Vidyodaya (...) Golden Jubilee Issue 195 - 212

Employment Change in Manufacturing Industries in the Western Province of Sri Lanka: A Shift and Share Analysis

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Abstract

Within the last two decades manufacturing sector has been important to the economy of Sri Lanka in different manner. Particularly in terms of the employment generation and the location of manufacturing units Western Province leads other provinces of the country. Accessibility as well as the availability of infrastructure facilities has played a vital role in attracting industries to the Western Province. However, data for the 1990 decade indicate that manufacturing employment of the Western Province has been fluctuating by loosing its relative significance. Therefore, it is important to analyze how the employment change in this province has taken place during past few years, as it is the core region of the country. Such an analysis is useful to understand the future locational pattern of manufacturing industries in the province.

Shift and share analysis is the technique used to analyse this employment change, as this paper attempts to evaluate the structural and regional influences for the employment change in the province. The analysis is based on the Annual Survey of Industries. It delimits the employment change in medium and large-scale manufacturing, as these surveys have only taken into consideration medium and large-scale enterprises for the enumeration. This analysis consists of two main parts. First part is the shift analysis and the second part is shift and share analysis.

Findings of the shift analysis indicate that the rate of employment decline of the Western Province is faster than the national rate of decline. Shift and share analysis emphasises that manufacturing establishments, which are not nationally well-distributed have a location preference to the Western Province. It is evident that industrial decentralization programme has particularly been responsible for this locational change in employment.

Keywords : Shift and Share Analysis, Structural Shift, Differential Shift

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Introduction

Industrialization is a process where by industrial activity comes to play a dominant role in an economy. The composition of an economy is measured by broad groups of economic activities using the International Standard of Industrial Classification (ISIC). United nations often define the industrial sector as the secondary sector of an economy, which covers four broad divisions of ISIC - Mining, Manufacturing, Construction and Utilities. It has been accepted that there must be a significant growth of manufacturing sector within the process of industrialization.

For a long time Sri Lanka had a large proportion of its labour force concentrated in its traditional agricultural sector. It is still the main economic activity of majority of population in the country. Yet, recent trends indicate that there has been a significant increase in the contribution of manufacturing sector to the Gross Domestic Product (GDP). For instance the contribution of manufacturing sector to the GDP increased from 15.3 per cent in 1990 to 21.0 per cent in 2000. Within the same period value of manufacturing production also increased from Rs.86756 million to Rs.462720 million.

The distribution of manufacturing industries in Sri Lanka shows an overwhelming concentration in the Western Province. Western Province is the leading part of the country regarding the location and the number of employment in manufacturing sector. According to the last Census of Industries in 1983, 23.1 per cent of total manufacturing establishments were located in the Western Province. In the same year Western Province contributed to 36.2 per cent of total number of employment in this sector. After the last census in 1983 data are available from Annual Survey of Industries and they have not taken into consideration small-scale establishments for the enumeration. Yet, Annual Survey of Industries also confirms the significance

of the Western Province in employment generation even regarding the medium and large-scale enterprises. For instance, according to the Annual Survey of Industries in 1987 58.7 per cent of the total employed in manufacturing sector has been generated by the Western Province. By 1990 its employment share has increased to 69.3 per cent. In 1995 and 2001 contribution of the Western Province to the total employment reported 69.8 and 68.9 per cent respectively. The accessibility as well as the availability of infrastructure facilities in Colombo and suburbs has played a vital role in attracting industries and employees to the Western Province.

Even though Western Province leads other provinces in the country in terms of manufacturing employment, Annual Surveys of Industries confirm that the number of employees generated by this province has been fluctuating within the 1990 decade. For instance, in 1990 Western Province generated 1,83,448 employees in medium and large scale manufacturing sector. After five years it increased by 1,66,969 jobs by indicating 91 per cent growth in 1995. Thus, the total number of employment generated by the Province in 1995 was 3,50,417. After three years it once again came down reporting 13.6 per cent negative growth in 1998. By 2001 the number of manufacturing employment generated by the Western Province is 3,31,946. It is 9.6 per cent growth compared to 1998.

The above statistics make some interest to know how the employment change in manufacturing industries has taken place within the last decade in the Western Province of Sri Lanka. Employment change in a region is not an isolated phenomenon. It could be due to the national rate of change in manufacturing or the change in industrial structure of the region itself. It may also be due to locational advantages or disadvantages of the region. It means that there may be some structural and regional influences for the employment change in a region. An analysis of the relative importance of these different elements is essential particularly for future industrial planning. Therefore, this paper attempts to make such an analysis regarding the change in manufacturing employment in the Western Province of Sri Lanka.

Objectives and the technique applied

As explained in the part of the introduction objective of this research paper is to analyse how the employment change in the Western Province has taken place in 1990s. Shift and share analysis is the technique used to analyse its employment change. As it is expected to evaluate the structural and regional influences for the employment change there must be a suitable method of estimating the relative importance of these different elements. One approach to statistically interpreting employment change over time in particular places is shift-share analysis (Hayter 1998). Shift and share analysis is most appropriate for describing such employment change in a region as it provides better guidelines to understand the influences of these different elements (Watts 1987). Shift analysis relates the rate of employment change in an area to the rate of employment change in some larger unit of which the area is a part. Shift and share analysis is developed by shift analysis. It is most appropriate for analysing net changes in all manufacturing activities. Shift analysis alone is not particularly useful in examining all manufacturing because the net shifts may include major structural influences. The technique of shift and share analysis breaks down the manufacturing employment change in a region into three elements: regional share, structural shift, and differential shift. Structural shift component examines the effect of industrial structure on the rate of manufacturing employment change in a region. The differential shift can also be interpreted as reflecting the strength of the locational advantages or disadvantages of a region. Thus, shift and share analysis basically distinguishes an 'industry mix effect' and 'regional effect' (Watts 1987: 231 - 237; Appendix 1; Hayter 1998: 433 - 439; Appendix 1).
The results of this technique are interpreted with reference to the following definitions and formulas.

G = National employment in manufacturing industry

Ei - National employment in industry i

Ej = Total employment in manufacturing industry in region j

$$S\,Ej = G$$

eij = Employment in industry i in region j

T_1 data (time period 1) are represented by

$G^\circ \quad E\,i^\circ \quad Ej^\circ \quad e^\circ ij$

T_2 data (time period 2) are represented by

$G^1 \quad Ei^1 \quad Ej^1 \quad e^1ij$

Total Shift (TS) = $Ej^1 - [\,Ej^\circ \times G^1 / G^\circ\,]$

Regional Share Component (RS) = $[\,Ej^\circ \times G^1 / G^\circ] - Ej^\circ$

Structural Shift Component (SS) = $\Sigma \{ e^\circ ij\,(Ei^1/Ei^0) - (G^1/G^\circ)]\}$

Differential Shift Component (DS) = $\Sigma \{ e^1ij - [e^1ij\,(Ei^1/Ei^\circ)]\}$

Data and its Limitations:

As explained, this analysis comprises of two main parts: shift analysis and shift and share analysis. Shift analysis is based on the Annual Survey of Industries in 1990 and 2001 but shift and share analysis is only limited to the Annual Survey of Industries in 1995 and 2001. In understanding the employment change within the last decade in the Western Province an earlier year other than 1995 should have been used for shift and share analysis. Although a year between 1990 and 1995 would have been more useful and ideal for the analysis, suitable and relevant data for those years are not available. Annual Survey of Industries of those years does not provide provincial data according to ISIC categories, which are essential for shift and share analysis. Data pertaining to 1995 are found to be the only relevant avialable data, as they provide more suitable information for the shift and share analysis. As the data in 1995 and 2001 does not provide any information regarding the employment change within the first half of the ninety-decade data in 1990 is also used for the shift analysis to minimise this deficiency.

On the other hand, Census data would also have been used for this kind of analysis but any Census regarding industries has not been held within the 1990 decade. Census of Industry in 1983 is the only source, which provides in depth and more details about the structure of manufacturing industries in Sri Lanka. But such a 25-year-old census does not give any information regarding the employment change in 1990s. Therefore, this analysis is completely based on the Annual Survey of Industries.

It should also be noted that these Annual Survey of Industries have only taken into consideration medium and large-scale industries for the enumeration. In defining small, medium and large-scale enterprises these surveys have used the employment criterion. They designate those units, which employ less than 5 persons as small, between 5 to 24 persons as medium and those with 25 or more persons engaged as large-scale enterprises. All establishments of large-scale enterprises and a probability sample of medium scale sector have been canvassed but small-scale

manufacturing sector has completely been excluded by the surveys. Thus, the analysis had to be delimited to the medium and large-scale manufacturing sector. In understanding the result of this analysis readers must also be careful as the North and Eastern Provinces in Sri Lanka have completely been excluded from the analysis. Because of the civil war in the North and East Annual Surveys of Industries have excluded these two provinces from enumeration. Finally, interpreting these results also needs care, as each and every aspect of this analysis has been viewed compared to the national situation. It should be noted here that there are some major criticisms if shift and share analysis is used as a descriptive technique to isolate the effects of industrial structure on regional employment change.

Employment change in the Western Province

Shift Analysis:

Calculations for the shift analysis are indicated in Table 1 based on the Annual Survey of Industries. As illustrated by the table 1 Western Province has generated 1,83,450 jobs in 1990 by contributing to 69.3 per cent of total manufacturing employment in the country. By 1995 it has additionally generated 1,66,970 employments. Shift analysis indicates that the national rate of employment growth during this period is 1.89. If the employment change in the Western Province had followed the national rate of growth it should only have additionally generated 1,64,080 jobs. But in 1995 it additionally generated 1,66,970 employments by contributing to a net gain of 2890 jobs.

The analysis further illustrates that the net shift represented 4 per cent of increase in jobs and thus 9480 jobs are involved in the redistribution of employment among provinces. During the period from 1990-95 total manufacturing employment in the country has increased by 236890 reporting 89.4% growth rate. But the rate of increase among provinces varied widely emphasising the regional inequalities in the growth of manufacturing employment. Table 1 illustrates that four provinces

experienced a growth of manufacturing employment higher than the national rate while the rest reported lower rates than the national average. Among the provinces, which report higher rate of manufacturing employment than the national average, Western Province reports the second place.

Table 1 : Employment Change by Provinces, 1990 - 95: Shift Analysis

Province	Employment No. ('000s) 1990	Employment No.('000s) 1995	Expect 1995	NET GAIN	NET LOSS
Western	183.45	350.42	347.53	2,89	
Central	22.18	40.42	42.02		-1.60
Southern	14.76	30.44	27.96	2.48	
North-western	17.68	28.29	33.49		-5.20
North-Central	2.39	5.16	4.53	0.63	
Uwa	8.12	18.87	15.38	3.49	
Sabaragamuwa	16.27	28.14	30.82		-2.68
Other Provinces	-	-	-	-	-
TOTAL	**264.85**	**501.74**		**9.48**	**-9.48**

Source: Annual Survey of Industries, 1990 and 1995

Result of the shift analysis for the data in 1995 and 2001 is presented in Table *2*. It confirms that the significance of Western Province in employment generation has come down during the second half of the 1990 decade. Within this period national employment in the manufacturing sector has also decreased by 96 per cent. The analysis confirms that the rate of decline of the Western Province for the period is faster than the national rate. In 1995 Western Province has generated 350420 jobs. If employment change had taken place to the national rate the province

should at least have generated 336490 jobs in 2001. But the province experienced a net loss of 4540 employments, as it could only generate 331950 jobs in 2001.

Two sets of analysed data presented in Table 1 and 2 further disclose the nature of employment decline in the Western Province compared to other provinces. Within the first half of the decade Western Province recorded the second place in employment generation by reporting a net gain of 2890 jobs but it lost its comparative importance within the second half of the 1990 decade. As presented by Table 2, within the second half of the decade not only the Western Province reported a net loss of employments but also it recorded the second highest loss of employments among provinces.

Table 2: Employment Change by Provinces, 1995 - 2001: Shift Analysis

Province	Employment No.('000) 1995	Employment No.('000) 2001	Expect 2001	NET GAIN	NET LOSS
Western	350.42	331.95	336.49		-4.54
Central	40.42	52.22	38.81	13.41	
Southern	30.44	26.55	29.23		-2.68
North-western	28.29	32.01	27.17	4.84	
North-Central	5.16	2.59	4.95		-2.36
Uwa	18.87	12.79	18.12		-5.33
Sabaragamuwa	28.14	23.69	27.02		-3.33
Other Provinces	-	-	-	-	-
TOTAL	**501.74**	**481.8**		**18,25**	**-18.25**

Source: Annual Survey of Industries, 1995 and 2001

Although the above shift analysis provides some kind of idea of the employment change in the Western Province it is not particularly useful in examining all manufacturing since net shift may include major structural influences. Thus, it is

necessary to examine the effect of industrial structure on the rate of change in manufacturing employment of the province. Shift and share analysis provides the basis to examine this effect.

Shift and share Analysis:

In order to approach the first stage of shift and share analysis, calculations relating to the national rate of change in each industry and the rate of change in all industry are needed. As presented in Table 3, difference between these two indicates the relative performance of each manufacturing division compared to the national average and it is used to calculate the structural effect of manufacturing employment in Western Province. Thus, calculations for the structural effect for the Western Province are presented in Table 4.

Table 3 :Relative Performance of Manufacturing Divisions Compared to National Average

ISIC Code (Industrial Category)	Sri Lanka 1995	Sri Lanka 2001	Industry Ratio	All Industry Ratio	Difference
31. Food beverages and tobacco industries	87.29	102.47	1.1739	0.9651	0.2088
32. Textile, wearing apparel and leather products	275.87	237.89	0.8623	0.9651	-0.1028
33. Wood and wood products	9.85	14.07	1.4284	0.9651	0.4633
34. Paper and paper products	13.87	15.75	1.1355	0.9651	0.1704
35. Chemical and chemical products	40.27	44.41	1.1028	0.9651	0.1377
36. Non-metallic mineral products	27.97	26.01	0.9299	0.9651	-0.0352
37. Basic metal industries	2.17	1.33	0.6129	0.9651	-0.3522
38. Fabricated metal products	24.87	27.75	1.1158	0.9651	0.1507
39. Other manufacturing industries	19.57	14.54	0.7430	0.9651	-0.2221
TOTAL	**501.73**	**484.22**	**0.9651**		

Source: Annual Survey of Industries, 1995, 2001.

Table 3 indicates that the relative performance of the manufacturing divisions such as wood products, food beverages and tobacco, paper products, fabricated metal products and the chemical products is better than the national performance in employment generation. During the period from 1995 to 2001 national employment in manufacturing has declined but the employment of these manufacturing divisions has increased. On the other hand employment decline of the manufacturing divisions such as basic metal industries, other manufacturing category, textile wearing apparel and leather products and non-metallic mineral products is strong than national decline in employment. The analysis also discloses that the employment decline of these manufacturing divisions is faster than that of the national decline. Difference between the national rate of change in each industry and the rate of change in all industry, illustrates the industrial divisions which are having better performance than the national average. Thus, wood and wood product division indicates the best performance while basic metal division reports the worst performance.

Table 4 : Calculating Structural Shift: Western Province 1995 - 2001

ISIC Code (Industrial Category)	Western Province 1995 ('000s)	Difference	Structural Effect
31. Food beverages and tobacco industries	27.77	0.2088	5.80
32. Textile, wearing apparel and leather products	215.69	-0.1028	-22.17
33. Wood and wood products	5.8	0.4633	2.69
34. Paper and paper products	11.49	0.1704	1.96
35. Chemical and chemical products	32.34	0.1377	4.45
36. Non-metallic mineral products	14.66	-0.0352	-0.52
37. Basic metal industries	2.17	-0.3522	-0.76
38. Fabricated metal products	22.98	0.1507	3.46
39. Other manufacturing industries	17.52	-0.2221	-3.89
TOTAL	**350.42**		**-8.98**

Source: Annual Survey of Industries, 1995,2001.

Analysis of the structural shift in Table 4 indicates that food beverages and tobacco industries in the Western Province perform better than the average for all manufacturing industries nationally. Presence of food beverages and tobacco industries in the Western Province might be expected to contribute an additional 5800 jobs. Other manufacturing divisions, which perform better than the national average for all manufacturing industries are the chemical products, fabricated metal products, wood products and paper industry. Total of the structural effect of these divisions indicates that their presence in the Western Province may contribute to additional 12560 jobs.

Closer examination of the performance of each sector shows that much of the structural shift was due to the presence of food beverages and tobacco industry, chemical and chemical products and fabricated metal products, which attain some gains nationally. Their job-attaining rate is exceeded by wood and wood product division but its contribution to the structural shift is so low due to its less presence in the Western Province. National job-attaining rate of paper industry is also higher than chemical industry and fabricated metal product division but it has also not contributed to major structural shift due to its less presence.

Table 4 further explains that textile, wearing apparel and leather product division reports higher employment decline within the structural shift. Even though its rate of decline is lower than those of basic metal product and non-metallic mineral product divisions it has contributed to a significant negative shift. It is clear that major presence of this sector in the province has caused this significant negative effect. On the other hand basic metal industries report the highest rate of employment decline nationally but it has not contributed to significant negative effect because of fewer location of basic metal industries in the province.

Analysis in Table 4 can be viewed in another aspect. It confirms that wood and wood products, food beverages and tobacco industries, paper products, fabricated metal products and chemical industry are nationally important industries. Among them wood and wood products indicate the best national performance but it has not contributed so much to employment generation in the Western Province. On

the other hand some industries, which are not nationally important, have also not located in the Western Province. This is confirmed by the case of basic metal industry, which has not contributed to significant employment generation in the Western Province and nationally. This may provide some evidences to conclude that the industries which are important nationally are not located in the Western Province.

Table 5 calculates the effect of differential shift for the Western Province. As explained above, differential effect component of the Western Province illustrates the advantages and disadvantages of the location of each manufacturing division in the province.

Table 5 : Differential Shift, Western Province, 1995 - 2001

ISIC Code (Industrial Category)	Western 1995	National change Ind: Ratio	Expected 2001 t2	Actual 2001 t2	Difference
31. Food beverages and tobacco industries	27.77	1.739	32.60	26.81	-5.79
32. Textile, wearing apparel and leather products	215.69	0.8623	185.99	198.06	12.07
33. Wood and wood products	5.8	1.4284	8.28	6.19	-2.09
34. Paper and paper products	11.49	1.1355	13.05	12.51	-0.54
35. Chemical and chemical products	32.34	1.1028	35.66	35.96	0.30
36. Non-metallic mineral products	14.66	0.9299	13.63	12.49	-1.14
37. Basic metal industries	2.17	0.6129	1.33	1.33	0.00
38. Fabricated metal products	22.98	1.1158	25.64	25.29	-0.35
39. Other manufacturing industries	17.52	0.7430	13.02	13.31	0.29
TOTAL	**350.42**	**0.9651**		**331.95**	**2.74**

Source: Annual Survey of Industries, 1995,2001.

Table 5 illustrates that most of the industrial divisions with better national performance have a poor employment record in the Western Province. Food beverages and tobacco industry and wood and wood product division, which reported a better national performance, have poor employment records, contributing to -2090 and -5790 jobs of the differential shift respectively. Other manufacturing divisions with better national performance but worse employment record in the Western Province are paper and paper products and fabricated metal products. Chemical and chemical product is the only division, which contributes to very slight employment performance in the Western Province with a better national employment record. Not only non-metallic mineral products had a poor national performance but also it reported negative employment record, contributing to the loss of 1140 employments of the differential shift. Employment in non-metallic mineral products in the Western Province is falling faster than the employment in non-metals nationally. Analysis also confirms that employment decline in basic metal industry in the Province has taken place to the same rate of employment decline nationally.

Industries having a markedly better employment performance in the Western Province are only textile, wearing apparel and leather product, chemical and chemical products and other manufacturing division. Those divisions contribute to offset some of the negative differential shift. The most significant feature regarding textile and other manufacturing divisions is that they have attained a better differential gain even through their national employment has declined. Even though their actual employment has come down compared to 1995 it has not declined to the extent of national rate, emphasizing their strength of locational advantages in the Western Province.

The overall results of the analysis are summarized in Table 6. As mentioned in the table 6 calculation of the total shift shows that manufacturing in the Western Province lost 6240 jobs than would have been expected if its employment had changed at the national rate. The loss of 6240 employments is accounted by structural and differential shift components. However, that loss should have been more if it had

not been offset by the differential gain of 2740 jobs. Regional share component indicates that national trends have lost 12230 jobs in the Western Province over the period from 1995 to 2001. But this trend has been modified by the structural and differential shifts. Sum of the total shift and trend effect indicates that the net loss experienced by the province is 18470 jobs. It is 5.3 per cent of the labour force of the Western Province in 1995.

Table 6. Shift-share Analysis, Western Province, 1995 - 2001 (000's)

Actual employment 2001('000s)	Expected employment 2001('000s)	Total Shift	Regional Share	Structural Shift	Differential Shift
331.95	338.19	-6.24	-12.23	-8.98	2.74

Conclusion

The above analysis indicated how the change in employment took place within Western Province in 1990s. It comprises of two main components: shift analysis and the shift and share analysis. Shift analysis is done for the first and second half of the ninety-decade. According to shift analysis, within the first half of the 1990 decade manufacturing employment both in the Country and Western Province has increased. That increase in the Western Province has exceeded the national rate of growth for this period. Thus, within the first half of 1990s Western Province has been able to generate more employments, as its rate of employment growth is faster than the national average. But within the second half of the 1990 decade national employment as well as the employment in the Western Province has declined. The rate of decline of the Western Province for this period is faster than the national rate. Within the second half of 1990s not only the Western Province experienced employment decline than the national average but also it lost its relative significance among provinces.

Shift and share analysis disclosed that the employment in the Western Province has declined particularly within the second half of 1990s. Analysis based on the structural and differential effect of the shift and share analysis has confirmed that the rates of employment growth and decline vary according to the product type of the industrial structure.

Shift and share analysis confirms that food beverages and tobacco industry, chemical and chemical products, fabricated metal products, wood and wood products and paper and paper industry in the Western Province perform better than the national average for all manufacturing industries. Much of the structural shift of the province is due to the presence of food beverages and tobacco, chemical and chemical products and fabricated metal products. Even though wood and wood products have a good job-attaining rate its contribution to the structural shift is so low due to its less presence in the Western Province. On the other hand national rate of employment decline in textile, wearing apparel and leather product division is lower but it contributed to a significant negative shift because of its major presence.

There are evidences to conclude that some industries which are nationally important in terms of employment genaration are not located in the Western Province. It means that some of the industrial divisions with a better national performance have a poor employment record in the Western Province. Only three divisions such as textile wearing apparel and leather products, chemical and chemical products and other manufacturing division have emphasized their strength of locational preference to the Western Province but these divisions are not nationally well distributed.
After 1990 successive governments in Sri Lanka have taken measures to decentralize particularly textile and wearing apparel industries to other provinces but the analysis confirms that their locational preference is still mainly limited to the Western Province. Thus, it is timely to evaluate the success of industrial decentralization programme in the country. Accessibility and the infrastructural facilities available in Colombo and suburbs may still play a vital role in attracting these industries to the Western Province. Therefore, it is essential to develop infrastructural facilities in other provinces by evaluating the factors affecting decision making and locational choice of entrepreneurs.

As much of the negative differential shift is due to food beverages and tobacco sector it is also policy imperative to examine why Western Province with a higher concentration of population has not been able to attract food beverages and tobacco products towards the province. Food beverages and tobacco products are consumer-based industries and their location should be associated with population distribution in the country. But the contribution of food beverages and tobacco industry to the employment generation of the Western Province is not sufficient compared to its population concentration. Therefore, it is important to find out the factors directing to the negative differential shift of this sector. It is also timely to look into why wood and wood products and paper and paper products, which are also considered as market-oriented industries, have contributed to negative differential shifts in the Province.

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