

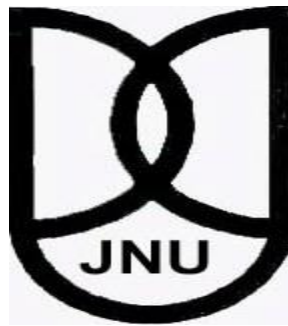
**THE ROLE OF TRADE AND RELATIVE  
BACKWARDNESS IN EXPLAINING INCOME  
CONVERGENCE IN THE ASEAN AND THE EU: A  
COMPARATIVE ANALYSIS**

*Thesis submitted to Jawaharlal Nehru University for award of the  
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by

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December 17, 2018

DECLARATION

I declare that the thesis entitled “**The Role of Trade and Relative Backwardness in Explaining Income Convergence in the ASEAN and the EU: A Comparative Analysis**” submitted by me for the award of the degree of **Doctor of Philosophy** of Jawaharlal Nehru University is my own work. The Thesis has not been submitted for any other degree of this University or any other university.

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For any errors or inadequacies that may remain in this work, the responsibility is entirely my own.

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## **List of Abbreviations**

AEC	ASEAN Economic Community
AFTA	ASEAN Free Trade Area
AREAER	Annual Report on Exchange Arrangements and Exchange Restrictions
ASEAN	Association of South East Asian Nations
BLUE	Best Linear Unbiased Estimator
CLMV	Cambodia, Lao PDR, Myanmar and Vietnam
ECB	European Central Bank
ECSC	European Coal and Steel Community
EEC	European Economic Community
EU	European Union
FEM	Fixed Effects Model
FGLS	Feasible GLS
FDI	Foreign Direct Investment
FD Index	Financial Development Index
FPC	Factor Price Convergence
FPE	Factor Price Equalization
FTA	Free Trade Agreement
GDP	Gross Domestic Product
GLS	Generalized Least Squares
HOS	Heckscher-Ohlin -Samuelson
IMF	International Monetary Fund

MENA	Middle East and North Africa
MPK	Marginal Productivity of Capital
MRA	Mutual Recognition Agreement
MPL	Marginal Productivity of Labour
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PPP	Purchasing Power Parity
REM	Random Effects Model
SWIID	The Standardized World Income Inequality Database
USD	US Dollar
USA	United States of America
VIF	Variance Inflating Factor
WGI	Worldwide Governance Indicators
WDI	World Development Indicators
WRT	With Respect to

# Chapter I

## Introduction

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### 1.1 Background

Economic growth and convergence of income across countries have occupied a centrality of importance in the economic development literature for the last few decades. The key issue in such discourse is whether the *long-run* process of economic growth has any in – built mechanism that leads to per capita income convergence among countries which are at different levels or stages of per capita income to begin with. This question has been dealt with theoretical rigor and empirical scrutiny from the experiences of different countries both at the national level as well as cross country levels. At the national level, one attempts to find if different regions within a nation or country tend to converge along the growth process (Rao, M.G. et al., 1999; Kanbur and Zhang, 2005; Paas et al., 2006; Kalirajan et al., 2009; Barua and Chakraborty, 2010; Mikulić et al, 2013 ;Menon ,2013 etc.), while at the cross-country level the same question has been posed for a group of countries with varied levels of per capita income at the initial stage of analysis (Barro Sala-i-Martin, 1992; Ben-David,1993, 2001; Baruah et al 2006; Jayanthakumaran and Lee, 2009, 2013, etc.). Obviously, in both type of approaches, time is allowed to play a role in an essential way as one is observing the growth trajectories of countries (or regions) against *time* as a variable. This study is an attempt to contribute in examining if *international trade* has any role to play in triggering or at least in speeding up the convergence of per capita income across countries. We, however, refrain from analyzing the *inter – regional* aspects of convergence for reasons that will be discussed later<sup>1</sup>.

In the backdrop of the above analysis, we need to first of all discuss the predominant view that takes the pride in posing the growth – convergence issue per se. The standard neoclassical

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<sup>1</sup> In the second chapter of this thesis, we have reviewed literature on inter-regional aspects of convergence and in the Appendix, we have given an overview of inter-regional convergence in the EU and the ASEAN. However, owing to non-availability of relevant data, we have not delved deeper into the mechanisms of inter-regional income convergence. More on this is discussed in the subsequent chapters and in Appendix.

growth model that was originally proposed by Solow-Swan (1956) has been applied to explain growth and income convergence in many studies. For instance, Barro (1991), Sala-i-Martin (1991, 1992, 1995,1996), Quah (1995), Durlauf (1996), Rodrik (2003,2005) etc. have attempted to explain the process of income convergence in terms of the neoclassical growth process. The production function as assumed by Solow-Swan growth model exhibits constant returns to scale and diminishing returns to each input of production (i.e., capital and labour) and a constant savings ratio. The model assumes no technical progress in the growth process and therefore growth is entirely due to capital accumulation. The Solow-Swan model thus proposes that if the rich countries and the poor countries, defined solely in terms of the levels of per capita income are on a Solow – Swan growth path then in their transition to the long run steady state level, *the initial per capita income must be inversely related to subsequent growth in per capita income due to diminishing returns to capital resulting in identical per capita incomes in the long run for the rich and the poor countries alike*. It is therefore obvious that the income convergence is the result of the implicit assumptions of the model. This simple and elegant model has been empirically tested for many countries in a series of studies such as Barro (1991), Sala-i-Martin (1991, 1992, 1995,1996), Quah (1995), Durlauf (1996), Rodrik (2003,2005) and it was observed that the empirical results confirm the prediction of income convergence based on the Solow-Swan model. It needs to be recognized at this stage that the income convergence within the Solow – Swan model is the *inevitable consequence of an automatic growth process* caused by capital accumulation and is solely determined by the assumptions of the model as explained above provided there always exist a competitive equilibrium. This *inevitable consequence* of the growth makes the role of *economic policies either redundant or inconsequential* in examining the issue of convergence of per capita income. One might legitimately ask if some policy intervention may be necessary to either initiate the growth process or to speed up the convergence process. For instance, policy interventions like trade liberalization and formation of regional trading arrangements, government consumption expenditures and other policies like factor mobility and trade etc. may enhance or even initiate a growth process which may consequentially lead to income convergence. That is one of the serious limitations of the neo-classical convergence analysis has been to completely ignore the role of any triggering force to initiate economic growth leaving economic growth to be determined by something in – built automaticity of capital accumulation.



In this background, this study is purported to emphasize on the importance of the forces that trigger economic growth and therefore the role of deliberate policy interventions to achieve the goal of income convergence. As emphasized in the foregoing discussion on income convergence, based on the Solow-Swan growth model, there is no role of international trade. Although the essentially closed economy Solow-Swan model has been extended to study the issue of income convergence in a cross-country framework, international trade was not allowed to play any legitimate role in the convergence process in those countries. However, there is a huge literature on economic growth during the post – War period showing that international trade does contribute to increase in economic growth. Obviously, one might be therefore tempted to ask whether international trade can be a force in itself to bring about the convergence or at least to expedite the process of income convergence in a certain way. If international trade does play any role in income convergence then it might be possible to argue that countries which trade intensively are able to achieve the goal of income convergence in a much shorter span of time as compared to those countries which are laggard in achieving vigorous growth in trade. Our focus of attention in this study will be to address the question whether trade enhances per capita income (output) convergence across different economies.

The long -run analysis of international trade in a neo – classical framework is based on a model which resembles the Solow-Swan model except for the fact that there is no growth either through technological progress or via capital accumulation. However, the countries are different in terms of the endowment of the factors of production such as labour and capital. Trade between any two countries can be allowed in such a model in a very simple way. Popularly known as the Heckscher-Ohlin – Samuelson (HOS) trade model, this model “states that a country will export the good that uses its abundant factors intensively and import the goods that uses its scarce factors intensively” (Krugman and Obstfeld, 2009). The model predicts that as free trade follows between the countries, factor prices between the countries will be equalized completely under certain reasonable assumptions. This result is known as the factor price equalization theorem which was due to P. A. Samuelson (1948, 1949). The theorem states that under the conditions of constant returns to scale, perfect competition, unequal factor intensities between goods and if the factor endowment rays of the countries lie within the *cone of diversification*, then complete free trade (meaning no hindrance to trade either by man – made factors or by natural barriers such as transport cost), can lead to the equalization of factor prices. However, it needs to be emphasized that the

convergence of factor prices does not necessarily imply convergence of the per capita income. Per capita incomes can still diverge if endowments across countries are becoming very different. For instance, a highly capital abundant economy can enjoy a higher per capita income despite the fact that both capital rich and capital poor countries are experiencing equality of factor returns as a result of trade. Thus, traditional trade theory does not provide us with strongly convincing result on the very important question of whether trade leads to per capita income convergence across countries.

The advantage of the international trade analysis for examining the convergence issue lies in that it allows for structural change within an economy due to specialization since the economy is usually modelled in a multi – sectoral framework. In contrast, the Solow – Swan model is based on a single sector economy and therefore does not recognize any scope for the evolutionary growth process and its impact on income convergence. Economic growth is essentially an evolutionary process where an economy moves away from a state of primary specialization to manufacturing orientation and eventually to service sector specialization. There is enormous historical evidence which demonstrates that as an economy moves away from the primary specialization to manufacturing orientation, sustained economic growth emanates from the dynamic changes which result from the manufacturing growth by way of increasing returns to scale and unfolding of newer possibilities of technical change due to scope for finer division of labour with the expansion of the size of the markets (Barua et al, 2010; UNCTAD Report, 2014; McGregor and Verspagen, 2016; Jayasooriya, 2017; Busse et al, 2017 etc..). The single sector Solow – Swan model based on constant returns to scale is incapable of handling such dynamic changes stemming from increasing returns to scale and technical changes unfolded by the process of economic growth. The scope for international trade allows for possibilities of specialization and structural transformation within an economy which help in the realization of the benefits of increasing returns to scale and technical progress. In that sense, international trade may be taken as a triggering force to cause economic growth and structural transformation. This link between trade and growth has been so aptly epitomized by the well-known British economist D. H. Robertson in his famous statement that “trade is an engine of growth”<sup>2</sup>. In their seminal paper, Barua et al (2010) established, using a

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<sup>2</sup> This phrase seems first to have been coined by D. H. Robertson in characterizing the role of international trade during the nineteenth century, see Robertson, D.H., “The Future of International Trade” in *Essays in Monetary Theory*

simple theoretical model, how trade can lead to growth in relatively backward regions. The authors assumed a country to be having two regions. Specifically, these regions being the periphery and the metropolis. Further assumptions are the following. First, the periphery is assumed to be characterized by unskilled labor and abundant land while the metropolis is assumed to be characterized by skilled labor and abundant capital. Second, within the region, while labour is assumed to be immobile, capital is assumed to be mobile. Third, it is assumed that the periphery specializes in the production of agricultural good and manufactured goods of a specific type that intensively use land and unskilled labor respectively. As opposed, it is assumed that the metropolis produces machinery and the service good which are capital intensive and skilled labor intensive, respectively. Fourth assumption is that the machinery that is produced in the metropolis region is employed in the periphery region, in the creation of consumer goods, as an intermediate good. Fifth, in their model, trade between these two regions was allowed be determined by relative production advantage. Another assumption of the model is that, for this country, both agricultural goods and service goods are internationally non-tradable. The final assumption is that world price is given and is considered exogenous variable for the country when it is exposed to trade with the rest of the world. In the given scenario, if the country faces cheaper world price for machinery as compared to the world price of the consumer goods, the country will specialize in the production of consumer goods. The country will export the so produced consumer goods to rest of the world and import machinery from them. Now, as the periphery region of the country is abundant in unskilled labor, capital will move to the periphery region from the metropolis region. The consequence of this will be a fall in the machinery sector in the metropolis. Simultaneously, the periphery region will experience an expansion of the consumer goods sector without having much bearing on agricultural sector. The rationale for this being that the agricultural sector is exclusively using land as input. Though, unskilled labor is drawn out of agriculture sector and directed to the consumer goods sector, its capital intensity will grow, and agriculture sector will increasingly become mechanized. In the metropolis region, with the decline of the machinery sector, there will be release of both skilled labor and capital. As skilled labor is assumed to be immobile, therefore it will get absorbed in the service sector. The service sector in the metropolis region may undergo

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(London, 1940), p 214, reprinted in the American Economic Association's Readings in the Theory of International Trade (Philadelphia, 1949). For similar views, see Ragnar Nurkse "The pattern of Trade and Development. Stockholm, 1959".

an expansion followed by the expansion of the periphery region that may balloon up the demand for the services goods. Consequently, the periphery region will experience an increase its per capita income as it will see a relatively higher the share of manufacturing in their GDP as compared to the metropolis region. This process is in line with the structural transformation hypothesis of Chenery-Syrquin (1988). This was empirically demonstrated by Barua et al (2006) in their paper on unification and convergence in the European Union that as a result of the opening up of the economies to the forces of international trade, the relatively backward countries of the EU are able to achieve faster rate of growth in income which eventually contributed to the reduction in inter – country per capita income inequality.

In view of the importance of the evolutionary process in growth and its role in changing income structure across population, our study shall attempt to examine how international trade can be taken as a factor leading to income convergence. The relatively backward countries may witness forces that lead to greater interdependences with the more advanced economies in terms of trade and factor movements. The increasing requirements of high economic growth in the face of rising population and the Malthusian crisis associated with the rise of population may create an ever-increasing urge in the relatively backward economies for intensive trade with the advanced economies in an attempt to realize the benefits from increasing returns and exposures to new technology. This urge gives rise to pro- active forces to act for greater trade liberalization and other economic reforms to facilitate economic growth. The rise of the European Union (EU) as a trading block and in the same way the emergences of the ASEAN among the South East Asian developing economies are examples of this kind. The subject of income convergence across countries becomes even more salient in the context of proliferating regional economic integration of countries<sup>3</sup> as it has been claimed by many theorists that certain benefits are accrued on account of economic integration to the member countries (Venebles, 2003; Barton et al.,2006; Nsour, 2008; Freund and Ornelas, 2010 etc.) whereby the poorer countries that join with higher income countries of the economic union can experience faster growth rate of income from increased specialization. Of course, the richer countries of the union also gain from such trading union but if trade leads to income convergence across the countries then the benefits accrued to the relatively backward

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<sup>3</sup> A brief note on the current scenario of Regional Trade Areas (RTAs) is given in appendix A1.1

economies may have to be much higher compared to the advanced economies. We shall discuss this issue in the next section.

The renewed interest for understanding the trade – growth nexus and how trade may cause income convergence across countries have contributed to the proliferation of large number of empirical studies in both advanced and relatively backward economies. Empirical researches that have tried to assess the role of trade on income convergence discuss various conduits through which trade can cause income convergence by positively impacting the growth rate of income. *Firstly*, trade leads to efficient allocation of resources; and scale efficiency due to greater access to expanded markets and greater capacity utilization (Ventura 1997; Ghose 2004; Dawson 2007; Velde, 2011) which in turn leads to higher income and rate of domestic savings. *Secondly*, trade induces capital inflow and thus causes higher real return to capital in countries abundant in unskilled labor and exploit the comparative advantage of unskilled labour (Ben-David, 1996; Ben-David and Rahaman, 1996; Sachs and Warner, 1995 etc.). It is believed that openness brings about increased factor mobility and encourages diffusion of new products and technology and structural and organizational improvements which in turn leads to per capita income convergence among the countries with low income countries catching up with the high -income countries. *Thirdly*, trade liberalization can mediate international flow of technology and knowledge spillover (Balassa, 1978; Krueger, 1980; Feder, 1982; Baumol, 1986; Edwards, 1992). The different levels of technologies prevalent in different countries can be transfused between the countries by means of trade. This may materialize through interpersonal contacts accompanying trade and as countries reverse engineer their imported goods. This flow of technology changes per capita income via its impact on factor prices. Depending on country's endowments of inputs, technological improvements entail higher marginal productivities for factors and hence higher prices are accrued to these factors. As technology flows from the advanced countries to the less advanced countries, trade has the impact of raising factor prices in less advanced countries aligning it with the factor prices in advanced countries.

In view of such important links between trade openness and income convergence, it is ironical that much of the existing and extensive literature in the area of economic growth that deals with income convergence ignores the role of trade openness in the process of convergence. On the one hand, convergence in the context of the traditional Solow-Swan model (1956) is devoid of any

role of trade. On the other hand, in those endogenous growth models that allow for trade, the focus is on steady-state growth rates rather than convergence in the levels of income in different economies. In our study we shall try to emphasize on this missing link between trade and per capita income convergence.

## 1.2 Scope and Objectives of Research

Given the background, our study primarily intends to examine the significance of trade in contributing to per capita income convergence across<sup>4</sup> the member countries of regionally integrated area that have mutually committed to engage in *freer trade* between them. For our study we shall consider two economic groups- the European Union (EU)<sup>5</sup> and the Association of South East Asian Nations (ASEAN)<sup>6</sup> for the period 2000-2014<sup>7</sup>. The rationale behind picking these two

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<sup>4</sup> According to the theory of comparative advantage, liberalization of trade is anticipated to advance economic efficiency and raise the aggregate welfare in all the countries involved in trade. Yet another implication of conventional trade theory is that free trade alters the patterns of demand and that of wages for unskilled and skilled workers which may increase within country income inequality. Within countries, especially in the US, and developing countries like India and China, recent studies suggest that opening up to trade has contributed to widening of wage inequality between the high-skilled and low-skilled workers by being factor waning the relative demand for unskilled workers (Borjas, Freeman, and Katz, 1992; Bernard and Jensen 1995; Krugman 1995; Wood 1996; Cline 1997, 2001; Kumar, 2000; Marjit et al., 2007; Agarwal et al., 2008; Mishra et al., 2008; Krishna et al., 2011; Barua et al., 2010, 2015; Yinglan et al., 2014; Chan et al., 2014; Zakaria et al., 2016; Furusawa et al., 2016; Cerdeiro et al., 2017). In addition, New Trade Theory suggests that within countries, regional comparative advantage (including external economies of scale) arises from agglomeration economies that allow certain regions to acquire and maintain cost advantages over other regions (Krugman, 1991). Nonetheless, the overall benefits of globalisation and free trade cannot be denied. For example, the higher growth rates of developing countries of Asia and the emergence of a new middle class in these countries have been attributed to benefits of globalization and opening up of trade (Stiglitz, 1996; World Bank Policy Report, 1993). It may be note at this point that the present study focuses on between country-convergence analysis in the context of trade openness owing to formation of RTA. More on the concepts of between country and within country convergences are discussed in the following chapter on literature review.

<sup>5</sup> For a brief historical background on the evolution of the EU, see Appendix A1.2

<sup>6</sup> For a brief historical background on the formation of ASEAN, see Appendix A1.3

<sup>7</sup> The rationale behind taking this time period is explained in detail in Chapter 3, section, 3.6.

particular groups is that they present a wide range of differences<sup>8</sup> in terms of time of formation and advancement, levels of development etc. and hence make interesting case for study. One of the major differences between the two is that the European Union promotes much deeper integration than ASEAN. The former is a customs union, while the latter is a free-trade zone. The sole distinction between a customs union and free trade is that, “a customs union is a free trade union with a common policy regarding tariffs and measures having equivalent effect...each member state in a customs union imposes the same tariffs, quotas, etc. vis-a-vis non-members, whereas each member state in a free trade zone continues to apply different tariffs, quotas, etc. vis-a-vis non-members” (Clausing, 2000). Moreover, EU is in a level of supra-national co-operation while ASEAN is in a level of inter-national co-operation (Bollinger, 2014). This means EU countries are all tied to each other – monetarily and financially- more intricately than the ASEAN nations. In terms of trade openness, EU is more open than ASEAN. ASEAN opened up to trade only in the 1990s, whereas EU has been open since the 1950s.

The scope of the research undertaken in this study encompasses three major objectives. The *first objective* will be to do a rigorous empirical examination of the role of trade as a causal factor of income convergence. Since trade can lead to income convergence via growth, the *second objective* of this study is to evaluate and explain the role of relative backwardness influencing per capita income convergence in the countries of these two economic groups. The theory of relative backwardness (Gerschenkron, 1952) postulates that the more backward an economy is at the outset of economic development, the more likely are certain conditions to occur in order for the economy to achieve higher growth rates. Along the lines of the theory of relative backwardness, the study attempts to analyze whether countries which are initially backward in relation to the other countries in the region respond promptly to openness to trade and thereby accruing gains in terms of achieving higher rates of growth in per capita income. Thus, finally, taking into the dynamic nature of trade, the *third objective* of the study is to examine whether trade drives income convergence across countries in the region by driving structural transformation of the economies.

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<sup>8</sup> A detail profile on the economies of the EU and the ASEAN during 2000-2014, bringing out the differences in these two regions, is given in Appendix A1.4. Also, a comparative overview of per capita income convergence in the EU and the ASEAN nations during the period 2000-2014 is presented.

### 1.3 Motivation of the Study

The motivation of this study stems from four compelling reasons. *First* motivation emanates from the fact that even though the previous studies on income convergence on the EU and the ASEAN have highlighted various aspects of convergence, such as the essence of the phenomenon itself; its absence or presence in various sub-regions and groups of countries in the EU and the ASEAN, or within some individual countries of the EU and the ASEAN; the factors underlying the presence or absence of convergence *etc.*, no dedicated attempt have so far been made to analyze the impact of trade on per capita income convergence in the EU and the ASEAN as whole in the recent times. All the earlier studies on income convergence in the EU and ASEAN are based on the traditional concepts of *beta* and *sigma* convergence (developed by Barro Sala-i-Martin, 1992) which in turn are based on the Solow – Swan model. However, economic growth is an evolutionary process where an economy transforms from an agricultural specialization to industries to services and how such evolution contributes to income convergence is unexplained by the single sector growth model of Solow – Swan underlying the Barro Sala-i-Martin analysis of convergence. Moreover, this neo -classical steady- state analysis completely ignores the role of trade in convergence. Hence, adopting the Barro Sala-i-Martin (1992) analysis of convergence will not be suitable for analyzing the underlying process of structural change that an economy experiences as the forces of trade and factor movements get unfolded in response to exogenous policy shocks. In this study, the analysis of convergence in the EU and the ASEAN is based on *Theil ratio* of inequality, culled out from the *Theil index* of income inequality, which provides a multi-sectoral analytical framework, allowing us to capture structural transformation of the economies in response to trade and policy shock.

*Second*, there is no concrete consensus in the literature on the issue of convergence in the EU and the ASEAN. For the EU, many find evidence of convergence (Armstrong, 1995; Ben-David, 1993, 2001; Dewhurst and Mutis-Gaitan, 1995; Leonardi 1995; Kutan and Yigit 2009; Boldrin and Canova, 2001; Barua et al 2006; Villaverde and Maza, 2008), while others find mixed results of convergence and divergence, (Marques and Soukiazis, 1998; Dunford, 1996), and still others find or predict divergence (Arestis and Paliginis, 1995; Hallett, 1981; Slaughter 1997, 2001). Similarly, for the ASEAN, few find evidence of convergence (Ismail, 2008; Jayanthakumaran and Lee, 2009, 2013; Chowdhary et al, 2011; Sperlich and Sperlich, 2012;



Solarin, 2014), while Mu Shun Wang (2012) find the evidence of both convergence and divergence over two different time lengths, and still others find divergence (Lim and McAleer, 2004; Lee et al, 2005; Korshed, 2005). *Third*, to the best of our knowledge, only two papers have tried to assess the link between trade and trade-related policy and income convergence – Baruah et al. (2006) found trade has caused income convergence for the EU-15 countries and Jayanthakumaran et al. (2008) showed that multilateral trade policies had great impact on income convergence among the ASEAN-5 than regionalism. But these studies, like all other earlier studies, have limited their analysis to pre- or early 2000s and not all the countries of the EU and the ASEAN have been included in the analysis owing to non- availability of data for all the countries. This gives us the motivation to cover the time recent period of 2000-2014 as during this time period, the EU and the ASEAN countries have been witnessed to great economic developments. *Finally*, thus far there hasn't been any comparative study on the process of per capita income convergence in the EU and the ASEAN. As these two particular groups present a wide range of differences in terms of time of formation and advancement, levels of development etc., they make interesting case for comparative study to understand whether countries at different stages of development and different levels of openness experience differently towards convergence.

#### **1.4 Organization of the Study**

The thesis is organized in seven chapters including this introduction chapter which provided a broad perspective of the research. In **Chapter II**, we provide an exhaustive survey of the existing theoretical and empirical literature pertaining to income convergence, role of trade and relative backwardness in causing income convergence and the link between trade, structural transformation and income convergence. The chapter also discuss the existing empirical literature based on per capita income convergence in the EU and the ASEAN countries. In particular, we review literature on how trade and other factors contribute to per capita income convergence in a region and specifically for the EU and the ASEAN. The chapter then highlights that there are not enough empirical studies for per capita income convergence in ASEAN, and that the earlier studies on the relationship between trade and income convergence in the EU and the ASEAN are inconclusive and dated. Also, we try to build strong theoretical underpinnings of the models to be used in this

thesis so that a sound study can be undertaken. Last but not least, the chapter also identifies exactly where and how this study can contribute to the sparse literature in this field. In the following chapter, **Chapter III**, we set out the three major hypotheses that would be tested in the course of this study. This chapter also discusses at length and with clarity, the theoretical foundations and motivation behind each of the hypothesis. It provides a detail discussion of undertaken methodologies which is then trailed by a detailed documentation on data sources and database construction. In **Chapter IV**, we empirically test for per capita income convergence in these two groups of countries in the recent period i.e., 2000-2014 using the concepts of beta and sigma convergence. This is followed by investigation of the question whether inequality with respect to income (measured by GDP) and its sectoral components -agriculture, industry and services- have reduced among the countries of EU and ASEAN during 2000-2014, employing Theil index of inequality. Also, in this chapter, we rigorously study the role of trade in the process of per capita income convergence in the EU and the ASEAN. To do this we use panel regression analysis on Theil ratios for the study period 2000-2014. We further provide comparative overview of convergence for the ASEAN and the EU. This is followed by **Chapter V** where we test for the relevance of A. Gerchenkron's theory of relative backwardness in explaining income convergence in the EU and the ASEAN during 2000-2014. In order to do so, we examine the relationship between various economic variables of development like trade, government expenditure, financial development etc. and economic growth in EU and ASEAN over the period of 2000-2014. This is done in order to understand the undercurrents of economic development in EU and ASEAN in the process of income convergence. In the penultimate chapter, **Chapter VI**, we try to examine the relationship between income convergence and economic structural transformation/orientation across the EU and the ASEAN nations during 2000-2014 and the significance of trade in impacting the process of income convergence via propelling structural transformation in these two trade unions. The concluding chapter, **Chapter VII**, summaries the different aspects of the analysis attempted in the study with focus on the key findings and conclusions of this study. Also, the chapter follows up with some policy implications.

## Chapter II

### Literature Review

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As explained in the previous introductory Chapter I, in this thesis we are primarily concerned with examining if at all international trade can contribute to per capita income convergence across nations. The notion of “convergence” can be interpreted in a variety of ways in economics but we have used a very specific meaning of *economic convergence* in our study and that is narrowing down of *per capita income differentials across countries* over time with the process of economic growth. Now there may be many factors which might contribute to the narrowing down of per capita income differences across countries but our primary focus in the study is to highlight on the extent and the ways international trade can play a role in the process of income convergence across countries. Two types of economic convergence are usually studied: nominal convergence and real convergence (Kutan et al, 2005; Lein-Rupprecht et al, 2007 etc.). Nominal convergence means the tendency towards a greater uniformity of *nominal variables* (those indicative of macroeconomic stability) whereas *real convergence* expresses the approximation of the levels of economic welfare, generally indicated by per capita income defined in terms of per capita gross domestic product (GDP). This latter view of convergence, that is, the real convergence of income per capita has drawn attention of economics scholars. This attention has given rise to a wide array of empirical outcomes and a broad range of interpretations<sup>9</sup> of income convergence.

At this point, it may be noted that the core concept related to income convergence discussion is the concept of “*catching-up*”. Even though the concepts “convergence”<sup>10</sup> and “catching up” are often used synonymously, these two concepts need to be distinguished from each other. While “Catching-up” is a country’s ability to narrow the gap in its income vis-à-vis the

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<sup>9</sup> Various interpretations of income convergence can be put into following broad categories- convergence within and across economies, convergence in terms of growth rate of income and convergence in terms of levels of income, beta-convergence ( $\beta$ - convergence) and sigma convergence ( $\sigma$ -convergence), absolute (unconditional) and conditional convergence. All these concepts are discussed at length in the subsequent sections of this chapter.

<sup>10</sup> Henceforth, the terms income convergence and catching up will be interchangeably used, unless specifically mentioned otherwise.

income of a leader country, “convergence” refers to a trend towards an overall reduction in income differences in the world as whole (Amable, 2006). If all the countries below the frontier are able to catch up the “frontier” country or countries, convergence of course will necessarily follow. But the result of process of convergence is ambiguous if only few countries are able to catch up while others fall behind (Abramovitz, 1986).

We shall now provide a detailed review of the literature on “catching up”. We organize this review in the following way. In **section 2.1**, we provide an extensive review of theoretical and empirical literature on the evolution of the concept of “income convergence”. The next **section 2.2** deals with the literature related to the causal relationship between trade and income convergence. In **section 2.3**, we review the literature on the role of relative backwardness on income convergence. The **section 2.4** discusses the interlinkages between trade, structural transformation and income convergence. In the **sections 2.5 and 2.6** that follows we try to provide accounts of empirical literature on “catching- up” in the case of EU and the ASEAN respectively. Finally, the last **section 2.7** sums up the major findings of the literature review.

## **2.1 Growth and Income Convergence**

### **2.1.1 Theoretical Underpinnings**

The earliest attempts at explaining the process of income convergence were based on the neoclassical growth model as propounded by Solow (1956) and Swan (1956), which later on was refined or extended by Cass (1965) and Koopmans (1965) and Mankiw et al, (1992). The Solow-Swan model largely postulates a Cobb-Douglas production function, that exhibits constant returns to scale, in which the output depends essentially on stock of physical capital and the amount of effective labour. Also, the characteristic feature of the production function is that it follows diminishing returns to each input (capital and labor) and a constant savings ratio. In the absence of technical change, the Solow-Swan model predicts that due to diminishing returns to individual factors of production, long-run economic growth is impossible and the economy will reach a steady state in which the growth of per capita income is zero. Thereby, according to the model, the main obstacle to sustained economic growth is diminishing returns. If exogenous technical progress is introduced in the basic model, then sustained economic growth is achieved; this, however, is linked

to the exogenous rate of technical change. The technical progress overcomes diminishing returns as labor becomes increasingly productive, and, therefore, economies exhibit positive rates of per capita income growth, which is linked to the rate of technical progress. In other words, the Solow-Swan model predicts that in the long run, economies converge to their steady state equilibrium and that sustainable growth is achievable only through technological progress.

The Ramsey-Cass-Koopmans (CKR) model (named after the original work of Ramsey (1928) and subsequently refined by Cass (1965) and Koopmans (1965)), was an advancement over the Solow-Swan (1956) model. This model presents an analytical framework in which *saving rate is determined endogenously by optimizing* behavior of the infinitely-lived households and firms that interact in competitive markets. The lifetime decision on consumption (and savings) is made by the households made by maximizing their utility subject to an intertemporal budget constraint. On the other hand, firms choose the levels of inputs- capital and labor- required for the production of output so as to maximize their profits. However, this specification of consumer-maximizing behavior does not lead to qualitatively different equilibrium conditions from the Solow-Swan model. The only distinction between the two approaches is that, in the long-run equilibrium, the optimal level of per capita output obtained in CKR framework may turn out to be lower than that obtained in a Solow-Swan framework. This happens because the presence of a discount factor works in a way that future consumption does not yield the same utility as present consumption. The analysis based on the CKR framework also predicts like the prediction of the Solow-Swan model as discussed above that as long as diminishing returns prevail, there will be no growth in per capita income, without the possibility of exogenous technological progress.

It becomes apparent from the growth models as discussed above that technical progress can overcome the limitations posed by the diminishing returns to factors as serious impediment to sustained economic growth. But technical progress in these models of neo-classical production function is generally assumed to be exogenous. Critics of this interpretation of technical progress argue that technical progress is not a cost-less phenomenon implying that it is the outcome of a production process requiring investment of real resources. Moreover, without an “incentive mechanism” there is no reason why a firm should invest resources in a technology innovative exercise where internalization of the knowledge is impossible without doing away with the basic assumption that knowledge is a “free good” under competitive equilibrium. The hallmark of the

perfectly competitive model underlying the neo – classical analysis of growth is that knowledge should be assumed as free good. As Schumpeter has argued that for an innovative frontier to exist, we need to assume that some sort of monopoly right, even if it is temporary, needs to be granted to the firms which invest resources for innovation. Thus, monopoly is the essence of the generation of technical progress in this view.

Another alternative way to get around diminishing returns is to directly consider a production function which is not subject to diminishing returns. AK model (Paul Romer, 1986) does the same by considering output to be a linear function of capital, where A is the index of technology and the definition of K taken in a broad sense so as to include different forms of capital stock such as human capital (as in the model developed by Mankiw, Romer and Weil (1992)), physical capital, environmental capital etc.

An implication of Solow's model is that poor countries should grow faster and eventually catch-up the rich countries. In other words, these initial neoclassical growth theories explain convergence as a result of diminishing returns to inputs which are being used in production. As long as physical capital exhibits diminishing returns, the poor economies that have lower initial capital per worker have higher rates of return and, therefore, higher growth rates as compared to the rich economies that have higher initial capital per worker. As a result, poor economies will converge with rich economies to the same steady-state without conditioning on any other characteristics (such as savings ratio, population growth) of economies. That is, the countries have a common rate of saving rate and the production function is identical for all countries.

This process of convergence is referred to as *absolute convergence*. When there are structural similarities with respect to technology and preferences across economies, then absolute convergence holds true. This paradigm of Neoclassical growth has been extensively used to understand the differences in growth levels across countries (inter-country convergences) and differences in standards of living (or within country or inter-regional convergence). In comparison with this, the process of convergence is conditional when an economy with a lower initial per capita capital stock grows at a faster rate and converges to its own steady-state depending upon the other characteristics of the economy. Since real economies tend to be structurally different, it is *conditional convergence* that has found much greater empirical support. In the discussion of income convergence, it is therefore pertinent to distinguish between the two broad dimensions of

income convergence, i.e. within- country income convergence and between country income convergence. Within or intra-country inequality addresses income inequalities within the geographical boundary of a country. On the contrary, between-, cross-country or inter-country inequality (which is sometimes referred to as international inequality), compares income differences between countries. Hence, in principle, while within-country inequality compares the differences in income between households or individuals of a country; between-country inequality is based on a country's mean gross domestic product (GDP) per capita vis-à-vis another country's GDP per capita. But between country inequality doesn't account for the internal inequalities between individuals of a particular country; however, it can take into account the population of a country, like within country income gap. The occurrence of between and within country convergence has been debated for long by economists.

Across the regions of a country, it is usually assumed that there is no significant difference in the patterns of saving and consumption, investment ratio, industrial structure, levels of technology, human capital and other structural factors. In this scenario, more relevant is the concept of unconditional convergence between the regions of the same country which are more or less homogeneous. In the case of within-country convergence, country-specific internal policies like government expenditure etc play more crucial role in convergence by *redistributing income* from richer regions to poorer regions of a country (Cashin and Sahay, 1996; Barua et al, 2010, 2015). Contrarily, different countries having different structures are assumed to converge to a different steady state point at various speeds of convergence which in turn are dependent on national economic performances. In this context, convergence is referred to as conditional convergence, conditioned on various structural factors which are supposed to influence the growth of the per capita income. Within the neoclassical growth framework, a number of studies have attempted to examine the differences in growth rates and convergence across regions and countries (Baumol, 1986; DeLong, 1988; Lucas, 1988,1990; Barro and Sala-i-Martin, 1991, 1992; Mankiw, Romer and Weil, 1992; Shioji, 1993; Cashin, 1995; Coulombe and Lee, 1993; Persson, 1994; Keller, 1994; De la Fuente, 1996; Koo et al., 1998; Rodrik, 2003). Thus, the concept of convergence associated with neoclassical growth theory, although started as within-economy convergence, went on to be designated as across-economy process as well. Per capita income convergence, in the context of the Solow- Swan neoclassical growth model, is driven by diminishing returns to capital, i.e., countries with lower initial ratios of capital to labour will have

higher growth rates of per capita income. Convergence can also occur through the redistribution of incomes from relatively rich countries to relatively poor countries through flows of labour from poor to rich regions, inter-regional capital mobility and flow of technology and knowledge spill overs as a result of international trade (Grossman and Helpman, 1991; David and Loewy, 1998; Barua et al., 2010 etc). More on this will be discussed in subsequent section.

The understanding of the concept of convergence across economies can be branched into two sub-concepts, namely “*convergence in terms of growth rate*” and “*convergence in terms of income level*”. For this, the neoclassical growth theory of technology needs to be extended to the international level. As discussed, the specification of technological progress in neoclassical growth theory assumes that no resources are needed to generate technological innovation, benefits from it are equally distributed, and there is no payment of compensation for benefiting from it. In a global scenario, these assumptions imply that technological progress is equally shared by all the countries, and therefore in the steady state they all can experience the same grow rate. This gives rise to the hypothesis of income convergence in terms of growth rate. Researchers often add to this the assumption that all countries are characterized by aggregate production function that are identical implying that income levels of all countries are identical in the steady state. This then gives rise to the hypothesis of convergence in terms of income level.

Conceptually, the most important dimension of the theory of income convergence is probably the distinction between conditional and unconditional convergence. *Unconditional convergence* assumes that all the country-specific (economy-specific) elements are the constant for the economies (countries) considered. In terms of the relationship between initial level of income and growth in income, this implies that the growth in income will be negatively related with the initial level of income even if no other country-specific characteristic variables are considered in the analysis. Contrarily, the *conditional convergence* concept underscores possible differences across countries in the steady state and hence mandates that appropriate variables be considered while analyzing the relationship between growth in income and initial level of income in order to control for country-specific differences. Conditional convergence also suggests that different countries having distinct levels of economic development experience different paces of catch-up.



The foundation for the theory of conditional convergence was established in the essay-“Economic Backwardness in Historical Perspective” by Alexander Gerschenkron in 1952. He developed the “theory of relative backwardness” based on the historical data of the European countries. The principle doctrine of Gerschenkron’s theory is the following: “the opportunities inherent in industrialization may be said to vary directly with backwardness of the country”. Further, Gerschenkron (1952) laid emphasis on the conditions essential for a country to take advantage of its backwardness. They are “adequate endowments of usable resources” and the “absence of great blocks to industrialization”. Gerschenkron (1952, 1962) also underscored the importance of manufacturing and industrial sector in the catching up of latecomer country. One of the main features of A. Gerschenkron’s theory comprises of the argument that the latecomer economies of the 19th century didn’t have the means at their disposal to repeat or replicate the path of industrialization that was embarked on by England. Therefore, in a bid to industrialize and to catch-up with England, these economic latecomers were required to shape special institutions. They were also required to encourage mature ideologies so that this process could be legitimized. Otherwise, it would not have been possible to mobilize the essential support and resources to realize the task of catching up (Gerschenkron, 1962). This process, as the theory propounds, was directly related to the country’s degree of backwardness. More on this will be taken up in section 2.3.

The work of Barro and Sala-i-Martin (1991, 1992) proposed two types of convergence – beta ( $\beta$ ) and sigma ( $\sigma$ ) convergence. Convergence in terms of growth rate as well as in terms of income level requires  $\beta$ - convergence. That is, *beta- convergence* considers whether the growth rates of countries exhibit a negative correlation with the initial level of real GDP per capita. Thus, *beta-convergence* implies that countries with low real GDP per capita possess more potential for faster growth rates than countries with high real GDP per capita. On the other hand, *sigma-convergence* measures whether the dispersion of real per capita income is falling over time. Other authors offer “evidence that low income economies tend to grow faster than high-income economies, after controlling for rates of savings and population” (Durlauf 1996), which suggests conditional convergence and largely support neoclassical growth model.

Quah (1995) and Sala-i-Martin (1996) confirm that a “*necessary condition for the existence of sigma- convergence is the existence of beta-convergence*”. The initially poorer countries must

grow at a faster rate than the richer countries for the narrowing of the dispersion of GDP per capita between two countries. So, the existence of beta-convergence drives the existence of sigma-convergence. However, beta-convergence is a necessary but not sufficient condition for the existence of the sigma-convergence. This is because there could be economic shocks that push countries or regions wider apart even though beta-convergence functions in such a way to bridge the income gap. Rodrik (2005) delves into the question as to whether the gap in performance between the developed and developing countries will continue and if there is convergence of the developing countries towards the income level of the developed countries then what is the likelihood of sustained convergence. The author claims that growth in the developing economies should not depend on growth in the advanced economies per se but it should depend on the difference in the productivity levels of the two groups of countries, i.e. on the “convergence gap”. Also, the rate at which lagging economies catch up depends heavily on their ability to assimilate ideas and knowledge from the technological frontier. It has been greatly emphasized in the paper by Rodrik (2005) that a variety of *institutional settings* can have a thrust on the growth process and the process of income convergence and the most fitting institutional settings (like governance, monetary and fiscal policies, openness etc.) will depend on local conditions prevailing in the countries.

### **2.1.2 Empirical Evidences**

There exist various studies that have attempted to empirically test the evidence of income convergence and also the relative significance of the theories pertaining to income convergence as discussed in the above subsections. For instance, amongst the earliest studies, Jonas et al (1970), using the method of index numbers, found that countries behind the technological frontier experience episodes of rapid growth driven by rapid productivity catch-up. Using micro-data, averaged up from household to birth cohort level, Azzoni et al (2000), have ascertained the role of

household human capital, public infrastructure and health and education services on the per capita income convergence of the Brazilian countries<sup>11</sup>.

Using regional time series data on income covering the time period since the early 1970s for all regions of the Scandinavian countries, Bentzen and Smith (2003) tested for  $\beta$ -convergence and found support for the absolute convergence in real incomes among the regions of Scandinavian countries. Thus, there is a general consensus that economies with low-income will be inclined to grow faster as compared to economies with high-income due to various factors as discussed above and thereby economic convergence across economies in the levels of their per capita income will be promoted.

Now we enumerate few literatures pertaining to within country income convergence. For instance, the paper by Rahman and Hossain (2009) examines per capita income convergence across six regions in Bangladesh using annual data for the period 1977-2002 employing ordinary least squares as well as time series approach<sup>12</sup>. The findings of this paper, however, do not provide enough evidence in favour of the convergence hypothesis even though the regions of Bangladesh have almost similar socio-economic background, physical infrastructural arrangements, and access to the same financial system, institutions of administration, and technology. They suggest that strategy of pro-poor growth may propel the per capita income convergence across regions in Bangladesh. In another study, Agarwalla and Pangotra (2011) examine trends in regional disparities in India over a period of 26 years (from 1980 to 2006) and find wide and increasing variations in economic performances of states over time. Results of panel data estimation based on the neo-classical framework on 25 state economies in India are suggestive of convergent trend in regional incomes, which is conditional upon rates of growth of inputs, and rate of technological progress.

Global trends in within- and between- country- inequalities over the last three decades have been studied extensively in various papers (Bourguignon et al., 2002; Madison, 2004; Anand et al, 2008; Milanovic, 2013, 2016) and it has been found that over time between-country inequality has

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<sup>11</sup>The analysis is Azonni et al (2000) involves the construction of cohort/state/year averages of all variables of interest, and regressed income levels and income growth on a variety of human capital, public infrastructure, health and education and services.

<sup>12</sup> Here the time series approach refers to unit root test.

decreased and concurrently within-country inequality has increased. In the recent times, global inequality, which is defined as the sum total of between- and within- country inequality, has seen a humble decline but mostly remains on the higher side (Milanovic, 2013, 2016; Bourguignon, 2015). Milanovic (2013) has shown that the period between the Industrial Revolution and the early part of the twentieth century has generally seen a rise in global inequality. Also, during this period, both between-country inequality and within-country inequality amplified. The rise in global inequality during this period was majorly attributable to rising between-country inequality. During this period, the economies of Western Europe and North America were increasingly pulling apart from the rest of the world owing to the Industrial Revolution which was manifested in the broadening of the gap in the national mean incomes. (Milanovic, 2013, 2016).

Further, Milanovic (2016) noted that global inequality reached its peak around 1980 and has ever since posted a minor decline. Post 1980s, the decline in global inequality was a result of declining trend in the inter-country inequality (Milanovic, 2013, 2016). There has been notable socio-economic progress in the developing countries and as economic growth accelerated in the developing countries, the average growth in per capita income in developing economies surpassed the average growth in per capita of advanced economies. This led to the mean incomes of the developing countries to converge toward the mean incomes of the advanced countries. After 1990, and more so in the 21<sup>st</sup> century, there was further acceleration in the decline in inter-country inequality. This was the result of continuous progress on the front of economic reforms which led to higher growth in a wider group of developing economies; this included the large populous countries like India and China (Milanovic, 2013, 2016; Piketty, 2014). It must be taken on note that in the post-1980 period, while there was a strengthening of economic growth in the developing countries to the extent that many of these developing countries became more board-based and emerged as dynamic market economies, there was a dampening of growth in economic output and productivity in the advanced countries to the extent that growth levels plummeted down from the levels witnessed in the post-war period (Milanovic, 2013, 2016). Alongside, during this period, there was an upsurge in the income inequality within the countries of the advanced economies as a result of decelerating trend in economic and productivity growth together with an intensification in income inequality in the past three decades in almost all the major economies of the world (Lakner and Milanovic, 2013).

Hence, although the income differences between countries have narrowed for the 21<sup>st</sup> century, income inequality within countries has been rising, as have been shown by various literature (Keeley, 2015; Krugman, 2015; Milanovic, 2013, 2016, Piketty, 2014 etc.). The increasing trend of inequality within countries during this period was observed in advanced economies (Panizza, 2002; Milanovic, 2013, 2016; Ali et al., 2016 etc) and also in several major developing countries (Kanbur and Zhang, 2005; Melchior, 2010 etc). In particular, China (Xubei et al., 2008; Han et al., 2016, etc) and India (Das and Barua, 1993,1996; Rao, M.G. et al., 1999; Zhang et al., 2002; Kalirajan et al., 2009; Barua and Chakraborty, 2010; Barua et al., 2015, etc.), saw growing within-country inequality, specifically in the latter part of this period. Atkinson, Piketty and Saez (2011) and Acemoglu and Robinson (2013) for instance, show that the top tail of the income distribution is marked with concentration of wealth, particularly in the US, India, and China.

While for within country convergence, country-specific distributive policies are crucial; for between country convergence global policies matter more. It is of course possible, according to the theory of convergence, that economies do not converge to the same level of per capita income because of obstacles to income convergence, for example structural policies that are unsuccessful in enhancing market efficiency, trade and factor movements across the countries. Thus, a study of cross-country convergence is not complete without studying conditional convergence.

## **2.2 Trade and Income Convergence**

Models under the neoclassical growth theory can yield income convergence in a closed economy and steady state set-up without the need for trade and thus ignore the effect of trade on economic growth and income convergence. Thus, even though theoretical extensions of neoclassical growth theories based on Solow-Swan model have been used to understand across country income convergence, they are not suitable for determining income convergence across open-economies. So, the next question arises in the context of open economy scenario – does trade cause income convergence? If yes, then what is the mechanism? To guide us on this, we have traditional trade theory of Heckscher- Ohlin and Factor Price Equalization Theorem of Paul A. Samuelson. In this

section, we will study the development of theoretical literature pertaining to the link between trade and income convergence.

### **2.2.1 Theoretical Underpinnings**

The traditional trade theory given by Heckscher Ohlin states that a country will export those goods the production of which uses its abundant factors intensively and import those goods the production of which uses its scarce factors intensively. The Heckscher Ohlin model assumes constant returns to scale and identical technologies across countries but countries are endowed with differential factor proportions. The well-known factor price equalization theorem (FPE) based on the standard neo-classical theory of trade demonstrates that free trade among countries tend to equalize factor prices across the countries and that the equalization of factor prices is not conditioned by number of goods and the number of countries which engage in trade. Accordingly, FPE theorem predicts that a move towards free trade in terms of trade liberalization will equalize factor prices between trading countries.

However, the FPE theorem as such has certain discrepancies. Firstly, FPE theorem relates to outcomes in the steady-state free trade equilibrium and fails to explain dynamics relating to trade liberalization (Leamer, 1995). A dynamic equivalent to FPE theorem is factor price convergence (FPC) theorem which was developed in the year 1995 by Edward E. Leamer and which captures the view that freer trade should lead to the convergence of factor prices across countries. In Leamer's words, "when two countries eliminate their mutual trade barriers, product price equalization eliminates factor price differences". Kotlikoff, Leamer and Sachs (1981) embarked on empirical work on FPC in the 1980s and demonstrated that the process of FPC has occurred for some countries. Across the United State of America, West Germany, Japan, and South Korea, manufacturing wages converge over the period 1967-77 and capital-labor ratio converges over the period 1958-75. Using data from European Economic Community (EEC) over the period 1950-75, Tovias (1982) argued that the assumptions that are required for FPC hold reasonably well in the EEC<sup>13</sup>.

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<sup>13</sup> Tovias (1982) proved the validity of FPE for EEC by taking standard deviations and coefficients of variation of manufacturing wages.

Another problem with FPE theorem is that it is highly regimented and holds well under a set of stringent assumptions. Paul Samuelson's (1949) early proof requires the fulfillment of eight assumptions including zero trade barriers, no transportation cost, incomplete specialization in production of goods, identical homogeneous technology that is linear and identical preferences across regions, and all goods are produced in all regions. These assumptions hardly hold in the real world. The same problem is attached to FPC theorem as well. Alan V. Deardorff (1986) showed, with the help of a theoretical model, that a slight change in assumptions can invalidate the FPC theorem. In his example, the close substitutability of some products in demand means economic integration which converges international product prices but diverges international factor prices. Also, Deardorff (2001) showed that countries with different initial endowments may end up with unequal factor prices in different diversification cones.

A basic problem with FPE and FPC is that they take in account only the factor prices. Let's consider following basic equation relating per capita income with factor endowments, viz., labor and capital:

$$\frac{Y}{L} = \frac{w * L + r * K}{L} = w + \frac{r * K}{L} \text{ --- (2.1)}$$

where Y: National income, L: Labor, K: Capital, w: wage, r: rent

From the above equation, it is evident that, per capita income is a function of factor prices as well as factor endowments, i.e., it is summation of wage and per capita share of capital return. Therefore, even if trade is leading to the convergence of factor prices as per the FPE or the FPC theorem, there can still be divergence of per capita incomes if the endowments across the countries are becoming very different over time. Moreover, the concept of income is wider and includes sources of income that are non-tradable and sometimes include natural resources and these cannot be taken into consideration just by observing the factor prices. Hence, factor price equalization need not ensure per capita income convergence (Rassekh and Thompson,1996).

Lastly, FPE and FPC theories describe outcomes only the in steady state with free trade, and says nothing about the dynamic process of trade liberalization.

### 2.2.2 Earlier Approaches Linking Trade and Income Convergence

As far as the link between trade and income convergence is concerned, it has been demonstrated by scholars that international trade is efficacious in increasing the growth rate of output or per capita income. One of the earliest contributions in this regard is by Black (1970) who argues that “in the medium run the growth rate of production may be temporarily increased via the increase in accumulation made possible by the increased real incomes resulting from the gains from trade”. However, Black (1970) is of the view that there is no the long-term increase growth rate (which he refers to as natural growth rate) due to trade because “trade must eventually become negligible relative to its output; so, for it the gains from trade ultimately vanish... in the long run growth rate is the same as that which it would have achieved in isolation”. Nonetheless, he does recognize that trade can engender a “take-off” if it is impactful in stimulating technological progress or rates of savings. This projects the country on the trajectory of high growth rate. Black (1970) also maintains that trade can stimulate growth through the import of intermediate goods and services.

In a more refined analysis, Corden (1971) marries the traditional theory of gains from trade with the growth models of Solow (1956) and Swan (1956) and argues that trade gives rise to both static gains and intensifies capital accumulation, leading to a higher growth rate of per capita output. Corden (1971) notes, “any trade policy that raises real income creates a static gain and, for any given propensity to save, also raises the rate of growth”. The inference drawn from his analysis is that a country that shifts from autarky to free trade achieves a higher steady-state income and consequently grows at a faster rate during the transition period. Johnson (1971) inspects the linkage between trade openness and growth from a perspective completely different from that of Corden (1971). Grounded in the Heckscher-Ohlin model, the author analyzes the impact of accumulation of factor and that of technological progress on the process of economic growth. The factor-accumulation gives rise to the typical Rybczynski result, i.e., “at constant prices, the output of a good rises if the supply of the factor used intensively in its production increases and the output of the other good decreases”. The effects of accumulation of factor on the growth rate of output are hinged on whether the good that is exported is capital intensive or it is labour intensive and on whether the supply of factors, viz., capital or labour rises. Next, the effect of technological progress on economic growth is hinged on whether the technological progress is capital-saving, labour-saving or neutral. Once more we see a Rybczynski result that comes to the picture- “at constant



prices, the output of the industry that is enjoying neutral technical progress increases while the output of the other industry shrinks”.

Srinivasan (1999) illustrates that in the Harrod-Domar model “in which constant returns to scale prevails, trade liberalization has a long-run growth effect because the marginal product of capital is either constant or it remains above a positive lower bound”. Also, in the paradigm Feldman-Mahalanobis model<sup>14</sup>, Srinivasan (1999) explores the role of trade and shows that “if the capital-goods sector is opened to free trade . . . while the consumer goods sector is kept closed, there will be a positive long-run growth effect and a welfare effect relative to autarky” (Srinivasan, 1999). In addition, if trade is assimilated into the neoclassical framework of the Ramsey-Cass-Koopmans model<sup>15</sup>, Srinivasan (1999) illustrates that we “obtain a positive log-run growth effect of trade liberalization” subject to “a production function in which the marginal product of capital is bounded below by a sufficiently high positive value as capital-labour ratio goes to infinity” (Srinivasan, 1999)<sup>16</sup>.

### **2.2.3 Modern Approaches Linking Trade and Income Convergence**

Modern approaches linking trade and income convergence emphasize the welfare benefits of trade in terms of efficient allocation of resources according to comparative advantage (Ventura 1997; Ghose 2004; Dawson 2007; Velde, 2011), scale efficiency and greater capacity utilization, greater access to expanded markets and competent management in response to competition, factor mobility leading to higher returns to factors (Ben-David, 1996; Ben-David and Rahaman, 1996; Sachs and Warner, 1995), diffusion of technology and knowledge (Balassa 1978; Krueger 1980, Feder 1982; Baumol, 1986; Grossman and Helpman, 1991; Young, 1991; Edwards 1992). Modern

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<sup>14</sup> In simple terms, the model suggests that in order to reach a high standard in consumption, investment in building a capacity in the production of capital goods is firstly needed. A high enough capacity in the capital goods sector in the long-run expands the capacity in the production of consumer goods.

<sup>15</sup> The Ramsey–Cass–Koopmans model differs from the Solow–Swan model in that the choice of consumption is explicitly micro-founded at a point in time and so endogenizes the savings rate. As a result, unlike in the Solow–Swan model, the saving rate may not be constant along the transition to the long run steady state. The outcome of this model is Pareto optimal.

<sup>16</sup> Henrekson et al. (1997) find that European integration led to much more than goods trade and factor mobility

literature concerning trade and convergence can be bifurcated into two branches – one, the impact of trade on growth in per capita income and two, the impact of trade on factor-price ratio.

The earliest seminal works pertaining to the link between trade and income convergence, for example Balassa (1978), Krueger (1980), Feder (1982), etc., emphasized the role for exports in economic growth and income convergence. These studies explained the benefits of exports and international trade in terms of greater capacity utilization, resource allocation according to comparative advantage, exploitation of technological improvements, economies of scale and competent management in response to competitive pressures abroad, and so on. To the extent that technology and knowledge flow from advanced countries to less-advanced countries, trade raises the factor prices in less-advanced countries so as to match with the factor prices in advanced countries (Baumol, 1986). Moreover, considerable differences between the productivities of export-oriented and non-export-oriented industries ensure that countries which have adopted export-oriented policies benefit from higher growth<sup>17</sup>.

In his seminal work, Rivera-Batiz and Romer (1991) have developed an endogenous growth model to study the impact of trade in goods, in ideas, or in both on the growth rates of the economies and their integration. The authors demonstrate that when the economy of a nation integrates fully with the economy of the world, it reaps benefit arising from increasing returns to scale and the enlargement of the global market, paving way for a permanent increase in the growth rate of the economy (Rivera-Batiz and Romer, 1991)<sup>18</sup>. Consequently, national income convergences with world average income. Grossman and Helpman (1991) developed the product cycle model wherein the North (richer countries) enters into trade with the South (poorer countries)<sup>19</sup>. In this model, trade contributed to faster economic growth in both the regions (Grossman and Helpman, 1991) as trade freed up resources in the richer countries that could be profitably employed in research and development, and the poorer countries could import the

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<sup>17</sup> Edwards (1993) gave empirical analysis to support this view.

<sup>18</sup> In another endogenous growth model, Romer (1990) argues that since the stock of human capital is key to economic growth and more of this resource can be acquired through trade, 'free international trade can act to speed up growth.' (Romer, 1990).

<sup>19</sup> In literature, the term is borrowed from North-South model of developmental economics formulated by Robert Findlay to explain the growth of a less developed "South" or "periphery" economy that interacts through trade with a more developed "North" or "core" economy.

technologies of the richer countries, which would require lesser resources to operate than if they were to be reinvented. Along the same lines, Young (1991) supported the idea that trade generates income convergence in his static trade model.

Dan Ben-David (1996) examined the link between international trade and income convergence among countries by focusing on country groups consisting of major trade-partners and found that majority of these countries significantly exhibited convergence. Further, the author carried out a comparison of convergence process across countries in the trade-based groups with that of across countries that are not necessarily grouped according to trade between them and concluded that the former group of countries are more likely to exhibit income convergence than the latter group of countries. Ben David (1996), by concentrating more on the role of increased trade flows, posits that the probability of occurrence of convergence is much higher for those groups of countries that trade with each other than for those groups of countries that are formed on the basis of non-commercial criteria. In addition to this, Ben David and Rahman (1996) appraised two mechanisms that promote the absolute convergence between countries. The first one is founded on the convergence of capital intensity ratios and the second one is founded on the convergence of technological levels. Based on this, the authors found that countries that are grouped according to a “reciprocal exchange” are distinct from others in terms of convergence of total factor productivity, but not in terms of convergence of their capital ratios. However, this result of Ben David has been contested by Slaughter (1997).

The hypothesis that trade openness can lead to income convergence between rich and poor economies and relatively better economic growth by poor countries, is widely tested (Ventura 1997, Ghose 2004, Dawson 2007). According to Ventura (1997), there are various conduits through which trade can cause income growth. Firstly, trade leads to efficient allocation of resources; and scale efficiency due to greater access to expanded markets (Ventura 1997) which in turn promotes higher income and higher rate of domestic savings. Also, trade induces capital inflow and thus causes higher real return to capital in countries abundant unskilled labour that exploit their comparative advantage (Barua and Chakraborty, 2010). It is believed that openness brings about increased factor mobility and encourages diffusion of new products and technology and structural and organizational improvements which in turn leads to per capita income convergence among the countries with low-income countries catching up with the high-income

countries. Velde (2011) empirically examined whether and how regional integration leads to income growth and convergence amongst developing countries. Employing standard growth models for nearly hundred developing countries over the period 1970-2004, the author finds that trade and foreign direct investment (FDI) stimulate growth, and since regional integration tends to increase trade as well as FDI, regional integration has a positive impact on economic growth in its members via the effects of increased trade and investment on growth.

Modern endogenous growth models also emphasize the spill over of ideas and technological knowledge, in addition to trade, as a crucial instrument boosting growth in income and income convergence. The transmission of “scientific knowledge” into low-income economies may ensue when they attract foreign direct investment (FDI) which brings with it the “skills of investors”, or it may ensue through trade (Krugman, 1996) by way which economies could acquire knowledge and skill by exporting, interacting with foreign clientele about meeting higher standards of products, or through technology embodied in imports. For instance, Barro and Sala-i-Martin (1997) developed an endogenous growth model in which the long-term growth happens with discoveries of new technology. In his model, “follower economies” catch up to “leader economies” by imitating technology. With the diminishing of the pool of “un-copied ideas”, the cost of copying technology rises and accordingly, the growth rate of “follower economies” decline. Furthermore, migration of labour from low-wage economies to high-wage economies may result in higher economic growth and income convergence. Migration will be the root of labour becoming scarce resource in low-income economies and becoming abundant resource in high-income economies. This will have an impact in the reduction wage differentials between economies.

Another channel through which trade can cause per capita income convergence is through trade in capital goods. Trade in capital goods influences per capita income of a country through its endowment of capital. Income convergence across countries might be triggered by the importing a huge chunks of capital goods by the capital poor countries from capital rich countries such that the capital-labor ratios across the countries converge. Razin and Yuen (1995) have developed a theoretical model to show that capital mobility is influential in engendering complete equalization of growth rates across countries and labour mobility is influential in bringing about equalization income levels across regions in the existence of knowledge spillovers. This theory is further

supported by them with empirical evidences<sup>20</sup>. Likewise, Ben-David and Loewy (1998) have built a theoretical model wherein the outcome of trade liberalization is manifested in the knowledge and skill diffusion. This then fuels economic growth. In this model, countries with low income experience higher rates of growth as they are the principal entities benefitting from spillover of knowledge resulting from trade. Moreover, the knowledge spillovers help in projecting the steady-state income of the low-income countries in the direction of that of the high-income countries. This results in convergence of per capita incomes<sup>21</sup> between these countries.

Another stream of literature concentrates on political aspects and institutional set up of a country as chief driving factors of growth (e.g. North, 1990 and Acemoglu et al., 2001). The hypothesis presented in these literatures is that the institutions governing property rights and the “rule of law” determine the prosperity of the economy. In fact, Sachs and Warner (1995) indicate that there is direct positive relationship between changes in policies pertaining to trade and per-capita convergence. In their study, Sachs and Warner (1995) created an index capturing trade openness for 122 countries using variables – average tariff rate, non-tariff barrier on imports, socialist economy, state of monopoly of major exports and black-market premium exceeding 20 per cent. During 1970, 89 countries that pass openness test, i.e., are negative on the five variables display income convergence among them. Trade and investment reforms like the removal of quotas and tariffs tend to induce the resources within a region to be reallocated from a rich nation to a poor nation. The catch-up due to the involvement in newly emerging manufacturing sectors occurs owing to comparative advantage and converging capital-labor ratio across countries in the region.

To test the hypothesis that trade related policies and institutions do matter in convergence, Rodrik et al. (2002), Easterly et al (2003) and Dollar and Kraay (2003) make an attempt to dismember the impact of trade, institutions and geography on growth of the economy. The major

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<sup>20</sup> The empirical work by Razin and Yuen (1995) consists of panel regression analysis of 138 countries over a time period of 1950-1988. They split the sample of 138 countries into four groups – countries displaying high, middle-high, middle-low, and low capital mobility. The capital mobility indicator they use is external-debt indicator and concessional debt indicator. Their result strongly supports the fact that total income growth rate converges under capital mobility.

<sup>21</sup> Also, see the theoretical model developed by Mountford (1998).

finding of Dollar and Kraay (2003) was that in the long-run both trade as well as institutions have weighty roles to play in encouraging growth, but to disentangle the partial causal effects of each factor separately is difficult. However, in the short-run, the authors find that trade do play a larger role than institutions in the growth process. In contrast, Rodrik et al. (2002) and Easterly et al. (2003), find that institutions play a larger role. Additionally, according to the findings of the authors, government policies (including trade policy), trade openness and economic growth and income convergence fail to explain cross-country differences in GDP per capita once one controls for the impact of endowments on institutions (Easterly and Levine, 2003). Curiously, both the studies give us the same finding that institutional variables are the chief determinants of economic growth and progress.

Sachs (2003) contends that the model-specifications as employed by Rodrik et al. (2002) and Easterly et al. (2003) are unsophisticated and overlooks important aspects. More importantly, the model disregards the element that growth is fundamentally a dynamic process as the model doesn't control for the initial level of income. Also, Sachs (2003) shows that geography influences the process of economic growth independently of institutions. Taking the results of these studies a step further, Gwartney et al. (2003) hypothesized that income and growth rates of income are influenced mainly by three factors; they are - geography, quality of institutional set up, and inputs that include physical capital and human capital per capita.

Recently, Liu (2007) found causality runs from trade in homogenous sectors to convergence of income; this can be taken as the strong evidence of "trade-induced income convergence". Priddy et al. (2009) analyzed and explained the real convergence process in Middle East and North African (MENA) countries over the past 50 years and found that trade mattered in the process of real convergence. Similarly, Jaumotte et al. (2009) also found that globalization is connected with a reduction in income inequality for a panel of 51 countries over a period from 1981-2003. Through panel-data regressions, Choi (2009) found that both per capita income level and growth turn out to converge when the bilateral trade intensity ratio increases between the countries.

At this point it will be contextual to also review the impact of trade on within country income convergence notably for period post-1990s, which is marked by globalization and opening up of trade between countries. According to the theory of comparative advantage, liberalization of

trade is anticipated to advance economic efficiency and raise the aggregate welfare in all the countries involved in trade. Yet another implication of conventional trade theory is that free trade alters the patterns of demand and that of wages for unskilled and skilled workers which may increase within country income inequality. Within countries, especially in the US, and developing countries like India and China, recent studies suggest that opening up to trade has led to worsening of wage inequality between the high-skilled and low-skilled workers by being factor waning the relative demand for unskilled workers (Borjas, Freeman, and Katz, 1992; Bernard and Jensen, 1995; Krugman, 1995; Wood, 1996; Cline, 1997, 2001; Kumar, 2000; Marjit et al., 2007; Agarwal et al., 2008; Mishra et al., 2008; Krishna et al., 2011; Barua et al., 2010, 2015; Yinglan et al., 2014; Chan et al., 2014; Zakaria et al., 2016; Furusawa et al., 2016; Cerdeiro et al., 2017). In addition, *New Trade Theory* suggests that within countries, regional comparative advantage (including external economies of scale) arises from “agglomeration economies” that supports certain regions in acquiring and maintaining cost advantages over other regions (Krugman, 1991). Nonetheless, the overall benefits of globalisation and free trade cannot be denied. For example, the higher growth rates of developing countries of Asia and the emergence of a new middle class in these countries have been attributed to benefits of globalization and opening up of trade (Stiglitz, 1996; World Bank Policy Report, 1993). A very recent survey-based study by Urata et al. (2017) revealed that an increase in trade openness by developing countries have contributed to narrowing of development gap vis-à-vis developed countries, while its impact on income gap between developing countries is not as clear. The results of another study based in developing country, by Siwach (2016) do not find evidence of any significant change in rates of convergence for the developing countries pre- and post-liberalization.

One of the studies that reconsider the influence of international trade particularly on income distribution rather than simply on income growth is by Bensidoun et al. (2005). Bensidoun et al. (2005) developed a model and showed that the influence of changes in trade (as a result of either liberalization of trade or other determinants) on distribution of income is captured by the changes in factor content of net export. Their main empirical finding is that the changes in factor content of net export, expressed relatively to the factor endowments of the country, has a significant effect on the distribution of income (measured in terms of Gini Coefficient), but the direction of this impact is conditioned on country's level of income or on the share of non-educated population

over the age of 15. Specifically, their estimates advocate that a rise in the factor content of net export (expressed either in terms of labour, or labour minus capital) leads to a rise in income inequality in poor countries (with a threshold GDP per capita measured in PPP below USD 5,000, approximately), while it leads to narrowing the inequality in relatively richer countries (with GDP per capita above the threshold). Matthias and Jens (2012) prove that the expansion of trade and the access to additional technologies associated with it has a substantial impact on income growth. In addition, they show that the two channels - trade and the expansion of trade - have independent influence on growth in per capita GDP. The same results are obtained by the authors separately for both exports and imports.

Nevertheless, these results were contested; the results and discussions of such studies are enunciated in the following paragraph. While there have been evidences of income convergence among group of trading nations in many researches as reviewed above, another stream of literature takes an opposite view and argues that trade-exchanges do not always benefit countries and are likely to cause huge disparities and fuel income divergence among the countries. A number of economists endorse the divergence theory. These economists have reason to vouch for the existence of a growing inequality between countries which arises from their empirical research on the subject. For example, Bernard and Jones (1996) have found that as economies open up to trade, incomes across countries diverge. So, the authors claimed that the theory of comparative advantage gives preeminence to the diversification of the goods that are exchanged in trade, thus, in principle, neither it is valid to expect that the production technology is similar nor the convergence of factor prices over time.

Besides, Rodriguez and Rodrick (1999) do not support the results as presented by Ben David (1993). The authors show that since Ben David (1999) excluded Germany from the sample of European countries, it has led him to conclude that most liberalization incidents since the 19<sup>th</sup> century are not correspondent with the periods of divergence or convergence between countries. In fact, these authors contest the relationship between trade openness and income convergence as presumed by Ben David for the countries of the European Free Trade Association. Additionally, Rodriguez and Rodrick (1999) gave the example of countries of the Latin America that have experienced an income convergence during the period of import substitution, followed by an income divergence from the late eighties, a period when these countries had chosen economic



liberalization and thus, they have their reservations on whether there is defined relationship between liberalization of trade and income convergence.

Slaughter (1997, 2001) challenged the results of Ben David (1996) and found that hypothesis that trade doesn't lead to income convergence holds truer. The author compared four multilateral trade liberalizations scenarios<sup>22</sup> from the pre- and post-1945. They find that trade liberalization didn't trigger convergence among randomly chosen countries in any of the four cases. Baliamoune-Lutz (2001), applying fixed-effect and adjusted fixed-effect analysis on panel data, established that greater openness failed to facilitate convergence to higher income levels, thus supporting the findings of Slaughter (2001). In this context, Pritchett (1997) proposed that the modern economy can be categorized by a difference of productivity levels and therefore, income levels between developed and developing nations. The author further argued that substantiation of the stark disparity between developed and developing countries suffered due to paucity of data for the least developed countries. The results presented by Slaughter and Baliamoune-Lutz strongly validate those of Canova and Dellas (1993) and Frankel and Rose (1998) which show that trade openness widens rather than reducing the income disparity between countries.

These findings were followed by that of Hallett and Piscitelli (2002) who identified the situations under which the onset of income convergence can be observed and presented that small economies that are not very well integrated tend to converge but countries that are more stable and are in cohesion with the global economy tend to diverge. In the same vein, Park (2003) found that during most of the years between the period 1960 and 2000, divergence grew between the countries in Asia and only in the last period they saw income convergence. In another study, Brunner (2003) found that the parameter estimates of panel data indicate that a one percent point increase in trade results in one percent change in average income, but the estimated effect of trade on income growth is quite small and is not robust. Studies by Hein and Trug (2005) and Welsch and Bonn (2006) state that the dispersion in per capita income increased between 1980 and 1995 and reduced thereafter for the countries of European Union. Another study by Pedroni and Yao (2006) demonstrated that economic openness had the long-term effect in terms of divergence of

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<sup>22</sup> The four episodes refer to – “the European Economic Community (EEC) Liberalization, the European Free Trade Association (EFTA) Liberalization, the EEC-EFTA Liberalization and the Kennedy Round Liberalization”.

economies in China. In other words, there occurred regional income divergence in China at the same time as the country opened up to international trade and business.

The divergence phenomenon observed could be due to the fact that some of the trade policies are not growth-friendly enough or that the region imports more than it exports, or it may be that their export basket is comprised majorly of primary and non-competitive goods. In fact, Nissanke and Thorbecke (2005) argued that the trade openness is a necessary but not a sufficient condition for efficacious development in a world where evolution is more and more interdependent. They reason that greater trade openness is also linked with greater economic shocks and volatility, which largely have negative impact on the vulnerable and poor households and this deepens income inequality and poverty. This is exactly what happened during the Asian financial crisis. Although there is a question mark as to what is the bearing of trade openness on income growth and income distribution, it is likewise important to understand the factors which determine the extent of impact of trade openness. Whether the influence of trade is positive or negative depends significantly on the growth patterns followed by the countries, developmental policies undertaken by countries and global economic policy.

Vamvakidis (2002) explored the link between international trade and growth during the period 1870-1990. The author carried out his research by dividing the period of study into four sub-periods, i.e., 1870-1910, 1920-1940, 1950-1970, and 1970-1990, and found that while no relationship exists between openness to trade and growth between 1870 and 1910 and between 1950 and 1970, negative relationship exists during the period 1920-1940 and there exists a positive relationship for the period 1970-1990 only. Taking a considerably large sample of countries, another study by Irwin and Tervio (2002) confirmed that trade positively affects income for the period from 1913 to 1990. In a nutshell, while Vamvakidis (2002) estimated the effects of trade openness on growth and found little evidence of impact of trade Irwin and Tervio (2002) estimated the effects of trade-volume on the level income and found substantial evidence of the impact of trade.

As per the endogenous growth models, the contribution of trade openness to growth in income differs contingent on the direction in which the comparative advantage is pushing the resources of the economy. If the resources are being directed towards the economic activities that enhance growth in the long-run, trade will have positive impact on growth; if the resources are

being diverted away from such activities, the impact of trade on growth will be negative (Rodriguez and Rodrik 2000). In addition, it is suggested by theories that owing to financial constraints and/or technological constraints, less developed economies may not have the required social and economic competence to fruitfully implement technologies transferred from the advanced economies with trade. This suggests that the empirical studies of growth and convergence phenomena should account for temporal non-linearities and country-specific elements. On the empirical front, Kim (2011) revisited this subject matter and explored whether the effects of international trade will differ with differing levels of economic development. To do this he used the Levine et al.'s (2000) dataset and the instrumental variable threshold regressions approach of Caner and Hansen (2004). He found the evidence that trade had differential effects on the long-run economic performance. While trade openness seems to have strongly beneficial impact on growth and the standard of living of developed countries, it had significantly negative effects on the growth of real income in the less developed countries. Empirical investigation carried out by Ulasan (2012) for the period 1960-2000 finds that openness is positively and significantly correlated with long-run economic growth. However, openness-growth association is fragile and the significance of openness variables disappears once other growth determinants, such as institutions, population heterogeneity, geography and macroeconomic stability are accounted for. Ulasan (2012) reinforces the findings of Levine and Renelt (1992) who demonstrated that there is high correlation among the policies encouraging growth (such as trade, trade-enhancing policies, fiscal policy, monetary policy, macroeconomic stability and quality legal framework) but it is not so easy to establish the direction of causality. It could be so that the countries with higher income are found to be more open to trade, as high-income countries may be better posited to afford infrastructure that is trade-enhancing, to afford resources to tide over the search costs of information accompanying trade, and to demand goods that are highly traded. Amidst these conflicting theoretical findings, in the study on the impact of trade, institutional set up is being recognized as a predominant determining factor of economic growth and development while trade simply the enabler. The studies by Rodrik et al. (2002), Dollar and Kraay (2003), Winters (2004), Aghion et al. (2005), Borrmann et al. (2006), and Freund et al. (2008) are few examples. Put more precisely, the positive effects of trade on growth happens in the long-run only when trade is accompanied with suitable institutional set-ups and policy frameworks that boost investment, promote accumulation of human capital and resolve socio-economic conflict. Hence, countries

with institutional development below a threshold level, having weak financial system and poorly developed or distortionary government policy may not be able to reap the benefits of trade openness.

While analyzing the impact of trade on growth in income, distinction between developed and developing countries is important because the level of economic development has been found to be the determinant of the effect of trade on growth. For instance, while trade openness enables the diffusion of technological innovations, the adoption of such technology rests on the “absorptive capacity” of a country, which in turn is largely determined by human capital (Abramovitz 1986; Cohen and Levinthal 1989; Acemoglu and Ziliboti 2001; Benhabib and Spiegel 2005) and R&D (Verspagen 1991; Fagerberg 1994). Impoverishment in terms of investment in human capital or research and development thwarts the process of taking full advantage of international technology transfers for the less-developed countries, and therefore encumbers growth in productivity. Besides, Harrison (1996), Dowrick and Golley (2004) and Rassekh (2007) offer empirical proof that the effects of trade in terms of the level of real development varies.

Another stream of recent empirical studies like Frankel and Romer (1999) and Hall and Jones (1999), trailed by Irwin and Tervio (2002), Alcalá and Ciccone (2004), and Rodrik, Subramanian and Trebbi (2004), have increasingly emphasized that trade is intricately linked with the level of real per capita income. Hall and Jones (1999) claimed that the levels of income encapsulate the variances in long-run economic developments that are pertinent to economic welfare which is expressed in terms of the consumption patterns.

While, we have enumerated studies where trade openness has been regarded as a key determining factor of economic growth, the deliberation on the exact linkage between trade openness and growth is quite far away from being incontestable. Neither theoretical nor the empirical studies on the linkage between trade and economic growth are conclusive (See, Edwards, 1993 and Lopez, 2005). While in various theoretical studies on economic growth and development, it is often suggested by that trade could contribute to economic growth in the long-run, there are other studies that argue that trade openness may impede growth. In case trade openness leads an economy to specialize in sectors having comparative disadvantage in R&D, then even if there are improvements in R&D efficiency in world resources it may not speed up the rate of steady-state growth (Grossman and Helpman 1990, 1991). Similarly, international trade

openness may in fact diminish growth rate in the long-run if an economy specializes in sectors that do not have potential comparative advantage in productivity growth (Redding, 1999) or that have comparative advantage in sectors where there is exhaustion in technical innovations or learning-by-doing (Lucas 1988; Young 1991). For these countries, selective protections are necessary to ensure faster advances technology.

Having done intensive review of literature, we reiterate that the existing literature suffer from two major drawbacks. One, both theoretical as well as empirical studies give us no certainty on whether trade causes income convergence. For convergence to happen, the lower income country should grow at higher rate. This forms the core of Relative Backwardness Hypothesis which we will review in the next section. Secondly, the outcomes described in the literature surveyed are in steady state with free trade and throw no light on process of trade liberalization per se. Most studies are based on the concepts of beta and sigma convergence- not suitable for capture underlying structural change an economy witnesses with trade. The process of convergence, which is linked with development of lower income countries vis-à-vis higher income countries, is essentially associated with large scale structural transformation as economies shift from being primarily agrarian to becoming increasingly non-agrarian. Thus, income convergence across countries will certainly be linked with convergence of economic structure across countries and with trade openness the economy undergoes structural transformation. This important aspect is missing in the previous studies on trade and income convergence. In the section 2.4 we will try to understand the link between structural transformation and income convergence and how trade plays a role in accelerating changes in economic structural composition by review literature linking trade and income transformation.

### **2.3 Conceptualizing the Link between Relative Backwardness and Catch-up**

The core concept related to the convergence discussion is the concept of “catching-up”. There are many evidences of (initially) backward countries that, at different times, have managed to narrow the gap in income between themselves and the frontier countries, that is, by “catching up”. Even though the concepts, convergence and catching up, are used interchangeably and partially overlap in convergence discussions, these two concepts should be distinctively treated. Whilst “Catching-

up” is a country’s ability to narrow the gap in its income vis-à-vis the income of a leader country, “convergence” refers to a trend towards an overall reduction in income differences in the world as whole (Amable, 2006). If all the countries below the frontier are able to catch up the “frontier” country or countries, convergence of course will necessarily follow. But the result of process of convergence is ambiguous if only few countries are able to catch up while others fall behind (Abramovitz, 1986). Empirical studies usually study convergence in confined groups of countries (like in our case, we will study convergence in the EU and the ASEAN countries), -or “convergence clubs”- in specific periods of time. We will explore more on the convergence phenomenon in the EU and the ASEAN in the subsequent chapters. Here we delve into the concept of catch-up. Arguably, to explain differences in the conditions for catch-up through time it is not enough to rely only on general mechanisms, a historical perspective is required.

How did the backward countries managed to narrow the gap in income between themselves and the frontier countries? The answer to this question can be found in the essay “*Economic Backwardness in Historical Perspective*” by Alexander Gerschenkron (1952). He developed the “theory of relative backwardness” based on on the historical data of the European countries. The principle doctrine of Gerschenkron’s theory is the following: “the opportunities inherent in industrialization may be said to vary directly with backwardness of the country”. Further, Gerschenkron (1952) laid emphasis on the conditions essential for a country to take advantage of its backwardness. They are “adequate endowments of usable resources” and the “absence of great blocks to industrialization”. Thus, it is inevitable that the backward countries, provided that the conditions of adequate resources and absence of obstruction to development are met, grew at faster rate than the developed countries, thus gradually bridging the income-gap between them and the developed countries.

A. Gerschenkron accorded that the early industrialized countries and the latecomer countries developed in ways distinct to each other. In the nineteenth century, it was observed that the countries-Germany, Russia, Japan and Italy- billed as the latecomer countries, witnessed rapid spurts in the growth rates of their economic development to such an extent that they outdid the growth rates of the countries that had industrialized ahead of them. Alexander Gerschenkron sought to explain this typical phenomenon of the nineteenth century which led him to develop the “theory of relative backwardness” to elucidate why the countries that had languished earlier, all of

a sudden witnessed such phenomenal growth (A. Gerschenkron 1962, 1963, 1965). With the spread of modern economic growth from England to France, to Germany, to the United States, and to elsewhere, countries that lurched behind in the participation the in modern economic growth process but had development potential were rendered relatively backward. The countries that were the first beneficiaries of modern economic growth could reap the benefit due to prevalence of favourable preconditions (Rostow 1965). For example, England was the first to experience modern economic growth because it had built up a “constitutional democracy, social infrastructure, an entrepreneurial middle class, and a track record of domestic capital formation”. Relatively backward countries, as the definition would have it, were backward because they were deficient in preconditions needed for modern growth. A. Gerchenkron explained that countries trapped in a state of relative backwardness faced pressure to bridge the economic gap between themselves and their richer counterparts. This economic slippage in latecomer countries made them more competitive vis-à-vis their advanced counterparts. Since preconditions cannot be built instantaneously, A. Gerschenkron claimed that relatively backward countries can substitute for missing preconditions creating conditions for rapid growth. If there is no middle class to supply entrepreneurs, foreign entrepreneurs can be used. For example, the absence of skilled labour force can be substituted by capital-intensive machinery, deficient domestic capital formation can be substituted by state capital formation or foreign saving (Gerchenkron 1968, 1970).

The main feature of Alexander Gerschenkron’s theory comprises of the precept that economic latecomers of the nineteenth century could not bring themselves to repeat the industrialization path taken by England. To attain industrialization and to catch-up with economic performance of England, these countries had to build special institutions. In addition, to legitimize this process of industrialization they were also required to advance ideologies, Else, it would not have been possible to organize the necessary resources and support system to accomplish the catch-up (A. Gerschenkron, 1962). This process, as the theory propounds, was directly linked to degree of country’s backwardness.

In simpler terms, countries that experience industrialization much later undergo tension due to their relative economic backwardness. Relative backwardness causes strain and tension within the society in forms of – absence or lack of entrepreneurial class, illiterate population, and limited capacity of domestic saving and investment and so on. The realization of being caught

relative backwardness state, however, pushes the economies to actively participate in the process of industrialization by undertaking rapid innovations so that missing preconditions are overcome. In this way, industrialization can take place in a speedy stride without the necessity of first establishing preconditions which is rather time-consuming process. The higher the degree of relative backwardness, the greater will be the number of missing preconditions; the countries must become more resourceful in finding innovative substitutions for missing preconditions to growth. Within this process, Gerschenkron underscored that the financing mechanisms are very important. For example, in Germany, the banks performed the role of financing, while in a more backward country, Russia, the state had to intervene in financing. Though the works of Gerschenkron (1952, 1962) are concerned with a specific period of history, they throw light on vital aspects of the process of catching-up.

Findlay (1978) tried to prove the validity of Gerschenkron's model theoretically. He set up the hypothesis that the rate of technological progress in a relatively backward region is an increasing function of the difference between its own level of technology and the technology level prevailing in the advanced region. Also, the improvement in technology happens at a constant rate. In addition, the rate of technological progress is also dependent on the degree to which the backward region receptive to foreign direct investment which is measured by the proportion of foreign capital operating in the region to domestic capital in that region. Constructing a simple dynamic model that captures the way in which the transfer of technology takes place, the author also includes the role of foreign direct investment and determines the process of the relative growth rates of foreign and domestic capital.

There have been a number of empirical studies based on testing A. Gerschenkron's hypothesis in various situations. A. Gerschenkron himself has demonstrated the existence of a discontinuous spurt in industrial growth in Russia during the 1880s<sup>23</sup>-a result which was subsequently supported by other researchers<sup>24</sup>. Using a small sample of European countries-

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<sup>23</sup>A. Gerschenkron, "The Rate of Growth in Russia since 1885".

<sup>24</sup>Raymond Goldsmith, "The Rate of Growth in Tsarist Russia, 1860-1913," *Economic Development and Cultural Change*, vol. 9 (April 1960).



Germany, Russia, Italy, and Bulgaria, Gerschenkron has also established that the industrial spurt has been more rapid in relatively more backward countries so surveyed.

Jonas et al (1970) re-examined Gerschenkron's empirical evidence using the method of index numbers and concluded that countries placed below the technological frontier witness incidents of rapid growth driven by rapid catch-up in productivity. Knack (1996) empirically established, for middle-income poor countries, that “a bit of backwardness may contribute to a high growth rate, but beyond some point it seems clearly to become pure handicap”. However, the empirical study by Pritchett (1977) employing panel regression model found prevalence of absolute divergence for less developed countries implying that while there may be a potential advantage to backwardness, the evidences that backward countries, especially the most backward of countries, actually gaining significantly on the leading countries are historical rarity. Poor countries clearly nurture potential forces for rapid growth, such as those experienced by some countries in East Asia. But there also exists robust forces for stagnation owing to disintegrated civil society, a factor often ignored by earlier studies. He concluded that backwardness carries severe disadvantage, thus questioning the absoluteness of Gerschenkorn’s theory.

Hjerppe et al. (2007) embarked on examining the rationality behind Gerschenkorn (1952, 1962) emphasis on the importance of manufacturing and industrial sector in the catching up latecomer countries with advanced countries. More precisely, he attempted to find whether the late industrialization and the growth in the secondary production could explain convergence in Finland post-World War II. He arrived at result that the difference in per capita GDP between Finland and Sweden remained almost constant during 1945 to 1965 and the impacts for catching up of Finland were derived from the advantages of production in both the secondary and the tertiary sectors during the period 1965 to 2003. The rapid growth in secondary production partially explains convergence of Finland towards Sweden, but it is the growth in tertiary production that had a crucial effect on faster growth in GDP and productivity of aggregate labour in Finland between 1965 and 1980 and a cumulative positive effect of secondary and tertiary production had the strongest impact between 1980 and 2003.

The works of Alexander Gerschenkron’s offer an interesting area of research on comparative studies for two characteristically different groups of counties. According to Gerschenkron, the characteristics of the institutions and ideologies that are responsible for the

process of catch up will be different for different countries depending on their degrees of relative backwardness. Nevertheless, to the best of our knowledge, till now there is no literature which has delved into this field of research. This study will try to bridge this gap in literature as far as possible.

## **2.4 Trade, Structural Transformation and Income Convergence: Review of Literature**

Analysis of the process of structural transformation of economies has an important tradition in economic theory. The cornerstone of the analyses of sectoral transformation of an economy were laid by Fisher (1939) and Clark (1940), who, through their works, explained shifts in the composition of the labour force across the sectors of the economy. They were possibly the first to study and explain the process of reallocation of the factors of production associated with economic growth and adopt a tripartite sectoral division of the economy in primary, secondary and tertiary sectors. They used the measures of economic structure that are most traditional, i.e., sectoral shares of the labour force. Kuznets (1966, 1971) examined these three sectoral shares of GDP in greater detail and demonstrated empirically that growth is resultant of the changes in sectoral composition which is due to the changes in factors determining demand and supply side.

It was argued by Fisher (1939) and Clark (1940) that agricultural goods are characterized by low income elasticity of demand, therefore, as the levels of income rise, the demand for agricultural products relatively declines. In sharp contrast, income elasticity for industrial sector is high and it is still higher for services. Accordingly, with the rise in income, the demand for industrial goods increases and, after reaching sufficiently high levels of income, demands for services increases sharply. As a result, the share of different sectors in the national product or the national income is determined fundamentally by the changes in the patterns of demand. On the supply side, since the production in agricultural sector is primarily dependent on land which is a fixed factor of production, there is a limit to growth in agricultural sector due to the operation of the law of diminishing returns. On the other hand, industry offers wide scope for the employment of capital and technology, hence augmenting its productivity. Even though the contraction in the supply of labour can restrain the expansion of industry as well, it is still possible to override this curtailment by introducing technological changes that are labour-saving. The same logic holds

well for services sector where application of technologies may offer much wider room for expansion and growth. According to Kaldor, expansion of services sector was persuaded by the requirements of both growing industrial sector and rising income levels. Clark (1940) qualified that final demand will progressively shift towards the services sector, but the shift of labour force occurs owing to high productivity of industrial sector and low productivity of services sector. Kuznets (1971) believed that the income elasticity of demand is the chief reason for economic structure to undergo changes, but he was also of the opinion that other factors viz., technological capacity and institutional framework play important roles in accelerating these changes in the economic structure. Although Kuznets used no econometric techniques, he presented the historical development and conceptual framework for the structural transformation.

Chenery (1960), Chenery and Taylor (1968) and Chenery and Syrquin (1975, 1989) were among the first and foremost empirical analyses that were put forward to examine patterns in the structural transformation process. The earliest research by Chenery (1960) and Chenery and Taylor (1968) identified uniform patterns of change in the structure of production as the levels of incomes of countries increased from small primary-oriented countries to small industry-oriented countries to large countries. Therefore, the central argument that emerges on the association of growth, development and structural transformation is that nations start as being producers of primary goods, then, resources shift to production of secondary goods and, finally, to production of services and these stages corroborate with the stages of development of economies. The identified development patterns also lead to shifts in shares of labour across sectors with economic development.

Pandit (1990, 1991) detected a void in the findings of Fisher (1939), Clark (1940), and Chenery (1975) and suggested that newly developing countries have a higher share of labour in the services sector as against the previously developed countries. The author observed a “hump” in a cross-sectional study of a large number of countries, although within an individual country he observed an increasing share of labour in the tertiary sector. In fact, an earlier study by Katouzian (1970) found discontinuity in the transformation from agriculture to industrial and services sector and suggested that this was true due to aggregation in the service sector and overlooking the heterogeneity of services sector which generally has three constituent parts- “new services” with high income elasticity of demand, “old services” with low income elasticity of demand and

“complementary services” whose growth was linked with manufacturing sector and government activities. In the recent times, Kongsamut et al. (2001) and Ngai and Pissarides (2007) presented a simple model that are consistent with the Kaldorian theory of structural transformation, balanced aggregate growth as well as the dynamics of reallocation labour in various sectors in the process of growth.

Kuznets, Miller, and Easterlin (1960), Williamson (1965), Kim (1998), and, especially, Krugman (1991) and Krugman and Venables (1995) support that there exists strong linkage between inter-regional or international convergence or divergence in incomes and convergence or divergence in economic structure. They also discuss the extent to which trade openness brings about structural transformation. Kuznets (1955) hypothesized that the relationship between economic growth and income inequality is represented by an inverted U-shaped curve. Kuznets propounded that as economies grow, income inequality will initially deteriorate because much of the growth is likely to reward those regions of the economy having access to capital and skill and thus, displaying a “pro-rich growth”. Gradually, as low-skilled workers move towards sectors that are productive and have high income elasticity, over time there will likely be a more “pro-poor growth”. As applied to the experience of the United States, Krugman (1991) argued that in the 19<sup>th</sup> century, the decline of transport costs, externalities in demand and increasing returns to scale commanded that the concentration of industrial production is restricted to one region only, and by historical accident this region was determined to be the Northeast. Afterwards, as population grew in the other regions, industrial sector flourished and sustained outside of the Northeast, resulting in convergence.

Evidently, various states that form the United States displayed substantial disparity in their per capita income in the 1880s which more or less vanished in the 1980s. In their paper, Caselli and Coleman (2001) explained that initial inequality in per capita incomes within the US was due to the differences across states in terms of the proportion of employment allocated to agriculture. Guided by the fact that the regional convergence of incomes in the United States, i.e., between its North and South overlapped with the occurrence of narrowing of differences in the share of employment in agriculture in these regions, Caselli and Coleman (2001) propounded that structural transformation model provides a deeper insight into the economic forces leading to convergence. Using a model of structural transformation with two sectors- agricultural sector and non-

agriculture sector and two regions -the North region and the South region, Caselli and Coleman (2001) showed that an improvement in the production technology in non-agricultural sectors was accompanied by a fall in the share of laborers employed in agricultural sector and a fall in the cost of mobility from agricultural to non-agricultural sector. This resulted in convergence of incomes between the North region and South region of the US. The authors also disintegrated into two parts the consequent convergence of per capita incomes. The first part was attributed to regional disparity in wage rates of the workers employed in the agricultural and non-agricultural sectors and the second part was attributed to the sharp decline in the share of employment in agriculture in the South along with the decline in the share of employment in agriculture in the US as whole leading to a higher rise in the wage rates of agricultural workers compared to non-agricultural workers. Their finding that the most of the convergence is attributable to the latter suggests that a major chunk of the historical regional convergence is result of the structural transformation out of agricultural sector rather than to the elimination of obstacles impeding inter-regional factor mobility. The authors' model of the structural transformation is based on the fact that while the relative wage rate for workers in the agricultural sector has risen, the relative supply of workers in the sector has dropped. These facts imply that over the last century the relative cost of attaining non-agricultural (manufacturing) skills has fallen.

Thus, we see that it is under the assumption of a closed economy that a large body of theoretical and empirical analysis to examine structural transformation, has flourished. Initially, most of the studies based their findings in a closed economy set up, but recently, few studies in open economy set up have emerged. On the link between trade and structural transformation, one of the first studies was by Matsuyama (1992) followed by Coleman II (2007), Echevarria (2008), Matsuyama (2009), Dessy et al. (2010), and Deardorff and Park (2010). In exploring the interrelations between global economic growth and the changing composition of global trade, Echevarria (2008) argued that in the long run, total factor productivity differential in two sectors determine the comparative advantage in the good produced in either of the sectors. Secondly, he argued that non-homothetic preferences imply that, as the global economy develops, fewer countries export only or mostly primary goods.

Matsuyama (1992) was the first to construct a model of endogenous growth to demonstrate that the relation between agricultural productivity and growth performance can be extremely

sensitive to the assumption made about the openness of an economy. Later, Matsuyama (2009) analytically worked out the idea for a simple two-country model. The author considered a “Stone-Geary utility function” with the “three-consumption goods”- agricultural goods, industrial (or manufactured) goods, and services and abstract capital and derived two important results. Firstly, he showed that with technical progress in industrial sector, the total labour employed in industrial sector of both the countries declines. Secondly, he demonstrated that in case one of the countries experience stronger technological progress in industrial sector than the other, then labour force in the industrial sector in the first country may initially increase while labour force in the industrial sector in the second country eventually falls, when technological progress in the industrial sector has been adequately robust, the share of labour force in the industrial sector in the first country will also decline. These results suggested that a “hump-shaped” relationship may occur in the country that witnesses the stronger technological progress in the industrial sector.

Dessy et al (2010) prove that trade can trigger the structural transformation of a society that is primarily agrarian and can induce productivity gains for the economy to get launched on higher growth path. Their dynamic general equilibrium model provides a clear illustration of the mechanics behind such structural transformation. Using a simple variant of the standard Heckscher-Ohlin Model, Deardorff and Park (2010), explain how a developing country, by opening up to trade with a large capital-abundant economy, can be induced to shift resources into more capital-intensive production than that which it was producing in autarky.

On the empirical side, one of the first studies on structural transformation in the context of open economy was done by Stokey (2001), which considers international trade as one of the factors fuelling the English industrial revolution and eventually leading to structural transformation in Britain. More recently, authors like Uy, et al. (2013), Tombe (2012), Huang (2011), Ungor (2011). Uy et al. (2013) demonstrate that higher productivity growth in manufacturing in one country can result in an inverted U-shaped pattern for the shares of labour in that country and a steady fall in other countries. For example, an increase in manufacturing productivity in China can cause a decline in labour shares in manufacturing for countries such as the US, Korea and Japan (Coleman II 2007, Ungor, 2011) but an increase in the labour shares in manufacturing for China. The idea of Matsuyama was generalized to a two-country of structural transformation by Yi and Zhang (2010). In their generalization, all goods are assumed to be produced with labour only. Under the

assumption that agricultural and manufactured goods are tradeable and there are no trade costs, allocation of consumption will be in the manufactured goods and services (i.e. variances in income elasticities). The authors therefore make assumption that each of the three sectors represent aggregate of a continuum of goods, as it was assumed by Eaton and Kortum (2002). Yi and Zhang (2010, 2013) run simulation of their model assuming that one country has higher productivity growth in manufacturing as compared the other country. They provide instances for which the country having higher productivity growth in manufacturing witnesses a “hump shape” in the value added and shares of labour force in manufacturing while the other country witnesses a downward sloping curves with respect to value added and shares of labour force in manufacturing labour. From the empirical point of view, it is interesting to question whether there is evidence for the impact of openness on structural transformation, in addition to the “hump shape” of manufacturing employment and value added. The important prediction of the models of Yi and Zhang (2010), like the model of Matsuyama (2009), is that the countries that have different sectoral productivities should have differing allocation of labor shares in sectors producing tradeable goods should. In a three-sector model, Huang (2011) makes an inclusion of negative trade balance for the US to demonstrate that such a model is able to explain the fall in the shares of hours worked in industry. In general, theories presented in literature envisage that countries with deteriorating trade balances will witness swift decline in the labor shares for industry and a higher growth rate in the distortion of the service.

Betts et al. (2011), Spasi (2011), and Teignier (2012) have examined the process of structural transformation in South Korea during its growth miracle. In particular, they examined the role of international trade in Korea’s industrialization and find that trade played a crucial role in the rapid growth in the employment shares in manufacturing and manufacturing value added. The authors claim that international trade augmented the transition of the economy out of agriculture sector into industrial and services sector. If South Korea had not simultaneously introduced protection policies in agricultural, trade could have played an even greater role, argues Teignier (2012).

We conclude from the review of the literature above that the impact of trade openness on structural transformation manifest when there is a discrepancy between production sector and consumption sector of the economies that are involved in trade with the rest of the world. In the

past, this applied to industrial sector, and to some extent to agricultural sector. However, in recent years, trade in services has seen an increasing trend. Technological transfers arising from globalization have facilitated acceleration of structural transformation in the developing countries (Aizenman, Lee, and Park 2012). The economy grows with the movement of resources from the less productive agricultural sector to the more productive industrial and service sectors, and this leads to the growth in national income (McMillan and Rodrik 2011; Rodrik 2013). Whether such growth benefits countries opening up for trade and leads to an equalization of income is contentious.

To the best of our knowledge there has been limited empirical analysis on the linkages between trade, structural transformation and income convergence. One of the recent studies is done by Sarma et al (2017) for the Vietnamese economy. Noting the fact that since the *Doi Moi* economic reforms of 1986, Vietnam has seen a rapid and sustained growth of the economy, the authors find that “structural transformation occurred across all income quantiles, but the shift from agriculture to manufacturing was more prominent for those at the centre of the income distribution”. Their data also indicates that there were positive returns to agriculture and manufacturing only for the top 10th to 20th percentile, aggravating the income divide. Using Growth incidence curves, they show that Vietnam’s growth has been pro-rich during 2002- 2010, They also demonstrate that structural transformation is not able to sufficiently account for the variations in income growth across the income distributions. Rather, it is the household characteristics, ethnicity and other un-observables that substantially account for the observed variations across the income distribution in terms of growth. Another recent empirical study by Paul et al (2017) makes an attempt to throw light on the mechanism of regional productivity growth, catch-up and convergence in Japan and their association with the process of structural transformation in the country. Using data for nine benchmark years spanning a period of nearly 135 years, from 1874 to 2008 on employment and sectoral value-added, the authors come up with the evidence that the process of structural transformation in Japan is in line with the trends seen in other industrialized countries.

A recent study by McMillan, Rodrik and Verduzco-Gallo (2014) argue that there are various reasons because of which structural transformation may not succeed in providing the required impetus to growth. They make a distinction between structural transformation that is



growth enhancing, mostly observed in Asia, and growth curbing, as observed in many countries in Africa and Latin America. They also make a strong point that in case where the intensity of contribution of structural transformation to economic growth varies across countries or across regions, then structural transformation that is growth enhancing may not necessarily result convergence.

Hence, we see that there is sparse literature on the how trade impacts income convergence by inducing structural transformation in a group of countries. Moreover, to our knowledge there has been no study on the EU and the ASEAN region. This chapter is an attempt to fill this gap in literature.

## **2.5 Inter-country Inequality and Convergence in EU: A Survey of Empirical Literature**

The origin of the European Union can be traced to European Coal and Steel Community (ECSC)<sup>25</sup> and the European Economic Community (EEC)<sup>26</sup>, established, respectively, by the 1951 Treaty of<sup>27</sup> Paris and 1957 Treaty of Rome<sup>28</sup>. The EEC was formed by 6-member countries and then it expanded and transformed into the 15-country European Union (EU-15) by 1995<sup>29</sup>. Its expansion to 25 countries in 2004 and later forming of the 28-member EU by 2013<sup>30</sup> is a dramatic and far-reaching contemporary development in international political economy that encompasses over 510

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<sup>25</sup> ECSC was an organization of 6 European countries set up after the World War II with an objective regulate their industrial production under a centralized authority. It was formally established in 1951 by the Treaty of Paris, signed by Belgium, France, West Germany, Italy, the Netherlands and Luxembourg.

<sup>26</sup> The regional organization EEC aimed to bring about economic integration among its 6-member states.

<sup>27</sup> The treaty came into force on 23 July 1952 and expired on 23 July 2002, exactly fifty years after it came into effect.

<sup>28</sup> Treaty of Rome remains one of the two most important treaties in the modern-day EU, along with the Treaty of European Union (originally signed in Maastricht in 1992).

<sup>29</sup> The EU15 comprised member countries in the European Union prior to the accession of ten candidate countries on 1 May 2004. They are- Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom.

<sup>30</sup> The 13 countries that joined the EU by 2013 are – Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovak Republic and Slovenia.

million<sup>31</sup> (as on 1 January 2016) people and an internal single market with per capita GDP (in PPP terms) at 32,384 USD in 2016. At the core of EU integration is the spirit of economic convergence. In support of “ever closer union,” EU’s regional and national policymakers have explicitly stated that the goal of the union is to reduce inequalities among EU member countries (Brandolini, 2007; Franzini, 2009), adopting policies designed to accomplish this convergence. Consequently, given the EU’s rapid progress toward a common market and the evidence that the creation of the EU increased the volume of trade among EU countries since its inception (Frankel 1997; Rose 2002), much of the scholarly debate surrounding the EU concerns the impact of the formation and expansion of EU on inequality and income convergence across its member countries and within the countries of the EU.

Among the several studies purporting to examine regional or inter-country inequality in Europe, the earliest is by Barro and Sala-i-Martin (1991, 1995), who looked at patterns of convergence across 73 regions of Western Europe since 1950 and found evidence of convergence within European countries; also, in particular, they found that the rate of convergence for European regions is about 2 percent a year. Ben-David’s (1993) celebrated study on  $\sigma$ -convergence within the EEC through 1985 measures economic integration among EU countries, but this study is limited in the sense that only the six original EEC countries are analyzed, and the data extend only to 1985, just before the Single European Act<sup>32</sup> took effect in 1986, and well before the Maastricht Treaty was signed in 1992. Furthermore, Ben-David does not show econometric evidence of an association between economic integration and convergence, and other work has suggested that economic integration cannot be credited with convergence among Denmark, Ireland, and the U.K., since convergence among these countries began well before they joined the EEC in 1973 (Slaughter 1997).

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<sup>31</sup> In 2016, Ireland recorded the second highest level of GDP per capita in the EU-28, at 104 per cent above the EU average, with only Luxembourg at a higher level. Bulgaria was the Member State with the lowest per-capita GDP, at 76 per cent below the EU average.

<sup>32</sup> The Single European Act (SEA) was the first major revision of the 1957 Treaty of Rome. The Act set the European Community an objective of establishing a single market by 31 December 1992, and codified European Political Cooperation, the forerunner of the European Union's Common Foreign and Security Policy.

Marques and Soukiazus (1998) analyzed sigma and absolute beta convergence process in the EU-12 countries from 1975 to 1995. The results of the analysis were that the EU-12<sup>33</sup> Member States were converging at the rate of 1.18 per cent. Using ten-year sub-periods, they concluded that the convergence rate from 1975 to 1984 was 1.55 per cent and from 1985 to 1995 1.61 per cent. However, the results for the sigma convergence were different- the countries were converging from 1975 to 1982 and from 1986 to 1991. The discrepancy in the results of the two approaches showed that the rate of beta convergence was not sufficient to ensure the approximation of the levels of per capita income in absolute terms.

Similarly, Yin et al. (2003) estimated both beta and sigma convergence using EU data for the period 1960-1995. For sigma convergence, the results showed that the cross-sectional standard deviation of the real GDP per capita for the EU-15, the EU-9<sup>34</sup> and the EU-12 had declined over the period 1960-1995. For the EU-6, the standard deviation declined in the first two decades, but increased in the last 15 years, even though it remained the lowest one. The results for the absolute and conditional beta convergence showed economic convergence within the EU-15 except for the 1980-85 subperiod where weak divergence was indicated, leading Yin et al. (2003) to conclude that convergence in the EU-15 had been going strong and uninterrupted.

Mathur (2005) examined the convergence process in the four regions, including the European Union, from 1961 to 2001. The EU showed the evidence of absolute convergence; the convergence rates in the periods 1980-2001 and 1990-2001 were not statistically significant, which could be caused by a challenge for designing the EU regional policies and coping with then-new entrants. Low growth was linked to high unemployment, the failure of the labor market and the unsolved problems in the systems of social security, which might require good governance and institutional changes. A review of studies testing for sigma and beta convergence at the country or regional level by Eckey and Türk (2007) provide the insight that the early literature detects beta convergence among EU regions, at both EU-15 and EU-27<sup>35</sup> level, with the speed of convergence

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<sup>33</sup> EU-12 comprises of new EU members- Bulgaria, Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia and Slovak Republic.

<sup>34</sup> EU-9 here refers to -Bulgaria, Latvia, Romania, Estonia, Lithuania, Hungary, Slovak Republic, Poland and Czech Republic.

<sup>35</sup> Includes all the member countries prior to 2013, i.e., all the EU countries except Croatia.

being rather low in the eighties and higher afterwards. Mora (2005), Fischer and Stirbock (2006) and Battisti and Vaio (2008) study optimal regional convergence clubs in the European Union. Their primary goal is to define clubs of regions within the European Union sharing the same characteristics in terms of income growth convergence.

While almost all studies on EU (focusing mostly on EU-15) agree that the per capita income in EU is converging (Armstrong, 1995; Neven and Gouyette, 1995; Fagerberg and Verspagen, 1996; Quah 1996; Lopez Bazo et al, 1999; Margini, 1999; Duro 2004; Ezcurra et al, 2005), some studies have observed that reduction in between- countries inequality has been accompanied by an increase in within-country regional inequality in Europe (see Esteban, 2004). Alternative explanations are offered to explain the regional inequality trend in Europe. For example, Esteban (2000, 2004) argues that economic integration has contributed to faster growth in the lower-income, acceding countries, contributing to convergence of per capita income across countries, although faster growth within the countries has not been uniformly distributed. This view is also confirmed by the study by Arbia et al (2005). Petrakos et al (2005) suggest that inequality at the national and the EU levels exhibit pro-cyclical behavior in the short-run, increasing in periods of expansion and decreasing in periods of slow growth. However, long time processes favour more equitable allocation of activities, leading to convergence of per capita income.

Another part of the literature has focused on the convergence process of new entrants from Eastern Europe. Using a cross-sectional approach, Matkowski and Prochniak (2007) find evidence of  $\beta$ -convergence within the group of new members while their convergence process towards original members seems slower. Rapacki and Prochaniak (2009) analyzed the effects of the EU enlargement on economic growth of ten new Member States from Central and Eastern Europe (CEE-10<sup>36</sup>), from 1996 to 2007. They tested sigma convergence and absolute beta convergence hypotheses of the EU-25, CEE-10 and EU-15, from 1996 to 2007 and in two subperiods, 1996-2001 and 2001-2007. The results indicated that the EU enlargement had significantly contributed to economic growth of the CEE-10 countries and that the convergence process had accelerated after 2000 as the enlargement had been approaching. In the same vein, Szeles and Marinescu

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<sup>36</sup> CEE-10 in this paper referred to 10 new members of the EU, namely – Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic and Slovenia.

(2010) studied the absolute and conditional convergence in the Central and Eastern European countries. They found evidence for both unconditional and conditional convergence. For conditional convergence, the labor productivity and trade openness had a positive and important role in fostering regional economic convergence. The exchange rate had a weaker significance and was in a negative relationship with growth. Government debt also had a weakly significant, but positive impact on growth. Kocenda et al. (2006) and Ingianni and Zdarek (2009) also support  $\beta$ -convergence among new entrants as well as towards former members of the EU, although they highlight significant disparities among new member states using a time-series approach. Kaitila (2013) analyzed only the sigma convergence of purchasing power adjusted GDP per capita in four groups of countries: the EU-15, the EU- 27, the EU-17 (the Eurozone) and the EU-33 (the EU Member States and the candidate countries at the end of 2012; Croatia, Iceland, Macedonia, Montenegro, Serbia and Turkey). The countries were converging from 1960 to 1973 and from 1986 to 2001.

Cavenaile and Dubois (2011) investigated the convergence process within the EU-27 from 1990 to 2007. While Cavenaile and Dubois (2011) find evidence of beta convergence within the European Union (27 countries) for the period between 1990 and 2007, they also show that the rates of convergence from the two groups of countries are significantly different; thus, supporting the existence of two heterogeneous groups; the EU-15 and CEE countries within the European Union. The presence of heterogeneity could have implications on the functioning of the EU and the Eurozone, as the recent sovereign debt crisis in the Greece highlighted. Próchniak et al. (2013) analyse the time stability of GDP beta convergence in the EU-27 during 1993–2010 and EU15 during 1972–2010. They find that EU-27 countries converged at the rate of about 5 per cent per annum and EU-15 countries at 3 percent per annum. Campos et al. (2014) estimates of the benefits from economic and political integration. They find large positive effects from EU membership, but these differ across countries and over time.

Halmai and Vàsàry (2012) analyzed four groups of the EU countries: “developed”, “Mediterranean”, “catchup” and “vulnerable” countries. They showed how convergence and potential growth rates were disrupted by the 2008 crisis through three different channels: capital accumulation, labor input and total force productivity. They concluded that the potential growth rate in the Eurozone would fall in the period 2009-2010 by 0.8 per cent. They also estimated that

a longer period of divergence might ensue in Europe. This is in line with an earlier study by Darvas (2011) assessing the impact of the 2008–2009 global financial and economic crisis on the medium-term growth prospects of the countries of Central and Eastern Europe, the Caucasus and Central Asia. Using cross-country growth regressions, they found that the crisis has had a major impact on the within sample fit of the models used, and that the positive impact of EU enlargement on growth is smaller than shown by previous research.

Dobrinsky and Halvik (2014) provided evidence of differentiated patterns in the new Member States and the EU as a whole, in the pre-accession and the post-accession periods. The results again indicated heterogeneity of growth, pointing more generally to uneven economic convergence within the EU. Also, the evidence of dissimilarities within the subgroups existed (for example Hungary and the Baltics in the new Member States), indicating the considerable within-group variation.

As we can see, there are many studies empirically testing the convergence hypothesis for EU, but the results are mixed. Many find evidence of convergence (Armstrong 1995; Ben-David 1993, 2001; Dewhurst and Mutis-Gaitan 1995; Leonardi 1995), while others find mixed convergence and divergence, depending on the period and countries included, and whether convergence is measured as  $\sigma$ - or  $\beta$ -convergence (Marques and Soukiazis 1998; Dunford 1996), and still others find or predict divergence (Arestis and Paliginis 1995; Hallett 1981; Slaughter 1997, 2001). Studies carried out post -2000 generally find evidence of economic convergence between GDP per capita in the long run (see ECB 2008, Kutan and Yigit 2009; Boldrin and Canova 2001; Baruah et al 2006; Villaverde and Maza 2008), due to the catch up in growth of the poorer countries (Greece, Ireland, Portugal and Spain in the earlier period, and Eastern Europe more recently). The literature is limited not only by inconclusive findings, but also, most of the studies that attempted to analyze regional disparities in the European context apply the traditional concepts of sigma and beta convergence of Barro and Sala-i-Martin (1991). However, this approach is not suitable for analyzing the underlying process for structural change and dynamic shifts that an economy experiences in response to changes in policies as the effects of spatial dependence are not considered in this approach. Moreover, regional data cannot be regarded as independently generated because of the presence of similarities among neighbouring regions, and so the standard estimation procedures employed in some previous empirical studies may be enhanced to reduce

any serious bias and inefficiency in the estimation of the convergence rate, that may arise under the assumption of complete heterogeneity across the countries in the region.

## **2.6 Inter-country Inequality and Convergence in ASEAN: A Survey of Empirical Literature**

The Association of Southeast Asian Nations, or ASEAN, was established on August 8, 1967 in Bangkok, Thailand, with the signing of the ASEAN Declaration (Bangkok Declaration<sup>37</sup>) by the five original member countries of ASEAN, namely Indonesia, Malaysia, Philippines, Singapore and Thailand. Later it was joined by Lao PDR, Myanmar, Cambodia and Brunei-Darussalam and Vietnam forming the 10-nation ASEAN<sup>38</sup>. The most striking feature of the ASEAN region is its great diversity. Indeed, its economic, political, cultural, and linguistic diversity is greater than even that of the European Union (Hill and Menon 2012). Economic diversity within the region is also vast reflecting the wide range of difference that exist between the ASEAN nations. ASEAN's economic diversity has become conspicuous—especially following the inclusion of Cambodia, Lao People's Democratic Republic, Myanmar, and Vietnam (collectively known as CLMV countries). ASEAN includes two high-income countries (Brunei Darussalam and Singapore), one upper middle-income country (Malaysia), five lower middle-income countries (Indonesia, Lao People's Democratic Republic, Thailand, Philippines, and Vietnam), and two low-income countries (Cambodia and Myanmar)<sup>39</sup>.

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<sup>37</sup> Also known as the ASEAN Declaration. The founding document states the basic principles of ASEAN: co-operation, amity, and non-interference.

<sup>38</sup> The accession years for Brunei Darussalam, Cambodia, Lao PDR, Myanmar and Vietnam are 1984, 1999, 1997, 1997 and 1995, respectively.

<sup>39</sup> Per capita incomes (GDP per capita at constant US \$) for the ASEAN countries in the year 2016 are as follows:

Brunei Darussalam – 31430.46 USD

Cambodia – 1079.11 USD

Indonesia - 3974.06 USD

Lao PDR – 1642.73 USD

Malaysia – 11031.82 USD

Myanmar – 1408.14 USD

ASEAN is among the most important integration efforts within the Asian continent with the reduction of regional income inequality prime among its agenda (ASEAN Vision, 2020). Hence, it becomes imperative to know whether the ASEAN economic integration has resulted in reducing income inequality and in leading to income convergence across the member countries. However, one visible feature of the previous studies on income convergence is that the focus has been more on the advanced countries in their samples. Only recently, in the last decade, there have been few studies that have documented the trends of per capita income convergence among the ASEAN countries. For instance, Lim and McAleer (2004) examined convergence in five founding member countries of ASEAN for the period 1965–1992. The paper was unable to find any evidence of convergence in these countries. Along the same lines, Lee et al. (2005) probed convergence of income in the same five ASEAN countries and Japan for a longer period of 1960–1997. The findings of Lee et al. (2005) revealed income divergence between each of the ASEAN country and Japan, with the exception of Singapore.

Similarly, Korshed (2005) investigated convergence of per capita income in the same ASEAN countries during an extended period of 1960–2001 but failed to support the hypothesis. All these studies employed time series analysis to investigate income convergence in ASEAN-5 countries. Korshed (2005) has examined the issue of convergence of per capita GDP across 9 ASEAN countries during 1960-2001 using World Bank data and failed to find evidence of sigma convergence, beta convergence and conditional convergence in ASEAN countries. However, Ismail (2008) utilized the panel cross-sectional techniques to explore convergence of income in five ASEAN countries for the period of 1960–2004. Test results provided supports both the unconditional and the conditional convergence hypotheses; the ASEAN-5 tend to converge to a steady state growth rate of per capita GDP with a speed of convergence of between 1.6 per cent and 16.6 per cent. Applying the Lumsdaine and Papell (1997) method, Jayanthakumaran and Lee

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Philippines – 2753.35 USD

Singapore – 52600.64 USD

Thailand – 5901.884 USD

Vietnam – 1735.291 USD



(2009, 2013) examined the convergence of income in five ASEAN countries and found evidence of convergence in the ASEAN-5 countries.

In the same spirit, Chowdhury et al (2011) applied test of convergence to determine if there is a convergence club for ASEAN-9<sup>40</sup> countries and whether, the catching up hypothesis which stated that the lagging country, with low initial income and productivity levels, will tend to grow more rapidly by copying the technology of the leader country, without having to bear the associated costs of research and development. The finding of beta and sigma convergence in the study for the period 1990-2008 suggests that ASEAN countries are converging towards common GDP per capita steadily but slowly. However, while convergence has occurred, the speed at which the initially poor countries are catching up with the initially rich countries is slow. They also noted that low income economies like Lao PDR, Cambodia and Vietnam are catching up with the high per capita income economies thus supporting the Solow's hypothesis of convergence.

Among the recent studies, Mu Shun Wang (2012) tested the income convergence hypothesis in the ASEAN region using panel unit root tests. As the newer member states of ASEAN are gradually developing in order to enter the economic zone, it was found that the great majority of original members showed income convergence over a time period of as long as 50 years. However, when a 22-year period was explored to encompass these newer member states, only three countries were found to support the existence of a 'catch-up' effect. Another recent study in the year 2012 by Sperlich and Sperlich (2012) proved that South-South Agreements<sup>41</sup> in ASEAN promote growth and  $\beta$ -convergence. Their analysis of the income developments of its member states and income (sigma) convergence in each area show that income dispersion does not generally decrease even though they find some indications of sigma convergence. The most recent study by Solarin (2014) examined the stochastic convergence of income for 9 ASEAN countries for the period 1970–2009. The findings of the time series analysis illustrate Brunei, Malaysia, Philippines, Singapore and Vietnam as having stochastic convergence towards the

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<sup>40</sup> ASEAN-9 group is comprised of Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar (Burma), the Philippines, Singapore, Thailand, and Vietnam.

<sup>41</sup>The term south-south cooperation is used by policy makers and researchers to describe the exchange of resources, technology, and knowledge between developing countries, also referred to as the countries of the Global South.

ASEAN's average. These countries also fulfil the sufficient condition criteria, implying the existence of convergence in the ASEAN countries.

However, little work on per capita income convergence seems to exist in the case of ASEAN countries. However, Lim and McAleery (2004) have done a study on five founding members of ASEAN. The study revealed a negative correlation between the average growth in income and its initial level for ASEAN-5 countries, but the estimates were found to be insignificant. A clear and robust finding of the study by Korshed (2005) is the rising per capita income dispersion in the region. On a positive note, some recent studies find that more rapid rates of economic growth in the CLV countries (Cambodia, Lao PDR, Vietnam) since the 1990s—driven by trade, investment, and other market reforms—have reduced these income differences leading to income convergence (see, for instance, Chowdhury et al 2011; Menon 2012; Mu Shun Wang 2012; Sperlich and Sperlich 2012; Solarin et al 2014 etc.). As can be seen, there are very few studies available the convergence and growth issues covering the ASEAN region and in these convergence studies, the scholars have mostly used the concept of  $\beta$ -convergence and  $\sigma$ -convergence. Also, owing to insufficient data, prior studies have included only a fraction of total members of the ASEAN. Moreover, the studies are inconclusive as to whether there has been a convergence or divergence among the ASEAN nations. We will try to include all countries in our analysis and re-examine the phenomenon of per capita income convergence in ASEAN from 2000-2014, as all the countries in the region are now actively involved in the integration process and therefore excluding any deserving country from the analysis may bias the results.

## **2.7 Summing Up**

It is now appropriate to sum up the main findings of the literature survey in an organized manner so that analysis can be taken up in the next chapter onwards. Theoretically, the concept of income convergence among countries in a given region has captured the interests of various scholars in the past and is still under consideration. The studies related to economic convergence starts with the pioneering work of Solow-Swan (1956) followed by Barro, Sala-i-Martin (1991) and Rodrik (2003). Two basic measures of income convergence –  $\beta$ -convergence and  $\sigma$ -convergence were put

forth by Barro and Sala-i-Martin. In due course of time, these measures were extensively used to determine income convergence among the countries in a group.

Later, analysts have put forward several factors that will garner the process of income convergence. These factors are - suitable institutional settings (like governance, monetary and fiscal policies, and openness), spillover of ideas and technologies from developed countries of the region to developing countries, migration of labor and capital mobility via FDI etc. Empirical research on the relationship between economic growth and trade and other factors like FDI, technological diffusion, 'initial backwardness' has been made possible by - the availability of international data on per capita income for countries, the development of endogenous growth theory, and having numerous practical experiences regarding the effects of international trade policies on income level and economic growth.

The issue of whether and how international trade impacts growth in income and income convergence has long been a subject of considerable interest and deliberation. The predominant message that emanates from the intensive research on the link between trade and growth is that policies encouraging international trade are conducive to economic growth leading. It has been theoretically found out that increased international trade facilitates the diffusion of knowledge and innovations from direct imports of high-tech goods, greater interactions with the sources of innovation, or from foreign direct investment (See, Grossman and Helpman, 1990, 1991; Rivera-Batiz and Romer, 1991; Barro and Sala-i-Martin, 1997 and Baldwin, Braconier, and Forslid, 2005). Also, by increasing the size of the market, trade openness allows economies to better capture the potential benefits from increasing returns to scale and exploit economies of specialization (See, Romer, 1989; Ades and Glaeser, 1999; Alesina, Spolaore and Wacziarg, 2000; and Bond, Jones and Ping, 2005). There are other streams of scholarly research and writing on the idea that international trade contributes to economic growth and income convergence by serving as a conduit for the flow of technology, intermediate goods, and knowledge among economies<sup>42</sup>. Further, trade openness incentivizes governments to adopt less distortionary policies and more disciplined macroeconomic management under the pressures of international competition (See, Sachs and Warner, 1995 and Rajan and Zingales, 2003).

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<sup>42</sup> This stream of thought emphasizes the dynamic interplay of trade and growth.

However, this logistics don't explicitly talk about per-capita income convergence as income convergence and factor price equalization is not one and the same thing. Two points deserve emphasis regarding the foregoing papers. First, the mixed empirical results resemble the theoretical models on trade and convergence, in that, both the theory and empirics leave us uncertain on whether trade leads to income convergence. Second, the literature has not adequately addressed a fundamental point concerning the role of Factor Price Equalization theorem in income convergence. This theorem maintains that under the conditions of the Heckscher – Ohlin – Samuelson model, free trade would equalize the prices of identical factors across countries<sup>43</sup>. Since per capita income is a weighted average of factor prices (where the weights are relative factor endowments) international trade by affecting factor prices, as predicted by FPE, affects per capita incomes. However, the equality of factor prices, caused by trade, does not imply the equality of per capita incomes. In fact, factor prices may become equal across countries while their per capita incomes remain unequal because their factor endowment ratios remain unequal<sup>44</sup>. The theoretical as well as the empirical relationships between the FPE and per capita income convergence/divergence have yet to be fully examined in the literature<sup>45</sup>.

Moreover, the studies that specifically concentrate on relationship between trade and income convergence have either regressed growth rates of per capita income on initial level of per capita income and trade, including other factors that determine income or have regressed standard deviation of per capita income on trade and various other variables. In other words, these studies are based on the concepts of either beta or sigma convergence, which are not so suitable to capture the underlying process of structural change that an economy witnesses with external shocks like trade, policy changes and growth.

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<sup>43</sup> Rassekh and Thompson (1993) did a survey on FPE theorem.

<sup>44</sup> See Mathew Slaughter (1997).

<sup>45</sup> See O'Rourke and Williamson (1999).

## Chapter III

### Hypothesis, Methodology and Data

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#### 3.1 Introduction

While it has by now been a well-established view that international trade has historically played the role of an “engine of growth” (Robertson, 1937; Maizels, 1963; Balassa, 1986; Dollar, 1992), it has unfortunately not as yet been seriously scrutinized whether international trade could also play the role in income convergence across countries. Interestingly, in recent years economists have emphasized on the importance of trade not only in increasing income per capita but also in reducing the per capita income differences across countries or regions (Armstrong 1995; Ben-David 1993, 2001; Dewhurst and Mutis-Gaitan 1995; Leonardi 1995; Lim and McAleer, 2004 etc..). The recent proliferation of regional economic integration both among the developed and developing countries (the EU and the ASEAN<sup>46</sup>, for instance) can be cited as example exemplifying the eagerness and the intensity with which countries of both rich and poor backgrounds are showing willingness to be part of the regional groupings due to their realization and conviction that international trade is not a zero-sum game. That is, both the rich and the poor countries do gain from regional groupings and the consequential trade liberalization process though the gains may be of different order. This gain from trade is distinctively different from the standard static gains from trade resulting from reallocation of resources as usually depicted in the text book. As against the standard gains from trade, the perceived gains from trade emanating from regional groupings are due to dynamic economies of scale and structural transformation as poor economy transforms from an initial agricultural specialization to industrial augmentation which eventually lead to orientation in providing services. This entire evolutionary process essentially implies that a country’s transformation schedule shifts upward continuously and as a result not only the size of the country’s cake gets enlarged but also each individual living in the society will

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<sup>46</sup>According to a World Bank brief “Regional trade agreements are increasing in number and changing their nature. Fifty trade agreements were in force in 1990. There were more than 287 in 2018” (<https://www.worldbank.org/en/topic/regional-integration/brief/regional-trade-agreements>).

be capable of commanding a higher share of the cake provided the society always follows an optimal redistribution of income by adopting optimal tax cum subsidy policies. The usual approaches to empirically find convergence across countries or regions are incapable of capturing these dynamic and evolutionary effects for the reasons as explained in the introduction chapter.

It is in this backdrop that we propose to examine empirically the role of trade in income convergence across countries. For the purpose of our empirical investigation we choose two regional groupings of countries, viz., the EU and ASEAN, for reasons as we explain below. The EU has a long historical evolution starting from the 3 BENELUX<sup>47</sup> countries to its present incarnation of 28 countries. It has experienced a rapid growth in output and trade since the formation of the union and it contains both highly rich as well as poor countries. Similarly, the ASEAN is a group of 10 diverse South Asian countries with the aim to accelerate economic growth and to promote trade integration. What had happened to income difference in these countries over the last three decades had been extensively studied by many economists as we had discussed in Chapter II, the literature survey. Income convergence did take place of course in these countries but there were very scanty attempts to consider whether international trade has made any contribution whatsoever in the process of income convergence in these economies. In order to fill this gap, we have made an attempt in this study to find the role of trade in income convergence following a study by Barua et al (2006) by using the *Theil Ratios* based on the Theil Index of Inequality (See Theil, 1967; Azad,1992; Barua et al, 2006, 2010 etc.). Also, we will try to assess the role of *relative backwardness* in income convergence and explain how the process of *structural transformation* unfolded by the forces of trade is linked with the process of income convergence. This chapter discusses in detail, the hypotheses of the study, the methodologies that will be undertaken to answer the hypotheses, data sources and assembling of the database. The *time period* of our study is 2000-2014. The chapter begins with stating of the hypotheses of our study and outlines the empirical model adopted to test each of these hypotheses, which is then followed by detailed discussion on the variables used in the study and the data sources. Finally, this chapter also discusses the reasons for considering the time period of the study as chosen 2000-2014.

In line with the objectives of the chapter, the chapter is planned out as follows. The **Section 3.2** lays out the hypotheses that will be examined in the study. The **Section 3.3** deals with the

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<sup>47</sup> These countries are – Belgium, Netherlands and Luxembourg.

methodologies/econometric tools that will be employed for the study. The **Section 3.4** provides the data sources and outlines the construction of the variables included in each econometric model. The penultimate **Section 3.5** gives the rationale for choosing the period as 2000-2014 for this study. The entire discussion is summed up in the last **Section 3.6**.

## 3.2 Hypotheses

We propose a set of hypotheses for our study as follows:

### Hypothesis (1)

*Trade plays a significant role in bringing about income convergence across the countries.*

The hypothesis is based on the assumption that expansion of international trade across countries stimulates competition, improves efficiency of production and enhances economic growth. An extensive discussion on this hypothesis has been already provided in the introductory Chapter 1.

### Hypothesis (2)

*The theory of relative backwardness holds true across countries, i.e., the countries with relatively lower initial value of per capita GDP experiences relatively higher growth rate of GDP per capita due to expansionary policies of government and trade.*

The foundation of this hypothesis lies on the theory of relative backwardness as proposed by Alexander Gerschenkron in 1952. Gerschenkron propounded the theory of relative backwardness to explain why economies that had previously languished should suddenly experience growth accelerations (Gerschenkron 1962, 1963, 1965). Almost by definition, relatively backward countries were backward because they lacked preconditions for modern growth – these economies are characterized by lack of natural resources, institutional obstacles such as the absence of political unification, poor quality of industrial labour force, lack of technological skills, absence of modern infrastructure and investment capital. Countries newly caught in a state of relative backwardness were under the pressure to close the economic gap between themselves and the advanced peers. Gerschenkron argued that relatively backward

countries can create conditions for rapid growth by substituting for missing preconditions by way of higher government expenditure, developing banking systems, etc...

Although Gerschenkron has spoken at length about the role of government expenditure in substituting preconditions and fostering higher growth in lower income economies, has failed to acknowledge the importance of international trade as one of the substitutes of precondition for higher growth of the economy. For our analysis, however, trade is an important variable because the main objective of creation of ASEAN and EU has been to increase mutual trade openness among the countries in the regions.

### Hypothesis (3)

*Trade plays an important role in expediting the structural transformation of a region from its initial agricultural dominance to industrialization and eventually to services sector specialization which contribute to increase in per capita income. The rise in income from such structural transformation is significantly higher for a backward economy as compared to a high-income economy for reasons as explained in the introductory chapter.*

The process of convergence, which is linked with development of lower income countries vis-à-vis higher income countries, is fundamentally related with large scale structural transformation as economies shift from being primarily agrarian to becoming increasingly non-agrarian. Earlier theories of structural transformation can be traced back to Lewis (1954). In fact, the process of structural transformation is at the heart of dual economy models of Lewis (1954), which is characterized by agriculture sector—the traditional sector has lower productivity while the modern sectors—industrial sector and services sector have higher productivity. Kuznets (1966) argued that structural transformation typically involves a contraction in agricultural activity which is accompanied by an expansion of non-agricultural sectors – industrial and services sector. Income convergence across countries, inter-alia, involves rise in the levels of incomes in poor countries. Fisher (1939) and Clark (1940) argued that income elasticity of demand for agricultural products being low, with rising levels of income, the demand for agricultural products relatively declines; while on the other hand income elasticity for industrial sector is high and for services, it is still higher. Consequently, with the rise in income, the demand for industrial goods increases and, after reaching sufficiently high levels of income, demands for services increases, although the shift from industrial sector to services sector may not be linear. Therefore, it follows that income



convergence is also an outcome of convergence of economic structure across countries and vice-versa. Lower income countries tend to have a big primary sector and relatively small secondary and tertiary sectors. As a lower income country grows, the share of the primary sector in the country declines while the share of the secondary and tertiary sector grows. In this manner, the economic structure of the country converges to the structure of high-income country, where the secondary and tertiary sectors account for the lion's share of national output. Hence it becomes important to test the hypothesis that structural transformation and income convergence are linked and to study that trade plays a role in accelerating changes in economic structural composition in the countries.

These three hypotheses will be empirically tested in the subsequent chapters for the EU and ASEAN. It is well perceived that common currency area like the EU and a free trade area like the ASEAN would create a Single Market, a territory without any internal borders or other regulatory obstacles to the free movement of goods and services; thus, expanding international trade. The catching-up of backward countries of the regions, and per capita income convergence are considered a likely consequence of expansion of trade as a result of economic integration and creation of single market. In fact, one of the founding principles of the EU was to foster economic cooperation by enhancing free trade among the member countries. In the same way, ASEAN was established with a view to increase the living standards of the countries via expansion and facilitation of trade. According to Ben-David (1996), Ben-David and Rahman (1996), Sachs and Warner (1995), Ventura (1997), Ghose (2004), Dawson (2007) Velde (2011) etc., convergence of incomes across countries would be assured by international trade. Contrary to the optimistic view, Bernard and Jones (1996), Rodriguez and Rodrick (1999), Slaughter (1997, 2001), Baliamoune-Lutz (2001), Park (2003) Hein and Trug (2005), Welsch and Bonn (2006), etc., are of the view that the economic integration by way of trade would lead to increasing specialization in only few countries, diverging economic structures, asymmetric developments, and widening of income differences across economies.

We will also do a comparative analysis for the EU and the ASEAN to understand whether countries at different stages of development and different levels of openness have different experience in terms of convergence and whether impact of trade for ASEAN and EU are

differential. In the following sections, we shall provide with an in-depth account of the research methodologies, the data sources used in the study and the construction of variables of interest.

### **3.3 Methodology**

The study intends to investigate the role of trade in per capita income convergence across the countries of the EU and the ASEAN. For this we first of all try to find if there is any evidence of cross-country per capita income convergence for the sample of countries under our consideration. This will be done first by using the concepts of beta and sigma convergence as developed by Barro Sala-i-Martin (1992) and using Theil index of inequality. Subsequently, we will examine the role of trade in per capita income convergence. This analysis constitutes our testing of the *first hypothesis*. The proposed hypothesis will be tested by applying the *Theil Ratios* following the study by Barua et al (2006) for the same sample points. Theil Ratio is basically the ratio of the share of country's income in total income of the group and the share of country's population in the total population which provides information on the relative position of a country in the region. Using a panel regression model on Theil ratios, the study intends to investigate the relative importance of the factors such as trade, labor mobility, capital mobility, government expenditure etc. in contributing to the per-capita income convergence among the ASEAN and EU nations.

We then propose to do the testing of the *second hypothesis* on relative backwardness for income convergence. This done by a panel regression on growth and various factors impacting growth. The *third hypothesis* on structural transformation has been conducted using panel regression model based on Chenery-Syrquin (1975) synthesis which provides the basic structuralist view on economic growth. The empirical models that will be used for each of these analyses are discussed separately and in granular detail in the following subsections.

#### **3.3.1 Assessment of Income Convergence in Steady State Scenario**

To assess the per capita income convergence hypothesis, we will use the standard concepts of income convergence viz., beta convergence and sigma convergence formulated by Barro, Sala-i-Martin (1992) based on neoclassical growth model of Solow (1956) and Swan (1956). In fact, both

the notions of beta convergence and sigma convergence are corollary of neoclassical growth theory, which assumes diminishing returns to capital. According to the theory, low income countries will experience higher growth rate in per capita income and should converge to the income levels of high-income countries, which will experience a lower growth rate in per capita income. To check for beta convergence, we plot initial per capita income, as measured by per capita Gross Domestic Product (GDP), for all countries against their growth rates over the period under consideration. A trend line with negative slope would validate the hypothesis of beta convergence.

Sigma convergence hypothesis embeds the idea that all countries in the region should converge to same level of per capita income. If this holds true for the countries of the EU and the ASEAN, then we should observe a fall in the dispersion in GDP per capita with time (for our study, it is year). The dispersion is measured by coefficient of variation which is ratio of standard deviation of GDP per capita over mean per capita GDP.

At this point, it is worth reiterating that neoclassical growth theory applies to closed economy and ignores the effect of trade on growth and hence convergence. Neoclassical model for open economy which makes provision for the inclusion of trade and factor mobility between countries that have opened up to trade will lead to convergence in a steady state set up with trade (and /or other policy variables). This set up doesn't say much about the process of trade liberalization and dynamic impact of trade on per income. Therefore, we will also test for per capita cross-country income convergence using Theil index of inequality which is introduced and explained in the next sub-section.

### **3.3.2 Assessment of Income Convergence taking into account the Dynamic Aspects of Convergence**

Testing of convergence hypothesis for the EU and the ASEAN countries entails in totality two things – one, preliminary test of whether inter-country inequality in terms of per capita income has reduced and secondly, whether inter-country inequality with respect to the sectoral components of GDP, viz., agriculture, industry and services have reduced. The latter is important because convergence in income also means convergence in structural composition of the countries in the

region and this aspect cannot be examined using traditional indicators of beta and sigma convergence. Therefore, it is necessary to understand the drawbacks of the concepts of beta and sigma convergence and how Theil ratio derived from Theil index of inequality can tide over these drawbacks.

### ***3.3.2.1 Drawbacks of Traditional Approaches to explain Income Convergence***

As mentioned earlier, the traditional beta and sigma measures of per capita income convergence suffers some drawbacks. The standard convergence analysis attributed to Barro-Sala-i-Martin (1995) is not suitable for analysing the underlying process of structural change that an economy witnesses as the forces that contribute to income convergence get unfolded as a response to policy changes and/ or trade openness. In order to capture structural change and consequent dynamic shifts that might be taking place in an economy we need to move away from a simplified Solow model (1956) of growth underlying the Barro-Sala-i-Martin analysis of convergence. In contrast, we need a multi-sectoral analytical framework, which allows us to inspect the structural transformation of economies in response to changes in economic policies over time. Hence, we will re-examine the phenomenon of income convergence using the measure of income inequality developed by Theil (1967). In other words, we inspect the development of Theil index of inequality with respect to income (GDP), its three major sectoral components (agriculture, industry and services), trade and government expenditure for the EU and the ASEAN during the period 2000-2014 to take a view as to whether these groups of countries have experienced convergence in terms of income, structural composition, trade openness and policy orientation. In addition, using individual Theil ratio as powerful measure of dynamic changes, we try to explain with empirical rigour the link between trade and convergence, the modalities of which we discuss in detail in the section 3.3.3.

### ***3.3.2.2 Concept of Income Theil Index***

The Theil index of inequality in income, often called the “entropy measure,”  $T_x$ , is defined as follows:

$$T_x = \sum x_i \log\left(\frac{x_i}{p_i}\right) \text{ --- (3.1)}$$

where  $x$  indicates income measured in terms of GDP. The subscript  $i$  stands for a country ' $i$ ' in the region – EU or ASEAN, as the case may be. In the mathematical specification (3.1),  $p_i$  is country  $i$ 's share of population in total population of the region (ASEAN or EU, whatever be the region under consideration), and  $x_i$  is country  $i$ 's share of income in the total income of the region.

The inequality measure takes non-negative values only. An equal distribution is denoted by  $T_x=0$ , which happens when every country's population and its share in income are equal. A rise in the value of  $T_x$  over time means that income inequality is rising over time. Similarly, an extremely unequal distribution implies that  $T_x = \log(P/P_i)$  where a single country owns all income while all other countries have zero income. The Theil index is an information-theoretic measure based on prior and posterior probabilities. In the measure  $T_x$ ,  $p_i$  and  $x_i$  can be regarded as prior and posterior probabilities, because  $\sum y_i = \sum p_i = 0^{48}$ .

In the same way we can define the levels of inter-country inequality in the sectoral components of GDP (viz., agriculture, industry and services), trade and government expenditure by replacing the indicator 'x' by variables representing agriculture, industry and services, trade and government expenditure, respectively. Also, decomposing outputs into three major sectors (agriculture, manufacturing and services) will help us to examine the structural shift the economy experiences with rise in income, openness in trade and policy shock.

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<sup>48</sup> On advantage of Theil measure of inequality over other measures of inequality, like Gini etc., is that it is independent of size-variations among regions as has been shown by Azad (1992). Further, the entropy captures all moments of distribution, whereas the commonly used measures such as coefficient of variation or disparity ratio are based upon mean and dispersion only. Moreover, while the coefficient of variation is an average index of inequality for all the regions, the entropy measure apart from giving an average index also provides information on the relative position of a region in the sample as described in terms of ratios,  $\frac{y_i}{p_i}$ , which we call "Theil Ratios". Another popular measure of inequality is Gini Coefficient, but inequality represented by Gini Coefficient cannot be decomposed into inequality within and between differently defined population subgroups. These are the reasons for our preference of entropy index of inequality over other similar measures for measuring inter-country income inequalities in EU and ASEAN. We will still be making use of Gini indices for assessing intra-country income inequality or intra-country income convergence in individual countries of the EU and the ASEAN. The Theil index has decomposability properties that make it especially useful. It can indeed be calculated for groups of individuals and decomposed additively into within-groups and between-groups components (that is, the within- and between-groups components add up to the overall index).

We will be examining the trends in Theil index of GDP, and its sectoral components, as well as Theil index of trade and Theil index of government expenditure to scale the process of income convergence, considering convergence in structural transformation, as well as convergence in trade openness across the countries of the EU and the ASEAN.

### **3.3.3 Model to Study the Role of Trade in per-capita Income Convergence using Theil Ratios**

#### ***3.3.3.1 The Concept of Theil Ratio***

Theil index of inequality gives an idea of the average levels of inequality for a group of countries, there is no way we can find any information from the index how different countries have reacted to exogenous shocks like trade openness or policy changes like an increase government expenditure, unless we cull Theil ratio from the index which provides information on the relative position of a country in the region (Barua et al, 2006). Theil income ratio is defined as the ratio,  $(y_i/p_i)$ ; where  $y_i$  is the share of country's income in total income of the group and  $p_i$  is the share of country's population in the total population. If the value of the ratio, *IncomeTheil* is unity, then it tells that the share of a country's income in total income of the region is exactly equal to the share of country's population in the total population of the region. So, it can be taken as the benchmark of perfect equality if all countries have this share equal to unity. A value less than unity for a country means that the country is lagging behind another country which has a value exceeding unity. The innovative way in which Theil ratios can be employed to study the dynamics impacts of trade on structural transformation of economies and income convergence across economies has not been explored in depth in previous studies of income convergence and this another area where our study will have its contribution.

#### ***3.3.3.2 Regression Model linking Trade and Income Convergence***

To assess whether trade or other factors do individually influence the position of a single country in relation to other countries in the region, we propose to estimate a panel regression model of individual countries' income Theil ratio on their trade Theil ratios and other controlling variables. In other words, to analyse the effects of trade and factor mobility on per capita income convergence, we formulate the following baseline panel regression model:

$$\ln(\text{IncomeTheil}_{it}) = \beta_0 + \sum_{k=1}^2 \beta_k * \ln(\text{TradeTheil}_{ikt}) + \beta_3 * \ln(\text{CapitalMobility}_{it}) + \beta_4 * (\text{LabourRestrictiveness}_{it}) + u_{it} \quad \text{----- (3.2)}$$

Here, subscript  $i$  denote the country under study at a particular time, designated by  $t$ . It is pertinent, now, to understand each of the variables of the regression equation in details. The dependent variable, i.e. “*IncomeTheil*” is the income Theil ratio<sup>49</sup>. The independent variable, *Tradetheil*, of the regression is the indicator of the intensity of trade among the countries of the trading block (when  $k=1$ , it denotes intra-regional trade) and intensity of international trade (when  $k=2$ , it denotes extra-regional trade) of the countries in trading block. *TradeTheil* is basically trade theil ratio which is calculated in the same fashion as income Theil ratio. It should be noted here that extra-regional trade is basically international trade which excludes the volume of trade of a country within the region it belongs to. The next two explanatory variables under consideration are capital mobility and labour mobility indices for country  $i$  at time  $t$ . According to our hypothesis, we anticipate the signs of the coefficients  $\beta_{k(k=1,2)}$  to be positive as an improvement in trade (intra-regional or extra-regional trade, as is the case) is expected to improve the relative position with respect to the per capita income across the countries, leading to income convergence.

It also becomes crucial to account for factor movements, i.e., labor mobility and capital mobility as impactful vehicle driving income convergence (or divergence) among group of trading nations. As far as economic theory goes, a reallocation of capital from richer to poorer countries speeds up per capita income convergence among countries as incomes in poorer countries rise faster than richer countries, reaping a higher marginal productivity of capital (MPK). Over time, such cross-border capital flows will equalize the MPKs prevailing in all countries. The same economic theory holds good for explaining the relationship between labour mobility and income convergence. Most often, the mobility of factors is restricted by the protective policies prevailing in countries. Formation of free trade areas and customs union encourages factor movements across countries.

However, factor mobility may not always prove to be income growth enhancing for the poorer countries. For instance, a gush of capital inflows giving rise to overvaluation of exchange

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<sup>49</sup> Theil ratio, part of Theil index, which provides information on relative position of a country in a region, is a powerful measure in explaining dynamic transformations in a region.

rate and a loss of international competitiveness will hurt income-growth. To shield against such consequences countries' saving rates need to be higher, exchange rates need to be more competitive and capital inflows channelled in such a way as to raise productivity. Similarly, labour mobility from depressed to prosperous countries doesn't necessarily equalise wage rate, unemployment movements as excess labour supply adds to labour demand and may not be absorbed efficiently. Thus, a negative impact of labour mobility is to increase the gap between income rich and income poor countries. In fact, Gunnar Myrdal in his classic book *Economic Theory and Underdeveloped Regions* (1957) challenges the positive impact of trade and factor mobility and puts forward the thesis of circular and cumulative causation meaning that economic success breeds economic success, and failure breeds failure. Considering this dynamic consequence, Myrdal (1957) proposes that factor mobility and trade may work in advantage of more prosperous countries. This means our  $\beta$ -coefficients can both take a positive or a negative sign, depending on the impact of trade and factor mobility on income in the EU and the ASEAN.

In order to control for the impact of government policies on income inequality, Barua et al (2006) suggest inclusion of Theil ratio of government expenditure in addition to Theil ratio of trade. Thus, to control for the impact of domestic policies, we will also estimate the following extended panel regression model for EU and ASEAN to capture country-specific characteristics, in addition to impact of trade:

$$\ln(\text{IncomeTheil}_{it}) = \beta_0 + \sum_{k=1}^2 \beta_k * \ln(\text{TradeTheil}_{ikt}) + \beta_3 * \ln(\text{CapitalMobility}_{it}) + \beta_4 * (\text{LabourRestrictiveness}_{it}) + \beta_5 * (\text{gov\_theil}) + u_{it} \text{ ----- (3.3)}$$

Theoretically, the government expenditure can have both negative and positive effects on growth. On the one hand, government expenditure can affect growth adversely because of crowding out effects on private investment (Landau, 1983; Engen and Skinner, 1992). Higher government expenditure also implies high taxes, most of which are growth-reducing due to their distortionary nature (De Gregorio, 1992). It may also be a source of inefficiency due to rent-seeking (Hamilton, 2013). On the other hand, however, government expenditure can play a growth enhancing role by providing public goods and infrastructure, minimizing externalities, ensuring rule of law, and maintaining a reliable medium of exchange. From a Keynesian perspective increased government spending increases aggregate demand that in turn induces growth in GDP.



Hence, the impact of government expenditure on income in the EU and the ASEAN will determine the sign of estimated coefficient of government Theil ratio.

The above panel regression models will be estimated separately for EU and ASEAN and comparisons will be drawn from the estimation results.

### 3.3.4 Methodology for Evaluating the Role of Relative Backwardness in Income Convergence

As we have discussed earlier, income convergence across countries in the region will necessitate higher rate of growth of per capita incomes of poorer countries as compared to that of richer countries, leading to a reduction in income gap. This is the tenet of Gerchenkron's Relative Backwardness Hypothesis. In this section we will discuss the methodology of testing the hypothesis that relative backwardness plays a role in the process of income convergence. Our empirical analysis of effect of government expenditure<sup>50</sup> and trade on economic growth is based on panel data methodology.

In compliance with the objective of the second hypothesis, following integrated growth specification is used, that incorporates countries' initial output levels, the variable capturing the convergence of long-term GDP levels and a set of control variables to account for host country-specific characteristics:

$$GRPCI_{it} = \alpha_0 + \alpha_1 \ln GDPPC_{it-1} + \alpha_2 TRADE_{it} + \alpha_3 GOVT_{it} + \alpha_4 FinDev_{it} + \alpha_5 INF_{it} + \alpha_6 PolStability_{it} + \varepsilon_{it} \quad (3.4);$$

where the dependent variable  $GRPCI_{it}$  is GDP per capita growth rate of country  $i$  in period  $t$ ;  $\ln GDPPC_{it-1}$  denotes logarithm of GDP per capita of country  $i$  in period  $t-1$ ;  $TRADE_{it}$  represents the total trade (as per cent of GDP) of country  $i$  in period  $t$ ;  $GOVT_{it}$  denotes government expenditure (as per cent of GDP) of country  $i$  in period  $t$ ;  $FinDev_{it}$  denotes the financial development index of country  $i$  in period  $t$  and  $PolStability_{it}$  is the index of political stability of country  $i$  in period  $t$  and  $\varepsilon_{it}$  is the random error term, the structure of the error being dependent on

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<sup>50</sup> An extensive review of literature on the link between government expenditure and growth is presented in the Appendix A3.1.

whether the model is estimated using Ordinary Least Squares (OLS), Fixed Effect Model (FEM) or Random Effect Model (REM) method. The above panel regression model will be estimated separately for the EU and the ASEAN to evaluate whether the countries with relatively lower initial value of per capita GDP experiences relatively higher growth rate of GDP per capita by becoming more resourceful in terms of expansionary government and trade. Also, comparative inferences will be drawn.

In this analysis, the independent variable  $GRPCI_{it}$  and the convergence variable  $\ln GDPPC_{it-1}$  are measured in constant 2010 US dollar. The latter variable is assumed to capture the catch-up influence on a country's economic growth. Along the lines of Relative Backwardness Hypothesis of Gerschenkron (1952), lower the initial income of the country, higher growth rate it will experience in order to catch-up. Therefore, we anticipate that initial income levels will have a negative effect on the growth rates of the countries under consideration. Accordingly, we expect the sign of the estimated value of  $\alpha_1$  to be negative.

The principal variables of interest are  $TRADE_{it}$  and  $GOVT_{it}$ .  $TRADE_{it}$  is the sum of exports and imports of goods and services measured as a share of gross domestic product and  $GOVT_{it}$  is government current expenditures for purchases of goods and services as a share of gross domestic product. As can be inferred from the review of earlier literature, the academic views on the influence of these two variables on income growth is divided (Busse and Koniger, 2012; Zahonogo, 2016 etc). Therefore, the estimated coefficients of  $TRADE_{it}$  and  $GOVT_{it}$  will depend on the host of country-specific characteristics.

In addition to variables capturing trade and government expenditure, it may be noted that inflation rate is an important variable reflecting macroeconomic condition. It is found to be an important determinant of growth process (Barro and Sala-i-Martin, 2004). Although inflation rate is not expected to directly influence the extent to which trade contributes to economic growth, the overall macroeconomic stability reflected in a low inflation rate is assumed to be positively interact with government expenditure and trade (Attari et al., 2013; Nguyen, 2014; Munir et al., 2011; Ramzan et al., 2013). Hence macroeconomic instability could generate market distortions (e.g., crowding out private investments, increasing interest rates, or increasing exchange rate volatility) adversely affecting growth rates in the long run. We expect inflation rate variable to have a negative effect on economic growth. While doing cross-country studies, inflation is usually

measured by the consumer price index (CPI). CPI reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used to construct inflation rate. Since inflation rate is an important variable reflecting macroeconomic conditions, it needs to be incorporated in model ((3.4). Rather than including a variable on inflation rate as explanatory variable in the model, we will be using the data on GDP and growth rate of GDP measured in terms of constant 2010 US dollar which takes into account the effect of inflation. Alternatively, we can add  $INF_{it}$  as the inflation variable to gauge the directional influence of inflation rate, i.e., whether inflation is positively or negatively impacting growth rate in per capita income.

Moreover, socio-economic policies and conditions like political stability ( $PolStability_{it}$ ) and financial development ( $FinDev_{it}$ ) have been found to impact the growth process. The relationship between financial development and economic growth has been extensively analysed in the literature. Most empirical studies conclude that the former, together with a more efficient banking system, accelerates the latter (Levine, 1997, 2005; Wachtel, 2001). Levine (2005) suggests that financial institutions and markets can foster economic growth through several channels, i.e. by (i) easing the exchange of goods and services through the provision of payment services, (ii) mobilising and pooling savings from a large number of investors, (iii) acquiring and processing information about enterprises and possible investment projects, thus allocating savings to their most productive use, (iv) monitoring investment and carrying out corporate governance, and (v) diversifying, increasing liquidity and reducing intertemporal risk. Each of these functions can influence saving and investment decisions and hence economic growth. The pivotal work by Alesina et al (1996) assume that political instability may reduce investment and the speed of economic growth and development.

It should be noted that literature highlights that the extent to which trade openness contributes to economic growth is also dependent on the stock of human capital available in the economies (Lucas, 1988; Owen, 1999; Gould et al., 1995; Barro and Lee, 1993, 2001; Acemoglu, 2001; Isaksson, 2002; Karimzadeh, 2013 etc.); thus, human capital is also an important determinant of growth rate of a country. However, we have not included human capital in the analysis, since data on the usual proxy variables for human capital, such as “average years of schooling” (Kyriacou, 1991; Benhabib and Spiegel, 1994; Birdsall and Londono, 1997; Lopez et

al., 1998; Bils and Klenow, 2000; Cohen and Soto, 2007; Zhang et al., 2011 etc.) and “labour with secondary education,” (Hanuskek and Kinko, 2000; Ranis et al., 2000; Fields, 2000; Klasen, 2002; Rouse, 2005 etc.) are typically not available for all the years under study<sup>51</sup>.

### **3.3.5 Methodology to Study the Link between Trade, Structural Transformation and Income Convergence**

The examination of the link between trade and income convergence via structural transformation involves two steps. The first is to examine which sectoral component of GDP contributed to the decline in overall income inequality in the region and the second is to determine whether trade has impacted the growth of that particular sectoral share of the GDP in the low-income countries of the region. By implication, we can say that trade has impacted income convergence by propelling structural transformation in favour of the poorer countries in the region.

#### ***3.3.5.1 Preliminary Investigation into the Relationship between Income Inequality and the Inequalities in its Sectoral Components***

As a preliminary investigation into the relationship between income inequality and the inequalities in its various components (viz., share of agriculture in income, share of industry in income and share of services in income), a cross-sectional regression analysis is performed where Theil index of income inequality is regressed on the Theil inequalities in its components. Precisely, we do an Ordinary Least Squares (OLS)<sup>52</sup> estimation of the following regression model for the EU and the ASEAN countries separately:

$$\begin{aligned}
 & \text{Income Theil Index}_t \\
 & = \beta_0 + \beta_1 \text{Theil Index of Agriculture}_t + \beta_2 \text{Theil Index of Industry}_t \\
 & + \beta_3 \text{Theil Index of Services}_t + \epsilon_t \text{ --- (3.5)}
 \end{aligned}$$

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<sup>51</sup> Barro-Lee database, the database that is widely used in research studies, reports data on education index once in 5 years. Interpolation of data to make it annual series may lead to bias in analysis.

<sup>52</sup> Our methodology is borrowed from Barua et al. (2010) who employ similar methodology for Indian economy.

The variables of the regression model have already been discussed in the section 3.3.2 and  $\epsilon_t$  is the error term which satisfies the assumptions of the OLS model<sup>53</sup>.

### 3.3.5.2 *Chenery Syrquin Equation for Structural Transformation*

Next, in order to determine the structural change across the regions due to trade, we will estimate the following semi-log version of augmented Chenery-Syrquin<sup>54</sup> model which also accounts for the non-linear income and size (population) effect:

$$X_{it} = \beta_0 + \beta_1(\ln Y_{it}) + \beta_2(\ln Y_{it})^2 + \beta_3(\ln N_{it}) + \beta_4(\ln N_{it})^2 + \beta_5 \ln TRADE_{it} + \beta_6 PCD * \ln TRADE \text{ -----(3.6)}$$

$X$  is the dependent variable representing various sectoral shares (i.e.,  $X$  represents the share of agriculture in GDP, share of industry in GDP and share of services in GDP; therefore, we estimate three regression equations),  $Y_{it}$  is per capita income (GDP) of country  $i$  at time  $t$ ;  $N_{it}$  is the population of country  $i$  at time  $t$ ;  $\ln TRADE_{it}$  is logarithm of total trade as percentage of GDP for country  $i$  at time  $t$  and  $PCD$  is “poor country” dummy variable<sup>55</sup>.  $PCD$  dummy for the EU and the ASEAN is constructed so that it takes value 1 for countries that have per capita income levels below the median income level of the EU/ASEAN in the year 2000. Thus,  $PCD * \ln TRADE$  is the interaction term in the regression model that captures the impact of trade openness on sectoral shares in low income countries of the EU and the ASEAN.

The regression equation is purported to explain that the output share of each sector depends on per capita income as well as the size of the population and trade openness. The process of structural transformation encompasses a reciprocal relationship between increasing income and the change in the proportion of the supply and demand. According to Chenery (1988), such

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<sup>53</sup> The error term is normally distributed and is homoscedastic and autocorrelated for all values of  $t$ .

<sup>54</sup> The well-known Chenery-Syrquin model provides the basic structuralist view on economic growth. It states that the manufacturing sector is the key sector that provides momentum for economic growth and thus determines the level of income, i.e., as the per capita income rises, the share of industries in GDP also rises and the share of agriculture falls.

<sup>55</sup> A similar exercise was done by Barua et al, 2010 in the Indian context. However, their definition of “poor/special state status dummy” differs from the way we define “poor country dummy” in the contexts of the EU and the ASEAN countries respectively. Barua et al. 2010 have defined “special state status” as representing Indian states where the Indian government provides economic incentives to encourage manufacturing orientation in the state. Construction of  $PCD$  for our study is explained in section 3.4.2.

relationship between income and the proportion of supply and demand is impacted by overall macroeconomic policies as well as sector-specific policies. Although, Chenery (1988) didn't highlight that macroeconomic policy could also relate to trade policy, in our augmented Chenery-Syrquin model (3.6) we have included the trade variable as considerable attention that has been placed on the role of trade openness in the growth process. Additionally, trade encourages high degree of specialization, expansion of market and allocation of economic activity across broad sectors across different countries of the regions. So, it becomes relevant to study the dynamic impact of trade on income convergence via its impact on convergence of structural set up of the countries. In their studies on the factors leading to the movement of activity out of agriculture and into industrial and services sector, Dennis and Iscan (2009), Ungor (2011), Huang (2011), Uy, Yi and Zhang (2013) etc. considered the role of trade in this transition. Our study is different from the previous study linking trade and structural transformation in the way that we consider how shares of agriculture, industry and services in total income change with an increase in trade rather than change in employment or labour shares and productivity in these sectors. Not only are we examining the process of structural transformation as a whole, but also whether poor countries in the region are undergoing the structural transformation.

While the per capita income variable captures the income effect of demand and the operation of Engel's law<sup>56</sup>, the population size variable represents the extent of demand, which affects the size of production and economies of scale. From the results obtained by recent standard cross-country results in literature (Ho, 2015; Mensah et al., 2016; Barua et al., 2016; Kanbur et al., 2017 etc.), we expect that the coefficients of these variables will take positive values for share of industries and services, implying that as income rises the demand for industrial and services output will rise following Engel's law and therefore it leads to a rise in the share of these sectors in GDP. Similarly, as the size of the population increases, the scale of production also rises with associated effects on reduction of the cost of production. The latter effect also will have an upward thrust on

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56 Engel's law is an observation in economics stating that as income rises, the proportion of income spent on basic commodities fall, even if absolute expenditure on basic commodities rise. In other words, the income elasticity of demand of basic commodities is between 0 and 1. Basic commodities are assumed to be production of agricultural commodities.

the share of industries and services. Corollary to this, we expect that both the share of agriculture and population; and share of agriculture and income to be inversely related to each other.

The variable of our interest is ‘trade’. What value the estimated coefficient of trade will take depends on how trade affect the process of structural transformation. The presumption is that trade openness will allow resources to be shifted away from primary agricultural sector to the industrial enterprises and eventually to services sector, since the lower income countries have comparative advantage in relatively unskilled labour-intensive industries. If it does indeed happen, then we expect that the share of industries and services in GDP will also rise with trade for each country and that of agriculture will decline, and accordingly each country should experience a rise in its per capita income as argued above in our analysis of structural change and economic growth. Thus, the estimated coefficient of trade will assume a positive coefficient for industrial and services orientation and negative coefficient for agricultural orientation. However, this structural transformation may increase or decrease income inequality depending on whether the impact on sectoral shares is unevenly or evenly spread out across the countries of the EU and ASEAN which will be captured by the estimated coefficient on the variable of poor country dummy, PCD. The dummy variable, PCD can be interpreted as the variable capturing the structural orientation of poor countries of the region.

### **3.4 Data Source and Variable Construction**

Data for this study has been mainly drawn from three databases- World Bank Database, United Nations Comtrade (UNCOMTRADE) database, International Monetary Fund (IMF) Database etc. In addition, we have also sourced data from Organisation for Economic Co-operation and Development (OECD) database, EUROSTAT database and SWIID Database. Following subsections provides an in-depth discussion on the construction of variables used in our analysis.

### 3.4.1 Data Sources

1. Data on total population and gross domestic product (GDP)<sup>57</sup> for all the countries of the EU and the ASEAN is taken from World Development Indicators (WDI) Database of World Bank.
2. The data for value added share of agriculture, industry and services in GDP for all countries in the EU and ASEAN have been sourced from WDI, World Bank
3. Data on total trade for all the countries of the EU and the ASEAN, which is expressed as the sum of exports and imports of goods and services measured as a share of gross domestic product, is sourced from WDI database of World Bank.
4. Data on country-wise total volume of intra-regional and total international trade (export plus import) is obtained from UNCOMTRADE.
5. Data on general government expenditure<sup>58</sup> and inflation<sup>59</sup> for all the countries of the EU and the ASEAN (annual frequency) are sourced from WDI database of World Bank.
6. The index for financial development is sourced from Financial Dataset of the International Monetary Fund (IMF). Financial development is defined, by the IMF working paper, as a combination of depth (size and liquidity of markets), access (ability of individuals and companies to access financial services), and efficiency (ability of institutions to provide financial services at low cost and with sustainable revenues, and the level of activity of capital markets). Hence financial development index<sup>60</sup> for a country reflects how overall developed financial institutions and financial markets are in a country.

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<sup>57</sup> GDP is total GDP of the country at market prices. It is calculated at constant base year of 2010 and is expressed in US dollars.

<sup>58</sup> General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defence and security but excludes government military expenditures that are part of government capital formation (Source: WDI). It is expressed as a share of gross domestic product.

<sup>59</sup> Measured by consumer price index (CPI).

<sup>60</sup> The IMF working paper 16/5 creates nine indices that summarize how developed financial institutions and financial markets are in terms of their depth, access, and efficiency. These indices are then aggregated into an overall index of financial development. With the coverage of 183 countries on annual frequency between 1980 and 2013, the database offers a useful analytical tool for research involving financial development.



7. Data on index of political stability has been sourced from the Worldwide Governance Indicators (2016)<sup>61</sup><sup>62</sup> of the World Bank. The index measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism.
8. Data on capital mobility indicators for all the countries of the EU and the ASEN are sourced from the database constructed by Chinn-Ito Database<sup>63</sup>(2014).
9. Data on total labour force and total unemployment<sup>64</sup> rates as percentage of total labour force for each country under consideration are extracted from WDI database.

The frequency of the data is annual.

The time period for the first part of the study will be 2000-2014. The time period is decided subject to the availability of the data and historic and socio-economic importance of the period which is discussed in the section 3.5 that follows. It has been tried to consider as wider a time period as possible so that the estimates of the coefficients of the models are robustly calculated.

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<sup>61</sup> The Worldwide Governance Indicators (WGI) are a research dataset summarizing the views on the quality of governance provided by a large number of enterprises, citizen and expert survey respondents in industrial and developing countries. These data are gathered from a number of survey institutes, think tanks, non-governmental organizations, international organizations, and private sector firms.

<sup>62</sup> Details on the underlying data sources, the aggregation method, and the interpretation of the indicators, can be found in the WGI methodology paper: Daniel Kaufmann, Aart Kraay and Massimo Mastruzzi (2010). "The Worldwide Governance Indicators: A Summary of Methodology, Data and Analytical Issues". World Bank Policy Research Working Paper No. 5430.

<sup>63</sup> The dataset is available in Excel or STATA format (STATA 12 dataset format). The data file contains the Chinn and Ito capital mobility index series for the time period of 1970-2014 for 182 countries. This index is widely used in various studies. The details of this series will be discussed in ensuing section.

<sup>64</sup> Unemployment here means general level of unemployment persisting in the country at a given year. It is expressed in thousands.

## 3.4.2 Construction of Database Pertaining to the First Part of the Study: Trade and Per Capita Income Convergence

### 3.4.2.1 Calculation of Theil Index of Inequalities for carrying out Trend Analysis.

In order to calculate income Theil index, we have sourced data on GDP<sup>65</sup> and total population for the EU and the ASEAN countries from WDI and used the formula (3.1). For trade theil index, the data on country-wise total volume of intra-regional trade (export plus import) is obtained from UNCOMTRADE. This data is then used to generate the country-wise data series of extra-regional trade values. Then intra-regional and extra-regional trade Theil indices are calculated using the mathematical specification (3.1), replacing  $x_i$  by  $t_i$ , where  $t_i$  is country  $i$ 's share in total intra-regional in the region and country  $i$ 's share in total extra-regional of the region respectively. For data on Theil Indices of Government Expenditure, General Government Final Consumption Expenditure as percentage of GDP<sup>66</sup> is sourced from WDI and are applied to GDP to derive overall expenditure volume,  $g_i$  respectively for country  $i$ . Thereafter, formula (3.1) is applied replacing  $x_i$  by  $g_i$  to get final index. Finally, for data on Theil Indices of sectoral shares of GDP, value added by agriculture, industries and services as percentages of GDP are sourced from WDI and are applied to GDP to derive overall value added by these sectors,  $a_i$ ,  $i_i$  and  $s_i$  respectively for country  $i$ . Then, formula (3.1) is applied replacing  $x_i$  by  $a_i$ ,  $i_i$  and  $s_i$ , respectively to get final sectoral Theil indices.

### 3.4.2.2 Construction of Database for Regression on Theil Ratio

#### Income Theil Ratio

Mathematically, Theil ratio of income is simply given by:

$$IncomeTheil_{it} = \frac{y_{it}}{p_{it}} \quad \text{-----} \quad (3.7)$$

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<sup>65</sup> GDP is total GDP of the country at market prices. It is calculated at constant base year of 2010 and is expressed in US dollars.

<sup>66</sup> General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defense and security but excludes government military expenditures that are part of government capital formation (Source: WDI).

### Trade Theil Ratio

After obtaining the data on country-wise total volume of intra-region trade (export plus import) from UNCOMTRADE and calculating extra regional trade values thereof, country-wise intra-regional trade Theil ratios are calculated using the mathematical specification (3.7), replacing  $y_i$  by  $t_i$ , where  $t_i$  is country  $i$ 's respective shares in total intra-regional and extra-regional trade in the region.

### Theil Ratio of Government Expenditure

Data for Theil ratio for government expenditure is generated using formula (3.7), which will be used in our extended regression model. Data for government expenditure is not available for Myanmar, hence this country is not included for our regression analysis.

### Capital Mobility Index

It is difficult to measure with precision the degree or extent of a country's capital and labor mobility with precision. Therefore, the choice of capital mobility indicator and labor mobility indicator is crucial and is based on the extensive study of the existing literature. Firstly, let's concentrate on the choice of capital mobility index. In the next subsection, we will discuss about the choice of labor mobility index. A country's capital mobility is believed to be reflected by the country's capital account balance, which is the difference between savings and investment. Various literature, Fisher (1930) to cite one, have used the relationship between the domestic saving and domestic investment of a country as an indicator of capital mobility. The rationale behind this is that with perfect world capital mobility, there would be insignificant or no relation between the amounts of saving created in a country and the domestic investment in that country. In contrast, if there are rigidities that obstruct the flow of long-term capital among countries, increases in domestic saving would be primarily due to additional domestic investment. The statistical evidence to substantiate this rationale has been provided by Feldstein and Horioka (1979) in their study on 16 OECD countries. They found that correlation between the savings and investments ratios were very high and positive, and concluded that these results strongly direct at the fact that long term capital was subject to significant impediments. Frankel (1989) applied the Feldstein-Horioka test to a large number of countries during the 1980s, which also included a number of Latin American nations. His results were also similar, indicating that savings and

investment have been significantly positively correlated in most countries. Montiel (1994) estimated a series of Feldstein-Harioka equations for emerging countries. He argues that the estimated regression coefficient for the industrial countries could be used as a benchmark for evaluating whether a particular country's capital account is open or not. According to him, a saving ratio regression coefficient of 0.6 provides a satisfactory benchmark, i.e., if a country regression coefficient exceeds 0.6, it can be classified as having a "closed" capital account; if the coefficient is lower than 0.6 the country has a rather high degree of capital mobility. Using this procedure, he concluded that many emerging nations have demonstrated a remarkable degree of capital mobility which is much greater than what an analysis of legal restrictions would propose. Later, Blanchard and Giavazzi (2002), in their study on Europe, argued that the whole process of financial integration must have an influence on the evolution of current accounts. They found that there is evidence of increased dispersion of current account balances which in turn reflects an increase over time in the tendency for capital to flow from the richer to the poorer European countries. Using the saving-investment differential as an index of capital mobility, Blanchard and Giavazzi (2002) showed that the size of the coefficient on per capita income in the current account equation increased meaning that the current account balances had become more responsive to a country's per capita income, with richer countries running larger current account balances. Accordingly, they speculated, that this responsiveness was associated with the process of financial integration within Europe. Nevertheless, this statement that there would be insignificant relation between savings and investments is sometimes misleading because this notion strictly holds only in a deterministic, or perfect-foresight, framework. Thus, it is only a rough first approximation in a dynamic economy. Moreover, even in a deterministic setup, positive association between savings and investment could emerge as a result of population growth or technological change (Obstfeld, 1986).

Another indicator was suggested by a stream of studies, Edwards (1985, 1988) and Edwards and Khan (1985). According to these studies, time series on domestic and international interest rates could be used to assess the degree of openness of the capital account. They used a general model that yields the closed and open economies cases as corner solutions to the economic degree of capital integration. They argued that capital restrictions play two roles: First, they introduce divergences to interest rate parity conditions and they tend to slow down the process of interest rate convergence. Haque and Montiel (1990), Resisen and Yeches (1991) and Montiel

(1994) have provide expansion of this model that allow for estimation of degree of capital mobility even in cases when there are not enough data on domestic interest rates, and that considered the possibility of a changing degree of capital mobility over time. Later, Dooley, Mathieson, and Rojas-Suarez (1997) developed a method for measuring changes in degree of capital mobility in developing countries while arguing that Edwards and Khan (1985) approach can give rise misleading results. They develop a model that recognizes the cost of undertaking disguised capital flows<sup>67</sup>.

Yet another index for capital mobility, which has been floated not long ago and is being frequently used in current studies, is based on the information in the International Monetary Fund's (IMF) Exchange Rate and Monetary Arrangements. Since 1967, Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) provides information on the extent and nature of the rules and regulations governing external account transactions for a wide cross-section of countries. It contains a summary table that conveniently enumerates the presence of restrictions for the countries. This table has provided the basis for researchers to come up with the dichotomous measure of capital controls or financial openness. Alesina, Grilli and Milesi-Ferreti (1994), for example, constructed a dummy variable index of capital controls. This indicator – which takes a value of one when according to the IMF capital controls are in place and zero otherwise -- was then used to analyze some of the political forces behind the imposition of capital restrictions in a score of countries. Rodrik (1998) used a similar index to investigate the effects of capital controls on growth, inflation and investment between 1979 and 1989. His results suggest that, after controlling for other variables, capital restrictions have no significant effects on macroeconomic performance. An important limitation of these IMF-based indexes, however, is that they are extremely general and do not distinguish between different intensities of capital restrictions. Moreover, they fail to distinguish between the type of flow that is being restricted, and they ignore the fact that, as discussed above, legal restrictions are frequently circumvented.

Quinn (1997) has constructed the most comprehensive set of cross-country indicators on the degree of capital mobility. His indicators cover 20 advanced countries and 45 emerging

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<sup>67</sup> The model is estimated using a Kalman filter technique for three countries – Mexico, Philippines and Korea. The authors suggest that the countries experienced a very significant increase in degree of capital mobility between 1977 and 1989.

economies. These indexes have two distinct advantages over other indicators: First, they are not restricted to a binary classification, where countries capital accounts are either open or closed. Quinn uses a scale of 0 through 4 to classify the countries in his sample, with a higher number meaning a more open capital account. Second, Quinn indexes cover more than one-time period, allowing researchers to investigate whether there is a connection between capital account liberalization and economic performance. This is, indeed, a significant improvement over traditional indexes that have concentrated on a particular period in time, without allowing researchers to analyze whether countries those open up to international capital movements have experienced changes in performance.

The latest advancement in the capital mobility index was done by Menzie Chinn and Hiro Ito (2006). The index created by them, Chinn-Ito index or KAOPEN is also based on AREAR report. KAOPEN is a cumulative index of binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's AREAER. Up to 1996 dummy variables were assigned for the four major categories on the restrictions on external accounts; namely k1 for the variable representing the presence of multiple exchange rates, k2 for restrictions on current account transactions, k3 for restrictions on capital account transactions and finally k4 for requirement of the surrender of export proceeds.

In 1996, the classification method in the AREAER changed and these four categories were disaggregated further, so that these categories can better mirror the complexity of capital controls policies. For the extension and updation of the four binary classifications after 1996, they followed the method suggested by Mody and Murshid (2005). In order to focus on the effect of financial openness— rather than controls— they reverse the values of these binary variables such that the variables are equal to one when there are no capital account restrictions. Besides, for controls on capital transitions ( $k_3$ ), they use the share of a five-year window (encompassing year t and the preceding four years) that capital controls were not in effect ( $SHAREk_3$ ).

$$SHAREk_{3,t} = \frac{k_{3,t} + k_{3,t-1} + k_{3,t-2} + k_{3,t-3} + k_{3,t-4}}{5} \text{ --- (3.8)}$$

Then the index for capital “openness”, ( $KAOPEN_t$ ), is constructed which is the first standardized principal component of  $k1_t$ ,  $k2_t$ ,  $SHAREk_3$ ,  $k4_t$ . This index assumes higher values the more open the country is to cross-border capital transactions.

This study shall borrow Chinn and Ito's  $KAOPEN_t$  index for the analysis. The advantage of this index is that it has been updated for 2014 using the summary table of AREAR 2015. They have constructed and compiled the capital mobility indices for 182 countries encompassing the time period of 1970-2014. This study uses their data file *kaopen\_2014.xls*. Luxembourg, Malta, Romania, Spain, Sweden and Brunei Darussalam have no observation for capital mobility index. So, these countries have been dropped from our samples before carrying out econometric analysis. The Chinn-Ito index is often used by international experts to quantify the level of openness of capital accounts in a given country. In 2014, the index values ranged from -1.91 to +2.36 (the higher the value of the index, the greater the financial openness in the country). A review of the indicator in EU member countries and ASEAN member countries shows a considerable spread in index values. In the ASEAN, the best value is boasted by Singapore at +2.36, with Cambodia and the Philippines featuring positive readings as well. The other countries of the ASEAN post negative values for the index, meaning that the capital account in the countries are not that open. In the case of EU, the average value of the index is +2.06, with all the countries in the EU featuring positive value. Thus, as compared to the ASEAN, the EU countries have greater financial openness

#### *Labour Restrictiveness Index*

Generally, the wage differential and unemployment differential have been used extensively as the indicators of labor mobility. Wider wage differential point to rigidity in labor market, i.e., labor is immobile. However, wage differential cannot be used as a general guide. This is because the properties consistent with adequate real wage flexibility in a stagflationary supply shock situation might indicate inappropriate real wage behavior in the case of a disinflationary demand shock. Thus, rigidity of nominal wages in the face of unanticipated disinflation tends to push up real wages despite rising unemployment. Unemployment dispersion is believed to tide over this problem. The labor mobility indicator used for the study is borrowed from the study by Eichengreen (1990) where unemployment differential within European Community and the United States has been used as the measure of labor mobility to study income convergence in these regions.

Using the data series on total labour force and total unemployment rates as percentage of total labour force for each country under consideration extracted from WDI database, data points for general level of unemployment for each country are obtained. Then, unemployment dispersion

for each country is calculated by taking mean absolute deviation of unemployment level of this country from the rest of the countries in the region. Finally, we apply the formula (3.6) to unemployment dispersions to get our labour restrictiveness index. As higher the unemployment dispersion of a country relative to region, lower is the mobility of labour of that country. In other words, lower value the index takes, higher is the labour mobility between countries.

### **3.4.3 Database for Second Part of the Study: Hypothesis on Relative Backwardness**

For this analysis, the independent variable  $GRPCI_{it}$  and the convergence variable  $\ln GDPPC_{it-1}$ , measured in constant 2010 US dollar; other dependent variables viz.,  $TRADE_{it}$  and  $GOVT_{it}$ , measured as a share of gross domestic product and inflation, measured by the CPI, the index for financial development and index of political stability are used in the regression equation (3.4) as extracted from their respective sources.

### **3.4.4 Database for the Third Part of the Study: Trade and Structural Transformation**

#### ***3.4.4.1 Regression on Theil Indices***

Construction of Theil indices with respect to income and its sectoral components have already been discussed in previous section. These indices enter the regression specification (3.5).

#### ***3.4.4.2 Chenery Syrquin Equation***

In order to construct the  $PCD$  dummy for the EU and the ASEAN, we first calculate the median<sup>68</sup> income level of the EU-28 and ASEAN-10 countries respectively in the year 2000 (i.e., the initial

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<sup>68</sup> We are taking median instead of mean, because we are interested in the relative position of a country with respect to other countries in the group in term of per capita income. While median by definition represents the value posited in the middle of a series, mean is the average of all the values in the series. Thus, the median is more useful than the mean when there are extreme values in the data set as it is not affected by the extreme values. This is true for our case, as in both the EU and the ASEAN, some countries have extremely high values of per capita income and some countries have extremely low values of per capita income.



year of our study). So, the PCD<sup>69</sup> takes value 1 for countries that have per capita income levels below the median income level of the group (EU/ASEAN, as the case may be) in the year 2000. All other variables will enter the regression specification (3.6) as extracted from their respective sources.

### 3.5 Period of Study

The time period of our study is 2000-2014, which is marked with unfolding of great economic dynamism in the EU as well as the ASEAN.

The Maastricht Treaty (or the Treaty of European Union), which was signed in 1993, proved to be the major milestone establishing the EU<sup>70</sup> and setting clear rules for the future single currency as well as introduced European Citizenship. This was followed by the completion of the Single Market which implemented the “four freedoms”—of people, goods, services, and capital within EU, introduction of Euro as single official currency and inauguration of European Central Bank (ECB) in Frankfurt, Germany which was charged with the responsibility for framing and implementing the EU’s monetary policy and managing the euro. Post the Maastricht Treaty, the period 2000-2014 saw the biggest enlargement of EU to date, with now 28-member countries (starting with initial 6 founding members<sup>71</sup>) forming the political and economic unit<sup>72</sup>. This is a unique expansion for EU, not only because of its range, but also since during this period countries with considerably less developed economies joined the EU. This makes the issue of convergence crucial for the further development of the EU. During 2000-2014, the adoption of Euro was strongly materialized replacing the old national currencies, with 19 of EU members using the

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<sup>69</sup> In case of EU, PCD takes value ‘1’ for Bulgaria, Romania, Latvia, Lithuania, Poland, Estonia, Slovak Republic, Hungary, Croatia, Czech Republic, Malta, Slovenia, Portugal, and Greece. In the case of ASEAN, PCD takes value ‘1’ for Cambodia, Lao PDR, Myanmar and Vietnam.

<sup>70</sup> Under the Maastricht Treaty, the name “European Union” officially replaced “European Community/Communities”.

<sup>71</sup> Founding members of EU- Belgium, France, Germany, Italy, Luxembourg and Netherlands.

<sup>72</sup> The countries that joined the EU during 2000-2014 are- Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia, Malta, Bulgaria, Romania, Croatia.

Euro<sup>73</sup>. Also, in this period the Schengen area (that emerged with Schengen Agreement of 1985<sup>74</sup>) underwent a major enlargement through the abolition of control of land and sea borders and border checks on intra-Schengen flights at airports were abolished. As a result, free movement was guaranteed within a territory covering 25 countries out of which 22 countries are EU member states<sup>75</sup>. Moreover, EU was expanding its international trade with neighbouring countries, for example, in 2007 the Transatlantic Economic Council (TEC) was created as a part of Transatlantic Economic Partnership (TEP)<sup>76</sup> to oversee and accelerate economic integration between EU and U.S.A. and in the field of trade and investment. Hence, the period 2000-2014 imbibes the effects of agreements and policies made prior to 2000 as well as is a witness to economic dynamism in the region.

Data prior to 2000 will reflect confounding impact of trade and other factors of per capita income convergence as the impact of East Asian Crisis of 1997 will overshadow the impact of these factors considered for the study. After the East Asian Financial Crisis of 1997, a revival of the Malaysian proposal<sup>77</sup>, known as the Chiang Mai Initiative, was put forward in Chiang Mai, Thailand. It called for better integration of the economies of ASEAN as well as the ASEAN plus

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<sup>73</sup> EU members that do not use the EURO are- Bulgaria, Croatia, Czech Republic, Denmark, Hungary, Poland, Romania, Sweden, the United Kingdom. The UK and Denmark have opted out of ever using the Euro. All other EU countries must enter the eurozone after meeting certain criteria.

<sup>74</sup> The Schengen Agreement is a treaty which led to the creation of Europe's Schengen Area, in which internal border checks have largely been abolished. It was signed on 14 June 1985, near the town of Schengen, Luxembourg, by five of the ten member states of the then European Economic Community. It proposed measures intended to gradually abolish border checks at the signatories' common borders.

<sup>75</sup> Of the six EU members that are not part of the Schengen Area, four – Bulgaria, Croatia, Cyprus, and Romania – are legally obliged to join the area, while the other two – the Republic of Ireland and the United Kingdom – maintain opt-outs. The four European Free Trade Association (EFTA) member states, Iceland, Liechtenstein, Norway, and Switzerland, are not members of the EU, but have signed agreements in association with the Schengen Agreement.

<sup>76</sup> EU and U.S. leaders adopted a joint statement on the Transatlantic Economic Partnership (TEP) in 1998, identifying ways to intensify and extend multilateral and bilateral cooperation.

<sup>77</sup> In 1990, Malaysia proposed the creation of an East Asia Economic Caucus (EAEC) composed of the members of ASEAN as well as the People's Republic of China, Japan, and South Korea. EAEC was a regional free trade zone. Japan refused participation due to the exclusion of the Western nations, which were already members of APEC and many other notable regional organizations in East Asia.

three countries, China, Japan, and South Korea and intended to avoid a future recurrence of Asian Financial Crisis. The ASEAN Free Trade Area (AFTA), which was established on 28 January 1992, includes a Common Effective Preferential Tariff (CEPT) to promote the free flow of goods between member states. When the AFTA agreement was originally signed, ASEAN had only six members: Brunei, Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Vietnam joined in 1995, Laos and Burma in 1997, and Cambodia in 1999, therefore, the full import of AFTA will be reflected in post 2000 data. Also, ASEAN has been moving towards the creation of a single market and production base, a competitive economic region, a region of equitable economic development, and a region that is fully integrated into the global economy<sup>78</sup>. Since 2007, ASEAN countries have gradually lowered their import duties to member nations. On 15 December 2008, the members of ASEAN met in the Indonesian capital of Jakarta to launch a charter, signed in November 2007, with the aim of moving closer to "an EU-style community". The charter turned ASEAN into a legal entity and aimed to create a single free-trade area for the region encompassing 500 million people. This incident is another motivation to do a comparative study on EU and ASEAN during the same period i.e. 2000-2014.

Thus, we see that both the ASEAN and EU nations have witnessed major economic developments post 2000. Also, most of the studies on trade and convergence in EU and ASEAN have focussed on the period before 2000. We could not be extended our analysis beyond 2014 owing to data constraints.

### **3.6 Summing Up**

This chapter begins with stating three hypotheses that the study intends to investigate. The hypotheses pertain to the investigation of the role of trade on income convergence among the EU and the ASEAN nations via two channels- growth in income and structural transformation. The chapter has discussed the methodologies for the analysis of the hypotheses. The construction of various indices relating to trade intensity, labor mobility, capital mobility, and income Theil; required for the analysis of per capita income convergence has been clearly outlined in this chapter.

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<sup>78</sup>See, AEC vision 2020.

Next, the chapter describes the various sources of data required for the study. The main data sources are UN COMTRADE, WDI database of World Bank and Chinn-Ito Database. Finally, the chapter discusses the rationale behind considering the time period of the study to be 2000-2014.

## Chapter IV

# Role of Trade in Per Capita Income Convergence: Empirical Evidence from the EU and the ASEAN

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### 4.1 Introduction

This chapter of the study consists of the analysis of the first hypothesis - whether trade plays a significant role in per capita income convergence among the ASEAN and the EU countries. This involves- first, the examination of whether the countries belonging to the EU and the ASEAN exhibit per capita income convergence; and second, whether trade has any significant role to play in the process of income convergence.

Literature that deal with the link between trade and income convergence emphasize the role of trade in income growth and convergence via the benefits of trade in terms of greater capacity utilization, efficient resource allocation according to comparative advantage (Ventura 1997; Ghose 2004; Dawson 2007; Velde, 2011), exploitation of the technical improvements, knowledge spill-overs (Balassa 1978; Krueger 1980, Feder 1982; Baumol, 1986; Edwards 1992), economies of scale, expansion of market, factor mobility leading to higher returns to factors, competent management in response to competitive pressure abroad etc (Ben-David, 1996; Ben-David and Rahaman, 1996; Sachs and Warner, 1995). These lead to increase in growth rate of income in economies that open up for trade amongst themselves and with the rest of the world and their integration eventually leads to convergence of incomes. On the other hand, there are studies that argue that trade increase income differences between regions or countries, leading to income divergence across countries or regions (Myrdal, 1957; Prebisch, 1959; Perroux, 1964, Slaughter, 1997). The chief reason that these studies cite is that the high- income countries or the centre may witness increased concentration of industries (and hence increased convergence of technology, knowledge and skill) rather than dispersing industries to the low-income countries or the periphery. Also, capital and labour may be complementary to each other which means that they are attracted to high income possibilities in center, worsening the prospects for the periphery; as, periphery

loses their factors of production. Moreover, the low-income countries may not be capable of adapting to new technologies required for catch-up.

While several explanations have been put forward by various studies on possible channels via which trade can impact convergence or divergence of income among countries, hardly any attempt has been made to do a rigorous empirical examination of the role of trade on income convergence. So far, the few empirical works that have tried to study the link between trade and income convergence leave us uncertain as to whether trade leads to income convergence or it leads to income divergence. Moreover, most of the earlier studies have largely been based on the traditional concepts of beta and sigma convergence in the framework of neoclassical growth models i.e. the studies have either regressed growth rates of per capita income on initial levels of per capita income and other factors that determine income growth and/ or income convergence or have regressed standard deviation of per capita income on various factors. Barro-Sala-i-Martin (1992) approach of convergence analysis is not suitable for analysing the underlying process of dynamic shifts and structural change that an economy witnesses as the forces of trade; factor movements and policy shock get unfolded. In order to capture dynamic shifts that might be taking place in the economy we need to move away from a simplified Solow (1956) and Swan (1956) model of growth underlying Barro-Sala-i- Martin (1992) analysis of convergence and use a multisectoral analytical framework. Therefore, in this chapter, the analysis of convergence is focused on the measure of inequality developed by Theil (1967) in conjunction with the analysis using the traditional beta and sigma convergence.

Empirically, the basic objectives of this chapter are two-fold. *First*, like the previous studies on income convergence, is assessing the evidence of beta and sigma convergence<sup>79</sup> across the EU and the ASEAN countries and re- confirming the same using Theil index of inequality. Earlier studies, trying to examine the occurrence of income convergence in the EU and the ASEAN (adopting the concepts of beta and sigma convergence) have limited their analysis to pre- or early 2000s and not all the countries of the EU and the ASEAN have been included in the analysis. This gives us the motivation to cover the recent time period of 2000-2014 as during this time period,

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<sup>79</sup> In carrying out an analysis of beta and sigma convergence for the EU and the ASEAN, our contribution to the existing literature will be in terms of updation of earlier analysis to recent period, and hence a fresh re-look at static convergence for the period 2000-2014.

the EU and the ASEAN countries have been witnesses to great economic developments<sup>80</sup>. Moreover, thus far there hasn't been any comparative study on per capita income convergence in the EU and the ASEAN. These two particular groups present a wide range of differences<sup>81</sup> in terms of time of formation and advancement, levels of development etc. and hence make interesting case for comparative study to understand whether countries at different stages of development have different growth and convergence experience. *Second* objective is to evaluate the impact of trade in reducing inter-country income inequality and bringing about per capita income convergence within the EU and the ASEAN and whether this impact is differential with respect to these two completely different groups of countries with different degrees of trade openness. We shed light on the significance of international trade openness, and regional integration (intra-regional trade) in contributing per capita income convergence across the EU and the ASEAN nations over the time period 2000-2014. The question of relations between international trade and convergence in the EU and the ASEAN is interesting, precisely because both these groups aim at totally erasing all trade barriers, resulting in a greater trade volume. However, there hasn't been extensive study on the dynamic relationship between trade and income convergence in the EU and ASEAN and comparative study of these two groups of countries. In case of EU, many find evidence of convergence (Armstrong, 1995; Ben-David 1993, 2001; Dewhurst and Mutis-Gaitan, 1995; Leonardi, 1995; Kutan and Yigit, 2009; Boldrin and Canova, 2001; Baruah et al, 2006; Villaverde and Maza, 2008), while others find mixed convergence and divergence, (Marques and Soukiazis, 1998; Dunford, 1996), and still others find or predict divergence (Arestis and Paliginis, 1995; Hallett, 1981; Slaughter, 1997, 2001). Similarly, for the ASEAN, few studies find evidence of convergence (Ismail, 2008; Jayanthakumaran and Lee, 2009, 2013; Chowdhary et al, 2011; Sperlich and Sperlich, 2012; Solarin, 2014), while Mu Shun Wang (2012) find both convergence and divergence over two different time lengths, and still others find divergence (Lim and Mcaleer, 2004; Lee et al, 2005; Korshed, 2005).

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<sup>80</sup> We have listed in details the economic developments witnessed by the EU and the ASEAN in the third chapter of this thesis.

<sup>81</sup> EU is customs union, while ASEAN is a free-trade zone. EU is in a level of supra-national co-operation while ASEAN is in a level of inter-national co-operation. This means EU countries are all tied to each other – monetarily and financially- more intricately than the ASEAN nations. In terms of trade openness, EU is more open than ASEAN. ASEAN opened up to trade only in the 1990s, whereas EU has been open since the 1950s.

We use Theil index of inequality in GDP, its components- agriculture, industry and services; trade and government expenditure to examine whether there is convergence with respect to income, trade and domestic policy variable (in our case, government expenditure) and use individual Theil ratios as powerful measure for explaining the relationship between per capita income convergence and trade<sup>8283</sup>.

The chapter has additional five sections. **Section 4.2** is on the analysis of convergence phenomenon using the concepts of beta and sigma convergences. The section is further divided into two sub-sections, one each for the EU and the ASEAN. In **section 4.3**, which is divided into two subsections, the trend analysis of Theil indices of inequality with respect to GDP; its components, trade and government expenditure for the EU and the ASEAN is carried out. This is followed by **section 4.4** which presents a detailed account of our empirical findings based on panel regression results. **Section 4.4** has two sub-sections viz., **4.4.1** and **4.4.2** where we look into the regression analyses pertaining to the EU and the ASEAN respectively. A comparative analysis of the results on the EU and the ASEAN provided in **section 4.5**. The final **section 4.6** summarises the major findings and concludes the discussion.

## **4.2 Convergence Hypothesis: Graphical Evidence**

Most of the earlier literature based on traditional concepts of beta and sigma convergence in the EU and ASEAN were for period prior to 2000, and there hardly is any study that focus on the

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<sup>82</sup> A similar study was done by Barua et al. (2006) for EU-15 countries for the period 1971 to 2002. Our study differs from theirs in following aspects. We include almost all the countries of the EU, depending on the availability of data, we do a comparative analysis of the EU and the ASEAN, we consider recent time period from 2000 to 2014. Also, another important difference of our study from the study by Barua et al (2006) is in terms of choice of control variables impacting income convergence, the rationale which will be explained in this chapter.

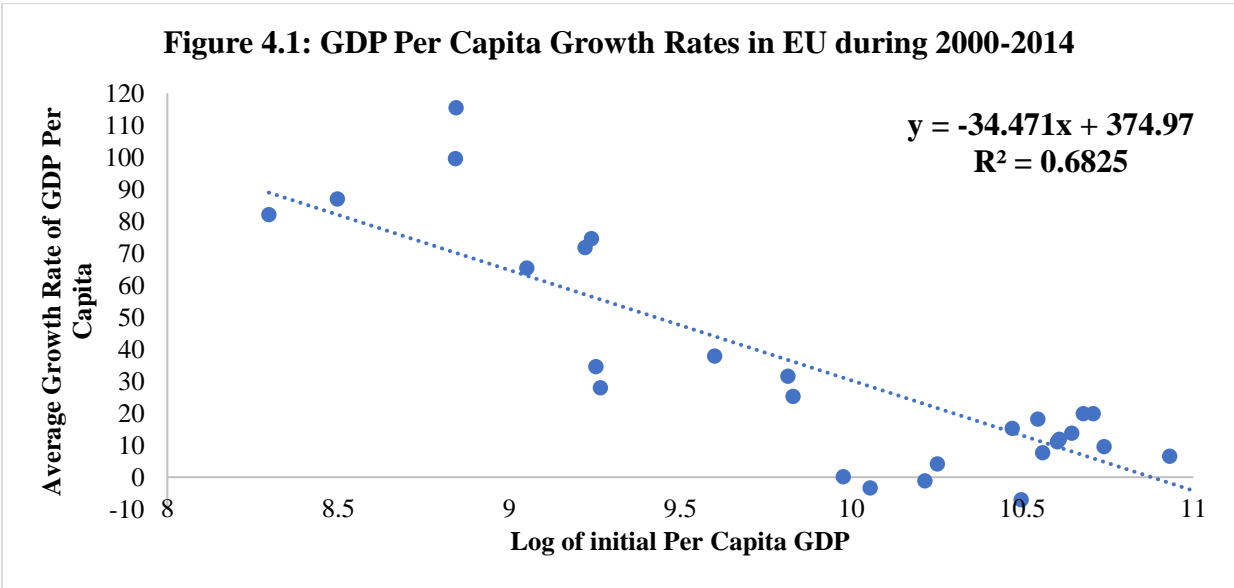
<sup>83</sup> In order to gauge within country inequality of individual countries in the EU and the ASEAN, we will also assess how these countries have performed in terms of Gini indices of inequality in Appendix A4.1. While we use Theil index of inequality to gauge across country income convergence, we use Gini indices for within country income convergence. This is because we don't have access to data on GDP and population for various regions of the countries which are the main components of Theil specification. Moreover, the main focus of the thesis is to study across country income convergence.



recent time period. In this section, we study the beta and sigma convergence in the EU and the ASEAN for the period 2000-2014.

### 4.2.1 Evidence of beta and sigma Convergence in EU

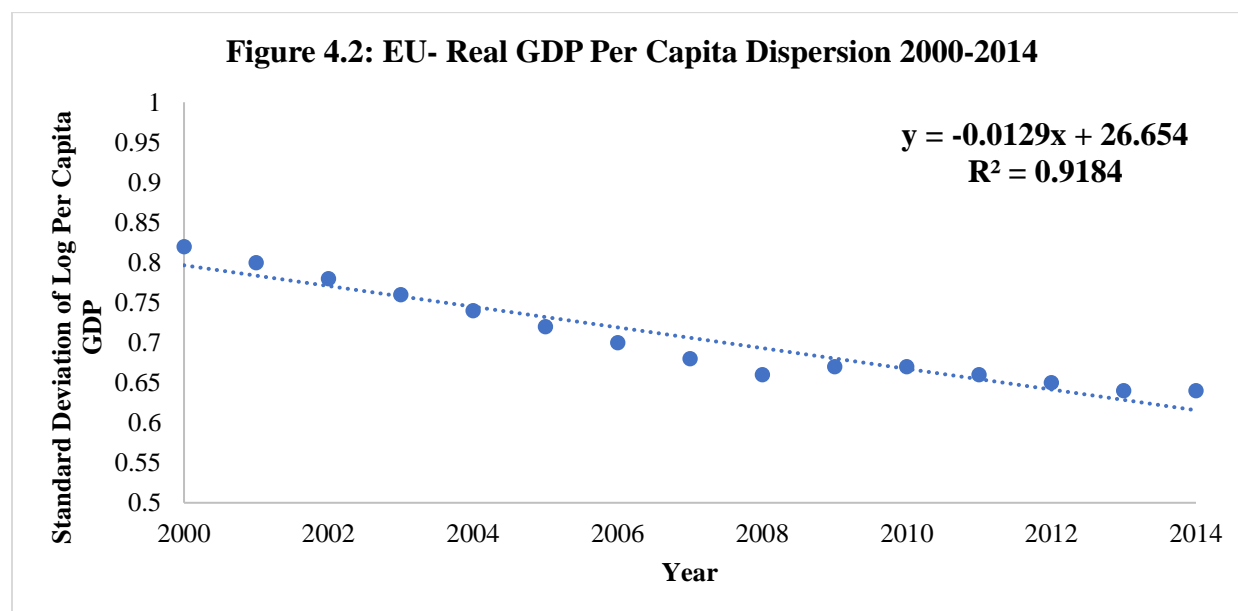
In this section, using empirical data and standard neoclassical formulations, we will formally try to see whether there is any evidence of per capita income convergence in the European Union over the time period 2000-2014. Firstly, we will try to examine the beta and sigma convergence (convergence concepts introduced by Barro-Sala-i-Martin, 1991, 1992 based on neo-classical growth model). Figure 4.1 represents the relationship between the logarithm of per capita GDP in the year 2000 and the growth rate of per capita income between 2000 and 2014 for the EU countries. The analysis of the relationship between the logarithm of initial per capita income (i.e., per capita income for the year 2000) in the EU countries and the average growth of per capita income between 2000 and 2014 for these countries has given a negative relationship between these two variables which indicates that the countries which have low per capita income in the initial stages generally grew faster than the countries with high per capita income in the initial stage.



Next, a cross-sectional regression analysis of the relationship between initial income and the growth of per capita income is carried out. The result of the cross-section convergence test for the

twenty-eight countries, shown in Figure 4.1, yields a negative  $\beta$ -estimate of  $-34.47$  (t-ratio =  $-3.43$ ), which is highly significant (at 1 per cent level of significance).

As beta convergence is a necessary but not sufficient condition for the reduction of income dispersion to be reduced over time, testing for sigma convergence along with beta convergence provides a relatively more accurate indication of income convergence along with beta convergence between countries. Hence, the cross-country standard deviations of the logarithms of GDP per capita for the 28 countries of the EU are computed for the period 2000-2014. Figure 4.2 graphically represents the evolution of the standard deviation of logarithms of GDP per capita from 2000 to 2014. The graph shows the dispersion of per capita GDP for the EU fell gradually from 0.82 in 2000 to 0.64 in 2014.

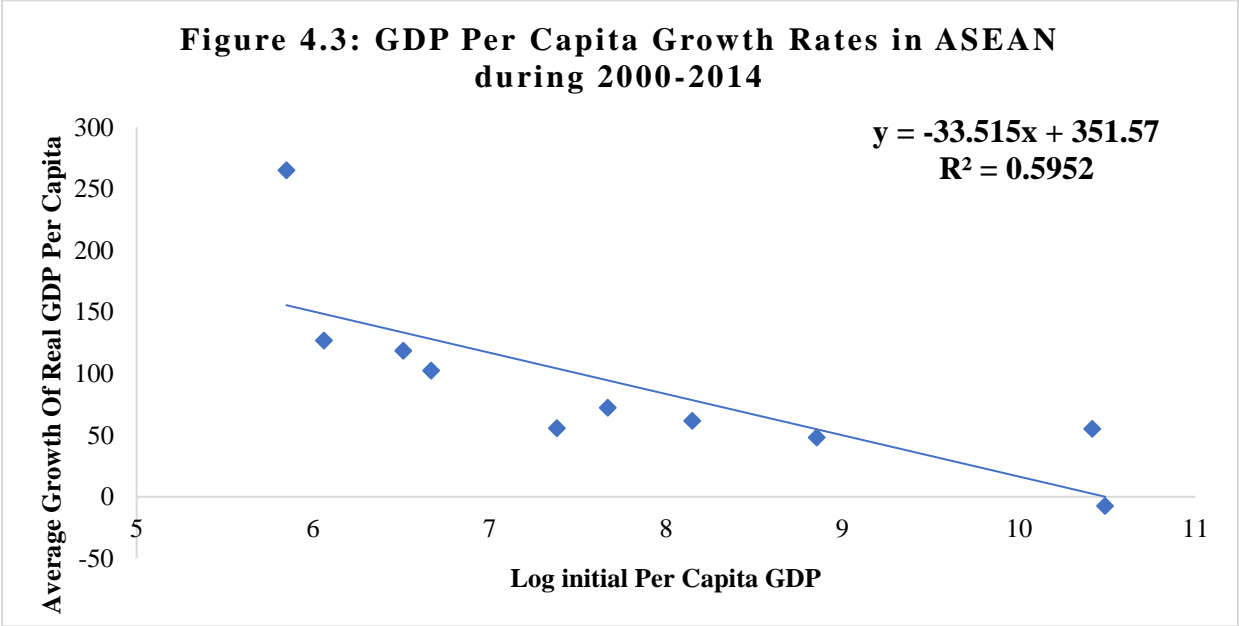


Further, a negative linear trend of log per capita GDP (Figure 4.2) provides stronger empirical support of sigma-convergence. Thus, graphical and cross-country regression results give support for beta and sigma per capita income convergence across the EU nations.

#### 4.2.2 Evidence of beta and sigma in ASEAN

We will now formally discuss, using empirical method based on standard neoclassical model whether the ASEAN nations have converged over the time period 2000-2014. As we did for the EU, we examine the beta and sigma convergence in ASEAN. Figure 4.3 represents the relationship

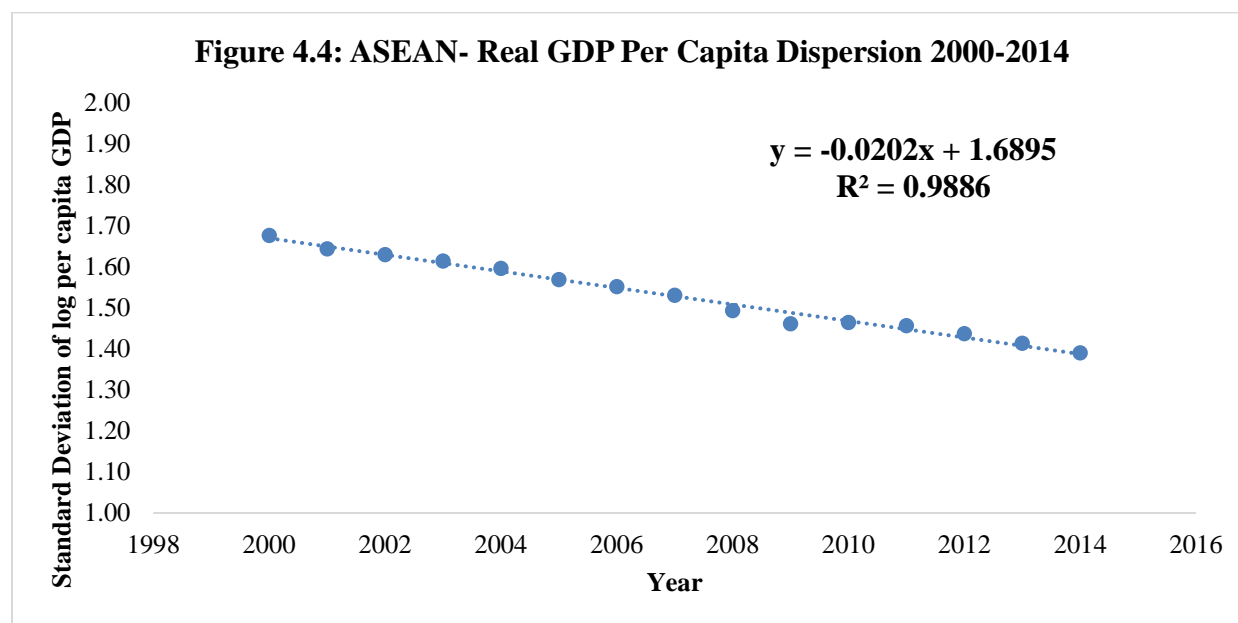
between the logarithm of per capita GDP in the year 2000 and the growth rate of per capita GDP between 2000 and 2014 for the ASEAN countries. The analysis of the relationship between the initial log of per capita income in ASEAN countries and the average growth of per capita income between 2000 and 2014 for these countries has given a negative relationship between these two variables which indicates that the countries which have low per capita income in the initial stages grow faster than the countries with high per capita income, showing evidence of beta convergence within the ASEAN region.



The regression result of the cross-section convergence test for the ten countries of the ASEAN shown in Figure 4.3 gives a negative  $\beta$ - estimate of  $-33.52$  (t-ratio =  $-3.43$ ), which is highly significant (at 1 per cent level of significance).

As we have discussed above that beta convergence is a necessary but not sufficient condition for income dispersion to be reduced over time, we test for sigma convergence which provides a more precise indication of income convergence across countries. Hence, the cross-country standard deviations of logarithms of GDP per capita for the ten ASEAN countries are computed for the 2000-2014 period. Figure 4.4 graphically represents the evolution of the standard deviation of logarithms of GDP per capita from 2000 to 2014. The graph shows the dispersion of

per capita GDP for ASEAN fell gradually from 1.68 in 2000 to a low of 1.46 in 2009, remained at 1.46 till 2011 before falling further to 1.39 in 2014.



Furthermore, a negative trend of log per capita GDP (Figure 2.4) provides stronger empirical support of sigma-convergence. Thus, we are able to establish the occurrence of beta and sigma convergence across the ASEAN nations. These results support the convergence theory and that poor countries in the ASEAN are catching up with the rich ones.

### 4.3 The Theil Index of Inequality: Trend Analysis

#### 4.3.1 Theil Index and their Trends for EU

Table 4.1 gives the Theil index of inequality with respect to GDP for the EU countries over the period from 2000 to 2014. GDP is further disaggregated into agriculture, industry and services<sup>84,85</sup>

<sup>84</sup> The data for value added shares of agriculture, industry and services in GDP have been sourced from WDI, World Bank.

<sup>85</sup> The trends in share of agriculture, industry and services in GDP of EU are presented in Appendix A4.2. Agriculture's share in GDP has been low as compared to the shares of industry and services in GDP for EU and it further declined from 2.33 per cent in 2000 to 1.63 per cent in 2014. Also, industry's share decreased over the period 2000-2014 from 27.9 per cent to 24.5 per cent. The services sector, which has been the largest share in GDP, saw an increase of around

and Theil index of inequality with respect to sectoral shares are calculated using the following mathematical specification:

$$T_x = \sum x_i \log\left(\frac{x_i}{p_i}\right) \text{ ----(4.1)}$$

**Table 4.1: Theil Index of Inequality with respect to (w.r.t.) Income and its Components, EU 2000-2014**

Year	GDP	Agriculture	Industry	Service
2000	0.11	0.12	0.11	0.13
2001	0.11	0.11	0.10	0.12
2002	0.11	0.12	0.10	0.12
2003	0.10	0.12	0.09	0.12
2004	0.10	0.09	0.09	0.11
2005	0.09	0.11	0.08	0.11
2006	0.09	0.10	0.08	0.11
2007	0.09	0.09	0.08	0.10
2008	0.08	0.07	0.07	0.10
2009	0.08	0.09	0.07	0.10
2010	0.08	0.09	0.07	0.10
2011	0.08	0.07	0.08	0.10
2012	0.08	0.08	0.08	0.09
2013	0.08	0.06	0.08	0.09
2014	0.08	0.07	0.08	0.09

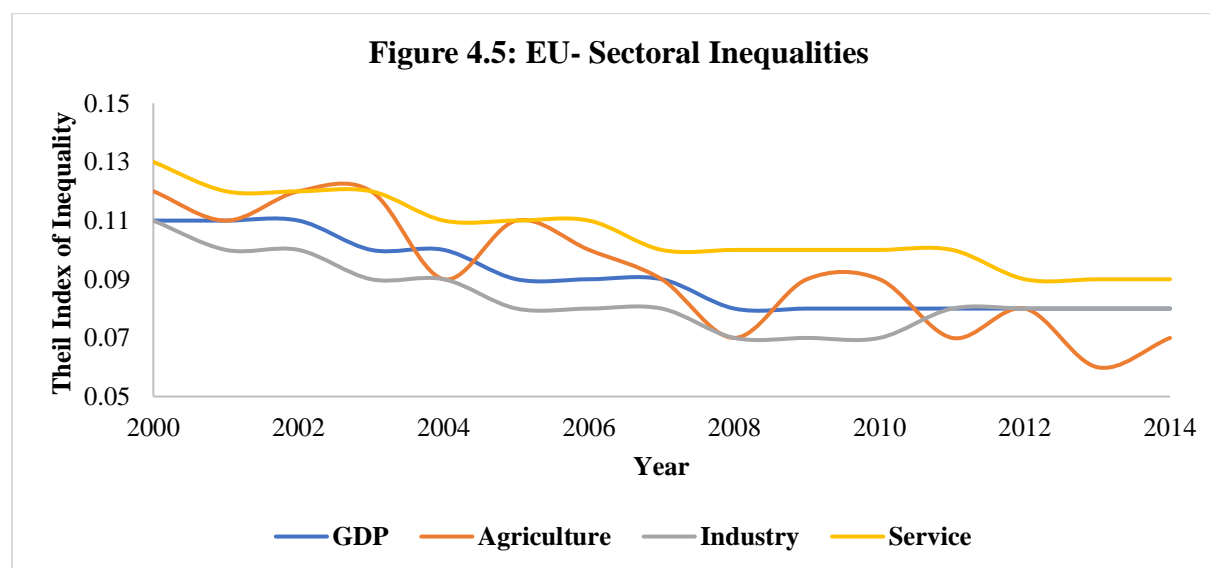
Source: Author's calculation using WDI, World Bank Database

The values shown in Table 4.1 indicate that the inter-country inequality in general has been decreasing for GDP, which is in line with the findings of beta and sigma convergence for the EU countries during 2000-2014, that we found in section 4.2.1. The analysis reveals that there is a secular decline in inter-country income inequality in EU from 2000-2014, i.e., from 0.11 in 2000 to 0.08 in 2009. Also, inter-country inequality for services has been decreasing while there is no such discernible trend for inter country inequality with respect to agriculture and industry.

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5.9 percentage points in its share. Bulgaria saw the largest fall in the share of agriculture in GDP and Malta saw the largest fall in the share of industry in GDP followed by Finland, Ireland and Czech Republic. The growth of the share of services has been largest in Malta, Finland and Ireland, followed by Cyprus and Spain.

Figure 4.5 below shows the inequality levels for GDP and its various components. It can be seen that the levels of inequality are the lowest for industry followed by GDP and services. As far as the inter-country inequality for agriculture is concerned, there seems to be a lot of fluctuation between 2000-2014. Post-2010, inequality with respect to industries becomes aligned with that with respect to GDP.



The estimates of the Theil inequality measures have been further analyzed and linear trends for inequality indices are estimated and presented in Table 4.2 below.

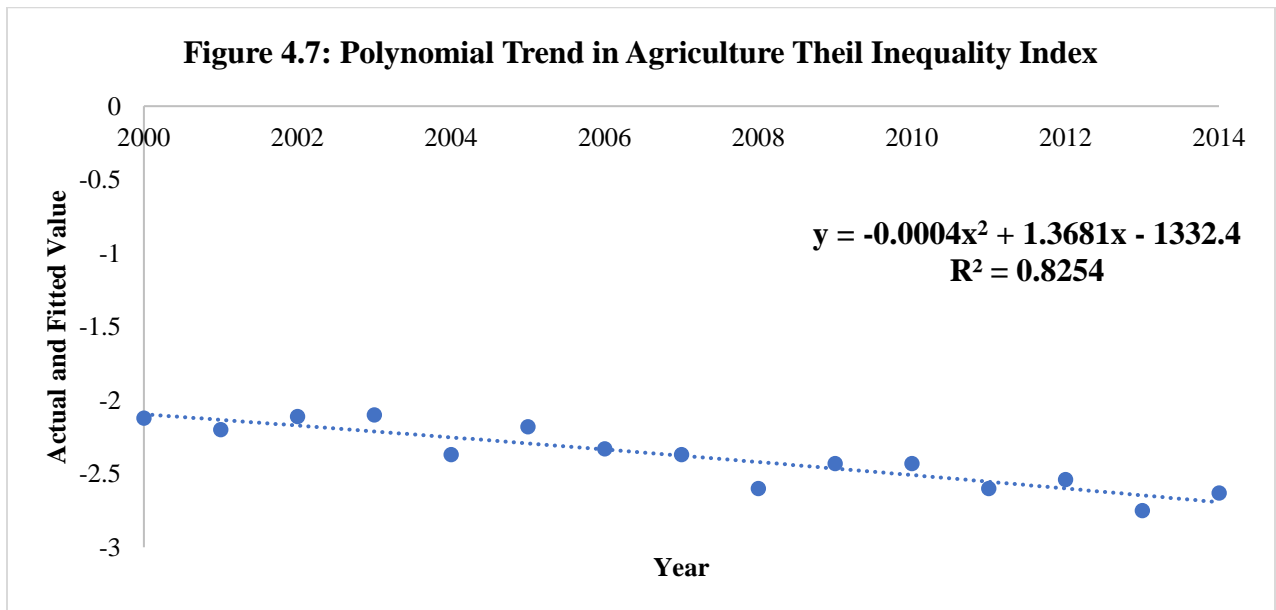
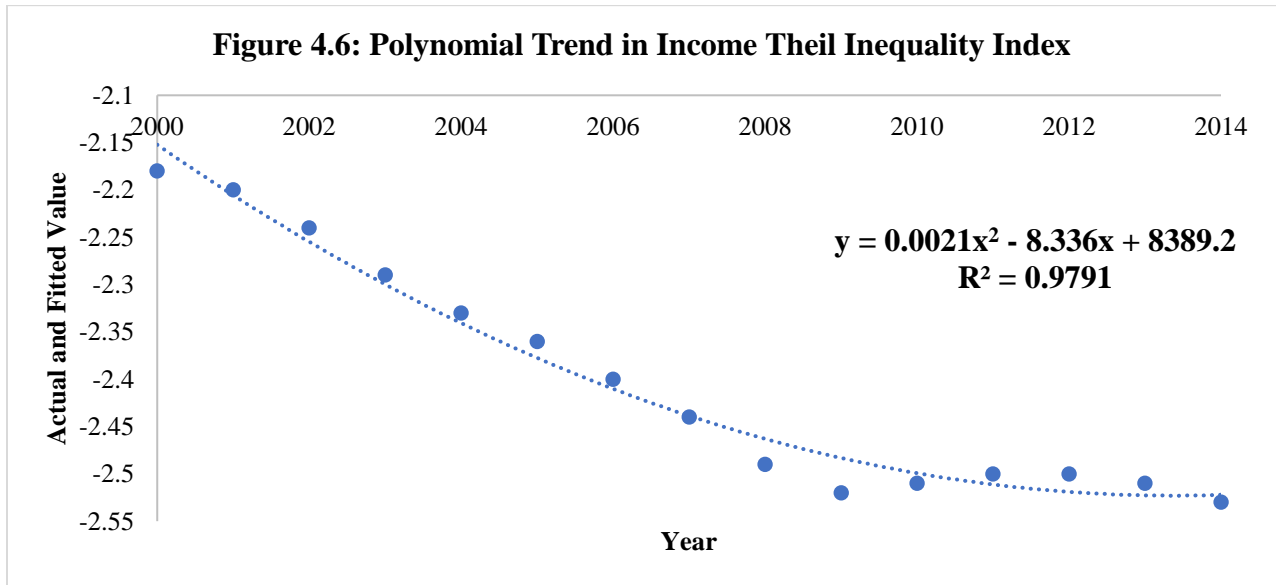
**Table 4.2: Trend Analysis of Theil Index with respect to (w.r.t) Income and its Components, EU 2000-2014**

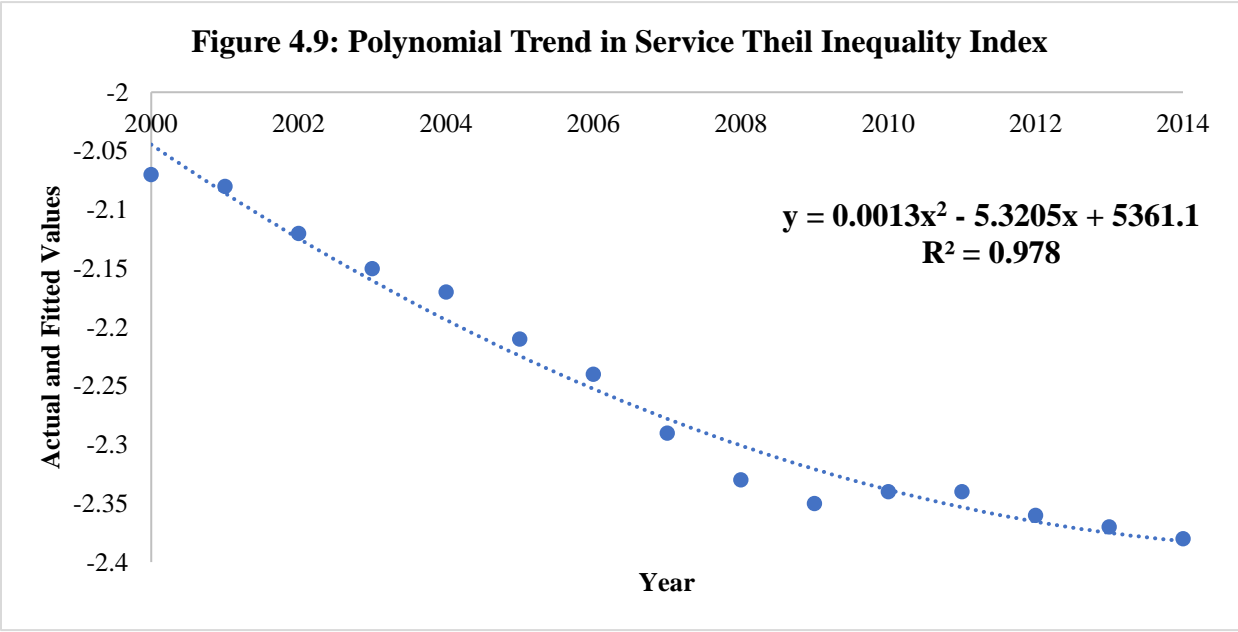
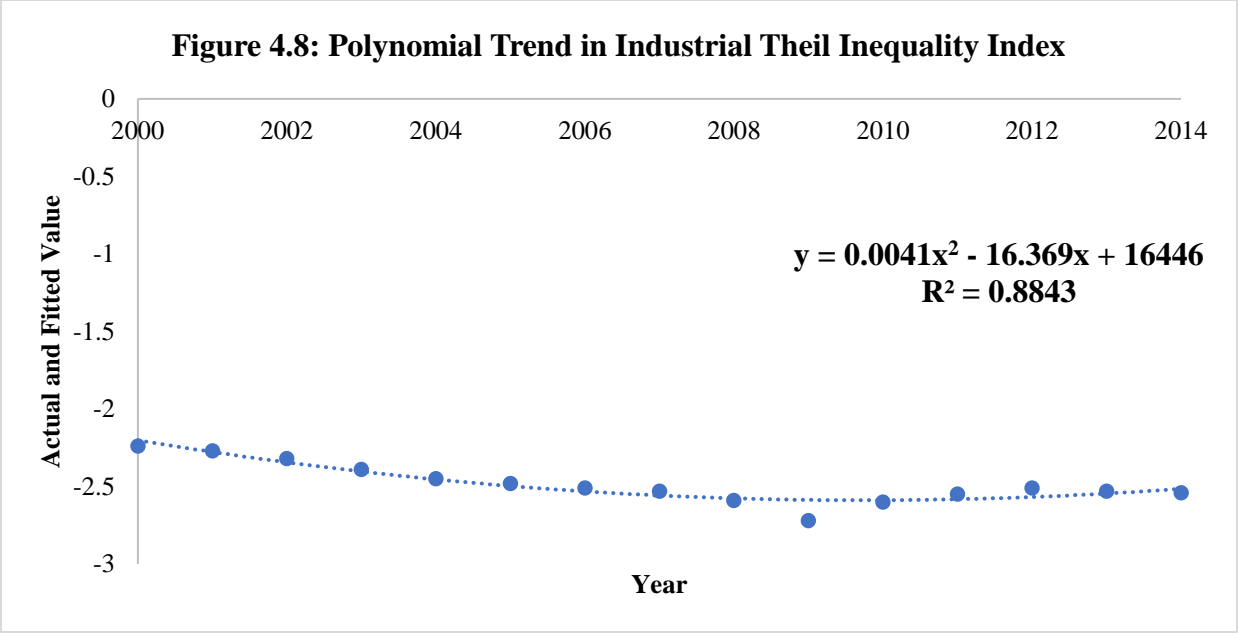
<b>Inequality Index</b>	<b>Average Annual Growth Rate</b>	<b>t-value</b>	<b>Adj. R-Squared</b>
<b>GDP</b>	-0.026	-10.69	0.898
<b>Agriculture</b>	-0.043	-7.82	0.825
<b>Industry</b>	-0.022	-4.36	0.594
<b>Service</b>	-0.024	-13.86	0.937

Source: Author's calculation using WDI, World Bank Database

It can be noted from table 4.2 that the Theil inequality indices have shown a negative trend for GDP and all its components- agriculture, industry and services and all the estimates are significant. This suggest that inter-country inequality has come down in all the sectors of the economy, with inequality in the agricultural sector witnessing higher rate of decline. The linear

trend results, particularly in case of agriculture, convince us that some measure of nonlinearity may exist in the behaviour of inequality over time and therefore non-linear polynomial trend is estimated for all Theil indices. It is found that the coefficient of time and its higher value up to second degree are significant. The figures 4.6,4.7, 4.8 and 4.9 provide the curves based on the regression coefficients of GDP and its components respectively.





Next, we consider the development of Theil index of income inequality vis-à-vis inequality in trade openness and government expenditure for the EU countries during the period 2000-2014. We have bifurcated trade into – intra-EU and extra-EU trade. In Table 4.3 we provide the calculated Theil Inequality indices using equation (4.1) for EU in terms of GDP (income), Government Expenditure and intra-EU and extra-EU trade.



**Table 4.3: Theil Index Inequality w.r.t. Income, Trade and Govt, Expenditure, EU 2000-2014**

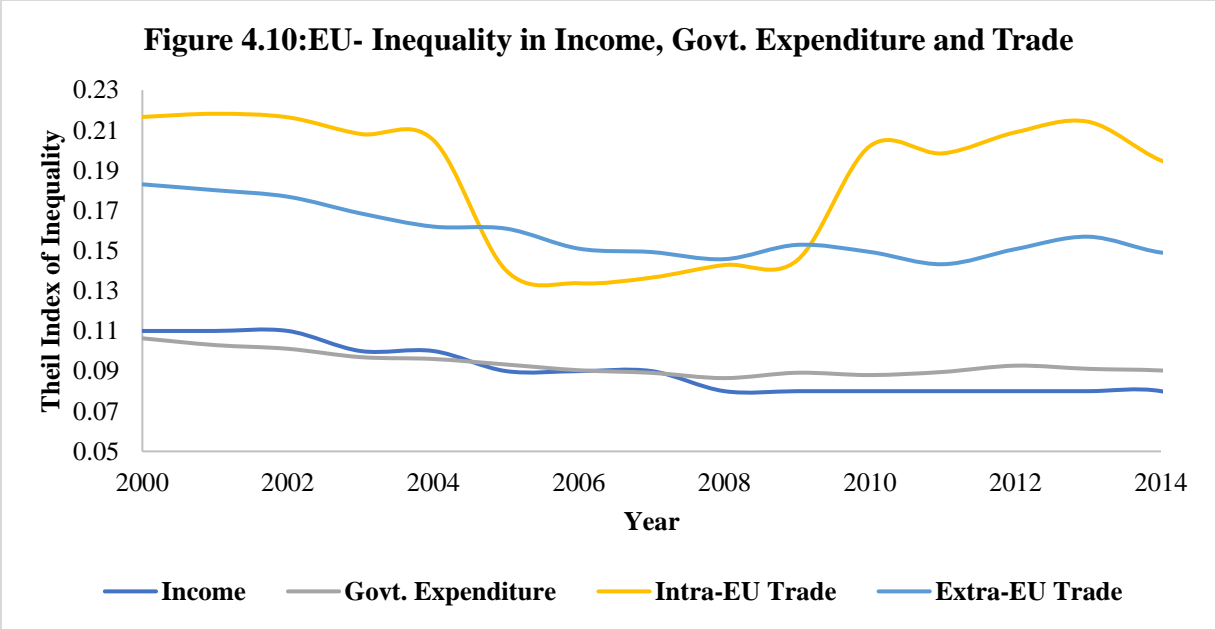
Year	Income	Govt. Expenditure	Intra-EU Trade	Extra-EU Trade
2000	0.11	0.11	0.22	0.18
2001	0.11	0.10	0.22	0.18
2002	0.11	0.10	0.22	0.18
2003	0.10	0.10	0.21	0.17
2004	0.10	0.09	0.21	0.16
2005	0.09	0.09	0.14	0.16
2006	0.09	0.09	0.13	0.15
2007	0.09	0.09	0.14	0.15
2008	0.08	0.09	0.14	0.15
2009	0.08	0.09	0.15	0.15
2010	0.08	0.09	0.20	0.15
2011	0.08	0.09	0.20	0.14
2012	0.08	0.09	0.21	0.15
2013	0.08	0.09	0.21	0.16
2014	0.08	0.09	0.19	0.15

Source: Author's Calculations using WDI Database

In general, we can observe from table 4.3 that there is a discernible decreasing trend in Theil index of inequality with respect to government expenditure vis-à-vis a decline in the inter-country inequality in EU. However, there is hardly a clear trend to be inferred from data of Theil index of intra-EU trade while there is declining trend in Theil index of extra-EU trade till 2008. After 2008, a distinct trend in international trade is hardly decipherable. Post 2008, as a result of financial crisis of 2007-08 and Greece Crisis of 2013, the engagement in extra-EU trade in various countries of EU was skewed<sup>86</sup>.

Figure 4.10 below shows the inequality levels for government expenditure and trade vis-à-vis inequality levels in income.

<sup>86</sup> Between 2003 and 2015 the proportion of trade with EU-28 partners decreased from 69 per cent to 63 per cent. Four Member States saw a decrease in this proportion of over 10 percentage points (percent points) with the largest decreases for the United Kingdom (down almost 15 percent points) and Greece (down almost 13 percent points). (Source: Eurostat).



It is obvious from figure 4.10 that the levels of inequality are lowest for income and government expenditure. Moreover, inequality in these two variables are more or less in line with each other. The level of inequality in intra-EU trade has been higher than that of inequality in extra-EU trade till 2004. Intra-EU trade inequality hovered below the extra-EU trade inequality during 2004-2009, before crossing it post 2009. Inequality with respect to intra and extra-EU trade spiked in 2008 before showing declining trend from 2010.

To get a better picture of the trends in various Theil indices, we estimate a linear trend model for these indices and present the result for EU nations in Table 4.4.

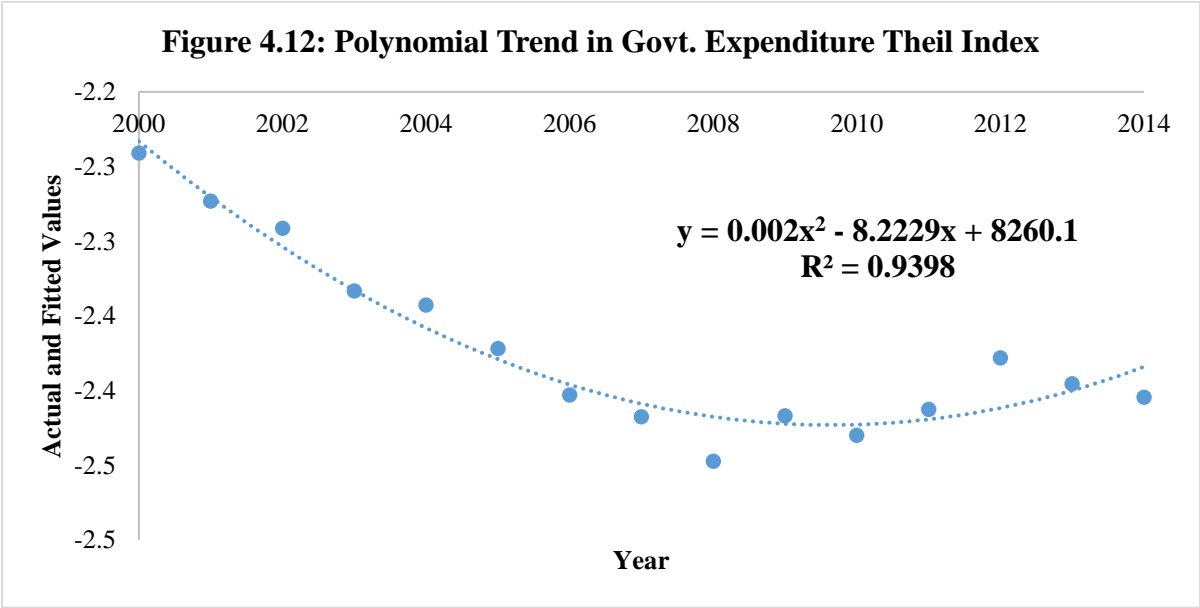
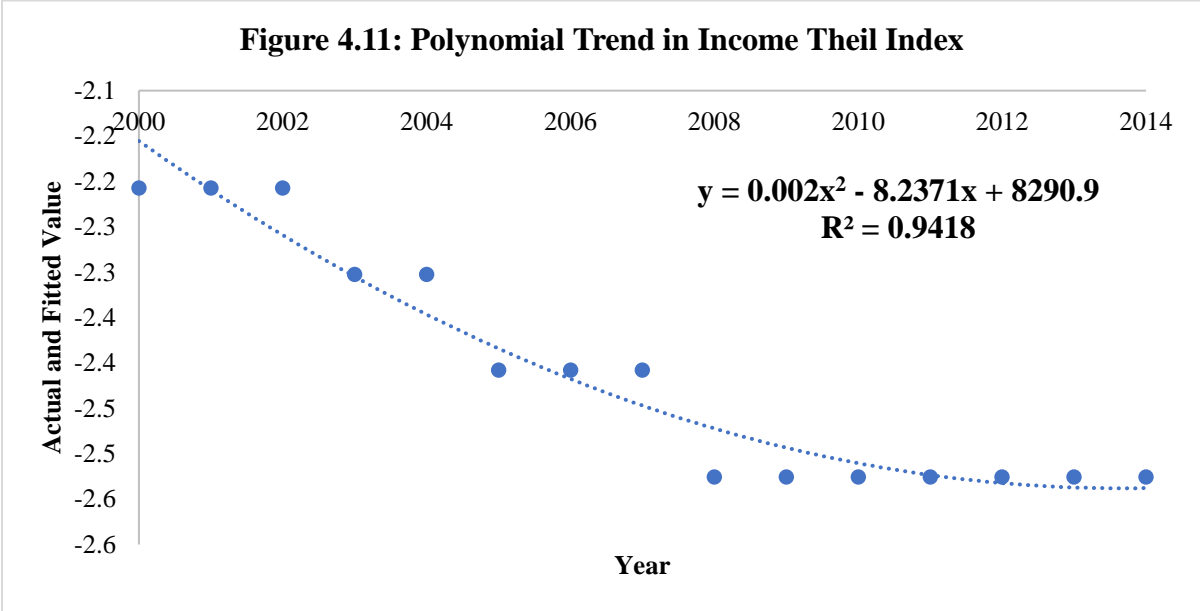
**Table 4.4: Trend Analysis of Theil Index w.r.t. Income, Trade and Govt. Expenditure EU 2000-2014**

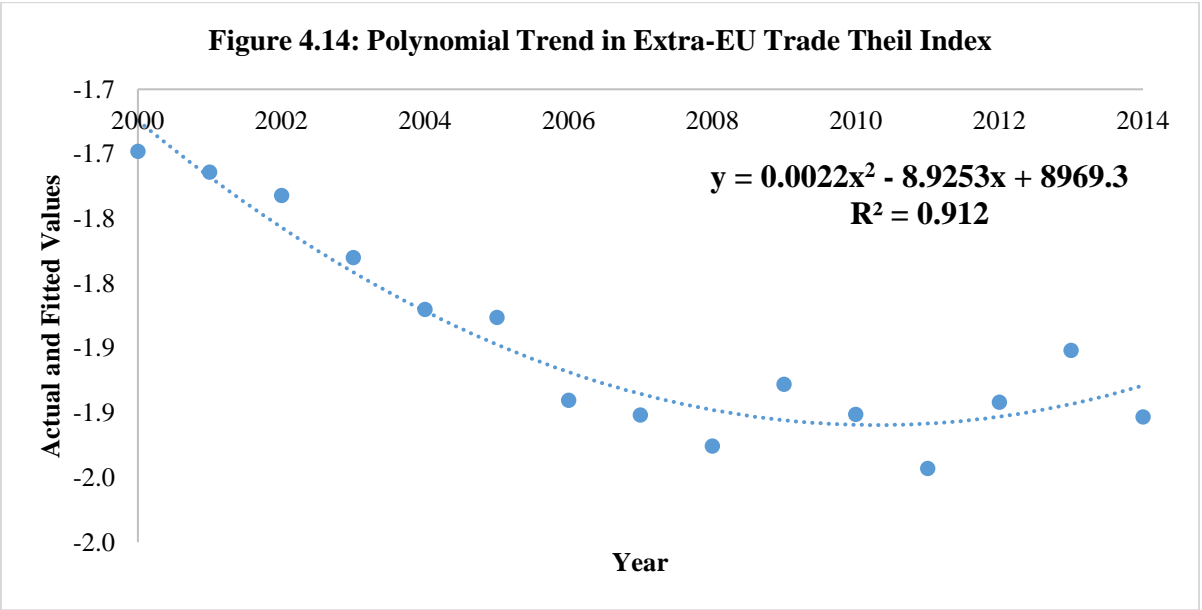
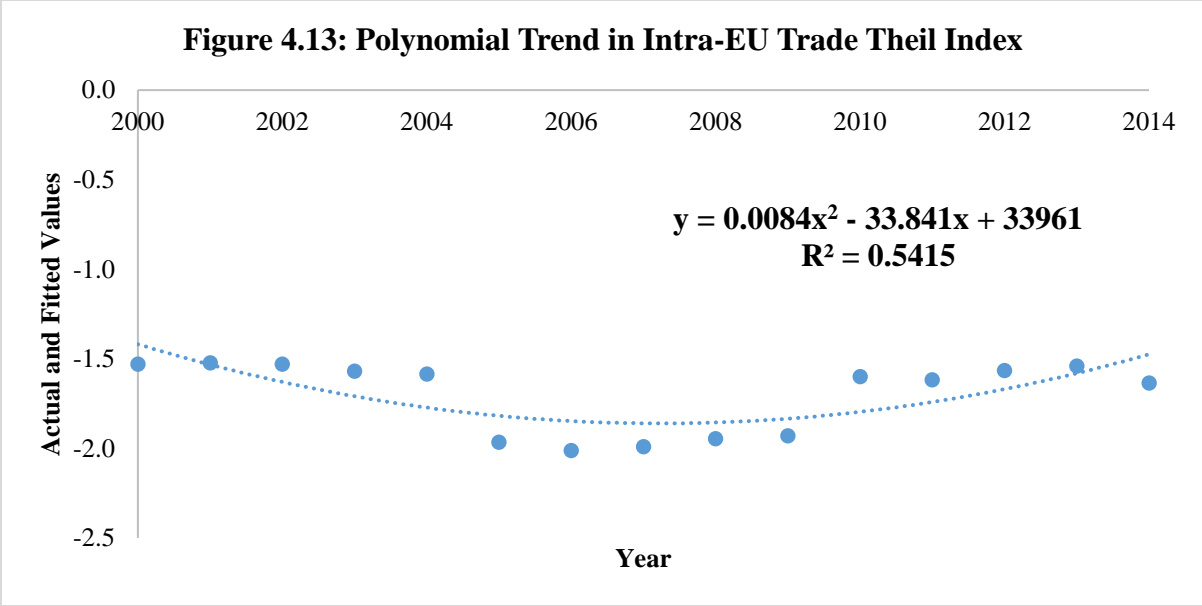
Inequality Index	Average Annual Growth Rate	t-value	Adj. R-Squared
$T_{gdp}$	<b>-2.73</b>	-9.32	0.86
$T_{gov}$	<b>-1.08</b>	-4.58	0.56
$T_{extra-EU}$	<b>-1.46</b>	-5.27	0.66
$T_{intra-EU}$	<b>-0.40</b>	-0.33	-0.07

Source: Author’s calculation using WDI database

The results for EU show that the Theil inequality indices have shown a negative trend in all cases. However, the coefficient on Theil index of intra-EU trade is insignificant. Also, the corresponding adjusted R-squared value is negative signifying that the linear trend model for Theil

index of intra-EU trade is not well fit. This suggests the presence of significant non-linearity in the trend with respect to intra-EU trade. Therefore, we estimate a non-linear polynomial trend for all Theil indices and find that coefficients of time and its higher value up to second degree are all highly significant. Moreover, the estimation result reveal that the intra-EU trade has an initial declining trend but later, specifically after 2008 shows an upward trend. The polynomial trends for all the variables are depicted in figures 4.11, 4.12, 4.13 and 4.14.





### 4.3.2 Theil Index and their Trends for ASEAN

Table 4.5 gives the Theil inequality index of inequality for the ASEAN countries over the period from 2000 to 2014. GDP is further disaggregated into agriculture, industries and services<sup>87</sup>.

<sup>87</sup> The trends in share of agriculture, industry and services in GDP of ASEAN are presented in Appendix A4.2. Agriculture's share in GDP has declined sharply by 9.4 percentage points from 12.5 per cent in 2000 to 11.3 per cent in 2014. In a striking similarity, industry's share fell by 10.1 percentage points in 2000-2014. The services sector, on

**Table 4.5: Theil Index of Inequality, ASEAN 2000-2014**

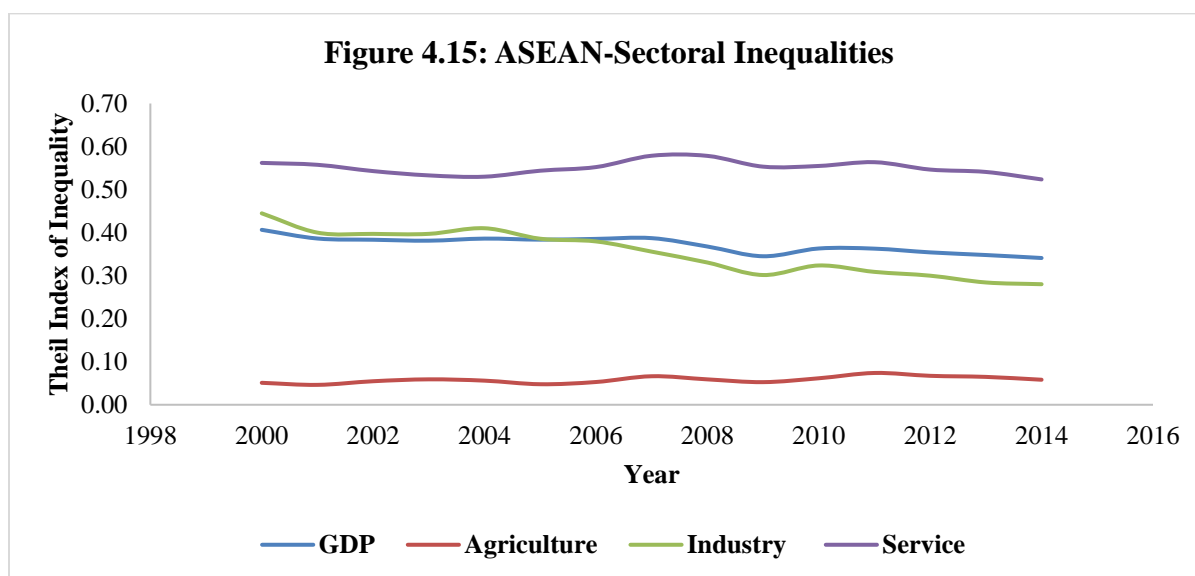
<b>Year</b>	<b>GDP</b>	<b>Agriculture</b>	<b>Industry</b>	<b>Service</b>
2000	0.41	0.05	0.44	0.56
2001	0.39	0.05	0.40	0.56
2002	0.38	0.05	0.40	0.54
2003	0.38	0.06	0.40	0.53
2004	0.39	0.06	0.41	0.53
2005	0.38	0.05	0.39	0.54
2006	0.39	0.05	0.38	0.55
2007	0.39	0.07	0.36	0.58
2008	0.37	0.06	0.33	0.58
2009	0.35	0.05	0.30	0.55
2010	0.36	0.06	0.32	0.55
2011	0.36	0.07	0.31	0.56
2012	0.35	0.07	0.30	0.55
2013	0.35	0.06	0.28	0.54
2014	0.34	0.06	0.28	0.52

Source: Author's calculation using WDI, World Bank Database

The values shown in Table 4.5 indicate that the inter-country inequality in general has been decreasing for GDP, which is in line with the findings of beta and sigma convergence for the ASEAN countries during 2000-2014. Also, inter-country inequality for industries has been decreasing while for agriculture it seems that the inequality has been increasing. There is no such discernible trend for services.

the other hand, saw a significant increase of 9.5 percentage points in its share in this period. The pattern of agricultures' decline and growing importance of services in the national economy is evident in the ASEAN economies. The fall in agriculture share has been largest in Myanmar (from 57.2 per cent in 2000 to 27.8 per cent in 2014) and Lao PDR (from 45.2 per cent in 2000 to 19.7 per cent in 2014), and smallest in Singapore and Brunei Darussalam, countries which already had the lowest share of agriculture of 1 per cent in GDP in ASEAN. The growth of the share of industry has been largest in again Myanmar and Lao PDR, followed by Brunei Darussalam and Cambodia, whereas Indonesia, Malaysia and Philippines and Singapore saw a decline in share of industry. In 2014, Brunei Darussalam and Indonesia have substantially larger GDP shares of industry than the other countries, followed by Malaysia Thailand and Vietnam. Myanmar and Vietnam's rapid increase in the share of industry has brought them up to similar levels to the other two ASEAN economies. The growth of the share of services has been largest in Lao PDR and Malaysia, followed by Singapore, Myanmar and Vietnam.

Figure 4.15 below shows the inequality levels for GDP and its various components. It can be seen that the levels of inequality are the lowest for agriculture followed by GDP and industry. As noted in Table 4.5 and is also shown in Figure 4.15 agricultural inequality has an increasing trend while inequality in terms of GDP and industry has generally witnessed a declining trend. Between 2004-2005 levels of inequality in industry coincided with that GDP, thereafter, falling below GDP.



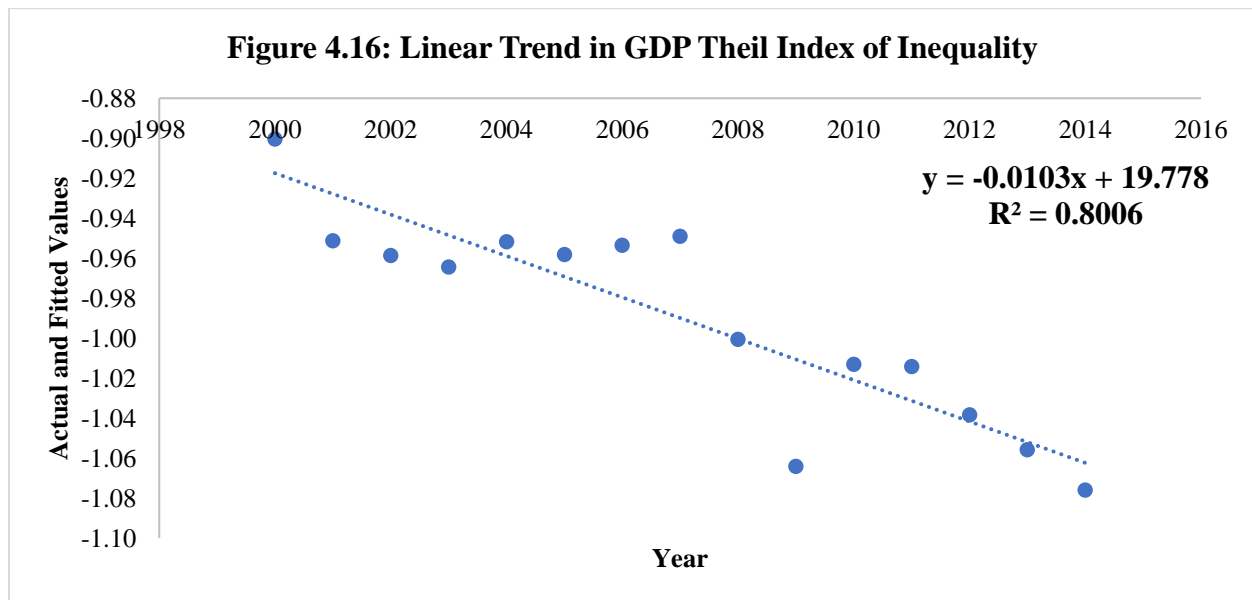
The estimates of the Theil inequality measures have been further analyzed and linear trends for inequality indices are estimated and presented in Table 4.6 below.

**Table 4.6: Trend Analysis of Theil Index w.r.t. Income and its Sectoral Components  
ASEAN 2000-2014**

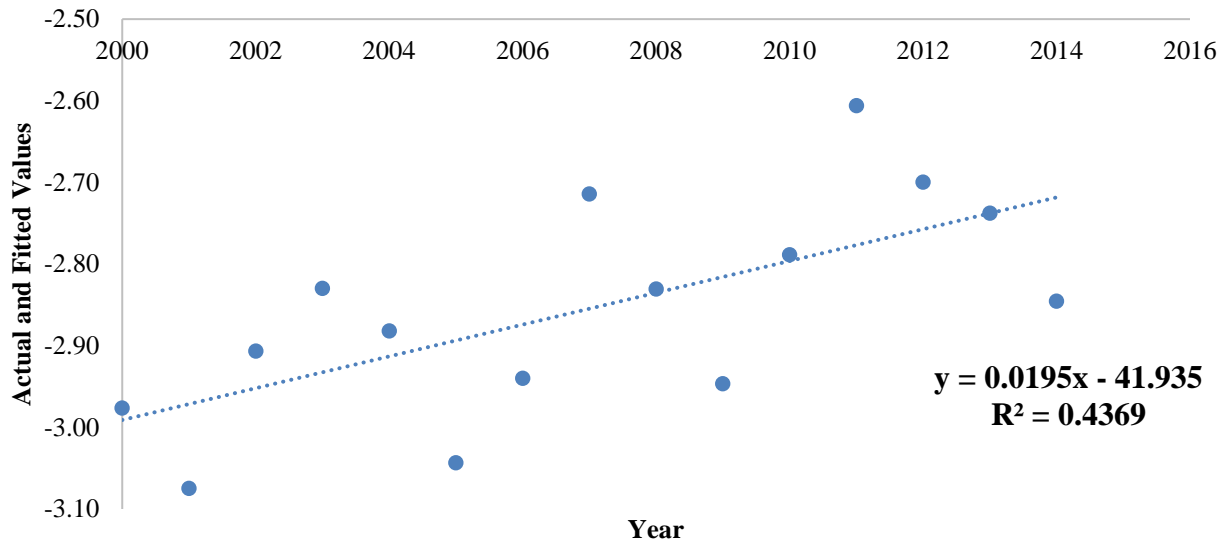
Inequality Index	Average Annual Growth Rate	t-value	Adj. R-Squared
<b>GDP</b>	-0.011	-7.380	0.793
<b>Agriculture</b>	0.019	3.140	0.387
<b>Industry</b>	-0.032	-13.180	0.925
<b>Service</b>	-0.001	-0.290	-0.070

Source: Author's calculation using WDI, World Bank Database

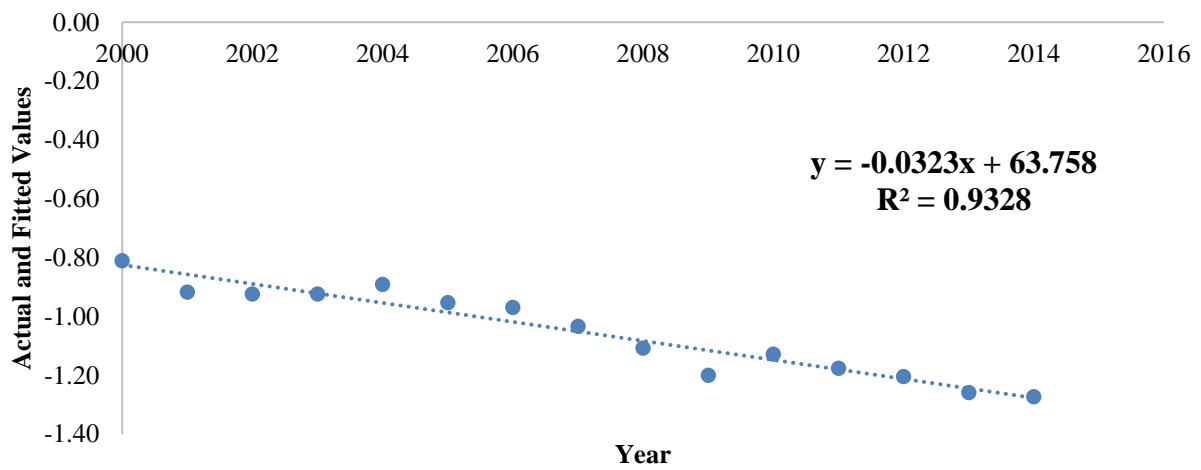
It is apparent from table 4.6 that the Theil inequality indices have shown a negative trend for GDP, industry and services and positive trend for agriculture. The annual average rate of growth of inequality are -0.01, 0.019, -0.032 and -0.001 for GDP, agriculture, industry and services respectively. However, the estimates are significant for GDP, agriculture and industry and insignificant for services. This suggests that there could be significant non-linear trend with respect to services and therefore non-linear polynomial trend is estimated for all Theil indices. It is found that in the case of Theil index of services, the coefficient of time and its higher value up to second degree are significant. Non-linearity in remaining variables is found to be insignificant. Figures 4.16, 4.17, 4.18 and 4.19 provide the curves based on the regression coefficients of GDP and its components respectively.



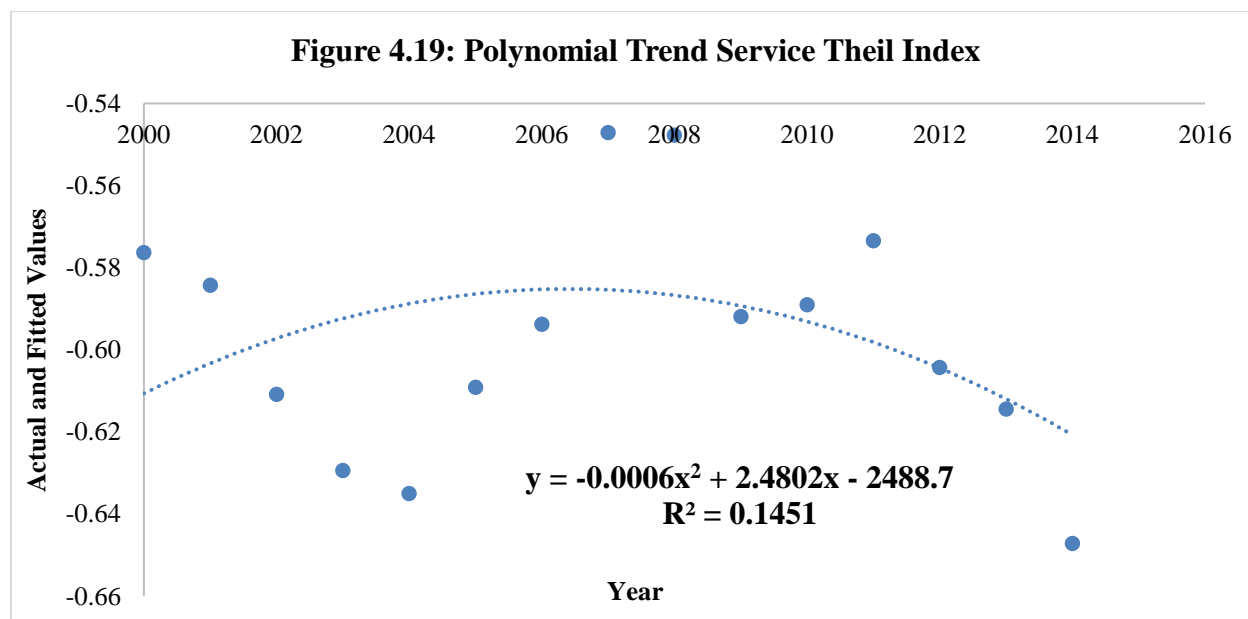
**Figure 4.17: Linear Trend in Agriculture Theil Index**



**Figure 4.18: Linear Trend in Industrial Theil Index**







Now, we will consider the development of Theil index of inequality vis-à-vis inequality in trade openness and government expenditure for the ASEAN countries during the period 2000-2014. We have split trade into – intra-ASEAN and extra-ASEAN trade. In Table 4.7 we provide the calculated Theil Inequality indices using equation (4.1) for the ASEAN in terms of GDP (income), Government Expenditure and intra-ASEAN and extra-ASEAN trade.

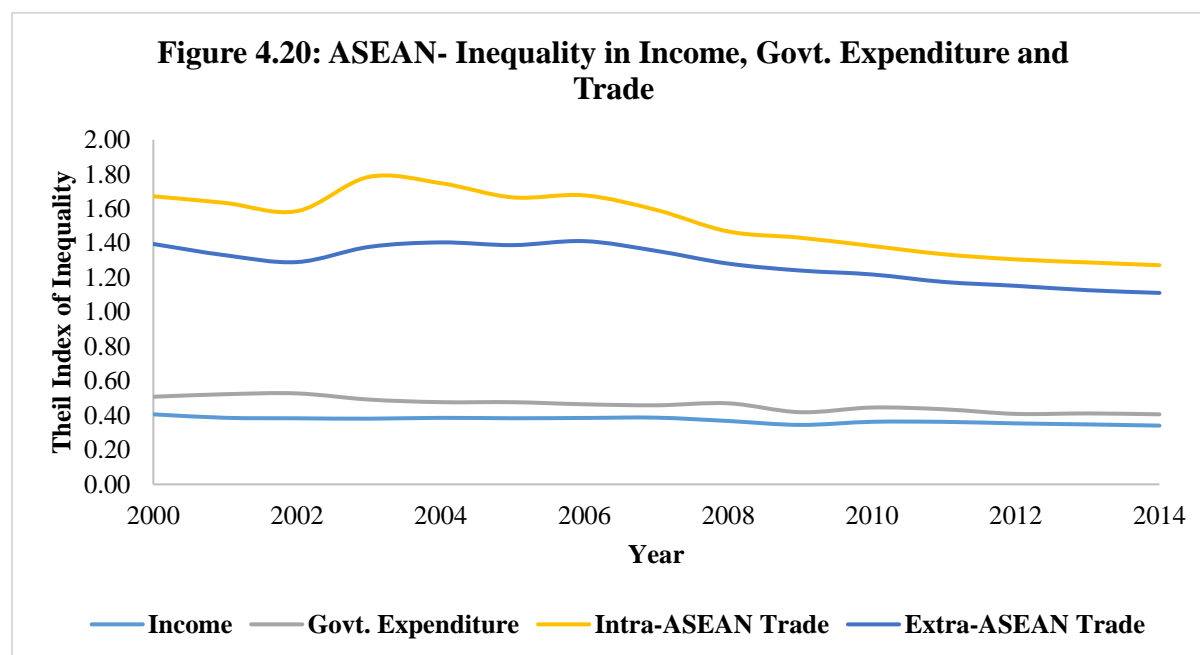
**Table 4.7: Theil Index of Inequality w.r.t Income, Trade and Govt. Expenditure, ASEAN 2000-2014**

<b>Year</b>	<b>Income</b>	<b>Govt. Expenditure</b>	<b>Intra-ASEAN Trade</b>	<b>Extra-ASEAN Trade</b>
<b>2000</b>	0.34	0.51	1.67	1.40
<b>2001</b>	0.33	0.52	1.63	1.33
<b>2002</b>	0.33	0.53	1.59	1.29
<b>2003</b>	0.33	0.49	1.78	1.38
<b>2004</b>	0.34	0.48	1.75	1.40
<b>2005</b>	0.34	0.48	1.67	1.39
<b>2006</b>	0.34	0.46	1.68	1.41
<b>2007</b>	0.35	0.46	1.59	1.35
<b>2008</b>	0.33	0.47	1.47	1.28
<b>2009</b>	0.31	0.42	1.43	1.24
<b>2010</b>	0.33	0.45	1.38	1.22
<b>2011</b>	0.33	0.44	1.34	1.17
<b>2012</b>	0.33	0.41	1.31	1.15
<b>2013</b>	0.32	0.41	1.29	1.13
<b>2014</b>	0.32	0.41	1.27	1.11

Source: Author's calculation using WDI database

For ASEAN, table 4.7 displays a noticeable decreasing trend in Theil index of inequality with respect to government expenditure, intra-ASEAN and extra-ASEAN trade vis-à-vis declining trend in Theil index of income inequality.

A graphical representation of the inequality levels, in figure 4.20, shows that levels of inequality is lowest for income followed by government expenditure. Inequality levels for intra-ASEAN trade are the highest, but it has a decreasing trend.



To get a better picture of the trends in various Theil indices, we estimate a linear trend model for these indices for the ASEAN and present the results in Table 4.8

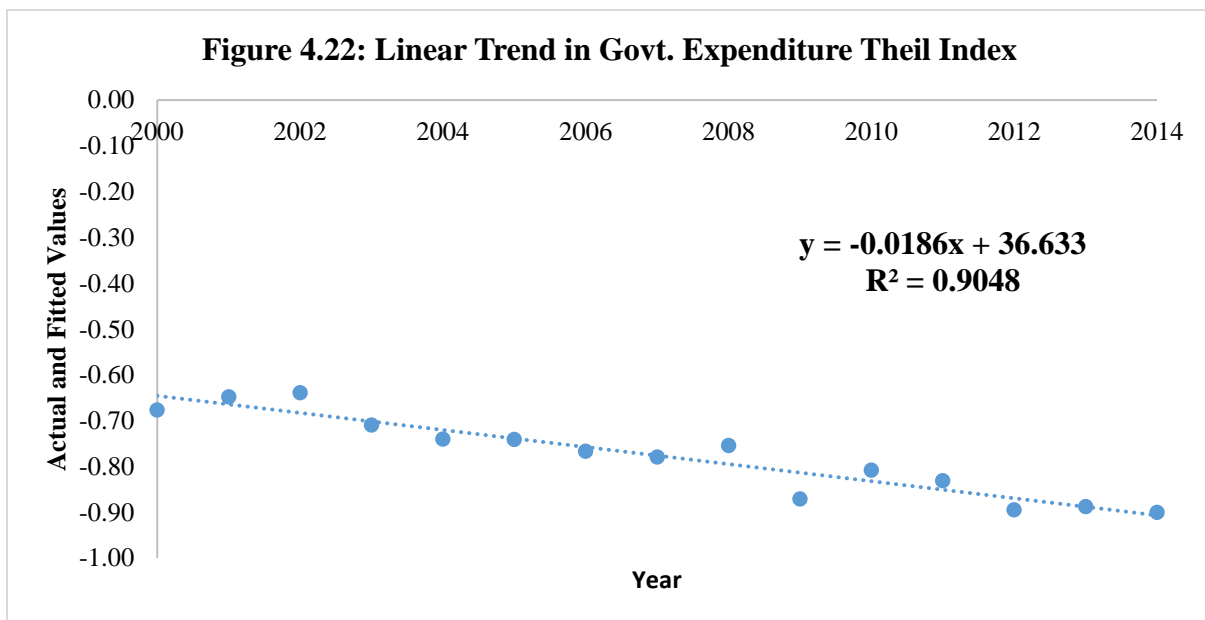
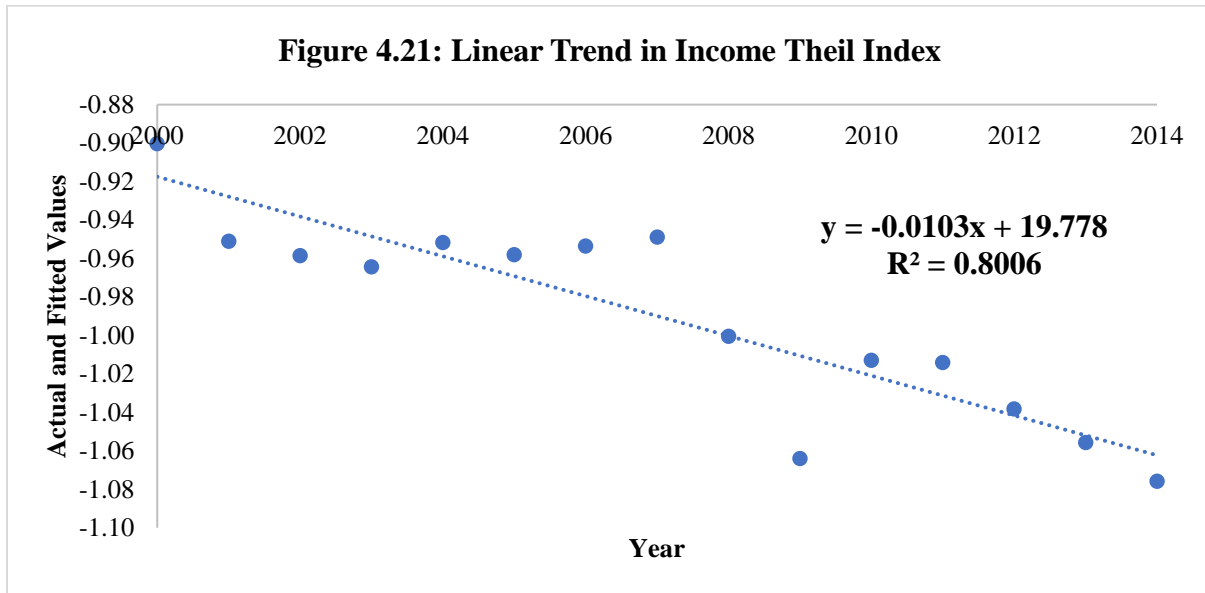
**Table 4.8: Trend Analysis of Theil Index w.r.t. Income, Trade and Govt. Expenditure, ASEAN 2000-2014**

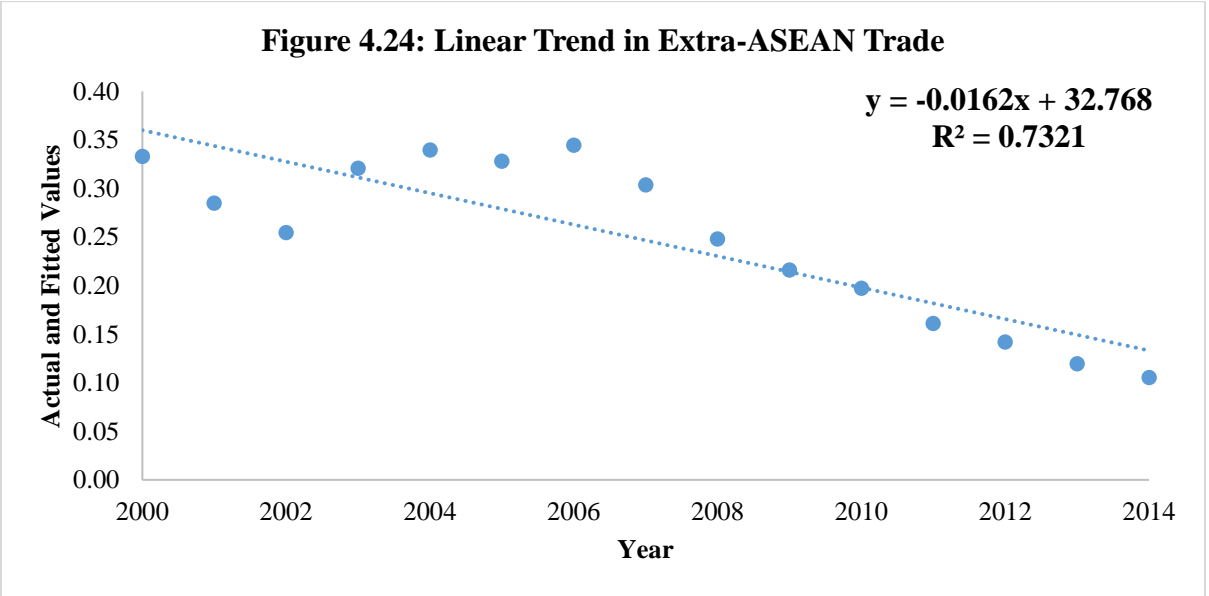
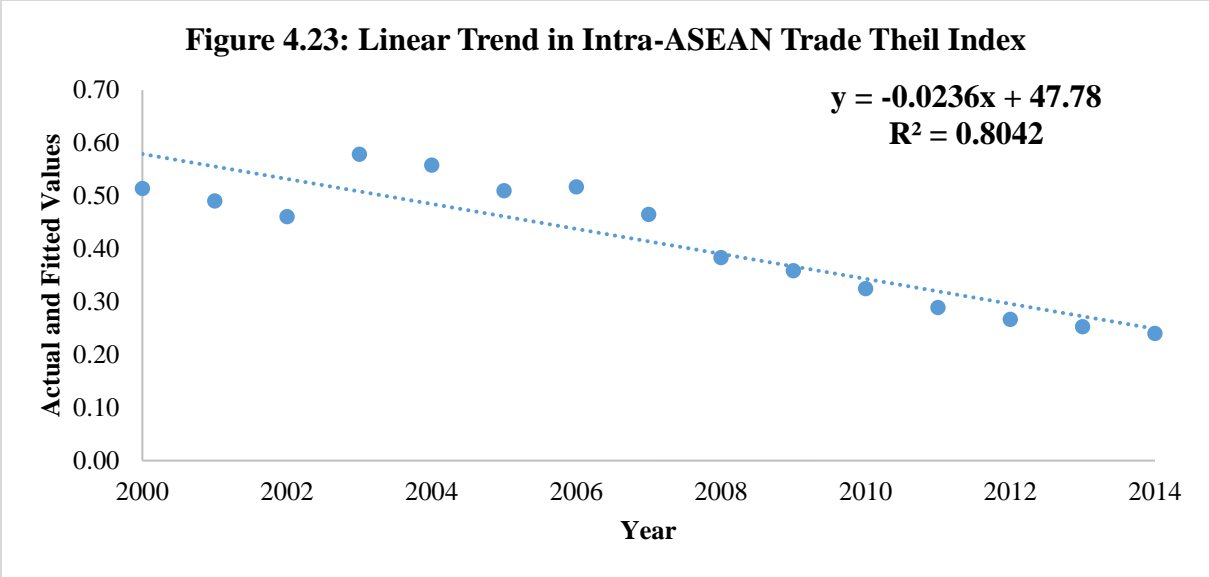
Inequality Index	Average Annual Growth Rate	t-value	Adj. R-Squared
$T_{gdp}$	<b>-1.05</b>	-7.38	0.79
$T_{gov}$	<b>-1.84</b>	-10.88	0.89
$T_{extra-ASEAN}$	<b>-1.60</b>	-5.96	0.71
$T_{intra-ASEAN}$	<b>-2.36</b>	-7.09	0.78

Source: Author's calculation based on WDI database

The results for ASEAN show that the Theil inequality indices have shown a negative trend in all cases and all the estimates are significant (table 4.8). Figures 4.21, 4.22, 4.23 and 4.24 gives

the curves based on linear regression coefficients of Theil indices when these variables are regressed over time.





**4.3.3 A Note Theil Index Vs. Beta and Sigma Convergence**

Since we have examined the existence of per capita income convergence in the EU and the ASEAN using both the traditional concepts of beta and sigma convergence based on neoclassical growth models and using Theil index of inequality, it will be interesting exercise to note the differences in the findings arising from these approaches.

It is clear that both the approaches vouched for the evidence of per capita income convergence in the EU and the ASEAN during 2000-2014. However, the most striking difference

in the two approaches is that while the phenomenon of income convergence in the EU and the ASEAN were depicted by negatively sloped linear curves (based on the relationship between the logarithm of initial per capita income and the average growth rate of per capita income and on the trend of dispersion of per capita income with time) by the traditional approach of convergence, the results of analysis with Theil indices were more than straightforward. For the EU, we got significant polynomial trend in Income Theil Inequality Index and for the ASEAN, we got linear trend in Income Theil Inequality Index. Thus, the analysis with Theil indices gave a clearer picture of the convergence process and hence scope to prod deeper into the dynamics of the process. Secondly, we are able to disintegrate Theil index of inequality into the inequalities with respect to its sectoral components. This allowed us to study the trends in Theil indices of inequality with respect to sectoral components of income vis-à-vis the trend in Theil index of income inequality. Lastly, we have also been able to do a trend analysis of inequality in the EU and the ASEAN pertaining to government expenditure and trade openness. Thus, Theil index of inequality is advancement over the traditional approach to study income convergence.

#### **4.4 Regression Analysis on the Impact of Trade and Government Expenditure on Per Capita Income Convergence based on Theil Ratios**

In this section, we analyse how trade impacts the process of income convergence/divergence for two different groups of countries – one developing and the other developed, viz., the ASEAN and the European Union nations, respectively.

More specifically, we try to find answers to the following research questions:

- Does trade play a significant role in causing per capita income convergence/reduction of per capita income inequality among a group of countries that have mutually opened up trade among themselves? Which among- inter-regional and international trade- have great impact (if any)?
- If trade does play a role, whether it impacts the process of per capita income convergence in the same way for group of developing and developed countries, viz. ASEAN and EU, respectively?
- Does government policy augment the impact of openness on per capita income convergence in the EU and the ASEAN?

This section discusses the key estimation results of following panel regression models, carried out for the EU and the ASEAN separately followed by comparison of the results:

$$\ln(\text{IncomeTheil}_{it}) = \beta_0 + \sum_{k=1}^2 \beta_k * \ln(\text{TradeTheil}_{ikt}) + \beta_3 * \ln(\text{CapitalMobility}_{it}) + \beta_4 * (\text{LabourRestrictiveness}_{it}) + u_{it} \text{ ---(4.2)}$$

$$\ln(\text{IncomeTheil}_{it}) = \beta_0 + \sum_{k=1}^2 \beta_k * \ln(\text{TradeTheil}_{ikt}) + \beta_3 * \ln(\text{CapitalMobility}_{it}) + \beta_4 * (\text{LabourRestrictiveness}_{it}) + \beta_5 * (\text{gov\_theil}) + u_{it} \text{ ---(4.3)}$$

#### 4.4.1 EU: Discussion of Regression Results

As mentioned earlier, Luxembourg, Malta, Romania, Spain and Sweden have no observation for capital mobility index. Hence, we have dropped these countries from our dataset before carrying out regression analysis. So, our panel dataset has 23 countries and 15 years (2000-2014); it is a short panel with many individuals (countries) for relatively few years (N >T). Presented below is the summary statistics of the variables of interest. The panel data is strongly balanced because there are no missing values (as is also evident from table 4.9).

**Table 4.9: EU- Summary Statistics**

Variable	Obs.	Mean	Std. Dev.	Min	Max
<b>Income Theil Ratio</b>	360	0.82	0.45	0.13	1.78
<b>Inter-regional Trade Theil Ratio</b>	360	1.12	0.91	0.11	4.34
<b>International Trade Theil Ratio</b>	360	-0.06	0.21	-0.75	0.38
<b>Capital Mobility Index</b>	360	1.89	0.96	-1.19	2.39
<b>Labour Restrictiveness Index</b>	360	4.62	8.58	0	44.82
<b>Theil Ratio of Govt. Expenditure</b>	360	0.83	0.52	0.13	2.22

#### Panel Diagnostic Tests

The countries in our sample are quite heterogeneous as the EU is heterogeneous, not only because of the greater differences between its members in terms of economic and financial structures as well as living standards but also because of the increased variety of languages and cultural

traditions, likely leading to different attitude of the countries towards openness and policies. As such, in our analysis, we have to take these differences into account, otherwise our estimates will give biased results. Therefore, we carry out diagnostic tests to check for the presence of heteroscedasticity and autocorrelation in our data.

We have performed the modified Wald test for group-wise heteroscedasticity to check for heteroscedasticity of the error term across countries. The null hypothesis is that the error variance is constant across countries. The p-value of the Wald test is 0.00 which implies that the null hypothesis is rejected, which implies the presence of group-wise heteroscedasticity. That is, the error variance varies across countries. Similarly, Wooldridge (2002) test is adopted to check for autocorrelation in our panel data. The null hypothesis is that there exists no first-order autocorrelation. The p-value of the Wooldridge test is 0.00. Hence, we cannot reject the null hypothesis. This implies that there also exists autocorrelation of order one. Thus, our diagnostic tests indicate that our error terms are heteroscedastic and autocorrelated.

Further, for detecting the multi-collinearity in the data we adopted two tests -Variance Inflating Factors (VIF) and the correlation matrix. We found that mean VIF was a little more than 2.5<sup>88</sup> (Table 4.10). It can be observed from the correlation matrix that correlations between explanatory variables included in the regression are by and large low (except for the correlation between inter-regional trade Theil and govt. expenditure Theil which is little over 0.5<sup>89</sup>) and multi-collinearity is unlikely to be an issue in our estimation (Table 4.11).

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<sup>88</sup> The rule of thumb is VIF should not exceed the value 10.

<sup>89</sup> Correlation between intra-regional trade Theil ratio and govt. expenditure Theil ratio being little above 0.5 should not pose a problem in our estimation. This can be substantiated by looking at the standard errors and confidence intervals for intra-regional trade Theil ratio in our output. If they are narrow enough that our estimates are sufficiently precise, then there is no problem.

**Table 4.10: Variation Inflating Factor**

<b>Variable</b>	<b>VIF</b>
<b>Intra-EU Trade Theil Ratio</b>	5.4
<b>Extra-EU Trade Theil Ratio</b>	3.7
<b>Capital Mobility Index</b>	1.3
<b>Labour Restrictiveness Index</b>	1.2
<b>Theil Ratio of Govt. Expenditure</b>	3.1
<b>Mean VIF</b>	<b>2.6</b>

**Table 4.11: Correlation Matrix**

<b>Explanatory Variables</b>	<b>Intra-EU Trade Theil Ratio</b>	<b>Intra-EU Trade Theil Ratio</b>	<b>Capital Mobility Index</b>	<b>Labour Restrictiveness Index</b>	<b>Theil Ratio of Govt. Expenditure</b>
<b>Intra-EU Trade Theil Ratio</b>	1				
<b>Extra-EU Trade Theil Ratio</b>	-0.68	1			
<b>Capital Mobility Index</b>	0.27	0.02	1		
<b>Labour Restrictiveness Index</b>	-0.1	0.16	-0.16	1	
<b>Theil Ratio of Govt. Expenditure</b>	0.58	-0.02	0.44	-0.23	1

*Income Convergence: Estimation Results for EU*

During the period 2000-2014, different countries joined the EU in different years. Out of 23 countries included in our dataset, 12 countries had joined EU prior to 2000<sup>90</sup>. Therefore, we include a dummy variable, “UNION” in the regression models (1) and (2) which takes the value 1 if a country was part of EU in a given year, otherwise it takes the value zero. Accordingly, the dummy variable, “UNION” will reflect the impact (if any) of EU membership on reducing income inequality across the member countries.

<sup>90</sup> The European Union has grown from the six founding states (Belgium, France, West Germany, Italy, Luxembourg, and the Netherlands) to the current 28. The accession dates of the member countries are given in the Appendix A4.3.



We have run both fixed effects (FE) and random effects (RE) regressions on specifications (4.3) and (4.4), corrected for autocorrelation and heteroscedasticity, followed by Hausman Specification test to choose between the estimates obtained from RE and FE models. Although the Hausman test suggests that FE estimations are more appropriate than RE estimations, we have chosen RE specification over FE one because the latter explores the relationship between the explanatory variables and the dependent variable within a country. But, RE specification ignores time-invariant variables that might affect the dependent variable. Any potential bias arising from possibly omitted time invariant variables does not bias the FE estimation, since the individual-specific intercepts capture the effects of these variables. However, by eliminating the effects of omitted heterogeneity through FE estimation, the valuable information stemming from the variation between individuals is lost as well. Higher standard errors and thus imprecise parameter estimates is the consequence of ignoring the variation between individuals (Durlauf et al 2005: 629-631). In such cases, it is better to rely on the estimations obtained from RE specification.

In order to get an in-depth picture of the variations in the variables included in the model across country and over time, we calculate the decomposed standard deviations of the variables and tabulate them in Table 4.12.

**Table 4.12: Decomposed Standard Deviations**

<b>Variable</b>		<b>Std. Dev.</b>
<b>Country</b>	overall	6.932
	between	7.071
	Within	0.000
<b>Year</b>	overall	4.327
	between	0.000
	Within	4.327
<b>Income Theil Ratio</b>	overall	0.449
	between	0.456
	Within	0.042
<b>Intra-EU Trade Theil Ratio</b>	overall	0.906
	between	0.905
	Within	0.180
<b>Extra-EU Trade Theil Ratio</b>	overall	0.210
	between	0.209
	Within	0.046
<b>Capital Mobility Index</b>	overall	0.955
	between	0.735
	Within	0.628
<b>Labour Restrictiveness Index</b>	overall	8.583
	between	8.733
	Within	0.622
<b>Theil Ratio of Govt. Expenditure</b>	overall	0.518
	between	0.526
	Within	0.046

In our model, income Theil ratio varies much more across countries than over time. The Income Theil Ratio coefficient (indicator for relative share of country's income in the EU) reports between- country standard deviation of 0.456 units and within- country standard deviation of 0.042 units. In situation like this, coefficient of the regressor, with little within variation, estimated using FE model will not identify within variation at all leading to efficiency loss. This will give rise to imprecise estimate for Income Theil Ratio. Moreover, all the explanatory variables included in our study exhibit greater between-country variations than within-country variations, indicating that a significant amount of valuable information would be lost if FE specification model is adopted. Also, according to Kanwar (2003) the advantage of the RE model over FE model stems from the fact that estimating a FE model implies not only substantially fewer degrees of freedom but also ruling out all information that may be available by directly comparing individual units. This would provide misleading results particularly when the number of individual units in a panel exceeds the number of time periods, for, in such a situation, we must make efficient use of the information across individual units to estimate that part of the behavioural relationship under study which contains variables that (are hypothesized to) differ substantially across the units. Since, the number of countries in our panel exceeds the number of time periods<sup>91</sup>, and going by the logic of Kanwar (2003), RE would be a more appropriate choice of estimation technique for our selected model. Therefore, our choice of RE estimates over FE estimates is justified.

Table 4.13 reports the regression results of our RE models<sup>92</sup> (for baseline and extended versions) that have been corrected for autocorrelation and heteroscedasticity using the method of Feasible GLS (FGLS). FGLS is the method suggested when the form of heteroscedasticity has to be estimated before applying GLS. FGLS estimates the unknown parameters of the regression model when the true error variance-covariance matrix is not known. FGLS uses an estimated error variance-covariance matrix to find the parameters of the model (Greene 2008).

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<sup>91</sup> N=23, T=15

<sup>92</sup> The results of FE model corrected for autocorrelation and heteroscedasticity is presented in the Appendix A4.4 for reference.

**Table 4.13: FGLS Estimates for the Impact of Trade on Income Convergence: EU**

<b>Dependent Variable: Income Theil Ratio</b>		
	<b>Baseline Model</b>	<b>Extended Model</b>
<b>Intra-EU Trade Theil Ratio</b>	<b>0.5045**</b> (0.0207)	<b>0.0894**</b> (0.0133)
<b>Extra-EU Trade Theil Ratio</b>	<b>1.5364**</b> (0.0863)	<b>0.2839**</b> (0.0471)
<b>Capital Mobility Index</b>	<b>0.0343*</b> (0.017)	<b>0.0036</b> (0.0071)
<b>Labour Restrictiveness Index</b>	<b>-0.0102**</b> (0.0015)	<b>-0.0008</b> (0.0007)
<b>UNION</b>	<b>0.1404**</b> (0.0423)	<b>0.0634**</b> (0.0178)
<b>Theil Ratio of Govt. Expenditure</b>		<b>0.7291**</b> (0.0177)
<b>Constant</b>	<b>0.2196**</b> (0.0343)	<b>0.0796**</b> (0.0147)
<b>Test for overall significance of the model</b>	Wald chi2(5) =958.23 <sup>a</sup>	Wald chi2(6) =7206.17 <sup>b</sup>
<b>(H0: All Slope Coefficients are zero)</b>	Prob > chi2 = 0.00 a: Reject H <sub>0</sub>	Prob > chi2 = 0.00 b: Reject H <sub>0</sub>

Standard errors in parenthesis. \*\*significant at 1% level of significance. \*significant at 5% level of significance.

Following broad observations can be drawn from the regression results. In the baseline model, the coefficients on core controls- Theil ratio of extra-EU and Theil ratio of intra-EU trade are positive and highly significant (at 1 per cent level of significance). This implies that a country which improves its relative position in overall trade versus the other countries in the EU also

improves its relative income position which in turn supports the process of per capita income convergence. This finding is in line with Baruah et al (2006) where they find same result for EU-15 countries. It can also be noted that the estimated coefficient on Theil ratio of extra-EU trade is higher than the estimated coefficient on Theil ratio of intra-EU trade implying that inter-national trade has a greater impact on the process of income convergence. In general terms, the impact of international trade seems to have greater impact on improving relative position of countries as compared to inter-regional trade. An explanation to this can be found in the theory of economic integration given by Viner (1950). Viner (1950) introduced the classic analysis of the real income effects of membership in a Custom Union (or Economic Union) characterized by inter-regional free trade among partner countries and established the ideas of trade creation and trade diversion. Membership in an FTA changes the sources from which products are supplied to member country markets, increasing the supply from the partner countries as these receive preferential treatment, but possibly also reducing the supply from domestic production and from the rest of the world. To the extent that overall supply is increased and lower cost imports from the partner country replace higher cost (previously protected) domestic production, we expect the welfare gains of trade creation. However, to the extent that increased imports from partner countries displace lower cost imports from the rest of the world (a possibility that arises because of the preferential treatment of partner imports) then the country experiences the welfare loss arising from trade diversion. Whether a customs union is desirable or undesirable depends largely on whether it leads to trade creation or trade diversion. It has been well argued that the tendency for these forces to lead to large concentrations of economic activity will be more pronounced in FTAs amongst low income countries than for those containing high income countries. This will be a further force for divergence of income levels in developing country custom unions. In other words, an FTA between developing countries might lead to divergence of their income levels, with the richer countries benefiting at the expense of the poorer. However, custom unions that contain high income members are more likely to lead to convergence rather than divergence of income levels. There is therefore a case for low income countries to forge trade links with high income countries, which is the case with EU. Hence, inter-regional trade in EU has greater trade creation effect than trade diversion effect and therefore, it contributes to the process of income convergence. But, the trade created among members of a currency union comes at the expense of a diversion (even though small) of their trade away from non-members which is not so in the case of international

trade. This is reflected in the regression result with impact of inter-national trade coming out to be higher than that of impact of inter-regional trade in causing income convergence.

The coefficient of capital mobility is positive and significant at 5 per cent level of significance, which implies the larger is the capital mobile between countries, higher will be the income Theil ratio. This suggests that capital mobility is a significant driving force of per capita income convergence in the EU. This finding is in resonance with findings of Barro et al (1995), Gourinchas and Jeanne (2006) etc, which agree that capital mobility leads to transference of capital from rich to poor countries. This reallocation of capital accelerates income growth and speeds up per capita income convergence as incomes in poorer countries rise faster to their steady state levels than they would in the case of restricted capital mobility thus improving their relative position with respect to income vis-à-vis richer countries. Capital mobility brings with it productivity benefits accruing from knowledge transfer or greater domestic financial sector efficiency, better governance, and improved macroeconomic discipline (Kose et al, 2006). However, such favourable impact of capital mobility also involves the risks of exchange rate overvaluation and loss of international competitiveness (leading to slow down of growth) associated with capital mobility cannot be ruled out. Hence, to reap the benefits of capital mobility it is better to guard against the vagaries of capital mobility by channelling the inflows of capital in improving productivity by raising technology content and quality of products.

The coefficient on labour restrictiveness index is negative and highly significant. Lowering barriers to labour mobility has been recognized to be vital for the integration of the EU single market as it allows labour to move from places with high unemployment to places with low unemployment (Barslund and Busse, 2016; Tersch et al., 2016). This seems to have contributed further to the convergence in the Union, since high unemployment is associated with the lack of convergence in some cases (Soukiazis, 2000). However, as mentioned before, some scholars have found evidence of labour mobility being an obstacle for income convergence, since it dampens the incentives for capital investment in the low-income country, and thus lower the capital stock (see Rappaport, 2005 and Faini, 1996). In the case of member countries of the EU, though, it is safe to argue that the investments in capital has not decelerated. The EU has mechanisms made to encourage investment to its less developed members, both through guidance and financial help for members having GDP per capita less than 75 per cent of the EU average (European Commission

Directorate-General for Regional Policy, 2008). Thus, we can conclude that the labour mobility is one of the factors that has promoted per capita income convergence in EU during 2000-2014. The entry of a country in the EU is associated with adjustments of the labour market, with people often moving abroad in order to look for more attractive job opportunities. These movements of labour are completely market driven, leading to better efficiency, improved human capital and knowledge spillovers, as often people working abroad do travel back to their home countries and share their experience and understanding of production and organizational processes.

As expected, coefficient of the dummy variable, UNION is positive and significant at 1 per cent level of significance validating the fact that European integration has contributed to reducing income inequality by improving the relative income positions of member countries. Consequently, accession to EU leads to per capita income convergence.

The results of FGLS regression on the extended model (which takes, in addition, Theil ratio of govt. expenditure explanatory variable) interestingly reflect that the coefficients of all the variables, except that of capital mobility index and labour restrictiveness index, are significant at 1 per cent level of significance. As far as our core variables of interest is concerned, the coefficient on extra-EU trade Theil ratio is positive and higher than the positive coefficient on intra-EU trade Theil ratio. This result is consistent with that of baseline model even though the coefficient of trade Theil ratios of the extended model are smaller than that obtained in baseline regression model. The coefficient on Theil ratio of government expenditure is positive and significant. This suggests that govt. expenditure has contributed to the process of income convergence in EU during the period of analysis. Our finding echoes similar findings by Aschauer (1989), Munnell (1990), Evans and Karras (1994) etc which report that government plays growth enhancing role by ensuring efficient distribution and allocation of resources. Moreover, government expenditure is crucial for socio-economic organization, political stability, provision of goods like health and education etc; all of which are necessary condition of per capita income growth and convergence.

It seems that the factor mobility indicators are rendered insignificant in the presence of Theil ratio of govt. expenditure. It may be due to the fact that govt. expenditure eclipses<sup>93</sup> the

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<sup>93</sup> Local government expenditure in terms of investment is found to have a positive effect on subsequent migration (labour mobility) while leaving growth in mean income unaffected (Lundberg, 2001). Shen et al (2015) have shown

effects of capital mobility and labour mobility respectively. Or it could be because of the way the data on government expenditure<sup>94</sup> is defined which doesn't give a complete picture of the nature of government expenditure. In any case, our result/interpretation on the relationship between trade and income convergence doesn't change, albeit difference in magnitude of the coefficients.

In a nut shell, our main empirical finding is that trade in general has a significant impact on per capita income convergence in EU. In addition, factor mobility too contributes to the process of income convergence by way of reallocating resources from factor rich to factor poor countries. In fact, several studies document how, up until the onset of the financial crisis in 2008, the various phases of EU deepening have led to greater trade integration (Gil-Pareja, LlorcaVivero and Martínez-Serrano, 2008), more financial integration (Jappelli and Pagano,2010) and more labour mobility (Portes, 2015, European Commission 2015) between EU member states. And we are able to show that trade integration of EU has positively impacted the improvement of relative position of poor countries vis-à-vis rich countries, thus leading to convergence across countries of the EU.

#### **4.4.2 ASEAN: Discussion of Regression Results**

As far as dataset of ASEAN nations is concerned, Brunei Darussalam has no observation for capital mobility index and Myanmar has no observation on government expenditure. Hence, we have dropped both Brunei Darussalam and Myanmar from our final dataset before carrying out

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that the degree of external financing matters for government spending effects in the environment with limited international capital mobility. The importance of accounting for financing sources, however, largely vanishes when international capital mobility becomes high. This may cause government expenditure effect to veil effects of labour and capital mobility.

<sup>94</sup> It has been found by various studies that with relatively bigger interventionist governments are also characterized by lower capital mobility because they tend to segment their capital markets from international capital markets beyond levels that would otherwise occur. For instance, legal restrictions on institutional investors such as insurance companies and pension funds could limit the amount they can invest abroad; alternatively, the risk of capital controls, and changes in government regulations, tax rules, and government procurement rules in ways that are especially disadvantageous to foreign investors, could inhibit flows of direct investment [Feldstein (1994)]. It is, however, not so much that these impediments actually have to be in place to reduce capital mobility; rather it is the perceived risk that these might occur, which could deter investors from shifting capital abroad. As far as our study is concerned, data for government expenditure is aggregative and hence much inference on its impact on capital mobility can't be drawn.



empirical analysis. Our final panel dataset has 8 countries and 15 years (2000-2014), it is a long panel with many time periods for relatively few individuals (countries), i.e., we are observing only 8 countries for relatively more number of years ( $T > N$ ). Summary statistics of the variables used in our regression is given in the following table.

**Table 4.14 ASEAN: Summary Statistics**

<b>Variable</b>	<b>Obs.</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<b>Income Theil Ratio</b>	120	2.46	4.13	0.17	13.86
<b>Intra-ASEAN Trade Theil ratio</b>	120	6.38	14.44	0.12	52
<b>Extra-ASEAN Trade Theil ratio</b>	120	-0.77	2.14	-11.07	0.33
<b>Capital Mobility Index</b>	120	0.08	1.19	-1.89	2.39
<b>Labour restrictiveness Index</b>	120	3.82	4.4	0.16	13.91
<b>Theil Ratio of Govt. Expenditure</b>	120	2.56	4.26	0.08	15.67

The variables, country and year, have the expected range. The variability in intra-ASEAN trade Theil ratio (our main predictor) is actually greater than the income Theil ratio (the regressand), with respective standard deviations of 14.44 and 4.13 respectively. This is because intra-ASEAN trade share of Singapore is very large as compared to other countries in ASEAN. All variables are observed for all 120 observations, so the panel is strongly balanced.

As specified in the beginning, our aim is to measure the responsiveness of income Theil ratio to explanatory variables, in particular, intra- ASEAN and extra-ASEAN trade Theil ratios. When the panel has few individuals (countries, in our case) relative to number of periods (years), the individual effects (here country effects) can be incorporated into the explanatory variables ( $x_{it}$ , say) as dummy variable regressors. Rather than trying to control for large number of year (time) effects as we do in short panels, it is better to take sufficient advantage of natural ordering of time (as opposed to individuals) and simply include a trend in time. Therefore, we will estimate a pooled model in the form of equation (4.6):

$$y_{it} = x'_{it} + u_{it}, \quad i = 1, \dots, N; t = 1, \dots, T \quad \text{----- (4.4),}$$

where the regressors  $x_{it}$  include an intercept, often time and possibly time squared, and set of individual indicators (like trade theil ratio, capital mobility index, labour restrictiveness index etc.). We assume that errors are stationary.

Since  $T$  is large relative to  $N$ , it is possible to relax the assumption that  $u_{it}$  is independent over  $i$  and there is no serial correlation. We present the estimation results of the above regression equation obtained using panel GLS that are asymptotically more efficient than those obtained from pooled OLS method. The panel GLS method that we are going to employ is more flexible as it allows for following characteristics of error term (that are distinctive of long panel dataset):

- Heteroscedasticity of error terms, i.e., variance of error terms is not constant across countries. So,  $u_{it}$  is independent with a variance of  $E(u_{it}^2) = \sigma_i^2$  that can be different for each country. As there are many observations for each individual,  $\sigma_i^2$  can be consistently estimated.
- Error correlation across individuals, with independence over time for a given individual, so that  $E(u_{it}u_{ij}) = \sigma_{ij}$ .
- Serial correlation of errors for each individual country, i.e. it permits autocorrelation of the error term with  $u_{it} = \rho u_{i,t-1} + \varepsilon_{it}$ , where  $\varepsilon_{it}$  is i.i.d.

### Regression Results

Table 4.15 presents our panel GLS regression results for both baseline and extended models. As all the member countries of the ASEAN have joined ASEAN prior to 2000, we have not included UNION dummy variable like in the case of the EU.

**Table 4.15: Panel GLS Regression Results the impact of Trade on Income Convergence: ASEAN**

<b>Dependent Variable: Income Theil Ratio</b>		
	<b>Baseline Model</b>	<b>Extended Model</b>
<b>Intra-ASEAN Trade Theil Ratio</b>	<b>0.3613***</b> (0.0063)	<b>0.3304***</b> (0.0099)
<b>Extra-ASEAN Trade Theil Ratio</b>	<b>0.5397***</b> (0.035)	<b>0.5084***</b> (0.0367)
<b>Capital Mobility Index</b>	<b>0.0187***</b> (0.0036)	<b>0.0249***</b> (0.0036)
<b>Labour Restrictiveness Index</b>	<b>-0.0179***</b> (0.0032)	<b>0.0014</b> (0.0048)
<b>Theil Ratio of Govt. Expenditure</b>		<b>0.1243***</b> (0.0239)
<b>Constant</b>	<b>0.6059***</b> (0.0125)	<b>0.3724***</b> (0.0179)
<b>Test for overall significance of the model</b>	Wald chi2(4) = 7008.06 <sup>a</sup>	Wald chi2(5) = 13190.80 <sup>b</sup>
<b>(H0: All Slope Coefficients are zero)</b>	Prob > chi2 = 0.0000 a: Reject H <sub>0</sub>	Prob > chi2 = 0.0000 b: Reject H <sub>0</sub>

Standard errors in parenthesis. \*\*\*significant at 1% level of significance.

The results of the baseline model are similar to the results we find in the case of the EU. The estimated coefficients of all the explanatory variables are highly significant at 1 per cent level of significance. Unambiguously, the coefficient on intra-ASEAN and extra-ASEAN trade Theil ratio are positive, with coefficient of the latter variable higher than that of the former. As explained earlier this may be due to some trade diversion effect caused due to formation of FTA. An estimated positive coefficient on capital mobility index reveals that capita mobility contributed

significantly towards per capita income convergence in the ASEAN. AEC Blueprint<sup>95</sup> talks about ensuring capital account liberalization in ASEAN<sup>96</sup>. As far as capital account convertibility is concerned, though some countries (Singapore, Cambodia, Brunei, and Indonesia) are highly open, many (Lao, Thailand, and Myanmar) still maintain various restrictions on capital flows (Park and Takagi, 2012). These initiatives have triggered free flow of capital within the ASEAN which in turn seems to have led to the per-capita income convergence within the region. As expected, the labour restrictiveness coefficient is negative, signifying higher the labour immobility lower will be the income Theil ratio, affecting per capita income convergence. Recognizing this, systematic initiatives have been taken by the ASEAN nations. These initiatives include facilitating the issuance of visas and employment passes for ASEAN professionals and skilled labor who are engaged in cross-border trade and investment related activities, strengthen the research capabilities of each ASEAN Member Country in terms of encouraging skills, job placements and developing labor market information networks among ASEAN Member Countries<sup>97</sup>. With Mutual Recognition Arrangement (MRA)<sup>98</sup>, each country may recognize education and experience, requirements, licenses and certificates granted in another country. The Bali Concord II in 2003 called for completion of MRAs for qualifications in major professional services by 2008 in order to facilitate the free movement of professionals and skilled labor. In recent years, ASEAN Labor Ministers meetings have supported greater intra-regional labor mobility of skilled persons, both vis-a-vis ASEAN trade liberalization and investment liberalization as well as the social dimensions of ASEAN economic integration. The ASEAN region has witnessed growing international and regional labor mobility due to interplay of many factors as noted by Chia Siow Yue (2011).

In the extended model, labour restrictiveness index is rendered insignificant. The coefficients of all other variables are positive and significant, as expected.

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<sup>95</sup> In both AEC Blueprint 2015 and AEC Blueprint 2025.

<sup>96</sup> Refer Appendix A4.5 for broad guidelines on capital account liberalization in ASEAN.

<sup>97</sup> In ASEAN Economic Community Blueprint, 2008.

<sup>98</sup> A Mutual Recognition Arrangement (MRA) is a proposed arrangement among ASEAN member countries designed to facilitate the freer movement and employment of qualified and certified personnel between ASEAN member countries. It was originally envisaged in the ASEAN Tourism Agreement 2002.

## 4.5 Per Capita Income Convergence in the EU and the ASEAN: A Comparison

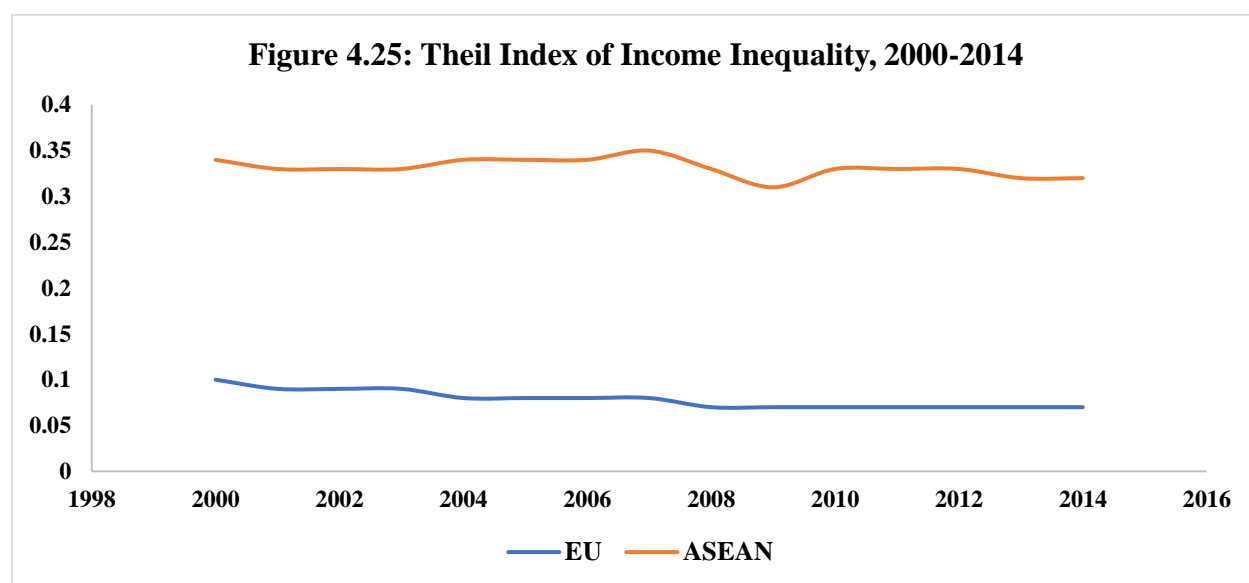
Regional integration has been a major research topic over the last two decades. The initial focus was on the assessment of the monetary policy and currency integration potential of the EU, later the research area further extends to cover the assessment of the success of the EU as well as the investigation of the integration potential of other regions like the East Asia, ASEAN, the South Mediterranean countries, the East African Community (EAC) etc. Among these regions, economists such as Bayoumi and Eichengreen (1997) suggest that ASEAN as one of the highly credible candidates for a currency union after EU, although significant differences exist in the integration process between the EU and East Asia (Capannelli and Filippini, 2010). To emphasize, by establishing a single market and production base, the ASEAN Economic Community (AEC) aims at EU-style deeper and broader economic integration between ASEAN member countries. It is in this context, we have embarked on a comparative analysis of per capita income convergence in the EU and the ASEAN, first gauging income convergence using the traditional concepts of beta and sigma convergence and Theil index of inequality and then evaluating the role of trade in the process of income convergence using panel econometric estimation methodology with Theil ratios. At this point it is however important to note that it is not possible to compare the estimated coefficients of regression models for the EU and the ASEAN in absolute terms. This is because the number of countries of the EU and the ASEAN, included in the model, are different plus the economic characteristics of EU is different from that of the ASEAN. That said, in this section, we provide some broad comparative inferences on the income convergence and on the role of trade and other factors in causing income convergence in the EU and the ASEAN, econometrically and in relative terms.

While the expansion of the EU from 6 founding members to 28 members has significantly increased the EU's diversity, the region still remains dominated by the developed countries and symmetric in comparison to ASEAN, which features developed countries, middle-income developing countries and least-developed countries<sup>99</sup>. This is well reflected by Theil indices of

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<sup>99</sup> In terms of per capita income, "six majors" refers to six largest economies in ASEAN, namely Indonesia, Thailand, Philippines, Malaysia, Singapore and Brunei Darussalam, that are many times larger than the remaining four CMLV countries, viz., Cambodia, Myanmar, Lao PDR and Vietnam. When Vietnam, Laos, Myanmar, and Cambodia joined

income inequality calculated for the EU and the ASEAN (Figure 4.25); income Theil indices for the EU is lower than those of the ASEAN in all the years during 2000-2014.



Our preliminary investigation into per capita income convergence provides us the evidence of both beta and sigma convergence in the EU and the ASEAN during 2000-2014. Also, a trend analysis of the Theil index of inequality with respect to income reinstates the evidence of income convergence across the countries of the EU and the ASEAN. Thus, we conclude that even though the countries of the EU and the ASEAN are at different levels of development, both groups exhibit per capita income convergence across countries.

From our regression results it is clear that trade and factor mobility have similar effect on the EU and the ASEAN nations. An improvement in trade Theil ratios, capital mobility index and Theil ratio of government expenditure led to per capita income convergence among the countries of the EU as well as the among the countries of the ASEAN. Also, labour restrictiveness affected income Theil ratio negatively in both the EU and the ASEAN, thus being counter force to per capita income convergence.

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ASEAN in the late 1990s, concerns were raised about a gap in average per capita GDP between older and newer members. In response, the Initiative for ASEAN Integration (IAI) was formed by ASEAN as a regional integration policy with the goal of bridging this developmental divide, which, in addition to disparities in per capita GDP.

One prominent finding is that while in both the case of the EU and the ASEAN, the estimated coefficient of extra-regional trade Theil ratio is higher than the estimated coefficient of intra-regional trade Theil ratio, the difference in the estimated coefficients of intra-regional and extra-regional trade Theil ratios is higher for the EU. Asian Development Bank Report (2008) notes that as ASEAN's economic integration in trade increases, a striking feature of the region is that this trend occurs with a parallel increase in ASEAN's trade integration with the rest of the world. But in the EU countries trade more among themselves than with the rest of the world. This becomes very evident from table 4.16.

**Table 4.16: Intra-Group and Extra- Group trade as Percentage of Total Trade of the Group**

Year	EU		ASEAN	
	Intra-EU trade	Extra-EU trade	Intra-ASEAN trade	Extra-ASEAN trade
<b>2000</b>	64.42	35.58	22.62	77.38
<b>2001</b>	64.60	35.40	22.12	77.88
<b>2002</b>	65.32	34.68	22.51	77.49
<b>2003</b>	66.19	33.81	24.98	75.02
<b>2004</b>	65.74	34.26	24.96	75.04
<b>2005</b>	64.60	35.40	25.43	74.57
<b>2006</b>	64.20	35.80	25.38	74.62
<b>2007</b>	64.48	35.52	25.50	74.50
<b>2008</b>	63.01	36.99	25.18	74.82
<b>2009</b>	62.95	37.05	24.71	75.29
<b>2010</b>	61.25	38.75	24.90	75.10
<b>2011</b>	60.46	39.54	24.41	75.59
<b>2012</b>	59.06	40.94	24.71	75.29
<b>2013</b>	59.77	40.23	24.52	75.48
<b>2014</b>	60.64	39.36	24.43	75.57
<b>2015</b>	59.80	40.20	23.89	76.11

Source: Author's calculation using data from UNCTAD

We can observe from table 4.16 that the share of intra-EU trade has been secularly higher than share extra-EU trade in total trade of the EU during 2000-2015 but for ASEAN, it is the reverse, i.e., share of extra-ASEAN trade in total trade of the ASEAN has remained higher than that of intra-ASEAN trade. This means the loss due to trade diversion is more for EU than for ASEAN, and the EU countries have greater scope of gaining in terms of speeding up the process of per capita income convergence relative to that of the ASEAN by opening up their trade relations beyond EU. This explains the point that the difference between the estimated coefficients of international and inter regional trade Theil is smaller for the ASEAN than for the EU.

In the ASEAN, regionalism is the outcome of free market forces bringing closer economic interaction and interdependence. Intra-ASEAN integration in general and trade in particular has been essentially market-driven, rather than being the result of government-driven initiative. National government authorities across the region has traditionally played a relatively less important role. This is in sharp contrast with the EU. However, as markets take the lead, government initiatives (in terms of, say, government expenditure) needs to be taken to reap the benefits of regional collective action and compensate for market failures. In fact, the Asian Financial Crisis of 1997 lately induced fiscalization comprising government expenditure, among other measure, to reverse the negative impacts of the crisis.

Intra and extra regional trade are complementary in both EU and the ASEAN (since, the estimated coefficients of both the intra and extra regional trade is positive for both EU and ASEAN). Thus, policy interventions to increase regional trade can also improve the international competitiveness of developing countries, calling for a double-edged policy; regional integration policy to scale up countries supply capacity, and international integration policy to scale up the demand they face.

Lastly, while the impact of government expenditure on per capita income overshadows the impact of both labour and capital movements on per capita income in the case of the EU; the impact of government expenditure on per capita income overshadows only the impact labour and not capital movements on per capita income in the case of the ASEAN. It could be because government expenditure in terms of investment has a positive effect on labour mobility leaving to growth in mean per capita income unaffected. In the case of the EU countries, government intervention and centralised monetary system promotes capital movement. But in the case of the



ASEAN countries, capital movement is market driven. Unlike the EU, ASEAN doesn't have a supra-government intervention and centralised monetary system to ensure capital mobility.

## **4.6 Summary and Conclusion**

The objective of this chapter was to examine the role of trade as a driver of per capita income convergence among the EU and the ASEAN countries and if trade is found to have an impact on income convergence, whether trade influences both group of developing and developed countries in the same way.

Using the traditional concepts of beta and sigma convergence developed by Barro-Sala-i-Martin (1991), we began by examining whether there is per capita income convergence among the EU and the ASEAN nations during 2000-2014 and found evidence of per capita income convergence across the countries in the EU and the ASEAN. This was re-affirmed by the trend analysis of Theil index of income inequality, whereby we found that that the Theil index of income inequality has declined for the EU and the ASEAN during 2000-2014.

Additionally, trend analysis for Theil index of inequality in terms of sectoral components were also done. For the EU, it was found that inter-country inequality for services has narrowed continuously, but the indices of inequality with respect to agriculture and services do not show any such specific trend. During 2000-2014, in EU, the levels of inequality are the lowest for industry, followed by income and services. Moreover, there is a visible decreasing trend in Theil index of inequality with respect to government expenditure vis-à-vis a decline in the inter-country inequality in the EU. However, there is hardly any noticeable trend in Theil index of intra-EU trade while there is falling trend in extra-EU trade till 2008. After 2008, a distinct trend in extra-EU trade is not as apparent. For the ASEAN, inter-country inequality with respect to industries has fallen during 2000-2014, but that for agriculture has risen. Nevertheless, there is no such distinct trend for inter country inequality with respect to services. During 2000-2014, in the ASEAN, the levels of inter country inequality are the lowest for agriculture followed by GDP and industry. Also, there is a decreasing trend in Theil index of inequality with respect to government expenditure, intra-ASEAN trade and extra-ASEAN trade vis-à-vis declining trend in Theil index of income inequality.

As per the empirical results, we have strong evidence that trade was the causal factor leading to income convergence in both the EU and the ASEAN as our results show that a country which improved its relative position in overall trade of the region versus the other countries in the region also improved its relative income position in the region which in turn drove the process of per capita income convergence. Its impact is more pronounced in the EU, which is more integrated with each other in terms of trade than ASEAN. International trade seems to have had greater impact on the process of income convergence than intra-regional trade for both the groups of countries. The difference in impact of international and inter-regional trade is higher for the case of the EU than for the ASEAN. This is the reflection of the fact that as ASEAN's economic integration in trade increased, there has been a parallel increase in ASEAN's trade integration with the rest of the world. This however is not the case with the EU countries which are more strongly integrated among themselves than with the rest of the world.

In addition to trade, factor mobility (capital and labour mobility) among countries were found to play crucial role in causing per capita income convergence in the EU and the ASEAN. An increase in government expenditure has had further boost on the process of income convergence. However, it is trade that has emerged as the most important factor in causing per capita income convergence across the countries of both the EU and ASEAN.

## Chapter V

# Gerschenkron's Hypothesis of Relative Backwardness and Income Convergence: Case Studies of the EU and the ASEAN

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### 5.1 Introduction

In the previous chapter we have found that a country which improves its relative position in overall trade versus the other countries also improves its relative income position which in turn supports the process of per capita income convergence. One way in which a country is able to improve its relative position in income with respect to other countries in a region is by attaining a relatively higher growth rate in per capita income as compared to other countries. In Chapter IV we saw that, for both the EU and the ASEAN economies during 2000-2014, countries with relatively lower (or higher) initial value of GDP experienced higher (or lower) growth rate (i.e., the evidence of beta convergence). In other words, the countries in the EU and the ASEAN that had lower per capita income in 2000, grew at higher rate of growth during 2000-2014. This finding is in accordance with theory of relative backwardness (Gerschenkron, 1952). Gerschenkron advocated the theory of relative backwardness to explain why economies that had previously trailed behind in the course of growth and development should suddenly experience growth accelerations (Gerschenkron 1962, 1963, 1965).

Deriving from the experiences of Britain, Germany, and Russia in the nineteenth century, Alexander Gerschenkron's (1952) influential essay 'Economic Backwardness in Historical Perspective', identifies three different channels of industrialization, growth and development, depending on the levels of initial backwardness. They are -(i) In the United Kingdom, the forerunner of industrial revolution, the accumulated wealth of private capitalists was a principal source of finance and individual entrepreneurs played a central role in industrialization and modernization of agriculture; (ii) by contrast, in the relatively more 'backward' Western parts of Europe, where capital was scarce and diffused, and entrepreneurship was less developed, the banking system took over the role of promoters of industrialization by promoting investment; (iii) Lastly, in Eastern Europe, where the extent of backwardness was even more accentuated due to

the absence of entrepreneurs as well as banks, the state performed the role of institutional instrument of industrialization.

Therefore, by definition of Gerschenkron's "relative backwardness", the relatively backward countries were backward because they lacked preconditions for modern growth like capital, entrepreneurship, sound financial system etc. Countries caught in a state of relative backwardness were under the pressure to close the economic gap between themselves and the forerunner countries. Gerschenkron argued that relatively backward countries can create conditions for rapid growth by substituting for missing preconditions by way of higher government expenditure, developing banking systems, encouraging entrepreneurship etc.

The objective of this chapter is to apply Gerschenkron's theory of Relative Backwardness to the study of per capita income convergence. Put in other words, the objective of this study is to assess the contribution of trade openness and government expenditure as a policy variable capturing the role of state in growth in per capita income in the ASEAN and the EU. This relates to the second hypothesis laid down in the third chapter of this thesis viz., the countries with relatively lower initial value of per capita GDP experiences relatively higher growth rate of GDP per capita due to expansionary policies of government and trade, i.e., the theory of relative backwardness holds for the countries in the EU and the ASEAN. Gerschenkron has spoken at length about the role of government expenditure in substituting preconditions and fostering higher growth by way of generating demand over and above domestic demand. But his tenet has fails to reflect on the importance of international trade in generating demand by market expansion and thus functioning as one of the important substitutes of precondition for higher growth of the economy. For our analysis trade is an important variable to be considered because the main objective of creation of the ASEAN and the EU has been to increase mutual trade openness among the countries in the regions and the period of our study is characterized by increased trade flows witnessed by the countries under study. Moreover, in the previous chapter we have empirically demonstrated that a country which improves its relative position in overall trade versus the other countries also improves its relative income position which is turn supports the process of per capita income convergence. While testing the hypothesis pertaining to role of 'Relative Backwardness' in per capita income convergence, we have also considered other important factors as well such as

financial development, inflation and political stability as controls in analyzing their impact on income inequality.

The chapter is organized into four sections including the introduction (**Section 5.1**). In the next **section 5.2**, we give a detailed account of our empirical analysis on role of relative backwardness in growth and convergence and the consequent findings. It has two sub-sections, viz., **5.2.1 and 5.2.2** dealing with the empirical analysis for the EU and the ASEAN respectively. This is followed by **section 5.3** which presents a comparative analysis of the results on the EU and the ASEAN, thereby highlighting the differences in growth experiences, if any, as a result of trade and government expenditure. The final **section 5.4** summarizes the major findings and concludes the discussion.

## **5.2 Role of Relative Backwardness in Income Convergence: Empirical Results**

Following the Gerschenkron's Relative Backwardness theory, the study hypothesizes that the more the backward the country is at the initial stage, higher will be its income growth rates. This will be facilitated by the active role of government by way of higher government expenditure and greater openness to international trade. We have already shown that a country with lower the initial per capita income, experience higher growth rate in per capita income. In this chapter, we will try to delve into a study of the factors that have contributed to higher growth rates and that led to convergence among the countries of the EU and the ASEAN. More specifically, we attempt to test whether higher growth rate during 2000-2014 experienced by countries with low-initial income in 2000 is supported by higher government expenditure and countries' opening up to trade. We also include other controlling variables in our model viz., financial development, political stability and economic stability measure in terms of inflation. In our attempt to determine the role of relative backwardness in explaining per capita income convergence across the countries of the, we estimate the following model, individually for the EU and the ASEAN:

$$GRPCI_{it} = \alpha_0 + \alpha_1 \ln GDPPC_{it-1} + \alpha_2 TRADE_{it} + \alpha_3 GOVT_{it} + FinDev_{it} + INF_{it} + PolStability_{it} + \varepsilon_{it} \quad (5.1)$$

where the dependent variable  $GRPCI_{it}$  is GDP per capita growth rate of country  $i$  in period  $t$ ;  $\ln GDPPC_{it-1}$  denotes logarithm of GDP per capita of country  $i$  in period  $t-1$ ;  $TRADE_{it}$  represents the total trade (as per cent of GDP) of country  $i$  in period  $t$ ;  $GOVT_{it}$  denotes government expenditure (as per cent of GDP) of country  $i$  in period  $t$ ;  $FinDev_{it}$  denotes the financial development index of country  $i$  in period  $t$ ;  $INF_{it}$  is the inflation rate of country  $i$  in period  $t$ ;  $PolStability_{it}$  is the index of political stability of country  $i$  in period  $t$  and  $\varepsilon_{it}$  is the random error term.

We have panel dataset of 28 countries over the period 2000-2014 in case of EU and 9 countries (as we don't have data on government expenditure for Myanmar, we drop it from our sample) over the same period of 2000-2014.

### 5.2.1 Empirical Analysis: European Union

#### *Panel Diagnostic Tests*

Before formally going for panel diagnostic tests, we present the descriptive statistics for variables used in the analysis in Table 5.1.

**Table 5.1: EU-Descriptive Statistics**

<b>Variable</b>	<b>Obs.</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<b>GRPCI</b>	420	2.05	3.83	-14.56	12.92
<b>lnGDPPC</b>	420	10.10	0.71	8.24	11.63
<b>TRADE</b>	420	112.59	61.31	45.61	378.62
<b>GOVT.</b>	420	19.78	2.71	14.08	28.06
<b>FinDev</b>	420	0.58	0.21	0.13	0.94
<b>INF</b>	420	3.04	3.63	-4.48	45.67
<b>PolStability</b>	420	0.78	0.43	-0.48	1.66

The overall sample size of  $N=28$  and time period is  $T=15$ . So, we have a balanced short panel data set. Given the longitudinal nature of the dataset, we begin by estimating Equation 5.1

for EU with pooled OLS Method. The OLS method is optimal if error processes have the same variance (homoskedasticity) and all the error processes are independent of one another. Nevertheless, the panel data are typically plagued by complicated error processes (Beck and Katz 1995): panel heteroskedasticity (i.e., variances of the error processes differ from country to country); contemporaneous correlation (i.e., large errors for country  $i$  at time  $t$  will often be associated with large errors for country  $j$  at time  $t$ ); and serial correlation (i.e., errors for each country show temporal dependence [autocorrelation]). According to Baltagi (2007), cross-sectional dependence is a problem in macro or long panels with long time series (over 20-30 years). This is not much of a problem in short panels ( $N > T$ ).

In other words, even if we start with the assumption that data are homoskedastic and not autocorrelated, we risk producing a regression estimate with observed heteroskedasticity and autocorrelated errors. This is because heteroskedasticity and autocorrelation are also a function of model misspecification. It is for this reason that we applied tests for checking the presence of heteroskedasticity and autocorrelation. First, a modified Wald test for group-wise heteroskedasticity in a fixed effect regression model reveals the presence of heteroskedasticity which, while leaving coefficient estimates unbiased, can significantly influence standard errors and therefore affect hypothesis testing. A number of statistical techniques can address this problem (e.g., weighted least squares), but their applicability and implementation are less clear in a panel context (Podesta 2000). In addition to heteroskedasticity, the estimates using the fixed effects model are also affected by serial correlation. In particular, a Wooldridge test for autocorrelation in panel data rejects the null hypothesis of no first-order serial correlation. The consequences of autocorrelation are similar to heteroskedasticity, but the problems caused by the latter are usually more severe. OLS coefficient estimates remain consistent and unbiased in the presence of autocorrelation, but they are no longer best linear unbiased estimators (BLUE) or asymptotically efficient. Furthermore, autocorrelation causes standard errors to be biased.

We performed the modified Wald test for group-wise heteroscedasticity is performed to check for heteroscedasticity of the error term across countries. The null hypothesis is that the error variance is constant across countries. The p-value of the Wald test is 0.00 which implies that the null hypothesis is rejected, which implies the presence of group-wise heteroscedasticity. That is, the error variance varies across countries. Similarly, Wooldridge (2002) test is adopted to check

for autocorrelation in our panel data. The null hypothesis is that there exists no first-order autocorrelation. The p-value of the Woolridge test is 0.00. Hence, we cannot reject the null hypothesis. This implies that there also exists autocorrelation of order one.

Further, for detecting the multi-collinearity in the data we adopted two tests -Variance Inflating Factors (VIF) and the correlation matrix. We found that mean VIF is 2.87<sup>100</sup> (Table 5.2). It can be observed from the correlation matrix that correlations between explanatory variables included in the regression are by and large low (except for the correlation between initial per capita GDP and index of financial development which is little over 0.5<sup>101</sup>) and multi-collinearity is unlikely to be an issue in our estimation (Table 5.3).

**Table 5.2: Variation Inflating Factor**

<b>Variable</b>	<b>VIF</b>
<b>lnGDPPC</b>	6.32
<b>FinDev</b>	4.98
<b>PolStability</b>	1.83
<b>TRADE</b>	1.67
<b>GOVT.</b>	1.31
<b>INF</b>	1.13
<b>Mean VIF</b>	2.87

<sup>100</sup> The rule of thumb is VIF should not exceed the value 10.

<sup>101</sup> Correlation between inter-regional trade theil ratio and govt. expenditure theil ratio being little above 0.5 should not pose a problem in our estimation. This can be substantiated by looking at the standard errors and confidence intervals for trade theil ratio in our output. If they are narrow enough that our estimates are sufficiently precise, then there is no problem.



**Table 5.3: EU-Correlation Matrix**

<b>Variable</b>	<b>lnGDPPC</b>	<b>TRADE</b>	<b>GOVT.</b>	<b>FinDev</b>	<b>INF</b>	<b>PolStability</b>
<b>lnGDPPC</b>	1					
<b>TRADE</b>	0.18	1				
<b>GOVT.</b>	0.32	-0.23	1			
<b>FinDev</b>	0.85	-0.08	0.28	1		
<b>INF</b>	-0.24	-0.09	-0.09	-0.14	1	
<b>PolStability</b>	0.48	0.45	0.21	0.24	-0.004	1

*Results of Panel Regression Estimation*

Since heteroskedasticity and autocorrelation are present in our panel, therefore, we have to address it; otherwise our estimates will be inefficient. However, robust standard errors provide the standard errors in fixed effects model (FEM) that are heteroskedasticity and non-normality, but not autocorrelation. The alternative approach is to use random effects model (REM), where the time invariant independent variables, which are automatically dropped from FEM, can be accommodated. Therefore, we have run both FEM and REM regressions on Equation (5.1) corrected for autocorrelation and heteroscedasticity followed by Hausman Specification test to choose between the estimates obtained from REM and FEM models. The Hausman test suggests that FEM is consistent whereas REM is not. Moreover, FEM is appropriate in estimating equations like that of (5.1) due to the fact that latent variables influence the regressors, initial per capita income and the volume of trade, which contradicts with the REM. So, we have chosen FEM specification with panel corrected standard errors and correction for first order correlation.

Table 5.4 reports the regression results of our FEM model, corrected for heteroscedasticity and autocorrelation. In Table 5.4, we have also reported (in Column (B)) FEM regression analysis for a subset of countries of EU (EU-13<sup>102</sup>) that excludes the earliest 15 members of the EU<sup>103</sup>

<sup>102</sup> In the rest of this chapter we will use the nomenclature EU-13 to represent this subset of the EU countries.

<sup>103</sup> EU-15: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

which are generally characterized relatively by high income<sup>104</sup>. Before discussing the results, we will briefly talk about the due course of diagnostic tests that have been carried out for the EU-13. We performed the modified Wald test for group-wise heteroscedasticity is performed to check for heteroscedasticity of the error term across countries. The p-value of the Wald test is 0.00 which implies the presence of group-wise heteroscedasticity. Similarly, Wooldridge (2002) test is adopted to check for autocorrelation in our panel data and a p-value of 0.00 was obtained. This implies that there also exists autocorrelation of order one. For detecting the multi-collinearity in the data, we adopted Variance Inflating Factors (VIF) and found that mean VIF is 1.87, thus multicollinearity is unlikely to a problem for data pertaining to EU-13.

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<sup>104</sup> Regression results for REM estimations for EU-28 and EU-13 countries are reported in Appendix A5.1.

**Table 5.4: FEM corrected for autocorrelation and heteroscedasticity for EU**

<b>Dependent Variable: GRPCI</b>		
<b>Explanatory Variables</b>	<b>(A) EU</b>	<b>(B) EU, Excluding EU-15 countries</b>
<b>lnGDPPC</b>	-19.23** (2.33)	-22.47** 3.04
<b>TRADE</b>	0.07** (0.02)	0.08** 0.02
<b>GOVT</b>	-1.07** (0.20)	-1.51** 0.30
<b>FinDev</b>	11.35* (5.19)	11.51 7.59
<b>INF</b>	0.06 (0.05)	0.16 0.12
<b>PolStability</b>	3.05** (0.99)	6.20** 1.44
<b>Constant</b>	200.99** (21.77)	225.34** 28.14
<b>No. of Obs.</b>	420	195
<b>Test for overall significance of the model</b>	F (6,27) =20.63 <sup>a</sup>	F (6,12) = 15.22 <sup>b</sup>
<b>H<sub>0</sub>: All slope coefficients are zero</b>	Prob > F=0.0000 a=reject H <sub>0</sub>	Prob > F=0.0001 b=reject H <sub>0</sub>

Note: Standard errors in parenthesis. \*\*significant at 1% level of significance.  
\*significant at 5% level of significance.

From table 5.4, it is clear that, there is large and significant negative effect of initial per capita income on growth rate of per capita income; this finding is in support of Relative

Backwardness Hypothesis of Gerschenkron, viz., poorer countries of the EU grew at a faster rate than richer ones during 2000-2014. The conditional rate of convergence is approximately 22.5 per cent per year when EU-13 countries are considered which is high as compared to 19.2 per cent per year when all the countries of the EU are encompassed in the regression analysis. These estimated rates of convergence are high compared to what has been found earlier in regional datasets (see e.g. Barro and Sala-i-Martin 2004; Rapacki and Próchniak 2009 etc.).

As expected, although the estimated coefficient for trade is positive and highly significant for both the case of EU-13 countries as well as for the complete set of the EU countries, the magnitude of the estimated coefficient of trade obtained from regression on the entire set of EU countries is small as compared to that obtained when only EU-13 countries are taken in the regression model. This means that trade had a positive impact on the growth rate of per capita income for the EU countries, more so for the poorer EU-13 countries. This finding that trade is an explanatory factor of growth is consistent with other contemporary studies on the link between trade and growth (see, Bassanini et al, 2001; Alcalá and Ciconne, 2004; Bayar 2016 etc.). In particular, Hoeller et al. (1998) found that trade openness in general has promoted economic growth in Europe.

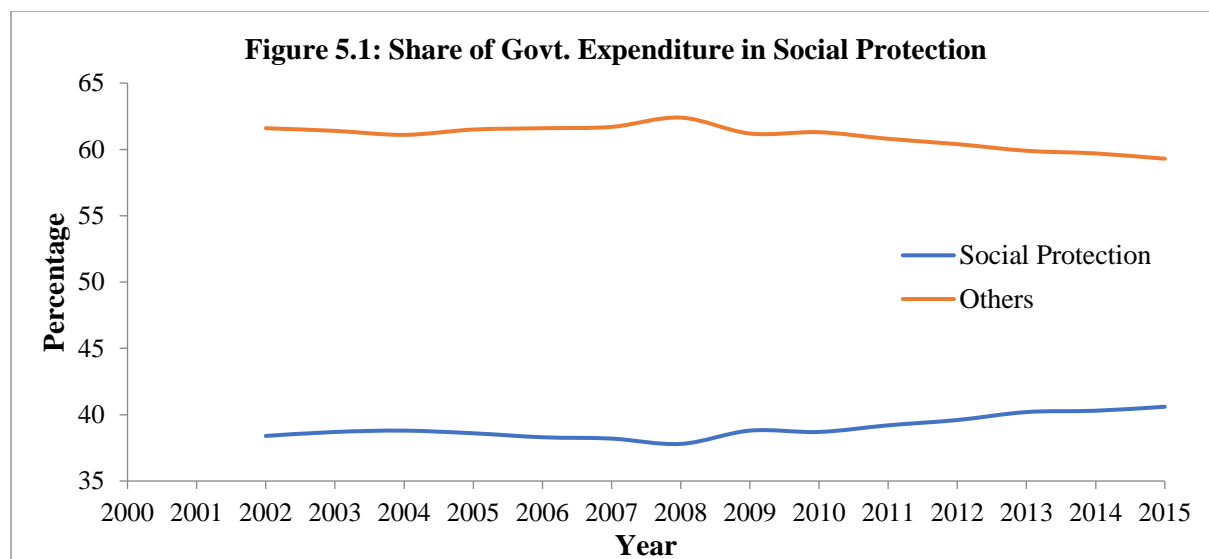
The relationship between government expenditure and growth is found to be negative and significant (though the negative magnitude of estimated coefficient of government expenditure is lesser for the EU-13 countries) over the period 2000–2014, which means government expenditure in the case of EU was not a factor for enhancing growth, as the Keynesian theory would have it. It could however be a reflection of the income distributional outcome of government expenditure which was majorly directed towards social welfare programmes in number of EU countries during 2000-2014. It could also be on account of financial crisis of 2008 and Greece crisis of 2013 when the objective of growth promotion was subordinate to other objectives, such as social policy concerns, redistribution of income, or protection of employment, of government expenditure. This finding confirms the results of previous study on a sub-set of countries of the EU (see Dinca, 2013; Boldeanu et al., 2016). In the following table 5.5, we present government expenditure in various fields as percentage of total government expenditure in the EU during 2000-2014. It is quite clear that the percentage of government expenditures during the period of our study have been the highest in social protection followed by general public services, health and education. Also, it can

be seen from figure 5.1 that after 2008, while there is an increasing trend in the share of government expenditure in social protection there is a decreasing trend in the share of government expenditure in other functions.

**Table 5.5: General Government Expenditure in the EU by Function**

Year	Public Service	Defense	Public Order	Eco. Affairs	Environ. Protection	Housing Amenities	Health	Culture	Education	Social Protection
	(As percentage of Total Government Expenditure)									
2002	14.9	3.3	3.9	9	1.6	1.8	13.7	2.3	11.1	38.4
2003	14.4	3.3	3.9	9.1	1.6	2	13.8	2.3	11	38.7
2004	14.2	3.3	3.9	9.1	1.6	1.9	14	2.3	10.8	38.8
2005	14.2	3.3	3.9	9.1	1.6	1.9	14.3	2.3	10.9	38.6
2006	13.9	3.2	3.9	9.2	1.7	1.9	14.5	2.3	11	38.3
2007	14.1	3.2	3.9	9	1.7	1.9	14.6	2.4	10.9	38.2
2008	14.1	3.2	3.9	10	1.7	1.9	14.5	2.4	10.7	37.8
2009	13.3	3.1	3.8	9.8	1.8	1.9	14.7	2.3	10.5	38.8
2010	13.4	3	3.8	10.2	1.7	1.7	14.6	2.3	10.6	38.7
2011	14.1	3	3.8	9.2	1.7	1.5	14.7	2.3	10.5	39.2
2012	14.1	2.9	3.7	9.5	1.7	1.4	14.6	2.2	10.3	39.6
2013	14.1	2.9	3.7	8.9	1.7	1.3	14.8	2.3	10.2	40.2
2014	13.8	2.8	3.7	8.9	1.7	1.3	15	2.2	10.3	40.3
2015	13.1	2.9	3.7	9	1.7	1.2	15.2	2.2	10.3	40.6

Source: EUROSTAT Database. Data for the years 2000 and 2001 not available



Index of financial development is found to have significant and positive impact on the growth rate of per capita income of the EU countries during 2000-2014. The level of financial development above for which the positive effects on growth begin to decline lies between 0.4 and 0.7 on the financial development index<sup>105</sup>. This estimate is an average across all countries and over a time span of 30 years. With a confidence level of 95 percent, the point at which the marginal impact of finance on growth becomes significantly negative is around 0.7. For EU, during 2000-2014, the average value of financial development index is 0.58, on the lower end of the band; and hence financial development has fostered economic growth the EU countries with 5 per cent level of significance. From column (B) of table 5.4, it can also be observed that even though the estimated coefficient of index of financial development is positive, its impact on growth is insignificant for the EU-13 countries. One of the important features of banking sectors of EU-13 countries (that include most of the Central and Eastern Europe (CEE) countries) is that the banks are relatively small in comparison to the rest of the EU and have relatively simple traditional business models (Karkowska et al., 2017). This could be the reason for the estimated coefficient of *FinDev* being insignificant for the EU-13 countries, because a less developed financial system in the EU-13 countries had a negligible impact on the growth rate of the per capita income of these countries.

<sup>105</sup> See, Rethinking Financial Deepening: Stability and Growth in Emerging Markets by R. Sahay et al. IMF Staff Discussion Note, May 2015.

In the same way, the estimated coefficient of index of political stability is positive and highly significant; the estimated coefficient of index of political stability being higher for EU-13 countries. Similar result was obtained by Vasileiou (2014) in the context of EU. Using the Granger causality test the empirical findings of Vasileiou (2014) suggest that in the case of the countries of EU, causality is one directional, moving from political stability to economic growth.

Inflation has a positive impact on growth rate in per capita income, albeit insignificant. This is not surprising as our income variables (GDP per capita) is measured in constant 2010 USD which is corrected for any effect that inflation<sup>106</sup> may have.

## 5.2.2 ASEAN

We present the descriptive statistics for variables used in the analysis in Table 5.6. Myanmar doesn't have data for government expenditure and hence we consider only 9 countries (henceforth, ASEAN-9) of the ASEAN for our analysis. The overall sample size is N=9 and time period is T=15. So, we have a balanced long panel data set.

**Table 5.6: ASEAN-Descriptive Statistics**

<b>Variable</b>	<b>Obs.</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<b>GRPPCI</b>	150	4.37	3.48	-4.27	13.22
<b>lnGDPPC</b>	150	8.06	1.49	5.73	10.83
<b>TRADE</b>	150	128.32	98.56	0.17	441.60
<b>GOVT</b>	135	10.89	5.04	3.46	29.40
<b>FinDev</b>	150	0.35	0.22	0.04	0.80
<b>INF</b>	150	5.57	7.53	-2.31	57.07
<b>PolStability</b>	150	-0.26	0.96	-2.11	1.40

<sup>106</sup> When we carry out regression analysis by taking data on per capita GDP (at current prices) growth rate, the direction of estimated coefficients of all the explanatory variables, i.e., initial income, trade, government expenditure, financial development, inflation and political stability are not different from regression result where GDP per capita is measured in current prices. However, now, the coefficient of inflation becomes significant.

When the panel has few individuals (countries, in our case) relative to number of periods (years), the individual effects (here country effects) can be incorporated into the explanatory variables ( $x_{it}$ , say) as dummy variable regressors. Rather than trying to control for large number of year (time) effects as we do in short panels, it is better to take sufficient advantage of natural ordering of time (as opposed to individuals) and simply include a trend in time. Therefore, we will estimate a pooled model in the form of equation (5.2):

$$y_{it} = x'_{it} + u_{it}, \quad i = 1, \dots, N; t = 1, \dots, T \quad \text{----- (5.2),}$$

where the regressors  $x_{it}$  include an intercept, often time and possibly time squared, and set of individual indicators. We assume that errors are stationary.

Since  $T$  is large relative to  $N$ , it is possible to relax the assumption that  $u_{it}$  is independent over  $i$  and there is no serial correlation. We present the estimation results of the above regression equation obtained using panel GLS that are asymptotically more efficient than those obtained from pooled OLS method. The panel GLS method that we are going to employ is more flexible as it allows for heteroscedasticity of error terms, error correlation across individuals, with independence over time for a given individual and serial correlation of errors for each individual country.

We run panel GLS regression, first for ASEAN-9 countries and then for only CLV<sup>107</sup> countries and present the results in Table 5.7 below. As noted earlier, the disparity in incomes and growth rates are more striking when ASEAN-6<sup>108</sup> countries are compared to the CLMV countries. The CLMV countries are significantly poorer than the earlier members of ASEAN, ASEAN-6 with less established institutional and political structures. Hence, a separate panel GLS regression analysis on CLV countries (Myanmar being dropped from the dataset owing to no data on government expenditure) is warranted for the better understanding of the factors impacting growth in the ASEAN. The results for the CLV countries are presented in column (B) of table 5.7.

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<sup>107</sup> This is also a balanced long panel with 3 countries and time period of 15 years. Therefore, in this case also we use panel GLS method for estimation.

<sup>108</sup> ASEAN-6 refers to older members of ASEAN which comprises of Brunei, Indonesia, Malaysia, Philippines, Thailand and Singapore.



**Table 5.7: Panel GLS Regression Results for ASEAN**

<b>Dependent Variable: GRPCI</b>		
<b>Explanatory Variables</b>	<b>(A) ASEAN-9</b>	<b>(B) CLV Countries</b>
<b>lnGDPPC</b>	-1.60** (0.20)	-3.85** (1.45)
<b>TRADE</b>	0.01** (0.003)	0.02* (0.01)
<b>GOVT</b>	-0.07* (0.04)	0.55** (0.17)
<b>FinDev</b>	3.20** (1.06)	2.88 (2.81)
<b>INF</b>	0.01 (0.011)	-0.01 (0.02)
<b>PolStability</b>	0.47 (0.13)	0.55 (0.51)
<b>Constant</b>	15.43** (1.29)	24.81** (7.99)
<b>No. of Obs.</b>	135	45
<b>Test for overall significance of the model</b>	Wald chi2(6) =541.73 <sup>a</sup>	Wald chi2(6) =12.04 <sup>b</sup>
<b>H<sub>0</sub>: All slope coefficients are zero</b>	Prob > chi2=0.0000 a=reject H <sub>0</sub>	Prob > chi2=0.0011 b=reject H <sub>0</sub>

Note: Standard errors in parenthesis. \*\*significant at 1% level of significance. \*significant at 5% level of significance.

The above table reveals that the estimated coefficient of *lnGDPPC* is negative and highly significant (at 1 per cent level of significance) in both the columns (A) and (B); this lends support that the relative backwardness hypothesis holds good for the ASEAN economy, i.e., lower the initial income of the country, higher will be its growth rate. Moreover, when we take only lowest income countries, CLV in our analysis, the magnitude of negative coefficient on *lnGDPPC*

becomes higher at -3.85 (column(B)) as compared to -1.60, estimated for ASEAN-9 countries. The positive and significant (at 1 per cent level of significance) coefficient of TRADE reported in both the Columns (A) and (B) of the above table suggest that trade has positively contributed to the per capita GDP growth rate in the ASEAN economies. This finding is in line with the finding of Lim and McAleer (2003) according to which each country of the ASEAN has experienced substantial economic growth due to the adoption trade-oriented policies, and sound macroeconomic policies. A recent study employing time-series analysis by Pradhan et al. (2017) found both short- run and long-run equilibrium relationship among trade openness, depth of banking sector and economic growth.

Column (A) of table reports that the estimated coefficient of *GOVT* is negative and significant implying government expenditure has a negative effect on GDP growth per capita when ASEAN countries as a whole is considered. However, if we consider only the CLV countries, we find from column (B) that the estimated coefficient obtained for *GOVT* is positive and highly significant (at 1 per cent level of significance) which is a strong evidence that government expenditure has positive influence on the growth rates of three countries – Cambodia, Lao PDR and Vietnam. In other words, while government expenditure is found to have increased the growth rate in per capita income of CLV countries, it seems to have dampened the growth rate of high income countries of the ASEAN. This could signify that government expenditure had n income distributive effect for the ASEAN, leading to lowering of per capita income differential across the countries in the ASEAN<sup>109</sup>.

We find the evidence that the index of financial development has a significantly positive impact on the growth when ASEAN as a whole is considered (column (A)), however, this impact becomes insignificant when only CLV countries are taken into account (column (B)). The impact of financial development in CLV countries is insignificant because the banking sector in Cambodia, Vietnam and Lao PDR is generally relatively small. The CLV countries probably need

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<sup>109</sup> In Chapter 4, earlier, a rigorous analysis was carried out to study the impact of government expenditure on the per capita income of ASEAN. It was found that the countries that improved their relative position in terms of government expenditure vis-à-vis other countries in the region also improved its relative position in terms of per capita income, lending support to convergence in ASEAN.

to attain a certain threshold level of modernization of sustainable banking sector before it is able to benefit from financial development.

Inflation has a positive impact on growth rate in per capita income when ASEAN as a whole is considered, but it has a negative impact for the growth rate in per capita income in the CLV countries. This may be because the average inflation of ASEAN-9 during 2000-2014 was 5.57 which is low but the average inflation for the CLV countries alone was 6.86. At this point it is relevant to point out the study by Thanh (2015) which finds that there exists a statistically significant negative relationship between inflation and growth for the inflation rates above the threshold level of 7.84 per cent, above which inflation starts impeding economic growth in the ASEAN-5 countries. Even though the study is based on ASEAN-5, we can at least conclude that higher inflation rate is growth impeding for the ASEAN. The coefficient of inflation is, however, insignificant in both the cases. This is because our income variables (GDP per capita) is measured in constant 2010 US \$ which is corrected for any effect of inflation<sup>110</sup>.

Lastly, if we examine the impact of political stability on growth, the obtained coefficient for *PolStability* is positive for both the scenario, although not significant, which may imply that political stability contributes to growth but its role in ASEAN may not be significant during 2000-2014.

### **5.3 Comparison of the EU and the ASEAN Experiences**

Countries in both the EU and the ASEAN that were initially backwardness in terms of per capita income benefited, in general, from trade openness and expanded market access, government transfers, the adoption of better financial institutions and stable political environment. In this section, we highlight striking differences in growth experiences of the countries belonging to these two groups of economic integration.

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<sup>110</sup> When we carry out regression analysis by taking data on per capita GDP (at current prices) growth rate, the direction of estimated coefficients of all the explanatory variables, i.e., initial income, trade, government expenditure, financial development, inflation and political stability are not different from regression result where GDP per capita is measured in current prices. However, now, the coefficient of inflation becomes significant.

Trade has emerged as the significant factor contributor to growth in per capita income for countries in both the EU and the ASEAN during 2000-2014. The impact of trade on income growth was more pronounced when only low- income countries, EU-13 and CLV were considered. In the EU, government expenditure was not a factor for enhancing income growth during 2000-2014, rather it had income distributional outcome as government expenditure was directed mostly towards social welfare programmes in number of EU countries on account of financial crisis of 2008 and Greece crisis of 2013 when the social policy concerns and redistribution became the main objectives of government expenditure. The percentage of government expenditures during 2000-2014 have been the highest in social protection followed by general public services, health and education. Also, whilst the share of government expenditure in social protection has risen during 2000-2014, it has fallen in other functions like economic affair, housing amenities, health, culture etc. For ASEAN, while government expenditure is found to have increased the growth rate in per capita income of CLV countries, it seems to have dampened the growth rate of high-income countries of the ASEAN, signifying that government expenditure had a distributive effect for the ASEAN.

Index of financial development is found to have significant and positive impact on the growth rate of per capita income of the EU countries and ASEAN countries during 2000-2014. However, when only the EU-13 countries and CLV countries, where the banking sector is relatively small, are considered its impact on growth becomes insignificant for the same period. As far as the index of political stability is concerned, it had positive and highly significant impact on growth for the EU countries; with still higher impact for EU-13 countries. But the impact of role of political stability in growth of income in the ASEAN has not significant during 2000-2014.

## **5.4 Concluding Observations**

Gerschenkron (1952,1963, 1956) underscored the centrality of government intervention in the form of government expenditure to compensate for the missing prerequisites of growth- adequate supplies of capital, skilled labor, entrepreneurship etc.- in relatively backward countries or the late developing countries. Indeed, Gerschenkron argued that “the greater the degree of backwardness, the more government intervention is required in the market economy to channel capital and

entrepreneurial leadership to nascent industries” (Fishlow 2003). While Gerchenkron emphasized the criticality of capital and entrepreneurship as the necessary means of overcoming the technological gap confronting the relatively backward nations, he failed to address “trade” as an important factor that can lead to technological gains via technological and knowledge spillovers and consequently lower the income gap between the initially backward countries and the richer countries.

The contribution of our study to the existing literature is to apply Gerschenkron’s theory of Relative Backwardness in the context of income convergence by augmenting the analysis of the theory of relative backwardness, incorporating the impact of trade, in addition to government expenditure. The role of trade and government expenditure in growth in per capita income has been widely debated. The objective of this chapter was to examine the effect of government expenditure and trade on per capita income convergence via their effect on economic growth in the countries of the EU and the ASEAN. In addition to trade and government expenditure, we also have considered initial per capita income, indices of financial development and political stability and inflation as explanatory variables, where growth in per capita GDP is the explained variable.

The main finding of our analysis is that trade was the prime catalysis for per capita income growth in both the EU and the ASEAN countries during the period 2000-2014. We find the evidence that whereas government expenditure had negative and significant impact on growth in per capita income when EU and ASEAN-9 is considered, it had a positive and significant impact on growth when CLV countries are considered. Thus, government expenditure had essentially impacted distributional aspect of income rather than the growth aspect of income for the two blocs during 2000-2014.

The results further suggest that there seems to be a strong tendency for convergence in these economies during the period of our study, as theory predicts. The empirical findings also demonstrate a significant positive impact of index of financial development on economic growth in the EU and the ASEAN; however, when only the low income CLV and EU-13 countries are considered, its impact was insignificant. While index of political stability was found to be one of the key determinants of economic growth in the economies of the EU, political stability didn’t seem to have a significant impact on economic growth in the ASEAN countries.

## Chapter VI

# Trade, Structural Transformation and Income Convergence: Empirical Evidence from the EU and the ASEAN

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### 6.1 Introduction

In the earlier chapters, we have established using both traditional concepts of convergence (beta and sigma convergence) and trend analysis of Theil index of inequality that the EU and the ASEAN countries have demonstrated convergence in per capita income during 2000-2014. Also, we have shown that a country that improves its relative position in trade in comparison to other countries in the region also improves its relative position in income. This becomes possible as it has been empirically shown that trade has led to higher rate of growth in income among the EU and the ASEAN countries. In other words, we have empirically established that trade is a factor that has led to the observed per capita income convergence among the EU and the ASEAN countries. The process of convergence, which is linked with development and higher growth rate of income of lower income countries vis-à-vis higher income countries, is essentially associated with large scale structural transformation as economies shift from being primarily agrarian to becoming increasingly non-agrarian. This structural transformation process was considered in dual economy models as that of Lewis (1954), where agriculture—the traditional sector has lower productivity while the modern sectors—industrial sector and services sector have higher productivity. Kuznets (1966) argued that structural transformation typically involves a contraction in agricultural activity which is accompanied by an expansion of non-agricultural sectors – industrial and services sector.

Income convergence across countries is significantly linked with convergence of economic structure across countries. Lower income countries tend to have a big primary sector and relatively small secondary and tertiary sectors. As a lower income country grows, the share of the primary sector in the country declines while the share of the secondary and tertiary sector grows. In this manner, the economic structure of the low-income country converges to the economic structure of high-income country, where the secondary and tertiary sectors account for the lion's share of national output. This chapter is devoted to the understanding the link between structural

transformation and income convergence and whether trade plays a role in accelerating changes in economic structural composition in the EU and the ASEAN countries which comprises the testing of the third hypothesis of our study.

Studies show that reallocation of productive resources between the primary, secondary and tertiary sectors, which is commonly referred to as structural transformation, is crucial in helping us understand not only the process of economic growth and convergence across nations (Duarte and Restuccia, 2010), but also convergence in regional development (Caselli and Coleman, 2001; Hnatkovska and Lahiri, 2014). Economic development and growth entail large-scale structural transformation of economies (Hnatkovska and Lahiri 2014)—typically from agriculture to manufacturing and service sectors. Such structural transformation inevitably entails reallocation of productive resources from the primary sector to the manufacturing and service sectors. One of the important questions arising from such structural transformation led growth is, whether such growth reduces income inequality and leads equalization of income across countries or it acts so as to widen the income differences across countries. The absorptive capacity of the economies to cope with the demands of structural transformation will determine whether there will be convergence or divergence of per capita incomes across these economies.

The process of structural transformation gets heightened by the forces of trade. To understand this, we take support of simple logic of economics. Under autarky and in the absence of external forces like trade, low income countries allocate most of its productive resources to agriculture. When the countries open up for trade, there occurs technological changes and capital accumulation, as has been explained in the earlier chapters of this thesis. This results in consumers in these countries to get higher incomes and their share of agricultural consumption decreases and the share of non-agricultural consumption increases. This in turn leads to the reallocation of productive resources from the agricultural sector to the non-agricultural sectors viz. industrial and services sector. That is to say, structural transformation takes place as a result of trade between countries. Moreover, since the goods are assumed to be complements, a fall in the relative price of agricultural commodities also leads to structural transformation. Also, when the countries open up for trade, their production pattern start depending on the world prices and, hence, their production pattern may be different than their consumption pattern. In particular, when the domestic relative price of the agricultural commodities under autarky is higher than the international one, countries

import agricultural good and reduce their agricultural production. As a result, structural transition from agriculture to industry and services, experienced by these countries, accelerate.

To understand the link between forces of structural transformation and its transmission leading to convergence, it is important to understand which economic sectors have been most critical in driving the process of growth in per capita income and subsequent convergence over years. It is well established that the structural transformation of an economy during development is intrinsically determined by the initial economic conditions. Next, in order to establish trade impacts income convergence via its impact on structural transformation, we have to show that trade has differential impacts on structural changes in the member countries. Hence, more precisely put, in this chapter we examine the relationship between income convergence and economic structural transformation/orientation across the EU and the ASEAN nations during 2000-2014 and the significance of trade in impacting structural transformation.

This chapter has six subsections, including the introduction. **Section 6.2** clearly outlines the research objective of the chapter and sets the tone of the chapter. The next section, **Section 6.3** discusses the regression results based on Theil indices of inequality. This section is divided into two subsections, viz., **6.3.1 and 6.3.2**, dedicated to the EU and the ASEAN respectively. This is followed by **section 6.4** wherein results of empirical analysis based on the Chenery-Syrquin model of structural transformation for the EU and the ASEAN are presented. **Section 6.5** gives a comparative overview of structural transformation and income convergence in the EU and ASEAN and **section 6.6** concludes the main findings of the chapter.

## **6.2 Outlining Objectives**

In the second chapter of this thesis, using Theil index of inequality, we have seen the trends in overall inequality in the EU and the ASEAN in terms of income as well as different sectoral outputs – agriculture, industry and services. In the case of the EU, it was noted that inter-country inequality has come down in all the sectors of the economy, with inequality in the agricultural sector witnessing higher rate of decline. In the case of the ASEAN, it was observed that inter-country inequality in income and industries has general been decreasing while for that for agriculture the



inequality has been increasing. There is no such discernible trend for inter-country inequality with respect to services.

It must, however, be noted that since the measure of inequality is only a statistical construct, it does not by itself provide any explanation of the causes of a decreasing trend of inter-country income disparity and income convergence. Hence, the *first objective* of this chapter is to evaluate the compositional significance of the income Theil indices to determine to what extent each of the sectoral components are driving the process of convergence in the EU and the ASEAN. In other words, we try to estimate which components of income are significant in the trend of Theil index of income inequality.

The second objective is to examine the effect of trade openness on structural orientation of the EU and the ASEAN region. While the examination of structural transformation of economy as a result of forces of trade will give an idea of how trade has led resources to be shifted away from agriculture to industry and services, it is interesting to ask how the group of lower income countries versus higher income countries have fared with opening up of trade. Therefore, we also control for poor country to test whether poor country in the EU and in the ASEAN have succeeded in gaining in terms of structural orientation, thereby causing income convergence among the countries.

### 6.3 Regression on Theil Indices of Inequality

In order to gauge which component(s) of income (GDP) viz., agriculture, industry and services is (are) significant in the trend of income inequality, a preliminary investigation into relationship between income inequality and inequality in its components is done by performing following linear regression of Theil index of income inequality on the Theil indices of inequalities in its components.

$$\begin{aligned}
 \text{Income Theil Index}_t & \\
 &= \beta_0 + \beta_1 \text{Theil Index of Agriculture}_t + \beta_2 \text{Theil Index of Industry}_t \\
 &+ \beta_3 \text{Theil Index of Services}_t + \epsilon_t \text{ --- (6.1)}
 \end{aligned}$$

The results of EU are discussed in section 6.3.1 and those for ASEAN are discussed in section 6.3.2.

### 6.3.1 EU

The above model (6.1) is based on time series data on their indices of inequalities with respect to income, value added of agricultural, value added of industry and value added of services. Unlike cross sectional data, time series data cannot be considered to be randomly sampled, therefore, each observation cannot be assumed to be identically and independently distributed (i.i.d.). Also, the error terms may be correlated over time, which is the violation of one of the basic assumptions of OLS estimation. Other important assumptions of OLS estimation are – error terms should be homoscedastic and there should be no multicollinearity. We performed the White test to detect the presence of heteroscedasticity of the error terms. The p-value of the White test is 0.104 which means that null hypothesis that of constant variance of error term is rejected which indicates that heteroskedasticity is a problem in our data<sup>111</sup>. Durbin-Watson test for multicollinearity shows the presence of autocorrelation in our data<sup>112</sup>. Further, we calculate VIF which is found to be 5.6 (table 6.1), thus multicollinearity is unlikely to be an issue in our estimation.

**Table 6.1: Variation Inflation Factor**

<b>Variable</b>	<b>VIF</b>
Theil Index of Agriculture	5.5
Theil Index of Industry	2.84
Theil Index of Services	8.3
<b>Mean VIF</b>	<b>5.55</b>

In order to correct for heteroscedasticity and autocorrelation in our data, we estimate the model (6.1) corrected with Newey-West estimator which can be used to improve OLS when the residuals are heteroskedastic and/or autocorrelated. The regression results are reported in Table 6.2 below.

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<sup>111</sup> We have also performed Breusch Pagan test for heteroscedasticity which yielded p-value of 0.04, again rejecting the null hypothesis of homoscedasticity, thus, heteroscedasticity is assumed in our dataset.

<sup>112</sup> Durbin-Watson d-statistic (4, 15) = 1.979383. This value is greater than  $d_U$  1.96 at 5 per cent level of significance.

**Table 6.2: Regression Results of Income Inequality: EU**

<b>Income Theil Ratio</b>	<b>Coefficient</b>
<b>Theil Index of Agriculture</b>	<b>0.1173</b> (0.0878)
<b>Theil Index of Industry</b>	<b>0.5676***</b> (0.0856)
<b>Theil Index of Services</b>	<b>0.2956*</b> (0.1438)
<b>Constant</b>	<b>0.0008</b> (0.0010)
<b>Number of Observations</b>	15
<b>Test for overall significance of the model</b>	F (3,11) = 63.53
<b>(H0: All slope coefficients are zero)</b>	Prob. >F = 0.00

Newey West standard errors in parenthesis. \*\*\*significant at 1% level of significance. \*significant at 10% level of significance

The regression results for the EU (Table 6.2) unequivocally show that Theil index of income inequality move in the same direction as the Theil indices of inequalities with respect to all the sectoral shares of income, as the estimated coefficients of these indices take positive signs. This means that a decline in inequality in any of the sectoral component of income will feed into the decline in overall income inequality. However, as can be inferred from the results in table 6.2, only the coefficients pertaining to Theil index of industrial inequality and Theil index of services inequality are significant with 1 per cent and 10 per cent levels of significance respectively. Thus, reduction in inequality in the industrial sector and services sector have positively and significantly led to the reduction in inequality in income<sup>113</sup>. Though the coefficient for agricultural inequality is

<sup>113</sup> We already shown in Chapter 3 that Theil index of income inequality has a declining trend for EU.

positive as expected, it is not found to be significantly contributing to the overall income inequality.

### 6.3.2 ASEAN

As the regression model, (6.1) is time series in nature, it is apposite to carry out diagnostic checks before the estimation. We performed the White test to detect the presence of heteroscedasticity of the error terms. The p-value of the White test is 0.992 which means that null hypothesis that of constant variance of error term cannot be rejected which indicates that heteroskedasticity is not a problem in our data<sup>114</sup>. Durbin-Watson test for multicollinearity shows the absence of autocorrelation in our data<sup>115</sup>. Further, we calculate VIF which is found to be 1.3 (table 6.3), thus multicollinearity is also not a matter of concern in our estimation.

**Table 6.3: Variation Inflation**

<b>Factor</b>	
<b>Variable</b>	<b>VIF</b>
Theil Index of Agriculture	1.4
Theil Index of Industry	1.34
Theil Index of Services	1.07
<b>Mean VIF</b>	<b>1.27</b>

Therefore, even though model (6.1) is time series in nature, all the assumptions of OLS model holds for the data pertaining to ASEAN. So, we conduct OLS regression estimation the results of which are presented in table 6.4.

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<sup>114</sup> We have also performed Breusch Pagan test for heteroscedasticity which yielded p-value of 0.920, again we accept the null hypothesis of homoscedasticity, thus, heteroscedasticity is not an issue for our dataset.

<sup>115</sup> Durbin-Watson d-statistic (4, 15) = 1.773681. This value lies in the range of  $d_L$  and  $d_U$ , i.e., between 0.39 and .96 at 1 per cent level of significance.

**Table 6.4: Regression Results of Income Inequality: ASEAN**

<b>Income Theil Ratio</b>	<b>Coefficient</b>
<b>Theil Index of Agriculture</b>	<b>0.0894</b> (0.1994)
<b>Theil Index of Industry</b>	<b>0.3607***</b> (0.0286)
<b>Theil Index of Services</b>	<b>0.3021 ***</b> (0.0789)
<b>Constant</b>	<b>0.0741</b> (0.0429)
<b>N</b>	15
<b>R-Squared</b>	0.9539
<b>Adjusted R-Squared</b>	0.9413

Standard errors in parenthesis. \*\*\*significant at 1% level of significance.

In the case of the ASEAN, the regression results (Table 6.4) clearly show that industry and services inequalities positively contributed to income inequality; their coefficients being highly significant (at 1 per cent level of significance) and positive. Though the coefficient for agricultural inequality is positive, it is not significant.

#### **6.4. Estimation of Chenery-Syrquin Model**

The above analysis of income inequality index and inequalities in its components gives a picture of the two regions as a whole, it will now be interesting exercise to investigate how the group of poor countries vs. rich countries fared with trade openness and also to determine the structural change across the regions due to trade. For this, we have estimated the augmented Chenery-Syrquin model (6.2), the framework that is generally used to cross—country patterns of structural

changes. We estimate the equation (6.2) for shares of agriculture, industry and services in GDP in the EU and the ASEAN separately, and have discussed the results in the following subsections.

$$X_{it} = \beta_0 + \beta_1(\ln Y_{it}) + \beta_2(\ln Y_{it})^2 + \beta_3(\ln N_{it}) + \beta_4(\ln N_{it})^2 + \beta_5 \ln TRADE_{it} + \beta_6 PCD * \ln TRADE_{it} \quad \text{--- (6.2)}$$

In this study, we will first ignore the variables representing trade openness and interaction term between poor country and trade from the model and consider structural transformation pattern in a closed economy framework. Thereafter, we relax the assumption of close-economy and introduce the variables on trade and poor country dummy to study the impact of trade in structural transformation and how the poor countries are responding to opening up to trade.

#### **6.4.1 EU**

##### *Closed Economy Framework*

We have a strongly balanced short panel data. With the pooled sample, we estimate the model in the closed economy set up by both the techniques of fixed effect model and random effect model which is followed by the Hausman test to find the desirability of the model. Even though the Hausman test favours RE estimation over FE specification, we have considered the results of RE estimation for our analysis because FEM eliminates the effects of omitted heterogeneity leading to the FE loss of valuable information stemming from the variation between individuals. This results in higher standard errors and thus imprecise parameter estimates (Durlauf et al 2005). In our case, the dependent variables (the sectoral shares of GDP) and all the explanatory variables included in our study exhibit greater between-country variations (Table 6.5) than within-country variations, indicating that a significant amount of valuable information would be lost if FE specification model is adopted. In such cases, it is better to draw analysis hinged on the estimations obtained from RE specification.

**Table 6.5: Decomposed Standard Deviations**

<b>Variable</b>		<b>Std. Dev.</b>
<b>Share of Agriculture</b>	overall	2.13
	between	1.94
	within	0.95
<b>Share of Industry</b>	overall	5.94
	between	5.66
	within	2.07
<b>Share of Services</b>	overall	6.94
	between	6.64
	within	2.37
<b>lnY</b>	overall	0.70
	between	0.70
	within	0.11
<b>(lnY)<sup>2</sup></b>	overall	14.03
	between	14.10
	within	2.16
<b>lnP</b>	overall	1.40
	between	1.42
	within	0.04
<b>(lnP)<sup>2</sup></b>	overall	44.05
	between	44.79
	within	1.16
<b>lnTRADE</b>	overall	0.46
	between	0.46
	within	0.11
<b>PCD*lnTRADE</b>	overall	2.36
	between	2.39
	within	0.10

In case of panel regression model with share of agriculture as dependent variable, Wald test for group-wise heteroscedasticity gave p-value =0.00 indicating that the error variance varies across countries, meaning error terms are heteroscedastic. In case of panel regression with share of industries as dependent variable, Wald test gave p-value =0.08 so that we reject the null hypothesis of homoscedasticity at 10 per cent level of significance. In case of panel regression with share of services as dependent variable, Wald test gave p-value =0.11, so we cannot reject the null hypothesis of homoscedasticity. In addition, Wooldridge test for autocorrelation yielded

p-value = 0.00 for our panel data, for all the three models with three sectoral shares, implying presence of first order autocorrelation. As panel diagnostic tests indicate that error terms in our model are heteroscedastic and autocorrelated that need to be addressed before estimation. The random effect model permits autocorrelation in model error. Thus, regression model pertaining to share of services can be estimated using simple random effect model. However, since regression models pertaining to shares of agriculture and industries are infested both by heteroscedasticity and autocorrelation, and the form of heteroscedasticity is unknown, the estimation is done using FGLS method. The results of RE estimations, corrected for autocorrelation and heteroscedasticity are present in the following table (6.6)<sup>116</sup>.

**Table 6.6: Structural Change Equation for EU in Closed- Economy Framework**

	Dependent Variable		
	Share of Agriculture	Share of Industry	Share of Services
<b>lnY</b>	-25.916*** (1.904)	14.805* (8.563)	-11.883 (13.783)
<b>(lnY)<sup>2</sup></b>	1.178* (0.095)	-0.886** (0.427)	0.911 (0.719)
<b>ln P</b>	4.202 (0.721)	27.062*** (3.242)	-1.848 (13.190)
<b>(lnP)<sup>2</sup></b>	-0.130 (0.023)	-0.837*** (0.103)	0.094 (0.420)
<b>Constant</b>	110.507*** (0.023)	-248.358*** (48.916)	101.54* (119.691)
<b>N</b>	420	420	420
<b>Test for overall significance of the model (H0: All Slope Coefficients are zero)</b>	Wald chi2(4) =1233.80 Prob > chi2= 0.00	Wald chi2(4) = 213.68 Prob > chi2= 0.00	Wald chi2(4) =47.68 Prob > chi2= 0.00

\*\*\*Significant at 1%, \*\*Significant at 5%, \*Significant at 10%, Figures in parentheses represent the standard errors.

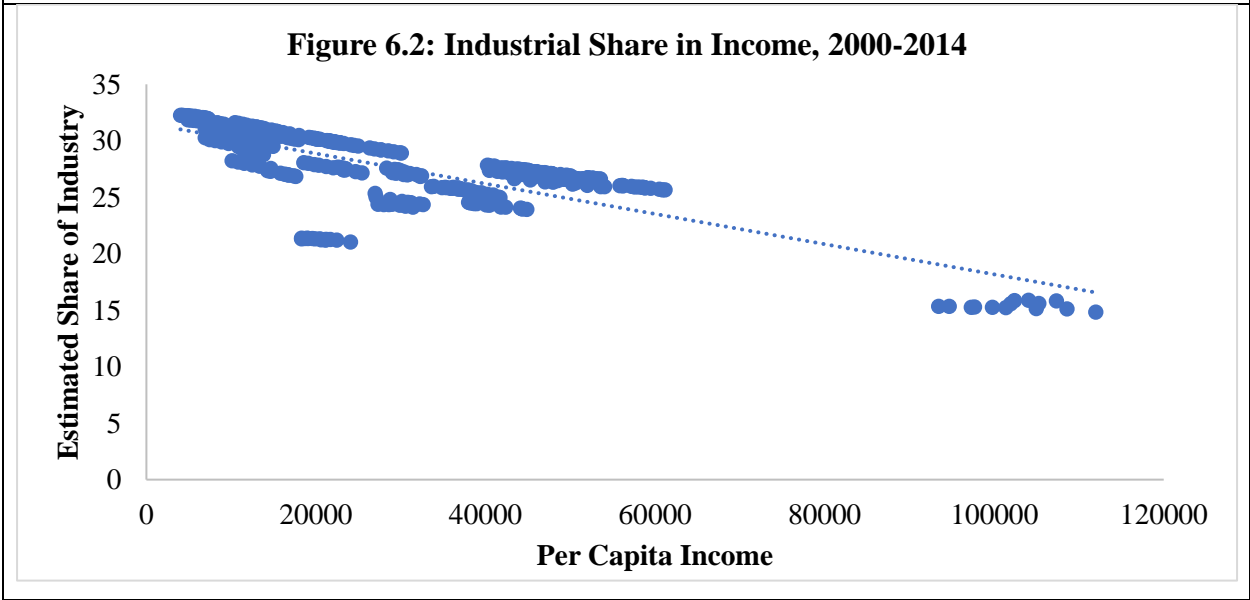
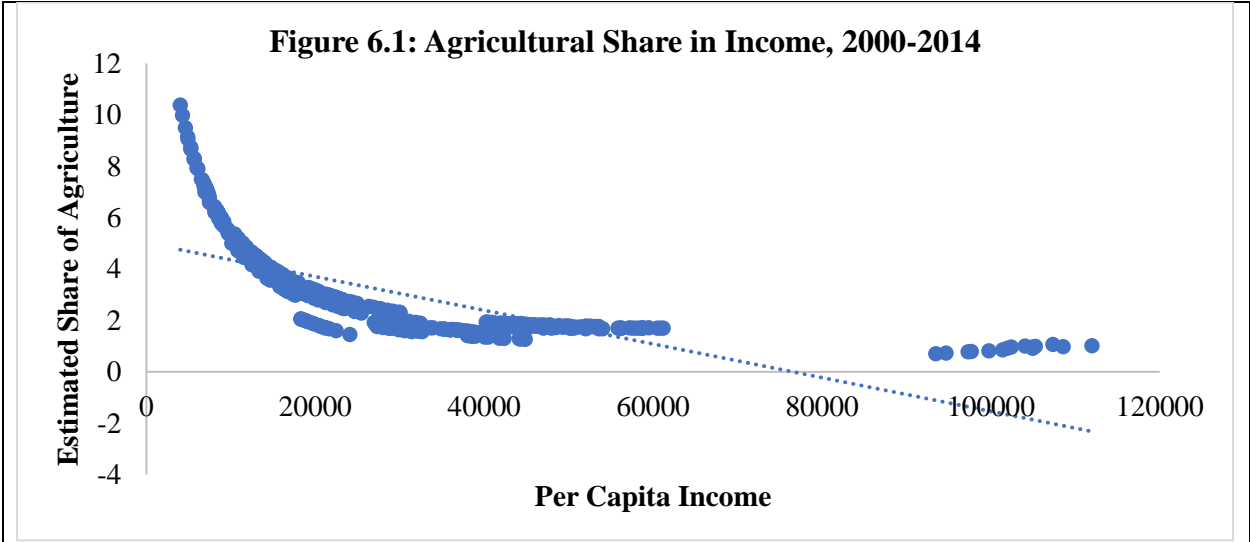
In table 6.6 we notice that while the share of agriculture is significantly negatively related to per capita income and significantly positively related to square of per capita income, the share of industries is significantly positively related to per capita income and significantly negatively related to square of per capita income. The share of services is positively related to per capita

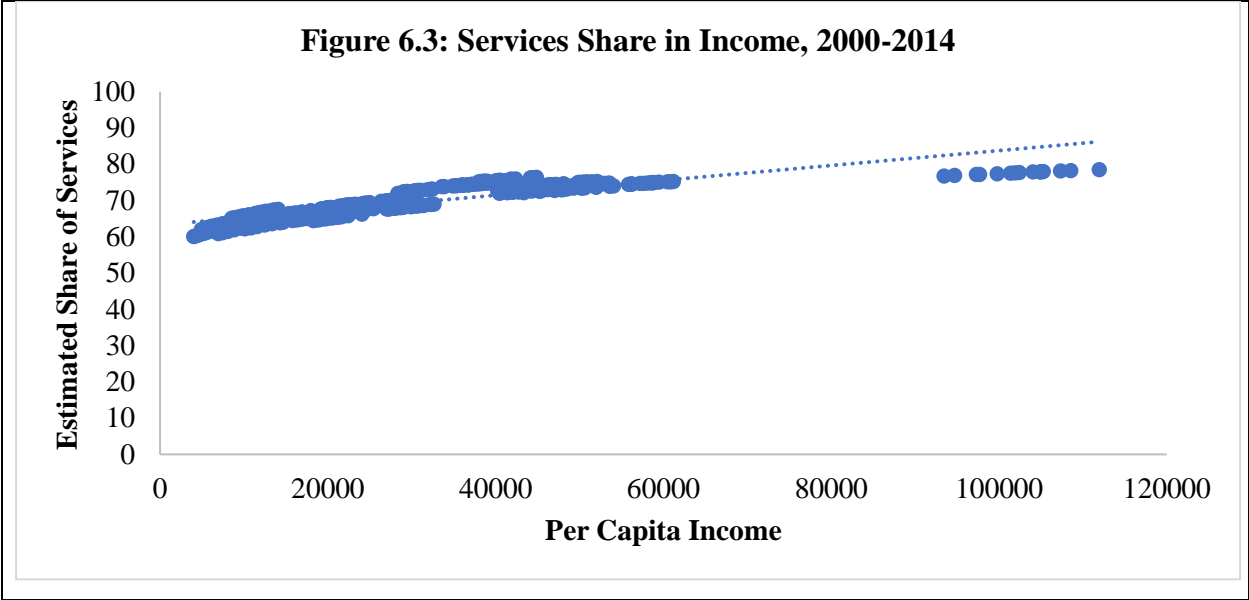
<sup>116</sup> The results obtained using FEM corrected for autocorrelation and heteroscedasticity is reported in Appendix A6.1



income and negatively related to square of per capita income; however, the coefficients of income variables are not significant. The population variable is highly significant in explaining the share of industry, supporting the operation of economies of scale in structural transformation; however, the population variable is not at all significant in explaining the shares of agriculture and services.

Now we plot the graphs depicting the relationship between shares of agriculture, industry and services and per capita income. The graphs of estimated values of sectoral shares against per capita income are given in charts 6.1, 6.2 and 6.3 respectively.





We draw the following observations from the above charts. Firstly, as expected, share of agriculture and industries have declined over time and over higher per capita income countries in the EU. The relationship between estimated shares of agriculture and industry and per capita income are depicted by negatively sloped curves indicating that low-income countries witnessed sharper rise in agriculture and industrial orientation over time. The slope in chart 6.1 is steeper as compared to that in chart 6.2, which implies that the decline in share of agriculture (agricultural orientation) over higher income countries is greater than that in share of industries. Secondly, the services orientation has increased for countries with higher per capita income. Thus, our results validate the process of structural transformation in the EU and are consistent with standard cross-country results. Also, lower income countries displayed having higher orientation of industrial sector and lower orientation of services sector as compared to high income countries.

Open-Economy Framework

We now turn to the effects of trade openness on structural orientation across the countries of the EU and the efficacy of trade in bridging the gap in structural transformation between the higher income and the lower income countries. We re-estimate model (6.2) incorporating the trade and the interaction variables as explanatory factors.

Although the Hausman test indicates that FE specification is better fit to our panel data, we have chosen RE specification over FE because the latter eliminates the effects of omitted

heterogeneity. And as already inferred from table 6.5 the dependent variables (the sectoral shares of GDP) and all the explanatory variables included in our study exhibit greater between-country variations than within-country variations, indicating that a significant amount of valuable information would be lost if FE specification model is adopted. In case of panel regression model with share of agriculture as dependent variable, Wald test for group-wise heteroscedasticity gave p-value =0.00 indicating that the error variance varies across countries, meaning error terms are heteroscedastic. Wald test gave p-value =0.94 in case of panel regression with share of industries as dependent variable and p-value =0.61 in case of panel regression with share of services as dependent variable. So, we cannot reject the null hypothesis of homoscedasticity in these two cases. In addition, Wooldridge test for autocorrelation yielded p-value = 0.00 for our panel data, for all the three models with three sectoral shares, implying presence of first order autocorrelation. As panel diagnostic tests indicate that error terms in our model are heteroscedastic and autocorrelated that need to be addressed before estimation. The random effect model permits autocorrelation in model error. Thus, regression models pertaining to shares of industries and services can be estimated using simple Random effect model<sup>117</sup>. However, since regression models pertaining to shares of agriculture and industries are infested both by heteroscedasticity and autocorrelation, and the form of heteroscedasticity is unknown, the estimation is done using FGLS method. The results of RE estimations for the model for the sectoral shares, corrected for autocorrelation and heteroskedasticity is reported in Table 6.7<sup>118</sup>.

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<sup>117</sup> For panel regression with industrial share, REM with AR (1) disturbance is considered.

<sup>118</sup> Results obtained employing FEM estimates, corrected for heteroscedasticity and autocorrelation is reported in Appendix A6.2

**Table 6.7: Structural Change Equation for EU in Open-Economy Framework**

	Dependent Variable		
	Share of Agriculture	Share of Industry	Share of Services
<b>ln Y</b>	- 26.543*** (1.971)	-13.373 (15.450)	-7.529 (15.639)
<b>(lnY)<sup>2</sup></b>	1.196* (0.101)	0.817 (0.808)	0.525 (0.831)
<b>ln P</b>	3.392 (0.677)	25.987** (10.246)	-2.060 (12.996)
<b>(lnP)<sup>2</sup></b>	-0.116 (0.021)	-0.773** (0.326)	0.1328 (0.415)
<b>lnTRADE</b>	-1.154*** (0.175)	1.624*** (0.967)	6.023** (1.289)
<b>lnTRADE*PCD</b>	-0.122** (0.050)	1.701*** (0.510)	-0.676** (0.629)
<b>Constant</b>	129.681*** (11.161)	-149.2445 (109.209)	64.650 (126.492)
<b>N</b>	420	420	420
<b>Test for overall significance of the model</b>	Wald chi2(6) =1496.78	Wald chi2(7) =40.38	Wald chi2(6) = 75.65
<b>H<sub>0</sub>: All slope coefficients are zero</b>	Prob > chi2=0.00	Prob > chi2=0.00	Prob > chi2=0.00

\*\*\*Significant at 1%, \*\*Significant at 5%, \*Significant at 10%. Figures in parentheses are the standard errors.

The results given in table 6.7 clearly show that trade has significantly affected all the sectoral shares of the EU economy (while the estimated coefficient of *lnTRADE* is significant at 1 per cent level of significance for the shares of agriculture and industries, it is significant at 5 per cent level of significance for the share of industries). On the one hand, trade has significant effect

on increasing the shares of industries and services and on the other hand it has a significant effect on lowering the share of agriculture in the overall per capita income of the EU. In other words, it is observed that the overall agricultural orientation of EU has declined significantly due to trade openness, as a 1 per cent increase in trade leads to an absolute change in share of agriculture by 0.01154 units with decline for the lower income countries being greater at 0.0128 units (0.01154+0.00122). Simultaneously, the lower income countries in EU seem to have gained in shares of both industry and services, however, the gain in share of services for low-income countries is lesser as compared to gain in share of services by high income countries. This explains that poorer countries in the EU have gained in terms of higher shares of industrial and services vis-à-vis richer countries as a result of trade which led to their catch-up with the high-income countries, resulting in per capita income convergence in the EU, albeit the magnitude of catch up with respect to the industrial sector is high as compared to the magnitude of catch up in terms of services sector.

In addition, our findings regarding the relationship of sectoral shares with per capita income and population remains the same as presented in table 6.6; only that the income variable is rendered insignificant in explaining industrial shares with the inclusion of trade variable.

## **6.4.2 ASEAN**

### *Closed Economy Framework*

Here, we have strongly balanced long panel data. When the panel has few cross-sectional entities (country in this case) relative to number of time entity (year in this case), the individual country effects can be incorporated as explanatory dummy variables, leading to too many time (year) effects. Rather than trying to control for these, it is better to take advantage of the natural ordering of year as opposed to countries. Panel feasible generalised least squares (PFGLS) method for long panels allow for the error terms in the model to be auto-correlated and heteroscedastic. The results PFGLS method are presented in table 6.8.

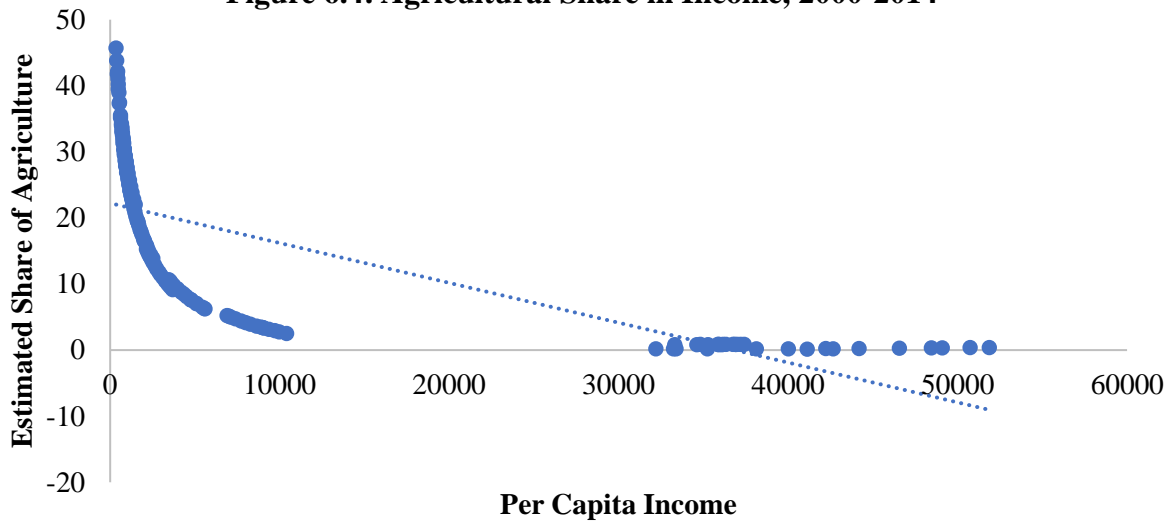
**Table 6.8: Structural Change Equation for ASEAN in Closed Economy Framework**

	Dependent Variable		
	Share of Agriculture	Share of Industry	Share of Services
<b>lnY</b>	-45.805*** (1.637)	56.786*** (4.357)	2.031 (10.274)
<b>(lnY)<sup>2</sup></b>	2.188*** (0.081)	-3.229*** (0.263)	0.252 (0.644)
<b>ln P</b>	0.709 (1.501)	-91.090*** (4.003)	65.190*** (7.341)
<b>(lnP)<sup>2</sup></b>	-0.035 (0.052)	2.738*** (0.121)	-1.908*** (0.219)
<b>Constant</b>	237.254*** (9.011)	545.825** (37.022)	-539.462*** (65.173)
<b>N</b>	150	150	150
<b>Test for overall significance of the model</b>	Wald chi2(4) = 1572.66	Wald chi2(4) =1630.14	Wald chi2(4) =115.02
<b>H<sub>0</sub>: All slope coefficients are zero</b>	Prob > chi2= 0.00	Prob > chi2= 0.00	Prob > chi2= 0.00

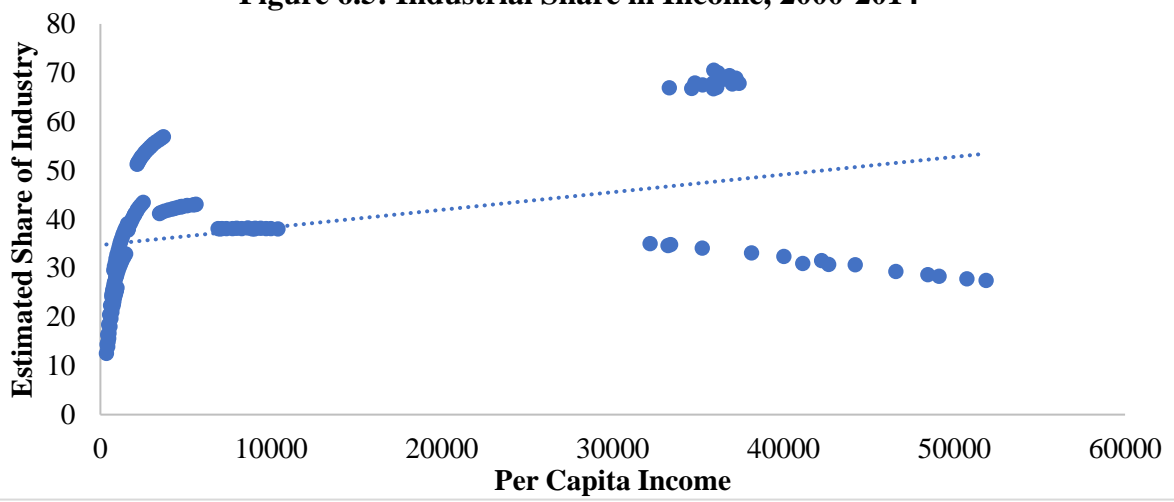
\*\*\*Significant at 1%. \*\*Significant at 5%. Figures in parenthesis are standard errors.

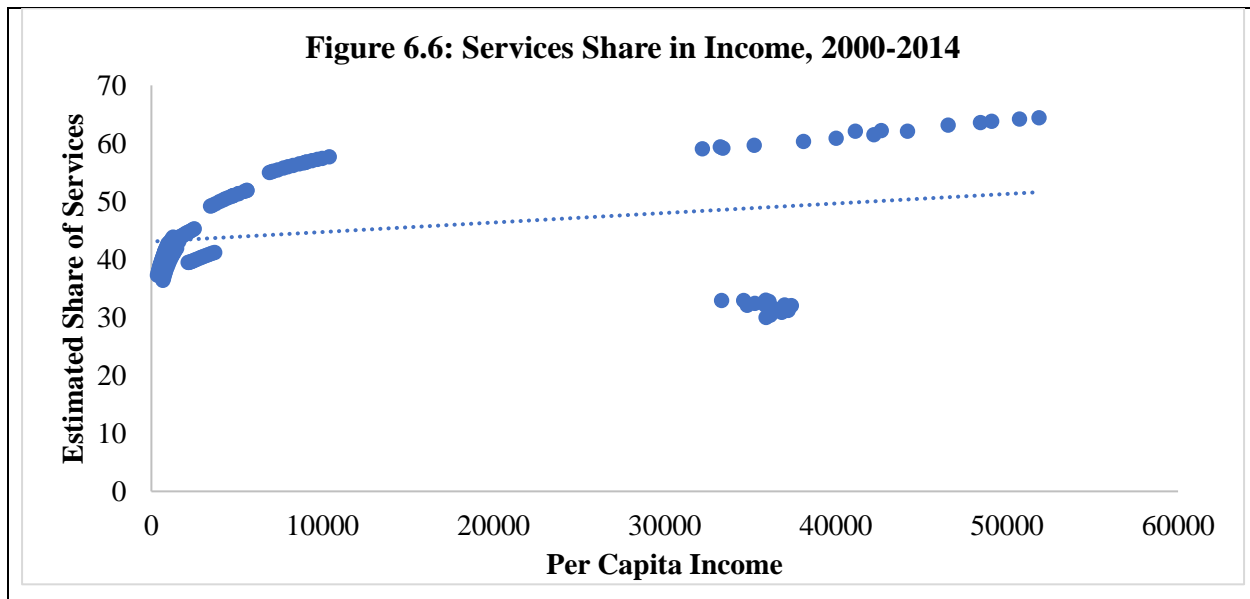
From table 6.8 we observe that while the share of agriculture is significantly negatively related to per capita income and significantly positively related to square of per capita income, the share of industries is significantly positively related to per capita income and significantly negatively related to square of per capita income. The share of services is positively related to both per capita income and square of per capita income; however, the coefficients of income variables are not significant. The population variable is highly significant in explaining the share of services and industry, supporting the operation of economies of scale in industrial and services sector; however, the population variable is not at all significant in explaining the share of agriculture.

**Figure 6.4: Agricultural Share in Income, 2000-2014**



**Figure 6.5: Industrial Share in Income, 2000-2014**





Next, we plot the graphs depicting the relationship between shares of agriculture, industry and services and per capita income. The graphs of estimated values of sectoral shares against per capita income are given in charts 6.4, 6.5 and 6.6 respectively.

We draw the following observations from the above charts. Firstly, as expected, share of agriculture has declined over time and over higher per capita income countries in the ASEAN; the relationship between estimated shares of agriculture and per capita income has depicted a negatively sloped curve indicating that low-income countries witnessed sharper rise in agriculture and industrial orientation over time. Secondly, the industrial and services orientation have increased for countries with higher per capita income. Thus, our results validate the process of structural transformation in the ASEAN and are consistent with standard cross-country results. Also, lower income countries displayed having higher orientation of agricultural and industrial sector and lower orientation of services sector as compared to high income countries.

#### Open-Economy Framework

We now turn to the effects of trade openness on structural orientation across the countries of the ASEAN and the efficacy of trade in bridging gap in structural transformation between the higher income and the lower income countries. We re-estimate model (6.2) for ASEAN incorporating, in addition, the trade and the interaction variables as explanatory variables.



**Table 6.9: Structural Change Equation for ASEAN in Open Economy Framework**

	Dependent Variable		
	Share of Agriculture	Share of Industry	Share of Services
<b>lnY</b>	-44.911*** (1.664)	53.281*** (7.936)	0.123 (4.319)
<b>(lnY)<sup>2</sup></b>	2.121*** (0.088)	-2.942*** (0.520)	0.308 (0.277)
<b>ln P</b>	13.103*** (2.392)	-81.342*** (11.409)	60.021*** (6.317)
<b>(lnP)<sup>2</sup></b>	-0.430*** (0.079)	2.464*** (0.359)	-1.766*** (0.191)
<b>lnTRADE</b>	-1.281*** (0.193)	0.552 (0.728)	1.154*** (0.354)
<b>lnTRADE* PCD</b>	0.0234 (0.188)	0.193 (0.738)	-0.913*** (0.322)
<b>Constant</b>	146.040*** (20.008)	467.224*** (89.390)	-483.781 (53.804)
<b>N</b>	150	150	150
<b>Test for overall significance of the model</b>	Wald chi2(6) = 3055.76	Wald chi2(6) = 720.84	Wald chi2(6) = 418.36
<b>H<sub>0</sub>: All slope coefficients are zero</b>	Prob > chi2 = 0.00	Prob > chi2 = 0.00	Prob > chi2 = 0.00

\*\*\*Significant at 1%. Figures in parentheses are standard errors.

From table 6.9, we note that the share of trade has significant effect on shares of agriculture, industry and services; trade has negative impact effect on agricultural share of the ASEAN, it has positive impact on industrial and services sector. It can also be inferred from the table that the overall agricultural orientation of the ASEAN has declined significantly due to trade openness, as a 1 per cent increase in trade leads to an absolute change in share of agriculture by 0.01281.

Although trade has shown to pull down the agriculture orientation by 0.01258 of lower income countries, the impact is not significant. Also, the lower income countries in the ASEAN seem to have gained in shares of services due to trade, however, the gain in share of services for low-income countries is lesser as compared to gain in share of services by high income countries (trade elasticity for services orientation for lower income countries is placed at 0.241 while that for higher income countries is placed at 0.913). This explains that poorer countries in the ASEAN have significantly gained in terms of both services and industrial orientation as a result of trade, though the gain in industrial orientation is not significant. Since income of the poor countries in the ASEAN were much lower than the richer countries, the increased orientation in industries and services were not as large. Thus, trade has led to the income convergence among the ASEAN nations by fuelling the growth of services sector among the low-income countries (CLMV countries). In addition, our findings regarding the relationship of sectoral shares with per capita income and population remains the same as presented in table 6.8. It can also be noted that while income has expected impact on the sectoral share; population has a negative impact on industry share in ASEAN which could be due to disproportionate expansion of working age population and population majorly being dependent population.

## **6.5 Structural Transformation in the EU and the ASEAN: A Comparison**

Our analysis affirms that per capita income convergence in the EU and the ASEAN is a result of trade that has caused rise in per capita income to a larger extent in lower income countries in comparison with relatively higher income countries leading to narrowing of the gap in per capita income across countries and thus improving the relative position of lower income countries in terms of income vis-à-vis the higher income countries. While in the EU, reduction in inequality with respect to income was mainly due to lowering of inequality with respect to industries and was partly contributed to reduction of inequality in the services; in the ASEAN, lowering of income inequality was due to reduction in inequality with respect to industry and services.

In both the EU and the ASEAN, trade has accentuated the structural change process. We have been able to show that the ASEAN economy as a whole is swiftly shifting from agricultural sector to industrial sector due to trade. And the economy of EU as whole, which is already

characterized by very little share agriculture, is moving from industrial sector to services sector owing to trade. In the case of the EU, trade had positive and significant impact in increasing the share of both industry and services. Also, poor countries seem to have gained in the share of both industry and services, the gain has been significant only in the case of industry. In case of the ASEAN, trade has positively contributed in increasing the shares of industries and services and reducing the share of agriculture. Nevertheless, poor countries have gained significantly in only the shares of industry.

The extent of the impact of trade in ASEAN is lower than that in the EU. ASEAN is yet to reap the full benefit of trade. In particular, the lower income countries of the ASEAN have not been able to extract the full advantages of opening up to trade, as they are yet to gain from increased orientation of industrial sector caused due to opening up to from trade.

As far as demographic transformation is concerned, there is quite a different between the EU and the ASEAN. Population growth in EU is increasing at a very slow pace, if at all whereas population is on an increasing trend in the ASEAN. All the EU nations are comparatively at a higher level of development than the ASEAN nations as reflected in their respective Theil indices. All this together implies that the EU must be witnessing higher rate of growth in income and therefore an increasing demand for industrial production. In contrast, income is growing at a much slower pace in many of the ASEAN countries, especially in the CMLV countries. As a result, demand for industrial production may not be growing that significantly. In the ASEAN, higher population growth has translated into expansion of agricultural and services sector, offsetting the increased demand for industrial production.

## **6.6 Concluding Remarks**

In this chapter, we had set our objective to investigate how the process of differential structural transformation in the member countries unfolded by the forces of trade led to the observed convergence in per capita income in the EU and the ASEAN countries. Our analysis shows that while in the EU, reduction in income inequality was largely contributed to by reduction of inequality in the industrial sector and to some extent by reduction in inequality in the services

sector; in the ASEAN, lowering of income inequality was due to reduction in inequality with respect to industry and services.

In both the EU and the ASEAN region, trade has accentuated the structural change process. In the case of the EU, trade had positive and significant impact in increasing the shares of both industry and services. Also, poor countries in the EU seem to have gained in the shares of both industry and services, the gain has been significant only in the case of industry. In the case of the ASEAN, trade had positively contributed in increasing the share of industries and services and reducing the shares of agriculture. Also, poor countries have gained significantly in share of both industry and services, however the gain in services sector was not significant. A comparative analysis shows that ASEAN is yet to reap the full benefit of trade. This is may be because ASEAN countries opened up for trade only in 1990s while EU countries were open in terms of trade since the 1960s.

## Chapter VII

### Conclusion

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This study as noted in the introduction chapter is fundamentally concerned with explaining the importance of international trade in determining per capita income convergence across countries. We have argued that the standard approaches to explain per capita income convergence across countries (Barro, Sala-i-Martin (1991, 1992, 1995,1996), Quah (1995), Durlauf (1996), Rodrik (2003,2005) etc.) have been conducted within a closed economy framework and therefore the role of trade in determining convergence has been ignored by them. More precisely, in these studies what triggers growth in an economy is essentially the rate of capital accumulation as propounded by Slow and Swan (1956). However, it has been both theoretically and empirically substantiated that international trade has historically played the role of an “engine of growth” (Robertson, 1940; Maizels, 1963; Balassa, 1986; Dollar, 1993 etc.). Therefore, it raises a question how does international trade affect income levels between countries and hence the cross-country income convergence. Interestingly, in recent years economists have emphasized on the importance of trade not only in increasing income per capita but also in reducing the per capita income differences across countries or regions by easing the dissemination of knowledge and innovations from direct imports of high-tech goods, greater interactions with the sources of innovation, or from foreign direct investment (Grossman and Helpman, 1990, 1991; Rivera-Batiz and Romer,1991; Barro and Sala-i-Martin ,1997 and Baldwin, Braconier, and Forslid, 2005, etc.). Moreover, international trade by providing opportunities for expansion of market size enables economies (i) to realize the benefits of increasing returns to scale from specialization in production (Romer,1989; Ades and Glaeser,1999; Alesina, Spolaore and Wacziarg, 2000; and Bond, Jones and Ping, 2005, etc.) and (ii) to improve management competence in response to competition and factor mobility due to international movement of factors (Ben-David, 1996; Ben-David and Rahaman, 1996; Sachs and Warner, 1995). But these literatures also failed to recognize certain dynamic aspect of trade and growth linkages resulting from the *structural changes* in economies and their influences in determining income convergence. As emphasized by Kuznets et al, 1960, Williamson, 1965, Krugman and Venables, 1995, international trade significantly contributes to structural

transformation of an economy by which it is meant how an economy transforms itself from a backward primary producing to an advanced manufacturing production hub. This important aspect of growth is conspicuously missing in the received literature on trade and income convergence based upon endogenous growth models which is built upon the usual steady-state growth analysis. Our study will be an attempt to fill this gap up.

In our attempt to examine the significance of trade in per capita income convergence and *pari passu* of the role of structural changes in the process of convergence, we have considered two blocks of countries, the EU and the ASEAN, and taking the period of 2000-2014 – a period which is marked by unfolding of great economic dynamism in both the blocks of countries. The choice of the two blocks of countries – the EU and the ASEAN – for this study is chiefly motivated by the fact that they present a wide range of variations in terms of formation and advancement in the levels of development. While the former is a customs union, the latter is a free-trade zone. Since the EU countries are all tied to each other both monetarily and financially, therefore they are more intricately integrated than the ASEAN nations which form a free trade area. And thus far, there has not been any comparative study of income convergence for these two groups of countries representing different degrees of trade openness. Also, a study for post-2000 will throw lights on recent convergence dynamics in the EU and the ASEAN as well as be a contribution to the existing literature.

Specifically, the study comprises of first determining whether there is evidence of cross-country per capita income convergence among the ASEAN and EU nations using the concepts of beta and sigma convergence propounded by Barro Sala-i-Martin (1992). We attempted at re-establishing their finding using Theil index of inequality. It is then followed by evaluating the role of trade in the process of income convergence by employing panel regression estimation on *Theil ratios*. Similarly, the assessment of the role of relative backwardness on income convergence is dealt with using panel regression on income growth and various factors impacting growth. Finally, the analysis on the link between trade, structural transformation and income convergence is treated using the augmented Chenery-Syrquin model of structural transformation for panel data.

*Chapter 1 – 3* have been devoted to introduction, literature survey and the data, hypothesis and methodology of the study.

*Chapter 4* is the *first contribution* of this thesis, wherein first using the traditional concepts of beta and sigma convergence developed by Barro-Sala-i- Martin (1991), we established per capita income convergence across the countries in the EU and the ASEAN during 2000-2014. Since, standard convergence analysis attributed to Barro-Sala-i-Martin (1995) is not suitable for analysing the underlying process of structural change that an economy witnesses as the forces that contribute to income convergence get unfolded in response to policy changes, therefore, in order to capture structural change and consequent dynamic shifts we have looked into the phenomenon of income convergence observing the trends in the Theil index of inequality. The beauty of Theil index of inequality is that it allows us to segregate the inequality in income into the inequality in its sectoral components and thus enables us to measure the proportional contribution of each sector of income pulling up or down the total inequality in income. To the best of our knowledge, Theil index of income inequality and sectoral Theil indices of inequality has not been previously employed in studies to gauge the income convergence across countries. Our study fills this gap in literature.

The convergence process in the EU and the ASEAN was re-affirmed by the trend analysis of Theil index of income inequality, whereby we found that the Theil index of income inequality has declined for the EU and the ASEAN during 2000-2014. Here it is worth emphasizing that a trend analysis of Theil index of income inequality gives a polynomial trend in the case of EU and a linear trend in the case of ASEAN. Thus, we can say that while there is an overall cross- country convergence in the EU, it has not been a secular trend as we have observed an uptick in the Theil index of inequality since 2008. This phenomenon was not as evident in the beta and sigma analysis of convergence. Hence, Theil index of inequality is a better measure of convergence than the beta sigma analysis.

Furthermore, trend analysis for Theil index of inequality in terms of sectoral components were carried out. For the EU, it was found that inter-country inequality for services has narrowed continuously, but the indices of inequality with respect to agriculture and services do not show any such specific trend. During 2000-2014, in the EU, the levels of inequality are the lowest for industry, followed by income and services. Moreover, there is a visible decreasing trend in Theil index of inequality with respect to government expenditure vis-à-vis a decline in the inter-country inequality in EU. However, there is hardly any noticeable trend in Theil index of intra-EU trade

while there is falling trend in extra-EU trade till 2008. After 2008, a distinct trend in extra-EU trade is not as apparent. For ASEAN, inter-country inequality for industries has been falling during 2000-2014, but that for agriculture has been increasing. Their indices with respect to both agriculture and industry follow linear trend. Nevertheless, there is no such distinct linear trend for services. During 2000-2014, in ASEAN, the levels of inequality are the lowest for agriculture followed by GDP and industry. Also, there is a decreasing trend in Theil index of inequality with respect to government expenditure, intra-ASEAN and extra-ASEAN trade vis-à-vis declining trend in Theil index of income inequality.

Furthermore, in *Chapter 4 our second substantive research contribution* is rigorous empirical analysis on the role of trade on income convergence employing panel data regression analysis on Theil ratios. Theil income ratio is defined as the ratio of the share of country's income (or its sectoral components or other variables like trade and government expenditure) in total income of the group to the share of country's population in the total population of the group and it gives the information of the relative position of a country in the region. The empirical results validate that trade is the important driving force in causing the observed income convergence across the countries in both the EU and the ASEAN as our results show that a country which improves its relative position in overall trade of the region versus the other countries in the region also improves its relative income position in the region which in turn drives the process of per capita income convergence. The impact of trade has been found to be more pronounced in the EU, which is more integrated with each other in terms of trade than its impact in the ASEAN. International trade seems to have greater impact on the process of income convergence than intra-regional trade for both the groups of countries. The difference in impact of international and inter-regional trade is higher for the case of EU than for the ASEAN. This is the reflection of the fact that as ASEAN's economic integration in trade increases, there has been a parallel increase in ASEAN's trade integration with the rest of the world. This is not true of the EU countries which are more strongly integrated among themselves than with the rest of the world. In addition to trade, factor mobility (capital and labour mobility) among countries did play crucial role in causing per capita income convergence in the EU and the ASEAN during 2000-2014. Also, an increase in government expenditure was found to have furthered the process of income convergence. However, it is trade that has emerged as the most important factor driving per capita income convergence across the countries of both the EU and ASEAN.



The *third important contribution* of this thesis is the evaluation of A. Gerschenkron's theory of relative backwardness in the context of income convergence which is the subject matter of *Chapter V*. In other words, in *Chapter V*, we tested whether the theory of relative backwardness holds true across countries, i.e., whether the countries with relatively lower initial value of per capita GDP experiences relatively higher growth rate of GDP per capita due to expansionary policies of government and trade. In the framework of theory of relative backwardness, while Gerchenkron (1962) underscored that relatively backward countries can create conditions for rapid growth by substituting for missing preconditions by way of higher government expenditure, developing banking systems, etc. in order to catch up with industrialized countries, the theory overlooked the contribution of trade as one of substitute propelling convergence process. Thus, our contribution, in Chapter V, is empirical analysis of effect of greater trade openness and higher government expenditure as pursued by initially backward countries on economic growth using panel data methodology. The other control variables included in our panel regression model are – countries' initial income levels (the variable capturing the convergence of long-term income levels) and a host of country specific characteristics like index of financial development and political stability. From our regression results, it is clear that there is significant negative effect of initial per capita income and significant positive effect of trade on growth rate of per capita income in case of both the EU and the ASEAN and trade is found to be a significant catalysis for per capita income growth in both the EU and the ASEAN countries

We find evidence that government expenditure has negative and significant impact on growth in per capita income when EU countries are considered. This could be reflection of the outcome of social welfare programmes in number of EU countries by way which government expenditure had a distributional impact on income rather than having a growth enhancing impact on income. It could also be on account of financial crisis of 2008 and Greece crisis of 2013 when the objective of growth promotion was subordinate to other objectives, such as social policy concerns, redistribution, or protection of employment, of government expenditure. When we looked at government expenditure in various fields as percentage of total government expenditure in the EU, it was quite clear that the percentage of government expenditures during the period of our study have been the highest in social protection followed by general public services, health and education. Also, we saw that while there is an increasing trend in the share of government expenditure in social protection there is a decreasing trend in the share of government expenditure

in other functions. In case of the ASEAN, while government expenditure has negative and significant impact on growth in per capita income when ASEAN-9 is considered, it has a positive and significant impact on growth when CLV countries are considered. In other words, while government expenditure led to the rise in growth rate of per capita income of the CLV countries, it had a dampening effect on the growth rate of per capita income of high-income countries of the ASEAN. This implies that government expenditure had a distributive effect for the ASEAN, leading to convergence in per capita income of the countries in ASEAN.

The empirical findings also demonstrate a significant positive impact of index of financial development on economic growth in the EU and the ASEAN; however, when only the low income CLV countries are considered, its impact is insignificant. While index of political stability is found to be one of the key determinants of economic growth in the economies of the EU, political stability didn't seem to have a significant impact on economic growth in the ASEAN countries.

The *fourth key contribution* of this study is *Chapter VI*, wherein we have investigated how the process of differential structural transformation in the member countries of the EU and the ASEAN unfolded by the forces of trade lead to observed convergence in per capita income in these two regions. Our analysis shows that while in the EU, reduction in income inequality was largely contributed to by reduction of inequality in the industrial sector and to some extent by reduction in inequality in the services sector; in the ASEAN, lowering of income inequality was mainly due to reduction in inequality with respect to both industry and services. In both the EU and the ASEAN region, trade has accentuated the structural change process. In case of EU, trade had positive and significant impact in increasing the share of both industry and services. Also, even though the low-income countries in EU have gained in the share of both industry and services, the gain has been significant only in the case of industry. In case of ASEAN, trade has positively contributed in increasing the share of industries and services and reducing the share of agriculture. The low-income ASEAN countries have gained significantly in shares of both industry and services, although the gain in services sector is not significant. A comparative analysis shows that the extent of the impact of trade in the ASEAN is lower than that in the EU. This is may be because the ASEAN countries opened up for trade only in 1990s while the EU countries were open in terms of trade since the 1960s and is yet to reap the full benefit of trade.

It may be noted that while rapid growth in lower- income countries in the ASEAN and the EU has reduced per-capita income differentials across the countries in the ASEAN and the EU, respectively; the distribution of these gains from higher growth rates have been uneven and have not been translated in income countries within most of these countries of the two regions. It has appeared that inter-country differences Theil indices are narrowed and at the same time intra-country differences in per capita income as measured by Gini indices have widened<sup>119</sup>. We have empirically shown that trade is the predominant contributor to cross- country income convergence in the ASEAN and the EU; and few studies like Paas (2006), Asian Development Bank (2012), Menon (2013) reasoned that globalization could have accentuated within country income divergence. Also, the authors contend that higher growth in the countries have been achieved at the cost of rising inequality within these countries. How can we explain these diverging patterns within the countries of the EU and the ASEAN? Are they simply temporary and due to the crisis? Or should they be attributed to country-specific structural features and domestic policies? Whether trade is a factor of within country income divergence? Investigation on these important questions is beyond the scope of this thesis as country-wise regional data on income and population of the countries of the EU and the ASEAN is not easily available. Thus, finding the answers to these questions posed above could be the topic of future research.

Income polarisation within countries will eventually threaten social cohesion which in turn may weaken country's competitiveness, lead to dissatisfaction towards trade openness and jeopardize sustainability of future growth. Since, neither reducing growth nor reversing the inclination towards greater openness and market orientation in a bid to reduce within country income divergence are practical policy decisions; therefore, importance of continued country specific policy for equitable distribution of resources within the country becomes heightened. Governmental intervention is called for to boost investment in social infrastructure, like education and health, in order to produce a skilled- labour force who are more accomplished to participate in the growth process led by opening up of trade and expanded market. Likewise, it is necessary to improve the investment climate so as to increase capital inflow and labour absorption. Last but not least, productivity has to be enhanced in order to gain from structural adjustment of the economy.

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<sup>119</sup> A brief note on this observation is given in the Appendix to this thesis, A4.1

These policies also need to be accompanied with the policy strategies aiming at inclusive growth within countries.

Before concluding this thesis, we would like to make few points on future extension of this thesis. One interesting scope for future study could be a in depth scrutinization of within country income convergence in the EU and the ASEAN and an extensive empirical study on the role of trade in within country income convergence.

# Appendices

## **A1.1: A Brief Note on Current Scenario of Regional Trade Agreements (RTAs)**

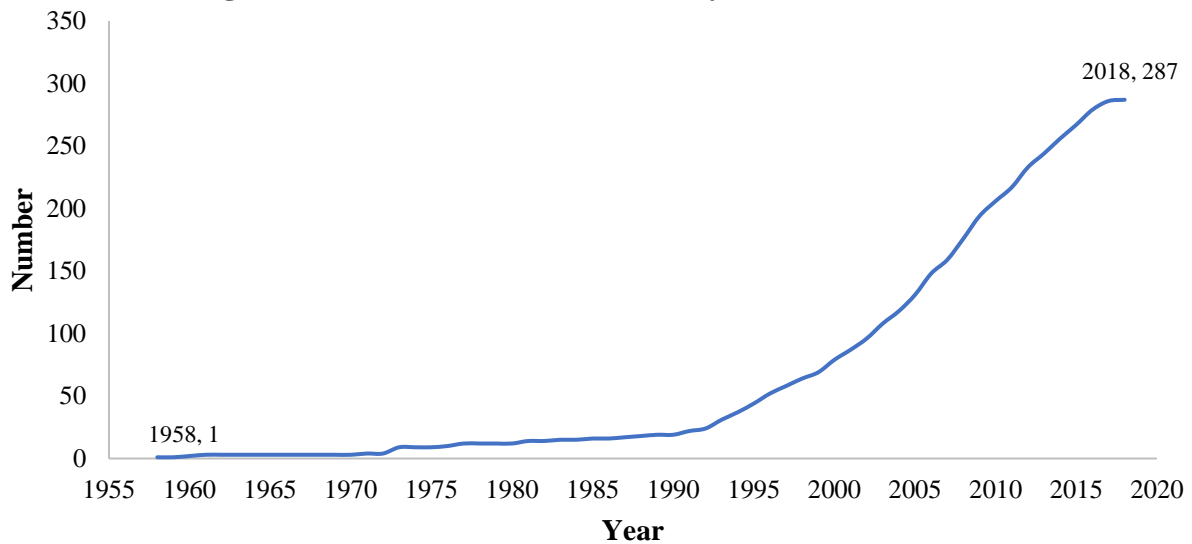
In the recent time, there has been an enormous proliferation of regional trade agreements (RTAs) across the world. It can be observed from Chart A1, the number of regional trade agreements (RTAs) in force have grown exponentially from 1 in 1958 to 287 in 2018.<sup>1</sup> The Treaty of Rome came into force in 1958. It was the first so-called regional trade agreement (RTA) under the WTO's regime, which was called General agreement on Tariffs and Trade (GATT) at that time. The treaty endeavored to make the flow of goods and services between France, Italy, Germany and the Benelux countries easier. It was the foundation of the European Union. More on this is discussed in the next section. Pace of RTAs took momentum, with two or more countries increasingly embracing formalization of free trade between themselves, since mid-1990s which coincided with the end of World Trade Organization's Uruguay Round<sup>120</sup>.

Since 1995, the scope and geographical reach of RTAs have expanded so much so that nearly every country today is either a member of, or is discussing participant in, one or more regional agreements. Region-wise analysis of trade agreements reveal that Europe has maximum participation in RTAs followed by East Asia (Chart A2). The greatest concentration of RTAs is in Europe; and in Europe, the RTAs are mainly centered on the European Union. After Europe, the major concentration of RTAs is in the East Asian region.

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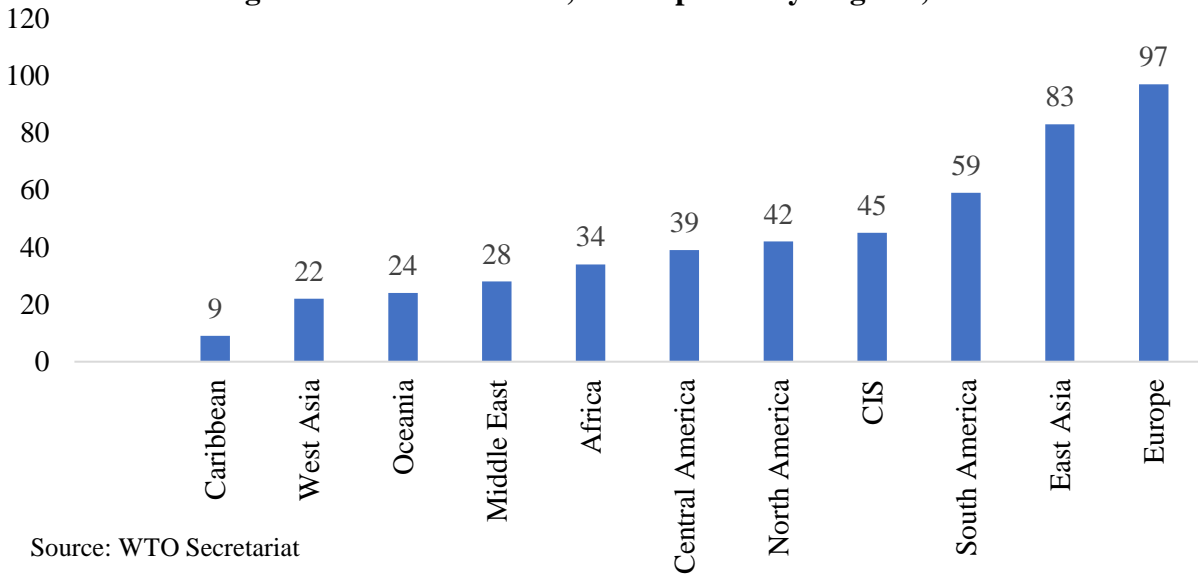
<sup>120</sup> The Uruguay Round led to the creation of the World Trade Organization, with GATT remaining as an integral part of the WTO agreements. The main ratification of the Round had been to extend GATT trade rules to areas that were previously exempted like agriculture and textiles and important new areas previously not included like trade in services, intellectual property and investment policy trade distortions.

**Figure A1: Cumulative Number of Physical RTAs in Force**



Source: WTO Secretariat

**Figure A2: RTAs in Force, Participation by Regions, 2018**



Source: WTO Secretariat

## **A1.2: A Brief History of the European Union**

The European Union traces its origins from the European Coal and Steel Community (ECSC) established by the 1951 Treaty of Paris. In 1957, the five founding member countries, viz., Germany, France, Italy, the Netherlands, Belgium and Luxembourg established the European

Economic Community (EEC) by the Treaty of Rome, which came into effect in 1958. The Maastricht Treaty of 1992 created the European Union (EU). At the core of the formation of the EU was the economic goal to create a European Common Market. The Common Market aimed at abolition of still existing non- tariff barriers to trade in services and to dismantle restrictions on labour and capital mobility within five years. This real integration in goods and factor markets was accompanied by a monetary integration which started slowly but took momentum after German Unification in 1990s.

EU policies aimed to ensure the free movement of people, goods, services and capital within the internal market, and maintain common policies on trade were guaranteed with the Maastricht Treaty of 1992. The treaty also led to the member countries agreeing to establish a monetary union with single European currency, the Euro. Hence, in 1999 the European monetary union came into existence. It started with eleven countries, Greece joined later. The UK, Sweden and Denmark didn't take part.

Simultaneously, with the real and monetary deepening of the European Integration, several enlargements took place. With the enlargements in 1973 UK, Ireland and Denmark became members. Greece, Spain and Portugal joined the EU between 1981 and 1986. This enlargement is known as the Southern Enlargement. The Northern Enlargement took place in 1995 after the fall of iron curtain (the name for the boundary dividing Europe into two separate areas from the end of World War II in 1945 until the end of the Cold War in 1991), making Sweden, Finland and Austria members of the EU. With the Eastern Enlargement, the largest enlargement of the EU in 2004, eight Eastern European countries and two Mediterranean islands (Malta and Cyprus) joined the EU. By 2013, Romania, Bulgaria and Croatia joined the EU so that EU consists today of twenty-eight-member countries.

### **A1.3: A Brief History of the Association of South East Asian Nations**

The Association of Southeast Asian Nations (ASEAN) is a geo-political and economic organization of ten countries located in Southeast Asia. ASEAN was formed on 8 August 1967 by the signatories - Indonesia, Malaysia, the Philippines, Singapore and Thailand. Subsequently, membership has expanded to include Brunei, Myanmar, Cambodia, Laos, and Vietnam. It aims at

acceleration of socio- economic growth and progress, and cultural development among its member countries, and also protection of regional peace and stability. In 2000s important development was the formation of ASEAN Free Trade Area (AFTA) which was followed by signing of a Common Effective Preferential Tariff (CEPT) Agreement that limited the tariff to 0-5% by 2003. Moreover, an agreement (in 1992) for intra-ASEAN investment, non-tariff barriers, services, intellectual property, and customs and tourism was also made. After the severe recession in the mid -1980s, ASEAN countries embarked on de-regulation, trade and foreign direct investment so as to achieve greater degree of trade liberalization. ASEAN has been continuously making effort to foster closer political ties as well as to strengthen economic cooperation and strengthen its huge market opportunities. Based on foundations laid in 1997 in the “ASEAN Vision 2020”, the ASEAN leaders agreed to transform ASEAN’s ten-member countries into an ASEAN Community. This include an ASEAN Economic Community (AEC) – “a single market and production base with free flow of goods, services and skilled labor and freer flow of capital by 2020”. In the same year, the efforts towards regionalism has been further stepped up in East Asia with the formation of the ASEAN+3 grouping, comprising of ASEAN member countries and China, Japan and South Korea, the three major economies in East Asia. This has been widely observed as a move towards achieving an East Asia wide Free Trade Area and furthermore, this formation does become an important building block for a wider pan-Asian Economic Community in the future. Nevertheless, ASEAN+3 is fundamentally a heterogeneous group of countries, ranging from low income (such as Laos) to high income (such as Singapore) economies. The significant heterogeneity among these Asian countries does present significant challenges in achieving AEC.

## **A1.4: Economic Developments in EU and ASEAN during 2000-2014: A Discussion**

### **A1.4.1 European Union**

European countries have similar common political, historical and institutional characteristics which has inspired the formation and expansion of European Union of 28 countries. Nevertheless, despite common institutional, political and economic background, the per capita income distribution and other indicators of economic development in the region are uneven. Amongst the



EU countries, as in the year 2016, Malta<sup>121</sup> is the smallest in terms of area and population but is the highest in terms of population density. Germany<sup>122</sup> is largest in terms of population, among the large countries in terms of area (France being the largest in terms of area) and among the smaller countries in terms of population density (Finland being the smallest in terms of population density). In 2016, while Luxembourg reported the highest GDP per capita at 108,600.90 USD followed by Ireland at 69,974.10 USD, Denmark at 60,670.24 USD and Sweden at 56,473.02 USD; Bulgaria reported lowest GDP per capita at 7,967.71 USD followed by Romania at 10,065.49 USD<sup>123</sup>.

Table A1 gives the per capita GDP growth for countries of the EU during 2000-2014 vis-à-vis initial per capita GDP, i.e. per capita GDP in 2000. According to the convergence hypothesis, countries with relatively higher (or lower) initial value of GDP will have lower (or higher) growth rate (Gerchekron, 1952). Among the EU nations, we observe that countries with lower initial per capita real GDP (i.e., per capita real GDP in the year 2000) like Slovakia, Estonia, Poland, Lithuania, Latvia, Romania and Bulgaria (registering per capita GDP between 4000 USD to 10500 USD in the year 2000) grew at an impressively high growth rates during 2000-2014, clocking above 65 per cent. Countries like Slovenia, Malta, Czech Republic, Croatia and Hungary which are placed in the middle-income ranks among the countries of the EU posted growth rates between 25 per cent to 40 per cent during 2000-2014. Italy, Greece and Cyprus witnessed a negative growth rates during the said period while countries like Denmark, Netherlands, France, Spain and Portugal witnessed low positive growth rates ranging between 0.1 per cent to 10 per cent. These countries are among the countries with high initial per capita GDP as in the year 2000. However, other countries that have relatively high initial per capita income, like Luxembourg, Sweden, Ireland, Germany and United Kingdom also registered relatively high growth rates between 15 per cent to 20 per cent. This observation gives an indication that there could be catch up and income convergence in the EU during the period of 2000-2014.

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<sup>121</sup> Area and Population of Malta as recorded in 2016 are 320 kilometer square and 437,418 respectively. Population density is 1366.93 per square kilometer (source: WDI Database, World Bank as downloaded on May 29, 2018).

<sup>122</sup> Area and Population of Germany as recorded in 2016 are 348,900 kilometer square and 82,487,842 respectively. Population density is 236.42 per square kilometre (source: WDI Database, World Bank as downloaded on May 29, 2018).

<sup>123</sup> As per data sourced on May 29, 2018 from WDI Database, World bank

**Table A1: EU-Per Capita GDP Growth Rates**

	<b>Initial GDP per capita (constant 2010 US\$)</b>	<b>GDP Per Capita Growth (per cent)</b>
<b>Country</b>	<b>2000</b>	<b>2000-2014</b>
<b>Austria</b>	41942.3	13.7
<b>Belgium</b>	40239.9	11.0
<b>Bulgaria</b>	4011.1	82.0
<b>Croatia</b>	10570.1	27.9
<b>Cyprus</b>	27317.8	-1.2
<b>Czech Republic</b>	14767.0	37.8
<b>Denmark</b>	55850.6	6.5
<b>Estonia</b>	10108.2	71.7
<b>Finland</b>	40450.4	11.8
<b>France</b>	38522.2	7.6
<b>Germany</b>	37998.4	18.1
<b>Greece</b>	23275.4	-3.4
<b>Hungary</b>	10439.8	34.5
<b>Ireland</b>	43386.8	19.8
<b>Italy</b>	36180.8	-7.1
<b>Latvia</b>	6924.5	99.5
<b>Lithuania</b>	6933.6	115.4
<b>Luxembourg</b>	93462.9	14.9
<b>Malta</b>	18306.7	31.5
<b>Netherlands</b>	46133.2	9.5
<b>Poland</b>	8526.3	65.3
<b>Portugal</b>	21513.5	0.1
<b>Romania</b>	4900.5	86.9
<b>Slovak Republic</b>	10296.7	74.5
<b>Slovenia</b>	18570.7	25.2
<b>Spain</b>	28335.0	4.1
<b>Sweden</b>	44693.7	19.8
<b>UK</b>	35250.9	15.2

Source: Author's calculation using WDI, World Bank Database

In addition to income convergence, it is also good to adjudge whether the countries in the EU are broadly converging in terms of other developmental parameters. For instance, poverty reduction is a key policy component of the Europe 2020 strategy. By setting a poverty target, the EU put social concerns on an equal footing with economic objectives. Table A2 gives the poverty scenario in the European for the period 2000-2014.

**Table A2: Poverty in EU, various years**

<b>Country</b>	<b>Reported Year</b>		<b>Poverty Rate (Per cent of population below poverty line)</b>	
	<b>Initial</b>	<b>Final</b>	<b>Initial</b>	<b>Final</b>
<b>Austria</b>	<b>2007</b>	<b>2014</b>	9.7	9.0
<b>Belgium</b>	<b>2004</b>	<b>2014</b>	8.6	9.1
<b>Czech Republic</b>	<b>2004</b>	<b>2014</b>	5.8	5.9
<b>Denmark</b>	<b>2011</b>	<b>2014</b>	5.8	5.5
<b>Estonia</b>	<b>2013</b>	<b>2014</b>	15.5	15.5
<b>Finland</b>	<b>2000</b>	<b>2014</b>	5.3	6.8
<b>France</b>	<b>2012</b>	<b>2014</b>	8.5	8.2
<b>Germany</b>	<b>2011</b>	<b>2014</b>	8.7	9.5
<b>Greece</b>	<b>2004</b>	<b>2014</b>	12.0	14.8
<b>Hungary</b>	<b>2007</b>	<b>2014</b>	6.6	10.1
<b>Ireland</b>	<b>2004</b>	<b>2014</b>	13.4	9.2
<b>Italy</b>	<b>2005</b>	<b>2014</b>	12.6	13.7
<b>Latvia</b>	<b>2004</b>	<b>2014</b>	14.1	16.2
<b>Lithuania</b>	<b>2004</b>	<b>2014</b>	13.8	15.7
<b>Luxembourg</b>	<b>2004</b>	<b>2014</b>	8.3	8.1
<b>Netherlands</b>	<b>2013</b>	<b>2014</b>	7.8	7.7
<b>Poland</b>	<b>2004</b>	<b>2014</b>	17.0	10.4
<b>Portugal</b>	<b>2004</b>	<b>2014</b>	13.1	13.5
<b>Slovak Republic</b>	<b>2004</b>	<b>2014</b>	8.2	8.7
<b>Slovenia</b>	<b>2004</b>	<b>2014</b>	7.9	9.4
<b>Spain</b>	<b>2007</b>	<b>2014</b>	14.2	15.3
<b>Sweden</b>	<b>2013</b>	<b>2014</b>	8.6	9.0
<b>UK</b>	<b>2002</b>	<b>2014</b>	12.6	10.5

Source: OECD Database. Note: Data for Bulgaria, Croatia, Cyprus, Malta and Romania is not available

It is quite clear that there has been a substantial increase in poverty across the EU, owing to the 2008-09 crisis and due some extent to Greece crisis of 2013. Indeed, the intensity of the Greece crisis of 2013 is reflected in higher level of poverty in Greece in the year 2014 and substantial increase in poverty level from 12.0 per cent in 2004 to 14.8 per cent in 2014. Finland, Greece, Hungary, Italy, Latvia, Lithuania, Slovenia and Spain – experienced the most substantial increases in poverty ranging from one to four per cent points. Belgium, Germany, Portugal, Slovak Republic and Sweden also witnessed marginal increase in their poverty ratio. It is interesting to note that Poland, one of the poorest countries saw the largest decrease in poverty during this period

followed by Ireland and United Kingdom. In Austria, Denmark, France, Luxembourg and Netherlands there were modest reductions in poverty. One reason for the disparity in poverty rates across the EU could be the uneven impact of the economic crisis. Differences could be further due to the effectiveness of the Member States' existing social policies and the extent of countries' efforts to adapt to contemporary challenges and crises.

In order to assess within country inequality scenario in the EU, we present various measures of inequality in Table A3 below. From the table, we can see that the income inequality as measured by Gini coefficient, rose in more than half of the countries in the region in 2012. There has been a substantial rise in Gini coefficient in Bulgaria, Croatia, Cyprus, Denmark, France, Greece, Hungary, Lithuania, Luxembourg and Spain in 2012; and a marginal rise in Austria, Italy, Latvia and Sweden in the same year. The Gini measure of inequality fell for rest of the European countries in the recent years, with greatest fall witnessed in United Kingdom, Slovenia and Belgium. The Gini coefficient in the region in the recent years has been between 25.59 in Slovenia to 36.68 in Greece signifying an unequal distribution in the region.

**Table A3: Inequality Measures for EU for various years**

Country	Reported Year		Gini		Income share held by highest 20%		Income share held by lowest 20%		Income share held by second 20%	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
<b>Austria</b>	<b>2004</b>	<b>2012</b>	29.87	30.48	38.55	38.41	8.49	7.78	13.25	13.29
<b>Belgium</b>	<b>2004</b>	<b>2012</b>	30.63	27.59	39.19	36.41	8.37	8.62	13.4	14.16
<b>Bulgaria</b>	<b>2001</b>	<b>2012</b>	32.68	36.01	40.06	42.7	7.06	6.16	12.81	12.2
<b>Croatia</b>	<b>2000</b>	<b>2012</b>	31.33	32.51	39.93	39.46	8.3	6.87	12.67	12.72
<b>Cyprus</b>	<b>2004</b>	<b>2012</b>	30.09	34.31	38.96	42.74	8.78	7.99	12.98	12.11
<b>Czech Republic</b>	<b>2004</b>	<b>2012</b>	27.53	26.13	37.01	36.12	9.04	9.55	14.28	14.52
<b>Denmark</b>	<b>2004</b>	<b>2012</b>	25.89	29.08	35.2	37.75	9.24	8.48	14.62	14.03
<b>Estonia</b>	<b>2000</b>	<b>2012</b>	35.78	33.15	43.14	40.83	6.93	7.17	11.66	12.86
<b>Finland</b>	<b>2004</b>	<b>2012</b>	27.92	27.12	37.42	36.68	9.4	9.43	13.8	13.97
<b>France</b>	<b>2004</b>	<b>2012</b>	30.8	33.1	39.29	41.23	8.34	7.8	12.92	12.62
<b>Germany</b>	<b>2006</b>	<b>2011</b>	32.78	30.13	40.39	38.64	7.39	8.37	12.85	13.12
<b>Greece</b>	<b>2004</b>	<b>2012</b>	33.97	36.68	40.89	42.31	6.8	5.55	12.28	11.67
<b>Hungary</b>	<b>2000</b>	<b>2012</b>	27.22	30.55	36.93	38.58	9.55	7.8	13.89	13.35
<b>Ireland</b>	<b>2004</b>	<b>2012</b>	33.72	32.52	41.39	40.57	7.49	7.73	12.38	12.65
<b>Italy</b>	<b>2004</b>	<b>2012</b>	34.53	35.16	41.39	41.68	6.7	6.23	12.31	12.28
<b>Latvia</b>	<b>2002</b>	<b>2012</b>	35.09	35.48	42.54	42.39	7.13	6.34	11.96	12.19
<b>Lithuania</b>	<b>2000</b>	<b>2012</b>	31.67	35.15	39.72	42.02	7.85	6.51	12.7	12.24
<b>Luxembourg</b>	<b>2004</b>	<b>2012</b>	30.25	34.79	38.75	41.86	8.25	7.06	13.16	11.81
<b>Netherlands</b>	<b>2004</b>	<b>2012</b>	30.74	27.99	38.62	37.07	7.75	8.87	13.43	13.93
<b>Poland</b>	<b>2000</b>	<b>2014</b>	32.97	32.08	41.05	40.2	7.87	7.99	12.31	12.47
<b>Portugal</b>	<b>2004</b>	<b>2012</b>	38.9	36.04	46.26	43.17	6.41	6.45	11.16	12.12
<b>Romania</b>	<b>2000</b>	<b>2013</b>	29.32	27.45	37.93	36.36	8.54	8.88	13.33	13.71
<b>Slovak Republic</b>	<b>2004</b>	<b>2012</b>	28.94	26.12	38.3	34.86	9.13	8.62	13.51	14.64
<b>Slovenia</b>	<b>2002</b>	<b>2012</b>	29.12	25.59	37.86	35.23	8.65	9.43	13.35	14.58
<b>Spain</b>	<b>2004</b>	<b>2012</b>	33.38	35.89	40.36	41.83	6.85	5.76	12.48	11.94
<b>Sweden</b>	<b>2004</b>	<b>2012</b>	26.43	27.32	35.62	36.23	9.13	8.7	14.32	14.3
<b>UK</b>	<b>2004</b>	<b>2012</b>	36.22	32.57	43.10	40.07	6.58	7.51	11.75	12.29

Source: WDI, World Bank. Note: Data for Malta is not available

Similar pattern can be observed for the income share held by the top 20 per cent of the population, with Cyprus and Bulgaria recording the highest share in EU at almost 42.7 per cent of income. The income share held by the lowest 20 per cent fell in all the fourteen countries during 2000-2014 that witnessed a rise in Gini coefficient, in addition to Austria. This further underscore income polarization within these countries. Therefore, we see that while low-income countries of the EU show a tendency of catching up with high-income countries of EU; within country income

inequality is rising for most of the countries in the region. This phenomenon will be discussed in little more detail in the forthcoming chapters.

One of the important aspects of catch-up is bridging development divide which in turn entails, in addition to income convergence, improving the human development in terms of various health indicators and literacy rate. In Table A4 we present data on primary health indicators and in Table A5 we present the literacy rates across the EU nations to have a broad idea of the performance of the European countries in these indicators.

**Table A4: Health Indicators for EU**

Country	Life Expectancy at Birth (total years)		Infant Mortality Rate (per 1000 live births)		Maternal Mortality Ratio (national estimate, per 100,000 live births)	
	2000	2014	2000	2014	2000	2014
Austria	78.2	81.6	4.8	3	2.6	8.6
Belgium	77.8	81.4	4.8	3.4	5.2	2.4
Czech Republic	75.1	78.9	4.1	2.4	9.9	6.4
Denmark	76.9	80.8	5.3	4	0	8.9
Estonia	71	77.2	8.4	2.7	45.9	0
Finland	77.7	81.3	3.8	2.2	5.3	5.3
France	79.2	82.8	4.5	3.5	6.5	5.1
Germany	78.2	81.2	4.4	3.2	5.6	4.1
Greece	78.6	81.5	5.9	3.7	0	4.3
Hungary	71.9	75.9	9.2	4.5	10.2	6.6
Ireland	76.6	81.4	6.2	3.3	1.8	1.5
Italy	79.9	83.2	4.3	2.8	3	1.2
Latvia	70.3	74.3	10.3	3.8	24.8	14
Lithuania	72.1	74.7	8.6	3.9	13	9.8
Luxembourg	78	82.3	5.1	2.8	17.5	0
Netherlands	78.2	81.8	5.1	3.6	8.7	2.9
Poland	73.8	77.7	8.1	4.2	7.9	2.1
Portugal	76.9	81.2	5.5	2.9	2.5	7.3
Slovak Republic	73.4	76.9	8.6	5.8	1.8	3.6
Slovenia	76.1	81.2	4.9	1.8	22.1	4.8
Spain	79.3	83.3	4.4	2.8	3.5	2.1
Sweden	79.7	82.3	3.4	2.2	4.4	3.5
UK	77.9	81.4	5.6	3.9	6.8	6.7

Source: OECD Database. Data for Bulgaria, Croatia, Cyprus, Malta and Romania is not available

As can be deciphered from table A4, the life expectancy at birth for all the countries in the EU have improved over 2000-2014. The life expectancy at birth in EU, in 2014, is in the impressive range of 74.3 years- 83.3 years. While almost all the EU-countries have performed well in reducing infant mortality rate during 2000-2014, some countries in the EU (Austria, Denmark, Greece, Portugal and Slovak Republic) have recorded higher maternal mortality ratio in 2014 as compared to 2000. The best performance in terms of maternal mortality ratio in the region have been achieved by Estonia and Luxembourg that have been successful in reducing maternal mortality ratio to zero.

**Table A5: Literacy Rate in EU**

Country	Reported Years		Adult Total (% of people ages 15 and above)	
	Initial	Final	Initial	Final
<b>Bulgaria</b>	2001	2011	98.20	98.35
<b>Croatia</b>	2001	2011	98.15	99.13
<b>Cyprus</b>	2001	2011	96.80	98.68
<b>Estonia</b>	2000	2011	99.77	99.89
<b>Greece</b>	2001	2014	95.99	97.53
<b>Hungary</b>	2004	2014	99.03	99.05
<b>Italy</b>	2001	2011	98.42	98.85
<b>Latvia</b>	2000	2011	99.75	99.90
<b>Lithuania</b>	2001	2011	99.65	99.82
<b>Malta</b>	2005	2011	92.36	93.31
<b>Poland</b>	2004	2014	99.62	99.77
<b>Portugal</b>	2011	2011	94.48	94.48
<b>Romania</b>	2002	2011	97.30	98.60
<b>Slovenia</b>	2004	2014	99.65	99.71
<b>Spain</b>	2004	2014	97.17	98.09

Source: WDI, World Bank. Data for the remaining 13 countries of EU is not available

Literacy rates, which were already high for the EU nations, have further improved during 2000-2014 across all the countries (Table A5).

#### **A1.4.2 ASEAN**

The formation of ASEAN is ascribed to geographical proximity and regional, economic and political co-operation among its member countries. In the past thirty years, the ASEAN countries

that differ considerably in size, level of economic development and resource endowment have undergone profound transformations. Amongst the ASEAN countries, Singapore is the smallest in terms of land-area and population size but has the highest GDP per capita (GDP per capita of Singapore in 2016 was 52,600 at constant 2010 USD). In the year 2016, Indonesia is the largest country among ASEAN in terms of both land area and size of population and forms the median-income countries along with Philippines. also has among the lowest GDP per capita. CMLV countries' share of GDP per capita among the ASEAN countries in 2016 was only 1.3 per cent<sup>124</sup>.

Table A6 gives the per capita GDP growth for ASEAN countries during 2000-2014 vis-à-vis initial per capita GDP, i.e. per capita GDP in 2000. Considering the ASEAN countries, we observe that Brunei has the highest initial per capita income (at USD 35923.4 in the year 2000) and the lowest per capita growth rate at (-7.3 per cent) for the entire sample period 2000-2014. The CLMV countries with lower initial per capita real GDP - Cambodia (at 428.5 USD), Laos (at USD 672.2) Myanmar (at USD 346.8) and Vietnam (at USD 787.7), grew at higher growth rates of – 127.1 per cent, 118.8 per cent, 265.1 per cent and 102.7 per cent, respectively. Thailand and Indonesia have relatively high initial per capita income (at USD 3458.1 and USD 2143.4, respectively) and also relatively high growth rates of per capita income (61.6 per cent and 72.3 per cent, respectively). However, evidence shows that the growth rates in per capita GDP during 2000–2014 are among the lowest for countries with their initial real per capita income among the highest in the region. The growth rates in the region has been in general high and positive, except for Brunei Darussalam. This is in according with the convergence hypothesis given by (Gerchenkron, 1952), viz., countries with relatively higher (or lower) initial value of GDP will have lower (or higher) growth rate. Hence, we find preliminary indication of per capita income convergence in the ASEAN countries.

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<sup>124</sup> Based on the data sourced from WDI database, World Bank.



**Table A6: ASEAN-Per Capita GDP Growth Rates**

Country	Initial GDP per capita (constant 2010 US\$)	GDP Per Capita Growth (per cent)
	2000	2000-2014
<b>Brunei Darussalam</b>	35923.4	-7.3
<b>Cambodia</b>	428.5	127.1
<b>Indonesia</b>	2143.4	72.3
<b>Lao PDR</b>	672.2	118.8
<b>Malaysia</b>	7009.6	48.4
<b>Myanmar</b>	346.8	265.1
<b>Philippines</b>	1607.2	55.9
<b>Singapore</b>	33390.1	55.3
<b>Thailand</b>	3458.1	61.6
<b>Vietnam</b>	787.7	102.7

Source: WDI, World Bank and author's own calculation

Rapid growth among the countries in the ASEAN has also translated into reductions in poverty across the region (Table A7). Nevertheless, the level of poverty remains a relatively larger concern in Philippines, Lao PDR and Cambodia as it has been reduced to below 15 per cent in the other ASEAN countries. In all countries except Lao PDR, most of the reductions in poverty have taken place in the rural area.

**Table A7: Poverty in ASEAN, various years**

Country	Reported Year		Poverty headcount ratio at national poverty lines (% of population)		Rural poverty headcount ratio at national poverty lines (% of rural population)		Urban poverty headcount ratio at national poverty lines (% of urban population)	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final
<b>Cambodia</b>	<b>2003</b>	<b>2012</b>	50.2	17.7	54.2	20.8	28.5	6.4
<b>Indonesia</b>	<b>2002</b>	<b>2014</b>	18.2	11.3	21.1	14.2	14.5	8.3
<b>Lao PDR</b>	<b>2002</b>	<b>2012</b>	33.5	23.2	37.6	28.6	19.7	10.0
<b>Malaysia</b>	<b>2002</b>	<b>2014</b>	6.0	0.6	13.5	3.4	2.3	0.3
<b>Philippines</b>	<b>2003</b>	<b>2012</b>	24.9	25.2	-	-	12.6	13.0
<b>Thailand</b>	<b>2000</b>	<b>2014</b>	42.3	10.5	51.4	13.9	22.2	7.7
<b>Vietnam</b>	<b>2010</b>	<b>2014</b>	20.7	13.5	26.9	18.6	6.0	3.8

Source: WDI, World Bank. Note: Data for Brunei Darussalam, Myanmar and Singapore is not available

In order to assess the inequality in the ASEAN, we present various measures of inequality in Table A8 below. From table, we can see that the income inequality as measured by Gini coefficient rose substantially in Indonesia in 2013 and in Lao PDR in 2012, and marginally in Malaysia in 2009 and Vietnam in 2014. The Gini measure of inequality fell for Cambodia, Philippines and Thailand in the recent years. However, the Gini coefficient in Philippines, throughout 2000-2012, has remained above 40 per cent, a threshold level considered to signify a highly unequal distribution. The same is true for Malaysia for the period 2004-2009.

**Table A8: Inequality Measures for ASEAN for various years**

Country	Reported Year		Gini		Income share held by highest 20%		Income share held by lowest 20%		Income share held by second 20%	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Initial	Final
<b>Cambodia</b>	<b>2004</b>	<b>2012</b>	35.46	30.76	44.17	40.21	7.93	9.05	11.6	12.66
<b>Indonesia</b>	<b>2002</b>	<b>2013</b>	29.74	39.47	39.62	47.38	9.53	7.23	13.02	10.41
<b>Lao PDR</b>	<b>2002</b>	<b>2012</b>	34.66	37.89	43.32	45.86	8.09	7.25	11.87	11.13
<b>Malaysia</b>	<b>2004</b>	<b>2009</b>	46.05	46.26	51.36	51.38	4.68	4.56	8.76	8.64
<b>Philippines</b>	<b>2000</b>	<b>2012</b>	46.17	43.04	52.28	49.64	5.38	5.92	8.79	9.45
<b>Thailand</b>	<b>2000</b>	<b>2013</b>	42.83	37.85	49.74	45.12	6.16	6.93	9.60	10.79
<b>Vietnam</b>	<b>2002</b>	<b>2014</b>	37.32	37.59	45.60	44.61	7.46	6.59	11.1	11.18

Source: WDI, World Bank. Note: Data for Brunei Darussalam, Myanmar and Singapore is not available

The same pattern can be observed for the income share held by the top 20 per cent of the population, with Malaysia recording the highest share in ASEAN at almost 51.38 per cent of income. The income share held by the lowest 20 per cent fell in all the four countries, Indonesia, Laos, Malaysia and Vietnam during 2000-2014, further highlighting divergence in terms of income inequality within these countries. Again, even in the case of ASEAN, we find a corroboration of the fact that a rise in within country income inequality has occurred parallelly with a fall in across country income convergence. We will revisit this facet of convergence in the following chapters.

As highlighted earlier, catching -up in broader sense of economic development, in addition to income convergence, also includes bridging socio-economic divide by way of improving the human development and social indicators. In Table A9 we present data on social indicators in ASEAN to have a broad idea of the performance of the ASEAN countries in these indicators.

**Table A9: ASEAN: Social Indicators**

Country	Life Expectancy at Birth (total years)		Infant Mortality Rate (per 1000 live births)		Maternal Mortality Ratio (national estimate, per 100,000 live births)		Literacy Rate, Adult Total (% of people ages 15 and above)	
	2000	2014	2000	2014	2000	2014	2000	2014
<b>Brunei Darussalam</b>	75.29	78.81	7.60	8.50	31	23	92.67	96.09
<b>Cambodia</b>	58.35	68.21	80.40	26.30	437	170	73.61 (2004)	73.90 (2009)
<b>Indonesia</b>	66.25	68.89	41.10	23.60	265	133	90.38 (2004)	95.12
<b>Lao PDR</b>	58.88	66.12	83.20	52.30	546	213	69.58	72.70 (2005)
<b>Malaysia</b>	72.87	74.72	8.70	6.20	58	41	88.69	93.12 (2010)
<b>Myanmar</b>	62.08	65.86	60.70	40.70	308	184	89.94	92.92
<b>Philippines</b>	66.68	68.27	29.90	22.80	124	117	92.60	96.40 (2013)
<b>Singapore</b>	77.95	82.50	3.10	2.20	18	10	92.65	93.70 (2013)
<b>Thailand</b>	70.63	74.42	19.10	10.90	25	21	92.65	93.70 (2013)
<b>Vietnam</b>	73.15	75.63	26.10	17.80	81	54	90.16	93.52 (2009)

Source: World Development Indicator, World Bank

As can be noted from the above table, there have been improvements in all indicators in the ASEAN countries, indicating that the development outcomes in ASEAN have been impressive during 2000-2014.

## A1.5: GDP of EU, at constant USD, 2000-2014

Table A10: GDP at Constant 2010 USD (in Billions), 2000-2014

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<b>Austria</b>	336.0	340.6	346.2	348.8	358.3	365.9	378.2	391.9	397.9	382.8	390.2	401.2	404.2	404.7	407.3
<b>Belgium</b>	412.5	415.9	423.3	426.5	442.0	451.3	462.6	478.3	481.9	470.9	483.5	492.2	492.9	492.6	500.7
<b>Bulgaria</b>	32.8	34.2	36.2	38.1	40.6	43.5	46.4	50.0	52.8	50.6	50.6	51.6	51.6	52.0	52.7
<b>Croatia</b>	46.8	48.4	50.9	53.8	56.0	58.3	61.1	64.2	65.5	60.7	59.7	59.5	58.2	57.6	57.3
<b>Cyprus</b>	19.0	19.6	20.3	20.8	21.8	22.6	23.6	24.7	25.7	25.2	25.6	25.6	24.8	23.4	23.0
<b>Czechia</b>	151.4	156.1	158.6	164.3	172.5	183.6	196.2	207.1	212.7	202.4	207.0	211.2	209.5	208.5	214.1
<b>Denmark</b>	298.2	300.7	302.1	303.3	311.3	318.6	331.1	334.1	332.4	316.1	322.0	326.3	327.0	330.1	335.6
<b>Estonia</b>	14.1	15.0	15.9	17.1	18.2	19.9	21.9	23.6	22.4	19.1	19.5	21.0	21.9	22.2	22.8
<b>Finland</b>	209.4	214.8	218.4	222.7	231.5	237.9	247.6	260.4	262.3	240.6	247.8	254.2	250.5	248.6	247.1
<b>France</b>	2346.5	2392.3	2419.1	2438.9	2506.9	2547.2	2607.7	2669.3	2674.5	2595.8	2646.8	2701.9	2706.8	2722.4	2748.2
<b>Germany</b>	3123.9	3176.9	3176.9	3154.3	3191.2	3213.8	3332.7	3441.4	3478.6	3283.1	3417.1	3542.2	3559.6	3577.0	3634.1
<b>Greece</b>	251.5	261.9	272.2	287.9	302.5	304.3	321.5	332.1	330.9	316.7	299.4	272.0	252.2	244.0	244.9
<b>Hungary</b>	106.6	110.6	115.6	120.0	126.0	131.6	136.6	137.2	138.5	129.4	130.3	132.5	130.4	133.2	138.5
<b>Ireland</b>	165.1	175.1	184.9	191.6	204.5	216.3	229.0	237.7	227.3	216.9	221.3	221.3	218.8	221.2	239.9
<b>Italy</b>	2060.2	2096.7	2101.9	2105.1	2138.4	2158.7	2202.0	2234.5	2211.0	2089.8	2125.1	2137.3	2077.1	2041.2	2043.5
<b>Latvia</b>	16.4	17.5	18.7	20.3	22.0	24.3	27.2	29.9	28.8	24.7	23.8	25.3	26.3	27.0	27.5
<b>Lithuania</b>	24.3	25.8	27.6	30.5	32.5	35.0	37.6	41.8	42.9	36.5	37.1	39.4	40.9	42.3	43.8
<b>Luxembourg</b>	40.8	41.8	43.4	44.1	45.7	47.2	49.6	53.7	53.1	50.7	53.2	54.6	54.4	56.5	59.7
<b>Malta</b>	7.1	7.2	7.4	7.6	7.6	7.9	8.1	8.4	8.7	8.4	8.7	8.9	9.1	9.5	10.3
<b>Netherlands</b>	734.7	750.3	751.1	753.2	768.5	785.1	812.7	842.8	857.1	824.8	836.4	850.3	841.3	839.7	851.6
<b>Poland</b>	326.2	330.3	337.0	349.0	366.9	379.8	403.2	431.6	449.9	462.6	479.3	503.4	511.5	518.6	535.6
<b>Portugal</b>	221.4	225.7	227.4	225.3	229.4	231.1	234.7	240.6	241.0	233.9	238.3	233.9	224.5	222.0	224.0
<b>Romania</b>	110.0	116.1	122.2	128.9	139.7	145.5	157.2	168.0	182.2	169.4	168.0	169.8	170.9	176.9	182.3
<b>Slovakia</b>	55.5	57.3	59.9	63.2	66.5	71.0	77.0	85.3	90.1	85.2	89.5	92.0	93.5	94.9	97.4
<b>Slovenia</b>	36.9	38.0	39.5	40.6	42.4	44.1	46.6	49.8	51.4	47.4	48.0	48.3	47.0	46.5	48.0
<b>Spain</b>	1149.5	1195.5	1229.9	1269.1	1309.3	1358.1	1414.7	1468.1	1484.4	1431.4	1431.6	1417.3	1375.7	1352.3	1370.9
<b>Sweden</b>	396.5	402.7	411.1	420.9	439.1	451.4	472.6	488.7	486.0	460.8	488.4	501.4	500.0	506.2	519.3
<b>U.K.</b>	2076.0	2132.6	2183.7	2259.4	2316.5	2385.4	2445.1	2507.6	2491.9	2384.0	2429.7	2466.3	2498.7	2546.5	2624.7
<b>EU28</b>	14769	15100	15301	15506	15908	16240	16785	17303	17382	16620	16978	17261	17179	17217	17505

Source: WDI, World Bank Database

## A1.6: GDP Per Capita of EU, at constant USD, 2000-2014

Table A11: GDP per capita at Constant 2010 USD (in Thousands), 2000-2014

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<b>Austria</b>	41.9	42.3	42.8	43.0	43.8	44.5	45.7	47.2	47.8	45.9	46.7	47.8	47.9	47.7	47.7
<b>Belgium</b>	40.2	40.4	41.0	41.1	42.4	43.1	43.9	45.0	45.0	43.6	44.4	44.6	44.3	44.1	44.7
<b>Bulgaria</b>	4.0	4.3	4.6	4.9	5.3	5.7	6.1	6.6	7.0	6.8	6.8	7.0	7.1	7.2	7.3
<b>Croatia</b>	10.6	10.9	11.5	12.1	12.6	13.1	13.8	14.5	14.8	13.7	13.5	13.9	13.6	13.5	13.5
<b>Cyprus</b>	27.3	28.0	28.6	29.0	29.9	30.6	31.4	32.2	32.7	31.2	30.8	30.1	28.7	27.1	27.0
<b>Czechia</b>	14.8	15.3	15.6	16.1	16.9	18.0	19.2	20.1	20.5	19.4	19.8	20.1	19.9	19.8	20.3
<b>Denmark</b>	55.9	56.1	56.2	56.3	57.6	58.8	60.9	61.2	60.5	57.2	58.0	58.6	58.5	58.8	59.5
<b>Estonia</b>	10.1	10.8	11.5	12.5	13.3	14.7	16.3	17.6	16.7	14.3	14.6	15.8	16.5	16.8	17.4
<b>Finland</b>	40.5	41.4	42.0	42.7	44.3	45.4	47.0	49.2	49.4	45.1	46.2	47.2	46.3	45.7	45.2
<b>France</b>	38.5	39.0	39.1	39.2	40.0	40.3	41.0	41.7	41.5	40.1	40.7	41.3	41.2	41.2	41.4
<b>Germany</b>	38.0	38.6	38.5	38.2	38.7	39.0	40.5	41.8	42.4	40.1	41.8	44.1	44.3	44.4	44.9
<b>Greece</b>	23.3	24.1	25.0	26.3	27.6	27.7	29.2	30.1	29.9	28.5	26.9	24.5	22.8	22.3	22.5
<b>Hungary</b>	10.4	10.9	11.4	11.8	12.5	13.0	13.6	13.6	13.8	12.9	13.0	13.3	13.1	13.5	14.0
<b>Ireland</b>	43.4	45.3	47.0	48.0	50.2	52.0	53.6	54.0	50.6	47.8	48.5	48.3	47.7	48.1	52.0
<b>Italy</b>	36.2	36.8	36.8	36.7	37.1	37.2	37.9	38.2	37.6	35.4	35.8	36.0	34.9	33.9	33.6
<b>Latvia</b>	6.9	7.5	8.1	8.9	9.7	10.9	12.3	13.6	13.2	11.5	11.3	12.3	12.9	13.4	13.8
<b>Lithuania</b>	6.9	7.4	8.0	8.9	9.6	10.5	11.5	12.9	13.4	11.5	12.0	13.0	13.7	14.3	14.9
<b>Luxembourg</b>	93.5	94.7	97.3	97.7	99.8	101.4	104.9	112.0	108.6	101.9	105.0	105.3	102.4	104.1	107.4
<b>Malta</b>	18.3	18.3	18.7	19.0	19.0	19.6	19.9	20.6	21.1	20.5	21.1	21.3	21.7	22.4	24.1
<b>Netherlands</b>	46.1	46.8	46.5	46.4	47.2	48.1	49.7	51.4	52.1	49.9	50.3	50.9	50.2	50.0	50.5
<b>Poland</b>	8.5	8.6	8.8	9.1	9.6	10.0	10.6	11.3	11.8	12.1	12.6	13.2	13.4	13.6	14.1
<b>Portugal</b>	21.5	21.8	21.8	21.5	21.9	22.0	22.3	22.8	22.8	22.1	22.5	22.2	21.4	21.2	21.5
<b>Romania</b>	4.9	5.2	5.6	6.0	6.5	6.8	7.4	8.0	8.9	8.3	8.3	8.4	8.5	8.9	9.2
<b>Slovakia</b>	10.3	10.7	11.1	11.8	12.4	13.2	14.3	15.9	16.7	15.8	16.6	17.0	17.3	17.5	18.0
<b>Slovenia</b>	18.6	19.1	19.8	20.3	21.2	22.0	23.2	24.7	25.4	23.3	23.4	23.5	22.9	22.6	23.3
<b>Spain</b>	28.3	29.3	29.7	30.1	30.5	31.1	31.9	32.5	32.3	30.9	30.7	30.3	29.4	29.0	29.5
<b>Sweden</b>	44.7	45.3	46.1	47.0	48.8	50.0	52.0	53.4	52.7	49.6	52.1	53.1	52.5	52.7	53.6
<b>U.K.</b>	35.3	36.1	36.8	37.9	38.6	39.5	40.2	40.9	40.3	38.3	38.7	39.0	39.2	39.7	40.6
<b>EU28</b>	14769	15100	15301	15506	15908	16240	16785	17303	17382	16620	16978	17261	17179	17217	17505

Source: WDI, World Bank Database

## A1.7: GDP of ASEAN, at constant USD, 2000-2014

Table A12: GDP at Constant 2010 USD (in Billions), 2000-2014

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<b>Brunei</b>															
<b>Darussalam</b>	11.9	12.3	12.8	13.2	13.2	13.3	13.9	13.9	13.6	13.4	13.7	14.2	14.4	14.1	13.7
<b>Cambodia</b>	5.2	5.6	6.0	6.5	7.2	8.1	9.1	9.9	10.6	10.6	11.2	12.1	12.9	13.9	14.9
<b>Indonesia</b>	453.4	469.9	491.1	514.6	540.4	571.2	602.6	640.9	679.4	710.9	755.1	801.7	850.1	897.3	942.2
<b>Lao PDR</b>	3.6	3.8	4.1	4.3	4.5	4.9	5.3	5.7	6.1	6.6	7.1	7.7	8.3	8.9	9.7
<b>Malaysia</b>	162.5	163.4	172.2	182.1	194.5	204.9	216.3	236.7	244.6	238.4	255.1	268.5	283.2	296.5	314.3
<b>Myanmar</b>	15.9	17.8	19.9	22.7	25.8	29.2	33.1	37.1	40.9	45.2	49.5	52.3	56.2	60.9	65.7
<b>Philippines</b>	125.3	128.9	133.7	140.3	149.7	156.9	165.1	176.1	183.3	185.5	199.6	206.9	220.7	236.3	250.8
<b>Singapore</b>	134.5	133.2	138.8	144.9	158.8	170.7	185.8	202.8	206.4	205.2	236.4	251.1	260.9	273.9	283.7
<b>Thailand</b>	217.7	225.2	239.1	256.3	272.4	283.8	297.9	314.1	319.5	317.3	341.1	343.9	368.9	378.9	382.4
<b>Vietnam</b>	61.2	64.93	69.1	73.8	79.4	85.4	91.3	97.8	103.4	108.9	115.9	123.2	129.6	136.7	144.8

Source: WDI, World Bank Database

## A1.8: GDP Per Capita of ASEAN, at constant USD, 2000-2014

Table A13: GDP Per Capita of ASEAN, at Constant 2010 USD (in Thousands), 2000-2014

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
<b>Brunei Darussalam</b>	35.9	36.2	36.83	37.2	36.8	36.3	37.4	37.0	35.9	34.8	35.3	36.1	35.9	34.6	33.3
<b>Cambodia</b>	0.4	0.5	0.48	0.5	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.9
<b>Indonesia</b>	2.1	2.2	2.26	2.3	2.4	2.5	2.6	2.8	2.9	2.9	3.1	3.3	3.4	3.6	3.7
<b>Lao PDR</b>	0.7	0.7	0.73	0.8	0.8	0.8	0.9	0.9	1.0	1.1	1.1	1.2	1.3	1.4	1.5
<b>Malaysia</b>	7.1	6.9	7.11	7.4	7.7	7.9	8.3	8.9	9.0	8.6	9.1	9.4	9.7	9.9	10.4
<b>Myanmar</b>	0.4	0.4	0.42	0.5	0.5	0.6	0.7	0.8	0.8	0.9	0.9	1.1	1.1	1.2	1.3
<b>Philippines</b>	1.6	1.6	1.64	1.7	1.8	1.8	1.9	1.9	2.1	2.1	2.1	2.2	2.3	2.4	2.5
<b>Singapore</b>	33.4	32.2	33.24	35.2	38.1	40.0	42.2	44.2	42.7	41.1	46.6	48.5	49.1	50.7	51.9
<b>Thailand</b>	3.5	3.5	3.73	3.9	4.2	4.3	4.5	4.7	4.8	4.7	5.1	5.1	5.4	5.6	5.6
<b>Vietnam</b>	0.8	0.8	0.87	0.9	0.9	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.5	1.5	1.6

Source: WDI, World Bank Database

### **A3.1: Link between Govt. Expenditure and Growth**

The debate on the role of government expenditure and growth in income (interchangeably referred as economic growth) is widespread as the relationship between growth and government expenditure is an issue that has puzzled scholars for decades. According to the prediction of Keynesian economics government expenditure should lead to economic growth. The Keynesian view argues that economic growth occurs as a result of rising public-sector expenditure<sup>125</sup> and hence could be used as an efficient policy variable to influence economic growth. Kneller et al. (1999) carried out a research on growth of government expenditure and concluded that, at the early stages of economic development, the rate of growth of public expenditure will be very high because government provides the basic infrastructural facilities and most of these projects are capital intensive, therefore, the spending of the government will increase steadily. The investment in education, health, roads, electricity, water supply are necessities that can launch the economy from the laggard stage to the higher stage of economic development, making government to spend and increasing the amount with time in order to achieve higher economic growth.

Governments can adjust their levels of spending so as to influence their economies, although the relationship between these variables can be positive or negative, depending on the countries included in the sample, the period of estimation and the variables which reflect the size of the public sector. The empirical evidence on the relation between economic growth and government expenditure has been mixed. Barro (1991) in a study of 98 developed and developing economies finds a positive but insignificant relation between public expenditure and economic growth over the 1960-1985 period. Easterly and Rebelo (1993) find a positive association between government expenditure and economic growth, in particular, transport and communication. Devarajan *et al.* (1996) find a negative relation between the capital component of government investment and economic growth for a group of developing economies. They attribute this to the misallocation of public capital expenditure by developing countries causing them to be

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<sup>125</sup> This is based on the Keynesian argument that the increase in government spending will lead to increase in purchasing power of the consumers and thereby stimulating aggregate demand in the periods where demand is low. Higher demand in turn will lead to increase in production in the economy, which in turn will result in higher economic growth.

unproductive at the margin. The studies of Hulton (1996), Pritchett (1996) and Aschauer (2000) examine the effectiveness of public capital in economic growth. Pritchett argues that public investment may not create productive capital in the developing countries due to inappropriate use. His argument is based on estimates of an implied relative effectiveness coefficient on public capital investment which is defined as the ratio of government investment that passes into public capital growth if the returns to capital on private and public capital are equal. Hulton (1996) constructs an index of government capital effectiveness by aggregating mainline telephone faults per 100 telephone calls, electricity generation losses as a percent of total output, the percentage of paved roads in good condition and diesel locomotive availability as a percent of the total. Assigning each of these indicators quartile rankings and then averaging across these rankings to obtain an aggregate infrastructure effectiveness index, he finds that infrastructure effectiveness is the single most important variable explaining growth differentials between countries. Aschauer (2000), uses the same indicators as Hulton (1996), however, normalizes each indicator rather than assigning it a quartile ranking and averages the normalized indicators to construct a public capital effectiveness index. Examining both the effects of the quantity and effectiveness of public capital on economic growth, Aschauer (2000) concludes that both these factors lead to increases in output per capita.

Cooray (2009) uses the governance indicators compiled by Kaufmann, Kraay and Mastruzzi (2006) to construct a composite governance index which is then used to identify four levels of governance – very high, high, low, very low. Ranking the governance indicators this way enabled the author in examining the differential impact of each level of governance (government quality) on economic growth. While poor governance can be regressive to sustained growth, good governance acts to improve the efficiency of the stock of public capital. Public investment can lead to enhanced growth. However, certain countries already allocate a large proportion of public resources to the provision of social services and further increases in government spending may or may not improve economic growth. Using cross sectional data for 71 countries, developed, developing and transition, over the 1996-2003 period, Cooray (2009) finds a positive relation between government expenditure, governance and economic growth.

Using panel data analysis with a dataset of 182 countries during 1950-2004, Wu et al. (2010) concluded that government spending is helpful to economic growth regardless of how we



measure the government size and economic growth. In contrast, Afonso et al. (2010) both the size and volatility of government spending and revenue have detrimental impact on growth of OECD and EU countries.

#### **A4.1: A Note on Income Inequality within the Countries of the EU and the ASEAN**

Employing Theil index of inequality, we have found that during 2000-2014, the level of income across the member states of the EU as well as across the member states of the ASEAN have been converging towards the EU average and the ASEAN average, respectively. Overall, the differences in GDP per capita have been reduced for both these regions. This result is mostly driven by the fact that initially poorer member countries, experienced higher income growth rates. Conversely, initially richer countries, both in the EU and the ASEAN, grew at a slower pace. While the collective result of these developments is per capita income convergence in the EU and the ASEAN, some interesting dynamics emerge within member countries of these two regions.

In this section, we will investigate convergence (or the absence of it) within each country of the EU and the ASEAN. For this purpose, we will explore the trend in income inequality as measured by Gini indices for our EU and ASEAN countries. While for between country comparison, earlier in this thesis, we have used Theil as the powerful measure of income inequality; for within country inequality, we are using Gini measure of inequality. This is because country-wise regional data on income and population of the countries of the EU and the ASEAN, which are the core components of Theil Index, is not easily available on the public domain. Hence, we resort to Gini measure of inequality for these countries as data on Gini is available for the period of our study.

The Gini indices for the countries under study are sourced from the SWIID, constructed by Solt (2016) using the Luxembourg Income Study<sup>126</sup> as the harmonized benchmark for comparable

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<sup>126</sup> The Luxembourg Income Study Database is the largest available income database of harmonized microdata collected from about 50 countries in Europe, North America, Latin America, Africa, Asia, and Australasia spanning five decades.

estimates. The SWIID provides two definitions of the Gini indices—based on market income and disposable income, net of taxes and transfers—on an annual basis, using a custom missing-data multiple-imputation algorithm to standardize observations collected from various sources<sup>127</sup>. We will be using Gini index of disposable income inequality from the latest version of SWIID<sup>128</sup>. We choose this database over other databases on income inequality because it provides the most comprehensive and comparable figures across 192 countries and over a longer span of time, from 1960 to 2014.

To gauge the patterns of regional convergence and divergence within each member countries of the EU and the ASEAN, we plot the Gini indices sourced from SWIID against year for each country and we present the analysis in the following subsections, viz., A4.1.1 and A4.1.2 respectively. In case of the ASEAN, Brunei Darussalam is not in the graph as we don't have data for this country.

#### **A4.1.1 Analysis of Gini Indices for the Countries in the EU**

Trend analysis of Gini indices reveals that income inequality in 19 out of 28 of the EU countries have risen significantly, i.e. close to 70 per cent of the EU countries exhibited within country income divergence. Estonia, Greece, Hungary and Italy show a similar pattern with significant polynomial (U-shaped) trend: during 2000-2014, income inequality in these countries have initially declined, increasing post-2005. The trend lines for Belgium, Ireland and United Kingdom, whose per capita incomes were higher than the average income of EU in 2000, have statistically significant negative slopes, suggesting within country income convergence in these countries. In addition, relatively poorer countries like Malta and Slovenia also show a strong converging trend during 2000-2014, as can be seen from their respective graphs below. Interestingly, during 2000-2014, Finland, Poland, Latvia<sup>129</sup> and Portugal (these countries experience higher growth rates of

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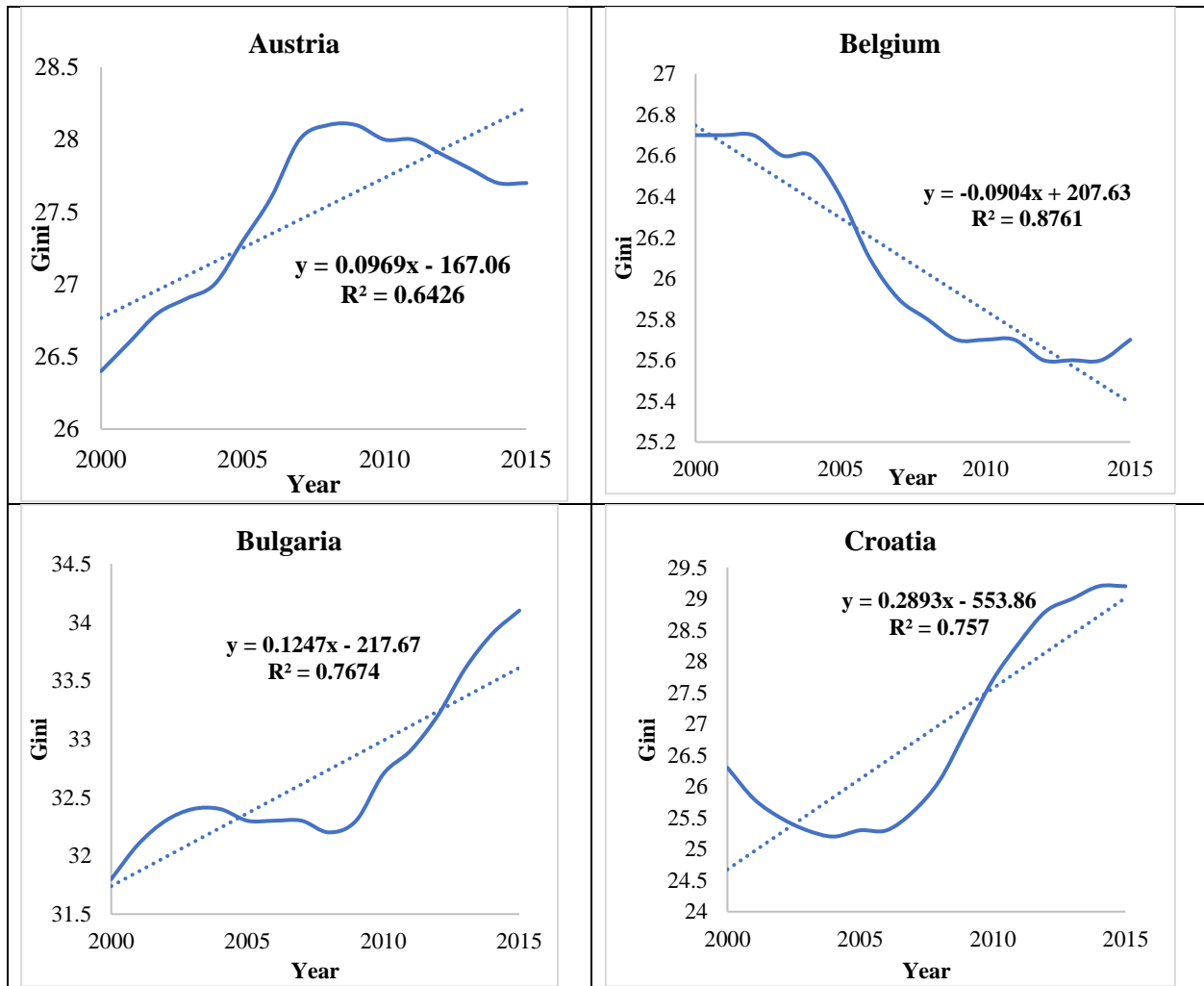
<sup>127</sup> The databases are- OECD Income Distribution Database, the Socio-Economic Database for Latin America and the Caribbean generated by CEDLAS and the World Bank, Eurostat, the World Bank's PovcalNet, the UN Economic Commission for Latin America and the Caribbean, national statistical offices around the world and academic studies.

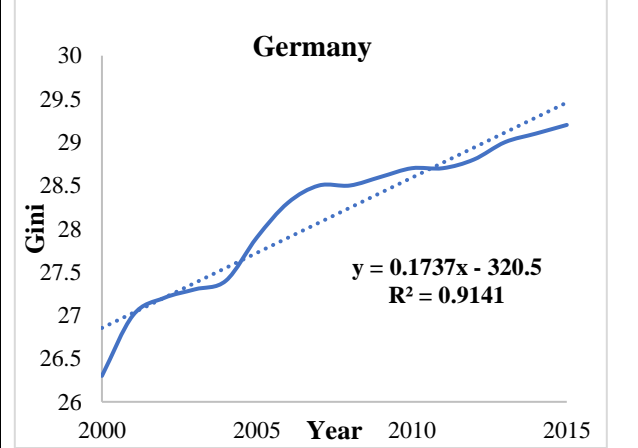
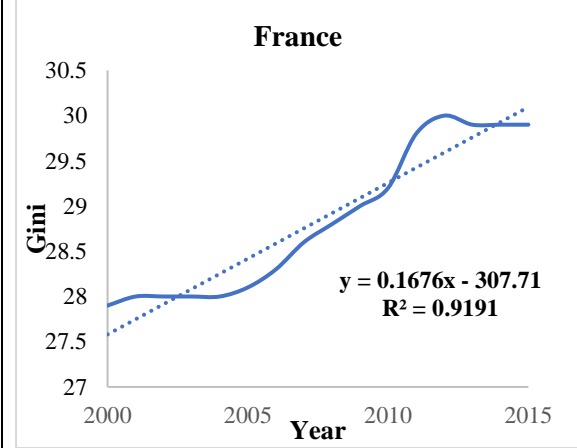
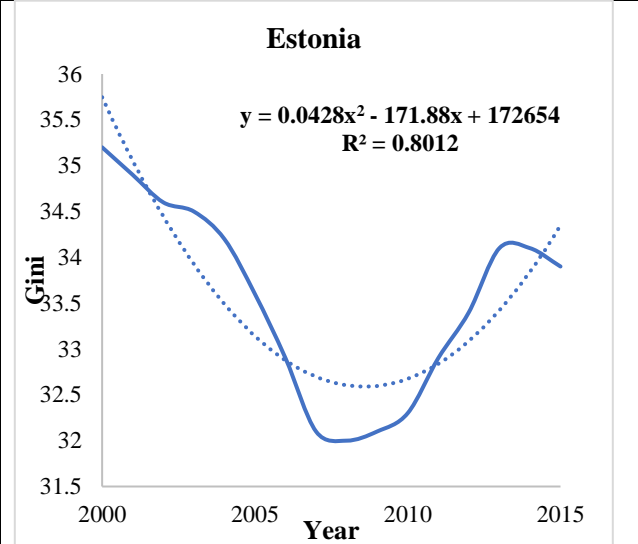
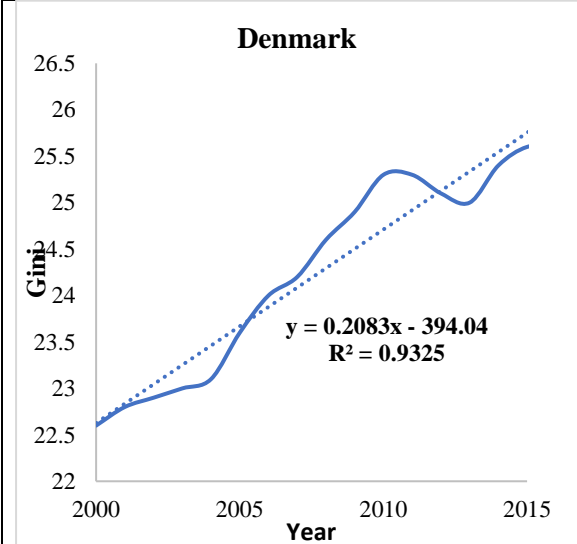
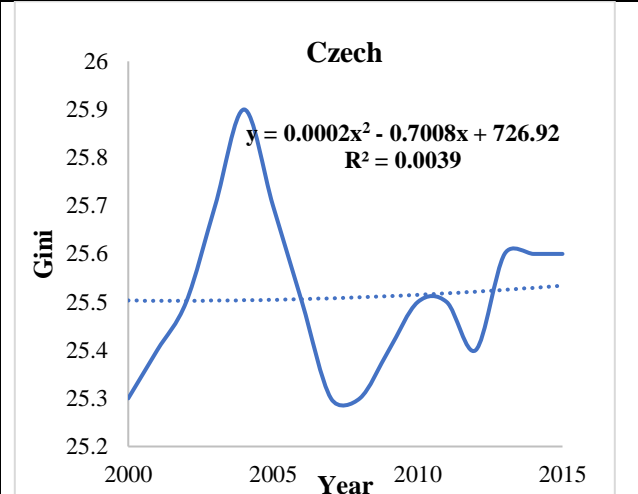
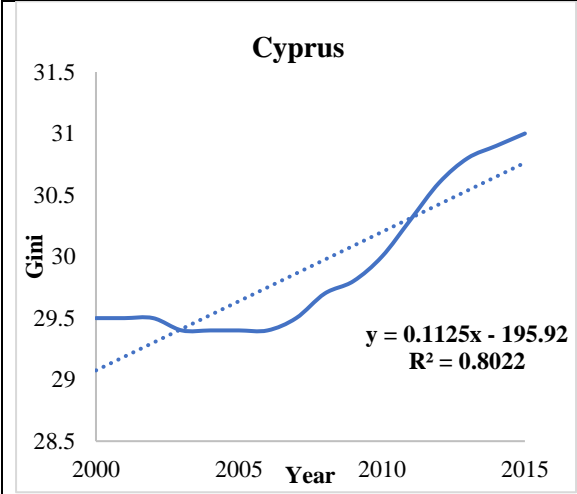
<sup>128</sup> Latest version of SWIID (6.2) is available at <https://fsolt.org/swiid/>

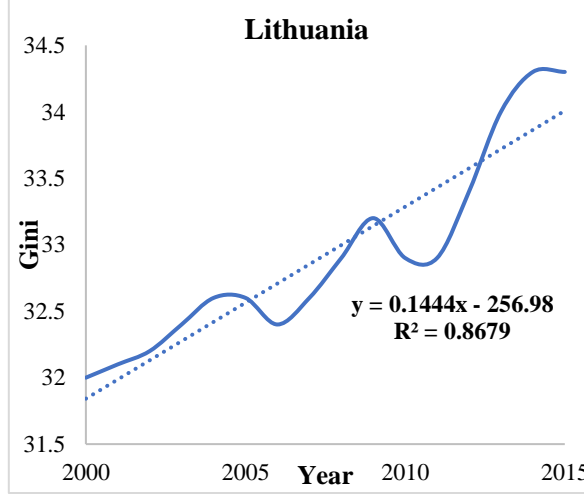
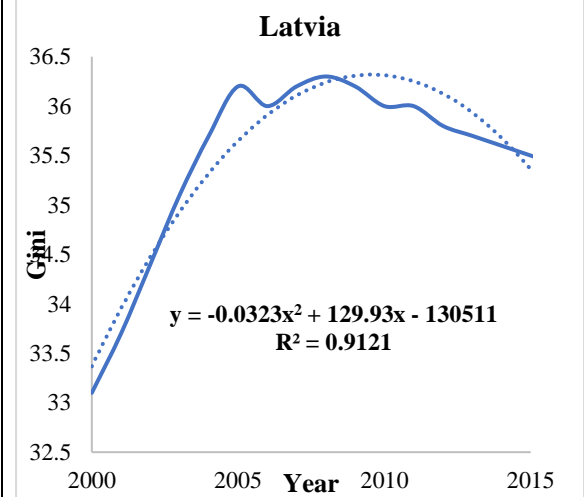
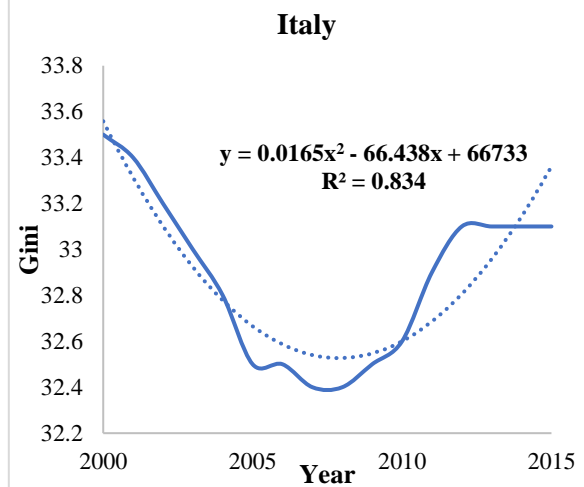
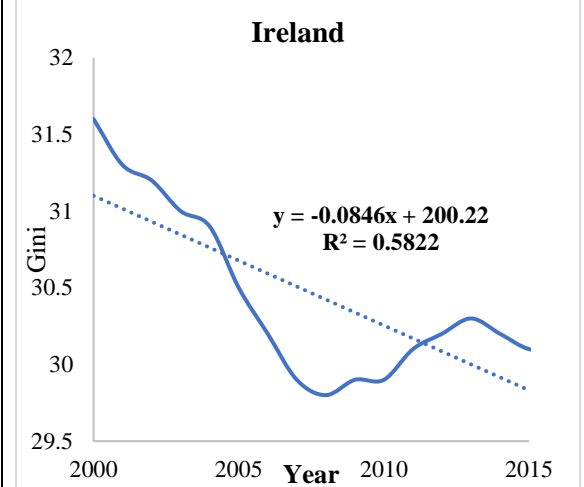
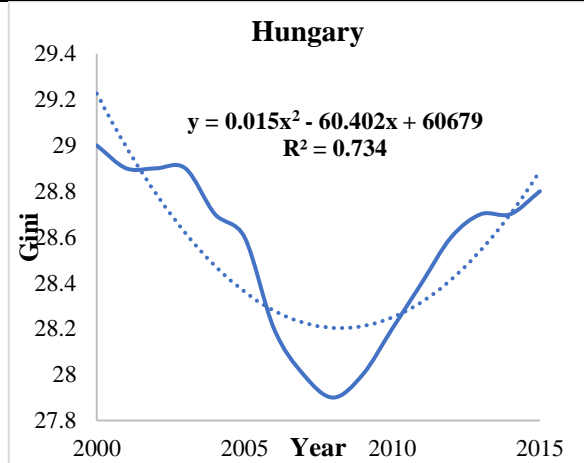
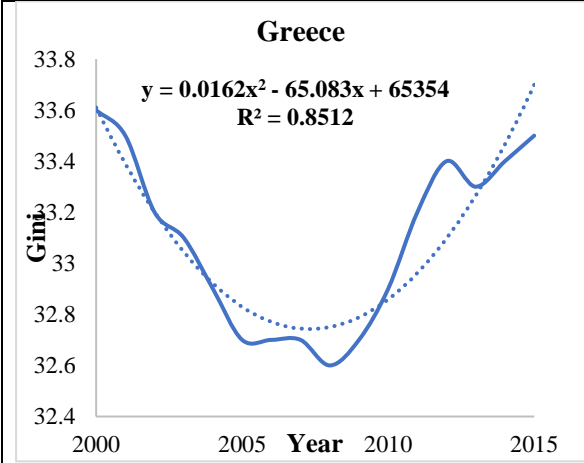
<sup>129</sup> Linear trends in Gini index for Latvia and Poland are significant at 5 per cent level of significance, whereas polynomial trend is significant at 1 per cent level of significance; hence we are drawing our conclusions according to the polynomial trends of these two countries.

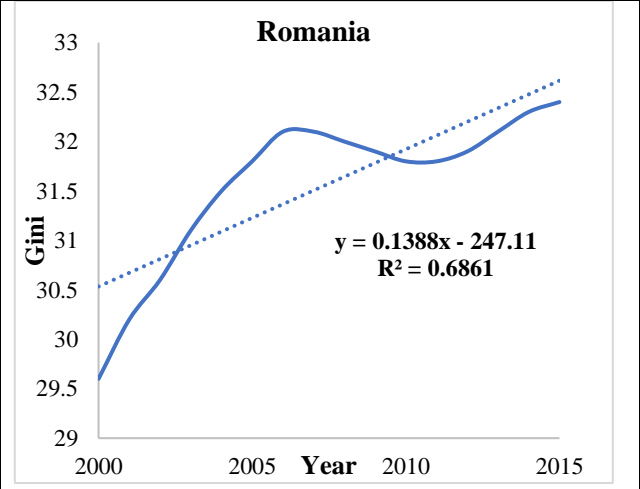
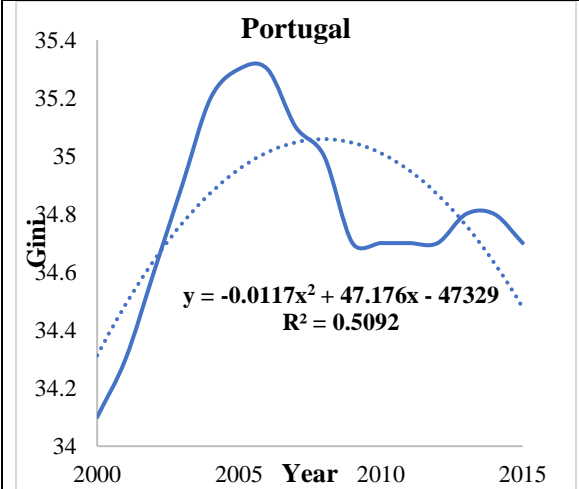
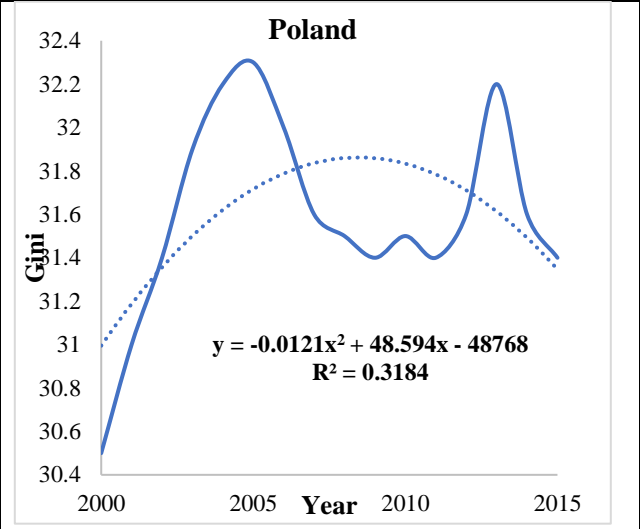
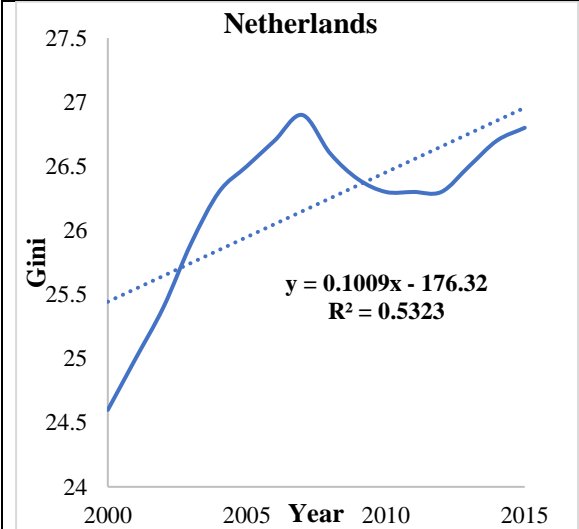
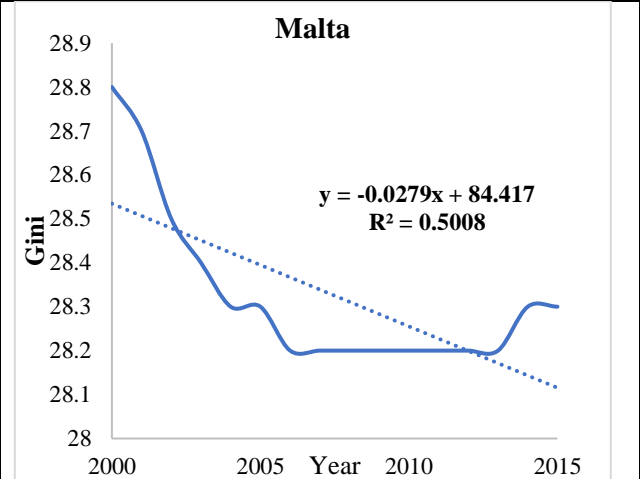
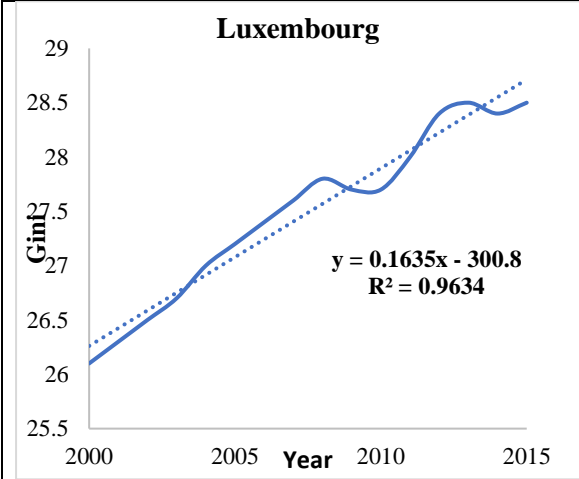
income in this period) demonstrate the classic case of Kuznets' inverted U-curve: after initial rise, income inequality in these countries declined significantly. There is no discernible trend in the Gini indices for Czech Republic. Our findings are similar to Paas et al. (2006) and Mikulić et al (2013), although their period of study is slightly dated. Decomposing the overall regional inequality measured into between- country and within-country components in EU-25, Paas et al. (2006) show that a small decline of overall income inequality is caused by the decline of between-country inequality and that the share of the within-country component in overall regional inequality is increasing. Mikulić et al (2013) found that while overall disparities in the EU have diminished, an increasing dispersion in economic development is evident among the regions of individual new member state.

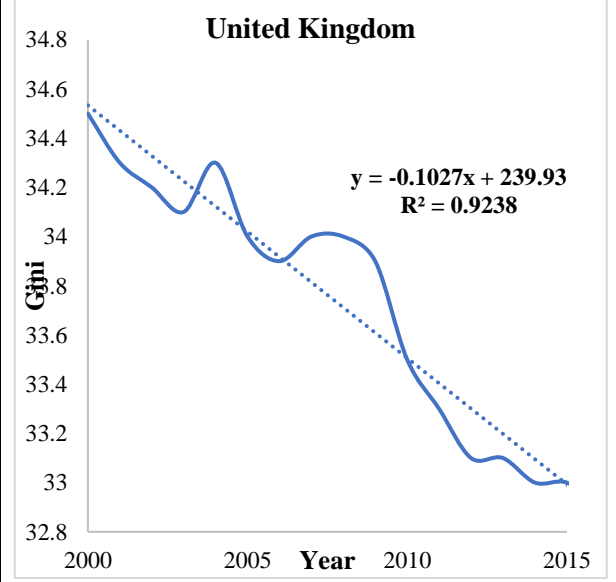
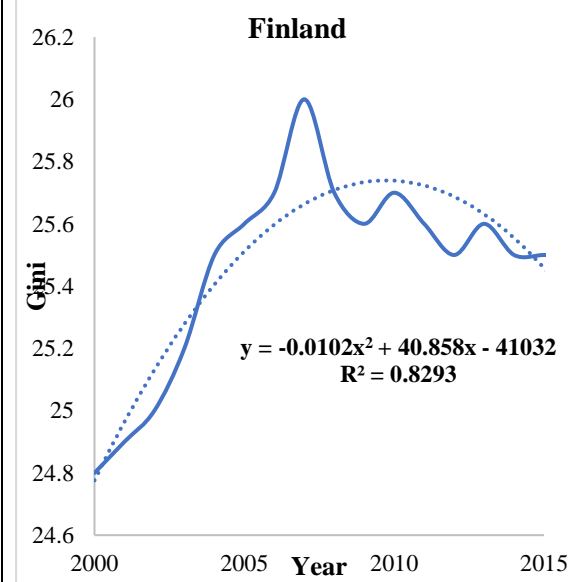
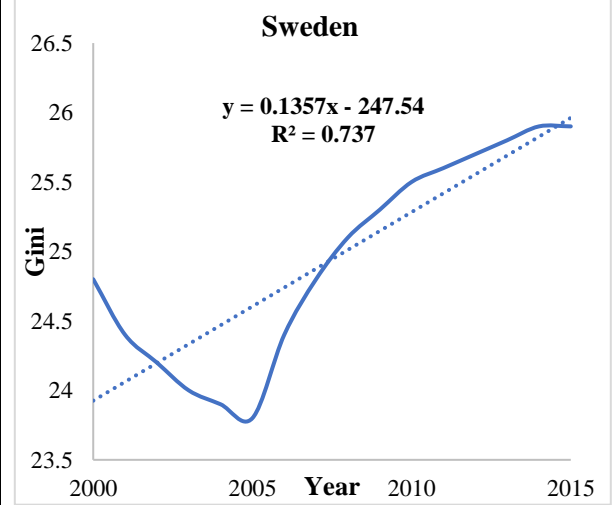
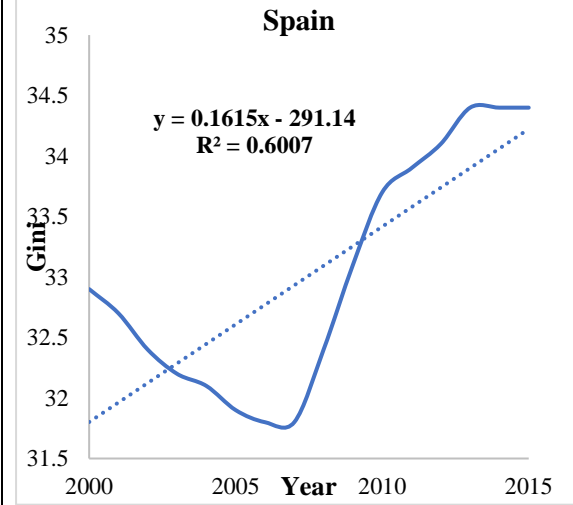
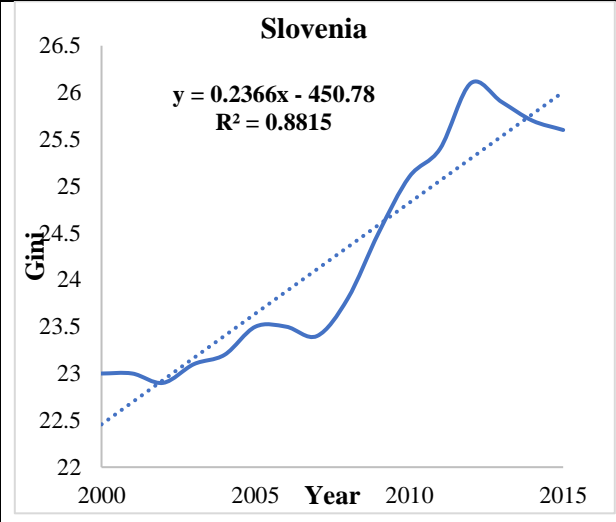
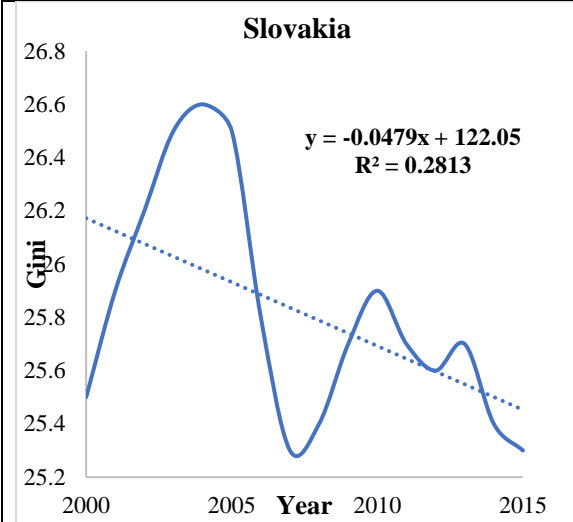
**Figure A3: Trend Analysis of Gini Indices for the EU Countries**









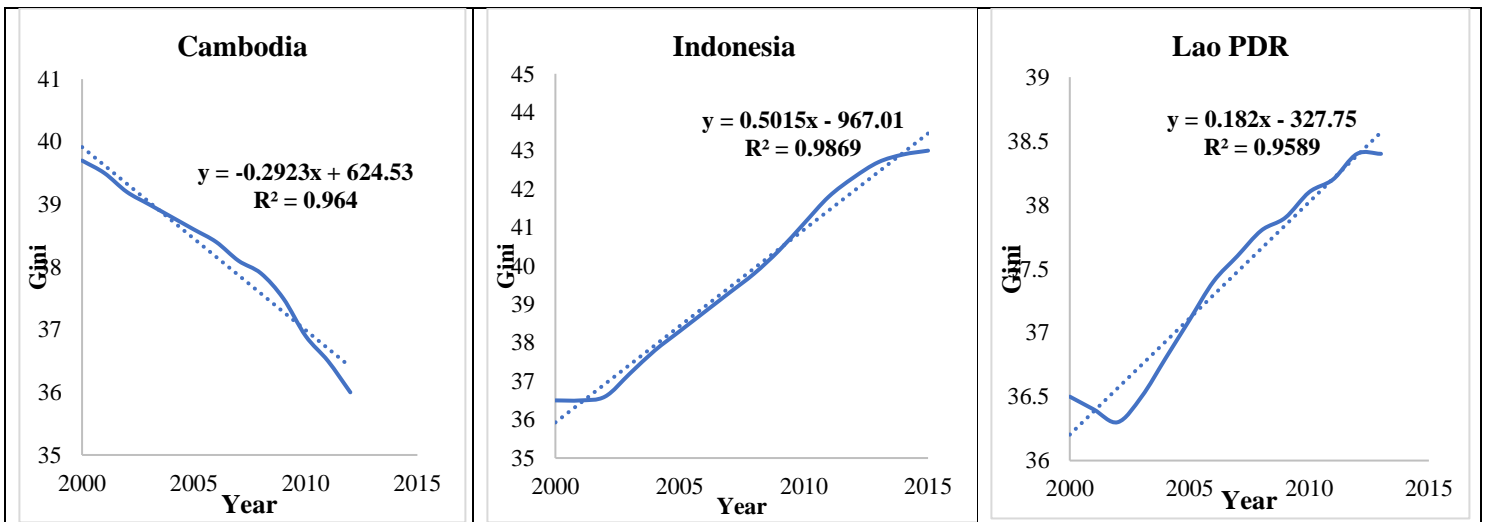


One of the reasons for the observed within country income divergence in the countries in the EU could be higher spatial concentration of skilled labour within the countries that have experienced income divergence as argued by Ghosh et al. (2010) in their study on Europe for the period 1995-2006.

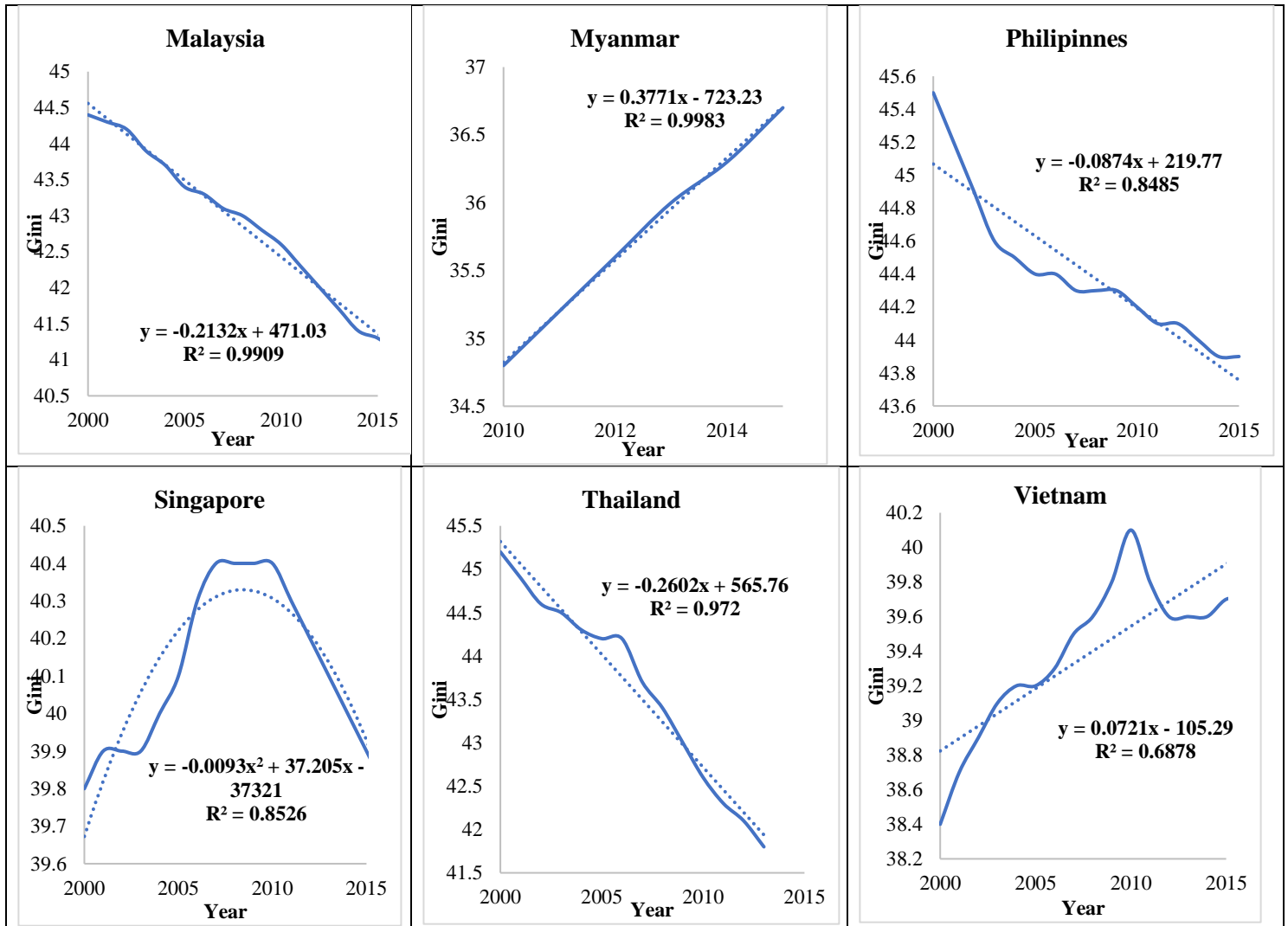
**A4.1.2 Analysis of Gini Indices for the Countries in the ASEAN**

From the graphical analysis of the Gini indices for ASEAN, it is quite evident that intra-country income differences have increased for Indonesia, Lao PDR, Myanmar and Vietnam; these countries display a significant upward trend in their Gini indices during the period 2000-2014. Relatively richer countries, viz., Malaysia, Philippines and Thailand witnessed intra-country income convergence. Also, Cambodia, which is one of the low-income CLMV countries, has also achieved significant reduction in intra-country income difference, thereby witness within country income convergence. Singapore presented the classic case of Kuznets’ inverted U curve, with inequality first rising and then falling sharply after 2010.

**Figure A4: Trend Analysis of Gini Indices for the ASEAN Countries**







Menon (2013) identified few factors that contributed to income divergence within the countries in ASEAN, namely, technological change, globalisation, and market-oriented reforms. According to Menon (2013), these forces while were primary drivers of growth, have tended to favour owners of capital over labour; high-skilled over low-skilled workers, and urban and coastal areas over rural and inland regions. Thereby, as per the finding of the author, these factors have led to within country divergence.

#### **A4.1.3 Trade and Within Country Income Convergence**

According to the theory of comparative advantage, liberalization of international trade is expected to improve economic efficiency and raises aggregate welfare in all countries. Yet conventional

trade theory also suggests that free trade may increase income inequality within countries by altering patterns of demand and wages for skilled and unskilled workers. Recent studies on within country convergence suggest that opening up to trade has contributed to widening of wage inequality between the high-skill and low-skill workers by causing a decline in the relative demand for unskilled labour (Borjas, Freeman, and Katz, 1992; Bernard and Jensen 1995; Krugman 1995; Wood 1996; Cline 1997, 2001; Kumar, 2000; Marjit et al., 2007; Agarwal et al., 2008; Mishra et al., 2008; Krishna et al., 2011; Barua et al., 2010, 2015; Yinglan et al., 2014; Chan et al., 2014; Zakaria et al., 2016; Furusawa et al., 2016; Cerdeiro et al., 2017). In addition, New Trade Theory suggests that within countries, regional comparative advantage (including external economies of scale) arises from agglomeration economies that allow certain regions to acquire and maintain cost advantages over other regions (Krugman, 1991). Also, as argued by Soukiazis et al. (1998) when a country integrates with world in trade, factor mobility which is consequence of such integration may happen in favour of prosperous regions within the country. Therefore, these lead to concentration of economic activities to these prosperous regions and higher level of industrialization in these regions further pulls back economic development in less developed regions of the country. The result being income divergence within the country.

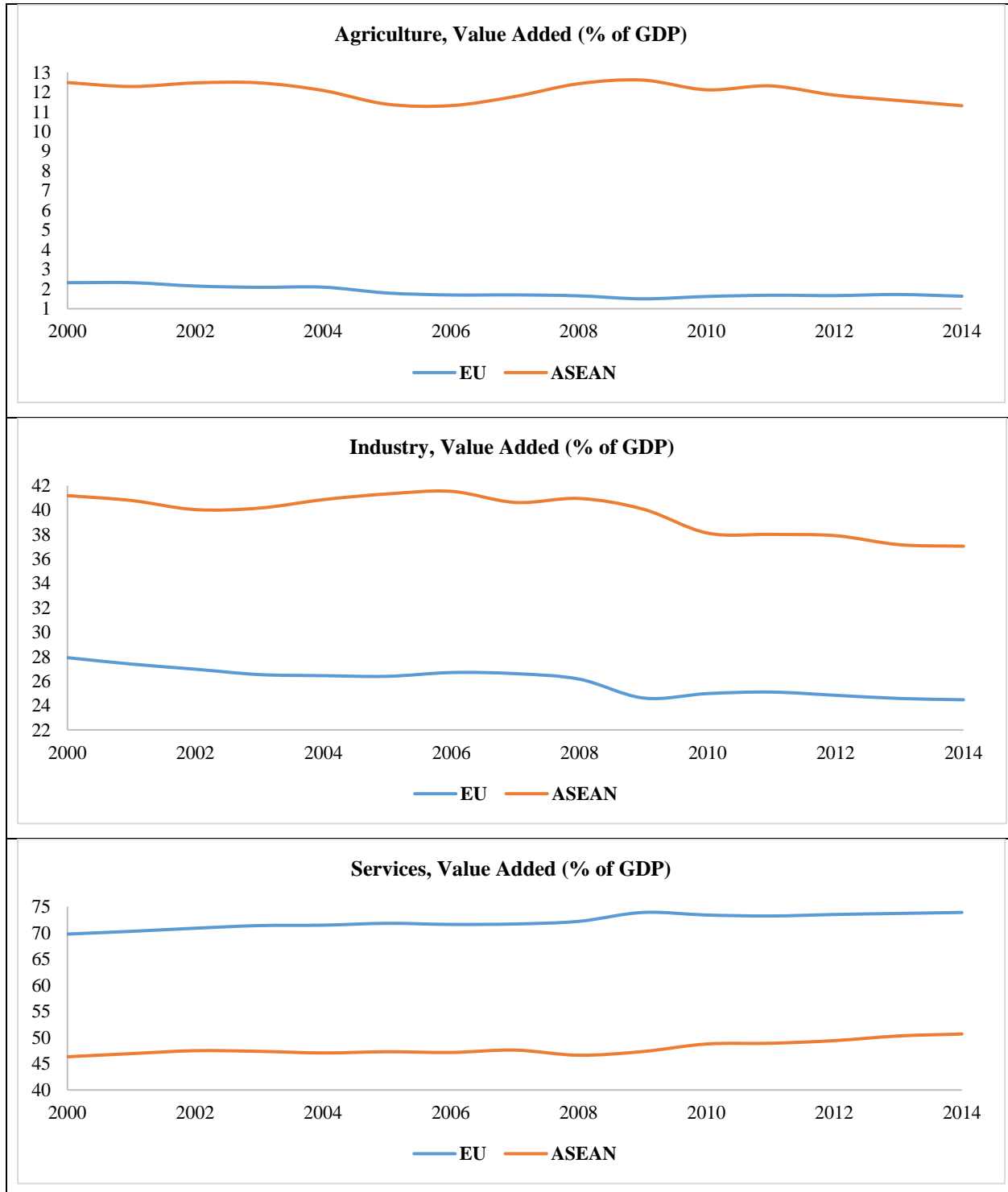
It is however difficult to empirically study the effects of trade on income convergence across the regions of a country because in working with standard trade models, entire country is largely regarded as a single market which in turn is characterized by existence of single product price and single factor price invariably everywhere within a country. In their studies on India, Barua and Pavel (2010) and Barua and Sawhney (2015) estimated exports and imports values for individual states of India to evaluate the impact of trade on income divergence within India<sup>130</sup>. In case data on population and state domestic product for individual states within each countries of the EU and the ASEAN could be accessed; this methodology could be utilized in future extension of our study to assess the impact of within income convergence or divergence in the countries of the EU and the ASEAN.

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<sup>130</sup> Refer to Barua and Chakraborty (2010) for methodology

## A4.2: Trends in Share (Value Added) of Agriculture, Industry and Services in GDP

Figure A5: Trend in the Sectoral Shares of GDP for the EU and the ASEAN countries



Source: Using data from WDI, World Bank

### A4.3: Accession Dates of EU Members

**Table A14: Accession Dates of the EU Member Countries**

Country	Accession Year
Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, UK	Prior to 2000
Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic, Slovenia, Malta	2004
Bulgaria, Romania	2007
Croatia	2013

### A4.4: FEM Estimates for the Impact of Trade on Income Convergence: EU

**Table A15: FEM Estimates for the Impact of Trade on Income Convergence in EU**

Dependent Variable: Income Theil Ratio		
	EU	
	Baseline Model	Extended Model
<b>Intra-EU Trade Theil Ratio</b>	<b>0.0865**</b> (0.0119)	<b>0.0867**</b> (0.0086)
<b>Extra-EU Trade Theil Ratio</b>	<b>1.4905**</b> (0.0935)	<b>0.2718**</b> (0.0483)
<b>Capital Mobility Index</b>	<b>0.0355*</b> (0.0136)	<b>0.0043</b> (0.0073)
<b>Labour Restrictiveness Index</b>	<b>-0.0098**</b> (0.0011)	<b>-0.0006</b> (0.0006)
<b>UNION</b>	<b>0.2081**</b> (0.0519)	<b>0.0908**</b> (0.0212)
<b>Theil Ratio of Govt. Expenditure</b>		<b>0.7250**</b> (0.0181)
<b>Constant</b>	<b>0.1721**</b> (0.0095)	<b>0.0615**</b> (0.0181)
<b>Test for overall significance of the model (H0: All Slope Coefficients are zero)</b>	F (5, 14) = 5743.53 <sup>a</sup> Prob > F = 0.00 a: Reject H <sub>0</sub>	F (6, 339) = 1153 <sup>b</sup> Prob > F = 0.00 b: Reject H <sub>0</sub>

Standard errors in parenthesis. \*\*significant at 1% level of significance. \*significant at 5% level of significance.

## **A4.5: Broad Guidelines of Capital Account Liberalization in ASEAN**

Within the context of ASEAN, the AEC Blueprint (under “Freer Flow of Capital” in Article A4) calls for the following provisions for Capital Mobility:

1. Achieve greater harmonization in capital market standards in ASEAN in the areas of offering rules for debt securities, disclosure requirements and distribution rules
2. Facilitate mutual recognition arrangement or agreement for the cross recognition of qualification and education and experience of market professionals
3. Achieve greater flexibility in language and governing law requirements for securities issuance;
4. Enhance withholding tax structure, where possible, to promote the broadening of investor base in ASEAN debt issuance
5. Facilitate market driven efforts to establish exchange and debt market linkages, including cross-border capital raising activities.

The liberalization of capital movements is to be guided by the following principles:

- Ensuring an orderly capital account liberalization consistent with member countries’ national agenda and readiness of the economy;
- Allowing adequate safeguard against potential macroeconomic instability and systemic risk that may arise from the liberalization process, including the right to adopt necessary measures to ensure macroeconomic stability
- Ensuring the benefits of liberalization to be shared by all ASEAN countries.

Following actions are also enlisted:

- Remove or relax restrictions, where appropriate and possible, to facilitate the flows of payments and transfers for current account transactions
- Remove or relax restrictions on capital flows, where appropriate and possible, to support foreign direct investment and initiatives to promote capital market development

In addition to these broad guidelines, the timeline of various measures have been put forth by three ASEAN frameworks on capital account liberalization, namely

1. The AEC Strategic Schedule, through 2015
2. The ASEAN Capital Market Forum (ACMF) Implementation Plan, through 2015
3. The Working Committee on Capital Account Liberalization (WC-CAL) Work Plan, through 2015.

A reading of these documents suggests that nothing concrete or binding has yet been agreed on. In particular, the ASEAN Strategic Schedule appears to be quite general, while the WC-CAL Work Plan is still at an early stage, with lists of specific rules said to be being prepared. The principles of harmonization and mutual recognition are advocated by the ACMF Implementation Plan as a means of promoting the regional flow of financial products. It is not clear what is envisioned for the years beyond 2015, as it is unrealistic to expect full capital account liberalization to be achieved by 2015 in all countries.

## A5.1: Results of REM Estimation for EU-28 and EU-13 Countries

Table A16: REM corrected for autocorrelation and heteroscedasticity

Dependent Variable: GRPCI		
Explanatory Variables	(A) EU	(B) EU-13
<b>lnGDPPC</b>	-3.619	-5.56
	0.71	1.07
<b>TRADE</b>	-0.001	0.00
	0.00	0.01
<b>GOVT</b>	-0.394	-0.92
	0.08	0.18
<b>FinDev</b>	3.114	-2.30
	2.17	3.58
<b>INF</b>	0.030	0.21
	0.05	0.11
<b>PolStability</b>	3.270	5.25
	0.57	1.15
<b>Constant</b>	42.042	69.43
	5.73	10.11
<b>No. of Obs.</b>	420	195
<b>Test for overall significance of the model</b>	Wald chi2(6) =124.02 <sup>a</sup>	Wald chi2(6) = 80.33 <sup>b</sup>
<b>H<sub>0</sub>: All slope coefficients are zero</b>	Prob > Chi2=0.0000	Prob > Chi2=0.000
	a=reject H <sub>0</sub>	b=reject H <sub>0</sub>

Note: Standard errors in parenthesis. \*\*significant at 1% level of significance. \*significant at 5% level of significance.

## A6.1: Fixed Effects Estimation of Structural Change Equation for EU in Closed- Economy Set-up

Table A17: Fixed Effects Estimation of Structural Change Equation for EU in Closed-Economy Set-up

	Dependent Variable		
	Share of Agriculture	Share of Industry	Share of Services
<b>lnY</b>	-65.195*** (5.310)	-20.732 (14.286)	85.927*** (15.888)
<b>(lnY)<sup>2</sup></b>	3.169*** (0.281)	0.970 (0.755)	-4.139*** (0.840)
<b>ln P</b>	-28.692*** (8.788)	-14.785 (23.644)	43.477* (26.296)
<b>(lnP)<sup>2</sup></b>	0.749** (0.288)	-0.645 (0.775)	-0.104 (0.862)
<b>Constant</b>	601.983*** (73.091)	535.513*** (196.658)	-1037.494*** (218.712)
<b>N</b>	420	420	420
<b>Test for overall significance of the model (H0: All Slope Coefficients are zero)</b>	F (4, 388) = 127.55 Prob > F=0.0000	F (4, 388) = 51.80 Prob > F=0.0000	F (4, 388) = 60.33 Prob > F=0.0000

\*\*\*Significant at 1%, \*\*Significant at 5%, \*Significant at 10%. Values in bracket represent respective standard errors.



## A6.2: Fixed Effects Estimation of Structural Change Equation for EU in Open-Economy Framework

Table A18: Fixed Effects Estimation of Structural Change Equation for EU in Open-Economy Framework

	Dependent Variable		
	Share of Agriculture	Share of Industry	Share of Services
<b>lnY</b>	-71.063*** (18.247)	-17.663 (25.769)	88.725*** (24.312)
<b>(lnY)<sup>2</sup></b>	3.419*** (0.915)	0.977 (1.364)	-4.396*** (1.267)
<b>ln P</b>	-27.424 (18.027)	-17.776 (42.748)	45.200 (52.115)
<b>(lnP)<sup>2</sup></b>	0.708 (0.590)	-0.474 (1.347)	-0.234 (1.670)
<b>lnTRADE</b>	-0.369 (0.810)	-4.503** (1.767)	4.872 (1.491)
<b>lnTRADE*PCD</b>	2.502 (1.523)	-0.352 (3.318)	-2.150 (3.780)
<b>Constant</b>	621.798** (196.577)	529.501 (346.635)	-1051.297 (416.054)
<b>N</b>	420	420	420
<b>Test for overall significance of the model</b>	F (6,27) = 6.17	F (6,27) = 9.71	F (6,27) = 12.44
<b>H<sub>0</sub>: All slope coefficients are zero</b>	Prob > F=0.00	Prob > F=0.00	Prob > F=0.00

\*\*\*Significant at 1%, \*\*Significant at 5%. Figures in parenthesis represent standard errors.

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