control company)

The variable '*Diff. in Diff.*' captures the average change in investment efficiency and valuation for each sample of restructuring companies relative to the change in the matched control sample. Using RINV as an example, the variable '*Diff. in Diff.*' shows the average value of:

(Change in RINV for each restructuring company – Change in RINV for each control company)

The difference-in-difference variables account for unobservable time-invariant control variables, whereas the level treatment-effect estimator does not. In addition, the variables *'After (bias adjusted)'* and *'Diff. in diff. (bias adjusted)'* are adjusted for the bias introduced by cases when the matching is not exact. According to Abadie and Imbens (2002) the simple matching estimator will be biased when the sample is finite and when the matching is not exact. Given m continuous covariates, the estimator has a term associated with the matching discrepancies (i.e. the difference in covariates between the matched observations and their matches) that is of the order $O_p(N^{-\frac{1}{m}})$. By incorporating the Abadie Imbens (2002) bias adjustment we attempt to remove some of this bias term which remains after matching. Whenever the difference-in-difference treatment effects are significantly greater than zero, we interpret this result as an indication that the given improvement in investment efficiency and valuation is driven by the restructuring event per se.

Interestingly, the average values of RINV and RVA before the performance of carve-outs are negative but not significantly different from zero, i.e. companies that perform carve-outs do not appear to be characterised with significant levels of investment inefficiency *per se* before the announcement of the event (Table 4, Panel A). It should be noted that to gain a better understanding of whether investment inefficiency existed before carve-outs we also need to examine whether the investment efficiency improves following carve-outs. Table 4, Panels B and C demonstrate that the value of RINV is negative and significantly different from zero *before* both spin-offs (-0.210) and sell-offs (-0.549) and the value of RVA is significantly negative before sell-offs (-0.006). These results suggest that conglomerates that perform spin-offs and sell-offs are characterised with significant levels of investment inefficiency before they embark on refocusing. The levels of investment inefficiency before spin-offs and sell-offs reported in this paper are higher than the values reported in Colak and Whited

(2007). As our sample covers the more recent time period of 2002-2013 this result suggests that conglomerates have become increasingly more inefficient at allocating investment capital. This finding could be partly explained by the fact that our sample includes the period of the most recent financial crisis.

The analysis presented in Table 4, Panel A, demonstrates that the investment efficiency of the parent is significantly improved over the two-year period following carve-outs. This result is evidenced by the significantly positive coefficients corresponding to the RINV (+0.546) and RVA (+0.369) measures of the *'Diff. in diff. (bias adjusted)'* variable. In addition, there is evidence that the ICM of the parent deteriorates over the two-year period following sell-offs as indicated by the significantly negative '*Diff. in diff. (bias adjusted)*' values of the RINV (-0.128) and RVA (-0.006) measures (Table 4, Panel C).

The results from the analysis of average treatment effects with the use of the Abadie and Imbens (2002) over three-year windows are presented in Table 5, All Panels. The analysis reveals that there is an increase in investment efficiency following carve-outs, as evidenced by the positive and significant difference in difference treatment effects, variable *'Diff. in diff.'* (+0.399) corresponding to the RINV measure (Table 5, Panel A). In addition, Table 5, Panel A shows that there is an increase in the RVA measure as indicated by the positive and significant '*Change*' variable which is equal to (+0.026).

In addition, the analysis provides some evidence of deterioration in the investment efficiency of parents during the three-year period following sell-offs as indicated by the significantly negative value (-0.006) of the variable '*Change*' corresponding to the RVA measure (Table 5, Panel C). The analysis does not show any significant change in the investment efficiency of the conglomerate when we consider both two- and three-year windows following spin-offs (Tables 4 & 5, Panel B).

The results from the analysis of the change in conglomerate value following the three forms of restructuring indicate that while there is no significant change in Excess Value following carve-outs, there is a significant decrease in Excess Value following spin-offs and sell-offs when we consider a three-year period. This finding is evidenced by the negative and significant values of the variable

'*Change*' which amount to -0.277 and -0.239 in the samples of spin-offs and sell-offs respectively. It should be noted that these effects are no longer significant once we incorporate a bias adjustment.

The results contained in Table 4 (All Panels) reveal that there are some systematic differences in the effects of each form of restructuring on the efficiency of capital allocation of the parent company. In particular, while there is no consistent evidence of any improvement in the ICM following spin-offs and sell-offs, there is consistent evidence that carve-outs can help increase the level of investment efficiency of the ICM in conglomerate firms. This result provides evidence in support of our a priori expectation that carve-outs present a more effective mechanism to improve the functioning of the conglomerate's ICM by exposing the given carved-out segment to greater stock market scrutiny and imposing greater transparency in the functioning of the ICM of the parent, and improving the quality of corporate governance of the parent and offspring following carve-outs.[2] The fact that parents are better able to allocate capital across different business segments following carve-outs also suggests that the pre-restructuring parent was suffering from ICM inefficiency.

4.4 Analysis of change in investment efficiency and valuation with the use of the Dehejia and Wahba (2002) PSM matching procedure

We next perform the analysis of the impact of carve-outs, spin-offs and sell-offs on conglomerate investment efficiency and valuation with the use of the Dehejia and Wahba (2002) PSM matching procedure. Tables 6 and 7 are structured in an identical way to Tables 4 and 5, with the first (second) section of each Panel showing the results without (with) an adjustment for the endogeneity of the refocusing decision.

Similar to the results presented in the previous section our analysis shows that the level of investment efficiency increases significantly over the two-year period following carve-outs. This finding is evidenced by the positive and significant values corresponding to the variable '*Diff. in diff.*'

[2] Please refer to section 4.6 for an analysis of how the governance characteristics of the parent and offspring companies change following carve-outs.

for the measures of RINV (+0.099) and RVA (+0.229) in Table 6, Panel A. The results are not statistically significant when we consider a three-year period following carve-outs (Table 7, Panel A).

The analysis of the change in investment efficiency over the two-year period following spin-offs suggests that there is no significant change in the RINV and RVA measures both when we ignore and when we account for treatment effects (Table 6, Panel B). Table 6, Panel C also shows that there is a significant deterioration in the investment efficiency of the parent company over the two-year period following sell-offs, with a change of (-0.301) and (-0.001) in the values of RINV and RVA respectively.

In contrast, when we consider a three-year period the results show that there appears to be some improvement in investment efficiency following spin-offs and sell-offs which is evidenced by the positive and significant change in the RINV of (+0.118) and (+0.301) respectively (Table 7, Panels B and C). In addition, there is a positive and significant change in RVA (+0.008) following sell-offs. Finally, the analysis contained in Table 7 (All Panels) shows that the level of Excess Value is significantly eroded following carve-outs (-0.264), spin-offs (-0.161) and sell-offs (-0.209).

4.5 Analysis of change in investment efficiency and valuation with the use of the Heckman bias adjustment procedure

Table 8 reports the results from the analysis of change in investment efficiency and conglomerate valuation with the use of the Heckman bias adjustment procedure. The variables labelled '*Heckman_Treated'* correspond to the sum of $(\alpha+\beta_1)$ in the Heckman regression which is of the form Δ Investment Efficiency$= \alpha + \beta_1 D_i + \beta_2 \text{InvMills} + \varepsilon_i$, and where *'Δ Investment Efficiency'* is the change in the given measure of investment efficiency and conglomerate valuation, *'D_i'* is a dummy variable which is equal to one if the company performs the specific restructuring activity and 0 otherwise, *'InvMills'* is the coefficient on the variable used to adjust for self-selection bias in the Heckman regressions. '*Heckman_Controls'* is the coefficient corresponding to α in the Heckman regression. Standard errors are reported in parentheses.

The results presented in Table 8 are consistent with the findings presented in the previous sections. There is some evidence that the functioning of the ICM is enhanced over the two-year period

following carve-outs which is indicated by the positive and significant coefficient (+0.019) corresponding to the '*Heckman_Treated*' variable for the RINV measure (Table 8, Panel A). There appears to be no significant improvement in the investment efficiency of the parent company over the two-year period following sell-offs and spin-offs (Table 8, Panels A and B).

Table 9 presents the analysis of the change in ICM with the use of the Heckman matching procedure. The results indicate that there is a significant improvement in the RVA over the three-year period following carve-outs which is evidenced by the positive and significant coefficient corresponding to the '*Heckman_Treated*' variable (+0.036). In addition, the analysis shows that investment efficiency does not change (deteriorates) significantly over the three-year period following spin-offs (sell-offs). While there is no evidence of significant improvement in conglomerate valuation following carve-outs, there is evidence of significant value erosion over the three-year period following spin-offs and sell-offs. The latter finding is evidenced by the significantly negative coefficient corresponding to the '*Heckman_Treated*' variable of Excess Value in the samples of spin-offs (-0.199) and sell-offs (-0.025).

It should be noted that in some cases the results based on the analysis of Excess Value contradict the results based on the analysis of RINV and RVA. This could be due to the fact that Excess Value is an indirect measure of investment efficiency. As a results, the measure of Excess Value may not accurately reflect the level of investment efficiency. In addition, Excess Value could be driven by factors which differ and are not related to the company's ability to allocate investment capital efficiently.

4.6 Analysis of corporate governance characteristics (year -2 to year +2)[3]

One of the propositions made in this paper is that the functioning of the ICM of the parent company is improved following carve-outs owing to better corporate governance in the parent and offspring companies. To test the validity of this proposition we examine the change in some governance

[3] We do not include analysis of change in governance characteristics over a period starting three years before and ending three years after carve-outs since our sample size decreases dramatically and does not lend any statistical significance to the results.

characteristics such as board duality, board size and board composition in our sample of carve-outs. Table 10 presents the analysis of the change in corporate governance characteristics following the announcement of carve-outs. The results show that the board size of the offspring tends to increase while the composition of non-executive directors is also increasing. Previous studies such as Yermarck (1996) record an inverse relationship between the board size and firm performance. Nevertheless, carved-out entities are newly-established and tend to expand their market share so that they may recruit more talent and increase their board size. The increase in the proportion of independent directors in the offspring sample suggests that there is a more independent board structure and higher governance effectiveness as the carved-out entity matures. Table 10, Panel B investigates the governance structure of parent firms. The analysis demonstrates that board size decreases after refocusing while board independence increases. The results suggest an improvement in the governance structure of the conglomerate as smaller board size may imply a better coordination among directors and more independent directors may improve the control and strategic roles of the board (Coles, et al, 2001).

5. Summary and Conclusions

This paper extends the analysis presented in a series of studies which investigate the impact of spin-offs and sell-offs on the ICM of the parent company (see e.g., Gertner, Powers, and Scharfstein, 2002; Ahn and Denis, 2004; Dittmar and Shivdasani, 2003; Burch and Nanda, 2003; and Colak and Whited, 2007) by considering an alternative mechanism of refocusing - carve-outs- in addition to spin-offs and sell-offs. We adopt the methodology in Colak and Whited (2007) and control for the endogeneity of each type of refocusing decision by evaluating the change in the efficiency of the ICM relative to the change in investment efficiency which occurs in a group of control companies with similar characteristics. Specifically, we account for the degree of diversification, size, industry control and IPO activity as well as industry growth. In line with the results in Colak and Whited (2007), we show that the changes in the efficiency of the ICM following spin-offs and sell-offs are not caused by these restructuring activities *per se* but that they are driven by the inherent differences between the companies that decide to perform a spin-off or sell-off and those that decide not to.

Interestingly, the analysis of the impact of carve-outs on the efficiency of capital allocation of the parent company demonstrates that both the improvement of the ICM and company valuation are a result of the refocusing activity *itself*. Specifically, our results show that the relative value added and relative investment ratio are significantly enhanced following carve-outs and that these results are not driven by any inherent characteristics associated with companies which choose to perform a carve-out but by the carve-out. The results are confirmed when considering two- and three- year event windows around the decision to perform a carve-out. These findings contribute to the extant literature on refocusing by showing that the functioning of the ICM can be enhanced by increasing the level of monitoring from company investors rather than reducing the size of the ICM. In addition, our analysis carries important implications for the corporate managers who seek to improve the investment efficiency of their companies by demonstrating that carve-outs could present a more effective mechanism to restructure company operations when compared to spin-offs and sell-offs.

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Table 1. Variable definitions

Variable name	**Description**	**Expected relation to the likelihood of refocusing**
Refocusing dummy	Dummy variable which is equal to one if the company performs the given type of refocusing and zero otherwise.	N/A
Relative Entropy	Measures the degree to which companies operate in diverse industries (see e.g., Cusatis, Miles, and Woolridge, 1993, Daley, Mehrotra, and Sivakumar, 1997; Krishnaswami and Subramaniam, 1999 use the entropy measure developed by Palepu, 1985; Desai and Jain, 1999; Maxwell and Rao, 2003). For a firm operating in n industry segments, the entropy measure of total diversification is defined as follows: if P_i is the share of the *i*th segment in the total sales of the firm then $DT = \sum_{i=1}^{N} \left[P_i * \ln\left(\frac{1}{P_i}\right)\right]$ This expression is a weighted average of the shares of the segments, the weight for each segment being the logarithm of the inverse of its share. The measure, thus, takes into consideration two elements of diversification: (i) the number of segments in which a firm operates, and (ii) the relative importance of each of the segments in the total sales.	+
Debt	Assuming that an incentive to perform a spin-off is the expropriation of wealth from debt holders to shareholders, it is necessary to control for the degree of indebtedness of the company (see e.g., Parrino, 1997). Leverage is measured as the ratio of long-term debt to net sales.	+
Log sales (Size)	Larger companies and companies with higher market share would be more likely to embark on sell-offs (see e.g., Haynes, Thompson, and Wright, 2003). Size is measured as the natural log of net sales.	+
Market Share	Market share is measured as the ratio of company sales to the three-digit (SIC-code) industry sales.	
Financing gap	Companies may be motivated to perform a sell-off when they need cash in order to finance future investment activities, such as future capital expenditures (see e.g., Lang, Poulsen, and Stulz, 1995). This variable is measured as the difference between capital expenditures and the sum of cash flow and net debt issuance normalised by net sales.	+
Cash Flow	The degree of liquidity of the company is proxied by the ratio of cash flow to assets, where cash flow is defined as ratio of EBITDA to net sales.	
Largest Segment Profits (Demand shock in industry)	Companies may be incentivised to dispose of assets when their main industry or business segment experiences a positive demand shock (see e.g., Maksimovic and Phillips, 2002). The presence of such demand shocks is measured by the operating profits of the firm's largest segment divided by that segment's net sales.	+
Industry Sales Growth	Two-year industry sales growth measured as of the year of the carve-out, spin-off or sell-off at the two-digit industry SIC code level.	

Variable name	Description	Expected relation to the likelihood of refocusing
Control Activity	The higher the liquidity of the market for corporate assets, the more likely the company is to perform a split-up transaction (see e.g., Schlingeman, Stulz, and Walkling, 2002). Control activity is measured by the value of all mergers, acquisitions, and acquisitions of majority interest (as defined by the SDC Platinum Database) in the firm's two-digit industry. The measure is normalized by the two-digit SIC code industry market capitalization.	+
IPO Activity	The higher the liquidity of the market for corporate assets, the more likely the company is to perform a split-up transaction (see e.g., Schlingeman, Stulz, and Walkling, 2002).Given by the market value of IPO activity in the firm's two-digit SIC code industry. The measure is normalized by the two-digit SIC code industry market capitalization.	
Market-to-book of parent	If companies are already highly value, they would be less inclined to downsize. However, if the market-to-book is a better proxy of expected investment opportunities, the relationship will be in the opposite direction. This variable is measured as the ratio of market value of equity to book value of equity as of one year before the announcement of the respective restructuring event.	+/-
RINV	Following Colak and Whited (2007), low levels of investment efficiency could motivate companies to dispose of assets. See equation 2 for a description of how this variable is calculated.	-
RVA	Following Colak and Whited (2007), low levels of investment efficiency could motivate companies to dispose of assets. See equation 3 for a description of how this variable is calculated.	-
Excess value	Following Colak and Whited (2007), low levels of investment efficiency could motivate companies to dispose of assets. See equation 4 for a description of how this variable is calculated.	-
Board Duality	A dummy variable equal to one if the CEO of the firm is also the chairman of the board of directors.	N/A
Board Size	The total number of members of the board of directors.	N/A
Board Composition	The ratio of non-executive directors to executive directors.	N/A

Table 2. Summary statistics: Carve-outs, Spin-offs, and Sell-offs

	Assets	Q	Operating income	Debt	Investment	Number of Segments
Carve-outs						
Average	38,671	2.84	0.097	0.331	0.062	6.75
Median	11,812	1.36	0.078	0.273	0.033	4.00
Observations	30					
Spin-offs						
Average	35,345	2.77	0.091	0.219	0.035	6.20
Median	3,231	2.37	0.101	0.156	0.032	5.00
Observations	125					
Sell-offs						
Average	110,901	2.36	0.092	0.270	0.064	6.64
Median	11,625	2.03	0.096	0.263	0.031	6.00
Observations	714					
Controls						
Average	4,659	2.68	0.025	0.219	0.046	4.45
Median	1,980	1.76	0.085	0.071	0.027	3.00
Observations	5,838					

Notes: The sample covers the period 2002 - 2013. Assets are measured in thousands of US $. Q is calculated is the market to book ratio as of one year before the respective restructuring event. Operating income, debt and investment are scaled by total assets.

Table 3. Analysis of likelihood to perform restructuring activities. Model 1 reports the results from the analysis of the probability to perform a carve-out, Model 2 reports the results from the analysis of the probability to perform a spin-off and Model 3 reports the results from the analysis of the probability to perform a sell-off.

Variable Name	**(1) Carve-outs**	**(2) Spin-offs**	**(3) Sell-offs**
Log sales	**0.279*** **	**0.130*** **	**0.257*** **
	(8.873)	(5.685)	(27.11)
Market to book	-0.005	**0.021***	-0.003
	(-0.211)	(1.940)	(-0.468)
Cash flow	0.142	**-0.341*** **	0.014
	(1.154)	(-3.994)	(0.121)
Debt	**0.376*** **	0.059	**0.263*** **
	(6.717)	(1.175)	(13.64)
Relative Entropy	0.110	0.027	**0.063** **
	(0.973)	(0.348)	(1.963)
RVA	19.57	-4.288	1.666
	(0.630)	(-0.188)	(0.200)
RINV	-0.428	-1.061	-0.167
	(-0.244)	(-0.701)	(-0.307)
Excess Value	-0.002	**0.002***	0.0001
	(-1.077)	(1.944)	(0.217)
Financing gap	0.026	**-0.114** **	**0.099** **
	(0.497)	(-2.029)	(2.476)
IPO activity	**14.11*** **	-5.144	**7.573*** **
	(6.290)	(-1.491)	(7.833)
Control activity	**-0.734** **	-0.137	-0.038
	(-2.398)	(-0.860)	(-0.787)
Industry sales growth	-0.770	-0.393	**0.437*** **
	(-1.090)	(-0.924)	(2.662)
Market share	-0.709	**1.037***	-0.150
	(-0.770)	(1.870)	(-0.642)
Largest segment profit	**-0.230***	**0.168*** **	0.0577
	(-1.821)	(2.998)	(0.665)
Constant	**-5.224*** **	**-3.655*** **	**-3.917*** **
	(-19.99)	(-21.51)	(-50.80)
Restructuring events	75	125	714
Pseudo R^2	0.329	0.108	0.224

Notes: The sample covers the period 2002 - 2013. Z-stats are reported in parentheses. *'RINV'*, *'RVA'* and *'Excess Value'* are defined according to equations 2, 5, 7, and 6. '*Relative entropy*' is calculated following Palepu (1985). *'Market share'* is given by the ratio of company sales to the sum of the three-digit industry sales. Log sales is calculated as the natural logarithm of net sales. '*Cash flow'* is proxied by EBITDA (Earnings Before Interest, Tax, Depreciation and Amortization). *'Financing gap*' is calculated as the sum of cash flow and net debt issuance minus net capital expenditures. *'Profit shock'* is estimated as the forecast error to a panel auto-regression of operating income. *'IPO activity'* is calculated as the value of all IPOs announced in the respective two-digit industry and *'Control activity'* is calculated as the corporate control transactions announced in the respective two-digit industry. The latter variables are divided by the sum of the market value of the companies in each two-digit industry. *'Industry sales growth'* is calculated for each two-digit industry. *'Largest segment profit'* is given by the operating profit of the largest segment of the conglomerate. Unless stated otherwise, all variables are normalised by the value of net sales. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

Table 4. Measures of investment efficiency and firm value calculated over a **two-year period before and two-year period after** corporate restructuring (Abadie and Imbens (2006) matching procedure)

Panel A: Carve-outs

Average	**RINV**	**RVA**	**Excess Value**
Before	-0.368	-0.077	**0.158*****
Std. Err.	(0.461)	(0.064)	(0.045)
After	-0.001	-0.065	0.038
Std. Err.	(0.006)	(0.124)	(0.559)
Change	0.367	0.014	**-0.119*****
Std. Err.	(0.467)	(0.064)	(0.045)
Treatment Effects			
Before	-0.368	-0.079	**0.158*****
Std. Err.	(0.461)	(0.064)	(0.045)
After	**0.101*****	**0.069*****	**-0.251***
Std. Err.	(0.029)	(0.019)	(0.149)
After (bias adjusted)	**0.360*****	**0.259*****	-0.065
Std. Err.	(0.119)	(0.087)	(0.168)
Change	0.469	0.149	-0.409
Std. Err.	(0.174)	(0.013)	(1.525)
Diff. in diff.	0.229	**0.099*****	-0.177
Std. Err.	(0.166)	(0.033)	(0.172)
Diff. in diff. (bias adjusted)	**0.546****	**0.369*****	0.183
Std. Err.	(0.237)	(0.127)	(0.226)
Number of observations	75	75	75

Panel B: Spin-offs

Average	**RINV**	**RVA**	**Excess Value**
Before	**-0.210*****	-0.001	**0.100*****
Std. Err.	(0.085)	(0.002)	(0.035)
After	-0.131	-0.002	0.544
Std. Err.	(0.135)	(0.001)	(0.176)
Change	0.079	-0.001	**0.444****
Std. Err.	(0.104)	(0.002)	(0.356)
Treatment Effects			
Before	**-0.210*****	-0.001	**0.100*****
Std. Err.	(0.085)	(0.002)	(0.035)
After	-0.159	-0.002	0.220
Std. Err.	(0.162)	(0.002)	(0.275)
After (bias adjusted)	-0.128	-0.001	0.295
Std. Err.	(0.166)	(0.002)	(0.287)
Change	0.051	-0.001	0.119
Std. Err.	(0.111)	(0.001)	(0.027)
Diff. in diff.	-0.014	-0.001	-0.600
Std. Err.	(0.125)	0.004	(0.498)
Diff. in diff. (bias adjusted)	0.003	-0.001	-0.594
Std. Err.	(0.125)	0.004	(0.496)
Number of observations	125	125	125

Panel C: Sell-offs

	RINV	RVA	Excess Value
Before	**-0.549*** **	**-0.006*** **	**0.270*** **
Std. Err.	(0.096)	(0.002)	(0.044)
After	**-0.675*** **	**-0.014*** **	0.307
Std. Err.	(0.066)	(0.001)	(0.056)
Change	**-0.126*** **	**-0.007*** **	0.037
Std. Err.	(0.036)	(0.001)	(0.042)
Treatment Effects			
Before	**-0.549*** **	**-0.006*** **	**0.270*** **
Std. Err.	(0.096)	(0.002)	(0.044)
After	**-0.580*** **	**-0.011*** **	0.021
Std. Err.	(0.197)	0.004	(0.089)
After (bias adjusted)	**-0.561*** **	**-0.009*** **	-0.803
Std. Err.	(0.194)	0.004	(0.092)
Change	-0.031	-0.005	-0.249
Std. Err.	(0.044)	(0.001)	(0.074)
Diff. in diff.	**-0.137** **	**-0.005** **	0.119
Std. Err.	(0.068)	0.003	(0.11041)
Diff. in diff. (bias adjusted)	**-0.128** *	**-0.006** **	-0.015
Std. Err.	(0.067)	0.003	(0.114)
Number of observations	714	714	714

Notes: The sample covers the period 2002 - 2013. Panel A, Panel B, and Panel C present the results from the analysis of the effects of carve-outs, spin-offs and sell-offs respectively on firm value and investment efficiency. *'RINV'*, *'RVA'* and *'Excess Value'* are defined according to equations 2, 5, 7, and 6. The values presented in the first section of each Panel are sample averages calculated before and after each restructuring event as well as average changes in each of the four variables. The values corresponding to the label *'Before'* in the second section of each Panel are the same as their counterparts in the first section. The variables labelled *'After'* in the second section of each Panel are treatment effects calculated as the difference between the post-event value for the treated observation and the corresponding value for each control observation. The values for *'Befor'* and *'After'* are calculated as averages over a **two-year window before and two-year window after** the announcement of each restructuring event. The variables labelled *'Diff. in diff.'* are calculated as the difference between the change in each variable for the treated observations and the change in each variable for the corresponding control observations. The variables *'After (bias adjusted)'* and *'Diff. in diff. (bias adjusted)'* are adjusted for the bias introduced in the cases when the matching is not exact. The matched sample is obtained following the methodology outlined in Abadie and Imbens (2006). Standard errors are reported in parentheses. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

Table 5. Measures of investment efficiency and firm value calculated over a period of **three years before and three years after** corporate restructuring (Abadie and Imbens (2006) matching procedure)

Panel A: Carve-outs

Average	**RINV**	**RVA**	**Excess Value**
Before	0.037	-0.013	**0.136*****
Std. Err.	(0.039)	(0.013)	(0.043)
After	0.034	0.009	**0.119*****
Std. Err.	(0.037)	(0.009)	(0.039)
Change	-0.004	0.022	-0.016
Std. Err.	(0.004)	(0.022)	(0.019)
Treatment Effects			
Before	0.037	-0.013	**0.136*****
Std. Err.	(0.039)	(0.013)	(0.043)
After	0.277	0.012	-0.191
Std. Err.	(0.194)	(0.014)	(0.127)
After (bias adjusted)	0.237	0.012	-0.159
Std. Err.	(0.228)	(0.014)	(0.280)
Change	0.239	**0.026***	-0.328
Std. Err.	(0.149)	(0.019)	(0.059)
Diff. in diff.	**0.399***	0.043	-0.055
Std. Err.	(0.238)	(0.029)	(0.092)
Diff. in diff. (bias adjusted)	0.365	0.044	-0.024
Std. Err.	(0.356)	(0.031)	(0.097)
Number of observations	30	30	30

Panel B: Spin-offs

Average	**RINV**	**RVA**	**Excess Value**
Before	-0.173	**-0.007***	**0.315*****
Std. Err.	(0.134)	(0.005)	(0.098)
After	-0.092	-0.005	**0.203*****
Std. Err.	(0.156)	(0.004)	(0.062)
Change	0.081	0.002	-0.112
Std. Err.	(0.079)	(0.002)	(0.087)
Treatment Effects			
Before	-0.173	**-0.007***	**0.315*****
Std. Err.	(0.134)	(0.005)	(0.098)
After	0.092	-0.002	0.038
Std. Err.	(0.237)	(0.006)	0.061
After (bias adjusted)	0.103	-0.002	0.029
Std. Err.	(0.231)	(0.006)	(0.061)
Change	0.265	0.005	**-0.277*****
Std. Err.	(0.166)	(0.004)	(0.080)
Diff. in diff.	-0.012	-0.001	-0.132
Std. Err.	(0.119)	(0.006)	(0.103)
Diff. in diff. (bias adjusted)	0.037	-0.001	-0.128
Std. Err.	(0.119)	(0.006)	(0.103)
Number of observations	125	125	125

Panel C: Sell-offs

	RINV	RVA	Excess Value
Before	**-0.263*** **	**-0.009*** **	**0.188*** **
Std. Err.	(0.065)	(0.003)	(0.017)
After	**-0.398*** **	**-0.013*** **	**0.162*** **
Std. Err.	(0.077)	(0.002)	(0.015)
Change	**-0.134*** **	**-0.004*** **	**-0.025** **
Std. Err.	(0.043)	(0.002)	(0.014)
Treatment Effects			
Before	**-0.263*** **	**-0.009*** **	**0.188*** **
Std. Err.	(0.065)	(0.003)	(0.017)
After	-0.234	**-0.014*** **	-0.051
Std. Err.	(0.162)	(0.005)	(0.036)
After (bias adjusted)	-0.222	**-0.013*** **	**-0.065** *
Std. Err.	(0.160)	(0.005)	(0.036)
Change	0.029	**-0.006*** **	**-0.239** **
Std. Err.	(0.043)	(0.002)	(0.014)
Diff. in diff.	0.108	0.0004	-0.024
Std. Err.	(0.105)	(0.003)	(0.028)
Diff. in diff. (bias adjusted)	0.126	0.002	-0.030
Std. Err.	(0.105)	(0.003)	(0.028)
Number of observations	714	714	714

Notes: The sample covers the period 2002 - 2013. Panel A, Panel B, and Panel C present the results from the analysis of the effects of carve-outs, spin-offs and sell-offs respectively on firm value and investment efficiency. *'RINV'*, *'RVA'*, and *'Excess Value'* are defined according to equations 2, 5, 7, and 6. The values presented in the first section of each Panel are sample averages calculated before and after each restructuring event as well as average changes in each of the four variables. The values corresponding to the label *'Before'* in the second section of each Panel are the same as their counterparts in the first section. The variables labelled *'After'* in the second section of each Panel are treatment effects calculated as the difference between the post-event value for the treated observation and the corresponding value for each control observation. The values for *'Befor'* and *'After'* are calculated as averages over a **three-year window before and three-year window after** the announcement of each restructuring event. The variables labelled *'Diff. in diff.'* are calculated as the difference between the change in each variable for the treated observations and the change in each variable for the corresponding control observations. The variables *'After (bias adjusted)'* and *'Diff. in diff. (bias adjusted)'* are adjusted for the bias introduced in the cases when the matching is not exact. The matched sample is obtained following the methodology outlined in Abadie and Imbens (2006). Standard errors are reported in parentheses. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

Table 6. Measures of investment efficiency and firm value calculated over a period of **two years before and two years after** corporate restructuring (Dehejia and Wahba (2002) matching procedure)

Panel A: Carve-outs

Average	**RINV**	**RVA**	**Excess Value**
Before	-0.368	-0.079	**0.158*****
Std. Err.	(0.461)	(0.064)	(0.045)
After	-0.001	-0.065	0.038
Std. Err.	(0.006)	(0.124)	(0.559)
Change	0.367	0.014	**-0.119*****
Std. Err.	(0.467)	(0.064)	(0.045)
Treatment Effects			
Before	-0.368	-0.079	**0.158*****
Std. Err.	(0.461)	(0.064)	(0.045)
After	**0.069*****	**0.101*****	-0.251
Std. Err.	(0.012)	(0.026)	(0.312)
Change	0.438	**0.179*****	-0.409
Std. Err.	(0.174)	(0.013)	(1.525)
Diff. in diff.	**0.099*****	**0.229*****	-0.177
Std. Err.	(0.018)	(0.093)	(0.314)
Number of observations	75	75	75

Panel B: Spin-offs

Average	**RINV**	**RVA**	**Excess Value**
Before	**-0.210*****	-0.001	**0.100*****
Std. Err.	(0.085)	(0.002)	(0.035)
After	-0.131	-0.002	0.544
Std. Err.	(0.135)	(0.001)	(0.176)
Change	0.079	-0.001	**0.444****
Std. Err.	(0.104)	(0.002)	(0.356)
Treatment Effects			
Before	**-0.210*****	-0.001	**0.100*****
Std. Err.	(0.085)	(0.002)	(0.035)
After	-0.153	-0.001	0.017
Std. Err.	(0.157)	(0.002)	(0.032)
Change	0.057	-0.0002	-0.084
Std. Err.	(0.111)	(0.001)	(0.027)
Diff. in diff.	-0.037	-0.003	-0.054
Std. Err.	(0.121)	(0.003)	(0.059)
Number of observations	125	125	125

Panel C: Sell-offs

	RINV	RVA	Excess Value
Before	**-0.549*** **	**-0.006*** **	**0.270*** **
Std. Err.	(0.096)	(0.002)	(0.044)
After	**-0.675*** **	**-0.014*** **	0.307
Std. Err.	(0.066)	(0.001)	(0.056)
Change	**-0.126*** **	**-0.007*** **	0.037
Std. Err.	(0.036)	(0.001)	(0.042)
Treatment Effects			
Before	**-0.549*** **	**-0.006*** **	**0.270*** **
Std. Err.	(0.096)	(0.002)	(0.044)
After	-0.249	-0.005	-0.019
Std. Err.	(0.326)	0.006	(0.217)
Change	**0.301*** **	**0.001*** **	**-0.289** **
Std. Err.	(0.044)	(0.001)	(0.074)
Diff. in diff.	0.001	5.15E-07	0.217
Std. Err.	(0.201)	(0.004)	(0.233)
Number of observations	714	714	714

Notes: The sample covers the period 2002 - 2013. Panel A, Panel B, and Panel C present the results from the analysis of the effects of carve-outs, spin-offs and sell-offs respectively on firm value and investment efficiency. *'RINV'*, *'RVA'*, and *'Excess Value'* are defined according to equations 2, 5, 7, and 6. The values presented in the first section of each Panel are sample averages calculated before and after each restructuring event as well as average changes in each of the four variables. The values corresponding to the label *'Before'* in the second section of each Panel are the same as their counterparts in the first section. The variables labelled *'After'* in the second section of each Panel are treatment effects calculated as the difference between the post-event value for the treated observation and the corresponding value for each control observation. The values for *'Befor'* and *'After'* are calculated as averages over a **two-year window before and two-year window after** the announcement of each restructuring event. The variables labelled *'Diff. in diff.'* are calculated as the difference between the change in each variable for the treated observations and the change in each variable for the corresponding control observations. The matched sample is obtained following the methodology outlined in Dehejia and Wahba (2002). Standard errors are reported in parentheses. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

Table 7. Measures of investment efficiency and firm value calculated over a period of **three years before and three years after** corporate restructuring (Dehejia and Wahba (2002) matching procedure)

Panel A: Carve-outs

Average	**RINV**	**RVA**	**Excess Value**
Before	0.037	-0.013	**0.136*****
Std. Err.	(0.039)	(0.013)	(0.043)
After	0.034	0.009	**0.119*****
Std. Err.	(0.037)	(0.009)	(0.039)
Change	-0.004	0.022	-0.016
Std. Err.	(0.004)	(0.022)	(0.019)
Treatment Effects			
Before	0.037	-0.013	**0.136*****
Std. Err.	(0.039)	(0.013)	(0.043)
After	0.488	0.026	**-0.128****
Std. Err.	(0.475)	(0.021)	(0.026)
Change	0.450	0.039	**-0.264*****
Std. Err.	(0.435)	(0.034)	(0.048)
Diff. in diff.	0.664	0.044	-0.083
Std. Err.	(0.914)	(0.035)	(0.114)
Number of observations	30	30	30

Panel B: Spin-offs

Average	**RINV**	**RVA**	**Excess Value**
Before	-0.173	**-0.007***	**0.315*****
Std. Err.	(0.134)	(0.005)	(0.098)
After	-0.092	-0.005	**0.203*****
Std. Err.	(0.156)	(0.004)	(0.062)
Change	0.081	0.002	-0.112
Std. Err.	(0.079)	(0.002)	(0.087)
Treatment Effects			
Before	-0.173	**-0.007***	**0.315*****
Std. Err.	(0.134)	(0.005)	(0.098)
After	-0.055	-0.002	0.154
Std. Err.	(0.166)	(0.006)	(0.063)
Change	**0.118***	0.005	**-0.161****
Std. Err.	(0.087)	(0.006)	(0.089)
Diff. in diff.	0.073	0.002	-0.043
Std. Err.	(0.088)	(0.005)	(0.092)
Number of observations	125	125	125

Panel C: Sell-offs

	RINV	RVA	Excess Value
Before	**-0.263*** **	**-0.009*** **	**0.188*** **
Std. Err.	(0.065)	(0.003)	(0.017)
After	**-0.398*** **	**-0.013*** **	**0.162*** **
Std. Err.	(0.077)	(0.002)	(0.015)
Change	**-0.134*** **	**-0.004*** **	**-0.025** **
Std. Err.	(0.043)	(0.002)	(0.014)
Treatment Effects			
Before	**-0.263*** **	**-0.009*** **	**0.188*** **
Std. Err.	(0.065)	(0.003)	(0.017)
After	0.038	-0.001	-0.022
Std. Err.	(0.038)	(0.001)	(0.012)
Change	**0.301*** **	**0.008*** **	**-0.209*** **
Std. Err.	(0.076)	(0.003)	(0.019)
Diff. in diff.	0.048	-0.0003	0.013
Std. Err.	(0.082)	(0.003)	(0.031)
Number of observations	714	714	714

Notes: The sample covers the period 2002 - 2013. Panel A, Panel B, and Panel C present the results from the analysis of the effects of carve-outs, spin-offs and sell-offs respectively on firm value and investment efficiency. *'RINV'*, *'RVA'*, and *'Excess Value'* are defined according to equations 2, 5, 7, and 6. The values presented in the first section of each Panel are sample averages calculated before and after each restructuring event as well as average changes in each of the four variables. The values corresponding to the label *'Before'* in the second section of each Panel are the same as their counterparts in the first section. The variables labelled *'After'* in the second section of each Panel are treatment effects calculated as the difference between the post-event value for the treated observation and the corresponding value for each control observation. The values for *'Befor'* and *'After'* are calculated as averages over a **three-year window before and three-year window after** the announcement of each restructuring event. The variables labelled *'Diff. in diff.'* are calculated as the difference between the change in each variable for the treated observations and the change in each variable for the corresponding control observations. The matched sample is obtained following the methodology outlined in Dehejia and Wahba (2002). Standard errors are reported in parentheses. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

Table 8. Measures of investment efficiency and firm value calculated over a period of **two years before and two years after** corporate restructuring (Heckman bias-adjustment procedure)

Variable	RINV	RVA	Excess Value
Panel A: Carve-outs			
Heckman_Treated	**0.019****	0.019	**0.046****
	(0.0002)	(0.012)	(0.002)
Heckman_Controls	**0.018*****	0.018	**0.043*****
	(0.001)	(0.015)	(0.014)
InvMills	**-0.023*****	-0.023	**-0.052*****
	(0.002)	(0.019)	(0.018)
Observations	75	75	75
Panel B: Spin-offs			
Heckman_Treated	-0.680	-0.011	-0.714
	(0.112)	(0.003)	(0.469)
Heckman_Controls	**-0.822*****	**-0.009*****	-0.203
	(0.148)	(0.002)	(0.276)
InvMills	**0.279*****	**0.003*****	0.020
	(0.053)	(0.001)	(0.102)
Observations	125	125	125
Panel C: Sell-offs			
Heckman_Treated	-0.204	-0.011	**0.077****
	(0.051)	(0.001)	(0.063)
Heckman_Controls	**-0.232*****	**-0.009*****	-0.074
	(0.069)	(0.001)	(0.076)
InvMills	**0.079*****	**0.004*****	-0.024
	(0.026)	(0.001)	(0.032)
Observations	714	714	714

Notes: The sample covers the period 2002 - 2013. Panel A, Panel B, and Panel C present the results from the analysis of the effects of carve-outs, spin-offs and sell-offs respectively on firm value and investment efficiency. RINV, RVA, and Excess Value are defined according to equations 2, 5, 7, and 6. The change in each of the investment efficiency and value measures is calculated over a window starting **two years before and ending two-years after** each restructuring event. The variables labelled '*Heckman_Treated'* correspond to the sum of $(\alpha+\beta_1)$ in the Heckman regression which is of the form Δ Investment Efficiency$= \alpha + \beta_1 D_i + \beta_2 \text{InvMills} + \varepsilon_i$, where *'*$\Delta$ *Investment Efficiency'* is the change in the given measure of investment efficiency (RINV, RVA, and Excess Value), *'*D_i*'* is a dummy variable which is equal to one when the company performed the specific restructuring activity and 0 otherwise, *'InvMills'* is the coefficient on the variable used to adjust for self-selection bias in the Heckman regressions. '*Heckman_Controls'* is the coefficient corresponding to α in the Heckman regression. Standard errors are reported in parentheses. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

Table 9. Measures of investment efficiency and firm value calculated over a period of **three years before and three years after** corporate restructuring (Heckman bias-adjustment procedure)

Variable	RINV	RVA	Excess Value
Panel A: Carve-outs			
Heckman_Treated	-0.005	**0.036*** **	-0.077
	(0.154)	(0.004)	(0.086)
Heckman_Controls	**-0.045*** **	-0.001***	-0.078
	(0.012)	(0.0004)	(0.007)
InvMills	-0.007	-0.0001	0.006
	(0.028)	(0.001)	(0.016)
Observations	30	30	30
Panel B: Spin-offs			
Heckman_Treated	0.053	0.003	**-0.199** **
	(0.101)	(0.003)	(0.007)
Heckman_Controls	**-0.045*** **	**-0.001*** **	**-0.078*** **
	(0.012)	(0.0003)	(0.007)
InvMills	-0.001	-0.0001	-0.001
	(0.007)	(0.0002)	(0.004)
Observations	125	125	125
Panel C: Sell-offs			
Heckman_Treated	**-0.134** **	**-0.004*** **	**-0.025** **
	(0.038)	(0.001)	(0.021)
Heckman_Controls	**-0.045*** **	**-0.001*** **	**-0.078*** **
	(0.013)	(0.0004)	(0.007)
InvMills	0.0001	1.57e-06	0.0001
	(0.001)	(0.00002)	(0.0004)
Observations	714	714	714

Notes: The sample covers the period 2002 - 2013. Panel A, Panel B, and Panel C present the results from the analysis of the effects of carve-outs, spin-offs and sell-offs respectively on firm value and investment efficiency. RINV, RVA, and Excess Value are defined according to equations 2, 5, 7, and 6. The change in each of the investment efficiency and value measures is calculated over a window starting **three years before and ending three years after** each restructuring event. The variables labelled '*Heckman_Treated'* correspond to the sum of $(\alpha+\beta_1)$ in the Heckman regression which is of the form Δ Investment Efficiency$= \alpha + \beta_1 D_i + \beta_2 \text{InvMills} + \varepsilon_i$, where *'Δ Investment Efficiency'* is the change in the given measure of investment efficiency (RINV, RVA, and Excess Value), *'D_i'* is a dummy variable which is equal to one when the company performed the specific restructuring activity and 0 otherwise, *'InvMills'* is the coefficient on the variable used to adjust for self-selection bias in the Heckman regressions. '*Heckman_Controls'* is the coefficient corresponding to α in the Heckman regression. Standard errors are reported in parentheses. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

Table 10. Measures of corporate governance change calculated over a period of two years after corporate restructuring

Panel A: Offspring

Average	**Board Duality**	**Board Size**	**Board Composition**
Before	**0.358*****	**7.051*****	**3.559*****
Std. Err.	(0.077)	(0.610)	(0.439)
After	**0.410*****	**7.846*****	**3.763*****
Std. Err.	(0.079)	(0.559)	(0.443)
Change	0.051	**0.795****	**0.313****
Std. Err.	(0.051)	(0.365)	(0.154)
Number of Observations	39	39	39

Panel B: Parent Firm

Average	**Board Duality**	**Board Size**	**Board Composition**
Before	**0.405*****	**11.824*****	**5.955*****
Std. Err.	(0.077)	(1.002)	(0.479)
After	**0.378*****	**11.175*****	**6.643*****
Std. Err.	(0.078)	(0.941)	(0.520)
Change	-0.027	**-0.648****	**0.687****
Std. Err.	(0.064)	(0.277)	(0.430)
Number of Observations	37	37	37

Notes: The values presented in panel A are sample averages calculated in the year of announcement and two years after the restructuring event. The variables labelled '*Before*' and '*After*' in the second section are calculated as the value in the restructuring year and two year window after the announcement of the event. For missing values, we adopt the value in adjacent year as a proxy. The values presented in panel B are sample averages calculated before and after each restructuring event as well as average changes in each of the three variables. The variables labelled '*Before*' and '*After*' in the first section are calculated as averages over a two-year window before and two-year window after the announcement of each restructuring event. Standard errors are reported in parentheses. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.