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### INNOVATIVENESS AND FIRM PERFORMANCE: EVIDENCE FROM NIGERIA

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#### ABSTRACT

*This paper investigates the relationship between innovativeness and firm performance in Nigerian. In doing so, we drew a sample of one hundred and thirteen (113) quoted firms that have consistently published their audited annual financial reports between 2012 and 2017. This necessitated the adoption of unbalanced panel data analysis to ascertain the possible firm's specific innovation factors (Labour-technology capital intensity, administrative and marketing, research and development (R&D), and innovative intangible asset rights) that are key in explaining the performance of quoted firms. The empirical evidence shows that labour –technology intensity and innovative intangible assets indicate positive and significant impact on profitability per employee, while administrative and marketing innovation and research and development both show negative but significant and insignificant impact on profitability per employee respectively. It is most surprising that research and development which form the greater part of innovation on the part of employees fail to conform with the apriori expectation, meaning it is has not really enhanced the performance of the employees enough to boost the firm performance. In the light of our findings, we recommend that new corporate innovation strategy be encouraged in Nigeria. More so, further applied and scientific research that has the tendency to engender employee productivity should be engaged.*

**Keywords:** Innovativeness, Profit per Employee, Firm Performance, Research and Development

#### INTRODUCTION

The business environment of the 21st century is proving to be very different from what it used to be in the past, especially in Nigeria. This new competitive landscape has greater uncertainty, dynamism and volatility caused by increasing technological developments, increasingly rapid diffusion of information and new technologies (see for example, Drucker, 1985; Hitt, Hoskisson, & Kim, 1997; Chesbrough, 2003). This is why some firms are able to implement and use advanced technologies with relative ease while others struggle. In recent times, most organizations have continuously searched for effective strategies to improve their competitiveness. In a stable environment, competitiveness has been achieved through effective operational practices such as specialization of labour and cost control, as proposed in the early management and economics literature (Mourdoukoutas & Papadimitriou, 1998). Recent changes in the competitive environment, particularly the emergence of globalisation (Salavou, Baltas & Lioukas, 2004); knowledge-based economies and advances in information and communication technology have

compelled firms to continue to seek new strategies because conventional strategies are no longer sufficient to provide a competitive edge (Chirico, 2008). Consequent to this, some researchers have proposed the notion of organisational innovation as an effective strategy for sustaining and improving firms' competitiveness and performance, particularly in a dynamic business environment (Birdthistle & Fleming, 2005; Woodside, 2005) such as Nigeria.

Contemporarily, it has become apparent that the critical issue for firms is not the technology they have, but rather, how they learn to evaluate, adopt, and use the technology effectively to improve their products and services. The factors that endow a competitive edge on a firm therefore, is what it knows, how it uses what it knows and how fast it can know something new (Prusak, 1996). With the pace of transformation in developing countries, firms are experiencing a growing need for innovation to remain relevant in the market place (Kemp, 1997).

Unfortunately, the absence of strong technological capability which contributes to sustainable competitiveness often impedes the improvement of firms' innovations (Prusak, 1996). In Nigeria and other developing countries, innovation is seen as a process of adoption, absorption and diffusion of traditional available technology (Lall, 1991; Jegede, Ilori, Sonibare, Oluwale, & Siyanbola, 2012). It is thus important for firms to develop the capability to exploit the locally available technology as a means of gaining competitive edge. This capability is embedded in the set of skills and competences which the firm possesses and/or can exploit to manage change (Oyelaran-Oyeyinka, Laditan, & Esubiyi, 1996). Innovation capability consists of the skills, knowledge, resources, creativity and attitude needed to continuously generate and translate ideas and change into marketable new or significantly improved devices, products, processes and services (Tidd, 2001). Innovation is very essential for the growth of firms and also for the firms to sustain competitive advantage (Souitaris, 2003; Tidd, 2001). Innovation has been strongly linked to economic growth (Tidd, 2001) as well as organisational growth.

Innovation is widely regarded as one of the most important sources of sustainable competitive advantage in an ever changing environment, because it leads to product and process improvements, gives room for continuous advances that assist organisations to survive, allow firms to grow rapidly, in a more efficient manner, and ultimately be more profitable than non-innovators. Firm performance, in the context of this study, is a subset of organisational effectiveness that covers operational and financial outcomes. New goods are at the heart of firm growth. The link between innovation and firm performance at various levels of aggregation has been the focus of attention in a number of studies in recent times. Our focus is also based on innovation and the performance implication associated with innovativeness in both product and process domain or context within established organizations. The research problem emanate from two broad perspectives. Firstly is the debate on innovativeness and firm performance nexus. There are arguments in literature that innovation brings about improved firm performance (see for example, Geroski & Machine, 1992; Neely & Hii 1998; Robert 1999; Cho & Pucik, 2005; Hua & Wemmerlave 2006; Lin & Chen, 2007),

Following the above, we observe too that most empirical studies on firms' performance in Nigeria, although relatively scanty to the best of our knowledge, did not consider innovation as a major determinant of firm performance. For example, Egbetokun

(2012) examines the relationship between firms, networking activities and innovativeness using innovation survey data on Nigerian firms, but did not consider the strength of the relationship between innovation and firm performance. Similarly, Dauda and Akingbade (2011) examine technology innovation and Nigerian banks' performance but also did not consider the strength of the relationship between the variables of interest. In addition to this, however, we observe that most known studies in Nigeria despite their not focusing on innovativeness and firm performance relied on the use of survey approach rather than quantitative approach in measuring and analyzing innovativeness. This forms another identified gap in the literature which this paper sought to fill. In doing so, we deem it appropriate to bring quantitative tools to bear on an examination of the issues.

In light of the above, the issue of innovation and firm performance has attracted the attention of management scholars since the argument of Schumpeter (1934) that, continuous innovation activity is the key source of long term firm success (cited in Rosenbusch; Brinkmann, & Bausch, 2011). It is against this background that we sought to investigate the relationship between innovation and firm performance using data from selected firms that cut across different sectors in Nigeria. In doing this, the specific objectives include: to determine the relationship between labour to technology capital intensity and firms' performance in Nigeria; to evaluate how marketing and administrative innovation determines firms' performance in Nigeria. The focus of this study entails to consider the key variables that are rooted in the involvement of employees as our dependent variable is the firm performance variable that measures the profit per employee.

The hypotheses to be tested are stated in null form as follows:

- Ho<sub>1</sub>:** Labour to technology capital intensity is not significantly related to firms' performance in Nigeria.
- Ho<sub>2</sub>:** Marketing and administrative innovativeness is not significantly related to firm's performance in Nigeria.

## REVIEW OF RELATED LITERATURE

Performance is not a contemporary phenomenon because for decades, firms were operating business in order to perform. As a concept, to perform is to produce valued results and it is also the end result of activities. Essentially, performance is the ability to attain firm goal by using resources in an efficient and effective manner (Daft & Maric, 2004). Also, performance could be described as the behaviour, the way in which organisation, teams, and individuals get work done. Armstrong (2005), for example, view the level of firm performance as that which is based on how effectively and efficiently managers utilize resources to achieve set objectives which managers are responsible for. This is evaluated on how well they meet organizational objectives through effective and efficient utilization of resources (Lussier, 2006). Thus, being effective and using objectives efficiently can result in high levels of performance (Bunderson, 2003). More so, without objective, capable management, resources remain under-utilized and never become productive.

In business policy literature, there are two major streams of research on the determinants of firm performance. One is based primarily upon an economic tradition, emphasizing the importance of external market factors in determining firm success. The other line of research builds on the behavioural and sociological paradigm and sees organisational factors and their fit with the environment as the major determinants of

success in firms. Within this school of thought, little direct attention is given to the firm's competitive position. Similarly, economics traditionally has disregarded factors internal to the firm (Gary & Birger, 1989). Koellinger (2008) argues that it is obvious that besides innovative activities, numerous other factors also influence the performance of an enterprise. He identified the factors to include: the market in which a firm operates, the presence of economies of scale and the size of the firm, the prevailing market structure and the market share of the enterprise, firm-internal structures and resources including the technology the firm uses; organizational structures; human resources, managerial competence, among others. The bottom line here is that successful managers are committed to improving performance, hence the question is "In what dimensions should the performance be based"?

A number of studies have identified dimensions of firm performance to include: profitability, growth, customer satisfaction, effectiveness, efficiency, among others (Stoner, Freeman & Gilbert, 2005; Fornell 1992; Johnson & Gustafsson, 2000; Weihrich, Cannice & Koontz, 2008; among others). In the case of profitability, Stoner *et al.*, (2005) described profitability of a firm as the ability to earn profits steadily over an extended period of time. It is also the efficiency of a firm in generating earnings and it reflects the financial performance of a firm. Profitability is the measure of an organization's ability to earn revenues above its expenditures so it is usually assessed in relation to some yardstick such as net assets, return on capital employed, positive net cash flows and sales revenue. Financial ratio analyses which include profitability ratios are used to determine firm's profitability and it is one of the most frequently used tool. Profitability ratios that measure both the profit margin that the firm is able to generate and show firm's overall efficiency via the return which it provides on the physical facilities, including the fund it employs. In addition, firms that will continue in business should be able to generate enough revenue that will cover their operating cost and also make enough profit as compensation to the providers of capital.

Effectiveness as another dimension of firm performance is seen as the degree to which an organization realizes its goals, (Etzioni, 1964). It is the ability to determine appropriate objectives and achieve them. Stoner *et al.*, (2005) view it as doing the right thing. It also involves choosing the right goals. Richard, Devinney, Yip and Johnson (2009) see organizational effectiveness as broad and captures internal performance outcomes which are normally associated with more efficient or effective operations and other external measures that relate to considerations which are broader than those simply associated with economic valuation (either by shareholders, managers or customers), such as reputation. Robbins (1990) identifies the criteria of the effectiveness of a firm to include: productivity, profit, quality, growth, turnover, job satisfaction, information management, value of human resources, achievements among others.

Following the above clarification on firm performance, a major concern in most studies on firm performance is how the concept is measured. Bates and Holton (1995) see performance as a multi—dimensional construct, the measurement of which varies depending on a variety of factors. They also stress that it is important to determine whether the measurement objective is to assess performance outcome or the behaviour. Choosing an indicator that would reliably capture all essential aspects of company performance is a non-trivial task especially in a developing country like Nigeria. A number of studies use labour productivity as the most suitable performance measure (see for example,

Kouzesnetsov & Muravyev, 2001) however, this measure is appropriate for short-term analysis only, as it is based on the implicit assumption that the level of capital remains unchanged.

Literature has not yet come to a definitive conclusion as to which firm or industry factors best determine firm performance during any state of the economy. However, Hawawini, Subramanian and Verdin, (2003) argue that industry or external firm factors play a more important role in dictating the influence of firm performance. On the other hand, Opler and Titman (1994) suggest that firm specific (internal) factors seem to be the major determinants of the operating performance, and are the main drivers for competitive advantage which is crucial for surviving economic downturns.

Koellinger, (2008) argues that firm performance can be measured in two forms: non-financial and financial measures. Non-financial measures are based mainly on subjective information provided to be relevant to the firm's state of affairs, whereas financial measures largely use the firm's accounting information. For example, Horngren, Datar and Foster (2000) argue that many organizations are increasingly presenting financial and non-financial performance measures for their subunits in a single report called balanced scorecard which translates an organization's mission and strategy into a comprehensive set of performance measures that provides the framework for implementing its strategy.

Klein (1998), Claudio, Teresa and Cristina (2010) and Artz *et al.*, (2010) use financially-based performance variables such as return on assets (ROA) to measure performance, while Afshan, Chakrabarti and Blaji (2014) use profitability per employee (EMP) to measure performance. Owusu (2010) uses profit after tax margin (PATM) to reflect firm performance. Sirilli (2001) opines that in measuring firm performance, different concepts are used. He pointed out the performance measures to include; sales per employee, export per employee, growth rates of sales, total assets, total employment, operation profit ratio and return on investment.

Following the above, we note that management literature recognizes numerous concepts and variables to measure performance (Koellinger, 2008). Apparently, it is obvious that many of the observed measures are correlated; hence, we believe that the measures that are given priority essentially depend on the perspective. We therefore believe that the choice of the performance measures to adopt in any empirical study is often limited by the availability of data as is the case in this study. This justifies our selection of the performance measures in terms of returns and profitability.

### **Profitability per Employee**

This variable is computed by dividing profit after tax by the number of employees. In general the higher the number, the more efficient the company uses its employee. But there are no rules about what constitute a good level of profitability per employee. Profitability per employee (EMP) approach focuses the mind of managers on increasing profit relative to the number of people company employs but it requires no adjustment for accounting convention. Total profit, after all, is also the product of profit per employee and the total number of employees; so maximizing both expressions increases total profit, which is a measure of firm performance (Bryan, 2007) but we see EMP as measuring the contributions made by firms' talented people

Afshan *et al.*, (2014) empirically investigated the use of people-productivity-linked indices to measure firm performance. Using profitability per employee (EMP) as major

indices to measure organizational productivity across two industries between 2004 and 2012, the ranked correlation of EMP with traditional financial indicators indicate significant association among the variables used. So there is need for widespread application and acceptance of employee-linked productivity indices.

Literature has shown that firms go into business in order to perform very well and that profitability per employee is a good measure of performance.

### **Innovation and Innovativeness**

However, Amara and Landry (2005) are of the opinion that there is no global consensus on the exact definition of the term which is evidenced by the flurry of five definitions given by Vyas (2009) below: (i) creation of new products or qualitative improvements in existing products (ii) use of new industrial process (iii) new market openings (iv) development of new raw-material sources or other new inputs and (v) new forms of industrial organisations. On the other hand, OECD (1981) opines that innovation consists of all those scientific, technical, commercial and financial steps necessary for the successful development and marketing of new or improved manufactured products, the commercial use of new or improved processes or equipment or the introduction of a new approach to a social service. They further view innovation as all the scientific, technological, organizational, financial, and commercial activities necessary to create, implement, and new market or improved products or processes.

In addition, the minimum requirement for an innovation is that the product, process, marketing method or organizational method must be new (or significantly improved) to the firm. This lends support to Dyck and Neubert (2009) who argue that innovation involves the development and implementation of new ideas and practices. Rogers (2003) also see innovation as the application of new ideas to the product, process or any other aspect of firm activities.

Furthermore, Stoner *et al.*, (2005) argue that innovation is the translation of a new idea into a new company, while Welhrich and Koontz (2005), Weihrich *et al.*, (2008) maintain that innovation implies the use of new ideas while Needle (1999) argue that innovation is the process through which new ideas and inventions become a business reality in the form of new products, processes, marketing strategies and new methods of organization and management. The thrust of these definitions of innovation remains the fact that it is the process of bringing the best idea into reality which generates a series of innovative events. Although an idea is a necessary condition for an innovation, but it should not be called an innovation in itself (De- Jong & Vermeulen, 2003). In addition, Tidd *et al.* (2005) posit that innovation is a process of turning opportunity into new ideas and putting these into practice which is more widely to lead to new or improved products, processes and business models. On the contrary, Okpara (2007) points out some pertinent questions that border in these areas as: Can one innovate without being creative? So creativity which is a mental process involving the generation of new ideas, concept or new association of the creative mind between existing ideas or concept (Olugbemide, 2008) precedes innovation. Creativity is also regarded as a starting point of idea generation for innovation. In the words of Badawy (1988) creativity brings something new into being and that innovation brings something new into use.

Furthermore, Udegbe and Udegbe (2013) opine that innovation could also be seen as an idea or object that is perceived as new by an individual or an agency. This perceived



newness of the idea from the individual's point of view determines his or her reaction to it. For example, Robertson and Tony (2001) opine that if the idea seems to be new to the individual, it is an innovation. In addition, an innovation consists of certain technical knowledge about how things can be done better than existing state of the art. The innovativeness therefore of a new product and firm innovation capability is important for several reasons because an innovation product presents opportunities for firms in terms of growth and expansions into new areas as well as allows firms to gain competitive advantage.

Chuang (2005) notes that, the breadth of innovation includes policies, system, administrative, processes, products, services, and others while the depth of innovation includes the importance, the degree of influence, effect on long term profitability, among others. Moreover, Bessant, Lamming, Noke, and Phillips (2005) examine the role of innovation in renewal, growth, and emphasize that innovation represents the core renewal process in any organisation.

Contemporary studies claim that firms which fail to engage in innovation put themselves at great risk (Koller, 2000). Some argue that due to the heightened level of competition and shortened product life cycles, firm's ability to generate innovations may be more important than ever, in allowing firms to improve performance and maintain competitive advantage (Artz, Norman, Hatfield, & Cardinal, 2010). In this regard, it is not surprising that innovation has become a requisite objective for all organizations. Although, the existing products are vulnerable to changing customer needs and tastes, new technologies, shortened product life cycles, and increased international competition. Therefore, it is generally accepted that all firms should innovate regardless of their size or sector in order to compete and survive in the market.

### **Categories of Innovation**

Innovation literature recognizes three distinct main categories of innovation outcomes depending on their newness: radical/discontinuous innovations, incremental, and transformational (Tide, 1998).

**Radical Innovation** consists of an abrupt major change or doing something different from what the organisation had done before (Nord & Tucker, 1987; West & Farr, 1990). Radical innovations refer to path-breaking, discontinuous, revolutionary, original, pioneering, basic, or major innovations (Green, Gavin, & Aiman-Smith, 1995). Duguet (2006) argues that radical innovation is a new-to-market product innovation or a process breakthrough, and examines the impact of the radicalism. This implies that it entails changing the relationship between customers and suppliers, displacing current products, restructuring marketplace economics, and creating new product categories entirely. Radical innovation refers to a novel combination of different fields of expertise resulting often in new technological patterns (Alguezaui & Filieri, 2010).

**Incremental (Routine) Innovation** entails a cumulative series of minor changes or introducing something similar to previous organisational practices. It includes the small improvements made to enhance and extend the established processes, products, and services. Similarly, it seeks to improve the systems that already exist, making them better, faster cheaper. Incremental innovation is very much essential for competitiveness in capital goods production such as machine tools, factory equipment, consumer durables, and

engines (Hall & Soskice, 2001). This lends support to Pratali (2003) who also suggest that incremental technological innovations help improve company competitiveness with the ultimate aim of increasing company value. The implementation of incremental innovations does not usually include enormous financial risks (Cromer, Dibrell, & Craig, 2011). More so, Olsen and Sallis (2006) state that incremental innovations are associated with the short-term viability of the organisation because through fine-tuning the products or services, they directly address short-term performance. So incremental innovation implies minor changes to the current products or processes (Alguezaui & Filieri, 2010).

**Transformational Innovation:** A number of studies have included transformational innovation as a category. It is when innovation is happening across a wide continuum, within a very wide set of contexts – including product, services and process. Tidd *et al.*, (2001) argue that transformational innovation is when an organisation does something fundamentally different, applying revolutionary new technology or processes to change the organization.

Consequently, Abernathy and Clark (1985) propose four different categories of innovation as: (i) architectural which means new technology that deviate from established systems of production, but can open up new linkages to markets and users, characteristic of the creation of new industries as well as the reformation of old ones, (ii) niche include the opening of new market opportunities via the use of existing technology, (iii) regular comprises changes that is based on an established technical and production reliability and it is applied to existing markets and customers, and (iv) revolutionary includes innovations which tend to disrupt or make obsolete existing paradigms or technologies in an industry.

### Types of Innovation

Researchers have argued that distinguishing types of innovation is very necessary for understanding organisations' adaption behaviour of innovation. The types of innovation include:

**Product Innovation:** Orlikowski (1991) opines that product innovation is the output of the work: The objects or services produced through the transformation activities delivered or sold to individuals or organizations beyond the unit. It is new goods put on sale. Product innovation means introducing the new products/services or bringing significant improvement in the existing products (Polder, Leeuwen, Mohnen & Raymond, 2010). This implies that product innovations are outputs of the organisation. In addition, Needle (1999) argues that product innovation is the development of a new model of or a new form of insurance policy or a restaurant offering a new special vegetarian menu. This implies that product innovation is the output of the work which is the object produced through the transformation activities, delivered or sold to individuals or organizations beyond the unit.

**Process Innovation:** This type of innovation is the creation of new process or improvement to existing process (Leonard & Waldman, 2007). This also implies that process innovation involves the implementation of a new significantly improved production or delivery method, characterized by changes in techniques, equipment and/or software (Bi, Sun, Zheng & Li, 2006). Similarly, process innovation is concerned with how the product is made or delivered to the customer (Needle, 1999) For example, the development of Robots in manufacturing industry is a form of process innovation to a restaurant opening a self-service section in addition to an existing waiter service operation. OECD (2005) suggests process innovation to be the implementation of the production or delivery method that is



new or significantly improved. It also includes bringing significant improvement in the equipment, technology and software of the production or delivery method.

**Service Innovation:** This is when a new or considerably changed service concept, client interaction channel, service delivery system or technological concept that individually, but most likely in combination, leads to one or more renewed service functions that are new to the firm. Econometric analysis confirms that ICTs play an important role in enabling service innovation. Gago and Rubalcaba (2007) find that businesses which invest in ICT, particularly those which regard their investment as very important, or strategically important, are significantly more likely to engage in services innovation. A service product is typically a service function or a set of functions marketed as a commodity or public service (Miles, 2008).

A change in the characteristics of the service itself is the first dimension of service innovation. De Jong and Verlaulen (2003) state that this dimension is most widely recognized and it involves a new service concept that describe the value that is created by the service provider in cooperation with the customer.

**System innovation:** System innovation may include some aspect or a combination of all types of innovations such as: product, process, marketing, administrative among others. It is by definition developed and implemented by many actors which can lead to a systematic change in both social (values, regulations, attitude and so on) dimensions and their relationship.

### Environmental Factors

**Organisations do not function in isolation.** They function within the broader context of the environment which requires them to innovate in order to adapt to the changing environment (Meyer & Goes 1988; Nohria & Gulati 1996). Organizations are more likely to be risk seeking in times of uncertainty and will therefore be more likely to innovate (Kahneman & Tversky 1979). Environmental Factors include competition, environmental turbulence and union influence. These factors include: competition, union influence, environmental turbulence,

**Competition** fosters innovation by exposing new ideas to companies. In addition, organizations operate in an environment that is highly competitive and dynamic which will enable managers to scan their environment for superior alternatives to the present one that will in turn lead to innovation that is necessary for firm survival (Kimberly & Evanisko 1981) Grawe , Chen and Daugherty (2009) suggest that competition is positively associated with innovation capability.

**Union Influence:** Organizations are under pressure to conform to union demands and pressured by this influence to act in accordance with pre specified procedures, rather than new processes. Meyer and Goes (1988) suggest that union influence is negatively related to innovation.

Turbulence forces make the organization to search for and process information from the environment and search for potential opportunities. Li and Atuahene-Gima (2002) argue that environmental turbulence has a relatively small impact on innovation.

A number of studies including Nord and Tucker (1987), Berglund (2004) all argue that determinants of innovation still fail to yield consistent findings, hence, they have introduced a number of moderating variables in order to tease out the different relationships and establish more stable and cumulative results. Examples of such moderators are *organizational characteristics* such as conservative and entrepreneurial, mechanistic and organic, traditional, mechanical, organic and mixed, manufacturing or service oriented, old or new (Koberg *et al.* 1996), big or small, prospecting, defending and analyzing strategy (Miles & Snow 1978). However, this study is interested in firm size and firm age as moderating variables.

Most studies focusing on medium-sized and large companies use size as a control or moderating variable. Size as a factor conducive to a faster rate of innovation has also been used in the past to justify industrial policies of support for national champions through public procurement and research and development subsidies. The relevance of such views depends on the validity of the hypothesis of a positive effect of firm size on innovation meaning that innovation pressures apply to large companies as well as small and medium-sized enterprises (SMEs) (Vracking & Cozijnsen, 1997).

The effect of firm size on innovation has been investigated, but the results are mixed. Whereas Kimberly and Evanisko, (1981) has reported a positive effect of firm size on innovation, others (Holmstrom, 1989; Martinez-Ros & Labeaga, 2002) have found a negative effect or no effect at all.

### **Firm Age**

Koberg *et al.* (1996) argue that firm age is one of the moderators that help to explain the determinants of innovation. Firms should also discover what they are good at over time (Jovanovic, 1982), based on past experiences. Firm age is defined as the difference between the current year and the year of firm creation according to registration of the firm in the Corporate Affairs Commission in Nigeria. Some scholars have lent support to a positive relationship between the age of the firm and innovation. Rao and Drazin (2005) found older firms to be more rigid and less open to change. On the contrary, older firms have demonstrated high potential for survival because they have a well-defined resource base that allows them the ability to be innovative (Kimberly & Evanisko, 1981). In other words, age is positively associated with innovation (Sorenson & Stuart 2000). It is on this note that this study adopts firm age as firm characteristic variable in explaining the innovativeness of selected sampled firms in Nigeria.

### **Measurement of Innovativeness**

Despite huge body of literature on innovation, there is, however, no consensus on the appropriate or standard measure of innovativeness. This implies that there is no generally accepted model of firm behaviour subject to risk arising from firm characteristics and environmental factors. Consequently, theory cannot provide definitive procedure as to the most suitable model to capture innovative capabilities. Holland and Sparagen (1933), proponents of innovation hypothesis, in a survey on research and development (R&D) that was conducted in a systematic way, concomitantly used R&D as a proxy for measuring innovation. This is contrary to the work of Carter and Williams (1957) that measured innovation using the output approach. In their study two aspects of innovation were measured: performance in terms of being first to commercialize new products and

processes and secondly in terms of the level and rate of increase in the use of new products and processes. The result shows that American firms were the most innovative.

Eurostat and OECD's methodological work in the early 1990's marked the beginning of standardization in the field of innovation measurement. The main objective was to develop output indicators, which, as statisticians and policy analyst firmly declared, would measure innovation by measuring the products, process and services that arise from innovation activities. Innovation is hard to measure because of its multi-dimensional character. The most commonly used measures of innovative activities include: R&D expenditure, patent counts and innovation counts. Recent research into measurement of innovation has provided some useful frameworks for a balanced assessment of the innovativeness of a firm. Activities as the systematic measurement of customer satisfaction and market research also may influence the innovative activities of a firm. In this study, we would adopt Lin and Chen (2007) framework. This framework points out the endogenous variables that determine innovation as: labour oriented technological innovation, administrative and marketing innovation. We have extended their framework by adding research and development, and innovative intangible asset rights. Accordingly, innovation measurement tends to be focused on products and related production systems.

### **Theoretical Considerations**

OECD (1981) and Berglund (2004) argue that there is no one best theory of innovation or innovativeness. Many authors have found innovation theory lacking in cumulativeness and consistency. This paper is anchored on economic theory of innovation which suggests that performance outcomes of an organization depends on the type of innovation, the intensity of competition, and the timing of the innovation irrespective of the stage or period of innovation as well as the price-elasticity of demand, the size of the market, the negotiating power of the innovating firm vis-à-vis suppliers and customers. This theory assumes that demand and supply conditions in a market are often exogenously given, and that firms can on their own influence the extent to which competing firms can imitate each other through employing one or a combination of various appropriation tactics, including: secrecy, lead-time, patents, copyright, trademark, particular sales and service efforts, and achieving a good fit between technology-related innovations and complementary rare assets of the firm (Teece, 1986, 2006). Thus, choosing adequate appropriation tactics can help the firm to gain private profits from innovations. However, the success of these tactics is likely to vary across industries and with the type of innovation carried out (Koelinger, 2008).

Innovativeness attributes such as labour- technology capital intensity, administrative and marketing innovation, R&D expenditure and innovative intangible asset rights and how they relate with firm performance has limited empirical literature especially in the areas of using non-survey statistical analysis methods. The below provide foundational studies to understanding the theoretical and empirical views on the relationship between firm performance and innovativeness. Several studies have explored the relationship between innovation efforts and firm performance (for example, Damanpour & Evan, 1984; Damanpour, 1991; Li & Atuagene-Gima, 2001) It is also noted that organisations and countries that continuously innovate contribute significantly to economic growth.

Similarly, a number of studies for example, Acs and Audretsch (1990) using innovation counts; and patent indicators have confirmed that technology and performance are associated; other authors also emphasize the fact that it is not easy to establish a causal link from technology to firm performance. The game-theoretic literature points out that firms that are able to outpace their direct competitors in technological development will capture market shares and profits from their rivals, possibly up to the degree that they drive their competitors out of business. Griliches (1990) examines the relationship between technological factors (measured by R&D and patents) and economic indicators (productivity and stock market value), and shows that the technological performance of the firm is positively associated to its market value. In a similar vein, there is evidence to suggest that investment in R&D, particularly those relating to technical change, are the major cause of improvements in productivity and output. In addition, most of the empirical studies use econometric models in order to model the linkage between productivity and innovation.

Dauda and Akingbade (2011) examine technology innovation and Nigeria banks' performance using Pearson correlation coefficient to analyse data. Their findings revealed that technological innovation influenced banks employee's performance, customer's satisfaction and improvement in banks profitability. Atalay (2013) examines relationships between technology innovation and firm performance. He conducted a survey on top level managers of 113 firms operating in the automotive supplier industry which is one of the most innovative industries in Turkey, as of the year 2011. The obtained data from the questionnaires were analysed through the SPSS statistical package program. The results demonstrated that technological innovation (product and process innovation) has significant and positive impact on firm performance. More so, Corsino (2008) investigated if successful innovations do not significantly enhance firm growth, using econometric procedures. The study tests the hypothesis that the level of observation at which applied research is typically conducted hampers identification of a significant association between innovation and sales growth rates. In exploiting a unique data set, the result shows that product innovations commercialized in the immediate past positively affect the sales growth of semi-conductor companies. From the above, we observe that there is a positive relationship between technology and firm performance.

Administrative innovation can increase the performance of the organization by decreasing the transaction cost and administrative cost. Firms bring administrative innovation into the business in order to bring efficiency into the business. The new organizational method must be at least new to the organization and new method can be developed by the firm itself or with the help of third party (Polder *et al.*, 2010) Administrative innovation is the only type of innovation that has a significant relationship with productivity according to Evangelista and Vezzani (2010) and Polder, *et al.*, (2010). Lin and Chen's (2007) find that administrative innovations have surfaced to be the most crucial factor in explaining company sales in Taiwan because it significantly explains it. In the same vein, Abdi1 and Ali (2013) investigate the relationship between Administrative innovation and firm's performance, using 143 target respondents from the telecommunication industry in Somalia. Therefore, *a priori*, it is expected that as the marketing capabilities increase, more people become attracted to the products, thus, increases sales growth which in turn causes profit to increase.

Research and Development expenditure affects product and process improvement but only product improvement affect firm growth. This implies that there is an indirect link

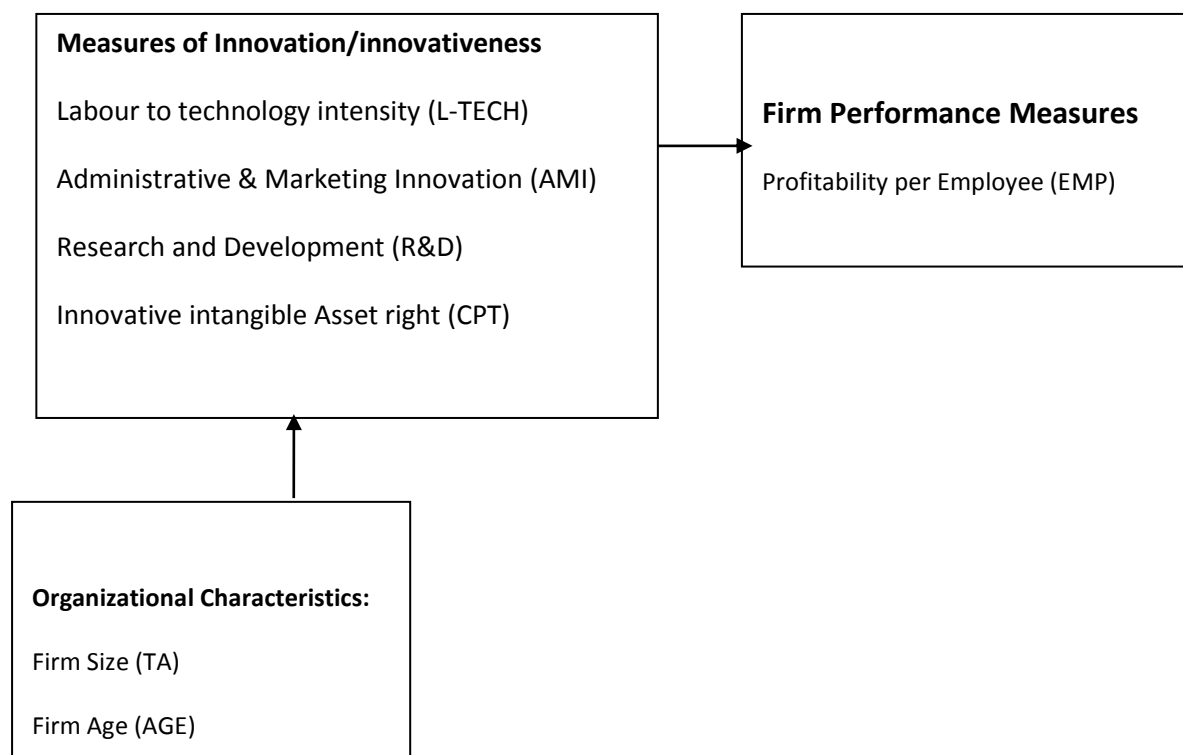
between R&D and firm performance (see for example, Mansfield, 1962; Griliches, 1986; among others). Companies that spend more on research and development have the tendency to acquire new ideas, hence, become more innovative and as this is reflected in its productivity growth, performance is improved. Duguet (2006) who analyzed French manufacturing firms found that R&D activities foster radical and incremental innovations but only radical innovations increased the firm productivity.

The quicker an innovation is copied by other firms, the less time each innovating firm has to reap additional payoffs from the investment in the innovation. This is known as the appropriability problem. Thus, the timing of an innovation influences the expected payoff. However, profits from innovation are only sustainable until competitors are able to copy the innovation and all associated complementary assets completely. For innovation to take place incentives need to be given and innovative intangible asset right is one possible government intervention to correct market failure. For example, Bottazzi, Dosi, Lippi, Pammolli and Riccaboni (2001) using detailed information for the world's large pharmaceutical companies over an 11 year period, find strong evidence that the introduction of neither new chemical entities nor patented products affects firms' growth performance.

Firm size has been commonly considered as a control / background variable in explaining the relationship between innovation and firm profitability (see for example, Diaz –Diaz, Agular-Diaz, De Saa-perez; 2008). However, the issue of whether larger firms are superior in performance to smaller firms or vice-versa, has generated large amounts of theoretical and empirical research in the economics, management and sociology disciplines. Majumdar (1997) argues that the size of a firm affects performance in many ways. The key features of a large firm are its diverse capabilities, the abilities to exploit economies of scale and scope and the formalization of procedures. These characteristics, by making the implementation of operations more effective, allow larger firms to generate superior performance relative to smaller firms Kemp *et al.*, (2003), study the relationship between innovation and firm performance and find a negative relationship between size and small firm performance (Kleinknecht, 2000; Loof, Heshmati, Asplund & Naas, 2001). The size of the firm is hence an important characteristic that must be considered to explain a firm's innovative performance.

With respect to the impact of age, Stinchcombe (1965) suggests that older firms are more experienced, have enjoyed the benefits of learning, are not prone to the liabilities of newness and can, therefore, enjoy superior performance. Another stream of research, however, suggests that older firms are prone to inertia, and the bureaucratic justification that goes along with age; thus, they are unlikely to have the flexibility to make rapid adjustments to changing circumstances and are likely to lose out in the performance stakes to younger and more agile firms. Fariñas and Moreno (2000), Correa, Acosta, González, and Medina (2003) and Geroski and Gugler (2004) form a wide literature that stresses that firm's age has a negative effect on firm growth. Loderer and Waelchli (2010) investigate the relationship between firm age and performance using panel data regression techniques. They offer two non-exclusive explanations of why firms may age. First, corporate aging could reflect a cementation of organizational rigidities over time. Consistent with that, costs rise, growth slows, assets become obsolete, and investment and R&D activities decline. Second, older age could advance the diffusion of rent-seeking behavior

inside the firm. They support the hypothesis by the poorer governance, larger boards, and higher CEO pay, which they observe in older firms. They find a highly significant negative relationship between firm age and firm profitability, which is quite robust with respect to different estimation techniques, regression specifications, and the way they measured firm age. In addition, firms seem to face a real senescence problem, so as firms grow older, their profitability seems to decline.



**Fig. 1:** Researcher's conceptual framework

## METHODOLOGY

The nature of this study necessitated the use of empirical approach. This entails the use of quantitative, and regression techniques which emanates from theoretical foundations in evaluating the research issues or problems. The population consists of all companies quoted on the Nigerian Stock Exchange as at December 31, 2017. There are 198 quoted active companies in the Nigerian Stock Exchange (NSE, Factbook 2017) but based on the availability of data, we used 158 quoted companies as the population of study. It should be noted that each company in the population must have finished its obligation in delivering annual report for the year ended 2012 to 2017 while the sample size was based on Yamane's formula (1967) and computer-assisted random sampling to obtain 113 firms. The companies in this study were drawn from the following sectors: Banking, Insurance, Agriculture, Automobile & Tyre, Breweries, Building Materials, Chemical and Paints. Others were Conglomerates companies, Food/Beverages & Tobacco, Footwear, Healthcare, Industrial/Domestic Products, Packaging, Printing & Publishing, Textiles and petroleum.

## Model Specification

Our model is anchored on Claudio *et al.*, (2010) framework simply because it deviates from previous methodologies. This model is one model found in the literature that considers critical company fundamentals to determine the relationship between the two variables of



interest (such as innovation and performance) in this study. We, therefore, adapt this framework to suit the Nigerian situation by introducing some fundamental variables as found highly relevant in Nigeria setting. We employed a panel data multivariate regression model, where the profitability per employee form the dependent variable as determined by the explanatory variables mentioned earlier. The model assumes that the dependent variable is a linear function of the independent variables with consideration to the heterogeneity in the pooled companies. This means that pooled regression model assumes that there is no difference in the pooled companies while panel regression model assumes cross sectional heterogeneity (cross section fixed effect) and period heterogeneity (time fixed effect). In specifying our panel regression model, we included cross sections (companies) and year dummies (2012 - 2017) in the panel regression models. The panel regression model with an error term ( $\varepsilon_t$ ) is specified in econometric form as:

$$EMP = \beta_0 + \beta_1(L-TECH)_{it} + \beta_2AMI_{it} + \beta_3RD_{it} + \beta_4CPT_{it} + \beta_5SIZE_{it} + \beta_6AGE_{it} + \omega_t + \varepsilon_{it}$$

Where:

- EMP = represents the ratio of profit after tax to the number of employee within the reference period. The variable is the measure of firm performance
- L-Tech = represents the ratio of capital employed to the total number of staff cost for the period 2012 to 2017. It is expected that increase in capital technology to labour would lead to higher performance.
- AMI = represents dummy variable that assigns the value 1 to represent companies that cut down administrative and marketing expenses by 15% based on preceding year value, otherwise 0. We tagged companies as been cost innovative when they have low administrative and marketing expenses to gross revenue. We assumed that it takes innovation to reduce core business operating expenses. We also assumed that a significant cut in operating expenses when gross revenue is increasing leads to higher performance.
- RD = represents the ratio of research and development expenditure to gross revenue between 2012 and 2017 in the selected companies. This variable is often computed as a ratio of R&D expenditure to gross revenue. This is in line with previous studies that stressed that R&D investment is a major proxy for innovation (Artz *et al.*, 2010). In this study, we used a dummy of 1 and 0 to measure R&D due to non-disclosure of R&D in most Nigerian companies' annual reports. Thus the value of "1" was assigned to companies operating in industry where R&D spending is essential and that also disclosed their R&D activities in their annual reports otherwise '0'. We also assumed that presence of RD activities as an innovative activity led to higher performance.
- CPT = represents innovative intangible asset rights which is computed as a ratio of copyright, patent and trademark to total asset as indicated in the balance sheet of selected companies.
- CPT = represents innovative intangible asset rights. This variable was computed as a ratio of copyright, patent, and trademark values in the balance sheet to total assets. This is in line with previous studies which stress that copyright,

trademark and patent (Cho & Pucik, 2005), when pulled together, form better proxy for measuring the depth of internal corporate innovation of a company (Rao, 2005; Corkindale & Belder, 2009). It is assumed that increase in innovative asset right value led to higher performance

SIZE = firm size, and it is measured by using the log of total assets. We also assumed that large companies are likely to be associated with higher performance.

AGE = firm's age, and it is measured by using the difference between year 2012 and the companies' year of incorporation. We also assumed that older companies are likely to be associated with higher performance.

$\beta$  = variables that vary across companies but do not vary over time

$\omega_t$  = variables that vary over time but do not vary across companies at any given time

$\varepsilon_{it}$  = error terms over the cross section and time

i and t = cross sectional and the time period effect respectively.

The presumptive signs of the parameters in the specifications are:  $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6 > 0$

### ESTIMATED RESULTS

Below is the descriptive statistics of the sampled firms.

**Table 1: Descriptive Statistics**

Variables	Mean	Min	Max	Jarque-Bera
L-TECH	0.631255	0.0	38.6954	261901.1(0.0)*
AMI	0.28991	0.0	8.5747	254415.3(0.0)*
R&D	0.523909	0.0	1	80.16(0.0)*
CPT	5.06E+08	0.0	2.47E+10	50658.8(0.0)*
TA	1.20E+11	3473797	3.23E+12	17323.03(0.0)*
AGE	61.87942	-2	2013	116229.9(0.0)*
EMP	2113574	-	5154	188857.2(0.0)*
No of Cross Section	113	1.49E+08	0843	
All data observation	481			

*Note: \* and \*\* implies 1% and 5% level of significant respectively*

Table 1 above shows the mean (average) for each of the variables, their maximum values, minimum values and Jarque-Bera (JB) statistics (normality test). The results above provide some insight into the nature of the selected firms that were used in this study as follows. Firstly, the large difference between the maximum and minimum values of total firm size (TA) shows that the sampled firms are not dominated by either large or small firms. Secondly, it is observed that on the average, over the six years period (2012-2017) that labour – technology capital intensity (L-TECH) is 63%. This implies that there is high level labour – technology capital intensity among the sampled quoted firms in Nigeria.

On the average, administrative and marketing innovation over the six-year period stood at 29%. We also observed that research and development driven industry (R&D) has

an average of 52%. The result also reveals that the average age of the selected quoted firms stood at 62%. A look at firm performance indicator (EMP) shows that on the average over the six-year period, the profitability per employee (EMP) of the sampled firms was N2, 113,574. This clearly shows that there is great commitment and efficiency of employees of the Nigeria quoted firms.

Lastly, the Jarque-Bera (JB) statistics shows that all the variables are normally distributed at 1% level of significance. This implies that the data collected was free from outlier and is reliable for drawing generalization in the sectors bearing the selected firms. In examining the association among the variables, we employed the Pearson correlation coefficient analysis (correlation analysis) and the results are as stated below.

**Table 2: Pearson Correlation Matrix**

	LTECH	AMI	R &D	CPT	TA	AGE	EMP
L-TECH	1.000						
AMI	0.728	1.000					
R&D	-0.039	-0.107	1.000				
CPT	-0.024	0.011	-0.132	1.000			
TA	-0.012	0.066	-0.355	0.122	1.000		
AGE	-0.002	-0.006	0.122	-0.023	-0.048	1.000	
EMP	-0.035	-0.076	-0.132	0.092	0.076	-0.021	1.000

*Source: Author (2018)*

Table 2 above presents the correlation between the firm's performance measure (EMP) and the four measures of innovation. The result shows that labour – technology capital intensity (L-TECH) is negatively associated with EMP (-0.035). This implies that most firms with more labour – technology capital intensity may not be able to generate consistent higher performance in terms of profitability per employee.

In the case of administrative and marketing innovation (AMI), the variable was negatively associated with EMP (-0.076). This implies that firms with more administrative and marketing innovation are likely to exhibit less profitability per employee.

We also observe that in the case of research and development driven industry (R&D) dominated firms are negatively associated with EMP (-0.132). This implies that research and development driven industries are likely to associate with poor profitability per employee.

Result also indicates that innovative intangible asset (CPT) was positively associated with EMP (0.092). This implies that innovative intangible assets are likely to associate with higher profitability per employee.

Also, firm size (TA) and firm age (AGE) both exhibit positive (0.076) and negative (-0.021) associations respectively with profitability per employee. A close look at the correlation matrix also reveals that no two explanatory variables were perfectly correlated. This implies that there is absence of multicollinearity problem in our model. Multicollinearity between explanatory variables may result to wrong signs or implausible magnitudes in the estimated model coefficients, and the bias of the standard errors of the coefficients.

### Regression Results

In order to examine the cause-effect relationship between the dependent variables (ROA, EMP and PATM) and the independent variables, we used unbalanced panel data

regression analysis since the data had time series (2012 to 2017) and cross-section properties. The outcome is tabulated below:

**Table 4: EMP Unbalanced Panel Regression Results**

	Expected Sign	EMP (Fixed Effect)	EMP (Random Effect)
<b>C</b>		-4765708.0 (-0.27) [ 0.78]	2919609.0 (2.54)* [ 0.01]
<b>L-TECH</b>	+	449510.1 (0.19) [ 0.23]	369985.6 (1.33) [ 0.18]
<b>AMI</b>	+	-2301560.0 (-1.57) [0.11]	-2476142.0 (-2.15)** [ 0.03]
<b>R&amp;D</b>	+	- - -	-1968950.0 (-1.35) [ 0.17]
<b>CPT</b>	+	0.0001 (0.65) [ 0.51]	0.0002 (1.21) [ 0.22]
<b>SIZE</b>	+	5.29E (1.35) [ 0.17]	2.44E (1.20) [ 0.23]
<b>AGE</b>	+	104286.3 (0.36) [0.71]	-88.10 (-0.02) [0.93]
<b>R-Squared</b>		0.447171	0.22559
<b>Adj-R-Squared</b>		0.285687	0.010467
<b>F-Statistic</b>		2.76(0.0)	8.16(0.0)
<b>Hausman Test</b>		-	2.24(0.81)
<b>N(n)</b>		113(6)	113(6)

**Note:** (1) Parentheses ( ) are t-statistic while bracket [ ] are p-values

(2) \* is 1% and \*\* is 5% level of significance respectively

To enable the selection of the preferred estimation result among the two results, we adopt the Hausman test and the result shows a high probability p-value of (0.81) meaning not significance. This outcome suggests that we should accept the null hypothesis (Ho) (which assumes that random effect model is preferred to fixed effect model, that is, when the chi square result is insignificant. This is an indication that we should adopt the random effect panel regression results in our study for the discussion of findings, policy formulation and recommendation(s).

On this note, we analyse only the random effect results to make generalizations. A look at the empirical findings of the random effect unbalanced panel estimation using the coefficients signs and magnitude of the innovative variables, result indicate that labour – technology capital intensity (L-TECH) has a positive though not significant impact on profitability per employee (EMP). This means that labour – technology capital intensity may not be a significant variable that explains variation in profitability per employee (EMP) as a measure for firm performance. The result suggests that we accept hypothesis one (Ho<sub>1</sub>)

which states that the effect of labour – technology intensity on firm performance as measured by profitability per employee is not significant.

On the other hand, the administrative and marketing innovation variable (AMI) has a negative and a significant impact on number of profitability per employee (EMP) at 5% level of significance. This implies that more administrative and marketing innovation will statistically decrease the number of profitability per employee (EMP) of the sampled firms in Nigeria as a measure of firm performance. The result suggests that we reject hypothesis two ( $H_{02}$ ) which states that the effect of administrative and marketing innovation on firm performance as measured by profitability per employee is not significant.

The variable, Research and development driven industry (R&D) has a negative and insignificant impact on profitability per employee (EMP). This indicates that the variable is not an innovative factor that drives profitability per employee (EMP) as a measure of firm performance. In the case of innovative intangible assets variable (CPT), the variable has a positive and was statistically insignificant in influencing the profitability per employee (EMP).

On the account of the control variables, it is found that firm size (TA) had a positive but statistically insignificant in influencing the profitability per employee (EMP) as measure of performance. While firm age (AGE) show a negative and insignificant impact on the number of profitability per employee (EMP) as a measure of firm performance. This implies that firm age is insignificant in driving firm performance. In summary, we find that firms in Nigeria have not been innovative driven and in addition, profitability per employee (EMP) is a good measure of performance in Nigeria.

### CONCLUDING REMARKS

We note that the issue of firm innovativeness to a large extent depends on the firms' capabilities. Again, we also observe that due to the non – homogeneity of firms' characteristics, the outcome of most of the variables appears to contradict the apriori expectations of the variables used in this study. However, the findings in this study suggest that the use of the innovation factors without considering the effort needed to achieve them might mean over estimating their effect on firm performance.

From our empirical evidence also shows that most of the negative relationship revealed is a pointer to poor management of resources which is peculiar to the Nigerian context. Most importantly, our major findings emphasize poor innovative drive and small size nature (that is, in terms of total assets) of most Nigerian firms. This has serious implications for R&D spending. No wonder the negative effect of R&D on profitability per employment. We observe that small firms with relatively low expenditures on research and development may have competitive advantage in R&D productivity, while R&D may be limited, such small firms are relatively efficient in decision making and coordination, allowing them to rapidly respond to market needs and quickly develop and launch new products. This R&D outcome is a pointer that its level in the firms sampled appeared too low such that can engender the firm performance.

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