

**Gordon Institute  
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**Economic uncertainty: implications for  
investment strategies of South African  
manufacturers**

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## Abstract

This paper examines the capital allocation decisions of a small sample of South African manufacturers in the context of macroeconomic uncertainty for the period 2006 - 2015. Employing a mixed methods approach, the research finds a moderate, negative relationship between a constructed proxy for uncertainty in the economy and non-maintenance-related investment spend. Moreover, there is evidence to suggest that investment has been less responsive to improvements in the uncertainty index in more recent years. This is traced to the declining profitability of manufacturing operations in the sample, and hence firms' abilities to invest in future capabilities and capacity. These findings probe an investigation of the business strategies employed by South African manufacturers, given the increasing price pressures resulting from the commodification of manufactured goods in the global economy. Rather than competing on price, this study points to the importance of investment strategies that aim not only to enhance production efficiencies, but also to reengineer the value proposition of traditional South African manufacturing away from a cost-focused approach. This is suggested as a potential means of improving profitability and thus developing greater opportunity for investment activity when more favourable economic contexts arise.

*Keywords: Uncertainty, investment, manufacturing, decision-making, capital allocation*



## Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Signature:

Name: Tamryn Hartogh

Date: 7 November 2016



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## 1. Introduction

*“... there’s a short term advantage, but after everything catches up to inflation and costs eventually increase, it generates uncertainty for investments, which keeps investment away... we want stability.*

*(Stakeholder interview with privately owned manufacturer, 2016)*

*“There is too much choice for global capital; [investors] have no obligation to invest here, and investors don’t put capital into unproductive assets”*

*(Stakeholder interview with listed manufacturer, 2016).*

There is no doubting the sense of frustration of South African business managers amidst the bombardment of macroeconomic events that have characterised the South African investment landscape in recent years. Uncertain of where the next shock to expected future returns will manifest, capital-intensive sectors such as manufacturing are particularly affected, given the predicament of where to allocate capital to achieve optimal yields. This has probed a scaling of the proverbial walls of the private firm, to examine the investment rationale of South African manufacturers, and to understand the nature of capital investment when expected returns are subject to highly unforecastable outcomes.

### 1.1. Background

It is traditionally held that markets are averse to uncertainty. When firms are nervous of investing, primarily due to risk perceptions, there is an incentive to delay potentially profitable ventures in expectation of more favourable investment conditions in the future (Gulen and Ion, 2013). That is, firms may rationally defer their capital allocations until the resolution of any speculated uncertainty (Julio and Yook, 2010). Because investment decisions are fundamentally forward-looking in nature (allocating resources in the current period in expectation of future returns), uncertainty impairs a firm’s ability to predict future profitability of an investment, where probabilistic situations involve inherent risk (Langlois and Cosgel, 1993). Intrinsically then, the unforecastable nature of macroeconomic factors such as growth in Gross Domestic Product (GDP), exchange rates, and interest rates are often discussed in terms of risk, and are identified as clouding expectations of future outcomes that serve to defer or discourage investment (TIPS, 2000). A rich literature exists to document the effects of uncertainty on investment, and its negative



consequences for economic growth (Bernanke, 1983; Gao, Harford and Li, 2013; Gilchrist, Sim & Zakrajsek, 2014; Gulen and Ion, 2015; Jurado, Ludvigson and Ng, 2015).

In contrast to this established literature however, a small body of empirical evidence suggests that periods of recession (and associated macroeconomic uncertainty)<sup>1</sup> may provide fertile ground for business start-ups and their concomitant allocations of capital. A Kauffman Foundation study examining U.S. firms and the impacts of economic downturns found that recessions do not have a significantly negative impact on the ability of the economy to generate new businesses. Rather, the study identified that more than half of the companies on the 2009 *Fortune 500* list were initiated during a recession or bear market (Stangler, 2009). Even historically, Cantillon's definition of the entrepreneur presents the idea of an individual who explicitly "exercises business engagements in the face of uncertainty", while the origin of entrepreneurial activity is recognised as arising out of a "lack of perfect foresight" (Wennekers and Thurik, 1999: 31). That is, corporate investment may be countercyclical among firms with heterogeneous traits and attitudes toward risk and uncertainty, as in the case of companies capable of perceiving opportunities in organic, competitive dimensions.

These contrasting views indicate that the effect of uncertainty on firm investment behaviour is not necessarily consistent across firms: as this paper explores below, macroeconomic uncertainty impacts investment activity of firms depending on myriad factors, such as fixed cost considerations, varying degrees of irreversibility of the investment decision, levels of risk aversion, or the extent to which financial frictions exist (Jurado, Ludvigson and Ng, 2015). In addition, investment actions are taken by individuals, or groups of individuals, on the basis of opinion in relation to imperfect information. As such, rather than the external macroeconomic factors themselves, firms' perceptions and abilities to infer future impacts of macroeconomic conditions on profitability determine their actions (Knight, 2012).

## 1.2. Research objectives

This research aims to augment traditional understandings of the link between macroeconomic uncertainty and investment decision-making by examining the conditions under which individual firms, with similar experiences of incomplete information, arrive at different investment outcomes. The research takes as its unit of analysis the capital investment behaviour of a small sample of South African

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<sup>1</sup> Bloom, Floetotto, Jaimovich, Saporta-Eksten and Terry (2012) show empirically how uncertainty shocks are strongly correlated with recessions



manufacturing firms with geographic footprints limited to South Africa. The manufacturing sector is of particular relevance in this study given the capital-intensive nature of operations, the “indivisibility of physical capital” and hence, their susceptibility to the problem of irreversibility in investment decision-making (Grazzi Jacoby and Treibich, 2013: 2). Selecting firms with geographic footprints limited to South Africa was done to filter out potential noise from international investment activities that may serve to mitigate exposure to economic uncertainty in South Africa. To the extent that heterogeneous investment decision-making exists within the sample, the research further seeks to understand whether countercyclical investment behaviour results in enhanced financial performance for firms in the long run. As such, this research hopes to add to the existing body of evidence in three ways.

First, while investigations of the link between corporate investment and uncertainty have generally been purely quantitative studies employing large datasets, this research employs a mixed methods approach that integrates qualitative firm-level insights via an administered online survey. Hence, this study exposes the behavioural finance elements associated with investment decisions in companies to a greater degree than has previously been explored.

Second, if uncertainty does lead to lower levels of capital investment, there is a seeming dearth of research into how risk averse investment behaviour may impact on the long run financial performance of the firm. Dixit and Pindyck (1994) make the point that firms with options to invest are considered more valuable by the market, because these represent opportunities to grow and generate cash flows in the future. As such, opportunities to sink capital can be argued to be more valuable than the capital a firm has already sunk. By considering a ten-year timeframe, an analysis of investment decision outcomes on financial performance is conducted in this study. The findings in this regard are instructive for investment decision-making at the firm-level, and are therefore deemed to have practical relevance for businesses.

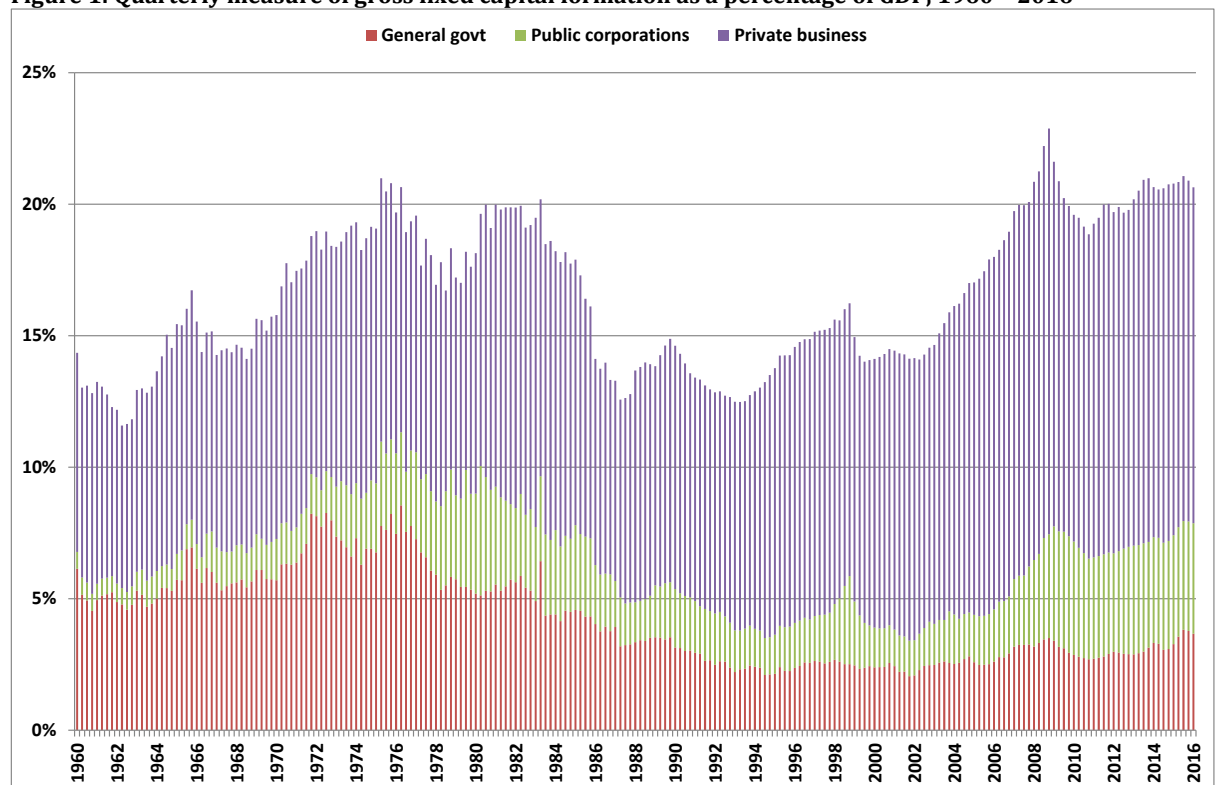
Third, studies of this nature are generally conducted in developed economy contexts, while developing economy examples are less prolific - possibly due to a lack of reliable quantitative data required for the typical method of investigation identified above (Redl, 2015). The (small) sample of South African manufacturing firms engaged for the purposes of this research thus presents a unique perspective on corporate investment behaviour in a developing economy, where factors of macroeconomic uncertainty are arguably a larger consideration.



### 1.3. Relevance to South African business

The application of this research is deemed to be particularly relevant in a South African context, because risk manifests itself as a consistent reality in the country and domestic investment has invariably come under pressure, judging from declining gross fixed capital formation (GFCF) in absolute terms in recent years. Expressed as a percentage of GDP, GFCF provides an important measure of how much value generated by an economy is invested rather than consumed, and thus illuminates the appetite for investment in a particular country or region. Figure 1 presents the profile of GFCF for South Africa since 1960, and while the trend suggests an overall improvement in investment levels over time, two important caveats are worth noting. First, as a measure of a percentage of GDP, the graph is misleading insofar as an increasing trend is not necessarily the case when one examines absolute Rand values, given declining GDP growth over time. Second, private sector-derived investment is a noticeably smaller component of the total level: private sector investment contributed as much as 75% of total GFCF in the early 2000s; it is now at a level of approximately 62% of total GFCF.

**Figure 1: Quarterly measure of gross fixed capital formation as a percentage of GDP, 1960 – 2016**



Source: South African Reserve Bank, Quarterly Bulletin Statistical Tables, June 2016. Retrieved from: [www.resbank.co.za](http://www.resbank.co.za)

The above graph suggests a looming constraint to the productive capacity of the country, while structural growth constraints are simultaneously hindering the country's ability to



advance GDP in the short and medium term.<sup>2</sup> Companies with a domestic footprint relying purely on local consumption to drive company performance will therefore be under very real survival pressures going forward (South African Reserve Bank, 2016). In South Africa's context of substantial and persistent macroeconomic uncertainty, theoretically rational decision-making – which would defer investments on the basis of an incentive to wait for more information – would imply a near and indefinite shutdown of corporate capital allocations. South Africa's macroeconomic environment therefore provides an interesting contextual opportunity to investigate investment behaviour at the firm level, given persistent levels of macroeconomic uncertainty.

#### **1.4. Structure of the report**

The remainder of this paper is structured as follows. Chapter 2 examines the literature on firm-level determinants of investment, managerial decision-making dynamics, and the extent to which these are affected by macroeconomic uncertainty. Chapter 3 develops hypotheses regarding the research focus of this report, based on the literature review. Chapter 4 describes the sample and variable construction, as well as the research methodology employed to interrogate the topic at hand. Chapter 5 details analysis of the results generated from quantitative reviews of firm-level financial data for the sample in relation to a composite indicator of macroeconomic uncertainty, and explores these results through the deployment of a qualitative survey with the same sample set. Chapter 6 provides a discussion of the key findings of the research, their implications both practically for capital investment decision-makers, and theoretically in respect of contributions to the existing body of evidence. Chapter 7 concludes with an assessment of the implications for business and an identification of areas for further research.

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<sup>2</sup> In July 2016, the Reserve Bank Governor revised the GDP growth forecast to zero per cent for the year, compared with 0.6 per cent previously. Growth rates of 1.1 per cent and 1.5 per cent are forecast for the next two years (Kganyago, 2016).



## 2. Literature review

### 2.1. Defining macroeconomic uncertainty

This research project takes as its objective the exploration of manufacturers' investment decisions and their implications for long run financial performance in the context of macroeconomic uncertainty. Jurado, Ludvigson and Ng suggest the definition of uncertainty as "the conditional volatility of a disturbance that is unforecastable from the perspective of economic agents", and note how such phenomena can depress the investment activities of firms that have fixed cost considerations, partial irreversibilities, are risk averse, or experience financial frictions (2015: 1177). In addition, the authors define macroeconomic uncertainty as a broader consideration than the identification of ambiguity in any single variable, requiring some commonality of variation across a large number of series.

Haddow, Hare, Hooley and Shakir, (2013) discuss a probability density function to describe uncertainty, where the most likely value of a variable is described by the mean (the 'first moment' of the distribution), and the uncertainty regarding this outcome is described by the width of the distribution (or 'second moment'). As such, the non-negligible chance that a certain variable can be the values approximated in the tails of the distribution suggests the range of perceived uncertainty, where greater uncertainty about outcomes results in a wider probability distribution function. Asymmetric shocks or heightened uncertainty that generates a higher perceived probability of bad or extreme outcomes are furthermore likely to affect the skewness of the probability function ('third moment' effects). Uncertainty shocks to real outcomes therefore manifest in multiple dimensions: shocks to the distribution generally coincide with shocks to the mean (mode) or confidence level (probability density) of a variable's distribution (Haddow et al., 2013).

### 2.2. The nature of capital allocation decisions in the context of macroeconomic uncertainty

Uncertainty in macroeconomic factors impacts on corporate investment decision-making differently because firms are heterogeneous in their experiences of varying degrees of irreversibility, risk aversion and financial frictions. Investigating the firm-level factors that increase the probability of an investment spike for the firm, Grazzi, et. al (2013) generate empirical results that indicate that firms' investment decisions are sensitive to changes in their ability to self-finance (proxied by a ratio of return to sales) implying the existence of financing frictions in respect of accessing external capital. Thus, firms are more likely to invest when their financial conditions are healthy. Additional factors impacting on firms' likelihood of investing capital include adjustment costs that are typically asymmetric: it is

generally more expensive for firms to reduce their capital stock than it is for them to increase it. Thus, because investment decisions can be irreversible, or at least costly to reverse, the value of delaying investment decisions is said to increase (Gilchrist, Sim & Zakrajsek, 2014). Empirical evidence supports this notion: The degree of irreversibility of the investment decision has been shown to be correlated with the strength of the slowdown in capital allocations of firms. In addition, firms with a higher fixed-to-total asset ratio would experience higher adjustment costs than firms that are more labour-intensive in nature, awarding them less discretion to scale down capital to new optimums (Gulen and Ion, 2015).

Moreover, the source of uncertainty has a bearing on the real economic activity of firms (including investment) and the persistence of outcomes, insofar as firm-level heterogeneity exists (Haddow et. al., 2013). Doms and Dunne (1998) show that capital adjustments vary by firm or plant level characteristics such as industry, size, age and ownership. Specifically, smaller firms, companies that undergo ownership changes, and businesses that develop into other industries, experience “lumpier” investments. The authors suggest that larger investment spikes in the case of smaller plants are a function of the indivisible nature of capital equipment: a new machine purchase of a small firm represents a proportionally higher share of its capital stock than that of a larger firm. Similarly, capital equipment requirements for processing may differ by industry: some industries may find it easier to adjust capital more smoothly. Finally, older plants are found to have smaller than average capital growth rate spikes.

### **2.3. Measuring uncertainty**

Jurado et. al. (2015) note, however, that macroeconomic uncertainty is an unobservable phenomenon that cannot be measured objectively, and that proxies typically employed to indicate uncertainty are inadequate. Redl (2015) reviews the literature on measuring uncertainty and identifies two methods that have typically been employed to construct a proxy index. The first focuses on macro-econometric estimation models using large datasets, and the second measures the dispersion of professional analysts’ forecasts.

With regard to the former category, macro-econometric approaches include Bloom’s (2009) use of large shifts in U.S. stock market volatility, and Mumtaz and Zanetti’s (2013) Structural Vector Auto Regression (SVAR) model allowing for time variation in the volatility of monetary policy shocks (cited in Redl, 2015). Bloom et al. (2015) use the variance of total factor productivity shocks to measure uncertainty. Further econometric techniques are explored by Haddow, et. al. (2013), who identify option-implied volatility



of equity prices as a widely applied measure of uncertainty for the economy as a whole, as well as option-implied models of volatility of the exchange rate. These are considered relatively sound proxies, given that the more uncertainty exists about future stock market performance, the higher the price that investors are willing to pay for options contracts that protect them against changes in its level. However, financial market measures can be influenced by external conditions and so may not accurately reflect the degree of uncertainty. Measures of implied volatility are also sensitive to the assumptions of the models used to generate them.

Jurado et al (2015) find shortcomings with some of these methods, maintaining that economic decision-making is affected, not by the variability or dispersion of particular economic indicators, but by “whether the economy has become more or less predictable; that is, more or less uncertain” (2015: 1178). Stock market volatility or cross-sectional dispersion measures of uncertainty generally fail to take this into account, and so are erroneous insofar as they categorise forecastable variations as “uncertain” (2015: 1179). They therefore construct a Dynamic Stochastic General Equilibrium (DSGE) model which they propose as a “superior” econometric estimate of uncertainty, with which they identify less frequent episodes of uncertainty relative to other measures, albeit correlated with larger and more persistent periods of real activity. This method requires a data-rich environment however, as it measures macroeconomic uncertainty as the conditional variance of the unforecastable component common to a large number of firm-level and macroeconomic variables (Redl, 2015).

The second method identified by Redl (2015) attempts to measure perceived uncertainty on the basis of the dispersion of forecast distributions of professional analysts. Examples of scholars that have constructed uncertainty indices in this manner include Baker, Bloom and Davis (2012). This method calculates a composite measure based on frequency counts of newspaper reports referring to uncertainty in macroeconomic or policy conditions, and the extent of disagreement over future government purchases and inflation as forecasted by economic analysts, as well as other proxies of uncertainty (Redl, 2015). Similar approaches have focused on frequency counts of uncertainty themes in monetary policy committee minutes and government policy publications (Redl cites Dendy, Mumtaz and Silver, 2013). Redl applies a method akin to that employed by Dendy et al. in the construction of an uncertainty index specific to South Africa (2015).

## 2.4. The link between investment and uncertainty

The link between investment and uncertainty is not a new area of interest, although greater attention to understanding this relationship has developed following the recession sparked by the Global Financial Crisis (Redl, 2015). Firms invest with the key objective of making an optimal return on their capital, where expected future profitability is determined by the costs, risks and barriers to competition experienced or perceived (World Bank, 2005). Lautier and Moreaub (2012) suggest that investment decisions are an outcome of an assessment of macroeconomic factors, driven predominantly by a calculation of demand volume (market size) versus investment risk (inclusive of political and macroeconomic uncertainty). The level of demand affects output growth and capacity utilisation, thereby raising productivity and efficiency which contributes to profitability (TIPS, 2000). From an investment risk perspective, macroeconomic and political factors such as country socioeconomic stability, government policy certainty, and costs associated with doing business, determine future expectations of profitability.

As such, the forward looking nature of investment is characterised by uncertainty regarding future profitability, and is subject to the timing decisions of investment decision-makers. The interaction of irreversibility, uncertainty and timing decisions has important implications for determining the optimality of investments, and investment behaviour has been found to be far more sensitive to macroeconomic uncertainty than to interest rate and tax policy changes (Dixit and Pindyck, 1994). Investment – the act of incurring an immediate cost for the prospect of future benefits – involves sinking capital into a project that is at least partially irreversible, or has adjustment costs. Understanding the nature of investment in the context of macroeconomic uncertainty therefore has potential significance for both investment decision-makers at the firm-level, as well as policy implications for governments aiming to support or encourage investment in an economy.

In addition, uncertainty regarding capital allocation decisions has been identified as having a role to play in deepening recessionary outcomes when firms are particularly subject to conditions of investment irreversibility and the costs of disinvesting are excessively onerous ((Friedman and Schwartz [1963], Romer [1990] and Higgs [1997], cited in Julio and Yook, 2010)). In the same vein, Bernanke (1983) examined irreversible investment decisions under uncertainty to understand how micro-level reductions in demand can propagate cyclical investment fluctuations. He found that economic agents faced trade-offs between the higher returns from “early commitment” and the benefits of more information gained from delaying the investment, and provided insights into why



recessions have disproportionate effects on durable goods producers. His work is built on an existing body of research that developed the concept of an “*option value* associated with avoiding irreversible actions” under uncertainty (1983: 88). Firms may exercise their option to wait because it awards the decision-maker the ability to choose preferred alternatives on the basis of new information. Investment projects, then, are understood as being sensitive to the arrival of new information.

Pindyck (1991) similarly discussed investment irreversibility in terms of choice of timing, showing that where investors face irreversible investment decisions and these can be postponed, there is an opportunity cost associated with investing now as a result of the increase in the cost of the marginal unit of capital relative to the marginal return, thereby reducing investment. Hence, Pindyck (1993: 1) identifies investment to be the “net effect of... this opportunity cost relative to the increase in the value of the marginal unit of capital” and claimed that the inverse relationship between uncertainty and investment would hold as a result of irreversibility of the investment decision due to a number of considerations.

First, convex adjustment costs imply that the marginal profit of a unit of capital will not exceed its marginal cost indefinitely. Second, intertemporal links between investment decisions imply that investment today will affect investment decisions in the future: Under contracting demand conditions, the stock of capital will impact the firm’s decision to invest in the future. Third, the lumpiness of investment and “time to build” is a constraint to investment, the former due to the indivisibility of physical capital. Finally, even where an increase in demand may provide opportunities for firms who invest to create or expand capacity to raise prices and extract their required returns, a new market equilibrium will eventually be reached that limits opportunities to raise prices in the market. However, similar mechanisms for limiting price falls do not exist under bad demand conditions. Uncertainty therefore affects investment through the feedback of industry-wide capacity expansion and firm entry on the distribution of prices (Pindyck, 1993).

In addition to these factors discussed by Pindyck, other factors such as adjustment costs and financing considerations have firm-level implications for the expansion of capital: large investments generally require external financing, which can constrain firms’ abilities to capitalise on future growth opportunities (Grazzi, et. al, 2013). A key driver of expected returns is the cost at which capital is accessed, where firms typically finance investment via a combination of internal and external funds, with the latter composed of debt and

equity sources. Financial market frictions are thus identified as a channel through which uncertainty affects investment, given that both moral hazard and agency problems, respectively, can increase the user cost of capital. In this regard, an unanticipated increase in uncertainty is found to result in a widening of credit spreads and a drop in real GDP, followed by a protracted decline in aggregate investment spending. Similarly, where higher borrowing costs are greater than the potential gain to equity holders, an increase in uncertainty regarding the expected payoffs of the investment will lead to a dampening of aggregate investment (Gilchrist, Sim & Zakrajšek, 2014).

Gao, Harford and Li (2013) observe financing frictions from the perspective of information asymmetry and find that this has a positive relationship with firms' levels of cash holdings (understood in this context to be the antithesis of investment). They note that agency conflicts can affect cash-holding strategies, finding that in countries where investor protection is lower, firms respond by holding more cash. Greater cash holding may also be undertaken to protect the company against adverse cash flow shocks that may jeopardise future investment opportunities due to costly external financing options. Interestingly, they also find evidence to suggest that the impacts of agency effects relative to financing frictions are higher, where public firms continue to hold a larger ratio of cash to assets than private firms do, despite the latter's lower access to external financing options. This is supported by the findings of Gulen and Ion (2015), who find greater cash holdings and lower debt issuance associated with firms experiencing higher levels of policy uncertainty. As such, when firms are nervous of investing – Gao et al. (2013) suggest primarily due to financing frictions and agency conflicts – firms hold cash for precautionary reasons.

Thus, a broad body of literature exists to suggest that changes in the levels of uncertainty lead optimising agents to trade extra returns associated with capital allocations for additional information gained by delaying their implementation. This is because the degree of irreversibility of the investment decision, in the context of uncertainty over future expected returns or discount rates, affects the future price of the underlying asset (Julio and Yook, 2010). An additional adverse shock materialises in respect of the liquidation value of capital, which diminishes the debt capacity of firms by reducing the value of their debt-raising collateral. As such, an increase in uncertainty and/or a decline in the resale value of capital can serve to mitigate the perceived benefits of capital allocation, as corporate bond yields rise more sharply where firms scale up expenditures, leading to a decline in investment (Gilchrist, et al., 2014). McDonald and Seigel (1985) further demonstrated that even moderate uncertainty surrounding future cash flows can

more than double the required rate of return for an investment opportunity (cited in Julio and Yook, 2010), supporting the notion that uncertainty reduces the likelihood of investment at the level of the firm.

## **2.5. The nature of the firm-level investment decision**

Generally, the firm-level option to invest is productively enabled as a result of managerial resources, technological knowledge, brand and market position, as well as scale (Dixit and Pindyck, 1994). Furthermore, investment decision-makers are likely to have unique information sets, experience and personal objectives that inform their investment decisions (Graham, Harvey and Puri, 2015). The previous subsection has suggested that exogenous factors governing uncertainty are perceived objectively by investment decision-makers inside the firm, with equal implications for a homogenous set of economic actors. This is unlikely to be the case, however, given that imperfect knowledge of the future forces firms to undertake judgements which, by their very nature, require subjective assessments of possible scenarios and estimations of their likely future values (Langlois and Cosgel, 1993). Under such conditions, agents can only ever hope to have access to partial knowledge (Knight, 2012). Given the inevitability of incomplete- and potentially inaccurate- information, agents are forced to make judgement calls to convert their lack of reasoned knowledge into a means of action (Langlois and Cosgel, 1993). As such, capital allocation decisions are dependent on expectations, and business decision-makers have subjective expectations of future conditions (Woodford, 2013).

Wenneker and Thurik (1999) discuss the case of imperfect information as a result of business environment uncertainty and the implications for future returns, and consider how economic agents react. In one scenario, imperfect information can lead firms to fail to realise an efficient use of internal resources, thereby reducing their productive potential. This is as a result of incomplete contracts, principal-agent problems, the lack of effort and alertness to change old routines, and a lack of consensus among individuals regarding business objectives (Wenneker and Thurik cite Liebenstein, 1968 and 1979). Managers cutting back on investment spending during such scenarios (for example, recessionary periods) may neglect to notice their transition to a lower level of capital intensity, and generally operate with a lack of foresight: they do not advance future projects to benefit from a more favourable cost of capital. Rather, managers tend to avoid commitments until they are more confident of the longer run status of the macro economy and their own financial position (Bernanke, 1983). As such, decision authorities are affected by information (and possibly agency) issues (Graham et al, 2015).

Alternatively, corporate entrepreneurship within firms can result in the identification of prospects for profitability and hence investment, in the presence of information asymmetries. Wenneker and Thurik identify information problems in the firm as unique and uninsurable (effectively, parallel to uncertainty) and suggest the need for “entrepreneurial coordination” in this event (1999: 31). This is based on their identification of entrepreneurship as originating in a “lack of perfect foresight”, suggesting that entrepreneurial individuals are required to develop firm-level resolutions in the presence of uncertainty (1999:31). In short, these authors suggest that information asymmetries may present opportunities for the appropriation of gains where these are pursued by “individuals... who may have perceptions of personal opportunity more or less at variance with opportunity for the firm” (Wenneker and Thurik cite Stevenson and Jarillo, 1990: 25).

Business decision-makers also operate within differing environments and contexts. Cai and Shefrin (2013) find that stronger internal and external governance measures put pressure on Chief Executive Officers (CEOs) and managers who make bad decisions, exacerbating their tendency to undertake risky capital allocations. They also find that boards tend to make decisions that are more extreme than the initial inclination of their individual members, suggesting that “risk appetite is not time invariant, but instead varies by circumstance” (Cai & Shefrin, 2013: 2). This reference to “groupthink” is defined by Shefrin and Cervellati (2011) as a form of collective confirmation bias, and reflects inadequate analysis of reasonable alternatives, potentially because of an entrenched group leader that discourages attention to detail in decision-making. Gao et al. (2013) find that public firms with weak governance structures (and resultant greater agency) tend to make large investments with excess cash quickly in the interests of perceived maximisation of shareholder wealth. Firms that exhibit tighter governance structures, by contrast, funnel excess cash to shareholders or to shrinking debt. Thus, better-governed firms hold more cash on average, and by extension, are more conservative in their investment decisions.

Similarly at an industry level, where all firms in a competitive environment are faced with similar market imperfections and incomplete information, unique business entities will leverage their comparative advantage through access to location-specific opportunities and incentives in relation to their own ideas, capabilities and strategies. For example, expected costs or reduced profitability associated with delaying investment will differ for firms, depending on the degree of competitiveness in their respective industries (Dixit and Pindyck, 1994). Similarly, in competitive industries where first-mover advantages



are large and investment opportunities are short-lived, delaying investment has significant repercussions for profitability that outweigh the benefits of waiting for better quality information.

## **2.6. Identifying capital investment episodes and measuring the impact on financial performance**

A key intention of this research is to identify whether investment rationales, in the context of uncertainty, result in differentiated financial performance among manufacturers. To do so, an understanding of how non-maintenance related investment has been identified is required, as is a consideration of apposite performance metrics. As highlighted by Doms and Dunne (1998), however, modelling new capital investment at the level of the firm, as well as at industry level, has proved challenging. While traditional neoclassical investment models assumed convex adjustment costs and reversibility, firms were expected to undergo smooth adjustments to their capital stock in continuous response to changing business environment conditions. Cooper and Haltiwanger suggest that convex cost adjustment models are “not sufficiently sensitive to shocks... [and therefore] create the slightly positive serial correlation of investment” (2005: 3).

More recently, however, acknowledgement of the irreversible nature of investment (as discussed above), as well as the identification of nonconvex adjustment costs has resulted in the realisation that firms will adjust their capital in sporadic bursts as and when their capital stock falls below a trigger level. Non-convex adjustment costs are due to fixed costs associated with installing new capital, such as those required for plant restructuring, worker retraining and organisational restructuring during periods of expansive investment, or investment in technological upgrades. The non-convex model captures increasing returns to installation of new capital and as a model of investment, produces relationships between macroeconomic fundamentals and investment that are empirically robust (Cooper and Haltiwanger, 2005). The trigger level is identified at the point where the difference between the desired and actual capital stock of the firm is significantly large (Doms and Dunne, 1998).

Grazzi, et al. (2013) investigate the relationship between manufacturing firms' investment activities (in tangible assets) and corporate performance, measured as productivity growth, sales growth, and employment growth, considering firm heterogeneity. They start by identifying the cyclical nature of equipment investment in relation to macroeconomic growth (maintenance and repair investment), and articulate differences in the type of investment undertaken by firms: investment, as opposed to maintenance related capital allocations, is generally “lumpy”, where heavy investment

periods are generally sporadic, and interrupt typically consistent patterns of maintenance-related capital expenditure. “Lumpy” investment is typically associated with technology upgrading or production expansion.

In their identification of investment spikes, Grazzi et al. (2013) suggest these as being a theoretical, rather than practically measurable, concept. However, they also cite several studies that postulate specific indicators of investment spikes. They draw on Nilsen et al. (2009) who state that the investment must be large relative to both the firm’s own investment history, as well as a cross-sectional average of firms in a similar industry, and should be an extraordinary event. In addition, as emphasised by Pindyck (1993) previously, Nilsen et al. (2009) are also cited as recognising the need to classify the relationship between investment and the existing capital stock. He incorporates this into a linear model which relates the threshold values for identifying investment spikes to the size of the firm, based on empirical evidence that shows a negative relationship between the capital stock (size of the firm) and the investment rate.

While their study is focused on the performance of manufacturing firms based on investment activities at the firm level, Grazzi et al. (2013) also link investment performance to the business cycle, and find that the frequency of investment spikes (defined as abnormal investment events) correlate positively with the rate of GDP growth. They suggest that firms “synchronise their investment decisions in reaction to aggregate shocks: they invest more frequently during periods of expansion than during periods of contraction” (2013: 6). However, the authors find contrasting results across countries in respect of whether investment results in future profitability.

## **2.7. Literature review conclusions**

Summing the total of this international body of literature back to the South African manufacturer’s investment dilemma provides a clear view of the adverse conditions facing domestic investment decision-makers. South Africa’s current macroeconomic context has been characterised by the Reserve Bank as “uncertain”, exacerbated by low company earnings and unattractive growth forecasts over the short and medium term (South African Reserve Bank, 2016: 74). As such, the unforecastable component of future earnings is increasing, and impacts on the required rate of return for investment projects undertaken domestically.

Much of the empirical work conducted on the topic of investment in the context of uncertainty is set against the backdrop of the manufacturing industry, given its inherently

high fixed-to-total-asset ratio, as well as the indivisible nature of capital equipment and the associated irreversibility of the investment decision. Firms looking to meet their profit objectives in the face of unforecastable growth and demand outcomes could therefore be considered “rational” in their decisions to adopt risk averse behaviour and accept the opportunity cost of early returns in exchange for the additional information that deferring investment may afford. In addition, the relatively high and increasing cost of capital in South Africa renders the viability of sinking capital into productive investments less feasible.

Within this context of imperfect information, however, a small body of theory explores the role of unique information sets ascribed to individuals as decision-makers within companies, and the consequences for managers who fail to take advantage of investment opportunities in uncertain or recessionary conditions (Bernanke, 1983). Borrowing from the disciplines of behavioural finance and organisational economics, this additional facet of investment decision-making probes consideration of what Graham et. al call the “black box of the firm”, to identify not only firm-level heterogeneity factors that may impact on decision-making, but also the impact of organisational design on investment outcomes (Graham et. al, 2014). Furthermore, while the literature suggests that investment is typically deferred, reduced or withheld in the context of macroeconomic uncertainty, little empirical evidence exists to indicate whether this is an optimal investment strategy in respect of long run financial performance outcomes.

This importance of this area of research cannot be over-emphasised: manufacturing is an endangered sector in South Africa, operating in unfavourable circumstances that are characteristically volatile and uncertain. Understanding the motivating factors for investment (or lack thereof) is key, not only in respect of the manufacturing sector itself, but more broadly, in the context of South Africa’s investment climate. The following chapter develops hypotheses to address these considerations and frame the mode of investigation that will be undertaken for the empirical investigation associated with this study.

### **3. Defining the research**

#### **3.1. Problem statement and research objectives**

The literature suggests that a firm's "risk appetite is not time invariant, but instead varies by circumstance" (Cai & Shefrin, 2013: 2). In addition, it is proposed that heterogeneous firms align themselves with differing investment rationales. This research aimed to investigate the nature of the investment decision of manufacturing firms when their future returns are determined by an unforecastable macroeconomic component. Specifically, the investment trends of publically-listed and non-listed South African manufacturers with domestic investment footprints were observed to identify the nature and drivers of investment in uncertainty. Do firms reduce investment in response to greater uncertainty? If so, what are the firm-level and manager-specific characteristics associated with these outcomes? These questions sought to augment traditional understandings of the link between macroeconomic uncertainty and investment decision-making with incomplete information.

The research further sought to understand whether countercyclical investment behaviour results in enhanced financial performance for manufacturers in the long run. As highlighted previously, firms with options to invest are often considered more valuable, because these options represent opportunities to generate and grow cash flows in the future (Dixit and Pindyck, 1994). As such, opportunities to sink capital can be argued to be more valuable than the capital a firm has already sunk. The research therefore aimed to identify investment strategies and firm-level drivers in the context of uncertainty, and the implications for long run financial performance.

#### **3.2. Research questions**

In line with these objectives, the following hypotheses were posed.

First, the research aimed to interrogate whether heightened economic uncertainty results in a reduction and/or deference of capital investment across manufacturing entities. The literature review has suggested that a full investigation of investment behaviour in the face of macroeconomic uncertainty has not been completed in depth, although capital allocations do appear to be circumstantial: it is understood that firms typically invest cyclically. By examining the investments of firms within a specific macroeconomic context, this study looks to understand the risk appetite of South African manufacturing firms.



*Null Hypothesis (1):*  $H_0 = 0$ , Heightened macroeconomic uncertainty results in lower levels of capital investment in a sample of South African manufacturing firms.

*Alternative Hypothesis (1):*  $H_1 \neq 0$ , Heightened macroeconomic risk DOES NOT result in lower levels of capital investment in the sample of South African manufacturing firms.

Second, the research aimed to understand how firm-level heterogeneity impacts on investment decision-making in uncertain macroeconomic environments. The literature has suggested the importance of industry, fixed-to-total asset ratios (or capital intensity), risk appetite, and governance structures (listed versus privately held firms), as independent variables impacting on firm-level investment strategies that may serve to skew investment decisions. Regarding the latter, the research aimed to investigate the role of principal-agent problems in causing deviations from risk-averse investment decisions, in the context of macroeconomic uncertainty.

*Null Hypothesis (2):*  $H_0 = 0$ , Firm-level heterogeneity in respect of industry, capital intensity (fixed-to-total asset ratios), growth phase, and governance structure, impact on firms' investment decisions in periods of uncertainty.

*Alternative Hypothesis (2):*  $H_1 \neq 0$ , Firm-level heterogeneity in respect of industry, capital intensity (fixed-to-total asset ratios), and governance structure DO NOT impact on firms' investment decisions in periods of uncertainty.

Third, the research considered whether conservative investment decisions in periods of uncertainty result in better long-run financial performance, relative to countercyclical investment decisions. The literature review provides limited insight into the implications of deferred investment in uncertain macroeconomic contexts in respect of long-run financial performance. By assessing key financial ratios, such as revenue growth, profitability, and productivity (measured as a ratio of inflation-adjusted revenue per employee), this research assesses the implications of conservative investment strategies, relative to more aggressive options.

*Null Hypothesis (3):*  $H_0 = 0$ , Deferring investment in periods of high macroeconomic risk results in BETTER financial performance in the long run, relative to less conservative investment strategies.



*Alternative Hypothesis (3):*  $H1 \neq 0$ , Deferring investment in periods of high macroeconomic risk results in WORSE financial performance in the long run, relative to less conservative investment strategies.

The objective of this paper is therefore to understand the investment decision of the manufacturing firm in the context of uncertainty, in a holistic manner. Chapter 4 below outlines the research methods employed to investigate the above sets of hypotheses, citing relevant authors where similar methods are employed.

#### 4. Research design

This research design acknowledges certain data limitations in the South African context. Specifically, South Africa does not offer a data-rich environment, and the use of large datasets for the purposes of a robust quantitative study are limited by the lack of firm-level data for domestic manufacturers. Given this lack of both depth and breadth of data, an analysis of corporate investment decisions in South Africa required a different approach. While studies of this nature have generally employed a purely quantitative investigation, this research is moreover concerned with the qualitative firm-level insights into the dynamics of capital investment decisions. Hence, this study exposes the organisational dynamics that govern investment decisions in companies to a greater degree than has previously been explored through a mixed methods approach. This is in line with Cooke's (1985) premise of "critical multiplism", which refers to the usefulness of combining different research methods (i.e. quantitative and qualitative) with different biases to examine research questions (cited in Johnson, Onwuegbuzie and Turner, 2007).

Johnson et al. understand mixed method research as "an approach to knowledge (theory and practice) that attempts to consider multiple viewpoints, perspectives, positions, and standpoints" (2007: 113). Mertens and Hesse-Biber highlight that as a research method, it provides "in-depth nuanced understanding of research findings... clarifying disparate results by placing them in dialogues with one another" (2012: 75). Mixed methods therefore synthesise quantitative and qualitative insights as a validation process to ensure that the research outcomes are the result of an "underlying phenomenon" and cannot be accused of representing a "methodological artefact" (Johnson et al. citing Bouchard, 1976: 113 - 114). They trace the development of this "triangulation" method through the research design literature, highlighting its relevance and methods of application. Importantly, the strength of "triangulation" exists insofar as the biases inherent in any single data source or method are controlled for by a cross-referencing mechanism. Citing Denzin (1978), the three outcomes that can arise from triangulation are convergence, inconsistency and contradiction; where the "researcher can construct superior explanations of the observed... phenomena" irrespective of which of these predominate (2007: 115).

Mixed methods are generally employed in research for verification purposes, although reasons for adoption may also include probing a dataset to determine its meaning, or developing understanding through re-composition by "facilitating thickness and richness of data, augmenting interpretation and usefulness of findings" (2007: 116). However,



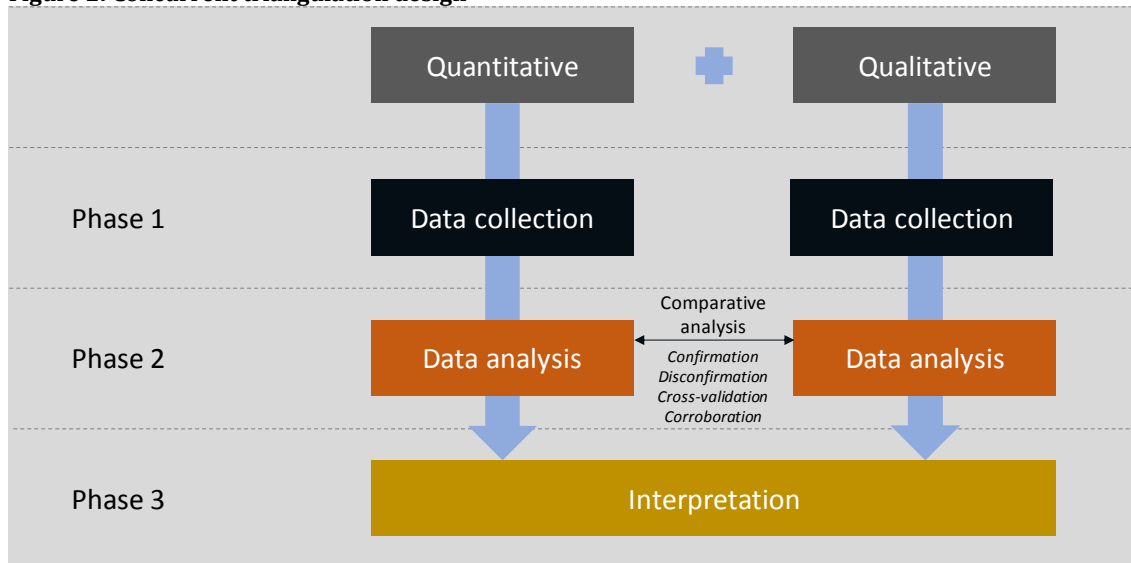
there are specific challenges associated with administering a mixed methods approach. These relate to the need for extensive data collection, and the time-intensive nature of analysis and corroboration of two or more sources of data. Interpretation of data from multiple sources requires great effort and it may be unclear how discrepancies should be resolved. In addition, consideration should be given to the phasing of different data collection mechanisms, as well as to the means and phasing of integration methods (Creswell, 2009). In the context of this research, mixing of methods was initiated during data interpretation, while collection and analysis was conducted in parallel.

Nonetheless, there exists some controversy amongst academia regarding mixed methods, as it attempts to bring together theoretical perspectives from both quantitative and qualitative disciplines, and as such poses challenges associated with compatibility of methodological outcomes (Mertens and Hesse-Biber, 2012). From a quantitative perspective, positivist research philosophy is preoccupied with the study of variables that are observable and measurable in a controlled context, to derive inferences regarding the resultant outcomes (Saunders and Lewis, 2012). In the context of this study, quantitative methods in line with a positivist approach were adopted, primarily in the analysis of macroeconomic data, as well as financial data for selected non-listed and publically-listed manufacturing firms. This was done to construct an index for macroeconomic uncertainty, and to identify examples of countercyclical investment at the level of the firm. On the other hand, qualitative data collection was conducted via an online survey of closed and open-ended questions to examine the drivers of investment behaviour, in line with a constructivist paradigm. As such, this investigation attempts to marry statistical inference with the subjective insights arising from survey data (Saunders and Lewis, 2012). The research thus synthesises quantitative positivist and qualitative, constructivist philosophies, thereby posing challenges in respect of marrying these methodological paradigms (Mertens and Hesse-Biber, 2012; Johnson et al., 2007).

This chapter outlines the mixed methods approach to data collection, analysis and interpretation employed for this study. By incorporating qualitative insights, the research aims to elucidate quantitative outcomes through the development and relation of prominent themes arising from statistical analyses. The specific approach is described as Concurrent Triangulation design, as represented in Figure 2. This model indicates the parallel collection of quantitative and qualitative data and analysis, before identifying themes that either confirm, disprove, cross-validate or corroborate each other in the final interpretation of the data. From a mixing perspective, Creswell suggests that data should be merged, or transformed into a common type of data, to create a basis for comparison.

Alternatively, data can be integrated or compared side-by-side in a discussions section (2008). This latter approach is employed in the context of this research.

**Figure 2: Concurrent triangulation design**



Source: Adapted from Creswell, 2008.

The remainder of this chapter describes the phased implementation of the research in line with the design presented in Figure 2, inclusive of a discussion regarding definition of the population and related sampling techniques.

#### 4.1.Phase 1: Data collection

##### 4.1.1. Macroeconomic uncertainty index data collection

The challenges associated with measuring macroeconomic uncertainty are discussed in the literature review above. As such, the process of collating data that are reasonable indicators of uncertainty posed a significant challenge. While a Policy Uncertainty Index (PUI) for South Africa has recently been constructed and is intended to be published regularly going forward, data for the index is only available from 2015 onwards, making it unsuitable for the longitudinal analysis conducted for this study<sup>3</sup>. Redl (2015), as mentioned above, has similarly constructed an index that is specifically concerned with macroeconomic uncertainty and does in fact look back over the 2006 – 2015 period of analysis with which this study is concerned. However, the raw data were not available at the time of writing, given that the study was yet to be finalised for publication. Nonetheless, its findings are considered here and referenced below as a guide in respect of identifying periods of macroeconomic uncertainty that are specific to the South African context.

<sup>3</sup> For more on the Policy Uncertainty Index (PUI) referred to here, please consult Professor Raymond Parsons at North West University, South Africa

Due to the unavailability of the above indices for the purposes of this research, four macroeconomic variables were used to develop a unique composite index on macroeconomic uncertainty in South Africa, complemented by two sentiment-related variables. These six factors are highlighted in the literature as showing varying degrees of correlation with uncertainty, and include: (1) the nominal effective exchange rate (NEER) of the Rand relative to a trade-weighted basket of currencies (2) R186 long bond yields (3) a standard deviation measure of quarter-on-quarter seasonally adjusted and annualised GDP growth (4) the five-year credit-default swap (CDS) spread (5) the business confidence index specifically pertaining to a sample of manufacturing respondents, as published by the Bureau of Economic Research and (6) citations of specific words related to economic uncertainty in the South African Reserve Bank Quarterly Bulletins for the period under consideration.<sup>4</sup>

To generate the data for this latter indicator, a frequency count of the word “risk”, along with the stem words “uncertain\*” and “volatil\*” was conducted for each of the 40 issues of the SARB Quarterly Bulletin published over the period 2006 – 2015. This publication was selected for analysis in accordance with the method followed by Redl. Albeit identifying the source as a broad review of developments in the socioeconomic and political environment, rather than having a pure focus on the macroeconomic environment, Redl nonetheless identifies the Bulletin as the most appropriate option available given the frequency and consistency of its release over time (2015). Graphical representation of the frequency counts for the period under consideration is presented in 22 (Appendix A).

Quarterly frequency data were sourced for each of these series, apart from the CDS spread, and were adjusted to create monthly data profiles. Thereafter, the data were normalised to have a mean of 0 and a standard deviation of 1 before applying an equal weighting to construct the index of standardised values. The index is constructed for the ten-year period spanning 2006 – 2015, and is compared in relation to the work of Redl (2015), as a point of cross-validation. The index and corresponding analysis is presented in the results section below.

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<sup>4</sup> Indicators (1), (2) and (4) were sourced from Bloomberg, while the GDP growth index was calculated using data sourced from Statistics South Africa.

#### 4.1.2. *Firm-level data collection and sampling method*

Manufacturing is taken as the industry for analysis based on its relatively high fixed-to-total asset ratio; identified in the literature as a key factor determining the degree of irreversibility of sunk capital, and therefore the extent to which macroeconomic uncertainty impacts on investment (Gilchrist et al., 2014). Manufacturing sector focus is also a defining characteristic of this research, insofar as it concentrates the analysis on firms with an exclusively South African investment profile. This is important in respect of eliminating any cross-border investment noise; in effect controlling for international capital allocations that could serve as a diversion from the South African investment context. Access to a database of privately held manufacturing firms was secured in addition to data for listed firms, which allowed for a public-private stratification of the data to unpack considerations of principal-agent problems and governance. By narrowing the universe to South African manufacturing firms only, sectoral differences are controlled for as explanatory variables.

The population defined for this research therefore includes all manufacturing firms in South Africa with predominantly South African-specific investment footprints. The sampling unit is defined as the firm capital allocation decision in the context of macroeconomic uncertainty. To this end, convenience sampling methods were applied in respect of quantitative and qualitative data collection, where the sample of firms selected for analysis were chosen on the non-probability basis of access to reliable financial data, and complementary survey responses. However, an element of judgement sampling is also applied, as selection considered the investment footprint of participating firms. Thus, while the results and findings that arose from the research are likely to be indicative of broader themes regarding the application of judgement in investment decisions of manufacturers in an uncertain South African economy, inference is unlikely to be extended with any degree of accuracy to the broader population, given the size of the sample relative to the total population, as discussed in more detail below.

Given that heterogeneity among firms running operations in different industries is expected, firms are stratified based on the following variables:

- i. Listing status on the Johannesburg Stock Exchange (JSE)
- ii. Capital versus labour-intensity
- iii. CEO dominance in investment decision-making

A total of 38 companies were contacted for responses (based on access to reliable financial data for a ten-year period), and 28 of these surveys were completed given the



limited timeframes available for the study, resulting in a 73.7% response rate. An effort was made to collect data for an equal number of listed and non-listed firms, despite the significantly lower representation of manufacturing firms on the JSE. The sample size was limited by the number of listed firms involved in manufacturing activity, as well as the number of non-listed firms for which a ten-year historical dataset could be secured. The resulting sample is thus a split of 39:61 between publically-listed and non-listed firms, respectively (that is, 11 listed, and 17 non-listed firms).

Firm-level financial data for manufacturers with investment footprints limited to South Africa were collected from two sources. First, listed firms' financial information is readily available in detail via iNet BFA, a provider of financial data feeds, for 2006 – 2015.<sup>5</sup> That is, all financial information pertaining to financial statements was available for the full range of firms for the period of consideration. Second, non-listed firms' data for specific financial metrics were collated from a proprietary database owned by Benchmarking and Manufacturing Analysts (BMA), where limited financial data were made available for the non-listed firms under consideration. This data is collected by BMA through their operational benchmarking process, and as such does not collect a full suite of financial indicators. Analysis for the total sample was therefore limited to a set of core metrics for which data was available for both listed and non-listed firms. Nonetheless, BMA's longitudinal dataset provides a unique source of information that is unavailable in the public domain, and therefore provides a novel opportunity to conduct comparative analysis of investment decision-making for listed and non-listed entities.

Concurrent to the process of quantitative data collection, qualitative metrics were developed and formulated into a succinct online questionnaire that was administered to business investment decision-makers at the companies included in the sample. While in-depth interviews would likely have yielded the best insights in a study of this nature, given time constraints and the intention to match quantitative observations with qualitative inferences, a carefully designed survey instrument was selected as the most convenient method of collecting qualitative data from key personnel such as CEOs, Managing Directors (MDs) or Chief Financial Officers (CFOs), or other key leadership staff with direct influence on investment decision-making within their respective firms. The predominant percentage of respondents were CEOs and CFOs, ensuring that respondent feedback reflected the investment rationale of the firm in question, as perceived by key decision-makers regarding capital allocations.

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<sup>5</sup> <http://research.mcgregorbfa.com>



As such, metrics that allow for certain controls in the quantitative analysis were made available. These include variables capturing the nature of capital expenditure (technology upgrading or purely expansionary) and investment rationale (opportunistic versus countercyclical, versus risk-seeking). Importantly, the questionnaire was not used as a mechanism to collect quantitative financial data, but rather to elicit responses regarding perceptions of uncertainty, investment strategies and rationales, the types of investment undertaken by the firm in the last ten years (maintenance-related, technology upgrade or purely expansionary) and concentration of decision-making power within the organisation. Reference was made to the work of Graham et al. (2015) in respect of the organisational economics component of the questionnaire, making use of similarly formatted questions to an executive survey administered by the same to understand delegation of decision-making authority in capital allocations of the firm.<sup>6</sup> While not intended to be an exhaustive engagement with the sample set, the 28 survey responses are considered a sufficient set with which to explore behavioural and qualitative aspects of investment decision-making among South African manufacturing firms.

#### 4.1.3. Variable construction

Table 1 lists the set of variables developed for testing the hypotheses set out in Chapter 3 above. Firm-level heterogeneity is captured by the first four metrics specified, prescribing dummy variables to indicate whether a firm is listed or not (LISTED), whether it is relatively more labour or capital-intensive (L\_K), the size of the firm based on the number of employees reported in 2015 (EMP\_SIZE), and the relative weighting of CEO investment decision-making power within the organisation (CEO\_DECISION). As highlighted in the literature, these four factors are found to have varying degrees of influence on investment decision-making in the context of macroeconomic uncertainty. Listed firms experience more shareholder influence on investment decisions, while firms that are more capital-intensive are particularly sensitive to the non-divisible nature of investment, as well as the efficiency implications of neglected investment over time.<sup>7</sup> Similarly, firm size can impact investment profiles given the nature of scale-up investments, while CEO decision-making dominance can result in a risk-averse investment profile.

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<sup>6</sup> The pdf version of the questionnaire is available at <https://faculty.fuqua.duke.edu/~jgraham/CEOCFO.pdf>

<sup>7</sup> The distinction of a threshold for this latter indicator was identified by analysing 2015 revenue per employee data, relative to the mean for clothing manufacturers (identified as a distinctly more labour-intensive sector than others included in the sample). All firms with revenue per employee greater than the clothing manufacturing mean are considered relatively more capital-intensive.



**Table 1: Description of variables constructed for testing of hypotheses**

Variable tag	Description	Construction
<b>Firm heterogeneity</b>		
LISTED	Shareholder status. In particular, whether the company is publically traded on the JSE, or not.	Dummy variable: 1 = Listed; 0 otherwise
LvK	Labour intensity, calculated on the basis of revenue per employee	Dummy variable: 1 = Capital-intensive; 0 otherwise
SMALL; MEDIUM; LARGE	Company size based on 2015 employment figures (permanent and contract). Specifically, small, medium or large	Dummy variables, where "small" <100 employees; "medium" 100= <500 employees; "large">500 employees
CEO	CEO decision-making dominance	Dummy variable: 1 = CEO dominates with limited help from others; 0 otherwise
<b>Investment and macroeconomic uncertainty</b>		
SPIKE	Investment spike, where non-maintenance related investments are identified as greater than 1.5 times average investment over the 2006 -2015 period	Dummy variable: 1= "investment spike"; 0 otherwise
UNCERT	Composite index of factors correlated with periods of macroeconomic uncertainty	Dummy variable: 1 = "macroeconomic uncertainty"; 0 otherwise
ADSITE	Indicator of investment in the development of an additional site in a particular year	Dummy variable: 1 = additional plant opened; 0 otherwise
EXPAND	Indicator of investment in the expansion of existing capital on current site(s)	Dummy variable: 1 = purely expansionary investment; 0 otherwise
TECH	Indicatof of investment in technology upgrading investment aimed at improving efficiencies	Dummy variable: 1 = technology upgrading investment; 0 otherwise
<b>Long run financial performance</b>		
REVENUE	Year-on-year revenue growth, after adjustment for inflation (2012 constant prices, calculated on the basis of PPI inflation published by Statistics South	Percentage change
PROFITABILITY	Operating profit (Earnings before interest and tax, depreciation and amortisation). This metric is inflation-adjusted at 2012 constant prices	Inflation-adjusted Rand value
PRODUCTIVITY	Revenue per employee, inflation-adjusted to 2012 constant prices. Employment figures reported include salary and waqed staff, both permanent and contract	Inflation-adjusted Rand value per employee

The second set of variables listed in Table 1 categorise non-maintenance related investment spikes (SPIKE) and related capital allocation indicators, in relation to macroeconomic uncertainty (UNCERT). Investment spikes were identified in accordance with the definition applied by Grazzi et al. (2013). That is, investment spikes were proxied by an investment rate (calculated as 1.75 times a given firm's median investment profile) to differentiate between true investment and capital expenditure associated with routine maintenance.<sup>8</sup> Investment spikes are identified using one of the methods cited by Grazzi et al. (2013), by recognising only investment episodes more than 1.75 times a firm's own median investment rate over the period of interest. In addition, data collected via the administration of the survey instrument assisted in identifying the nature of investment, in terms of being purely expansionary (ADSITE and EXPAND) or related to technology upgrading (TECH).

The final set of variables in Table 1 were constructed as indicators on long run financial performance, and measure firms' abilities to grow revenue (REVENUE) and operating profitability (PROFITABILITY), as well as enhanced efficiencies (PRODUCTIVITY), because of their investment strategies in the context of macroeconomic uncertainty.

<sup>8</sup> Grazzi et al (2013) measured the investment rate as the ratio of capital expenditure to tangible fixed assets at the beginning of the year. However, due to the fact that this data is not available for the non-listed firms making up a proportion of this survey, an alternate indicator of investment spikes (also cited by the authors) entails identifying investment episodes in excess of 1.75 times a firm's own median investment rate over the period of interest.



#### **4.2.Phase 2: Data analysis**

IBM SPSS Statistics (Version 24) was used to engage with micro and macroeconomic quantitative data, to analyse the correlation of investment spikes in the sample, relative to identified macroeconomic uncertainty. A spike dummy equal to 1 was assigned to such events in the data, and correlation tests were run to test the first set of hypotheses; to determine whether heightened uncertainty results in lower levels of investment. To test the second set of hypotheses- whether firm heterogeneity has an impact on investment behaviour given macroeconomic uncertainty- a logistics regression was run to understand whether firm characteristics (size, capital intensity, ownership) affect the probability of observing an investment spike.

Finally, to test whether counter-cyclical investment resulted in better or poorer financial performance in the long run, a second set of regressions were run. First, dummy variables were assigned to firms that were “uncertainty spikers” in their investment behaviour; equal to 1; whereas risk-averse investors were prescribed a value of zero. Second, financial performance metrics were defined. Referring to the work of Grazzi et al. (2013), financial performance was adjudicated on total sales growth over time, profitability (measured in terms of operating margins to account for the operational improvements that should be experienced due to capital investment), and productivity, measured as revenue generated per worker.

The qualitative data collected via the online survey were analysed concurrently (as per Figure 2) in respect of the four themes already mentioned; namely, respondents’ perceptions regarding uncertainty, their perceived impact on investment appetite, their associated investment strategies, as well as decision-making power concentration within organisations. The key benefit derived from collection of data of this nature, is the triangulation opportunities it presented in respect of perceived strategies versus actual investment outcomes. In addition, the survey collected data that allowed for an interrogation of the determinants of investment at a micro, firm-level of investigation.

#### **4.3.Phase 3: Synthesis of mixed methods data**

As above, Creswell (2009) outlines the importance of triangulating quantitative and qualitative data sources as a means of providing a better understanding of a research problem or issue than either research method alone can provide. The final phase of the research directly compared findings in respect of each of the data sources (quantitative and qualitative) analysed, as well as coaxing an integration and nuancing of the findings

developed from interrogation of each of the databases separately. This synthesis phase is therefore a cornerstone of the mixed methods research process, and allowed for the development of research conclusions based on the data triangulation method highlighted above, providing a more robust set of findings than either quantitative or qualitative research methods could have delivered on their own.

#### **4.4. Research method limitations**

The choice of a mixed methods research approach was made due to its usefulness in investigating the nature of the relationship between macroeconomic uncertainty and the factors driving investment, and the fact that it is a relatively inexpensive, efficient method of qualitative data collection. However, the following limitations are of consideration when reviewing the results in the following chapter.

First, manufacturers in specific sectors (clothing, textiles and automotive) in South Africa may have had access to investment incentives over the period of consideration. Although firms were requested to relay whether they have made use of such benefits through the survey instrument, it is worth noting that such occurrences may serve to skew the results.

Second, the sample selection is based on only those firms that have been in operation for most of the ten-year period specified (2006 – 2015), creating survivorship bias within the dataset. To the extent that this study interrogated how investment behaviour affects financial performance, the results are once again potentially skewed by the study's inability to account for those firms that have not weathered periods of macroeconomic uncertainty with any form of success.

Third, the online survey requests a single firm representative to provide insight into investments that have taken place over a ten-year period. To this extent, the research method assumes that the same management team or persons have been active participants in the investment decisions for all the years under consideration. Irrespective of whether the investment rationales of firms in the sample have remained consistent over the full period from 2006 – 2015, this is therefore a constraint on the extent to which relevant, or accurate, qualitative data can be attained.

Fourth, private firms supplying unaudited financial data for the purposes of this study may present opportunities for self-reporting bias, with little recourse available to the researcher in respect of verifying the data.

While the above limitations are acknowledged in respect of their ability to impact on the accuracy of the findings accumulated, the study design remains a capable vehicle for



providing analysis of a dataset of manufacturing firms in South Africa, in relation to the hypotheses set out above. Importantly, the study merges quantitative and qualitative methods to achieve these outcomes, providing dual dimensions of analysis, and hence a potentially greater degree of understanding of the factors driving investment. Thus, a lack of data breadth is compensated by the additional data depth offered by a mixed methods design.



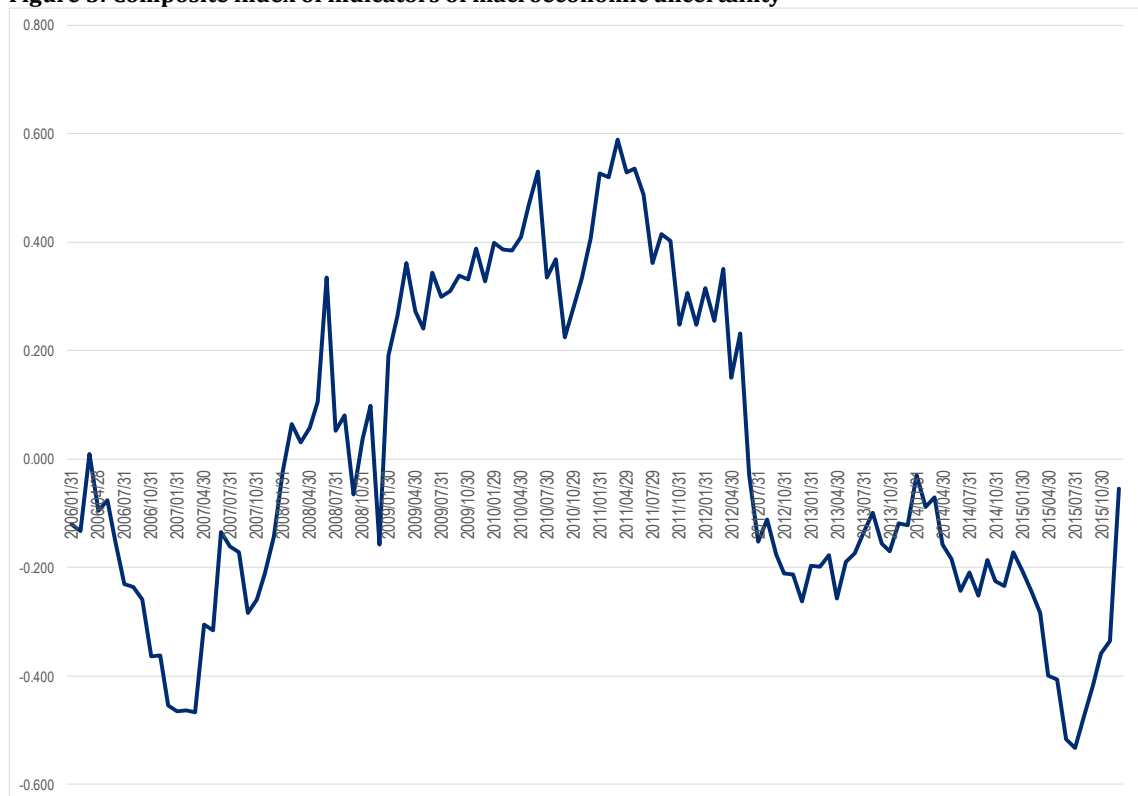
## 5. Data analysis and research results

This chapter presents the empirical outcomes of the research on capital allocations given high levels of macroeconomic uncertainty. It begins with a discussion of the quantitative findings, followed by a description of qualitative insights that will serve to confirm, disprove or nuance the results developed here. A discussion of alternative explanations and possible concerns regarding the analysis concludes this section and leads into a discussion and synthesis of the results in Chapter 6.

### 5.1. Composite index of macroeconomic uncertainty

Figure 3 exhibits the composite index of macroeconomic uncertainty developed from an equal weighting of the standardised values of the six variables described in Chapter 4. The results are compared to a similar index constructed by Redl for South Africa, albeit from a different set of indicator variables, to cross-validate the findings (Redl, 2015).<sup>9</sup>

**Figure 3: Composite index of indicators of macroeconomic uncertainty**



<sup>9</sup> Redl's index is constructed following the method of Dendy et al. (2013), and incorporates a measure of disagreement among professional forecasters regarding macroeconomic conditions (GDP, CPI, and interest rates, gold price, exchange rate, and the current account balance), a count of international and local news publications regarding economic uncertainty in South Africa, and a word frequency assessment of uncertainty in SARB Quarterly Bulletins.

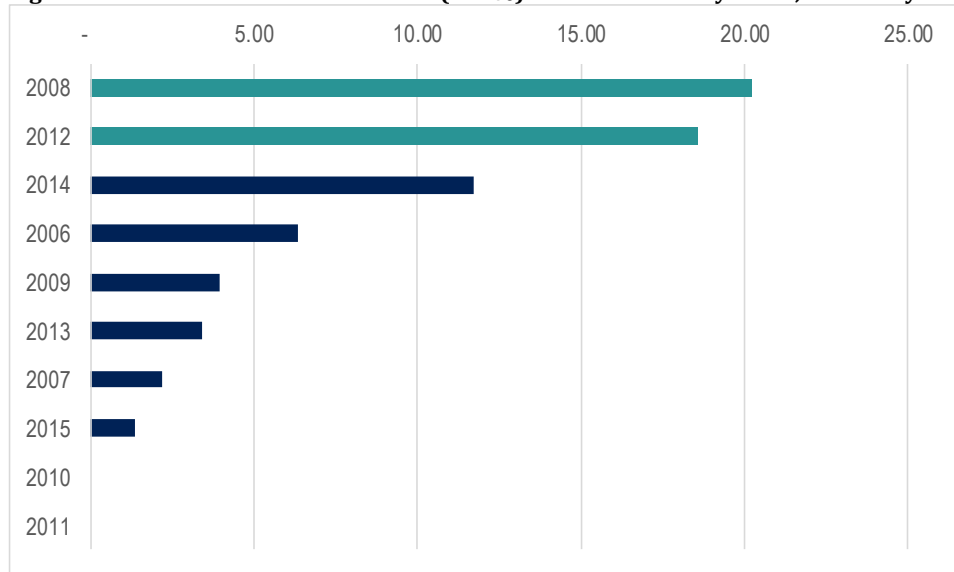
Figure 3 can be interpreted such that an increase in the index indicates a rise in macroeconomic uncertainty. As can be seen, the composite index identifies upward spikes in macroeconomic uncertainty that are most pronounced in 2008:Q2; 2009:Q3; 2010:Q2; 2012:Q1; and finally, 2015:Q4. The index is thus suggestive of a comparable trend in macroeconomic uncertainty to that of Redl's South African index (2015), which similarly found uncertainty peaking in the periods 2008:Q3 and 2010:Q1 for the time period under consideration. A review of the SARB Quarterly Bulletins for each of these quarters reveals the likely drivers of these spikes. In the second quarter of 2008 increased volatility and uncertainty in global markets had ripple effects on the South African economy: this is reiterated by Redl insofar as he identifies "developments in [the] global economy [had] a contagion effect on South Africa" (2015: 10). Redl also cites political uncertainty regarding Thabo Mbeki's resignation as president of South Africa as a source of internally generated uncertainty during this period. The global phenomenon, however, appears to have extended into the 2009 and 2010 period, where issues of the SARB Bulletin published during these years cite "the speed and extent of the recovery... still subject to a high degree of uncertainty" (SARB, 2009: 58). In 2010: "the sustainability of [expansionary monetary and fiscal policy] increasingly became a matter of concern" (SARB, 2010: 1). In addition, sluggish Eurozone recovery at the time had destabilising impacts on South Africa, given the region's prominence as a trading partner of South Africa (Redl, 2015). The 2015 spike in uncertainty is attributed to the firing of the Finance Minister in the final quarter of the year, as well as uncertainty regarding global financial markets and commodity prices remaining under pressure.

The composite index of Figure 3 thus exhibits a trend that is corroborated by Redl's analysis, is therefore advocated as a reasonable estimate of the unobservable phenomenon of macroeconomic uncertainty in the context of this study. However, while the above analysis presents an indication of high levels of uncertainty on a quarterly frequency, an annualised measure was required to conduct analysis at the level of the firm (following the annual reporting of company financial data). To identify the years in which firms were likely to have experienced the highest levels of macroeconomic uncertainty, the investigation follows the method employed by Grazzi et al. (2013). The frequency of uncertainty spikes, measured as a month-on-month (positive) movement in the index by 30% or more, are ranked for each year, and the results are presented graphically in Figure 4. A total of 22 months out of 120 were identified as periods of uncertainty spikes in the data, with the highest frequencies recorded for 2008 and 2012. Frequencies drops off significantly thereafter, and as such, these spike years are



considered particularly unique in respect of exhibiting heightened periods of macroeconomic uncertainty.

**Figure 4: Month-on-month movements (>30%) in the uncertainty index, ranked by frequency/year**



Although not highlighted in Figure 4 as a period of uncertainty comparable in magnitude to that identified in 2008 and 2012, the significant spike in the final quarter of 2015 (evident in the steepness of the slope of the index exhibited in Figure 3) is potentially underplayed by the method of analysis employed. In recognition of this, it is included as a period of consideration in respect of identifying countercyclical investment spikes, as described below.

## 5.2. Identification of investment spikes during periods of uncertainty

Figure 5 maps investment spike frequency for the sample of 28 firms relative to the composite macroeconomic index. Interestingly, the data suggest significant firm investment activity in 2013 and 2014; periods of relatively stable business conditions. However, it also indicates significant firm-level activity in 2008; when the uncertainty index appears to have reached its first significant peak during the period of consideration. The results for 2013 and 2014 are arguably unsurprising: while uncertainty appears to have subsided in 2013 and 2014, thus making way for a new wave of corporate investment confidence, 2008 investment spike activity appears to have taken place in the context of severe macroeconomic uncertainty. This is perhaps precipitated by the steepness of the curve associated with the index during the first quarter of 2008, which shows a sharp and sudden increase in uncertainty- rivalled only by the last quarter of 2015. In addition, this sudden increase is initiated from a low base (Redl similarly identifies the period 2005 – 2007 as a period of considerable stability for the country),

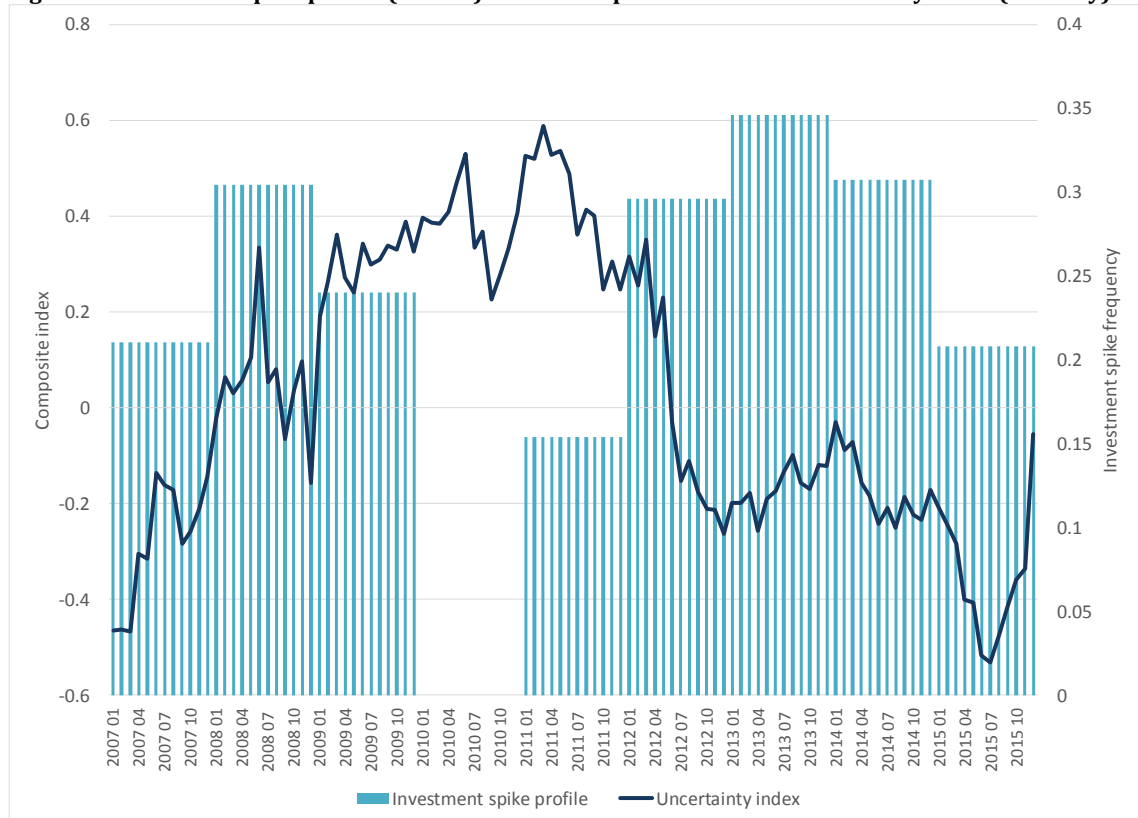




which is likely to have manifested in an opposite, yet equally dramatic, upsurge in corporate investor confidence. The potential result may have been a lagged adverse impact on investment activity.

Conversely, low levels of investment activity are evidenced for 2010 and 2011; years of high macroeconomic uncertainty per the index. This appears to confirm the evidence in existing literature, as it suggests a negative relationship between macroeconomic uncertainty and capital allocations of firms. However, an anomaly once again exists: despite the spike in the index in 2012, capital allocations of non-maintenance related magnitude once again increase in that year. Analysis of the trend in the index potentially sheds some light in this regard, however. Despite 2012 representing a significant period of heightened economic uncertainty, this spike year followed a trend of declining unforecastability, initiated in the previous year. In addition, the 2012 period of uncertainty appears to have been short-lived, while the downward trend continued into 2013. As such, the increase in non-maintenance related investment in 2012 may have been due to the short duration of the corresponding uncertainty episode.

**Figure 5: Investment spike profile (annual) versus composite economic uncertainty index (monthly)**

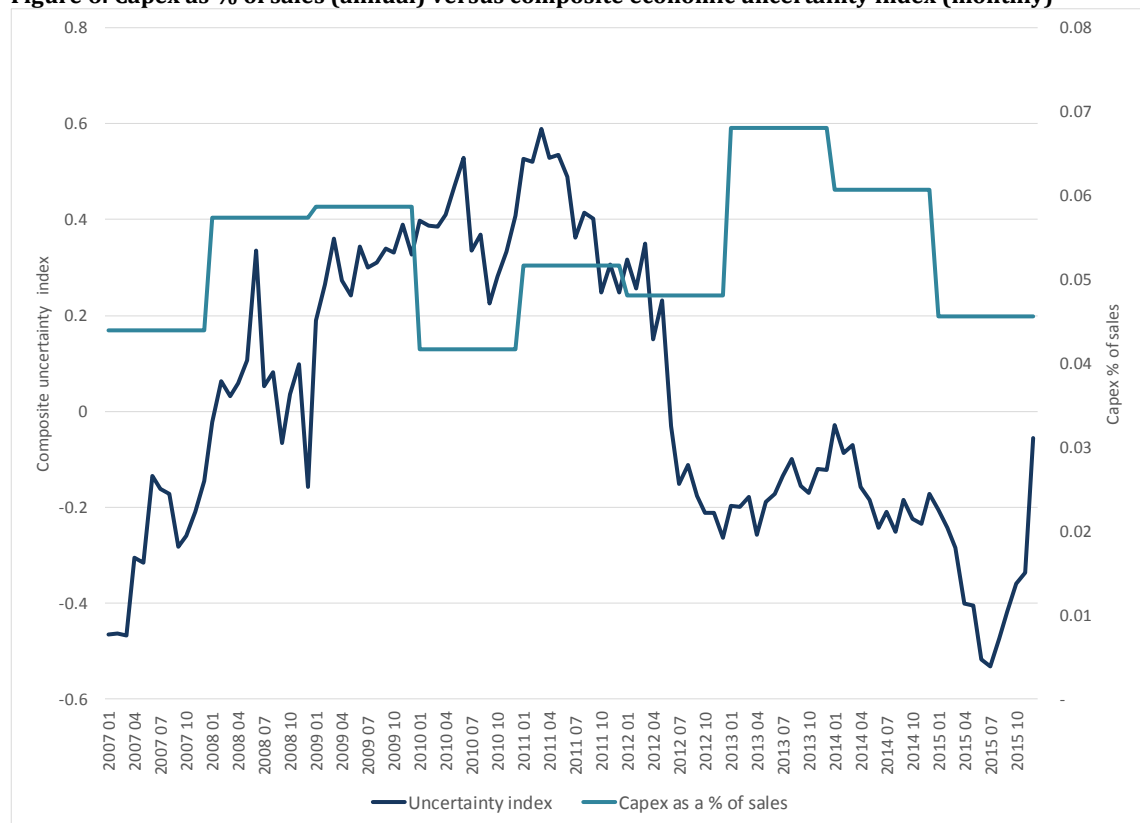


As such, a graphical review of the relationship between the large capital allocations of firms and macroeconomic uncertainty appears to confirm the theoretical suppositions that heightened unforecastability of the business environment leads to reduced



investment. To test this another way, capital expenditure as a percentage of sales was modelled for the same sample of firms and mapped against the composite index, as per the above. This exercise takes a view of investment more generally; that is, both maintenance and non-maintenance related investment; and the result is presented graphically in Figure 6. General investment of firms appears to remain robust in 2008 and 2009 while uncertainty is climbing, but falls in 2010 through to 2012, when uncertainty is at its highest. It rises again in 2013 and 2014, when uncertainty returns to more tolerable levels. This result suggests that even more so than the escalation of macroeconomic uncertainty, its absolute level is of concern to firms looking to make investment decisions.

**Figure 6: Capex as % of sales (annual) versus composite economic uncertainty index (monthly)**

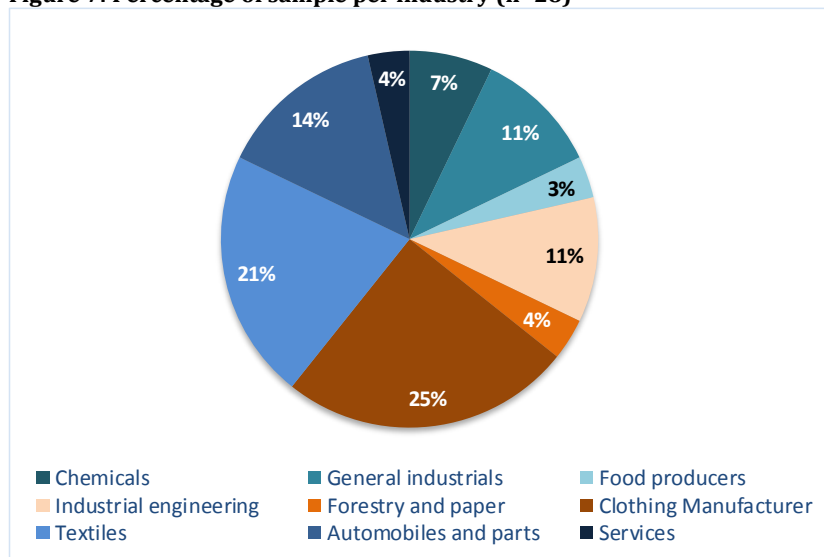


These graphical representations of the relationship between business environment instability and the investment activities of a sample of manufacturers is tested statistically for significance later in this chapter. Importantly, however, the macroeconomic uncertainty index constructed here is used to classify the sample into two groups: “uncertainty spikers” which choose to invest during periods of uncertainty, and “risk-averse” investors, which choose to invest in stable periods, or not at all. This provides the basis for a discussion of the descriptive statistics related to the firm-level data, presented in the next section, as well as further analyses investigating the impact of investment rationale on the long run financial performance of the firm.

### 5.3. Descriptive statistics of firm-level data

Figure 7 presents a breakdown of the 28 firms constituting the sample by industry in percentage terms. The figure reveals a clear bias in respect of clothing and textiles firms, motivated by two factors. First, the data on non-listed companies is sourced from BMA's proprietary database of manufacturing firms, with longitudinal data stretching back over ten years. This dataset has a specific focus on clothing, textiles, automotive and chemical firms, and as such, skews the data in this respect.

**Figure 7: Percentage of sample per industry (n=28)**



Second, insofar as this study sought to reduce the noise of international investing activity to derive a clear view of the effects of macroeconomic uncertainty on investment, clothing and textiles firms have proved more likely than other sectors to have a purely South African investment footprint.

Table 2 presents the summary statistics for the 28 firms in 2015. The standard deviations and ranges reported are the consequence of a sample that incorporates a range of small, medium and large firms. Nonetheless, describing median data by way of example, a typical firm from the sample had revenue of approximately R178 million in 2015, spent R9 million (or 5%) of that on capital expenditure in the same year, generated R12 million in operating profit, and achieved productivity levels of circa R600,000 in revenue per employee. The median employment is stated at 712 employees.



**Table 2: Total sample descriptive statistics (n=28)**

	Sales 2015	Capex 2015	Profitability 2015	Productivity (Rev/Emp)	Employment
Mean	2 557	135	204	0.92	1 993
Median	178	9	12	0.60	712
Max	20 111	863	1 400	3.54	20 479
Min	24	0	-7	0.05	46
Count	28	24	27	23	26
Std deviation	5 335	243	422	0.94	4 080

Note: Rand values in millions

Disaggregating the dataset in respect of investment behaviour, firms were split into two groups based on their investment spike profiles. The two most prominent years of investment uncertainty have already been identified through the ranking methodology applied above. In addition to 2008 and 2012, 2015 was also considered a highly uncertain year (highlighted by the significant move of the composite index in the last quarter of 2015 – see Figure 3) and hence included as a peak period of analysis. Firms identified as having carried out investment spikes in any of these years were grouped as such and termed “uncertainty spikers”. These companies are considered countercyclical allocators of capital, investing in capital projects during periods of macroeconomic uncertainty. The remaining firms are those which have steered away from investment spike activity during the period of analysis, or which have maintained their investment activity in periods of substantially lower levels of unforecastability. This grouping was labelled as “risk averse”. The former constituted fifteen of the 28 firms, while the latter was comprised of the remaining thirteen.

The summary statistics for these firms are presented in Table 3 and Table 4 below. Risk averse investors, on average, tend to be larger firms in employment terms relative to uncertainty spikers, and exhibited marginally higher levels of capital expenditure in 2015, despite lower operating profitability. As a percentage of sales, however, capital expenditure of risk averse investors is 4.74% in uncertainty peak years (versus uncertainty spikers’ 6.05%), and lower than their counterparts in every other year, as can be seen in Figure 8. The distinction between uncertainty spikers and risk averse investors is therefore clear from an investment profile perspective.

**Table 3: Uncertainty investor descriptive statistics (n=15)**

	Sales 2015	Capex 2015	Operating profit 2015	Productivity	Employment
Mean	2 321	110	206	1	1 375
Max	15 636	661	1 400	4	6 246
Min	24	0	-7	0	69
Count	15	13	12	14	14

Note: Rand values in millions

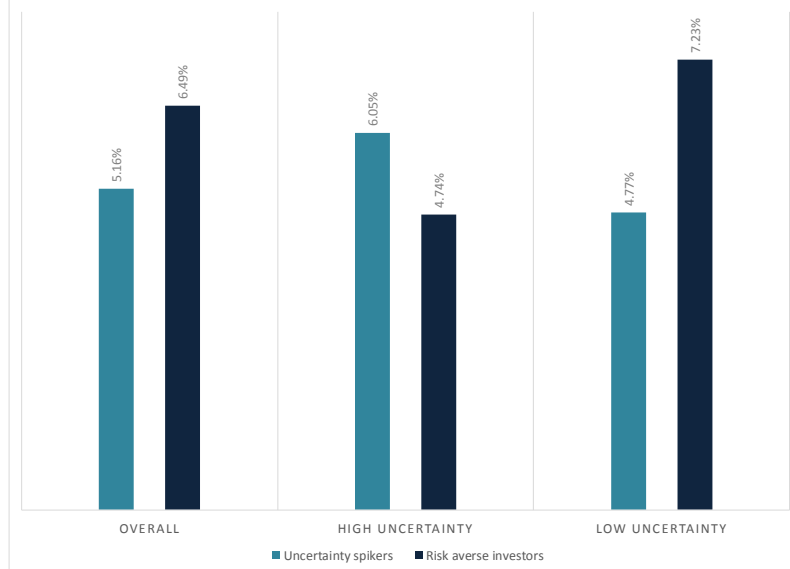


**Table 4: Risk-averse investor descriptive statistics (n=13)**

	Sales 2015	Capex 2015	Operating profit 2015	Productivity	Employment
Mean	2 830	165	202	1	2 714
Max	20 111	863	1 231	3	20 479
Min	39	0	-	0	46
Count	13	11	10	9	12

Note: Rand values in millions

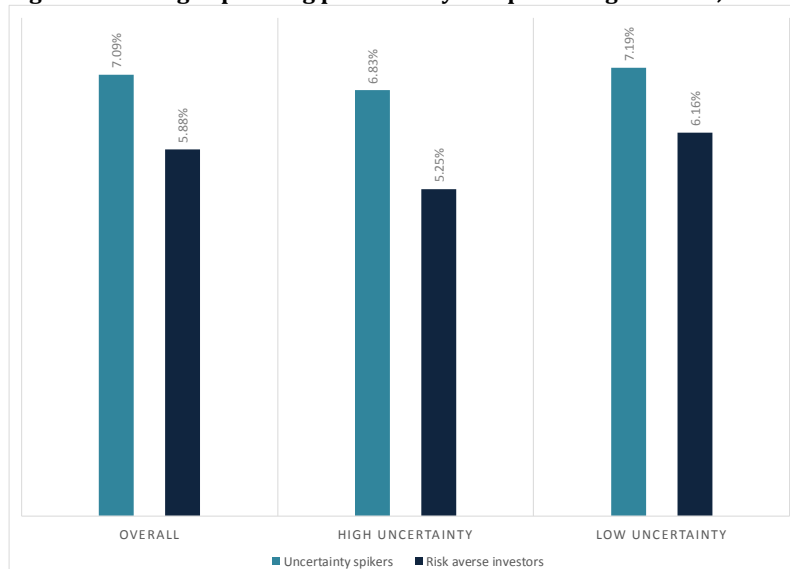
**Figure 8: Average capital expenditure as a percentage of sales, various timeframes**



Note: High uncertainty periods are defined for 2008, 2012, 2015. Low uncertainty periods are all other years of the time period under consideration

A further distinction between the groups is depicted in Figure 9, which shows the consistently lower levels of operating profitability demonstrated by risk-averse investors. While the direction of the relationship is unclear, some level of correlation appears to exist between the variables. At face value, then, it appears as if some correlation exists between operating profitability and investment strategy in the context of macroeconomic uncertainty.

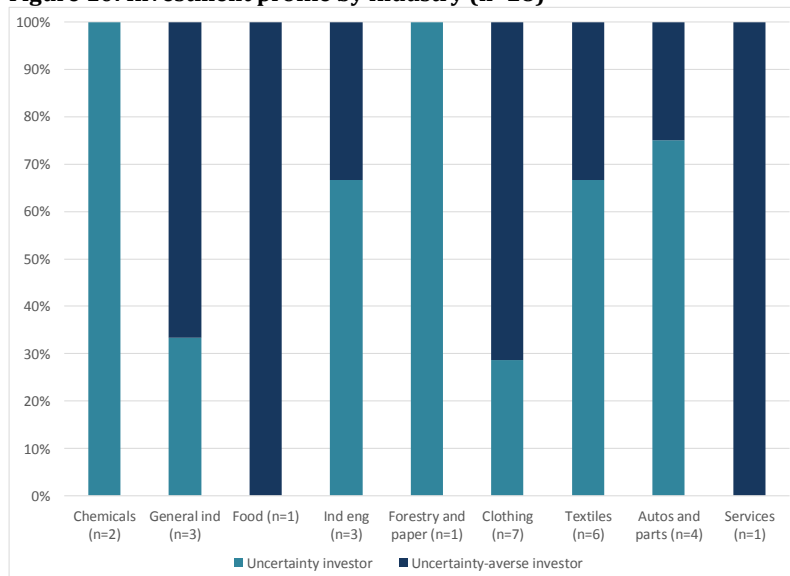
**Figure 9: Average operating profitability as a percentage of sales, various timeframes**



Note: High uncertainty periods are defined for 2008, 2012, 2015. Low uncertainty periods are all other years of the period under consideration

Analysing the profile of each of these groups, it is found that listing status (whether a company is publically traded or not) shows little differentiation between investment profiles (see Appendix A, Figure 23). In respect of industry, Figure 10 indicates that more risky investors dominate chemicals, textiles and automobiles and parts, as well as industrial engineering industries, while risk-averse investors have a majority presence in general industrials, clothing manufacture and services.

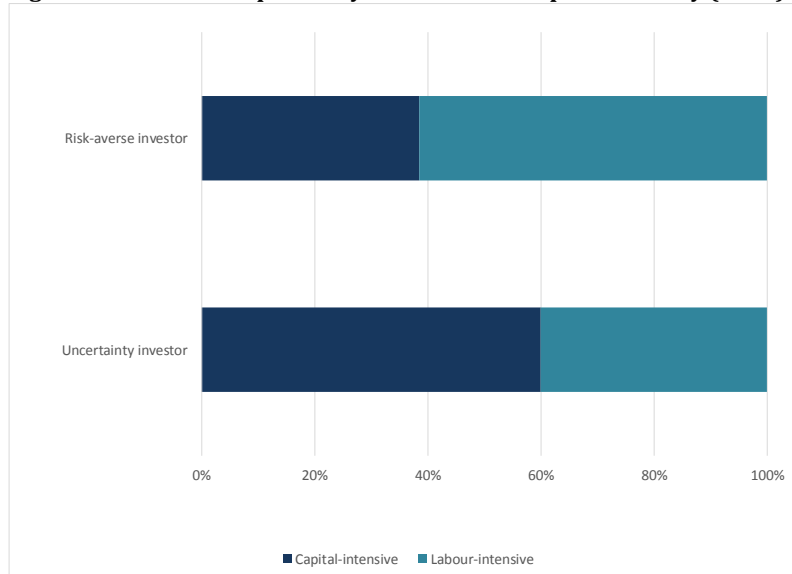
**Figure 10: Investment profile by industry (n=28)**



Viewed in respect of labour versus capital-intensity, a clearer distinction is apparent: Figure 11 suggests that, based on the sample, uncertainty spikers are generally capital-intensive operations, while risk-averse investors are more likely to be labour-intensive. Based on the literature observed in the context of this study, this is an interesting observation insofar as it contradicts the theory regarding the irreversibility of the investment decision: uncertainty spikers could be expected to be made up of a dominant labour-intensive constituency, given that their capital-intensive counterparts are, to a larger extent, restricted by the indivisible nature of capital equipment. In the context of South African manufacturing operations as represented by this sample, this relationship appears to be more tenuous.

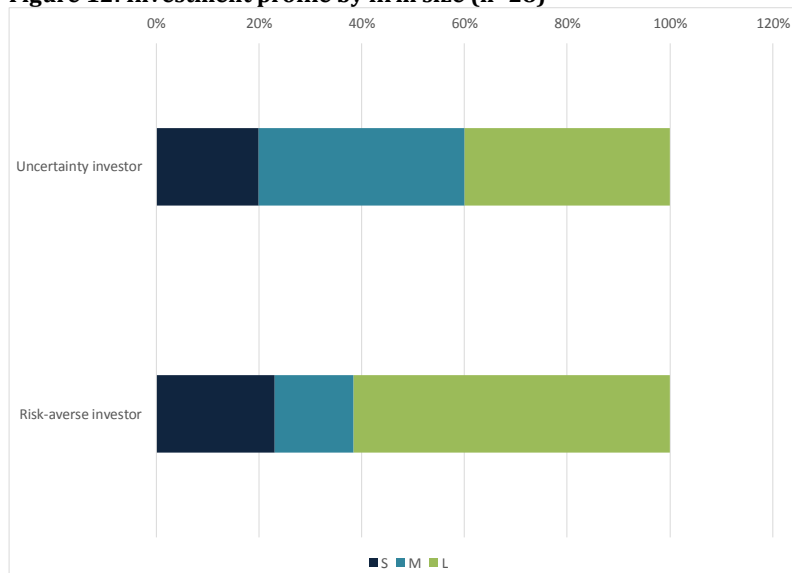


**Figure 11: Investment profile by labour versus capital intensity (n=28)**



From a firm size perspective, Figure 12 demonstrates the greater weighting of large firms in the risk-averse investment profile, while firms with an investment spike profile that overlaps with distinct periods of macroeconomic uncertainty are generally smaller firms. This profile is largely in line with the literature findings: large firms are likely to have a broader stakeholder profile to which they are held accountable, and therefore are risk-averse. In addition, small and medium firms are likely to appear more aggressive, given the indivisible nature of capital, which results in larger investment spikes relative to their size.

**Figure 12: Investment profile by firm size (n=28)**

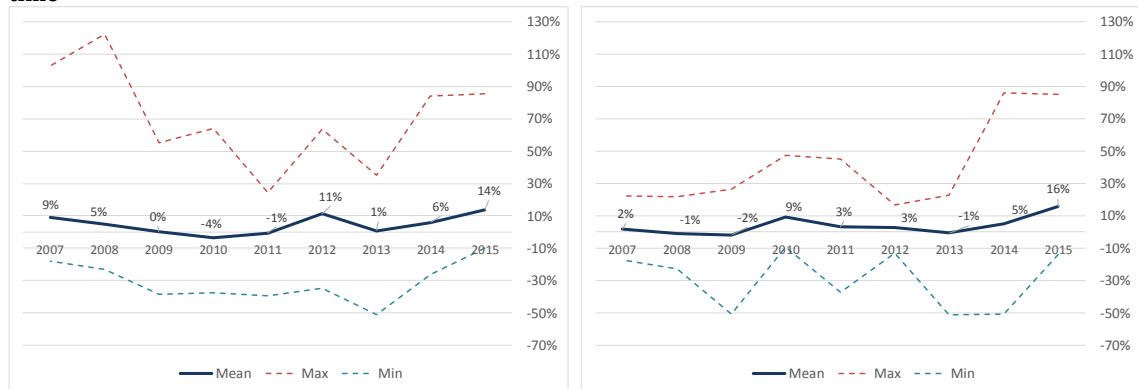


Finally, the sample stratification in respect of investor profiles is analysed in respect of revenue sales growth, and labour productivity over time. Over the period, uncertainty



investors and their risk-averse counterparts achieved revenue growth of 4.6% and 3.8%, respectively, suggesting a margin of difference between the groups. Their profiles over time are exhibited in Figure 13, where revenue growth for uncertainty spikers can be seen to have declined off a higher base in 2008, and is consistently more volatile at the margins than that of risk-averse investors between 2007 and 2015.

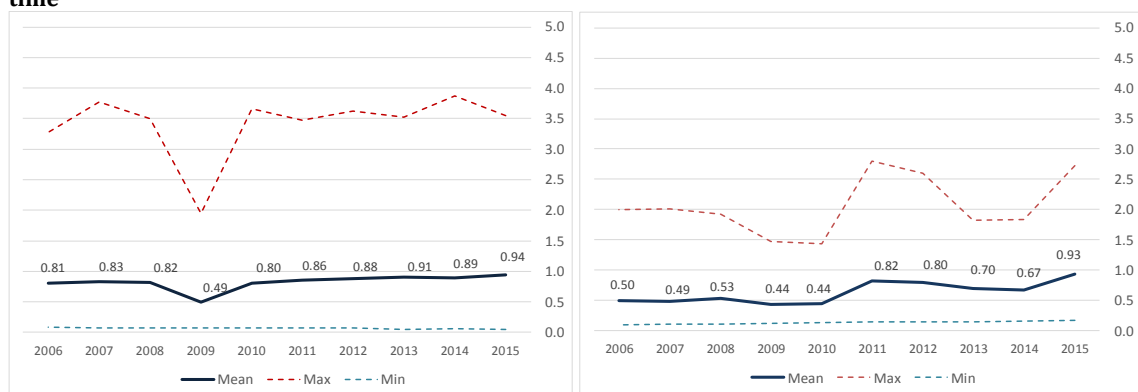
**Figure 13: Uncertainty spiker (left) and risk-averse investor (right) revenue growth performance over time**



Note: Outliers in the uncertainty spiker dataset have been removed for 2007 reporting period.

Productivity trends, exhibited in Figure 14, suggest that uncertainty spikers on average developed from a higher base over the period, and while companies belonging to this cohort suffered a significant drop in productivity following the recession in 2008, have improved productivity consistently on average through to 2015. By contrast, firms in the risk-averse group have grown substantially over time to achieve productivity levels almost on par with their counterparts, albeit with slightly more volatility in performance.

**Figure 14: Uncertainty spiker (left) and risk-averse investor (right) productivity performance over time**



Note: Outliers in the uncertainty spiker dataset have been removed for 2009 reporting period.

The descriptive statistics presented here have provided an overview of the investment profiles of both uncertainty spikers and risk-averse companies, and have suggested the existence of potential relationships between the variables considered. To further test the statistical significance of these potential relationships, the following subsections directly



address the three sets of hypotheses concerning this study, and present formal results regarding their outcomes.

#### **5.4. The relationship between economic uncertainty and investment**

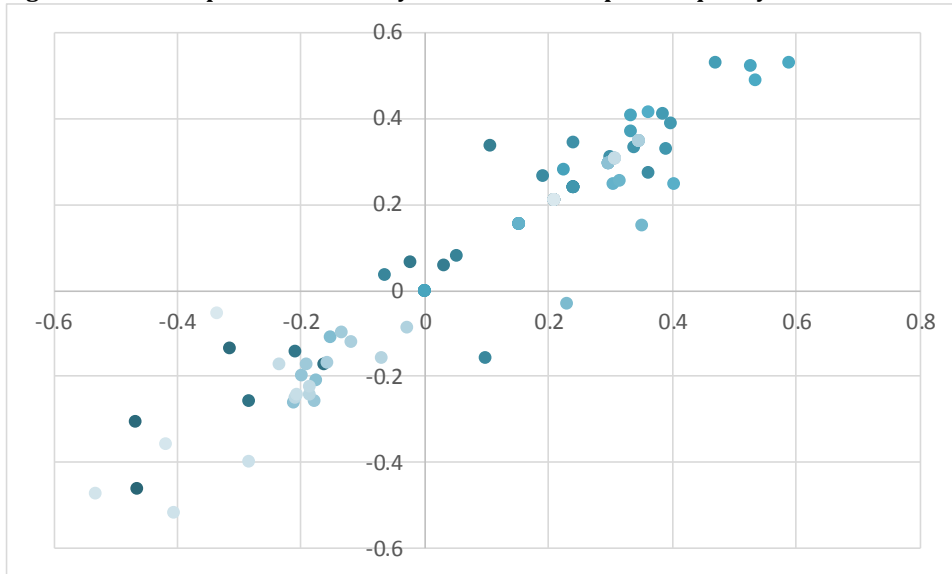
The research aimed to interrogate whether heightened economic uncertainty resulted in a reduction and/or deference of capital investment across manufacturing entities in a small sample for the 2006 – 2015 period. The data presented above suggests that this is arguably the case: as uncertainty increases; and particularly where uncertainty is maintained at high levels for prolonged periods of time; both major investment episodes and general (maintenance-related) investment levels appear to decline.

##### *5.4.1. Model specification*

A two-tailed Spearman's correlation test was applied to determine the strength of the relationship between the constructed macroeconomic uncertainty index and the frequency of the identified investment spike events. Spearman's correlation coefficients measure the strength of the relationship between paired data, where the closer the coefficient is to negative or positive 1, the stronger the relationship. This specific test for correlation is considered appropriate over Pearson's correlation when there is evidence of non-normality in the data. Testing the assumptions underpinning the Spearman's test with the data at hand, Figure 15 shows that the assumption of monotonicity generally holds in respect of macroeconomic uncertainty and investment spikes. Figure 26 and Figure 27 (Appendix A) exhibit the box plots for the macroeconomic uncertainty index and the investment spike frequency, respectively, as a further interrogation of the data. In the case of the former, the median is slightly closer to the lower quartile and the whiskers are of varied length, suggesting skewness in the data. In the case of the former, an outlier is identified. As such, both variables are found to have characteristics inconsistent with that of a normal distribution.



**Figure 15: Scatter plot of uncertainty and investment spike frequency**



Finally, skewness coefficients were run for both variables and are reported in Table 5. Consistent with the above, the magnitude of the coefficient on the investment spike frequency variable relative to its standard error suggests definite skewness in the data. As such, the appropriateness of the Spearson coefficient test as the method of analysis is confirmed and was as such applied to the data, the results of which are presented in Table 6 below.

**Table 5: Skewness coefficients**

	N	Mean	Skewness	
	Statistic	Statistic	Statistic	Std. Error
Uncertainty index	108	0.023	0.132	0.233
Investment spike frequency	108	0.229	-0.959	0.233
Valid N (listwise)	108			

#### 5.4.2. Results

The SPSS output for the Spearman correlation analysis indicates that a weak negative correlation exists between heightened periods of macroeconomic uncertainty and investment spikes for the sample of 28 firms. This result is statistically significant at the 1% level of significance, albeit showing weak correlation. As such, the data provides evidence to suggest weak, negative correlation between periods of increasing macroeconomic uncertainty and firm-level investment spike activity.



**Table 6: Correlation analysis for uncertainty index and investment spikes**

Spearman's rho		Uncertainty index	Investment spike frequency
Uncertainty index	Correlation Coefficient	1.000	-.382**
	Sig. (2-tailed)		0.000
	N	108	108
Investment spike frequency	Correlation Coefficient	-.382**	1.000
	Sig. (2-tailed)	0.000	
	N	108	108

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Albeit statistically significant, the weak negative correlation that was found to exist in the data inspired the use of survey response data to identify the nature of the investment spikes recognised in the quantitative data set. This was done to understand whether the type of investment might indicate a stronger relationship with macroeconomic uncertainty. Employing the dichotomy suggested by Grazzi et al. (2013), firm-level decision-makers were asked whether their investments had been made to expand capacity (through additional sites or incremental increases in their existing capital base) or to upgrade technologically, and were asked to identify the years in which these types of investments had taken place. Although obvious biases arise in respect of this method given the retrospective nature of the question and the associated response bias, it nonetheless provided a point of cross reference that allowed for a richer interpretation of the quantitative data. This classification yielded an identification for 43 of the 53 investment spikes identified- whether investments were expansionary; aimed at enhancing efficiencies through technology; or both- and the resulting frequency variables (EXPAND and TECH) were tested for correlation with the macroeconomic uncertainty as before. The Spearman correlation statistics are presented in Table 7.

Table 7 suggests that the specification of the nature of investment (whether firms are expanding or upgrading technologically) does have an impact on the strength of the relationship that is evident between investment and macroeconomic uncertainty: from the results, larger (negative) coefficients exist in respect of both cases relative to the generic investment spike indicator exhibited above. In addition, there is evidence to suggest that macroeconomic uncertainty is negatively correlated with expansionary investment to a greater degree than it is with technology upgrading investment.



**Table 7: Correlation analysis for uncertainty index and investment spikes by type of investment**

Spearman's rho		Uncertainty index	Expansive investment spikes
Uncertainty index	Correlation Coefficient	1.000	-.495**
	Sig. (2-tailed)		0.000
	N	108	108
Expansive investment spikes	Correlation Coefficient	-.495**	1.000
	Sig. (2-tailed)	0.000	
	N	108	108
**. Correlation is significant at the 0.01 level (2-tailed).			
Spearman's rho		Uncertainty index	Technology upgrade spikes
Uncertainty index	Correlation Coefficient	1.000	-.432**
	Sig. (2-tailed)		0.000
	N	108	108
Technology upgrade spikes	Correlation Coefficient	-.432**	1.000
	Sig. (2-tailed)	0.000	
	N	108	108
**. Correlation is significant at the 0.01 level (2-tailed).			

## 5.5. The impact of firm-level heterogeneity on investment profiles

Having established that a statistically significant (moderate negative) relationship exists between macroeconomic uncertainty and investment spike activity for the 28 firms included in the sample, logistics regression analysis was conducted to understand the extent to which firm-level heterogeneity has an impact on whether firms are “investment spikers” or “risk averse” when allocating capital in a context of macroeconomic uncertainty. To model fixed-to-total asset ratios, this study uses the capital-intensity dummy defined in Table 1 as a proxy. Governance structures are proxied by dummies for both listing status and CEO dominance in capital allocation decision-making; the latter informed by survey data requested to investigate the role of principal-agent problems in informing risk-averse investment decisions.

### 5.5.1. Model specification

A logistics regression was applied to infer whether the dichotomous categorical variable, UNCERT, could be determined by a selection of heterogeneous factors identified through the literature review process as having an impact on investment activities of firms. This analysis sought to test the empirical evidence presented by previous research in the context of business environment unforecastability, and as such defined a binomial dependent variable, with 1 equal to those firms considered as “investment spikers”, and 0 equal to those firms that had avoided major capital allocations in such periods. The logistics model employs binomial probability theory to predict whether dummy variables modelling firm size (Firm size), capital intensity (LvK), and listing status (LISTED)



determine a firm’s membership of one group or the other. Financial performance indicators were also included as continuous variables, namely SALES (defined as year-on-year sales growth over time) and OP (defined as operating profitability as a percentage of sales). As such, the following equation was tested for statistical significance:

$$\text{UNCERT} = \text{SALES} + \text{OP} + \text{Firm size} + \text{LvK} + \text{LISTED}$$

The probabilities associated with these predictors insofar as they result in an outcome of 1 or 0 are presented in Table 8 below. Excluding any of the independent variables identified, the Classification Table suggests that prediction of whether a firm belonged to either group would be correctly predicted 55% of the time. The table entitled “Variables not in the Equation” suggests that the addition of dummies for firm size and capital intensity do improve the model, while predictors such as listing status, sales growth and operating profit do not.

**Table 8: Logistic regression model results**

Classification Table					
Observed			Predicted		Percentage Correct
			US		
			0	1	
Step 0	US	0	0	108	0.0
		1	0	132	100.0
	Overall Percentage				55.0

Variables not in the Equation					
Step 0	Variables		Score	df	Sig.
		SMALL(1)	3.030	1	0.082
		MEDIUM(1)	14.851	1	0.000
		LARGE(1)	10.607	1	0.001
		LISTED(1)	0.140	1	0.709
		LvK(1)	6.204	1	0.013
		SALES	0.004	1	0.951
		OP	0.046	1	0.831
	Overall Statistics		32.607	7	0.000

**Table 9: Logistics regression results**

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 <sup>a</sup>	SMALL(1)	21.389	13384.364	0.000	1	0.999	1945584858
	MEDIUM(1)	19.889	13384.364	0.000	1	0.999	434331528
	LARGE(1)	21.505	13384.364	0.000	1	0.999	2186286741
	LISTED(1)	-0.352	0.381	0.851	1	0.356	0.703
	LvK(1)	-0.402	0.351	1.313	1	0.252	0.669
	SALES	-0.246	0.250	0.962	1	0.327	0.782
	OP	2.189	1.317	2.764	1	0.096	8.923
	Constant	-41.369	26768.728	0.000	1	0.999	0.000

The Hosmer and Lemeshow test is considered a more appropriate measure of goodness of fit than traditional tests in the context of logistics regressions, and the results are reported in Table 10. With a test statistic of 0.394 > 0.05, the null hypothesis cannot be



rejected, suggesting that goodness of fit does exist in the model as it is defined above. As can further be seen in Table 10, the model classifies 66.3% of cases correctly overall.

**Table 10: Hosmer and Lemeshow test for logistics regression goodness of fit**

Step	Chi-square	df	Sig.
1	8.410	8	0.394

**Contingency Table for Hosmer and Lemeshow Test**

		US = 0		US = 1		Total
		Observed	Expected	Observed	Expected	
Step 1	1	17	16.844	7	7.156	24
	2	13	15.712	11	8.288	24
	3	16	13.910	8	10.090	24
	4	16	12.965	8	11.035	24
	5	11	11.894	13	12.106	24
	6	11	11.490	13	12.510	24
	7	8	9.940	16	14.060	24
	8	6	7.339	18	16.661	24
	9	9	5.574	15	18.426	24
	10	1	2.332	23	21.668	24

**Classification Table<sup>a</sup>**

Observed		Predicted			
		US		Percentage Correct	
		0	1		
Step 1	US	0	65	43	60.2
		1	38	94	71.2
Overall Percentage					66.3

a. The cut value is .500

The final set of results for the analysis is presented in Table 11 below. Despite the goodness of fit suggested by the results in Table 10, the model's ability to correctly classify only 66.3% of outcomes points to the statistical insignificance of the variables included as predictors. The Wald statistics and associated probabilities suggest that the variables included in the model do not contribute significantly to the prediction, although at a 90% confidence level, operating profit may be considered a significant contribution to the prediction ( $p = 0.096$ ). The results thus allow for the conclusion that, in contrast to the literature, the specific factors of heterogeneity included in this model do not significantly impact on the likelihood of a firm allocating capital in periods of macroeconomic uncertainty. Only profitability can be considered to have some influence in this regard.



**Table 11: Logistics regression variables in the equation**

Variables in the Equation							
		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 <sup>a</sup>	SMALL(1)	21.389	13384.364	0.000	1	0.999	1945584858
	MEDIUM(1)	19.889	13384.364	0.000	1	0.999	434331528
	LARGE(1)	21.505	13384.364	0.000	1	0.999	2186286741
	LISTED(1)	-0.352	0.381	0.851	1	0.356	0.703
	LvK(1)	-0.402	0.351	1.313	1	0.252	0.669
	SALES	-0.246	0.250	0.962	1	0.327	0.782
	OP	2.189	1.317	2.764	1	0.096	8.923
	Constant	-41.369	26768.728	0.000	1	0.999	0.000

a. Variable(s) entered on step 1: SMALL, MEDIUM, LARGE, LISTED, LvK, SALES, OP.

## 5.6. Implications for long run financial performance

The final set of tests assesses revenue growth, operating profitability, and productivity (measured as a ratio of inflation-adjusted revenue per employee) to quantify the extent to which countercyclical investment, or investment in periods of identified macroeconomic uncertainty, impacts on long run financial performance, relative to risk-averse firms.

### 5.6.1. Model specification

Independent sample t-tests were run to test for differences between the means of the two investment profiles, to assess whether statistically significant differences existed in respect of the financial performance variables specified. The data fulfils the underlying assumptions of the model insofar as each of the dependent variables was specified as continuous (either growth year-on-year in percentage terms, or as a ratio), and the independent variable is categorical. Observations are independent for each group, and significant outliers in each of the dependent variables were removed for this test.

The null hypothesis for the independent samples t-test assumes that the differences between the sample means in equal to zero. The alternate hypothesis assumes the sample means of the two groups are not equal.

### 5.6.2. Results

Table 12 presents the descriptive statistics of the independent samples t-test for the two groups of firms in accordance with their investment profiles in the context of macroeconomic uncertainty. It can be seen in all three instances that uncertainty spikers (equal to 1 in the table) are, on average, higher performers than risk-averse investors, albeit only marginally so, and with larger standard deviations.



**Table 12: Group statistics for investment spikes in macroeconomic uncertainty**

UNCERT		N	Mean	Std. Deviation	Std. Error Mean
GROWTH	1	142	0.0499	0.7269	0.0610
	0	103	0.0294	0.1995	0.0197
PROFITABILITY	1	143	0.0655	0.1258	0.0105
	0	100	0.0625	0.0974	0.0097
PRODUCTIVITY	1	132	0.8220	0.9907	0.0862
	0	84	0.7281	0.7033	0.0767

Table 13 presents the independent sample test for the same data. The F-distributions and their associated p-values are greater than 0.05 in each case, implying that the data meet the homogeneity of variance assumption. However, the t-test results suggest that the differences between the means are small, and statistically insignificant in the case of revenue growth, operating profitability, as well as productivity. Given the p-values of greater than 0.05 in each of the rows of Table 13, it can be assumed that there is no statistically significant difference between the means in respect of the two cohorts, and any variation between the means is likely to be due to chance. As such, the null hypothesis cannot be rejected.

**Table 13: Independent samples test for long run financial performance for investment spike in macroeconomic uncertainty**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
				t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
		F	Sig.						Lower	Upper
GROWTH	Equal variances assumed	3.576	0.060	0.279	243	0.780	0.0205	0.0736	-0.1244	0.1655
PROFITABILITY	Equal variances assumed	2.868	0.092	0.201	241	0.841	0.0030	0.0150	-0.0265	0.0325
PRODUCTIVITY	Equal variances assumed	2.154	0.144	0.755	214	0.451	0.0938	0.1243	-0.1511	0.3388

Given the above outcome, further interrogation of the nature of investment in periods of economic uncertainty was undertaken to understand whether this was likely to have a greater impact on financial performance. This data was collected via the online survey, which requested firms to identify the nature of their investment in particular years, classifying it as purely expansionary or an upgrade in technology (to enhance efficiencies). Investment spikes in years of prevalent economic uncertainty were classified in this manner, and the results for each of the tests are presented in Appendix A. This iteration yielded similar results to those presented above: investment spike behaviour when classified by type does not appear to differentiate long run financial performance of the companies forming the sample.

Overall, the results presented above suggest that, while macroeconomic uncertainty may have a negative impact on investment, the relationship is relatively weak. In addition, firm-level factors are not directly associated with whether a firm chooses to invest in periods of uncertainty, although profitability may be a potential indicator of a likely investment spiker: that is, heightened profitability may render the relevant firms less



susceptible to the negative impacts of uncertainty. Finally, there is little evidence to suggest that investing in one time category over another, results in heightened financial performance. To understand these outcomes in more detail, the following section explores the qualitative data in parallel.

## 5.7. Qualitative results

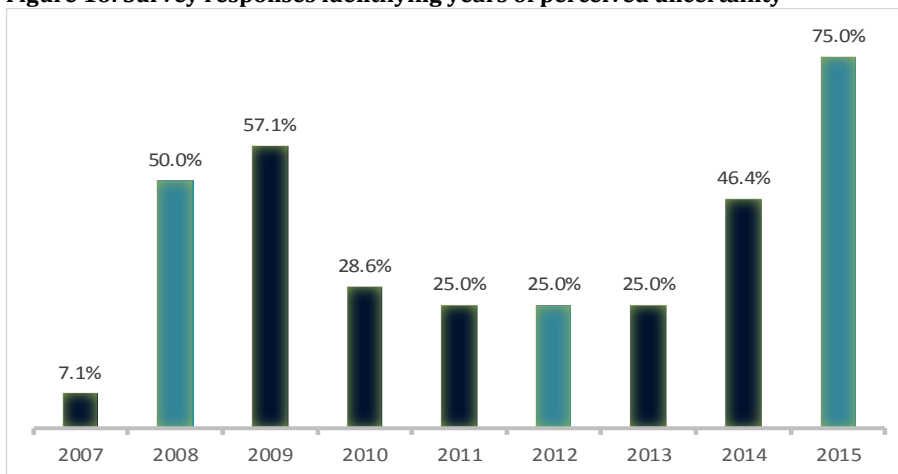
The qualitative findings discussed below draw on the survey results, collected independently via an online portal by a senior decision-maker within each firm. CEOs and CFOs were targeted to ensure responses were a true reflection of the investment rationale of each firm. Of the 28 firms, 50% of responses came from CEOs, 18% from CFOs or Group Accountants, 14% from MDs, and 14% from other senior decision-makers within the business, suggesting a reasonable level of validity of the responses.

Given the nature of the study, it is important to note the impact of access to investment incentives as a driver of investment activity. The sample of firms is heavily weighted in favour of manufacturers of clothing, textiles and automotive components. These firms are supported nationally by sector-specific projects that aim to increase investment. In addition, support mechanisms are also available to drive investment for manufacturing more generally. Of the 28 firms, only six had never accessed an investment incentive, and of the remaining 22 firms that had, exactly half indicated that they would not have made the investment without access to the support available via national government. This suggests that the capital expenditure levels described in the previous subsection, as well as the investment spikes that indicate non-maintenance related investment activity, are likely inflated, and potentially even more so in the periods of uncertainty identified above. While none of the respondents that completed the questionnaire indicated making use of investment support during the 2008 period, prolific use of investment incentives is cited from 2011 onwards. This is an important consideration when viewing macroeconomic uncertainty, where investment support mechanisms may alleviate some of the pressure associated with the business environment and spur investment levels at companies, irrespective of the conditions at hand.

Another important consideration in respect of the use of survey data is the inherent biases that manifest when respondents are required to report perceptions retrospectively. In the case of the survey employed for this study, firms were asked to recall the years between 2006 and 2015 in which they experienced macroeconomic uncertainty most intensely. A frequency plot of their responses is presented in Figure 16. Respondents identified episodes of uncertainty as being most prolific in 2015, followed by 2009 and

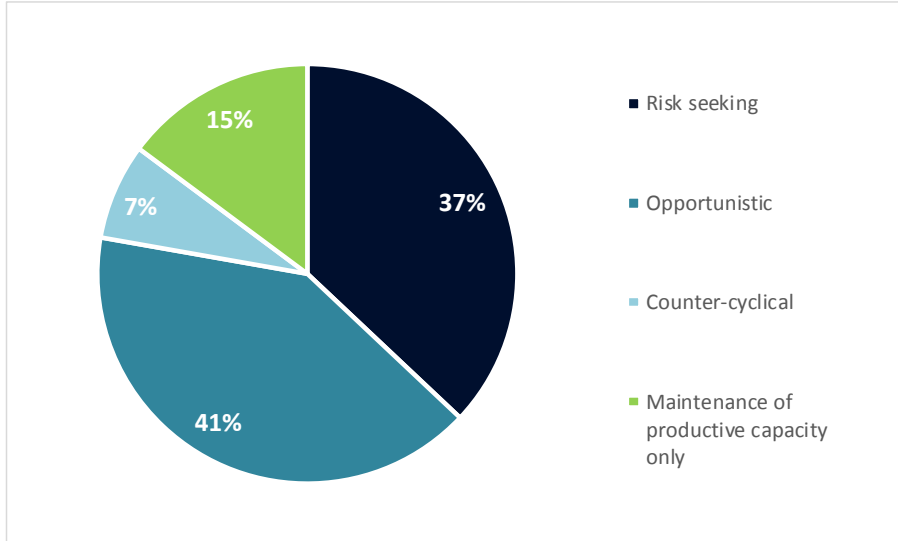
2014, in turn. This highlights three points of consideration. First, the weighting of 2015 as the most significant period of macroeconomic uncertainty demonstrates recall bias: respondents tended to evoke the effects of the most recent macroeconomic events with more emotional rigour than they did events from the more distant past. Second, the 2008 period of macroeconomic uncertainty identified by the uncertainty index demonstrated above manifests as a 2009 experience for firms. This potentially validates the lagged impact of uncertainty on investment, as discussed in relation to the quantitative findings presented above. Third, the 2012 uncertainty spike identified by the composite index in Figure 3 and Figure 4 does not feature in the minds of investment decision-makers as a period in which unforecastable macroeconomic considerations impacted on capital allocation activities. Discounting the potential recall bias in this regard, this subjective response reiterates the finding that prolonged periods of uncertainty are more impactful on the decision-making processes of the firm. Short periods of uncertainty as experienced in 2012 do not appear, either quantitatively or perceptively, to impact on investment decision-making outcomes. This is in line with the literature review findings presented above.

**Figure 16: Survey responses identifying years of perceived uncertainty**



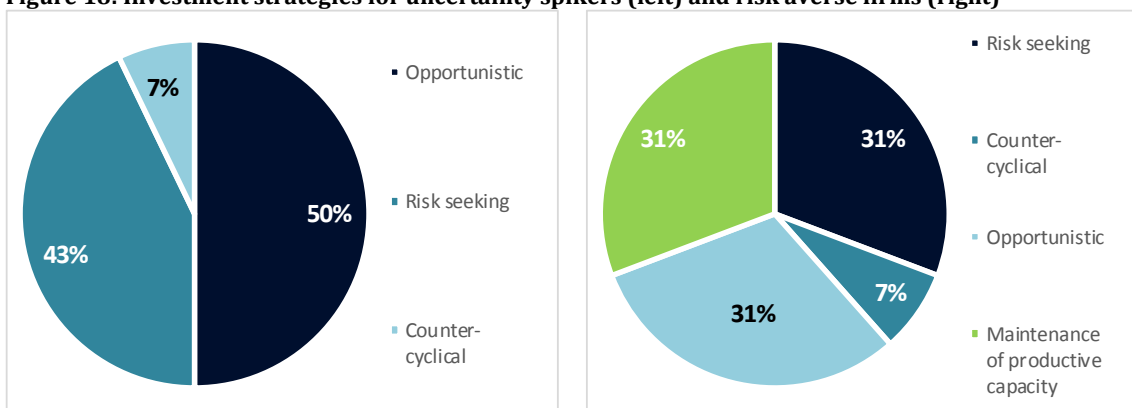
Firm-level acknowledgement of macroeconomic uncertainty as a factor impacting on investment decisions begs the question of what firms identify as their investment rationale more generally, and if these motivations change when firms are unable to forecast returns on potential projects. Figure 17 captures the split of investment strategies across firms. Most manufacturers in the sample are opportunistic insofar as they are willing to invest only if feasible and favourable opportunities are presented. This is followed by what are classified as risk-seeking investors, where respondents indicated their active interest in seeking out investment opportunities of an expansionary nature.

**Figure 17: Identified investment strategies of firms, based on survey response data**



Only a very small component of the population considered countercyclical investment or investment purely aimed at maintaining productive capacity as viable investment strategies for the future. Interestingly, this latter category exists only for risk-averse firms that have not invested during the identified periods of uncertainty. Investment in the case of such firms is performed as and when required to maintain current capacity, and as such correlates with the findings above: risk-averse firms (identified quantitatively) tend to identify themselves as such when commenting on their own investment objectives and rationale. By contrast, uncertainty spikers within the sample tend to value opportunistic investment strategies; a strategy that carries inherent risk. The differentiation in the investment strategy profiles of the defined cohorts are presented in Figure 18 below.

**Figure 18: Investment strategies for uncertainty spikers (left) and risk averse firms (right)**



Qualitatively, however, respondents also indicated that manufacturing investment in South Africa is necessarily aimed at “improv[ing] productivity in order to improve cost competitiveness and quality consistency... [thereby facilitating] the introduction of new more cost competitive product to substitute existing products”. This is considering the need for manufacturers to recognise a broader context of global competitiveness,

irrespective of which market a firm is supplying into. Respondents identified the importance of remaining globally relevant, and the shortcomings of not continuously improving efficiencies to reach and maintain performance in line with international benchmarks. In the absence of volume growth in the domestic (and international) market, the most effective way of growing profitability is identified through efficiency enhancements to production processes. This requires continuous investment in technology upgrading and systems, to be able to drive price down in line with global competition. As such, the nature of investment is associated with bringing in newer machines that are more energy-efficient; less resource-intensive; and that align capabilities with global market requirements. This type of investment is likely to be continuous and less “lumpy” than expansionary investment episodes.

Overall, only four of the 28 sample firms indicated that they would alter their investment strategy in the context of heightened macroeconomic uncertainty; and three of these four firms were classified as risk-averse firms. However, all firms were asked about their likely response to unpredictability in their respective business environments. In their responses, the term “uncertainty” appears to be conflated with negative events such as losing an export market, in which case firms would “mothball” operations and initiate other capacity reduction interventions. Other responses included a focus on reducing investment during difficult periods, taking cost-cutting measures and affecting efficiency optimisation to sustain their businesses through “difficult” periods. Only one of the 28 firms articulated a defined strategy to “[continue] to actively seek out investment opportunities - specifically businesses in distress”. A single other firm indicated that they would “improve competitiveness... to replace imports... which represent a large percentage of finished product sold at retail”.

More generically, firms were asked to rank their likely response to uncertainty in their business environments, the responses to which are captured in Figure 19 below. The heavy weighting on capacity expansion reiterates the fact that 15 out of 28 firms are found to be uncertainty spikers in respect of investment, in line with the quantitative findings. This affirms the open-ended responses of some participants, indicating their desire to diversify in respect of geographical markets and product offerings to mitigate their risk profiles. Deferred investment was an option for 30% of the sample, followed by cash hoarding strategies (although some firms indicated that they were generally not able to hoard cash in times of uncertainty or firm-level distress). Only one firm indicated disinvestment as a response to macroeconomic unpredictability.

Figure 19 presents an interesting contradiction to the quantitative analysis presented above, however. Given the negative (albeit weak-to-moderate) correlation between uncertainty and investment, firms' citation of capacity expansion as a reaction to macroeconomic uncertainty is unexpected. This was largely the response of firms indicating a related need to diversify their market offerings (for example, import substitution) to keep production running and hence, weather the proverbial macroeconomic storm. In this regard, expansion was associated with "build[ing] sustainability". Quantitatively, however, this did not translate into investment spikes of the magnitude with which this study is concerned. Capacity expansion in the context of unforecastability is potentially moderated, then, by the firms that claim this response as a reaction to heightened uncertainty.

**Figure 19: Survey responses regarding how firms handle uncertainty**

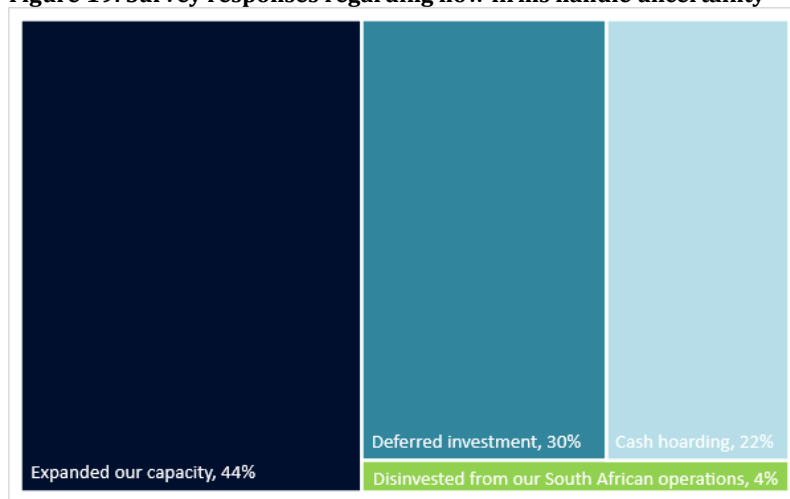
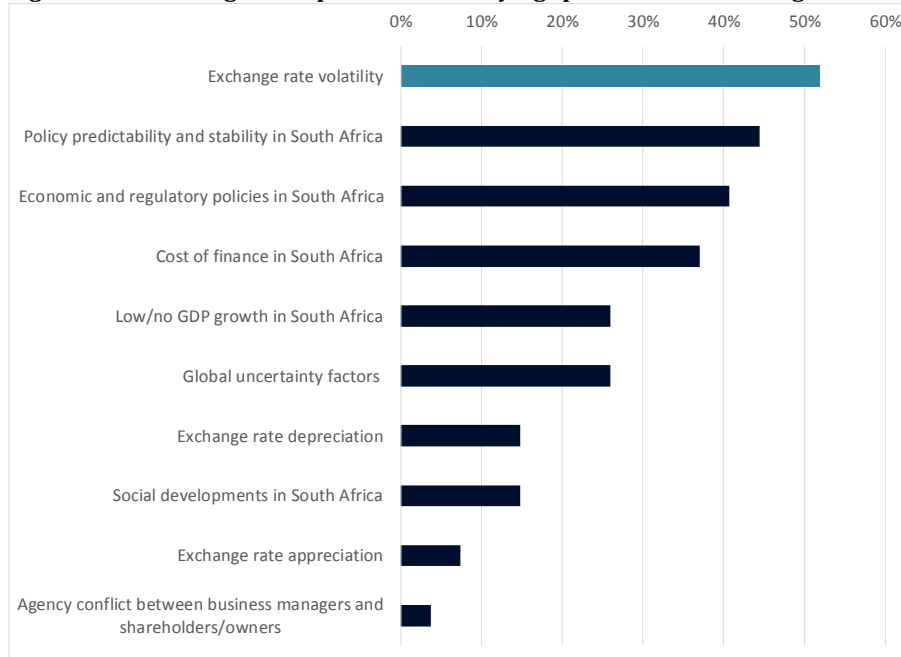


Figure 20 presents the ranking of factors likely to deter a firm from investing, based on a selection of factors arising as key drivers of macroeconomic uncertainty. These factors were determined by analysing the SARB Quarterly Bulletins used to construct the word frequency component of the macroeconomic uncertainty index. Respondents highlighted exchange rate volatility as a key driver of uncertainty hindering productive investment in the real economy. This is likely to be associated with the high import content of South African manufacturing operations, as well as the export market exposure that appears to be a key risk diversification strategy for firms in South Africa. Policy predictability, political stability and economic and regulatory policy stability were indicated as close followers in terms of their potential impact in deferring investment in the productive sector.



**Figure 20: Percentage of respondents identifying specific factors serving to defer an investment**



However, Figure 21 reveals some stark differences in respect of prioritisation of uncertainty factors between the cohorts. As can be seen, the largest gaps exist in respect of economic and regulatory policy stability (a highly rated factor for uncertainty spikers, and one of lower priority for risk-averse investors), and similarly for policy predictability and stability. The below results suggest some clear differences between the cohorts, particularly insofar as uncertainty spikers are most concerned with exchange rate volatility and economic, regulatory and political predictability and stability, while risk-averse investors are prioritising concerns related to exchange rate volatility, low/no growth in the South African economy, and cost of finance in South Africa.

These findings suggest that uncertainty spikers exhibit a higher appetite for risk relative to risk-averse firms; the former appearing to look outwards for markets (given their lack of concern for domestic growth forecasts), and potentially placing less reliance on external financing sources. That is, uncertainty spikers appear more willing and able to allocate their own capital, rather than having to source external financing. By contrast, risk-averse firms are severely concerned by domestic constraints, with respondents also indicating that while they are willing to invest in new technologies, these were typically “evolutionary” rather than “revolutionary”. In respect of expansion, international market opportunities were cited by some respondents as “not a strategic priority”, preferring to focus on more familiar domestic opportunities.



**Figure 21: Percentage of respondents identifying specific factors serving to defer an investment between cohorts**



Finally, decision-making mechanisms within the firm were interrogated in respect of drivers of the investment decision. Table 14 indicates the overall ranking of responses, where firms are heavily swayed by shareholder interests, as well as senior management’s “gut feel” in terms of making allocations of capital. At a disaggregated level, shareholders’ interests are a stronger driver of uncertainty spikers, while risk-averse firms are concerned about whether the project can secure external capital; a constraint to investment at a firm level. For both groups, South Africa’s GDP growth forecast is the least concerning factor when it comes to allocating capital to productive projects, although it is still considered “somewhat important”.

**Table 14: Respondents’ perceptions on what drives capital allocation decision-making**

	Not at all important	Less important	Somewhat important	Important	Very Important	N
Senior management's "gut feel"	2 8.3%	4 16.7%	6 25.0%	12 50.0%	0 0.0%	24
Shareholders' interests	1 4.0%	2 8.0%	2 8.0%	8 32.0%	12 48.0%	25
Timing of project cash flows	1 3.8%	2 7.7%	4 15.4%	13 50.0%	6 23.1%	26
Whether the project requires external capital (versus funding with internal funds)	3 13.0%	2 8.7%	3 13.0%	10 43.5%	5 21.7%	23
Protecting market share	1 4.3%	5 21.7%	5 21.7%	8 34.8%	4 17.4%	23
South Africa's GDP growth forecasts	0 0.0%	6 27.3%	8 36.4%	5 22.7%	3 13.6%	22

## 6. Discussion of the results

This study was premised on the assumption that when capital-intensive firms are nervous of investing, primarily due to risk perceptions, there is an incentive to delay investment in expectation of more favourable conditions in the future (Gulen and Ion, 2013). This is because a lack of perfect information regarding future profitability creates an incentive to wait to receive more data. However, the literature has also cited the development of numerous Fortune 500 companies during recessionary conditions. This suggests that investment decision-makers are capable of perceiving opportunities in organic, competitive dimensions, resulting in countercyclical investment events (Stangler, 2009). Furthermore, countercyclical investment may be in a firm's best interests: Bernanke (1983) highlights the potential benefits associated with achieving more favourable investment opportunities in recessionary periods, as discussed above. To this extent, macroeconomic variabilities and external factors do not directly inhibit investment; rather, it is the perceptions and abilities of business actors to infer the impacts on profitability that determines investment outcomes (Knight, 2012).

Nonetheless, manufacturing firms are particularly identified as concerned by macroeconomic uncertainty, given the capital-intensive nature of operations. The indivisible nature of physical capital renders such businesses susceptible to the irreversibility of the investment decision (Grazzi et al., 2013). In addition, firms with higher fixed-to-total asset ratios tend to experience higher adjustment costs than firms that are more labour-intensive in nature, awarding them less discretion to scale down capital to new optimums (Gulen and Ion, 2015). As such, manufacturing is the industry of focus for this research, assuming adverse effects of uncertainty on investment would be especially pronounced in this case. The research aimed to assess three dynamics of investment decision-making in relation to manufacturing, and the results are discussed in relation to each of the hypotheses, as set out below.

### 6.1. Macroeconomic uncertainty results in lower investment

Macroeconomic uncertainty is not a directly observable phenomenon, as highlighted by Jurado et al. (2015): economic decision-making is affected, not by the variability of conditions, but by the predictability of this variance. As such, the first challenge posed by the research was the development of a reasonable proxy to model its occurrence for the historical timeframe under investigation. A composite index of six equally weighted factors was constructed, including four macroeconomic indicators shown in the literature





to have a strong correlation with macroeconomic uncertainty. In addition, the index incorporated frequency word counts citing macroeconomic unpredictability in SARB Quarterly Bulletins for the period under consideration, and a business confidence index reported by the Bureau of Economic Research. The index was cross-validated against a similar index (Redl, 2015) to assess its appropriateness, and was found to align regarding identified periods of macroeconomic uncertainty in South Africa.

The index is striking insofar as it highlights the prolonged nature of the 2008/9 recession and accompanying period of uncertainty. It also indicates additional uncertainty peaks of relative brevity, such as in 2012. When modelled against the non-maintenance related investment activity of the sample, however, it is interesting to note the comparative lag on the investment profile of the sample, with the full effects of the 2008 uncertainty peak only apparently felt in 2010. In 2011, the uncertainty index peaks, but also experiences a rapid return to more favourable levels, and the investment profile reacts positively in the corresponding year. Investment continues to rise to its zenith in 2013, in response to more predictable economic conditions. It drops off thereafter, however, despite continued improvements in the index to the last quarter of 2015.

This behaviour may be indicative of what Cooper and Haltiwanger (2005) refer to as the trigger-level of capital stock, where firms adjust their capital in sporadic bursts if it falls below an identified point, such that the difference between the desired and actual capital stock of the firm is significantly large (Doms and Dunne, 1998). Given the decline of non-maintenance related investment between 2008 and 2010, it is likely that this capital decline would have triggered a surge in investment in the years that followed. Conversely, the high levels of investment in 2013 may have motivated firms to maintain their capital at a given level and reduce investment spikes, irrespective of developing stability in the economy. This suggests that, contrary to the supposition of Bernanke (1983), managers cutting back on investment spending during recessions do notice their transition to a lower level of capital intensity. This evidence suggests that managers are potentially aware of their capital stock position, and act accordingly to maintain it at a defined optimum level. In prolonged recessionary periods, macroeconomic uncertainty may however result in altered investment behaviour where decision-makers are forced to act on highly incomplete information indefinitely.

Although 2012 is identified as a period of uncertainty by the index, it is relatively short-lived. In addition, the index is experiencing a downward slope at the time of its occurrence, implying that the absolute level of uncertainty declined during this time. In response, investment spikes appear to increase in frequency in 2013, in reaction to this



overall positive market signal. However, it is interesting to note the steady decline in investment thereafter, irrespective of the reduction in macroeconomic uncertainty to very low levels through to the final quarter of 2015. Once again, Cooper and Haltiwanger's identification of a firm's trigger level of capital stock may have weight: by this explanation, capital stock levels are optimised and investment normalises after the aggregate sample spike in 2013, irrespective of record-low levels of macroeconomic uncertainty.

Statistical analysis of the data partially corroborates these findings. The weak-to-moderate negative correlation that exists between investment spikes and the uncertainty index suggests that other factors are at play in determining the nature of investment of South African manufacturing firms. Importantly, firms will sink capital as and when there is reasonable certainty regarding their ability to achieve additional returns. Irrespective of macroeconomic conditions, then, firms will look to capitalise on markets where these materialise. As such, this study provides evidence to suggest that the null hypothesis of the first research question cannot be rejected, stated as previous:

*Null Hypothesis (1):*  $H_0 = 0$ , Heightened macroeconomic uncertainty results in lower levels of capital investment in a sample of South African manufacturing firms.

*Alternative Hypothesis (1):*  $H_1 \neq 0$ , Heightened macroeconomic risk does not result in lower levels of capital investment in a sample of South African manufacturing firms.

However, it is important to note the caveats associated with this result: the correlation is a relatively weak one, and suggests that other factors, such as market developments and the existing capital stock may have a greater bearing on the investment outcomes of the firm. That said, there are additional firm-level factors that have the potential to impact on these manufacturers' investment profiles, and this becomes a particularly interesting question, given the non-response of the investment spike trend to a lull in the uncertainty index after 2013. This is the subject of the second hypothesis.

## **6.2. Firm-level heterogeneity impacts businesses' investment rationales**

Doms and Dunne (1998) showed that capital adjustments vary by firm or plant level characteristics such as industry, size and ownership. In the case of smaller firms, investment spikes tend to be larger and less frequent, given the indivisible nature of capital equipment: a new machine purchase of a small firm represents a proportionally higher share of its capital stock than that of a larger firm. Conversely, some industries

find it easier to adjust capital more smoothly. Grazzi, et. al (2013) furthermore provide evidence that firms' investment decisions are sensitive to changes in their ability to self-finance, implying an innate sensitivity to the cost and availability of external financing. Thus, firms are more likely to invest when their financial conditions are healthy. Based on these previous works, the identified factors of firm-level heterogeneity were modelled in a logistics regression that aimed to predict the probability of whether a firm belonged to the uncertainty spiker group of firms, or the risk-averse investor firms.

The findings resulting from the regression analysis suggest that firm-level heterogeneity has a smaller role to play in determining the investment strategies of South African manufacturers in the specific context of macroeconomic uncertainty. Nonetheless, the descriptive statistics produced on uncertainty spikers and risk-averse investors have highlighted some differences between the groups. Uncertainty spikers tend to be smaller firms, with lower levels of overall capital expenditure (measured as a percentage of sales). This is an interesting finding, given that the same set of firms is also more capital-intensive than their risk-averse counterparts, and typically more profitable at an operational level. An analysis of the averages also suggested that uncertainty spikers were more successful at growing revenue.

Despite these observed differences, the logistics regression modelling the extent to which these firm-level factors determined membership to one group or the other, did not provide statistically significant results. Only operating profitability could be identified as (marginally) statistically significant. This aligns somewhat with the findings of Grazzi et al. (2013) regarding the link between the financial health of the firm and investment. In the context of this study, higher profitability is found to result in a heightened ability to maintain investment through periods of uncertainty. Interestingly, the qualitative findings hint at a similar point: risk-averse firms (on average, the less profitable firms) were significantly more likely to identify cost of finance as a deterrent to investment than uncertainty spikers. It is likely that in times of uncertainty, less profitable firms are less able to demonstrate viability to external lending institutions, in turn less likely to lend to capital-intensive projects when the investment is at least partially irreversible, or associated with adjustment costs (Dixit and Pindyck, 1994). The link between financial health and access to external finance is thus an important consideration impacting on the investment profiles of firms in the sample. As such, the qualitative findings resulting from the survey add weight to the quantitative findings; that profitability and financial health result in a stronger investment profile during periods of uncertainty.

The set of hypotheses developed to address the question of whether firm-level heterogeneity impacts on investment are presented below:

*Null Hypothesis (2):*  $H_0 = 0$ , Firm-level heterogeneity in respect of industry, capital intensity (fixed-to-total asset ratios), and governance structure, impact on firms' investment decisions in periods of uncertainty.

*Alternative Hypothesis (2):*  $H_1 \neq 0$ , Firm-level heterogeneity in respect of industry, capital intensity (fixed-to-total asset ratios), and governance structure do not impact on firms' investment decisions in periods of uncertainty.

Based on the quantitative results, one should reject the null hypothesis in favour of the alternate hypothesis. However, the qualitative results nuance this outcome, given the prominence of external finance factors in determining the investment patterns of risk-averse firms; also the less profitable cohort in the sample. The results thus allow for the conclusion that, while the quantitative results are not strongly in support of the literature, financial performance may have a greater impact on whether a company continues to invest in periods of macroeconomic uncertainty than what is indicated. Where external financing options are costly or unavailable (that is, financial frictions are present), investment opportunities may be jeopardised for affected firms (Gulen and Ion, 2015).

### **6.3. The impact of investing in periods of uncertainty on financial performance**

If profitability has a significant impact on a firm's ability to invest during adverse or unpredictable economic conditions, does this result in a self-generating cycle of increased profitability and revenue growth in the long run? A key point of investigation of this study was to understand whether risk-averse investment behaviour resulted in differentiated long run financial performance for firms in the sample. The literature suggests several risk-averse investment strategies typically employed by firms attempting to reduce the impact of uncertainty on their investment activities. Companies may hoard cash to protect against adverse cash flow shocks (Gulen and Ion, 2015). Alternatively, firms looking to meet their profit objectives in the face of unforecastable growth and demand conditions might accept the opportunity cost of early returns in exchange for the additional information that deferring investment potentially affords.

The quantitative results presented in the previous chapter indicate that there is little evidence to support the notion that investments timed to coincide with periods of uncertainty have differentiated outcomes in respect of long run financial performance. Despite the literature indicating the importance of timing, irreversibility and uncertainty in

the investment decision-making process, the conditions and periods under which investments take place appear to have very little impact on the financial outcomes of the firms in the sample.

Qualitatively, risk-averse investors were significantly more likely than uncertainty spikers to identify their investment strategies as purely maintenance-related. While they are equally as likely to undertake what they perceive to be risk-seeking or opportunistic investment; quantitatively, this appears to be less true than in the case of uncertainty spikers. What is clear, however, is their higher levels of capital expenditure as a percentage of sales overall. These qualitative findings therefore corroborate the quantitative outcomes: risk-averse investors are better at smoothing out their investments over time, with this type of investment likely to be dedicated to maintenance or efficiency-enhancing investment activities.

Open-ended feedback from risk-averse cohort members further reiterated this outlook: investment in new technology was considered “not revolutionary”, and expansion appeared to remain focused on the domestic market. Risk-averse firms in the sample were also more concerned with domestic growth prospects, while this did not appear to be a major concern for uncertainty spikers. In the case of the latter, the trend appeared to be a stronger focus on finding external markets, if not external investment opportunities. This is corroborated by their greater focus on exchange rate factors as deterrents of investment.

In respect of the relevant hypothesis statement, which was stated as follows:

*Null Hypothesis (3):*  $H_0 = 0$ , Deferring investment in periods of high macroeconomic risk results in better financial performance in the long run, relative to less conservative investment strategies.

*Alternative Hypothesis (3):*  $H_1 \neq 0$ , Deferring investment in periods of high macroeconomic risk results in worse financial performance in the long run, relative to less conservative investment strategies;

The quantitative research findings lead to a rejection of the null hypothesis in favour of the alternative hypothesis. This is due to the outcome that investment timing, insofar as it coincides with periods of macroeconomic uncertainty, does not appear to impact on long run financial performance.

Nonetheless, the extent to which firms maintain their capital stock does, in fact, demonstrate some relationship with profitability. The lack of statistical significance produced by the above tests required a more foundational understanding of the link between the investment profiles of the firms in the sample, and their associated long run financial performance. Simple correlation coefficients were calculated in Microsoft Excel to understand the relationship between average capex as a percentage of sales, and financial performance over time. Capital expenditure as a percentage of sales has a correlation coefficient of 0.626 with operating profitability, suggesting a moderately strong, positive relationship between these variables for the overall dataset. In relation to revenue growth, the coefficient of correlation is weakly positive for the overall dataset, at 0.018. While these results do not suggest causality, the relationship between operating profitability and investment is clear.

Open-ended feedback once again provides some clarity in this regard. The nature of manufacturing in South Africa is not aimed at achieving innovative outcomes and winning market share, given the limited size of the domestic (and regional) demand opportunities. Rather, South African firms are investing to remain cost competitive in their respective supply chains. As such, the nature of manufacturing investment is focused on achieving greater production efficiencies relative to global competition. If this is indeed a true reflection of the status of manufacturing investment in South Africa, then Dixit and Pindyck's (1994) supposition, that opportunities to sink capital can be considered more valuable than the capital a firm has already sunk, presents a sounding bell for the future of the local industry.

Based on the findings of this research, South African firms are not assuming the frequency of high-risk investment undertakings required to reinvigorate the sector. Rather, investment appears to be focused on sustaining operations, and not particularly motivated by a desire to scale up revenues or margins. To refer to several qualitative responses to the survey, even expansive investments were classified as exercises in sustainability rather than aggressive moves to grow market share. This research identifies low profit margins and high costs of capital as key drivers of this outcome. Thus, in addition to the trigger-level of capital identified above as a potential factor determining investment outcomes, leaner profit margins and costs of finance may have rendered firms non-responsive to the improved conditions regarding economic predictability after 2013, as demonstrated in Figure 5 above.



## 7. Conclusion

This study has employed a small sample of South African manufacturers to provide evidence of the link between macroeconomic uncertainty and non-maintenance related investment, with an investigation of the implications for long run financial performance. The mixed methods approach implemented to conduct this analysis sought to build on the large body of quantitative work that has been compiled on the general topics of investment and macroeconomic uncertainty to date. By developing qualitative themes based on codified survey questions and open-ended responses, the research has sought to nuance the results presented by the quantitative findings, and provide greater depth of understanding of the drivers of manufacturing investment in South Africa's typically unpredictable economy.

Manufacturing is a key stimulus of the real economy in South Africa, and has seen a dramatic decline in activity over the past decade. As an endangered sector in South Africa, an understanding of the motivating factors for investment (or lack thereof) is therefore key to determining its continued viability in the years to come. The investment spike activity demonstrated over the past ten years (which includes larger scale investments for technology upgrading and expansion of productive capacity) suggests that a prolonged state of macroeconomic uncertainty initiated by the global financial crisis in 2008 has exacerbated a seeming decline in the number of viable investment options for industrialists in the country. In a climate of declining domestic demand, exchange rate volatility and high costs of finance, this research suggests that industrial experiences have spanned the mothballing of plants, and investment aimed at enhancing cost competitiveness, rather than serving new markets or developing innovative new product offerings. The latter is a particularly important oversight, given that margins are more likely to be supported by new value propositions in additional markets, rather than a cost-focused approach.

As such, even as macroeconomic conditions have become more predictable, investment appears to have declined, rather than responding as it should; with renewed investor confidence and an increase in investor spike frequency in the latter years toward 2015. Rather than investing for growth and expansion, domestic firms appear to be adopting investment strategies aimed at sustaining their viability in the short to medium term. The rationale behind this type of behaviour is partially explained by Grazzi et al. (2013), who identify that abnormal investment events correlate positively with the rate of GDP growth. This was confirmed in the qualitative responses of survey participants. This perspective highlights that firms "synchronise their investment decisions in reaction to aggregate

shocks: they invest more frequently during periods of expansion than during periods of contraction” (Grazzi et al., 2013: 6). In line with this evidence from the authors’ sample of European manufacturing entities, the lack of growth opportunities offered by the current domestic economy suggest that investments by South Africa’s manufacturing result in reduced opportunities to sink capital, while diminishing profit margins and financial frictions limit firms’ abilities to do so.

## 7.1. Principal findings

The evidence generated by this research supports the existence of a moderate, negative relationship between macroeconomic uncertainty and investment spike activity for the firms in the sample. This aligns in part with the broad body of literature reviewed above, documenting the effects of uncertainty on investment, and its negative consequences for economic growth (Bernanke, 1983; Gao, Harford and Li, 2013; Gilchrist, Sim & Zakrajsek, 2014; Gulen and Ion, 2015; Jurado, Ludvigson and Ng, 2015). As cited by Langlois and Cosgel (1993), because investment decisions are forward-looking in nature, uncertainty impairs a firm’s ability to predict future profitability of an investment. In addition, the literature highlights financial frictions as more common when uncertainty pervades the business environment. Given these conditions, and the decline in investment spike activity of South African firms after 2013 despite greater predictability in the macroeconomy, there is evidence to suggest that firms are potentially adjusting their trigger-level of capital to a new optimum. Based on the qualitative findings of this research, this new optimum could be one aimed at sustaining operations, rather than creating innovative opportunities for margin and revenue growth in the long run. Acknowledging the non-representative sample size, the research therefore indicates an increasingly unresponsive industry concerned with maintaining its current levels of competitiveness through efficiency-enhancing investments. The result is a general smoothing of the investment profile of the sample firms at lower, maintenance-related investment levels.

While the research aimed to identify factors of firm-level heterogeneity that might motivate whether firms invested countercyclically or not, the findings were relatively nominal insofar as only profitability was (marginally) positively associated with this type of investment profile. By contrast, factors such as ownership status (that is, whether a firm is listed publically or not), firm size, capital intensity or revenue growth were not found to be statistically significant in driving this relationship. This is nonetheless an important finding, awarded greater depth of understanding by the qualitative insights provided by survey respondents. Where uncertainty spiker investment profiles exist,





higher profitability appears to be supporting these firms' abilities to self-finance in a resource-constrained environment. As such, risk-averse firms are potentially misclassified in this regard, and could be considered less "cautious" and more "financially-strapped". This is supported by firms' responses to potential cash-hoarding strategies as a means of mitigating the effects of uncertainty on their businesses. Decision-makers stated plainly that there was "no cash" to hoard. The resulting "invest to survive" philosophy that appears to be relatively commonplace within the sample is therefore more or less born of necessity, rather than design.

It is therefore less surprising that financial performance is not influenced by the timing of investment activity. Firms' investments are focused on sustaining operations (even expansionary investment in uncertain periods is identified as such). Revenue growth is furthermore under pressure in a shrinking domestic market, while profitability is increasingly strained. Firms are thus only in a position to maintain their investment profiles in periods of economic uncertainty when profit margins allow them to do so. Given that such periods are correlated with higher costs of finance, firms that cannot self-finance, or at least demonstrate their viability to external financiers, will find their investment profiles compromised.

## **7.2. Implications for management**

Capital-intensive sectors such as manufacturing require continuous investment to remain competitive, given their positioning in global value chains. The difficulty of sourcing an appropriate sample for the purposes of this research provides a case in point: almost all manufacturers located domestically have diversified their investment footprints and market exposure away from a purely localised presence, or are looking to do so in the near future. Increasingly, the profile of South African manufacturers is international. Participants in the study acknowledged this reality: competitiveness was assessed in relation to globalised supply chains, and as such, investment was identified by several respondents as a means of becoming increasingly efficient to remain cost competitive.

However, firms' abilities to maintain and grow market share, both domestically (against imports) and internationally, additionally require larger-scale ramp-up investments for the firm to remain not only viable, but relevant. These may be purely expansionary, assisting the firm to serve greater volumes, achieve scale economies, and thus achieve greater efficiencies (and improve margins). Alternatively, these may be aimed at upgrading existing technologies, by which the firm can innovate their product offering and thus

achieve market premiums, or by innovating their processes such that they are productively efficient and thus more cost competitive.

This research has implicated the potentially waning ability of South African manufacturers to service larger-scale investments of this nature, following a prolonged period of macroeconomic uncertainty. The long-term implications of lacklustre investment in a sector with technology and capital requirements of this nature therefore has implications for South African businesses in respect of their abilities to maintain global momentum. This research has highlighted the importance of generating sufficient margins and profitability to support investment at this level.

South African manufacturers, under pressure to maintain domestic (and international) market share, have potentially adopted an overly ambitious cost-down approach. This appears to have resulted in a weakened ability to fund technology and innovation advances, exacerbated by higher levels of macroeconomic uncertainty. Consequentially, South African managers may find themselves in compromised positions in respect of their investment profiles, even when macroeconomic conditions improve. The result appears to be a move to a lower trigger-level of capital, such that investment is largely aimed at enhancing efficiencies rather than larger-scale innovations and technological upgrading.

This scenario presents an unsustainable trajectory for South African manufacturing. These findings thus potentially challenge local management to attempt to source innovation and technology via partnerships and joint ventures to modify their market positioning and thereby achieve higher margins. Alternatively, there is opportunity to redefine value propositions based on non-price related factors such as lead time to market, the ability to deliver frequently and in full, and to produce a quality product; such that cost is less of a factor to the consumer or client. This is no easy task, given the current demand challenges facing the domestic market, and the foreign exchange volatility considerations confronting manufacturers attempting to penetrate international markets. Value chain alignment is required across suppliers, producers and end-consumers, to achieve this outcome effectively. Local business owners and managers are challenged to define new value propositions for their domestic operations; solutions that are in no way dependent on the ability of the firm to compete on price.

### **7.3. Limitations of the research**

The limitations of the research method have already been discussed in brief in Chapter 4 above. However, it is worth reiterating that the findings and corroborating



recommendations presented here are based on a relatively small, and thus non-representative, sample of South African manufacturing firms. While these findings are therefore considered to be a true reflection of the investment challenges and behaviour of these firms and decision-makers in the economic context of the last decade, they cannot necessarily be generalised to the broader population.

In addition, while every effort was made to identify manufacturers with investment footprints limited to the domestic economy, joint venture developments and multinational takeovers did limit the robustness of the sample in this regard. In general, this condition is upheld. However, domestic firms are increasingly looking to diversify their risk by seeking international allegiances, opportunities for acquisition, and access to technology. This latter development is considered a positive development, given the findings of this research. Nonetheless, international linkages and exposure in respect of investment profiles of firms is considered to have had a marginal contaminating influence on the sample.

Due to the time constraints associated with this research, and the triangulation method selected as the means of investigation, it was impossible to engage with individual firms through any method other than the concise online survey used as the qualitative data collection tool. In addition, this was the most likely method to receive a response from senior decision-makers within each of these companies. However, there are clear shortcomings associated with the lack of qualitative depth that can be achieved through a structured survey engagement only. Further research might look to address this limitation by conducting semi-structured and/or open-ended engagements with decision-makers to solicit greater richness of data from a qualitative perspective.

Finally, while this study set out to explore the relationship between macroeconomic uncertainty and the associated impact on investment, additional factors impacting on the behaviour of firms were identified during the qualitative research investigation. Modelling these additional factors (namely, GDP growth and an explicit measure of the cost of finance over time) into the quantitative analysis may have resulted in a more robust logistic regression model. Specific inclusion of these factors in further iterations of this study are recommended as an opportunity for further research, in addition to the following factors.

#### **7.4. Opportunities for further research**

A novel aspect of this research is the mixed methods approach employed to obtain senior decision-makers' responses on the topic of investment in the context of macroeconomic

uncertainty. Given that the study is conducted at a point in time, and requires respondents to reflect on historic events, the element of recall bias is a key concern of the research process. There are thus a number of ways in which further research may improve upon the findings produced here.

First, as mentioned previously, face-to-face engagements with respondents would allow for a greater level of probing in respect of investment decisions that would provide a deeper understanding of the motivations and drivers of particular investment outcomes. This approach might entail the identification of individual investment events per firm and study these in greater detail to produce a more nuanced understanding.

Second, it would be interesting to track the same set of firms and produce case studies on investment events as and when they occur. As highlighted by Graham et al (2015), individuals make investment decisions; not corporate entities. Having access to the individuals responsible for the investment event in question, rather than an individual that was not necessarily present at the time, is likely to result in more accurate findings.

This research has attempted to add to an understanding of manufacturers' investment decision-making in the context of South Africa's heightened levels of macroeconomic uncertainty. The implications of the findings presented above challenge managers in all sectors of the South African economy to consider the opportunities for greater value creation to secure and grow markets and market share, given the negative trajectory of growth and investment that dominates the current business landscape. To ensure profitability and hence, meaningful and sustainable investment in the real economy, South African firms should look for novel ways to source innovation and technologies to redefine their market positioning and achieve greater margins. Alternatively, there is opportunity for manufacturing entities to develop value propositions that focus on delivering quality products on shorter lead times, more frequently, rather than focusing purely on cost-down strategies to remain competitive. Innovative strategies that define new markets and innovative value propositions to support margin growth are the most likely solutions to a pivotal challenge to the success of the domestic economy.



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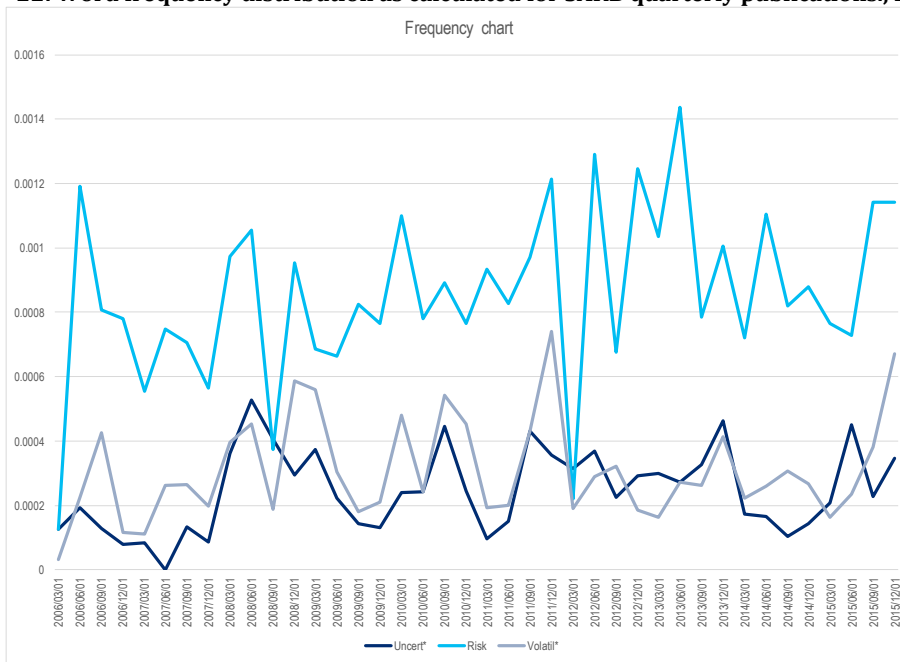
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## 9. Appendix A

### 9.1. Macroeconomic uncertainty index

22: Word frequency distribution as calculated for SARB quarterly publications., 2006 - 2015



### 9.2. Descriptive statistics

Figure 23: Investment profile by listing status

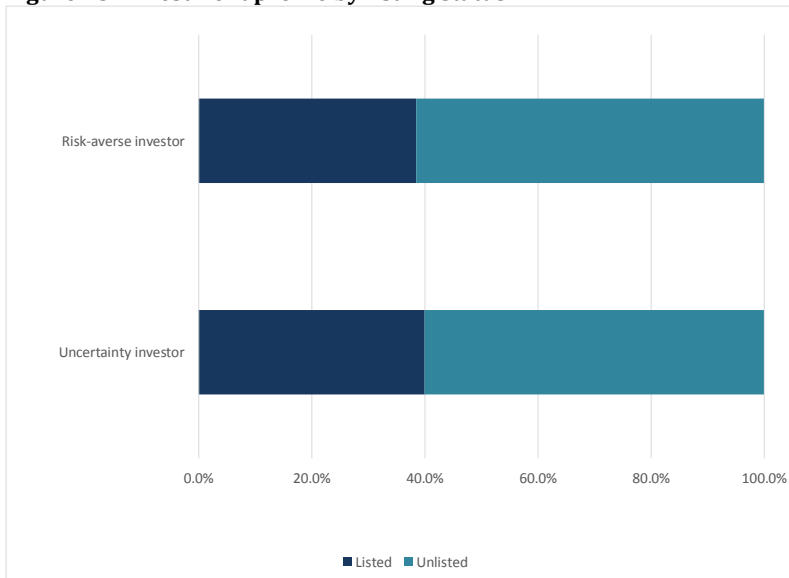




Figure 24: Uncertainty investor revenue growth performance, 2007 -2015

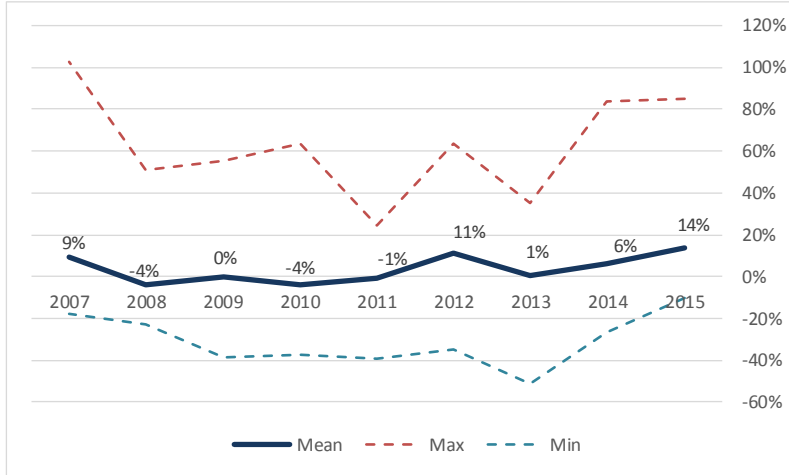
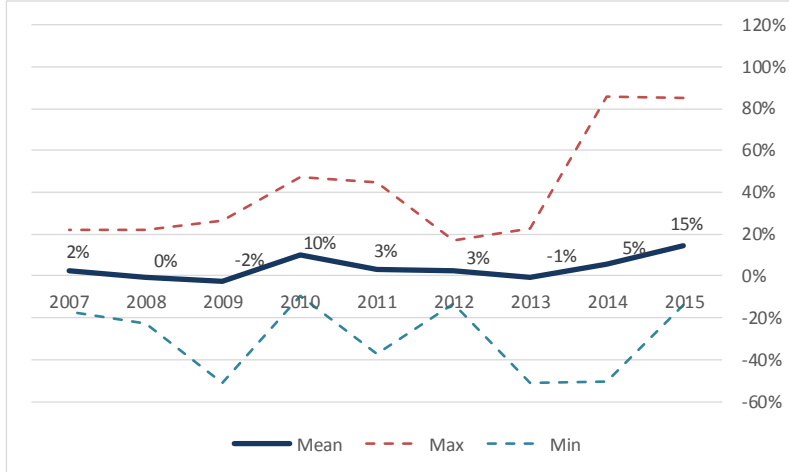
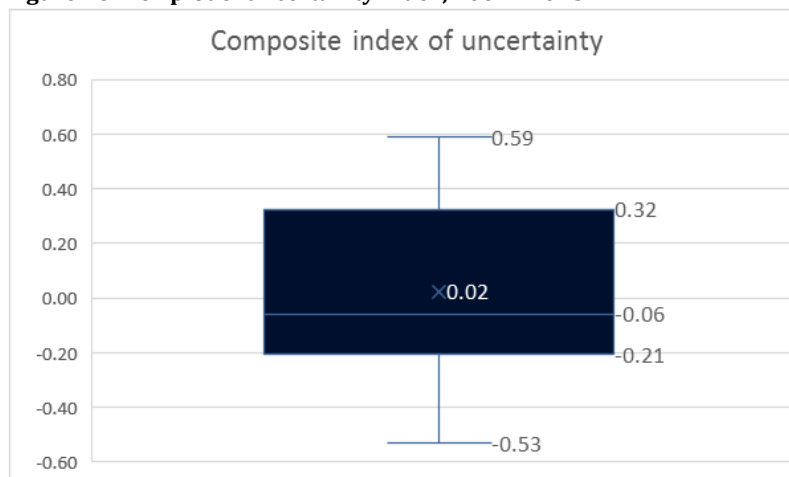


Figure 25: Risk-averse investor revenue growth performance, 2007 - 2015



### 9.3. Correlation analysis

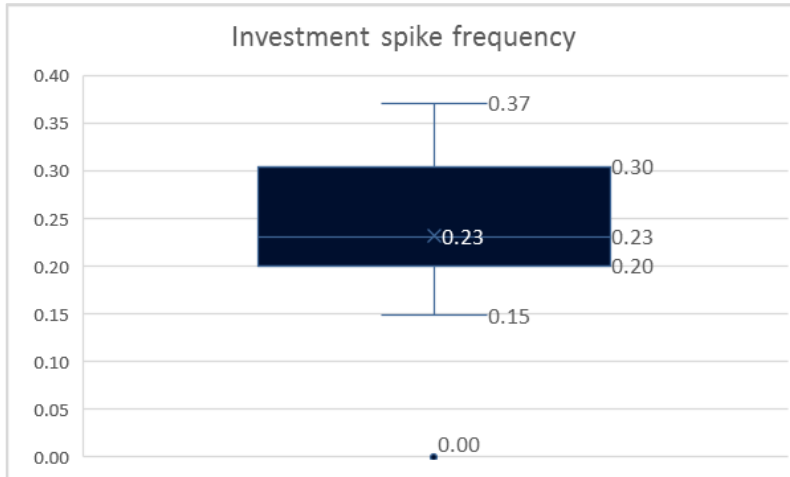
Figure 26: Box plot of uncertainty index, 2007 - 2015







**Figure 27: Box plot of investment spike frequency, 2007 - 2015**



#### 9.4. Tests for differences: Expansionary investment spikes and technology upgrading spikes

Expansionary investment spikes (that is, the addition of a site to the manufacturer's footprint, or expansion of existing facilities outside of maintenance-related activities) appear to improve the mean financial performance of uncertainty spikers in the case of both growth and profitability, but not in the case of productivity, where risk-averse companies are marginally more successful over time. These results are presented in Table 15.

**Table 15: Group statistics for expansive investment in macroeconomic uncertainty**

EXPAND		N	Mean	Std. Deviation	Std. Error Mean
GROWTH	1	115	0.0608	0.7982	0.0744
	0	130	0.0241	0.2135	0.0187
PROFITABILITY	1	116	0.0747	0.1354	0.0126
	0	127	0.0547	0.0914	0.0081
PRODUCTIVITY	1	105	0.7691	1.0139	0.0989
	0	111	0.8009	0.7574	0.0719

However, homogeneity of variance cannot be assumed for the data, as indicated by the p-values of less than 0.05 for the Levene's test for equality of variance, resulting in the relevant output in Table 16. As before, the t-statistics greater than 0.05 suggests once again that these differences between the means are attributable to chance.

**Table 16: Independent samples test for long run financial performance for expansive investment in macroeconomic uncertainty**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
GROWTH	Equal variances not assumed			0.478	128.433	0.633	0.0367	0.0768	-0.1152	0.1886
PROFITABILITY	Equal variances not assumed			1.338	199.212	0.182	0.0200	0.0150	-0.0095	0.0495
PRODUCTIVITY	Equal variances not assumed			-0.259	192.155	0.796	-0.0317	0.1223	-0.2730	0.2095



In the final output of Table 17 and Table 18, technology upgrading investment is modelled in relation to financial performance. Homogeneity of variances is assumed, although the results once again suggest that there is no statistical difference between the financial performance of the uncertainty spiker group and their risk averse counterparts.

**Table 17: Group statistics for technology upgrading investment in macroeconomic uncertainty**

TECH		N	Mean	Std. Deviation	Std. Error Mean
GROWTH	1	89	0.0130	0.6696	0.0710
	0	156	0.0574	0.5018	0.0402
PROFITABILITY	1	89	0.0616	0.1192	0.0126
	0	154	0.0657	0.1125	0.0091
PRODUCTIVITY	1	83	0.7982	1.1081	0.1216
	0	133	0.7775	0.7249	0.0629

**Table 18: Independent samples test for long run financial performance for technology upgrading investment in macroeconomic uncertainty**

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
GROWTH	Equal variances assumed	0.484	0.487	-0.588	243	0.557	-0.0444	0.0755	-0.1931	0.1043
PROFITABILITY	Equal variances assumed	0.069	0.793	-0.267	241	0.790	-0.0041	0.0153	-0.0342	0.0261
PRODUCTIVITY	Equal variances assumed	2.540	0.112	0.165	214	0.869	0.0206	0.1247	-0.2252	0.2664



## 10. Appendix B

### 10.1. Survey questionnaire

**Gordon Institute  
of Business Science**  
University of Pretoria

**Corporate Investment decisions**

Investment strategies of manufacturers in the context of macroeconomic uncertainty

I would appreciate your assistance in completing this survey, which requests your input on 15 questions aimed at understanding the key drivers of your company's investment decisions over the past ten years. The exercise should take no more than 20 minutes of your time.

\* 1. What is your company name?

\* 2. What is your position in the company?

CEO

CFO

Other (please specify)

\* 3. Has your company accessed any investment incentives (e.g. government grants, preferential loans) to assist in the allocation of capital to investment projects in the past ten years?

No

Yes: the investment **would have** been made without the additional support

Yes: the investment **would not have** been made without the support

If yes, please specify the year(s) in which these investments took place (eg. 2001, 2008, 2009):



\* 4. In the last ten years, has your company invested in the setup of additional sites in South Africa?

No

If yes, please specify the year(s) (eg. 2001, 2008, 2009):

\* 5. In the last ten years, has your company made investments to expand capacity at existing sites in South Africa?

No

If yes, please specify the year(s) (eg. 2001, 2008, 2009):

\* 6. In the last ten years, has your company made technology-upgrading investments in South Africa?

No

If yes, please specify the year(s) (eg. 2001, 2008, 2009):

\* 7. Indicate your company's general capital investment strategy in South Africa over the last ten years:

**Risk averse:** actively avoided allocating capital to investments at all costs

**Maintenance of productive capacity only:** no expansionary investments were considered

**Opportunistic:** did not actively look for opportunities to invest, but willing to invest if presented with a clear opportunity

**Risk seeking:** actively sought out investment opportunities of an expansionary nature

**Counter-cyclical:** investing during market downturns

Other (please specify)

\* 8. Have you deviated from this strategy over this time period due to an unforecastable macroeconomic shock?

No

If yes, please specify the year(s):



\* 9. Please indicate the years in which you recall South Africa experiencing high levels of **macroeconomic uncertainty**, defined as "volatility... that is **unforecastable** from the perspective of economic agents (i.e. analysts and business owners/managers)"

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Year	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

\* 10. Based on your answer to the question above, please also indicate your related investment strategies during these periods of uncertainty:

- Expanded our capacity
- Deferred investment
- Disinvested from our South African operations
- Cash hoarding
- Other (please specify)

\* 11. What are the key factors (if any) that have resulted in your company deferring / refraining from investing in a desirable capital project between 2006 - 2015?

- Low/no GDP growth in South Africa
- Cost of finance in South Africa
- Exchange rate appreciation
- Exchange rate depreciation
- Exchange rate volatility
- Policy predictability and stability in South Africa
- Economic and regulatory policies in South Africa
- Social developments in South Africa
- Global uncertainty factors
- Agency conflict between business managers and shareholders/owners
- Other (please specify)



\* 12. Under such circumstances, how has your company handled excess cash reserves:

- Dividend payments
- Held cash for a future opportunity
- Other (please specify)

\* 13. Amongst the management team, who has the most input in allocating capital to projects?

- CEO makes decisions without help from others
- CEO dominates decisions with limited help from others
- CEO shares decision making equally with others
- CEO makes decisions with extensive help from others
- Others make the decision

14. If all options were vested and exercised, what shareholding would be held by the CEO/business owner?

- Less than 1%
- 1% - 5%
- 5% - 25%
- 26% - 50%
- Majority shareholding



**\* 15. How important are each of the following factors in your allocation of capital for projects?**

	Not at all important	Less important	Somewhat important	Important	Very important
Senior management's "gut feel"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Shareholders' interests	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Timing of project cash flows	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Whether the project requires external capital (versus funding with internal funds)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Protecting market share	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
South Africa's GDP growth forecasts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Exchange rate volatility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Policy predictability and stability in South Africa	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Macroeconomic stability in South Africa	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Global uncertainty factors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



## 11. Appendix C

### 11.1. List of survey respondents

	Company	Sector	Ownership status
1	AECI	Chemicals	Publically listed
2	Argent	General industrials	Publically listed
3	Astrapak	General industrials	Publically listed
4	Bell Equipment	Industrial engineering	Publically listed
5	Bowler Metcalf	General industrials	Publically listed
6	EnX	Industrial engineering	Publically listed
7	Neway Power	Industrial engineering	Publically listed
8	Omnia	Chemicals	Publically listed
9	Mpact	General industrials	Publically listed
10	RCL Foods	Food producers	Publically listed
11	York Timber Holdings	Forestry and paper	Publically listed
12	Allwear	Clothing Manufacturer	Privately owned
13	Celrose	Clothing Manufacturer	Privately owned
14	DB Apparel	Clothing Manufacturer	Privately owned
15	Dyefin Textiles	Textiles	Privately owned
16	Falke	Textiles	Privately owned
17	House of Monatic	Clothing Manufacturer	Privately owned
18	Imraan Textile Mills	Textiles	Privately owned
19	Prilla	Textiles	Privately owned
20	Prestige	Clothing Manufacturer	Privately owned
21	Radeen Fashions	Clothing Manufacturer	Privately owned
22	SPM	Automobiles and parts	Privately owned
23	Uniclips	Automobiles and parts	Privately owned
24	Webroy	Automobiles and parts	Privately owned
25	Durban Overall	Clothing Manufacturer	Privately owned
26	Saddler Belts	Textiles	Privately owned
27	Zorbatex	Textiles	Privately owned
28	K-way	Clothing Manufacturer	Privately owned





## 12. Copyright declaration form

Student details			
Surname:	Hartogh	Initials:	T
Student number:	15388345		
Email:	Tamryn.hartogh@bmanalysts.com		
Cell :	082 456 5097	Landline:	N/A
Course details			
Degree:	MBA	Year completed:	2016
Department:	GIBS		
Supervisor:	Dr Adrian Saville		
Supervisor email:	adrian@cannonassets.co.za		
Confidentiality / Embargo			
Do you need to have your report embargoed? If so, attach a motivation letter. Without a letter this will not be granted.			
Yes		No	X
If yes, please indicate period requested			
Two years		**Permanent	
<b><i>**If permanent, please attach a copy of the letter of permission from the Vice-Principal: Research and Postgraduate Studies. Without a letter this will not be granted.</i></b>			
Access			
A copy of your research report will be uploaded to UPSpace Can the Information Centre add your email address to the UPSpace web site?			
Yes	X	No	
If no, please motivate (ignore if report is to be embargoed)			
Copyright declaration			
<p>I hereby certify that, where appropriate, I have obtained and attached hereto a written permission statement from the owner(s) of each third-party copyrighted matter to be included in my research report ("the work"), allowing distribution as specified below. I certify that the version of the work I submitted is the same as that, which was approved by my examiners and that all the changes to the document, as requested by the examiners, have been included.</p> <p>I understand that all rights with regard to intellectual property in the work vest in the University who has the right to reproduce, distribute and/or publish the work in any manner it may deem fit.</p> <p>I agree that, a hardcopy of the abovementioned work be placed in the Gordon Institute of Business Science Information Centre and worldwide electronic access be given to the softcopy on UPSpace.</p>			
Signature:			Date: 7 November 2016



### 13. Ethical clearance

Dear Ms Tamryn Hartogh

Protocol Number: Temp2016-01360

Title: Corporate investment strategies in the context of uncertainty: implications for financial performance.

Please be advised that your application for Ethical Clearance has been APPROVED.

You are therefore allowed to continue collecting your data.

We wish you everything of the best for the rest of the project.

Kind Regards,

Adele Bekker

### 14. Turn it in report

Please see below.