Middle Class to Rescue the Apparel Sector in Sri Lanka

Weerawansa S. R. S. D. K. [a*], Hewage T. U.[b]

[a*] *Department of Economics, University of Colombo, Sri Lanka*

[b] *Department of Mathematics, University of Colombo, Sri Lanka*

A B S T R A C T

Having begun as an unskilled labour-intensive mass-production, the apparel industry in Sri Lanka transformed itself into one that caters to high-end value chain manufacture in a relatively short time period. During its period of transition since the phasing out of the Multi-Fiber Agreement (MFA), which, de facto, provided a shield against its inherent competitive disadvantage *viz-a-viz* its competitors, since its inception in the 1970s, demanded extraordinary structural interventions within and outside the industry if the sector to survive. Though the sector's earning capacity is around US$5 billion per year, which is about 0.25% of the world revenue within the apparel sector, the industry is planning to achieve a revenue goal of US$8 billion per year by 2025. According to JAAF (Joint Apparel Association Forum of Sri Lanka), apart from stable policies and labour priorities, improving productivity is the most effective way of achieving these goals. This research explored the influence of Total Factor Productivity (TFP), a widely used economic factor in many similar empirical studies. The analysis of regression coefficients obtained by processing cross-sectional data through a multiple regression Cobb-Douglas production function suggests that higher TFP gains are mostly associated with medium-sized enterprises, the middle class in the sector, compared to small and large-sized organisations. The study envisages that the research findings will provide insights to pursue appropriate state policies that could unravel the true potential of the industry as a growth driver and a broad industry diversification catalyst.

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[*] Corresponding author: shashi@econ.cmb.ac.lk

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1. Introduction

Covid-19 hit the economies around the world hard, perhaps none harder than the Sri Lankan economy. Apparel, as the leading manufacturing export sector since the decline of the plantation export economy of the pre-independence era, was the hardest hit along with the tourism industry. Based on industry sources, the number of factories went down to 350 from approximately 1200 employing nearly one million directly and indirectly. A significant number of small and medium-size factories had to close down during the crucial period of 2020 - 2021. The cost of production has gone up by almost 50% owing to the high cost of fuel (the price of diesel went up by 140% since September 2021), salaries and wages due to increase in the cost of living and transportation costs domestically and internationally and prices of raw material due to depreciation of the local currency. While there are a lot of political and economic decisions to make on behalf of the whole country, there are a lot of decisions to be made in sector-wise rescue missions too. Measures of productivity will help the decision-making process of the firms and the policymakers by indicating the strength of the firms to expand and compete in the global market. Since the employment generation and export revenue through the apparel industry in Sri Lanka have been under par compared to other East-Asian countries up to now anyway, this could be the best time for the industry and the policymakers to think about a paradigm shift in their thinking. To contribute to the knowledge bank that can be helpful in such efforts, an analysis of Total Factor Productivity (TFP) in the apparel sector is embarked upon in this study. There is a large body of empirical evidence on TFP in other countries. In contrast, there is minimal empirical evidence on this topic in Sri Lanka. There are some limited attempts to estimate TFP at a macro level and industry level (for example, Duma, 2007; Bandara & Karunaratne, 2010 & Dutz & O'Connell, 2013). The last systematic study on labour productivity and TFP in the manufacturing sector has been carried out in the mid-1990s (Athukorala, 1996).

A widespread industry opinion is that the apparel sector in Sri Lanka has so far failed to achieve its true potential, though it is the only manufacturing export sector in the country that has an earning capacity above US$ 5 billion per year covering almost 50% of the total export earnings of the country. The expectations to increase the export revenue from the apparel sector to US$ 8.5 billion by 2020 (EDB,2015) were shattered due to the COVID-19 pandemic. It is believed that the growth of the apparel sector since the setting up of the WTO has been mainly driven by the initiatives of the industry without adequate support from the policy establishments. One possible reason for this policy apathy could be attributed to inadequate objective research on the crucial dynamics of the sector. Hence, this study is undertaken to address factor productivity as one such vital area for future policymaking and development of this crucial sector.

The study drawn from the conceptual basis articulated by Athukorala (1996), is done on developments during the period from 1995 to 2015 (based on the availability of data with different HS codes). The period is especially significant due to the abolition of the Multi-Fiber Agreement (MFA)[1] in 2005 and the loss of GSP Plus[2] in 2010, which are the most critical challenges the sector had to face. Though GSP Plus was reinstated in 2017, the benefit will come to an end by 2023 by which time the industry should have all the necessary ingredients ready to increase productivity.

1.1. Research question

***RQ**:* How can an analysis of Total Factor Productivity help the Apparel sector and policymakers in their efforts of restructuring and sustain the industry?

2. Literature review
2.1. Measurements of productivity
Broadly speaking, productivity can be defined as the amount of output produced per unit of inputs. Productivity can be measured for specific kinds of inputs (such as labour and capital), resulting in estimates of labour productivity and capital productivity respectively; or it can be measured for combinations of inputs (Douglas, 1976). Hence, there are three primary measures of productivity that are commonly used; Labour Productivity - the amount of output produced per unit of labour input; Capital Productivity - the amount of output produced per unit of capital input; and TFP also known as multi-factor productivity (MFP) - the amount of output produced per unit of a mix of inputs. In general, TFP is defined mostly as the portion of output not explained by the number of inputs used in production. Both theoretical and empirical studies have documented the importance of Total Factor Productivity (TFP) for long-term growth (Solow 1956).

2.2. Determinants of TFP
The growth of TFP provides society with an opportunity to increase the welfare of people (Isaksson, 2007). It is, therefore, worthwhile to ask, what determinants should policy focus on to enhance the performance of TFP? According to the findings of Isaksson (2007) education, health, infrastructure, imports, institutions, openness, competition, financial development, geographical predicaments and absorptive capacity (including capital intensity) appear to be the most important factors for TFP growth. Ineffective use of resources, poor information flow and non-productive activities have been identified as the key factors which are hindering the productivity prevalent in the Sri Lankan manufacturing industry (Vilasini et al., 2014). Isaksson (2007) highlights the role of knowledge in production looking at the two main components, inputs X (for example, labour and capital) and knowledge A, where the latter optimizes the contributions of the former.

2.3. Theoretical underpinning
In neoclassical growth models (for example, Solow, 1956), technological progress is manna from heaven and determined exogenously. But in modern growth theory (for example, Romer, 1986, 1990) technological progress comes because of the expansion of the "old" model by adding an explanation of how knowledge is created (hence A is endogenous). Modern growth models believe in endogenous knowledge creation allowing for continuous growth. Joseph Schumpeter (1947) has expressed similar views of 'creative, destruction', applying it to the Swedish textile and wearing Apparel sector and has found results that support the notion. Basu & Weil (1996), argue that technology is 'appropriate' only for countries with similar capital-labour ratios (capital intensities). In other words, US technology will, for example, not be appropriate for Lesotho. If innovation takes place at high capital-labour ratios, such technology spillovers will not benefit countries with low capital-labour ratios and thus cause them to fall behind. Empirical evidence for such an effect was provided by Isaksson (2007), and also by Timmer & Los (2005). Diffusion of technology from abroad can be expressed so that it directly relates to technology transfer, which, for example, can lead up to a Coe et al. (1997) specification for TFP. It does not purely mean technological improvement but also improvement in the quality of inputs due to other factors like HRD and HRM (Kartz, 1969).

Nelson & Phelps (1966) model, shows that the rate at which technological laggards achieve technological improvements in leader countries depends positively on their level of educational attainment, and proportionally on the technology gap between the leader and themselves. Benhabib & Spiegel (1994) extend the Nelson & Phelps model by adding an endogenous growth component showing that the level of human capital influences a country's capacity to develop its technological innovations, which in turn is a determinant of TFP growth. As many economists and management veterans emphasize, (Barro, 2001), the impact of labor quality has two main effects on economic growth; one has a direct impact by improving the effectiveness of the labor used for production and the other an indirect one through productivity growth. Human capital, for example, in the form of the level of education, has an important effect on TFP because of its role as a determinant of an economy's capacity to carry out technological innovation (Romer, 1990). Black & Lynch (1996) demonstrate the importance of educational quality for productivity in both manufacturing and non-manufacturing sectors, based on 1,600 manufacturing and 1,300 non-manufacturing plants in the US.

3. Methodology

This study will examine the product variations for different periods to understand the trends in TFP and then an in-depth investigation is carried out into productivity growth in the apparel sector by employing the regression approach (firm-level). Moreover, the regression analysis is carried out using various sub-samples drawn based on firm size, employment, and geographical area based on the district and province of the company to understand capital, labour and technology variations.

A limited number of studies available in this regard include those of Athukorala (1996), Bandara & Karunaratne (2010), Deraniyagala (2001), Karunaratne & Bandara (2004), and Kelegama et al. (1999), though some of them have referred to the method of growth accounting. This study analyses the TFP and its determinants in the context of the Apparel sector in Sri Lanka using the Cobb-Douglas production function with a regression analysis based on the published data extracted from the Annual Survey of Industries (ASI) by the DCS from 1995-2015.

The Cobb-Douglas production function is a particular functional form, widely used to represent the technological relationship between the amounts of physical output that can be produced by physical inputs. It's the most standard form for the production of a single good with two factors, the function is: $Y = A L^{\beta} K^{\alpha}$

Where: Y = Total production A = Total factor productivity L = Number of workers
K = Capital input

β and α are the output elasticities concerning labour and capital respectively and these values are constants determined by available technology.

In addition to standard variables of the Cobb-Douglas production function, several additional variables have been introduced to the model. Though the original Cobb-Douglas function took labour (L) and capital (K) into account, later they realized that it can be improved by introducing other non-correlated factors into the regression model (Douglas, 1976). They include district and province of firm operation, age of the firm, size of the firm, etc. The parameters of the model are estimated by a multiple regression model.

3.1. Data preparation and econometric specification – regression approach

$$Q_i = AL_i^{\alpha} K_i^{\beta} u_i \quad (1)$$

$$lnQ_i = lnA + \alpha lnL_i + \beta lnK_i + lnU_i \quad (2)$$

$$lnQ_i = lnA + \alpha lnL_i + \beta lnK_i + \sum_{i=1}^{25} \gamma_i D_i + lnU_i \quad (3)$$

Equation (1) – represents the traditional Cobb-Douglas production function where *A, L, and K* denote technology, number of labour and capital stock while α and β stand for the output elasticity of labour and capital respectively.

A linear log transformation of equation (1) could be written as equation (2). In addition to the capital and labour, equation (3) is constructed by introducing several dummy variables representing various characteristics such as the size and location of individual firms.

The ASI collects information related to several areas such as labour, capital, output, value addition, inputs, etc. This study makes use of firm-level information on capital (fixed assets), labour, a district dummy and company size based on employment. The district is a nominal categorical variable while all the other four variables are quantitative variables. Firms are classified into three categories namely small (employees less than 50), medium (employees 50 to 249) and large (250 employees or more).

4. Results and discussion

The regression results related to the Cobb-Douglas production function estimated for selected years namely, 1995, 1999, 2005, 2010 and 2015 are given in Table 1 below. The selection of years was done based on the availability of data. The regression models include key variables such as value-added, capital and labour. In addition to capital stock and a number of labour, the regression model is controlled for other variables such as the district (locational) and sector dummies. The estimated models explain over 50% of total variations in value-added. In addition to the regression models for the whole sample and sub-samples were generated based on the firm size in terms of employment to examine productivity differential across firms.

Table 1: The Cobb-Douglas Production Function Estimations

Cob-Douglas production function reports (regression results) estimated for selected years

Year	1995					1999				
Model/Size	M1	M2	S	M	L	M1	M2	S	M	L
Constant	5.92	6.77	6.53	9.23	8.61	5.79	6.54	6.2	9.13	6.93
Capital(β)	0.39	0.33	0.33	0.26	0.32	0.41	0.38	0.39	0.32	0.31
Labor(α)	0.81	0.8	0.86	0.67	0.46	0.83	0.81	0.88	0.5	0.7
No. of Observations	2066	2066	1170	647	249	1810	1810	1078	571	161
R. Squared	0.74	0.77	0.55	0.32	0.44	0.74	0.76	0.58	0.33	0.51
F-Test Value	2990	343	70.1	14.87	10.4	2592	320	80.4	14.2	10
α+β	1.2	1.13	1.19	0.93	0.78	1.24	1.19	1.27	0.82	1.01

Year	2005					2010				
Model/Size	**M1**	**M2**	**S**	**M**	**L**	**M1**	**M2**	**S**	**M**	**L**
Constant	7.37	7.51	8.04	6.66	9.87	8.32	8.3	8.14	9.07	8.43
Capital(β)	0.33	0.31	0.36	0.31	0.25	0.31	0.31	0.27	0.3	0.38
Labor(α)	0.76	0.77	0.61	0.91	0.59	0.82	0.82	0.93	0.74	0.63
No. of Observations	1522	1522	319	852	351	1680	1680	870	634	176
R. Squared	0.58	0.61	0.32	0.36	0.37	0.68	0.7	0.46	0.35	0.44
F-Test Value	1062	89	5.67	19.39	9.3	1811	148	27.2	14.3	6.9
α+β	1.09	1.08	0.97	1.22	0.84	1.13	1.13	1.2	1.04	1.01

Year	2015				
Model/Size	**M1**	**M2**	**S**	**M**	**L**
Constant	7.89	7.87	8.28	8.25	5.67
Capital(β)	0.43	0.42	0.37	0.4	0.67
Labor(α)	0.72	0.71	0.87	0.82	0.2
No. of Observations	862	862	460	296	106
R. Squared	0.47	0.5	0.27	0.29	0.37
F-Test Value	388	31.7	6.22	5.38	3.03
α+β	1.15	1.13	1.24	1.22	0.87

Source**:** Author created

M1: represents composite data for the entire sample. M2: represents the entire sample with a district breakdown.

S: Small Firms (employees < 50) M: Medium Firms (employees 50 – 249) L: Large Firms (employees >= 250)

4.1 Graphical summary of the Cobb-Douglas production coefficients

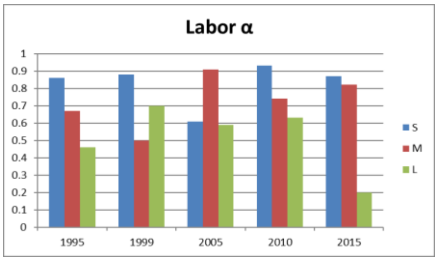

Figure 1: Graph 1
Source: Author Created

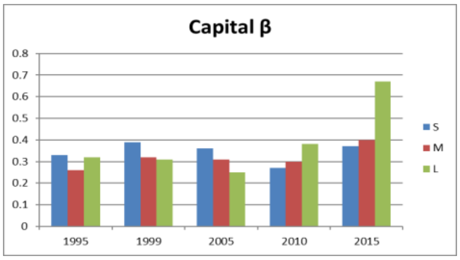

Figure 2: Graph 2
Source: Author Created

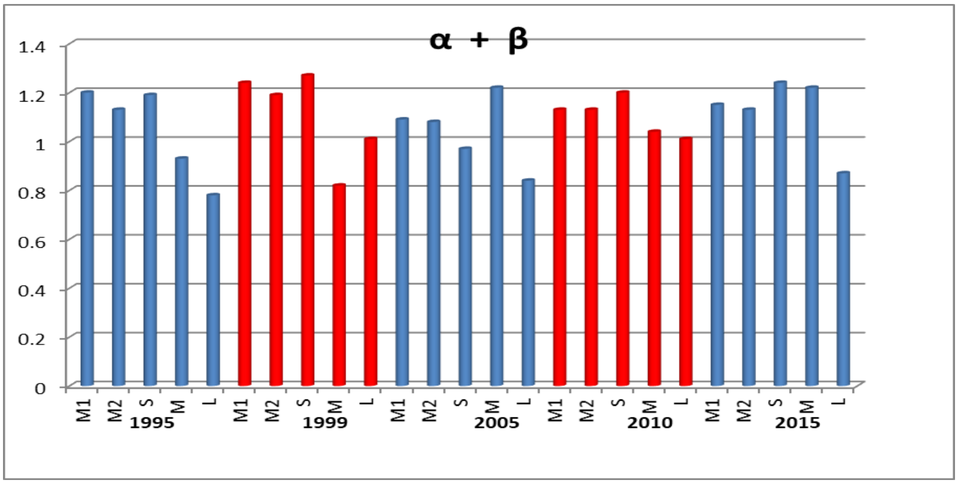

Figure 3: Graph 3
Source: Author created

Table 1 reports regression results related to the Cobb-Douglas production function for the selected years 1995, 1999, 2005, 2010 and 2015 for the variables: value-added, the capital stock, the number employed, and other related data. The table illustrates estimated results: in 1995; M1 the output elasticity of capital taken as a composite value is around 0.4; the same sample estimated with a district breakdown given in M2 has an output elasticity of around 0.3 and both coefficients are statistically significant at 1% level.

The output elasticity of labour across the two models in 1995 is 0.8 and it is acceptable at conventional significance levels. The estimated production function thus displays increasing returns to scale in terms of capital and labour.

In the context of the TFP estimation, researchers are interested in an estimated technical coefficient, i.e. the estimated constant term of the regression model. This constant term is referred to the contribution of technology to the production process. The estimated constant term, in 1995, at around 6 percent is statistically significant at a 1% level of significance. This technological coefficient is relatively high and varies from 6.5 to 9.1 at a 95% confidence interval. A higher level of the technological coefficient implies a greater sensitivity of the TFP on the level of production in the Apparel industry during the mid-year 1990. The F-statistic confirms a relatively high level of the explanatory power of the model. It may be noted that the model incorporates the controlled variables for locational (for instance district variations) and sector dummies (for policy segregation such as by the BOI etc.). The model further examines the influence of the levels of productivity across different firm sizes based on the level of employment.

The estimated technical coefficient in 1995, 6.5 for small firms, 9.2 for medium and 8.6 for large firms provides some evidence to suggest that medium-sized firms are more productive than both small and large firms. It is a common understanding that small firms typically demonstrate increasing returns to scale, whereas medium and large-scale companies tend to display decreasing returns to scale (Graph 3).

The estimated models explain around 30 -50 % of the variation in total value-added. The R-squared value related to the regression model based on small firms remains at around 0.55, for the medium at 0.32 and large firms at 0.44. Thus, the explanatory power of the medium-sized company sample appears to be relatively inferior to small and large firms, whereas the small firm sample displays the highest explanatory power.

In this regression model, the estimated productivity coefficient in 1999 is 6.54 and it is statistically significant at a 1% level of significance. A comparison of the year 1999 statistics with 1995 statistics indicates that there has not been any significant shift in the estimated coefficient values. Based on this outcome it could be concluded that productivity levels in the sector, including coefficients of capital (0.38) and labour (0.81) appear to have remained stagnant. It may, however, be noted that labour productivity remains high throughout notching over 0.8. The productivity coefficient taken together is greater than 1, thus reflecting that overall returns to scale are displaying a slightly increasing nature.

The TFP was relatively higher in 1999 for medium and large firms. The TFP for small firms based on employment size was around 6, while the same for medium and large firms stood at around 9 and 7 respectively. TFP results for both medium and large firms between 1995 and 1999 were higher than for small firms. Interestingly small firms, demonstrate increasing returns to scale while both medium and large-scale companies reflect decreasing returns to scale (Graph 3).

The estimated models explain around 30 -50 % of the variation in total value-added. The R-squared value remains around 0.58 implying nearly 58% of the variation in value-added is explained by the model based on small firms while the same value for medium firms remains around 0.33 implying nearly 33% of the variation in value-added, while the R-squared value related to the regression model based on large firms remains around 0.51 implying nearly 51% of the variation in value-added.

5. Conclusions

The Apparel industry has transformed itself into what it is today from a very basic beginning where the domestic contribution has primarily been the unskilled human resources on the factory floor to a very sophisticated global industry. However, the producers have moved up to a value chain to create the largest manufacturing and exporting business in Sri Lanka with substantial product complexity. In this process, several economic parameters have reflected its progression. The focus of this study, namely TFP, has been one of the key driving forces used as a co-indicator of this transformation. As the study has shown the TFP trends have displayed the inner working of the industry under rapidly and markedly changing internal and external factors. Until the year 2000, the coefficient of TFP has been hovering around six but thereafter up until the study period, 2015 the same has been rising beyond eight. The reason for this sustenance of TFP in the 2000s could be the overall changes the Apparel industry has embarked on and the impact on the productivity of firms. These changes may include the garment categories and upscaling in the value chain (Botchie et al. 2017). The sector, after 2000, had to embark on semiautomatic technology in order to circumvent the challenges in the labour market. Moreover, in the early 2000s, the technology was expensive due to heavy reliance on European countries. However, the same is sourced at low prices after 2010 from the Chinese markets. (Frederick et al. 2011).

The study findings reveal that TFP gains have been mostly associated with medium-sized enterprises (employees from 50 to 249) predominantly, the middle class in the sector, during the study period compared to small and large-sized organizations. (This is seen in Table-1 where the constant term for the M (Medium Firms) column is larger than that of the S column or the L column for most of the years.) The reasons for this outcome could not be attributed to one single factor. Given the macroeconomic uncertainties, labour shortages including, high labour turnover could provide partial explanations in individual cases as the impact of these factors could affect different firms without a common pattern. While small firms may have been affected by economies of scale, large firms may find other factors with a predominantly adverse impact although they enjoy economies of scale. According to industry sources, medium-sized units could be single product units and sub-contractors, which experience, low operational and handling costs.

TFP differs from district-wise and province-wise to a greater extent during the study period. It was also found that firm location is an important factor in determining value addition. This may be due to the existence of physical and social infrastructure facilities with which firms engage in production activities. The analysis of TFP provides only a partial explanation. The elaboration of the industry's current status was influenced by market factors that could perhaps not be listed under economic parameters.

Medium-sized enterprises (in terms of employment) that drive to higher TFP levels than small and large-sized enterprises show that the country can no longer drive growth simply through labour augmentation. That is why Sri Lanka will have to diligently work on increasing her Total Factor Productivity to drive growth. Hence, innovation and R&D will have to play a crucial role. It is understood that this area of intervention could not be handled by the industry alone as the issues are macro-dimensional. Thus, it could be said that government intervention with industry participation in an innovative way is much needed. Smaller enterprises could be clustered around larger enterprises through appropriate backward linkages. Medium-scale enterprises can focus on specialized and customized segments with enhanced capacities to shift between different orders at relative ease. They could be encouraged to work together to achieve economies of scale in production by creating a "pseudo value chain" process or something similar. Also, large enterprises could focus on mid-range or upper mid-range garments where mass production provides a competitive advantage while medium-sized factories could be encouraged and supported to focus on highly specialized garment segments which may not be drawing large orders. These different-sized factories could be within the same group of companies too. The results obtained in the TFP growth analysis indicate that promoting Middle Range Garment Factories will help the growth of the industry much faster. Empirical evidence shows that, other than labour, capital and technology, there are a host of noneconomic factors such as buyer loyalty, quality of ancillary and supporting services, worker attitudes, ethical supply sourcing, service levels, good relationships with buyers, effective communication, government support and organizational culture that have a significant bearing on TFP. Since there are other factors such as human resource development opportunities, leadership qualities of the top management and organizational culture in individual firms that can have a significant impact on the TFP, similar studies combined with qualitative analyses of such effects will provide greater insight into the evolution of the apparel industry in Sri Lanka. Such knowledge can be useful for all the stakeholders, especially for the policy makers, in their attempts of improving the industry that can again be the major pillar of the economy of the country.

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