

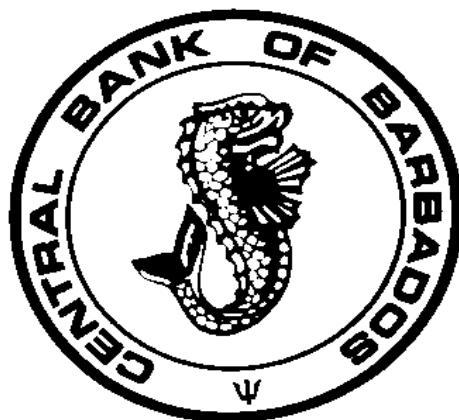
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**THE SUCCESS FACTORS OF MANUFACTURING FIRMS IN
CARIBBEAN SMALL ISLAND STATES: A LOOK AT BARBADOS**

BY

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CENTRAL BANK OF BARBADOS

**The Success Factors of Manufacturing Firms in Caribbean Small Island States:
A Look at Barbados**

Crystal Drakes* and Winston Moore**

Abstract

Since the 1970s, the output of Barbadian manufacturing industry has been on a steady downward trajectory. This paper utilises a database of 308 small and medium manufacturing firms to identify the factors that impact on the performance of manufacturing firms in island economies. An integrated model of firm performance including economic, organisational and innovation factors is developed and estimated using a pooled ordinary least square model.

Keywords: Barbados; Manufacturing; Firm Performance

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1 Introduction

Baldacchino (1998) argues that industrialisation, for many small open economies, was a vain attempt at best, with many islands lacking the necessary resources to implement and sustain successfully manufacturing industries. Due to their inherent characteristics and their limited infrastructure such as capital, natural resources and human expertise, it is no surprise that many small island economies do not have large manufacturing industries. With the exception of islands such as Fiji, Malta and Mauritius that have very modern and productive manufacturing industries, many SIDS have either small or declining manufacturing industries (Baldacchino 2005).

There has been a steady decline in output from the manufacturing industry of Barbados. During the 1970s and 1980s, the industry contributed significantly to economic activity in the economy, representing on average, 20% of GDP (Economic Planning and Research Unit, 1978). More recently, manufacturing has experienced a decline in output, and was estimated at just 4% of GDP in 2014. Given the decline in economic activity, along with other challenges such as globalised free trade, and increasing external current account deficits, Barbados must continue its attempts to diversify the economy. Despite the myriad of challenges that face Barbadian manufacturers, and other manufacturers in similar small island states, countries such as Prince Edward Island and Mauritius have shown that manufacturing can be a viable enterprise in island states.

Given the past performance of the manufacturing industry, the research question examined in this paper is as follows: what are the firm-level factors that contribute to the success of manufacturing firms in small states? To answer this question, a theoretical framework is proposed with an internal environment consisting of economic, organisational and innovation firm-level factors that impact on firm performance. The various factors identified in the framework motivated the integrated model used to investigate the research

question and builds on the work of Hansen and Wernerfelt (1989). The model consists of the traditional economic and organisational factors that have been previously found to impact on firm performance (Hansen and Wernerfelt 1989; Drexler, 1977; Wijewardena and Cooray 1994; Alvarez and Crespi 2003). In contrast to this literature, however, innovation factors are included in the analysis as they are identified as being critical to firm competitiveness and success in today's business environment (O'Regan, Ghobadian, & Sims, 2005). To test the integrated model, a pooled Ordinary Least Squared model was employed, using a micro level dataset of 308 small and medium manufacturers from the World Enterprise Surveys (WES) conducted in 2010.

Similar studies have investigated the factors that impact the growth of manufacturing firms (Chittithaworn, Islam, Keawchana, and Yusuf 2010; Baldacchino 2005; Alvarez and Crespi 2003; Hansen & Wernerfelt 1989). However, most of these studies have been done in large developing or developed countries. Little research has been done on manufacturing in small island states. This paper differs from other studies in two major ways. First, the focus of this study is on manufacturing firms in the small islands state of Barbados. And second, it uses econometric techniques to identify the factors that contribute to manufacturing success rather than qualitative techniques used by past research (see Baldacchino, 2005). The key contributions of the paper therefore are, (i) it moves away from identifying the challenges of manufacturing in a small island states, and shifts the discourse to factors that positively impact manufacturing growth, (ii) by attempting to identify the success factors, the paper adds to the literature a preliminary micro-level framework of factors proven to be associated with manufacturing firm growth, and (iii) the paper conducts a micro-level investigation using data which was previously unavailable.

The rest of the paper is organized as follows. Section 2 provides an overview of the literature on the manufacturing in small island states and firm performance. Section 3 outlines the methodology utilised and section 4 discusses the results, Section 5 concludes the paper.

2 Previous Literature

2.1 *Small Island Enterprise*

Small island developing states (SIDS) have structural and institutional characteristics that constrain not local firm performance, but their international competitiveness and process of economic growth. The UN Committee for Development Policy has acknowledged there is no accepted definition for SIDS. However, they do acknowledge the unique characteristics and natural challenges these countries encounter (United Nations, 2012). Bernal (2001) outlined these very candidly:

- 1) High Degree of Openness. Small island economies, in general, have a large external trade to GDP ratio. They rely on external resources owing to limited local resources, and the inability to maintain certain areas of production as a result of their small size of the market.
- 2) Export Product Concentration. Small economies have a limited spectrum of locally produced goods and services. Exports, particularly of goods, are usually limited to one-three main products. Furthermore, the products exported by these economies are usually primary commodities (i.e. low value-added) and non-unique on the global market. There are also extreme cases where one primary product dominates all export activity, for example bananas accounted for more than 90% of Dominica's exports in 1991.
- 3) Export Market Concentration. Export product concentration is further compounded by limited export markets. Small countries only sell to one or two main countries, in most cases it is their former coloniser. For example, 80% of Dominica's bananas and 90% of St. Lucia's exports were exported to Britain throughout the 1990s.
- 4) Imperfect Markets. Local markets are small in size with many market imperfections. Small market size results in the prevalence of monopolies and oligopolies in small islands. Moreover, usually one or few players dominate even when many players are in the market it.
- 5) Size of Firms. Firms in small island states are at a disadvantage in the global market for three main reasons. First, these firms, because they are so small, are unlikely to reap the benefits of economies of scale. Second, their basic (mostly outdated)

production methods and product simplicity make them unattractive to foreign investors. Third and finally, the obsolete technologies used and low level of product sophistication are results of insufficient funds invested into research and development.

- 6) Physical Vulnerability. SIDS around the world have fragile eco-systems. Furthermore, with global warming threatening to impact on the earth's natural equilibrium via changing temperatures and high sea levels, small islands need to be more focused on sustainable economic activity for their natural survival. Small island economies are also have a higher probability of being affected by natural disasters when compared to larger economies. An example of this was the damage Hurricane Ivan caused Grenada, where around 200% of their GDP (US \$1.1billion) in 2004 was destroyed. In comparison in 2005 Hurricane Katrina's property damage alone was an estimated US\$81 billion.

Similarly, Briguglio (2005) also identified the special disadvantages of SIDS: small size, insularity and remoteness, vulnerability to natural disasters, environmental factors, dependence on foreign sources and demographic factors. All these characteristics have highlighted two main issues, the extreme economic dependence of SIDS and their vulnerability to external shocks. In order for SIDS to address these issues they need to become more competitive and diversified in their economic structure and export markets (Bernal, 2001).

There are very few cases where goods are 100% produced by an island-based business and exported on the international market (Baldacchino 2002). In small islands, local business is usually oriented around low risk wholesale and retail trade (Baldacchino 1995). Baldacchino (2005) stated that small successful locally-owned small-scale export-oriented manufacturing are rare but not impossible.

Most of the previous research on small island business and island competitiveness is filled with pessimism (Saffu, 2003). To tackle this negative perspective Baldacchino (2005) suggested that inductive fieldwork based on comparative island research should be

undertaken by educators and researchers involved in promoting island enterprise. This effort should assist in reducing the negativity that defines away the progress of small-island business and ultimately the global competitiveness of small island states.

In order to improve manufacturing in small islands certain requirements must be met. Small firms must have skilled flexible labour with the ability to improve the production process. Management must place emphasis on product development and innovation and integrating these initiatives into a comprehensive competitive strategy. The introduction of lean business systems to reduce cost and improve quality is advised. Companies should also seek to engage in market research to gather information on product developments and technologies to keep abreast with what other companies are doing (Millar, 2009). Moreover SMEs in the Caribbean should take advantage of producing niche products, as they are small and flexible making them adaptable to the dynamic nature of high value niche markets (Leduc 2005, Punnet and Morrison 2006). In essence firms must exhibit essential characteristics that are proven to positively contribute to their success and growth.

2.2 Manufacturing in Barbados

The most prominent literature on small island industrialisation is the Sir Arthur Lewis Model of Industrialisation (Lewis, 1954). The Lewis model of industrialisation for Caribbean countries was birthed from the issue of the rapid growing population within many of the small islands in the region and the surplus labour should be absorbed into the new industries to produce new sources of income. He proposed agricultural and industrial revolutions are interdependent and the success of one is dependent on the performance of the other.

In the 1970s, the island's manufacturing industry contribution to GDP almost doubled thereby accelerating growth and creating jobs for thousands of individuals (approximately 15% of the labour force). Due to the importance of the industry in the past, researchers have been actively investigating the industry. The literature on the Barbados manufacturing industry has been mainly focused the policy orientation of the sector (see Cox, 1982; Whitehall, 1984; Worrell, 1986; Downes & Lavine, 1995). In the 1980s and early 1990s

researchers found that local-oriented firms were more focused on import restrictions and the protectionist policies, for example tariff protection, implemented by government reinforced the local orientation of firms.

At the turn of the century, many countries and regions turned to trade liberalisation in order to achieve economic development facilitated by the World Trade Organisation. This shift in economic policy led also led to a shift in the focus of research on manufacturing in Barbados. Watson (1990) in his study of the export performance of the sector found Barbadian non-traditional products did not have a substantial share in the American market under the framework of the Caribbean Basin Initiative. In addition, Howard (2006) in his analysis of economic development in Barbados provided an insightful view of the manufacturing sector of the country. Overall, Howard suggested that policy makers must concentrate on raising the level the country's international competitiveness to increase the country's manufacturing output. The author asserts that the role the manufacturing sector in the Barbadian economy has been constrained by the difficulty of penetrating foreign markets and high wage costs. It is proposed that given the importance of the manufacturing sector to the survival of Caribbean countries, further research on the impact of trade liberalisation on the sector should be done (Lewis Bynoe & Moore, 2000).

Although there is a growing body of literature done on manufacturing in the Caribbean, there still remain important knowledge gaps and research priorities for the Caribbean (Caribbean Development Bank 2009). The main gap in the research of manufacturing on the Caribbean lies at the enterprise level. It is argued that most of the empirical studies done throughout the Caribbean on manufacturing focused on trade, competitiveness, and EPZs or other conceptual ideologies that relate to manufacturing and industrialisation. Caribbean Development Bank (2009) argues that research priorities should include enterprise-level studies on manufacturing in countries where the sector either plays a significant role in economic activity or has the potential to do so. Furthermore, firm level studies would allow for the identification of specific characteristics of successful manufacturing enterprises in the Caribbean. The findings of these studies can then act as the premise for designing

policies and programs targeted at the most important issues affecting regional manufacturing.

Despite the moderate interest in the performance of the manufacturing industry in both Barbados and the rest of the Caribbean, little work has been done at the firm level to identify the cause of the slow growth and in some instances the contraction of the industry. The lack of micro-level analysis of the Barbadian manufacturing sector in the past may have been due to the absence of data.

3 Methodology

The research builds on the integrated model proposed by Hansen and Wernerfelt (1989) by adding to their integrated model of economic and organisational factors a set of innovation factors, which according to O'Regan, Ghobadian and Sims (2005) is necessary for small firm success. Innovation is a non-price competitive factor that is integral to explaining a firm as well as a country's trade performance (Roper & Love, 2001) and the ability to innovate is the driving force behind firm performance (Neely & Hii, 1998). Innovation impacts firm performance through innovation activities making the firm more competitive and the process of innovation allows firms to increase their internal capabilities (Neely & Hii, 1998). Traditionally there has been a focus on the impact of economic and organisational factors on firm performance. Since innovation has become an integral part of firm performance, these factors are included in the integrated model.

Throughout the literature, researchers have used various proxies of firm performance. What constitutes a successful firm is a focal phenomenon in business studies and is a complex and multidimensional subject of discussion. More often than not in business studies success refers to the financial performance of a firm (Chittithaworn, Islam, Keawchana, & Yusuf, 2010). Measures of firm performance such as profit, the number of employees, return on investment/assets and sales growth are prevalent throughout the literature (see for example Hall 1987; Steiner and Solem 1988; Grinyer, McKiernan, and Yasai-Ardekani 1988; Hansen and Wernerfelt 1989; Wijewardena and Cooray 1994). To date, however, there has

not been a consensus on the definition of firm success (Chittithaworn, Islam, Keawchana, & Yusuf, 2010).

Following the previous work of Steiner and Solem (1988), Cuba, Decenzo, and Anish (1983), Khan and Rocha (1982) and Wijewardena and Cooray (1994), sales growth will be utilised as a proxy for firm performance within this paper. Hofer & Schendel (1978) state that growth in sales is an economic measure of how well a firm responds to its external environment. Furthermore, Delmar, Davidsson, and Gartner (2003) suggest that given the numerous measures of performance, sales growth should be the preferred measure of firm growth. The authors state that sales growth is easily accessible and represents short-run and long-run changes in the firm. The growth in sales assumes that the growth in the firm is driven by increased demand for the firm's goods and services, allowing growth in other areas such as employment and assets (Fitzsimmons, Steffens, & Douglas, 2005). Moreover, the United States Small Business Administration identified sales as a key indicator of small business performance (Wijewardena & Cooray, 1994). It is therefore hypothesised that sales growth in SMFs in SIDS is influenced by economic, organisational and innovation factors. Sales growth is defined as the change in firm sales and is chosen over other measures of firm performance primarily because of its presence within the database. Other proxies that have been used such as profitability and return on investment, are absent from the database.

The firm performance proxies utilised are (i) the change in firm sales defined as (*GSI*) $\Delta \text{firm sales} = \text{sales}_{2009} - \text{sales}_{2007}$ and (ii) the short run growth rate in firm sales defined as (*GRSI*): $\ln(\text{sales}_{2009}) - \ln(\text{sales}_{2007})$. The integrated model of firm performance is empirically expressed below in equation (1).

$$Y_j = \alpha + X_j'\beta + W_j'\gamma + Z_j'\lambda + \varepsilon_j \quad (1)$$

Y_j represents firm performance of the j^{th} firm, α is the constant and ε_j is an normally distributed error. X_j' , W_j' and Z_j' denote the three groups of firm level factors (economic, organisational and innovation) that impact on firm performance. X_j' denotes a vector of economic firm level variables including variables such as exports share, the perception on the accessibility of financing, the number of employees, the values of capital, the value of

land and building, labour productivity and size. These variables are included to evaluate whether economic variables impact on firm performance.

The economic model is expressed in equation (2).

$$Y_j = \alpha + EX_j + AF_j + EM_j + C_j + LB_j + LP_j + S_j \quad (2)$$

The export shares (*EX*) variable is the percentage of firms' total sales that represent sales from exports. Exports in small island economies provide much needed foreign exchange, which is used for the payment of international goods and services as well as to finance growth and development programs (Prasad 2004: 2006). Also, small local markets within island states may not be able to facilitate the necessary growth firms may need to remain viable. Given the importance placed on export market participation in SIDS, it is expected that a company's export share should be positively associated to firm sales growth.

The access to finance (*AF*) variable is a dummy variable, where if a firm perceives there are no obstacles to accessing finance it takes a value of one and zero otherwise. Financing has been identified as a key factor that allows small firms the capacity to grow (Coricelli and Masten 2004; Koivu 2002; Beck and Laeven 2006; Schiantarelli and Jaramillo 1999; Schiantarelli and Srivastava 1999). Therefore it is assumed there is a positive relationship between the perception that there are no obstacles to accessing to finance to and firm growth. Firm size (*S*) is a dummy variable if the firm is small it takes the value of one and zero otherwise. Within the literature there is no consensus on the relationship between firm size and firm growth (Evans 1987; Hall 1987; Dunne, Roberts and Samuelson 1988) therefore no a priori relationship is assumed. Labour productivity (*LP*), is defined as the change in sales divided by the change in employment. It is assumed that *LP* is positively related to firm growth, given that the more productive labour is, the more efficient a firm becomes, positively impacting on firm growth (Roberts, Chen, & Aw, 2001). To control for firm heterogeneity that may affect firm performance, the following variables are also added to the regression. In the Caribbean labour markets are relatively small, the number of employees (*EM*) is a variable that represents the number of full time employees in the firm, it is expected that the *EM* is positively related to firm performance once full capacity of the firm has not been met. The variable capital (*C*) is the value of the firm's machinery,

vehicles and equipment and land and building (*LB*) is the value of the firm's land and building. Both *C* and *LB* are expected to have a positive relationship with firm growth assuming the firm has not pass optimal production levels.

To evaluate the work of Hansen & Wernerfelt (1989), a set of firm level organisational variables are included to the model represented by the vector W'_j . These variables include ownership type, owners experience, management type, employee training and the presence of international certification. The organisational model is:

$$Y_j = \alpha + SO_j + OE_j + FO_j + SL_j + ET_j + IC_j \quad (3)$$

Ownership type (*SO*) is a dummy variable representing sole proprietorship, the variables takes a value of one if the firm is owned by a sole proprietor or zero otherwise. This variable is based on the assumption that sole proprietorships have similar levels of entrepreneurial characteristics, making them risk-takers and flexible entities that respond quickly to market changes. However, sole proprietors may be constrained in decision making and limited expertise, hindering the growth of the firm. Consequently, the relationship between firm ownership and firm performance is a priori ambiguous.

Owner's experience (*OE*) represents the number of years the owner has had management experience prior to taking control of the firm. A positive relationship is expected between *OE* and firm growth. Female Ownership (*FO*) is a dummy variable that takes a value of one if the firm has a female owner and zero otherwise. In the Caribbean and globally more women have been entered the workforce. Since World War 2 more women have entered the work force and taken ownership of businesses in all sectors. This increase has been fuelled by the numerous factors including, financial security, self-sufficiency, inadequacy of one pay cheque to meet the needs of middle-class families, increased rates of divorce and an increasing number of female headed households (Halladay, 2002). There is no consensus within the literature on the relationship between female ownership and firm performance (Halladay, 2002; Downing, 1991) No a priori relationship is assumed. Skilled labour (*SL*) is the number of employees who hold tertiary level education. It is expected that *SL* will be positively related to firm growth as the literature suggests that skilled labour is more productive improving the performance of firms (Arvanitis, 2005).

Employee training (*ET*) is a dummy variable that takes a value of one if the firm has engaged in formal training for its full time employees and zero otherwise. It is expected that *ET* and firm growth will have a positive relationship. International certification (*IC*) is a dummy variable if the firm has internationally recognised quality certification takes the value of one and zero otherwise. Firms that have *IC* are expected to have higher levels of production and performance therefore a positive relationship between *IC* and firm growth is expected. This group of variables provides proxies for firm climate and is expected to be a significant contributor to firm growth following the results found by (Hansen & Wernerfelt, 1989).

Additionally, in the integrated model of firm performance a third group of variables is added. Z_j represents a vector of innovation firm level variables. This is a new dimension to the integrated model, as previous studies focused mainly on the impact of economic and organisational variables. The innovation firm-level variables include product development, research and development, collaborative innovation, government assistance for innovation activities, patents trademarks and copyrights, sales from innovation and process innovation. The innovation model is expressed in equation (4).

$$Y_j = \alpha + PD_j + RD_j + CI_j + GI_j + IP_j + PI_j + PTC_j + SI_j \quad (4)$$

Firm-level indicators of innovation are categorised into innovation in relation to inputs, process and outputs (Kemp, Folkeringa, de Jong, & Wubben, 2003). The variables categorised as innovation inputs are product development, research and development, collaborative innovation and government assistance for innovation. Process innovation is categorised as an innovation process variable. Innovation outputs include, patents trademarks and copyrights, sales from innovation.

Product development (*PD*) is a dummy variable that takes a value of one if a firm has engaged in product development activities and zero otherwise. R&D (*RD*) is a dummy variable that indicates if the firm engaged in research and development activities and zero otherwise. Collaborative innovation (*CI*) is a dummy variable if the firm engaged in innovation activities with other enterprises or science and technology institutions. Public assistance (*GI*) for innovation is a dummy variable if the firm received public support for

innovation related activities. Innovation support program (IP) is a dummy variable if the firm used services or programs to support innovation. All of the innovation input variables are expected to have a positive relationship with firm growth.

Process innovation (PI) is a dummy variable that takes a value of one if the firm introduced any new or significantly improved processes for the production of goods and zero otherwise. Patents, trademarks and copyrights (PTC) is a dummy variable if the firm has applied or filed for any patent, trademark industrial design or copyright related to its product or process innovation takes a value of one and zero otherwise. Sales from innovation (SI) is a variable representing the percentage of firm sales accounting for new or significantly improved products. It is also expected that innovation process and output variables have a positive relationship with firm growth given the importance of innovation in the literature to influence a firm's competitiveness (O'Regan, Ghobadian, & Sims, 2005).

The data used in the study was obtained from the World Enterprise Survey (WES). The WES database provides a unique cross section of Caribbean firms that was previously unavailable at the micro level. The survey contains approximately 2420 manufacturing and service industry firms ranging from small to large¹ from 13 Caribbean countries collected in 2010. The survey was designed to provide information on a wide cross section of areas such as infrastructure and services, sales and supplies, finance, business development, labour, innovation and overall firm performance amongst others. The sample used for this study consists of 308 small- and medium-sized manufacturing firms from 8 Caribbean countries for the year 2010. Given the size of the Caribbean and the lack of previous firm level studies the sample is considered large for the demographics of Caribbean small and medium manufacturing firms. The analysis includes other Caribbean islands due to the lack of data on small- and medium-sized Barbadian firms. It is assumed that since the Caribbean islands selected are SIDS and share common geographic, economic and other characteristics drawing conclusions regarding Barbados based on Caribbean data is appropriate. Given the importance of the assumption of homogeneity amongst Caribbean

¹Small ≥ 5 and ≤ 19 employees, Medium ≥ 20 and ≤ 99 employees, Large ≥ 100 employees

manufacturers, this assumption is tested and the results are reported below.

4 Empirical Results

It was assumed the data contained some cluster (country) specific effects. Therefore, equations (1)-(3) were estimated using a fixed effects equation. An integrated model, consisting of variables found to be statistically significant to firm growth, the Hausman test and Breusch Pagan Lagrange Multiplier Random Effects (Cameron & Trivedi, 2005) both reject the presence of fixed and random effects, respectively (see table 1 for test results). Therefore equations (1)-(3) were modelled using pooled OLS and the results are reported below.

Table 2 provides the results from the economic, organisational, innovation and integrated model, with the dependent variable defined as the change in firm sales: (GS1): $\Delta \text{firm sales} = \text{sales}_{2009} - \text{sales}_{2007}$. In the economic model (EM1) the number of full time employees, capital, land and building and labour productivity were found to be statistically significant explanatory variable. The other variables AF, S, C, EX were removed from the equation after there were found to be statistically insignificant at normal levels of testing. The overall model is statistically significant, with 80 percent of the variation in GS1 being explained by EM1. The OM1 and IM1 models were statistically insignificant with only one innovation variable, public support for innovation, being statistically significant.

Given the results of the firm performance proxy GS1, equation 1, 2, and 3 are regressed against the short run growth rate of sales (*GRS1*): $\ln(\text{sales}_{2009}) - \ln(\text{sales}_{2007})$. The results are reported in Table 3 in the appendix. Similar to the previous model, in the economic model (EM2) full time employees, capital, size, and labour productivity were found to be statistically significant to the short run growth rate of sales. Overall the EM2 model explains 90 percent of the variation in GRS1 and is statistically significant. Moreover, employee training and international certification were statistically significant and positively related to firm growth. Despite only 13 percent of the variation in firm growth being explained by the organisational model the overall model is statistically

significant (Prob >F: 0.000). In the innovation model (IM2) only sales from innovation was statistically significant to firm growth however, the variable was reported to be negatively related to the short run growth rate of sales.

An integrated model is derived from the statistically significant variables: full time employees, capital, size and labour productivity, international certification, employee training and sales from innovation and the results are reported in Table 4. The integrated model was statistically significant and the variables explained 88 percent of the short run growth of firm sales. It should be noted that in the integrated model that employee training, international certification and sales from innovation are no longer statistically significant.

4.1 Discussion

Overall, the findings reveal that economic factors are still the main driving force behind manufacturing firm performance. Using the short run growth rate in sales as the dependent variable it was found that the number of full time employees, capital, firm size and labour productivity are significant to manufacturing firm growth. In addition, the variables employee training, and international certification and the sales from innovation activities also have some influence on the growth rate in sales.

The findings revealed that firm performance of island manufacturers is mainly explained by firm-level economic variables: full time employees, the level of capital, labour productivity and firm size. Therefore, small and medium sized manufacturers seem to be maximising the input potential of their labour and capital to increase productivity, which in turn positively impacts on firm performance. Firm size was negatively related to firm performance following the argument that larger firms experience higher levels of sales and growth due to reasons such as to the exploitation of economies of scale, greater control over resources and the retention of better trained employees (Orlitzky, 2001).

The results of the organisational model on firm performance suggest that firms may be underutilising their human capital. The statistically significant, positive relationship found

between employee training and the short run growth rate in sales suggests manufacturers should focus on the development of persons through training activities. In doing so, firms create employees who have technical expertise in their jobs, building human capacity which in turn leads to more competitive firms (Wright, McMahan, & McWilliams, 1994). Attaining international certification and adhering to global standards is another factor in which manufacturers may enhance their performance. In doing so, small and medium sized firms have the opportunity to expand into foreign markets increasing their market share and sales.

The innovation firm level variable, sales from innovation, is the only variable that is statistically significant on firm performance. Overall, the innovation model does not have a significant impact on firm performance. The negative relationship found between sales from innovation activities and firm performance maybe due to the fact that firms usually gain returns from investment in innovation activities in the long run. Moreover, since the proxies for firm performance utilised in the empirics were all short-run indicators, this may account for the negative and insignificant relationship between the sales from innovation and firm performance.

The results not only have implications for manufacturers but also for policy makers who facilitate the business environment in which these firms operate. Policymakers must implement programs that are simple and effective enough to increase the capacity of manufacturers. Based on the results presented, public assistance is needed in the areas of human capital development, technical training, quality control and regulation as well as targeted innovation activities to improve the performance of manufacturers. In general, the state has a responsibility to provide support systems that facilitate the growth and competitiveness of the private sector (Punnet & Morrison, 2006). Overall, the findings imply that the manufacturing industry may become competitive if the right resources are employed. More emphasis must be placed by private owners and public officials on human capital, technological development and the fostering of creative and innovative thinking with the fundamental objective of exporting locally produced goods.

5 Conclusion

The purpose of this study was to build a firm level framework that identified the factors that contribute to the success and competitiveness of manufacturing firms in Barbados. To realize this purpose, the paper sought to answer the following research question: what are the firm level factors that contribute to the growth of manufacturing firms in Barbados? To answer this question, an integrated model of firm performance is developed using economic, organisational and innovation factors contributing to the work of Hansen and Wernerfelt (1989). The main contributions of the study to the literature on small island manufacturing were: i) it identified the success factors of manufacturing rather than the challenges frequently referred to in past studies, ii) it used micro level data, which was previously unavailable, making the analysis one of few microeconomic studies done on the Barbadian manufacturing industry and, iii) the study identified the firm level factors that impacted on manufacturing firm growth. These contributions are important given the instrumental role the manufacturing industry once played in the Barbadian economy and the potential economic activity it can generate in the future. By employing the integrated model and using a pooled OLS model it was found that the number of employees, the level of capital, labour productivity, and firm size were the factors that were statistically significant with firm growth.

Identifying factors that contribute to the success and competitiveness of manufacturing firms in small island states such as Barbados is important in order to propose alternatives to the many challenges SIDS face. The study has provided preliminary but critical research into small island manufacturing, an area where few studies have been undertaken. The contributions of this paper were to focus on the successful factors of manufacturing firms in Barbados as well as the identification of the importance of these factors using robust econometric techniques based on micro-level data. In investigating the factors that contribute to the growth of manufacturing firms, many areas for future research have emerged. First, the proxy used for firm performance, due to the nature of the data available, was a short-run variable. Therefore, the findings of the research were within the context of the short- to medium-run. To build on the current work, an analysis of the factors that impact on firm performance in the long-run would be of benefit to researchers and

manufacturing stakeholders, as it would assist in further understanding the complexity of small-island manufacturing.

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6 Appendix

Table 1: Cluster Specific Fixed and Random Effects Test

Hausman Test	Prob>chi2 = 0.9801
Breusch and Pagan Lagrangian multiplier test for random effects	Prob > chibar2 = 1.0000

Table 2: DEPENDENT VARIABLE: Δ firmsales = sales2009 – sales2007 (Cluster Robust SE)

	GS1EM1		GS1OM1		GS1IM1	
	Coef.	SE	Coef.	SE	Coef.	SE
FE	18981.900***	3114.400				
LB	-0.410***	0.020				
LP	-1.430*	0.462				
SO			-408519.200	258201.000		
FO			-46600.660	149706.600		
OE			146864.400	197458.400		
SL			1106.488	8241.414		
ET			-147183.500	256248.700		
IC			-570204.700	762169.600		
PD					295966.400	352744.300
RD					193571.900	157377.600
CI					75555.870	270425.800
GI					556834.800*	210218.700
SI					-7863.720	120192.800
PTC					-1280996.000	1003595.000
Constant	-80284.690	46274.940	334728.400	161137.100	-49933.770	212336.700
R-squared	0.790		0.022		0.036	
N. of cases	294		307		307	
* p<0.05, ** p<0.01, *** p<0.001						

Table 3: DEPENDENT VARIABLE: ln(sales2009) – ln(sales2007)

	GRS1EM2		GRS1OM2		GRS1IM2	
	Coef.	SE	Coef.	SE	Coef.	SE
AF	0.038	0.052				
FE	0.004*	0.001				
C	0.234**	0.047				
LB	0.061	0.044				
S	-0.331**	0.069				
LP	0.929***	0.105				
EX	0.016	0.038				
SO			-0.319	0.147		
FO			-0.063	0.216		
OE			-0.052	0.282		
SL			0.010	0.007		
ET			0.392*	0.122		
IC			0.484*	0.177		
PD					0.074	0.278
RD					0.031	0.253
CI					-0.464	0.287
GI					0.144	0.511
IS					0.320	0.461
PI					-0.394	0.248
PTC					0.139	0.144
SI					-0.007*	0.002
Constant	-0.475	0.309	5.783***	0.131	6.170	.
R-squared	0.905		0.134		0.119	
N. of cases	119		181		64	
* p<0.05, ** p<0.01, *** p<0.001						

Table 4: Integrated Model, Dependent Variable GRS1 ln(sales2009) – ln(sales2007)

	GRS1INM1		GRS1INM2 (Robust Cluster SE)	
	Coef.	SE	Coef.	SE
FE	0.003***	0.000	0.005*	0.002
C	0.218*	0.086	0.232**	0.062
S	-0.341**	0.097	-0.321**	0.063
LP	0.724***	0.063	0.906***	0.109
IC	0.056	0.093		
ET	0.040	0.088		
SI	-0.002	0.001		
Constant	1.173	0.675	0.032	0.502
R-squared	0.885		0.897	
N. of cases	49		132	
* p<0.05, ** p<0.01, *** p<0.001				