REGIONAL DISPARITIES IN SRI LANKA: AN EMPIRICAL ANALYSIS

*Deeptha Wijerathna, Jayatilleke S. Bandara, Christine Smith and Athula Naranpanawa**

To effectively implement the proposed United Nations development agenda beyond 2015, Governments will need to focus on reducing inequality in their national planning strategies. In order to provide an evidence base for such planning in the Sri Lankan context, a systematic and comprehensive analysis on regional inequality is required. The present study begins to undertake this type of analysis using summary sigma convergence statistics, such as the coefficient of variation, the Gini coefficient and mean deviation scores. Regional gross domestic product (GDP) per capita data for the period 1996 to 2011 reveal that inequality with respect to this welfare indicator is considerable. Analysis of trends, over this 16-year period, indicates that while some beta convergence has occurred since 2000, this convergence (both conditional and unconditional) is not statistically significant. Indeed, the results suggest that based on current trends, it will take 15 years to halve the current inequality and about 30 years to achieve a regionally balanced economy. In this context, well-planned regionally inclusive development strategies are needed in order for Sri Lanka to move forward, especially since the current levels of regional disparity are argued by some to have contributed to the civil unrest and conflict that led to a reduction in national economic development over the three decades to 2009.

JEL Classification: O2, O53, R11, R12, R58.

Key words: Economic disparity, regions, inequality, convergence, divergence, Sri Lanka.

* Deeptha Wijerathna, corresponding author (Tel: +61 7 3735 7295; fax: +61 7 3735 7760; e-mail: dwijerathna@gmail.com, deeptha.wijerathna@griffithuni.edu.au); Jayatilleke S. Bandara, Associate Professor; Christine Smith, Professor; and Athula Naranpanawa, PhD, are from Department of Accounting, Finance and Economics, Griffith University, Nathan, QLD 4111 Australia. An *earlier* version of this paper was presented at the 9th International Conference of Network of Asia Pacific Schools and Institutes of Public Administration and Governance (NAPSIPAG), which was held in Colombo from 12 to 14 December 2012. The present paper also benefited from constructive comments made at the Conference, as well as from those provided by two anonymous referees associated with this *Journal*.

I. INTRODUCTION

Sri Lanka needs to focus on post-war development strategies to get its economy back on track after it was severely affected by a civil war that ended in 2009 following nearly three decades of conflict (Collier, Hoeffler and Rohner, 2009; Wright, 2009). Furthermore, the country also faces the challenge of framing these strategies so that an equitable share of the benefits of economic growth is accessible to all regions and communities. Regionally imbalanced economic growth and regional disparities in the level of well-being is a widely discussed topic. Notably, it is evident in both developing and developed countries (Smith, 2004).

As many authors have highlighted, economic disparities can lead to social unrest and civil conflicts, which, in turn, contribute to the further widening of those disparities (Sen, 1997; World Bank, 2011; Wright, 2009; Vu and others, 2012; Buhaug and Gates, 2002; Buhaug and others, 2011). In its recent turbulent political history, particularly since 1970, Sri Lanka experienced two youth insurrections in the southern part of the country, one in 1971 and the other in the late 1980s, and nearly three decades of civil armed conflict in the northern and eastern provinces. In fact, in the late 1980s the country was involved in two wars, one in the South and another one in the North and the East (Abeyratne, 2004). The catchy slogan *Kolambata Kiri Gamata Kekeri* (Villagers have only low value cucumber, while people in Colombo enjoy the cream!), which was used by the southern revolutionary youth movement uprising in the late 1980s under the banner of *Janatha Vimukthi Peramuna* (JVP), provides a good example of civil unrest aroused by regional inequality and lack of economic and employment opportunities in regional economies (Sri Lanka, Presidential Commision of Youth, 1990; Hasbullah and Morrison, 2004; Karnik, 2002; Yeung and Lin, 2003). Even though the armed struggle of the Liberation Tigers of Tamil Eelam (LTTE), commonly known as the Tamil Tigers, for a separate state in the northern and eastern parts of Sri Lanka is widely viewed as a terrorism problem, regional economic disparities that prevented equitable access to opportunities generated by national economic development following the opening up of the economy in 1977 is often acknowledged to be a major cause of it (Abeyratne, 2004; Grobar and Gnanaselvam, 1993; Arunathilake, Jayasooriya and Kelegama, 2001; Dhananjayan, 2005).

To ensure that post-war economic and political stability continues, the Government of Sri Lanka is implementing a ten year development strategy targeting lagging regions under the banner *Mahinda Chintana* (Sri Lanka, National Planning Division, 2010). *Mahinda Chintana* gives priority to investments in infrastructure on the rationale that this type of investment will contribute to the rebalancing of regional economic growth. It also identifies a number of other policy measures to rebalance economic development, emphasizing their contribution to both spatial equity and economic efficiency (World Bank, 2010).

Clear understanding about the current level of economic disparities and the dynamics of those disparities during the past is of key importance in evaluating the impact of *Mahinda Chintana* and in formulating further development strategies aimed at reducing regional disparities. The number of Sri Lankan-specific studies on this issue is relatively sparse. The main objective of the present paper, therefore, is to conduct a comprehensive and updated empirical analysis on regional disparities even though the regional statistical database to support such analysis is weak in comparison with a number of other countries. The paper also provides a brief review of related theories and global experiences in analysing and mitigating regional disparities.

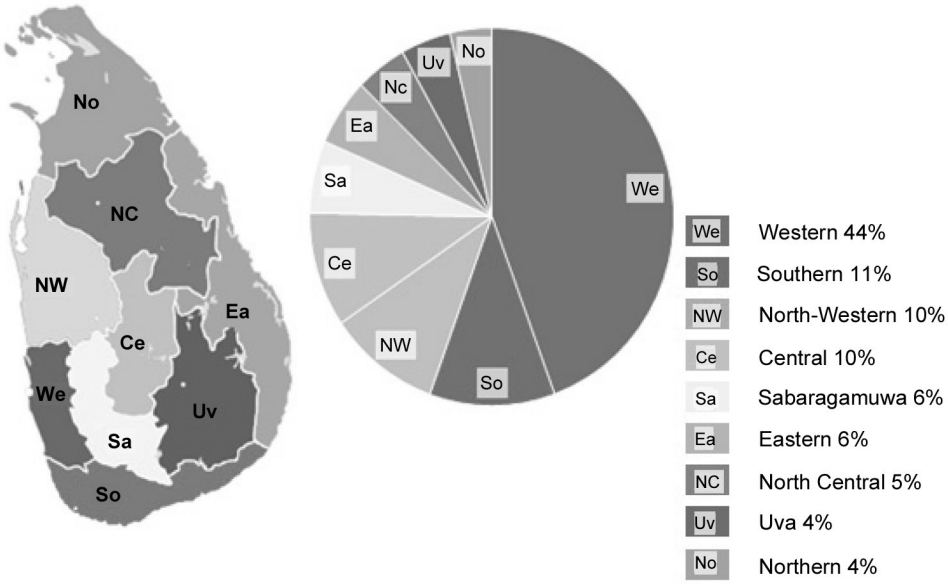
The present paper is structured as follows. The next section provides a brief overview of stylized facts on regional disparities and possible reasons for such disparities in Sri Lanka. Section three presents a summary of related economic theories and global experience. It also documents previous attempts to analyse regional development disparities in Sri Lanka. The fourth section provides an overview of the methodology employed in this paper to analyse such disparities over the period 1996-2011. The fifth section presents the authors' empirical findings, and the final section contains concluding remarks and a discussion on some relevant policy implications.

II. SRI LANKAN REGIONS: STYLIZED FACTS

Sri Lanka is a small island in the Indian Ocean, located at the south-eastern part of the southern tip of the Indian subcontinent. It was a British colony from 1815 to 1948 (De Silva, 1981). During that period, the country was geographically divided into nine provinces (see figure 1).

Except for the period 1948 to 1956 during which the colonial open economic policies were continued following independence and a brief episode of partial trade liberalization (from 1965-1970), Sri Lanka had a centralized unitary Government with closed economic policies up to 1977. The right-of-centre Government, led by the United National Party (UNP), which came to power in 1977, opened the economy by introducing a trade liberalization package and undertaking other structural reforms, including privatization. In 1978, the newly elected Government also introduced a new Constitution, making considerable changes to the administrative system. In response to growing regional unrest, especially in the Northern and Eastern provinces and the Indian intervention in 1987, the 13th Amendment to the 1978 Constitution was made to establish provincial councils as a second layer of Government (Leitan, 1990; Sri Lanka, 1987; Marasinghe, 2007).

Figure 1. Sri Lankan provinces and their contribution to national GDP 2011



Source: Central Bank of Sri Lanka (2013) and authors' calculations.

With the introduction of the provincial council system in 1988, the planning and administrative activities of Sri Lanka were decentralized to a certain extent. Due to variations in natural conditions, resource endowments and sociocultural settings, the production systems and economic conditions also vary across the provinces. According to statistics for 2011, 44 per cent of national GDP is produced in the Western province. This province, which is home to Colombo, the capital city, and serves as the country's commercial centre, comprises 5.7 per cent of the land area and 28 per cent of the population (see for details, Bandara and Jayasuriya, 2010; World Bank, 2010; Wijerathna, Bandara and Karunagoda, 2013).

The distribution of the land area, population and economic activity across the provinces is given in table 1.

GDP per capita, shown in last two columns of table 1 (in absolute terms and as a share of that of the country), demonstrates the economic dominance of the Western province (with a per capita GDP of 157 per cent of the national average) and the relative weakness of Northern, Uva, North Central and Eastern provinces (which have a GDP per capita of 64, 69, 76 and 76 per cent, respectively). This is consistent with the finding of Bandara and Jayasuriya (2010, p. 12) who argue that "...it is clear that

Table 1. Land area, population and GDP of Sri Lankan regions (2011)

Province	Land area (sq.km)	Land share (%)	Population ('000)	Population share (%)	GDP (Rs[a] billion – nominal prices)	GDP share (%)	GDP per capita (Rs)	GDP per capita relative to the nation (%)
Western	3 593	5.7	5 919	28.4	2 905	44.4	490 792	157
Southern	5 383	8.6	2 519	12.1	727	11.1	288 607	92
North-Western	7 506	12.0	2 366	11.3	652	10.0	275 571	88
Central	5 575	8.9	2 719	13.0	644	9.8	236 852	76
Sabaragamuwa	4 921	7.8	1 962	9.4	406	6.2	206 932	66
Eastern	9 361	14.9	1 584	7.6	375	5.7	236 742	76
North Central	9 741	15.5	1 255	6.0	300	4.6	239 044	76
Uva	8 335	13.3	1 342	6.4	292	4.5	217 586	69
Northern	8 290	13.2	1 203	5.8	241	3.7	200 333	64
Total / National	62 705	100.0	20 869	100.0	6 542	100.0	313 479	100

Sources: Central Bank of Sri Lanka (2013) and authors' calculations.

Note: [a]Sri Lanka rupee, US$1 = Rs 131.25.

WP (Western province) differs significantly from other regions: it has much higher per capita income and (a) lower rate of poverty, industry and services dominate the structure of the economy (with agriculture's share being almost negligible), accounts for most of manufacturing industry in the country (number of establishments, employment and value added), and has better infrastructure facilities (road density, communication facilities and access to financial facilities)."

These regional inequalities can also be observed in other regional economic data published by the Department of Statistics and the Central Bank of Sri Lanka. To date, only a handful of studies have attempted to explain the reasons for the regional disparities in Sri Lanka. For example, Castro and Devarajan (2006, p. 2), argue that market-oriented reforms, such as liberalization of trade, deregulating industry and promoting private investment, have benefited the Western province due to its superior location and infrastructure. Critically reviewing the above simplistic explanation, Bandara and Jayasuriya (2010, p. 213) argue that the historical evolution of policies and political factors created "initial conditions" favourable to the Western province and the nearly three decades of war have created conditions that exacerbate regional disparities. They further argue that the factors that produced the existing distribution

of economic activities and the associated infrastructure and institutions have been the main reasons behind the existing regional disparities.

However, as discussed below, the dominance of a national economy by the region that includes the national capital is not unique to Sri Lanka and in fact is not particularly unusual in the context of developing countries. What is more important is the pattern of change in these regional disparities over time and policies adopted to rectify this situation while maintaining a high level of overall national growth.

III. THEORETICAL AND EMPIRICAL EVIDENCE FROM PREVIOUS STUDIES

A number of theories on regional development are used to analyse regional development disparities (UNDP, 2012; Smith, 2004; World Bank, 2009). A review of these theories is important for understanding possible causes for existing problems, as well as for ascertaining the most appropriate ways to overcome these problems.

Development theories of the 1950s and 1960s primarily focused on the material growth associated with the process of modernization (Barca, McCann and Rodríguez-Pose, 2012). According to neoclassical regional growth theories, disparity across regions should not persist as convergence occurs naturally over time through the operation of free market forces. The movement of factors of production across regions in search of greater economic returns and absorption of new technologies from leading regions (by peripheral lagging regions) have been identified as the key factors leading to convergence (Ray, 2007). According to the associated catching-up hypothesis, the rate of growth of per capita income of lagging regions should be inversely related to their initial level of per capita income. In addition to government interventions, which create price distortions, barriers to the free movement of factors of production, such as family ties, links to the land, ethnic loyalties or religious affinities to particular localities, can adversely affect the process of convergence (Fotopoulos, 2012).

As per the endogenous growth theory, the smart use of resources owned by a region can provide the key to its economic success. However, many authors have observed that disparities may persistent due to differences in resource endowment among regions and lagging regions inadequate capacity to benefit from agglomeration in the leading regions (Marques and Soukiazis, 1998; Matsuki and Usami, 2011; Barro and Sala-i-Martin, 1997). Myrdal (1957) argues that while the leading region will have a favourable effect on the other regions due to “spread effects” of trade and modernization of institutions (as discussed above), this will normally be outweighed by adverse backwash effects with movements of factors of

production and other resources favouring the leading region at the expense of the lagging regions.

"New economic geography", which has evolved as a sub-discipline of both economics and geography, attempts to understand more clearly the causes and dynamics of agglomeration, urbanization, interregional and international trade and factor flows, regional economic growth and other location-specific socioeconomic issues (Sheppard and others, 2004; Krugman, 1990). Krugman (1998) and Fujita, Krugman and Venables (2001) highlight the role of history in shaping the economic geography of a region and discuss factors contributing to changes in the spatial structure of the economy. Recent regional growth and development theories also attempt to analyse the macroeconomic issue of the role of location in development.

As noted previously, few attempts have been made to analyse regional-level disparities within Sri Lanka (Bandara and Jayasuriya, 2010; Gunewardena, 2008; Kakwani, 1988; Karunaratne, 2007; Uduporuwa, 2007). Two of the studies undertaken are based on theories of convergence. Shankar and Shah (2003) have considered the level of regional disparity among Sri Lankan provinces during the period 1990-1995. They have also compared the level of regional disparity in Sri Lanka with both developed and developing countries that have either unitary or federal governing systems. Karunaratne (2007) analyses the provincial disparity of per capita income in Sri Lanka with a sigma convergence analysis that was carried out using the coefficient of variation measure for the period 1998-2003.

The present paper is unique due to three factors. First, it is based on regional GDP data for 16 consecutive years. Most other regional studies that focus on Sri Lanka are based on data for either a short period or a few selected reference years. As the analysis includes the pre and post Sri Lankan civil war eras, the use of data from a relatively long time span is also helpful in understanding the regional development impact of this phenomenon. Second, the present paper uses five established indicators to analyse regional disparity, which is significantly more than the number used for other studies. Third, it also employs an extension of mean deviation analysis to explain the contribution of individual provinces to regional disparity measures and the variation of those contributions over time.

IV. METHODOLOGY

The analysis is mainly based on the well-established regional inequality analysis methods of sigma and beta convergence. However, due to the poor performance of the standard beta convergence regressions given the limitations of the dataset, an alternative approach based on decomposition of mean deviations is employed to assist in understanding the pattern of convergence over time.

Following authors, such as Barro and others (1991), provincial-level per capita GDP, which is denoted as per capita GPDP (gross provincial domestic product) in the rest of the paper, is used for this analysis. Data required for the study were obtained from published and unpublished reports of the Central Bank of Sri Lanka (Central Bank of Sri Lanka, 2002-2013). As published provincial-level GDP data for Sri Lanka are available annually only from 1996, the quantitative analysis is restricted to a period of 16 years starting from 1996.

Sigma convergence analysis is commonly used in cross sectional studies to understand the level of overall economic disparities within countries. Repeated sigma convergence analysis is useful in understanding the variation in such disparities over time. Different authors have come up with alternative inequality measures for analysing the level of sigma convergence (Williamson, 1965; Shankar and Shah, 2003). Since these alternative indicators, with varying complexities, are best used for highlighting different aspects of disparity and convergence, four widely applied indicators are used in the analysis:

Maximum to minimum ratio (MMR)

The ratio of maximum and minimum per capita GPDP is the most simple and direct measure or indicator that can be used. In interpreting this measure, the ratio gets closer to one with an equal distribution and further from one with increasing disparity. Though this indicator is easily calculated, it is highly sensitive to the presence of outliers. Furthermore, it does not permit analysis of regions with per capita GPDP values that fall in between the minimum and the maximum.

$$MMR = \frac{GPDP_{\text{richest province}}}{GPDP_{\text{poorest province}}}$$

Coefficient of variation (*CV*)

Following the work of Williamson (1965), the coefficient of variation is widely used in convergence literature (Smith, 2004). *CV* is defined as the ratio between the real value of mean per capita GPDP and its standard deviation across the regions. It is essentially a measure of the dispersion of per capita GPDP of each region from their average. Since this is a standardized value, it can be used in comparisons over time or across other countries. It is possible to calculate *CV* either as a simple or weighted measure in a few different ways. Below are the methods used to calculate weighted and unweighted *CV*.

Unweighted Coefficient of Variation (CV_u)

$$CV_u = \frac{\sqrt{\sum_i^n \frac{(Y_i - \bar{Y}_u)^2}{N}}}{\bar{Y}_u}$$

where Y_i is the per capita GPDP of i^{th} province, N is the number of provinces and $\bar{Y}_u$ is the simple average of per capita GPDP and it is calculated as:

$$\bar{Y}_u = \frac{1}{N}\sum_{i=1}^{n} Y_i$$

Some authors, including Williamson (1965), have used national per capita GDP as the denominator in the above equation. Following the convention of Shankar and Shah (2003), an unweighted simple average of per capita GPDP is generally considered appropriate. The value of CV_u varies from 0, for perfectly equal distribution, to $\sqrt{N - 1}$ for perfectly unequal distribution. One problem with this measure is its sensitivity to outliers. A highly deviated single per capita GPDP value can increase the value of CV_u and provide an incorrect picture in comparisons (either across time or countries). The simple CV_u is also insensitive to the varying population of the different regions since they are each weighted equally.

Weighted coefficient of variation (CV_w)

To overcome possible bias due to varying populations in provinces, an alternative measure of weighted *CV* can be calculated. The population weighted coefficient of variation is calculated as:

$$CV_w = \frac{\sqrt{\sum_i^n (Y_i - \bar{Y})^2 \frac{P_i}{P}}}{\bar{Y}}$$

where Y_i is the per capita GPDP of i^{th} province, $\bar{Y}$ is per capita GDP of the nation, P_i is population of the i^{th} province and P is population of the nation. The value of *CV* varies from 0, for a perfectly equal distribution, to $\sqrt{(P - P_i)/P_i}$ for a perfectly unequal distribution where a single province generates the entire national GDP.

Weighted Gini index (G_w)

The Gini index is one of the most widely used indices in analysing inequality among people, households or regions. Following Kakwani and World Bank (1980); Kakwani (1988); Shankar and Shah (2003) the weighted Gini index is calculated as:

$$G_w = \left(\frac{1}{2\bar{Y}}\right)\sum_{i=1}^{n}\sum_{j=1}^{n}|Y_i - Y_j|\frac{P_i P_j}{P^2}$$

where $\bar{Y}$ is the national per capita GDP, Y_i and Y_j are per capita GPDP of i^{th} and j^{th} provinces, P_i and P_j are population of i^{th} and j^{th} provinces, P is national population and both i and j represent different provinces. G_w varies from 0 (for a perfectly equal provincial distribution) to *1-(Pi/P)* (for a perfectly unequal distribution where a single province generates all of the national GDP).

Weighted mean deviation (MD_w)

Weighted mean deviation is another measure used by researchers, including Smith (2004), Williamson (1965), Kakwani (1988), and Shankar and Shah (2003). In some studies, this measure is named as the relative mean deviation, such as in Shankar and Shah (2003). Given, however, that it is a summation of the absolute difference between national per capita GDP and per capita GPDP of each province, MD_w is applied for the following reasons. First, as it does not require the squaring of mean differences, it is less sensitive to outliers. Second, it is an additively decomposable measure. The following method is used in calculating MD_w.

$$MD_w = \left(\sum_{i=1}^{n}(|Y_i - \bar{Y}|)\frac{P_i}{P}\right)/\bar{Y}$$

where Y_i is the per capita GPDP of i^{th} province, $\bar{Y}$ is per capita GPDP of the country, P_i is population of i^{th} province, n is the number of provinces and P is population of the country. MD_w has the value of 0 for a perfectly equal distribution and varies up to $2P(n-1)/P_i$ for a perfectly unequal distribution.

Many authors have used beta convergence analysis, with cross sectional regressions employed to analyse the rate of convergence during a given time period. As Barro and others (1991) explain, if beta convergence exists among a group of regions or countries, a statistically significant negative relationship should be expected between the initial level of per capita GPDP and the corresponding rate of

growth over time. In this study, the use of (conditional and unconditional) beta convergence analysis is explored. However, due in part to the limited number of years of data and the limited number of provinces, it is supplemented with alternative measures aimed at understanding the rate of convergence and the time required for full convergence with the rate of current convergence.

Adopting the method of Smith (2004), the annual regional share (R_i) of province i in overall national disparity can be derived by decomposing the weighted mean deviation (MD_w) that was derived earlier:

$$MD_w = \left(\sum_{i=1}^{n} (|Y_i - \overline{Y}|) \frac{P_i}{P} \right) / \overline{Y}$$

where definitions for all terms are as above. By decomposing the right hand side of the above equation (R_i) can be calculated as:

$$R_i = (Y_i - \overline{Y}) \frac{P_i}{P} / \overline{Y}$$

By substituting the R_i into the equation for MD_w, absolute mean deviation of the country can be rewritten as an aggregation of weighted mean deviations of individual provinces as follows:

$$MD_w = \sum_{i=1}^{n} R_i$$

Furthermore, the percentage contribution of an individual region to the overall weighted mean deviation, which is defined as the regional share of weighted mean deviation $(RSMD_W)$ can be given as:

$$RSMD_W = \left(\frac{|R_i|}{MD_w} \right) * 100$$

While $RSMD_W$ provides the magnitude of deviation, the sign of R_i is important in understanding whether the region is contributing to inequality with an income higher or lower than the national mean. While a positive R_i indicates an upward contribution to inequality with a per capita GPDP larger than national per capita GDP, a negative R_i indicates a downward contribution to the inequality with a per capita GPDP less than national per capita GDP.

In addition, the following approach derived from decomposition of mean deviation and its change over time is used, with a particular focus on:

$$\Delta R_i = |R_{it}| - |R_{i\,(t-1)}|$$

where R_{it} and $R_{i\,(t-1)}$ are shares of mean deviation of the i^{th} province in time periods t and $t-1$, respectively, and ΔR_i is the annual absolute change in i^{th} region's share (contribution) to overall inequality.

If ΔR_i is negative (positive), that region is contributing to the convergence (divergence) over time. When a region is neither converging nor diverging, the value of ΔR_i is zero. The magnitude of ΔR_i is useful in understanding the relative contribution of individual provinces for total convergence (divergence). The rate of convergence of an individual province (RC_i) can be given as follows:

$$RC_i = \frac{\Delta R_i}{R_{it}} * 100$$

While the sign ΔR_i is useful in understanding whether the region is contributing to an overall convergence or divergence, the comparison of R_{it} with $R_{i\,(t-1)}$ is useful in understanding the direction or nature of convergence or divergence as follows:

If $R_{it} > R_{i\,(t-1)}$ and ΔR_i is negative, it is an upward convergence (UC);

If $R_{it} > R_{i\,(t-1)}$ and ΔR_i is positive, it is an upward divergence (UD);

If $R_{it} > R_{i\,(t-1)}$ and ΔR_i is zero, it is an upward neutral (UN);

If $R_{it} < R_{i\,(t-1)}$ and ΔR_i is negative, it is a downward convergence (DC);

If $R_{it} < R_{i\,(t-1)}$ and ΔR_i is positive, it is a downward divergence (DD);

If $R_{it} < R_{i\,(t-1)}$ and ΔR_i is zero, it is a downward neutral (DN); and

If $R_{it} = R_{i\,(t-1)}$ and ΔR_i is zero, it is an absolute neutral (AN).

Overall convergence (divergence) can happen either with upward convergence (downward divergence) of lagging regions, or with downward convergence (upward divergence) of leading regions or with both of these phenomena. Before concluding the methodology section, it is important to note the limitations of this empirical analysis. As noted in previous studies, the Sri Lankan regional statistical database is weak. As a result, the analysis may be skewed due to data limitations. The quality of empirical analysis is directly related to the quality of the data that are accessible. Provincial-level GDP data for Sri Lanka were available in published form only from 1996. The more comprehensive available provincial-level GDP data include some

values systematically derived from national-level GDP calculations. As a result, the level of accuracy of data in terms of coverage or reporting is unknown. Provincial-level GDP deflators were also not available, and thus the real price calculations are based on available national GDP deflators. This may have led to some incorrect estimation given varying price level changes in different provinces. The population census in Sri Lanka is usually carried out once in every ten years, but none were conducted during the period 1981 to 2001. Hence, most of the annual regional population data used in calculating per capita GDP during this period are estimated values published by the Department of Census and Statistics. Some over- or under-estimation of per capita GDP and GPDP values may have resulted associated with the estimation errors related to population.

It should also be noted that GDP is an imperfect measure of economic welfare, and its use as the focus of our convergence/divergence analysis may need some qualification in subsequent research. Per capita GDP represents income generated in a particular region or province rather than the per capita income actually received by residents of that region. For example, some of the GDP data recorded as being associated with the Northern and Eastern provinces represents expenditure on Sri Lankan armed forces located in those regions for "peacekeeping" purposes. Furthermore, a large proportion of GDP generated in the Western provinces accrues as gross operating surplus (or profits) to multinational corporations based in Colombo and the migrant work force rather than representing income that finds its way into the hands of local residents. Consumption, or household disposable income, is arguably a better measure of economic well-being and subsequent research by the current authors will focus on this measure.

V. RESULTS

The sigma convergence analysis results are presented in table 2 and figure 2. As depicted by the indicators in table 2, Sri Lankan provinces diverged during the period 1996 to 2000 (that is, indicators become larger in absolute size), before starting to converge again with some fluctuations (especially during the period 2000 to 2007). In 2000, the per capita GDP of the wealthiest province is 6.75 times higher than that of the poorest (see column 1 entries). By 2011 the condition has drastically improved such that the wealthiest province had a per capita GDP that is only 2.45 times higher than the poorest one. According to the other indicators, however, the overall disparity among regions only experienced a slight improvement compared to the 1996 situation. As shown in columns 4-6 of table 2 and in figure 2, the three population-weighted indicators (CV_w, G_w, MD_w) behaved in the same pattern over time though the absolute magnitudes of these indicators obviously differ. This pattern comprises

divergence between 1996 and 2000, a brief period of convergence between 2000 and 2001, a period of divergence from 2002 to 2004, followed by a period of convergence (with two minor fluctuations) from 2004 onwards. This convergence has accelerated post 2009, following the end of civil war.

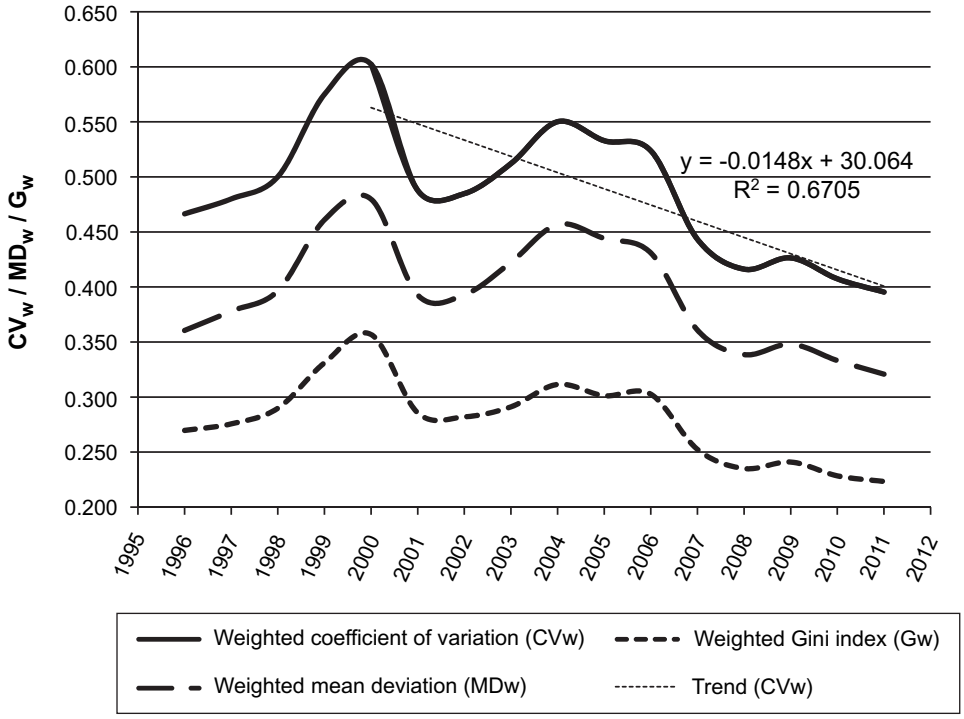
As it is possible to observe a linear trend in convergence from 2000 (see the regression line related to CV_W in figure 2), the rate of convergence is estimated as the mean annual percentage decrease of each of the weighted coefficients.

Table 2. Sigma convergence observed in Sri Lankan provinces

Year	Max/Min ratio *(MMR)*	Simple coefficient of variation (CV_u)	Weighted coefficient of variation (CV_w)	Weighted Gini index (G_w)	Weighted mean deviation (MD_w)
1996	5.311	0.395	0.466	0.270	0.361
1997	4.759	0.406	0.480	0.276	0.378
1998	4.655	0.467	0.500	0.290	0.397
1999	5.680	0.539	0.575	0.331	0.461
2000	6.747	0.577	0.602	0.357	0.480
2001	3.961	0.443	0.488	0.286	0.393
2002	3.652	0.434	0.485	0.282	0.393
2003	3.561	0.451	0.512	0.291	0.423
2004	3.422	0.487	0.550	0.312	0.457
2005	3.302	0.465	0.533	0.301	0.444
2006	3.519	0.465	0.524	0.303	0.431
2007	3.129	0.386	0.443	0.252	0.361
2008	2.933	0.358	0.416	0.235	0.339
2009	2.904	0.366	0.426	0.241	0.348
2010	2.681	0.346	0.407	0.228	0.333
2011	2.450	0.336	0.395	0.223	0.321

Source: Authors' calculations based on data from the Central Bank of Sri Lanka.

Figure 2. Dynamics of sigma convergence



Source: Authors' calculations.

As table 3 shows, sigma convergence among Sri Lankan regions is taking place at an average rate of 3.01 to 3.59 per cent from year 2000. If the country can maintain this rate for another 14 to 17 years, it may be able to halve its regional disparity and have a regionally balanced situation in about another 30 years.

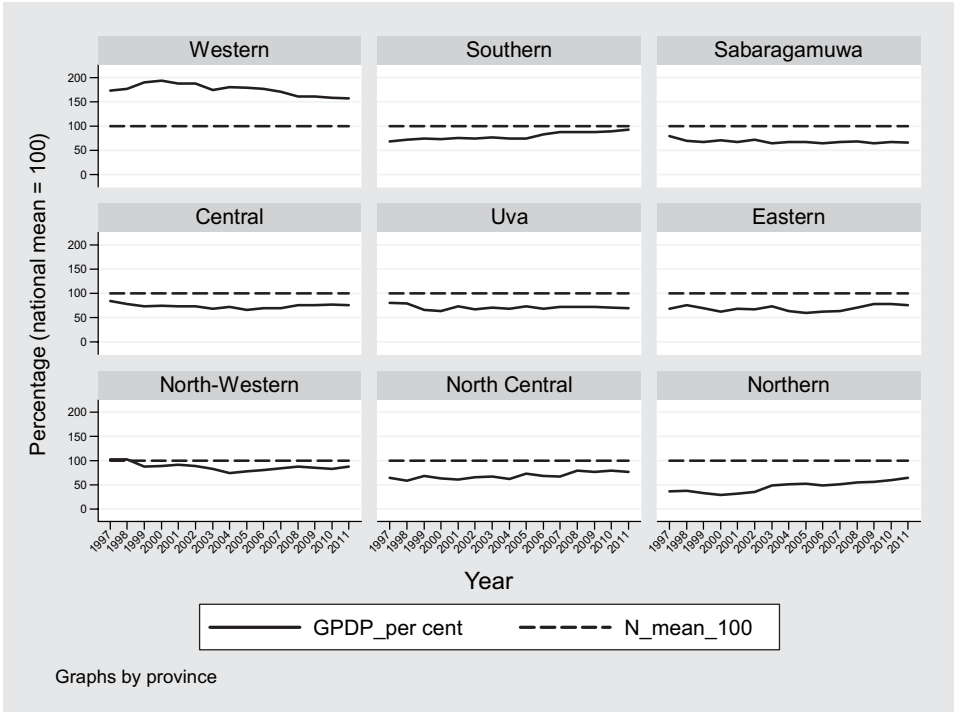
Table 3. Rate of convergence

	Weighted coefficient of variation	Weighted Gini index	Weighted mean deviation
Average annual % convergence (2000-2011)	3.22%	3.59%	3.01%
Half a life	16.00	14.00	17.00
Time for full convergence	31.00	28.00	33.00

Source: Authors' calculations.

All of the above indicators provide some understanding about the overall level of provincial disparity in per capita GDP distribution, but they fail to offer insights into the situation of individual provinces. Provinces can contribute to the disparity in per capita GDP values by being either higher or lower than the national average. Figure 3, based on normalized regional per capita GDP, is important in depicting the behaviour of the regional economies relative to the country over time.

Figure 3. Temporal variation in regional per capita GDP (with respective to national average)



Source: Authors' calculations.

In the case of Sri Lanka, a single province (Western province) is leading the economy and standing well above the national average. The Southern and North-Western provinces have maintained a level that is below but close to the national average, while the level for the Northern province has consistently stayed well below the national average. As for the other five provinces, although the level has remained below the national average, Sabaragamuwa and Uva provinces have exhibited slight divergence relative to the national average over time.

Figure 3 provides some idea about the nature of disparity by individual provinces, while table 4 shows the percentage of contributions of each region to national disparity based on the MD_w measure.

Table 4. Regional contribution to the inequality

(Percentage)

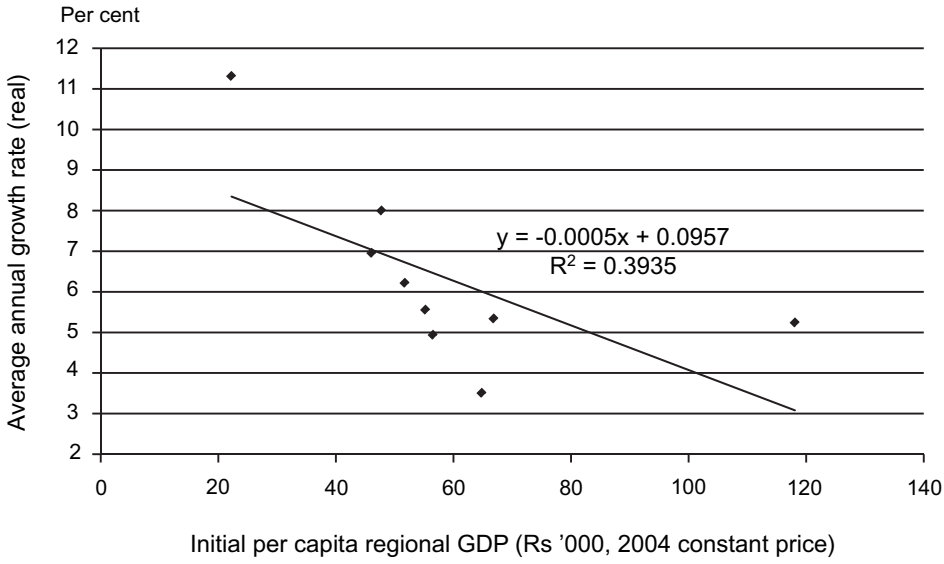
Year	Western	Southern	Sabaragamuwa	Central	Uva	Eastern	North-Western	North Central	Northern	Total
1997	49	11	5	6	3	6	1	6	13	100
1998	49	10	7	7	3	5	1	6	12	100
1999	50	8	7	8	5	5	3	4	11	100
2000	50	7	6	7	5	6	3	5	11	100
2001	50	7	7	8	4	5	2	5	12	100
2002	50	8	6	8	5	6	3	5	11	100
2003	50	7	8	10	4	5	5	5	7	100
2004	50	7	7	8	4	6	6	5	6	100
2005	50	7	7	10	4	7	6	3	6	100
2006	50	5	8	9	5	7	5	4	7	100
2007	50	4	8	10	5	7	4	5	7	100
2008	50	4	9	9	5	7	4	4	8	100
2009	50	4	10	9	5	5	5	4	7	100
2010	50	4	9	9	6	5	6	4	7	100
2011	50	3	10	10	6	6	4	4	6	100

Source: Authors' calculations.

The level of inequality among regions varies over the specified time. While the leading Western region is contributing to 50 per cent inequality with an upward deviation, other regions are contributing to 50 per cent of the downward deviation, with different rates that change over the time. This variation is due to the different rates of growth of the regions. For example, the Southern province contributed to 11 per cent of the downward deviation in 1997 and only 3 per cent in 2011. The Northern and North Central provinces also experienced significant declines in their contribution towards downward deviation between 1997 and 2011, falling from 13 to 6 per cent and from 6 to 4 per cent, respectively. In contrast, Sabaragamuwa province experienced an increase in its contribution to the downward deviation from 5 to 10 per cent over this same time period. The contribution also increased in the Central, Uva and North Western provinces. As Barro and others (1991) explain, if beta convergence exists among a group of regions or countries, a negative relationship is likely to exist between the initial level of per capita GPDP and the corresponding rate of growth over time. In figure 4, average growth rate of per capita GDP of individual

provinces is plotted against their corresponding initial values. As expected, the trend line has a negative slope, which provides evidence of beta convergence in the Sri Lankan case during the analytical period 1996 to 2011.

Figure 4. Beta convergence



Source: Authors' calculations.

The study employed the standard regression equations used in the literature to test for both unconditional and conditional convergence (see Rodrik, 2011 for a detailed description of this methodology). Unfortunately, no statistically significant convergence was found. Perhaps this was a result of not being able to find a version of the two types of regression equations that explained more than 10 per cent of the overall variance in our data. The study only had 16 time periods to include in our panel and a limited number of explanatory variables available for each of the nine provinces on an annual basis.

Under these circumstances, the study employed an approach derived from decomposing the mean deviation and its change over time to explore further the nature of convergence and divergence behaviour at the provincial level. In particular, it focused on the following indicator:

$$\Delta R_i = |R_{it}| - |R_{i\,(t-1)}|$$

where R_{it} and $R_{i\ (t-1)}$ are shares of mean deviation of the i^{th} province in time periods t and $t-1$ respectively, and ΔR_i is the annual absolute change in i^{th} region's share (contribution) to overall inequality.

If ΔR_i is negative (positive), that region is contributing to the convergence (divergence) over time. When a region is neither converging nor diverging, the value of ΔR_i is zero. The magnitude of ΔR_i is useful in understanding the relative contribution of individual provinces for total convergence (divergence). The rate of convergence of an individual province (RC_i) can be given as follows:

The sign of ΔR_i is useful in understanding whether the region is contributing to an overall convergence or divergence while the comparison of R_{it} with $R_{i\ (t-1)}$ is useful in understanding the direction or nature of convergence or divergence. Table 4 provides a summary of the diverging and converging pattern of different provinces over the time period. The nature of the divergence given in this table is derived as follows:

If $R_{it} > R_{i\ (t-1)}$ and ΔR_i is negative, it is an upward conver gence (UC);

If $R_{it} > R_{i\ (t-1)}$ and ΔR_i is positive, it is an upward diver gence (UD);

If $R_{it} > R_{i\ (t-1)}$ and ΔR_i is zero, it is an upward neutral (UN);

If $R_{it} < R_{i\ (t-1)}$ and ΔR_i is negative, it is a downward conver gence (DC);

If $R_{it} < R_{i\ (t-1)}$ and ΔR_i is positive, it is a downward diver gence (DD);

If $R_{it} < R_{i\ (t-1)}$ and ΔR_i is zero, it is a downward neutral (DN);

If $R_{it} = R_{i\ (t-1)}$ and ΔR_i is zero, it is an absolute neutral (AN).

Overall, convergence (divergence) can happen either with upward convergence (downward divergence) of lagging regions, or with downward convergence (upward divergence) of leading regions or with both of these phenomena. Table 5 is important in providing an overall understanding of the converging behaviour of each of the Sri Lankan provinces. Figure 5 depicts graphically the variation of normalized provincial-level per capita GDP over time.

As the analytical results depicted in table 5 and figure 5 indicate that the Sri Lankan convergence pattern is consistently driven by the behaviour of the leading Western region. During the period 1996-2000, the Western province contributed towards the overall national divergence with an upward divergence in the region. During that period, the North-Western and Southern regions each depict a converging behaviour and the other provinces display some diverging behaviour. Since 2004, the

Table 5. Regional contribution to the convergence

(Percentage)

Period	Western		Southern		Sabaragamuwa		Central		Uva		Eastern		North-Western		North Central		Northern		National	
	Rate	Type	Rate	Type	Rate	Type	Rate	Type	Rate	Type	Rate	Type	Rate	Type	Rate	Type	Rate	Type	Rate	Type
1997-1998	-5	UD	11	UC	-45	DD	-34	DD	-4	DD	22	UC	22	UC	-18	DD	3	UC	-5	D
1998-1999	-18	UD	8	UC	-7	DD	-26	DD	-69	DD	-28	DD	0	UC	23	UC	-8	DD	-16	D
1999-2000	-4	UD	-3	DD	9	UC	6	UC	-8	DD	-23	DD	5	UC	-14	DD	-7	DD	-4	D
2000-2001	5	DC	9	UC	-11	DD	-4	DD	28	UC	15	UC	23	UC	-7	DD	4	UC	5	C
2001-2002	0	DC	-4	DD	14	UC	0	DD	-25	DD	-4	DD	-32	DD	12	UC	6	UC	0	C
2002-2003	6	DC	16	UC	-23	DD	-18	DD	13	UC	17	UC	-51	DD	6	UC	42	UC	6	C
2003-2004	-9	UD	-12	DD	8	UC	10	UC	-9	DD	-41	DD	-44	DD	-14	DD	1	UC	-9	D
2004-2005	2	DC	2	UC	0	UC	-20	DD	13	UC	-8	DD	15	UC	30	UC	3	UC	2	C
2005-2006	3	DC	33	UC	-8	DD	8	UC	-16	DD	4	UC	9	UC	-20	DD	-9	DD	3	C
2006-2007	8	DC	25	UC	8	UC	1	UC	10	UC	3	UC	22	UC	-5	DD	4	UC	8	C
2007-2008	15	DC	6	UC	3	UC	21	UC	1	UC	20	UC	21	UC	38	UC	9	UC	15	C
2008-2009	-2	UD	-5	DD	-10	DD	-1	DD	-3	DD	28	UC	-24	DD	-16	DD	2	UC	-2	D
2009-2010	4	DC	12	UC	5	UC	5	UC	-5	DD	3	UC	-11	DD	11	UC	8	UC	4	C
2010-2011	4	DC	30	UC	-2	DD	-4	DD	-2	DD	-13	DD	29	UC	-14	DD	12	UC	4	C

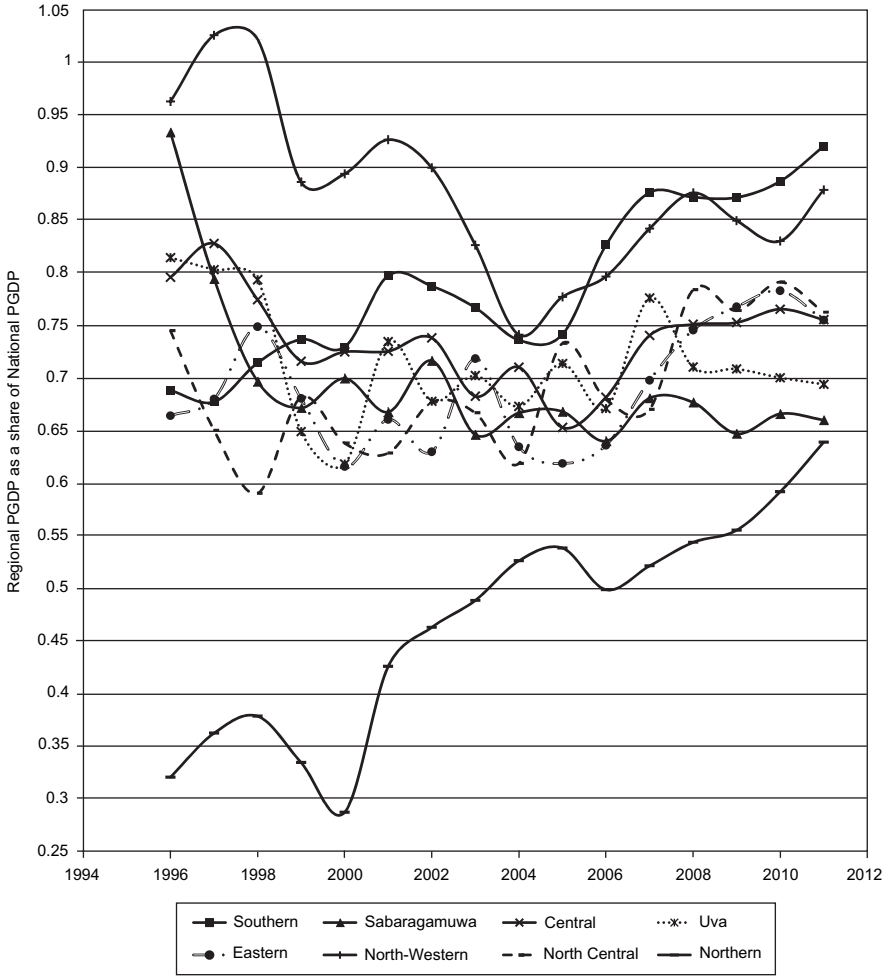
Source: Authors' calculations.

Notes: UD – upward divergence, DD – downward divergence, DC – downward convergence, UC – upward convergence.
C – convergence, D - Divergence.
Rate refer to the corresponding provincial rate of convergence.

Southern province has contributed to overall convergence with its high rate of upward convergence. Only in 2008 and 2009, a slight diverging behaviour can be observed.

Even though the North-Western region also started to converge during the same period, it contributed to divergence during 2008 and 2010. The Eastern province contributed to convergence for five consecutive years starting from 2005.

Figure 5. Normalized GPDP (of lagging provinces)



Source: Authors' calculations.

Note: PGDP – per capita GDP.

The Northern province also contributed to convergence in each of the last five years. The above results are consistent with the targeted infrastructure development programmes initiated by the Government under *Mahinda Chintana*. The two lagging regions of Uva and Sabaragamuwa mostly contributed to divergence during the entire analytical period.

V. CONCLUDING REMARKS AND POLICY IMPLICATIONS

Based on the analysis and insights from previous studies, we can derive the following set of conclusions. Economic conditions in Sri Lankan provinces are not equally distributed geographically and a considerable level of inequality has persevered over time. The disparity between provinces is visible both in the contribution that they are making to the national GDP and also in terms of value addition per head (in the province) or per capita GPDP. Variation in per capita GPDP is not as high as that of the provincial GDP due to comparatively high population density in the leading region.

All three weighted indicators (CV_w, G_w, MD_w) calculated to understand sigma convergence (in terms of per capita GPDP) show similar patterns of temporal variation. Though the magnitudes of indicators are not comparable, any of them can be used in analysing temporal variation of convergence behaviour. Sri Lankan provinces diverged during the period 1996-2000. Since 2000, there has been a declining trend in inequality, albeit with some temporary fluctuations for particular regions. Some fluctuations in the pattern of convergence are coincident with changes in political conditions and the prevailing armed conflict at the time. For example in 2009, at the peak of civil war, there is divergence. A clear convergence is visible after the conclusion of the war. This is a positive sign. Moreover, the average rate of convergence observed with our three weighted indices (CV_w, G_w, MD_w) during the period 2000-2012 varies from 3.3 to 4.1 per cent, and is almost twice as the average rate of 2 per cent of beta convergence observed by Barro and Sala-i-Martin (1997) with data of the United States of America. Furthermore, the current pattern of convergence observed in per capita GPDP is associated with recent rural road development projects and other post-war reconstruction projects initiated by the national government. Variations in industrial structure, natural resources endowment, the quality of human resources, available technology, and level of infrastructure conditions are the other main reasons for varying economic conditions in the provinces.

If the average rate of convergence prevailing in the period 2000-2012 continues linearly, Sri Lanka may be able to halve its current level of inter-provincial disparity in 16 years and eliminate the asymmetry in about 30 years. In saying this, however, it

must be recognized that there is no guarantee about continuity of convergence even with the maintenance of current policy settings. Policies suggested in literature on enhancing regional development fall into two main categories. Development policies designed without explicit consideration to space are designated "place-neutral" or spatially blind policies. Those policies are targeted at maximizing national economic growth and efficiency while improving the lives of individuals wherever they live or work, although not necessarily in an equitable manner. While some development practitioners and reports, including the *World Development Report 2009*, support this approach, some authors, such as Barca (2009); Barca, McCann and Rodríguez-Pose (2012), highlight the importance of spatially targeted or "place-based" development policies. The place-based approach suggests the need to focus on area-specific development policies that consider the social, cultural and institutional characteristics, as well as the natural and capital resource endowment of the geographical context (Pike, Pose and Tomaney, 2006; OECD, 2009a; 2009b). Development policy within this context seeks to target lagging regions for enhanced levels of economic growth even if it is at the expense of some loss in overall national growth.

In this context, recent Sri Lankan policy interventions involving targeted public investments in lagging regions are important towards achieving a higher level of convergence in regional per capita GDP over time. However, given the current emphasis on public-private partnerships to spread the public investment dollar further, the provision of incentives for private sector firms to establish operations in lagging regions is also required. Even if the focus is concentrated on public investments as a vehicle for achieving regionally balanced growth moving forward, there is an urgent need to develop a policy analysis tool, such as a bottom-up multiregional computable general equilibrium model, to guide the selection of the most appropriate set of interventions (both place-based and place-neutral). The authors are currently involved in development of such a policy analysis tool for Sri Lanka.

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