CHAPTER 3

EVALUATION OF GROWTH THEORIES

Introduction

In the earlier chapter, we saw the major theories and models developed over a period of time to understand the process of economic growth and development of a nation. These theories and models outlined the various factors that led to the economic growth and development of the nations. Furthermore, these variables facilitate in examining the disparities in the process of economic growth among the nations of the world. Moreover, these variables aided in analyzing disparities in the process of economic growth among nations of the world.

In today's time of economic turmoil – the US depression of 2000 and the major economic crisis in the European Union in the recent time – it becomes essential to understand as to which factor, given by the theories of economic growth and development, would get the troubled economies back on the growth track. How can the literature on economic growth assist in understanding this process successfully thereby providing fruitful results? The answer to this question, however, is complex and embraces the many economic variables.

In this chapter, I shall try to highlight some of these economic factors that allow us to understand economic growth of an economy in the light of the existing economic literature prevailing on the subject area. This would further aid in identifying research gap to be undertaken in this thesis.

Income

The evolution of growth theories over a period of time has evolved varied factors to measure the economic growth of a nation. One such important factor, which can be considered as pedestal, initially to compare the growth among countries is Income. The differences in the income per capita of the countries started to widen with the Industrial Revolution. At the same time, the number of middle income countries had dwindled and hence we had two polarized economic clubs: one rich and the other poor. Economists, therefore, use real income per capita to measure how well off people are. Maddison (2001) provided estimates of economic growth for the longest period of time. According to his data, growth was negligible from the Middle Ages to the Industrial Revolution, and it picked up in the nineteenth century. From the early part of the nineteenth century until World War I growth accelerated dramatically. World War I, the Great Depression, and the World War II slowed down the process of economic growth. World War II was followed by the Golden Age of economic growth (1950-70) – a period of rapid expansion not matched by any other historical episode. This Golden Age lasted until 1970s and with the outbreak of the oil crisis in 1973, economic growth slowed down. The growth rates on a whole have been uneven whilst the disparities in income per capita between the rich and the poor countries have increased. Sir Arthur Lewis, in his Nobel Prize acceptance speech said that "The performance of less developed countries was remarkable in absolute terms, but the gap between most developed countries and less developed countries in income per head continued to widen rapidly" (Lewis, 1980). Apparently, if we

compare the income levels of the countries in the world, it becomes straightforward in knowing the growth and developmental situations.

Growth of income in an economy is essential for achieving economical, social, political, and developmental goals. Nurkse (1952) and others have emphasized income as a factor contributing to economic growth while analyzing the relationship between income equality and growth for underdeveloped countries. Helpman (2004) described the disparities in income per capita among various countries of the world from 1992 up till 1996. He compared historical per capita income of the USA from 1870 to 1992 with other countries' per capita incomes in 1992. He measured economic growth by the rate of change of real income per capita stating that a country with a growth rate of 1 percent per annum doubles its living standard every 70 years, while a country with a growth rate of 3 percent per annum doubles its living standard every 23 years. Summarizing the growth rates of 104 countries during 1960 to 1990, he showed the growing disparities in the rate of growth among these countries. This exercise depicted higher growth rates for many countries prior to the 1973 oil crisis than after the crisis. "The simple average rate of growth of the 104 countries was 3 percent in the former period (*i.e. prior to 1973 oil crisis*); it dropped to 1.1 percent in the latter (*i.e. after the 1973 oil crisis*)" observed Helpman (Helpman, 2004 p. 5). Moreover, the coefficient of variation of the growth rates increased after the 1973 oil crisis period. However, it could be observed that the rich countries were less affected by the oil crisis compared to the poor countries. In words of Helpman "An important difference between the rich and poor countries is that even after the worldwide slowdown in economic growth that followed the oil crisis, none of

the rich countries experienced a prolonged period of declining income per capita" (Helpman, 2004 p. 5). However, the story was completely different for the poor countries as observed by Helpman – prior to oil crisis only nine counties out of 104 selected countries had negative growth rates, after the crisis the number increased to thirty two.

Helpman (2004) provided with the reasons for the disparities in the income per capita across the countries. Accumulation of physical capital, accumulation of human capital, (total factor) productivity, innovations, interdependence, (income) inequality, and institutions and politics are some of the reasons believed to create discrepancies among the income per head across various countries.

Growth economists have been rather concerned with the distribution of income across the nations. Effects of income (or the distribution of income) on economic growth has been one of the major concerns of growth theorists. Sizeable literature is available on economic growth and development of the nations which analyzes the distribution of income and the process of economic growth.

Earlier literature on income inequality and development was dominated by Kuznets hypothesis (Kuznets: 1955, 1963). Kuznets (1963) found an inverted U-shaped relationship between income inequality and GNP per head using time series and cross-country data. This view was recently supported by Chen (2003). Kuznets (1963) found that income inequality would increase during the early stages of development due to industrialization and urbanization, and decrease later as industries would already have attracted larger fraction of

rural labor force. Barro (2000) noted that income inequality appears to affect the growth rates of different countries differentially, depending upon their level of development. He showed that more income inequality reduces the growth rate of low-income countries but raises the growth rate of high-income countries. Shin (2008), in his theoretical model depending on the state of development of a nation, found a negative effect of income inequality on economic growth during the early stages of development, while a positive effect of income inequality on economic growth was found near a steady state. Voitchovsky's (2005) study suggested that inequality at the top end of the distribution positively affected growth, while the lower end of distribution was negatively affected by inequality. His suggestions were based on comparable data on disposable income from the Luxembourg Income Study for a panel of countries. Castelló-Climent (2010) found similar estimation in a dynamic panel data model which controlled for country specific effects and accounted for the persistency of inequality indicators. His investigations showed a negative effect of income inequality on economic growth in the low and middle-income economies, and positive effect of income inequality on economic growth in higher income countries.

Alesina and Rodrik (1994) by regressing the average growth rate over 1960-85 on the Gini coefficient of income, and Persson and Tabellini (1994) by regressing the average growth rate of GDP over 1960-85 on the income share, showed that for a cross section of countries the data support a negative correlation between the degree of income inequality and the subsequent growth of income per capita. Further Persson and Tabellini (1994) found negative effect of inequality on growth for nine developed countries for the

period 1830-1985, using a time series data. Perotti (1996) found a similar result for a large cross-section of countries. Aghion et.al. (1999) too showed a negative impact of inequality on growth then the capital markets were imperfect. Mo (2000) found significant negative effect of income inequality on the growth rate of GDP. In his paper, Panizza (2002), using both standard fixed effects and GMM estimates on a cross-state panel for the US, assessed the relationship between inequality and growth; wherein he found evidence in support for a negative relationship. However, he warns that the relationship between inequality and growth is not robust as small differences in the method used to measure inequality can result in large differences in the estimates. Helpman (2004) argues with limited confidence that inequality slows the growth of a nation[8]. Murphy et.al. (1989), Perotti (1993), Alesina and Perotti (1996), Acemoglu (1997), Tachibanaki (2005), Sukiassyan (2007) among others estimated a negative relationship between income inequality and economic growth. Analogously, it is believed that higher levels of income inequality are detrimental to the process of economic growth.

In sharp contrast to this, Birdsall (2007) feels that "a certain degree of (income) inequality may be necessary to permit the incentives that induce individuals to work hard, innovate, and undertake risky but productive investment projects, resulting in higher output and productivity, and therefore higher incomes and growth rates". In other words, this inequality of income by way of concentration in the hands of the few rich may encourage economic growth by increasing the marginal propensity to save (by the rich), leading to

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[8] Helpman (2004) reasons out his limited confidence as the research in this area has not been able to identify the mechanism through which this happens (Helpman, 2004; *The Mystery of Economic Growth*; p. 93).

more investment, and the undertaking of new investment projects. This inequality effect, as considered by Birdsall, is the outcome of what she calls 'constructive inequality'. Her views convince that inequality of income is conducive to the growth process of an economy. Okun (1975), Bourguignon (1990), Benabou (1996), Li and Zou (1998), Aghion and Howitt (1998), Forbes (2000) and others found a positive relationship between income inequality and economic growth. On the other hand, Strassmann (1956) believed that a low degree of income inequality in a large and prosperous economy may have no serious effect on growth. Such inequality may largely reflect the changeable conditions of supply and demand for various skills. According to him the factors which are conducive to high productivity and the use of productive investment are social homogeneity (when income inequality is not derived, directly or indirectly, from permanent differences in caste, race, ownership, and the like) and the resulting patterns of income equality. He believed that in a developed country, given a sufficiently large population, economic growth depended not only on capital formation and technological progress, but also in growing income equality which he later goes on to define as consumption equality. In his words "...when income inequality derives, directly or indirectly, from permanent differences in caste, race, ownership, and the like (social heterogeneity), and if consumption inequality is the result, then the marginal efficiency of capital in mass production industries will be lower than otherwise and the introduction of machinery will be retarded" (p. 440). The relationship between income distribution and productivity by an economy with homogeneous labor supply is illustrated by him with the help of examples that include farm workers and landlords. As the landlords import superior agricultural tools, productivity of laborers increase by which half of the labor

force is released. This released labor force is then available for employment in the mechanized mass-production industries – only if the national income increment overwhelmingly accrues to the released laborers from agriculture. In this sense, he says that if the portion of the labor force working in industries capable to intensive mechanization can be increased, then income redistribution can accelerate economic growth. Furthermore, he stated that 'the more mechanized an economy is to be, the more it must be high wage economy' (p. 430). However, he reminded that 'during the early stages of developmental process a direct redistribution of purchasing power may lead to increased per capita consumption at the expense of desirable capital formation. Even in advanced societies the channeling of workers into the production of capital goods may be intimately associated with institutional arrangements that involve an unequal distribution of income' (p. 431). Thus, under such circumstances it is not wise to increase the wages at the expense of a diminished rate of growth. And hence, he restated his theory of economic growth and income distribution in terms of 'consumption inequality or distribution of consumption'[9]. Empirically, he found an inverse correlation between income inequality (i.e. share of national income of upper and lower income groups) and per capita income in various developed and developing countries (U.S., the UK, Denmark, Italy, Ceylon, India, Puerto Rico) on the basis of the availability of the data. Further, comparing the eight countries viz. Finland, Australia, Switzerland, Canada, New Zealand, Southern Rhodesia, Chile, and Peru in which the portion of national income received by

[9] Unlike Keynes and Hobson who considered income inequality a cause of under consumption or over saving and therefore a cause of depression in the short-run and were concerned with the aggregate rate of consumption.

unincorporated enterprises varied no more than 7 percent from 28 percent and where the data for the late 1940s are available. It was found that higher the ratio of employees' compensation to profits, interest, rent, and royalties; the per capita income is likely to be higher. Thus, it is the consumption inequality that is likely to channel workers away from mass production industries into luxury handicraft industries and personal services like retainers, menial servants, etc.

In one of his seminal lecture series on economic growth, Nobel laureate, Sir Arthur Lewis (1974) discussed growth and income distribution with special reference to the less developed countries. The less developed countries are characterized by the dominance of the traditional sector and some leading sectors which are initially small compared to the traditional sector. Eventually the leading sectors grow creating both positive and negative impacts in income distribution and employment. Moreover, the process of economic growth begins only in these few leading sectors of the economy. And in the process of their expansion the (re)distribution of income takes place among the traditional and the leading sectors of the economy. Sir Lewis believes that the process of economic growth is not naturally an egalitarian process. Some sectors or regions grow more vigorously than others while causing some impoverishments in this growth process. However, he says that the distribution of income can be improved by emphasizing and improvising the growth process in agriculture and rural industries – sectors employing largest number of people in a less developed countries, wherever possible labor-intensive technique of production should be used so that more number of manpower can be employed – for the reason that in the process of growth of

the leading sectors there is growth in the population also. Furthermore, he added that enough employment opportunities should be provided to the rural people to retain them in the rural areas, thereby abstaining them from coming to the urban areas and adding to the urban unemployment rates. (Re) distribution of income can be made possible by taxing some of the product of more prosperous sector or regions or persons and using it to provide services in the form of basic infrastructural facilities for the less prosperous. Shin (2008) suggested that redistribution of income by higher income tax could reduce income inequality only near a steady state and not in the early stage of development. However, Easterly and Rebelo (1993) found positive effect of redistribution (as measured by marginal and average tax rates and different types of social spending) on economic growth rate. In a two-stage least squares growth regression, Perotti (1996), estimated a positive and significant impact of redistribution on economic growth. Aghion et.al. (1999) also found a positive effect of redistribution in economic growth. Lewis (1974) finally concludes "The problems of less developed countries cannot be solved mainly by redistributing what they have; the problems have to be solved mainly by growth. Growth and distribution are not enemies of each other". Thus, it can be said that redistribution has both direct and indirect effect on growth. On the one hand, it reduces differences in income and wealth, and hence lowers the rate of growth. While on the other, income redistribution through income tax diminishes the incentives to accumulate wealth, and hence have a negative effect.

Capital Accumulation

The classical growth theorists emphasized the role played by physical capital in the growth of a nation. However, with the passage of time growth theorists realized the efficacy that human capital had in the growth process of an economy. Here, we shall include the literature with respect to both the physical and human capital accumulations. Accumulation of physical capital and human capital has attained its important place in the formulation of growth theories. These forces have been considered as chief forces of income growth by the economists as they respond to the economic incentives. Plumper and Graff (2001) find a robust, positive and statistically significant correlation among physical capital accumulation and economic growth; and human capital accumulation and the rate of growth of a nation.

The effects of capital accumulation on growth are to the credit of Solow (1956, 1957) – the founder of neo-classical growth model. Rostow (1958, 1959) and Gerschenkron (1962) attributed rapid growth to rapid acquisition and installation of machinery and equipment. Landes (1969) explored Western Europe's economic development since 1750. He found that the role of machinery investment has been essential to economic growth. Mokyr (1990) characterizes technology embodied in equipment and machinery as "the lever of riches". Barro's (1991) regression study comprising for 98 countries from 1960-1985, finds that the estimated coefficient that measures the correlation between the growth rate of per capita real GDP and the investment share is significantly positive. De Long and Summers (1991) find that countries that invest heavily in equipment relative to other countries at the same stage of economic development exhibit rapid economic growth. According to their

analysis, in the period between 1960 and 1985, each extra percent of GDP invested in equipment is associated with an increase in GDP growth of almost one third of a percentage point per year. They concluded that there is a much stronger relationship between growth and equipment investment. Further, they found a strong negative association between equipment prices and growth suggesting that it is equipment investment that drives growth and not the other way round. In an extended version of the above paper De Long and Summers (1993), based on the data from Aitken (1991) and Lee (1992), found a strong link between investment in equipment and economic growth for developing countries. They concluded that where investment in equipment was found to be high growth was fast and vice versa. Sala-i-Martin (1997) in his analysis too agrees that physical capital investment is an important explanatory factor of economic growth. Benhabib and Spiegel (1994) too find that physical capital is a significantly positive explanatory variable to real output.

We have already discussed Solow's model in the previous chapter. However, two important features of his theory with respect to capital accumulation needs a special mention. First, the growth rate of income per capita converges to the rate of technological progress - which is assumed to be constant in his model of growth – in the long-run[10]. Secondly, growth rates vary with capital intensity i.e. the growth rate of income per capita is lower higher the capital-labor ratio[11]. Analyzing the US economy for hundred years, King and Rebelo

[10] This implies that the long-run rate of growth cannot be affected by the state of the economy or by the economic incentives. (Helpman, 2004; *The Mystery of Economic Growth*; p. 13).
[11] This has two implications: (1) the growth rate of a country declines over time when its capital intensity rises and vice versa and (2) in a cross-country comparision, countries with

(1993) concluded that the transitional dynamics driven by capital accumulation could not explain the sevenfold increase in income per capita. Unlike King and Rebelo, Barro and Sala-i-Martin (1992) found negative correlation between initial levels of output per capita and its subsequent growth – consistent with the Solow model. However, this relationship could be considered true only after controlling for variables that affect the steady states and hence was correctly termed as 'conditional convergence'. They found that income per capita converged to its long-run value at a rate of about 2 percent per annum[12]. However, the conditional convergence holds true within the group of rich countries, but not across the groups of rich and poor countries. William Baumol (1986) was one of the first economists to provide statistical evidence documenting convergence among some countries and absence of convergence among others. Barro and Sala-i-Martin (1991, 1992) show that the US states, regions of France, and prefectures in Japan all exhibit 'unconditional convergence'. Charles Jones (2002) examines for an unconditional convergence among OECD member countries during 1960 to 1997. Grier and Grier (2007) present an anomaly to the neoclassical growth models in one of their research papers. Unlike the neoclassical growth models (Barro and Sala-i-Martin, 2002; Mankiw et. al., 1992) which predicts that a country will converge to its own, possibly unique, steady state; the authors find a strong and continued income divergence in the world based on their

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higher capital intensity grow more slowly. (Helpman, 2004; *The Mystery of Economic Growth*; p. 13).

[12] The magnitude of this rate of convergence is closely related to the elasticity of output wit respect to the capital stock, which measures how readily output changes when the capital stock changes. The higher this elasticity, the faster the transition. (Helpman, 2004; *The Mystery of Economic Growth*; p. 14-15).

study of ninety countries from 1961 to 1999[13]. They confirm Pritchett's (1997) conclusion that at the country level, the world income distribution is characterized by continuing divergence over time[14]. Based on linear regression, they find no evidence of absolute or conditional convergence for all of the ninety countries in general and the sixty-eight developing nations in particular. Output in these samples was found to diverge while the neoclassical determinants of steady state were found to be converging. In their further attempts of investigation of variables that may be consistent with the finding that the rich countries converge while the others diverge; it was found that rich countries showed income convergence while developing countries diverged.

In their paper "A Contribution to the Empirics of Economic Growth", Mankiw, Romer and Weil (1992) evaluated the implications of the Solow model depicting that the cross-country variation in income per capita is a simple function of the cross country variation in the rate of saving, the rate of population growth, and the initial level of labor productivity. They concluded that the Solow model performed very well when their estimates explained about 60 percent of the cross country variation in income per capita in 1985 for 98 developed and developing countries. However, they then noted that the "fit" of the model could be improved even more by extending the model to include human capital. Using the secondary school enrollment rate in the working age population as a proxy for the fraction of income invested in

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[13] Of these ninety countries, twenty-two are rich countries while sixty-eight are developing nations.

[14] Lant Pritchett (1997) in a paper titled "Divergence, Big Time" calculates that the ratio of per capita GDP between the richest and poorest countries in the world was only 8.7 in 1870 but rose to 45.2 in 1990.

human capital, their modified estimated explained nearly 80 percent of the 1985 cross country variation in per capita income. Moreover, it should be remembered that the inclusion of human capital (accumulation) into the Solow model does not change the flavor of the model. Mankiw (1995) agreed with the conclusions drawn by Mankiw, Romer and Weil (1992) that Solow's model when estimated with the help of both physical and human capital accumulations explained the data very well. In response to the criticisms of the Solow-Swan model of economic growth; Knight, Loayza, and Villanueva (1992) extended the Mankiw, Romer and Weil's model of economic growth in two directions: 1). unlike the standard empirical study that employs a cross sectional data only, the authors employ a panel of time-series cross sectional data to determine the significance of country specific effects. It was observed, empirically, that the estimated effects of country-specific factors on economic growth resulted in a faster estimated rate of conditional convergence. This observation was based on the correlation between country specific effects and the independent variables in the growth process. Further, it was found that investment in physical capital has been less productive for developing countries with lower initial stocks of human capital and social infrastructure and higher rates of effective protection and 2) labor-augmenting technical change is assumed to be influenced by the extent of openness to international trade and the level of public infrastructure. It was observed that when openness and public infrastructure are taken into account, investment in physical and human capital became more quantitatively important in the growth process. Lucas (1988) assumed that the aggregate output depended on physical capital, aggregate human capital, and the average level of human capital of the workforce. It was assumed that if in an economy the average

level of human capital was higher, the combined effect of physical and human capitals on output would be larger. Further, he stated that the growth rate of an economy wherein individuals devote efforts to the accumulation of human capital depends on features of its technology for producing human capital. In another version of his model, Lucas considered a specialized human capital. It was assumed that human capital stock grew by the process of learning-by-doing. This part of his version stated that an economy in the long-run would grow even without technological change because learning-by-doing becomes the engine of economic growth. However, this version of human capital as a source of economic growth in Lucas' model was a sector specific study. Thus, Lucas considered human capital accumulation as a source of permanent long-run growth. But the view that growth of human capital is a permanent source of economic expansion was rejected on the grounds that an individual's lifetime was finite and that human capital per person cannot grow without bound.

Education is one another important mechanism for human capital formation. Based on this belief, Goldin and Katz (2001) found that during the twentieth century about a quarter of the US growth in income per worker was due to the rise in education. Mitch (2001) found that the spread of secondary and tertiary education had a larger impact on European economic growth in the twentieth century. Young found that the rise in years of schooling played a central role in the growth of Asian Newly Industrialized Countries (NICs).

Fiaschi and Lavezzi (2007) develop a model of non-linear economic growth considering the relation between growth and income. They identify three growth regimes based on different income levels: i) at low income levels the

relation is negative or flat; ii) at intermediate levels of income the relation is positive and iii) at high income levels the relation is again negative. Their paper tested this process of growth for 122 countries over the time period of 1950 to 1998 using absolute level of per capita gross domestic product. The paper considered a simple Solovian model with no exogenous technological progress wherein the production function exhibits increasing returns to scale within a certain range of income. It further assumed that average capital productivity does not decrease so much to generate poverty trap, and remains sufficiently high for high levels of capital to ensure positive growth in the long-run. Moreover, this particular model has no equilibria and the per capita income tends to grow indefinitely. Based on such assumptions, the authors detect non-linearities in the growth process. In particular they find support to the fact that initially the growth rates in an economy are low followed by a phase of acceleration in growth rates which eventually decelerates once a country has reached a certain level of per capita GDP. However, straightforward capital accumulation and population growth for human capital accumulation is not sufficient for sustained growth in per capita income. Therefore, the emphasis should be on accumulation of inputs of superior quality. The accumulation of capital and labor will increase long-run rate of economic growth if this capital embodies more sophisticated technology and if workers are more skilled.

Total Factor Productivity

Hence, economists use the concept of total factor productivity (TFP) to measure the joint effectiveness of all inputs combined in producing the output. Productivity is even more important than physical capital and human

capital accumulations in explaining income differences and growth rate differences across the countries (Helpman, 2004 p. 10). Changes in total factor productivity represent the joint effects of all input-augmenting technological improvements and the effect of Hicks-neutral technological change[15]. Total factor productivity is represented by the difference between the rate of growth of output and the contribution of input growth. That is, it represents the aggregate effect of the various forms of technological change. In the most general sense, all unmeasured improvements in the quality of inputs like improvements in technology, improvement in the organization of production and distribution, the reduction of distortions, and improvements in government policies will be attributable to total factor productivity growth. This total factor productivity is often termed as Solow's residual.

Solow (1957) calculated total factor productivity growth in the US for the first half of the twentieth century, finding it close to 80 percent of the rate of output growth. However, he did not account for the improvements in the quality of inputs. These improvements were incorporated by Jorgenson and Griliches (1967), Jorgenson and Yip (2001), and Young (1995). Nevertheless, it was accounted that total factor productivity has remained a major source of growth even in countries with the finest quality adjustments. Mankiw, Romer and Weil (1992) provide a satisfactory explanation for the variation of income per capita across countries by assuming a common total factor productivity growth in a simple Solovian model. Their estimates helped in explaining about 80 percent of the cross-country variation in per-capita incomes. Contrary to

[15] In addition to the input-biased productivity improvements, technological change can raise output by a factor of proportionality that is independent of the composition of inputs employed in production. This type of proportional shift is called Hicks-neutral technological change.

Mankiw, Romer, and Weil, Grossman and Helpman (1994a) observed that total factor productivity growth rates were different for different countries. Empirically testing for the relationship between total factor productivity growth and investment, they found a positive correlation between total factor productivity growth and investment-to-GDP ratio for 22 countries over 1970-1988. This explains that accumulation of capital may not be made possible in the absence of improvement in productivity as high productivity induces capital accumulation. Helpman (2004) provides for the differences in total factor productivity levels across countries by showing the 1960-1985 average productivity levels of 14 countries relative to Somalia - who had the lowest total factor productivity level. He found Hong Kong to be forty times and Canada to be thirty times more productive than Somalia. His data reveal large variations in productivity levels that exist across countries. Furthermore, he shows that the rates of total factor productivity growth too differ across countries. His calculations of the average total factor productivity growth from 1971 to 1995 for 21 rich countries depict that for countries like Finland, Ireland, Japan and Norway, the total factor productivity grew in excess of 2 percent per annum. While the total factor productivity growth in Germany and Spain was above 0.5 percent per annum. Total factor productivity in Portugal grew at just above 1 percent per annum, in the UK nearing 1.5 percent per annum and in Italy above 1.5 percent per annum. He further explores the relationship between total factor productivity and income per capita for a sample of 96 countries which is a part from Islam's (1995) sample. Helpman finds positive correlation among the two variables – average total factor productivity and income per capita. He observes that countries that had high levels of average total factor productivity in 1960-1985 periods also had

high income per capita in 1960 and 1990. In words of Helpman, "Since rich countries also have more capital per worker and their workers are both educated, it follows that their income per capita is higher for all three reasons: more physical capital, more human capital, and higher productivity" (Helpman, 2004 p. 31). There exists convincing evidence that total factor productivity plays a major role in accounting for the observed cross-country variation in income per worker and patterns of economic growth. Hall and Jones (1999) concluded that total factor productivity differences explain the ratio up to 7.7 for the disparities in income per worker in the US and Niger Klenow and Rodriguez-Clare (1997) decomposed the cross-country variation in income per worker in to fractions that can be attributed to differences in physical capital, human capital, and total factor productivity. This process found total factor productivity as a factor explaining, in major, the differences in income. Dowrick and Nguyen (1989) argue that any evaluation of relative success or failure in terms of economic growth should account for the total factor productivity catch-up. They tried to explain the income level convergence in the OECD nations with the help of total factor productivity catch-up. Income convergence for the past 35 years in the OECD countries, where it has occurred, is found to be the result from a systematic tendency for catching up in total factor productivity. As per Dowrick and Nguyen, this catch-up is not restricted to the immediate post-war years; indeed it appears to have continued to be a highly significant factor even after the oil crisis of 1973[16]. Controlling for the differences in the growth of factor inputs, regression results indicate that there has been no statistically significant

[16] This particular result contradict the conclusions which Abramovitz (1986) and Baumol and Wolff (1988) have drawn on the insignificance of income convergence since 1973.

decline in the proportional rate of total factor productivity catch-up within the OECD countries over the whole post-war period. Hence, the authors have extensively tested that levels of total factor productivity within the OECD nations have converged significantly in the post-war period. Moreover, it was found that income convergence in OECD since 1950 is critically dependent on total factor productivity catch-up. This result holds even when the authors control for potential data bias due to cyclical differences, different measures of purchasing power parity, potential errors in the backward projection of income levels, and sample selection bias. They find systematic total factor productivity catch-up throughout the post-war period in OECD countries for the combination of factors like the public goods, nature of technological progress, changing preference for quality of work and life rather than quantity of goods, and real and apparent differences in sectoral productivity growth. Total factor productivity catch-up appeared to have been operating at a very similar rate in the non-OECD industrial capitalist countries which were relatively rich in 1950.

More than half of the variation in income per capita results from differences in total factor productivity. Knowing the fact that productivity differences prevail across the countries, it becomes essential to know the reasons that lead to this productivity discrepancies across nations. In this respect, one of the factors functional in measuring the productivity discrepancies is explained next.

Technology And Research and Development

One of the explaining factors determining total factor productivity is the technological change. Much has been said about technological change both

implicitly and explicitly in the growth literature. The neo-classical economists considered technological change as essentially an imperative factor determining the economic growth of a nation. Yet, they considered technological change to be exogenous to the process of economic growth (because that was the only viable assumption at that time) while the modern growth theorists considered it to be endogenous to economic growth process. The new growth theories emphasized innovation as a source of growth. In R&D based endogenous growth models, the pace of long-run growth is solely determined by the number of researchers, respectively by the level of research expenditure. According to these models, subsidization of research leads unambiguously to a higher long-run growth rate. Grossmann (2008), in a quality ladder model, suggests that subsidizing R&D is conducive to R&D and growth without inducing the firms to raise advertisement outlays. Using post-war time series for major OECD economies, Jones (1995b) indicated that whereas the numbers of scientists and engineers engaged in R&D exhibit rapid exponential growth, aggregate total factor productivity growth rates were stationary. This finding is different from the essential prediction of R&D-based endogenous growth models, according to which the dependence of growth rates on the numbers of researchers is monotonically positive. Considering Jones findings, semi-endogenous growth models that overcame this inconsistency have been developed. In these models, long-run growth rate is affected neither by the level of research not by the degree of R&D subsidization. Moreover, the long-run growth rate here do not exhibit scale effects (i.e. does not depend upon the size of the economy). In fact, in these models, the long-run growth rate depends linearly on the population growth rate.

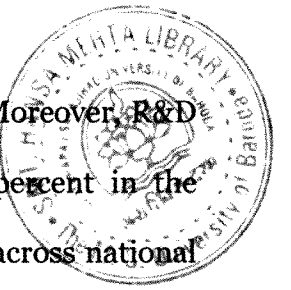
Endogenous growth theories have highlighted trade as the principal channel through which knowledge is transmitted internationally (Grossman and Helpman, 1991). A micro-level study for 17 OECD nations by Ulku (2007) too supports the view that openness increases knowledge spillovers and promotes innovation and growth. Frankema and Lindblad (2006) attributed technological progress as the main force explaining the differences in the long-run growth rates in Indonesia and Thailand during the second half of the twentieth century. The paper argues that technological progress shaped by official policies and the institutional framework of absorption sufficiently explains why outcomes have differed so substantially in Thailand and Indonesia despite apparently similar initial conditions of long-run economic growth. Using patent citation data Jaffe and Trajtenberg (2002) show that patenting is an important channel of technological diffusion together with providing a mechanism for R&D spillovers. Fagerberg (1987, 1988) found a significant positive association between patent applications in foreign countries and national gross domestic product growth. Contrarily, Jones (1995a, 1995b) raised doubts whether R&D has an effect on long-run growth. In particular he documented that growth rates in OECD countries since World War II have not exhibited any persistent upward trend in spite of a substantial rise in R&D efforts.

Romer (1990) developed a disaggregate model of business sector in order to study the evolution of productivity. His model predicted a link between resource allocation and productivity growth. According to this model, business firms invest into Research and Development (R&D) to develop a new product – which can be protected through patents – ultimately gaining a monopoly for

the new product. This imperfect market helps in gaining additional profits which can in turn be invested in further R&D process. Inadvertently, the innovators of the new product by R&D create knowledge which is available to others in the form of R&D spillovers. These R&D spillovers reduce the cost of future R&D (that is the more R&D performed in the past, the larger the stock of knowledge and the cheaper it is to do R&D today). But as more and more products are invented, competition among their suppliers cuts the profits of each of them leading to decline in profits per product. The incentive to innovate, thus, rises or declines over time depending on how fast the costs of R&D fall relative to profits. Yet, it is the technological feature that keeps the incentive to innovate constant and hence the economy experiences a constant rate of productivity growth which depends on the saving rate of that economy. Schumpeter's creative destruction was included in the model of economic growth by Aghion and Howitt in their 1992 seminal paper "A Model of Economic Growth through Creative Destruction". According to this model, growth results exclusively from technological progress. This technological progress, as per the authors, is the result of competition among research firms that generate innovations. As per this model each innovation comes up with a new intermediary good that can be used to produce the final output more efficiently than before. Monopoly rent of this new innovation can be enjoyed by patenting the innovation. However, these intermediary goods become obsolete and the monopoly rents will be destroyed with the introduction of new innovative goods. Economies with higher saving rates grow faster as they allocate endogenously more resources to R&D activities. Helpman (2004) accounts for the non-defense R&D as a percentage of GDP. The data for the G-7 countries from 1981 to 1998 represent variations across countries and time.

He points out that investment in R&D is substantially smaller than investment in physical capital. He emphasizes the importance of investment in R&D by quoting the direct and indirect effects of R&D on output – i) the rate of return on R&D is many times higher than the rate of return in investment in machines and equipment and ii) whenever R&D raises total factor productivity, the higher total factor productivity level induces capital accumulation. Jones (2002) found that between 1950 and 1993 rise in the stock of ideas produced in the US explained about 70 percent of the growth in the output per hour. The classical growth models based on innovation were criticized on the ground that they produced scale effects. Young (1998) presented a unified model without any scale effects on long-run productivity growth wherein long-run productivity growth was driven by growth in product quality. Employing non-scale endogenous growth model to sectoral analysis, Ulku (2007) empirically provides that R&D intensity promotes the rate of innovation in majority of the sectors in 17 OECD nations. Furthermore, he found a positive impact of rate of innovation on the growth rate of output in all the sectors. Nevertheless, Helpman (2004) feels that Young's model does contain some element of scale effect. Jones (1995b) and Segerstrom (1998) introduced crowding into the R&D activity and thereby eliminated the long-run effect of size on productivity growth. Grossman and Helpman (1991b) believe that international trade leading to the access of a larger market encourages investment in R&D and this boosts the growth of productivity. They termed this as the market size effect. Next they pointed at the competition effect wherein competition in the international market induces the incentive to invest in R&D. It may also induce technological leaders to forge ahead more quickly in order to avoid competition from technological

followers. They further pointed out at the effects of trade and FDI on domestic R&D and factor prices. They state that in an international market where competition is among the sellers and products worldwide, it is possible to reduce the duplication of R&D efforts thus, bringing about faster growth of R&D stocks of knowledge and lower R&D costs; finally leading to faster productivity growth. Finally they state that when R&D spillovers are international, they activate convergence forces. And when they are country specific, they activate divergence forces. The empirical results in an anomaly by Grier and Grier (2007) showed that R&D converged among the rich countries of their sample while diverged in the developing countries. The fact that more than 95 percent of the world's R&D is carried out by a handful of industrial countries has been well explained by Helpman (2004) by taking into account the ratios of domestic R&D capital to GDP in 1990 for the G-7 countries. This data showed large variations – on the one hand, the US, the UK and Germany had domestic capital stock in excess of 20 percent; Japan and France had it in excess of 15 percent; while on the other hand, Italy and Canada had domestic capital stocks in excess of only 5 percent. This reflects low levels of investment in Canada and Italy in R&D. Coe and Helpman (1995) estimated the effects of domestic as well as foreign R&D capital stocks on the productivity level of each of 22 countries. Their estimates were able to explain some 60 percent of the variation across countries in total factor productivity levels. In addition to this, they found that the elasticity of total factor productivity with respect to the domestic R&D capital stock was about three times higher in G-7 countries than in the smaller industrial countries. Computing rates of return to investment in R&D from these elasticities, they found rates of 85 percent in the small industrial countries and 120 percent in



the large industrial countries (of the sample of 22 countries). Moreover, R&D in the G-7 countries produced an additional return of 30 percent in the smaller industrial countries, thereby revealing R&D spillovers across national borders. Coe, Helpman, and Hoffmaister (1997) extended the above research to estimate the impact of foreign R&D capital stocks in total factor productivity of developing countries. For a sample of 77 countries, the study showed that foreign R&D capital stocks explained 20 percent of the variation in the total factor productivity levels of these developing countries. Keller (2001) decomposed the international R&D spillovers into three parts viz. trade, FDI and language skills. He found that close to 70 percent of the effect was due to trade, about 15 percent due to FDI, and 15 percent due to language skills. Helpman (2004) concludes that investment in innovation in the industrial countries leads to divergence of income between the rich North and the poor South.

Helpman (2004) distinguishes between growth driven by incremental (technologies) innovations and general purpose technologies (GPTs)[17]. In his words, "GPTs can trigger an uneven growth trajectory, which starts with a prolonged slowdown followed by a fast acceleration" (Helpman, 2004 p. 51). Different arguments have been laid down to explain this process. Hornstein and Krusell (1996) and Greenwood and Yorokolgu (1997) argue that the adoption of new technologies requires firms to learn how to use them, and this learning process slow down productivity growth. Helpman and Trajtenberg (1998) suggested that it takes time to develop complementary inputs that can

[17] Incremental innovations, as per Helpman, are when small improvements take the form of technological progress. While GPTs are rather drastic, have the potential for [pervasive use in a wide use of applications, triggers the development of many complementary inputs, and launch a prolong process of adjustment.

be used with new technologies, and that during the phase when resources are diverted to the development of these inputs, growth slows down. They also show that the arrival of new GPT reduces the value of firms that use the old technology. In the meantime the new technology is not very productive, because it takes time to develop its complementary inputs and organizational forms. As a result, the value of the stock market falls relative to GDP. The stock market starts to rise faster than GDP only when these GPTs become a large part of the economy. Helpman and Rangel (1999) argued that on-the-job training, which raises the productivity of the workers, can be the source of slowdown. Helpman (2004) shows, empirically, the annual average growth rate of output per hour in the US business sector from 1952 to 2001. This data depicts that output grew during the 1950s and 1960s around 3 percent, and declined during the 1970s that the growth rate of output accelerated. This data depicts the GPT driven growth in the US economy during the said period of time. Nelson and Phelps (1966) construct their models assuming Harrod-neutral technical progress and argue that education needs to be considered as an important aspect of technology driven growth process. Addition to this they believe that education is especially important to those functions requiring adaptation to change. They built their models in a dynamic world which is ever changing and progressing. By this way they contradict the earlier growth theories. In their 1966 paper they said "The earlier growth theories built the production function, the pertinent feature of which was the "marginal productivity" of education, which is a function of the inputs and the current technology, can remain positive forever even if the technology is stationary". Nevertheless, they believed that education has a positive pay-off only if the technology is always improving. Their approach viewed education as an act of

investment in people and that educated people are bearers of human capital. The models in the paper suggest that the progressiveness of the technology has implications for the optimal capital structure by showing that the rate of return to education is greater when an economy is technologically progressive. They suggest that for an economy where technology is dynamic, more human capital than physical capital should be built. And it is education that speeds the process of technological diffusion. Hence, the role of education as viewed by the authors seems to indicate another possible source of a divergence between the private and social rate of return to education. Similar to Aghion and Howit (1992), Palokangas (2005) uses Schumpeter's creative destruction to understand the growth process in multi-industry economy with capital market imperfections, wherein both innovation and imitation takes place – thereby distinguishing between the initial innovation process and the later imitation process. For this purpose, he extends the Wälde's (1999a, 1999b) growth model with risk-averting house-holds by replacing the sector of innovating firms by a large number of industries which innovate and imitate. This highly stylized model is used to explain the relationship of growth, product market competition and public policy (relating to subsidies provided to the industries by government for R&D). It is assumed that firms finance their R&D by issuing shares, and households save only in these shares. Further, he proposes that the government subsidizes R&D by discriminating between innovation and imitation, and promotes collusion or product market competition (PMC). The author finds that in a case where the government cannot discriminate between innovation and imitation, there is an "inverted U" relationship between product market competition and welfare. In such a situation, imitation induced product market competition would be growth

enhancing. However, he finds no support for the assertion that imitation-induced product market competition is growth enhancing in situation in which it is possible for the government to discriminate between innovation and imitation. Contrary to the existing literature, he provides that product market competition reduces the incentive to imitative R&D and not to innovate R&D. In such a case, he states that the households transfer their investment from imitating firms to innovative firms; firms spend longer time in the imitative stage, the proportion of innovative industries decreases and the growth rate falls. Hence, he emphasize on innovation as being the driving force to lead the process of economic growth. Yet, the process of innovation so discussed is not free from any hassle. There are hindrances in the path of innovation. One such factor causing hindrance to innovation is the availability of finance. Canepa and Stoneman (2008) accounted for such financial constraints to innovation in the United Kingdom. Their paper makes use of individual firm responses data from two surveys viz. CIS 2 (1994-96) and CIS 3 (1998-2000). Financial constraints to innovation arise only when a firm reported 'a lack of availability of finance', that is the firm could not raise the necessary funding at market rates. Based on the classification by firm size and level of technology it was found that small firms and firms with high technology levels were more likely to experience hampered projects because of lack of financial availability. This particular information was empirically tested by the authors using Ordinary Logistic Regression models separately on CIS 2 and CIS 3 data sets. Their empirical testing concluded that the financial factors do have an impact upon the innovative activity of the firms in the United Kingdom.

Hence, we can say that diffusion of knowledge is one of the ways of transmitting economic growth. In this sense, learning-by-doing is one form through with the diffusion of knowledge may take place. However, the growth rates of the countries are affected by the extent to which learning-by-doing create national or international spillovers states Grossman and Helpman (1995). In the long-run, a closed economy can grow faster if the country's size is large, there exists faster learning-by-doing in the favored sector and there is higher intrinsic productivity level of the favored sector. However, for an open economy, trade may drive a country to specialize in a sector with low growth potential, slowing down its long-run growth. Or it may allow the trading countries to grow faster in the long-run, as the process of learning-by-doing turns out to be international in scope[18].

International Trade

The theories of absolute and comparative cost advantage points out at one major wisdom that the economic growth of any nation cannot take place in a condition of autarky. Interdependence and international integration has sizeable effects on economic growth of any nation. The positive effects of international trade on economic growth were first pointed out by Smith (1776). International trade, as Smith said, leads to specialization which affects the capital accumulation and growth in an economy. In other words it can be said that international trade intensifies the ability and skills of workers, encourages capital accumulation and technical innovations, help overcome the technical indivisibilities, thus, leading to economic growth. Frankel and

[18] This outcome will depend on the size of the trading countries, their intrinsic productivity levels, and their speeds of learning.

Romer (1999) concluded that trade appears to raise income by encouraging accumulation of physical and human capitals and by increasing output for given levels of capital – based on his study for 150 countries in 1985. The neoclassical theories of economic growth emphasized up on international trade as a driving force for the growth of an economy through the process of technological diffusion, wherein the less developed countries are proved beneficiaries. However, the neoclassical theory did not account for the effects of international trade on the long-term rate of economic growth. Ram's (1987) empirical study for eighty-eight less developed countries, for the period 1960 to 1985, concluded that international trade (especially the exporting sector) have positive effects on the economic growth for about 70 percent of the sample countries. Krueger (as cited in Óscar Afonso) observed that since 1960s many less developed countries reduced commercial barriers and other controls of economic activity and obtained a significant increase in the rate of economic growth. Rajapatirana (as cited in Óscar Afonso) argued that international trade brings about dynamic gains to the less developed countries. It is only through international trade that less developed countries can specialize in different branches of industry and production stages. International trade leads the internal products for international competition. Knight, Loayza, and Villanueva (1993) too feel that countries which pursue outward oriented policies are likely to enjoy higher growth. Further, they also state that economic growth and openness of an economy are positively related to each other. Moreover, the literature with respect to openness and trade from 1970s until recently has established a positive relationship between openness of a country to trade and growth. Afonso (2001) suggested that trade openness is beneficial to the growth of developed as well as less developed

countries. Moreover, he feels that the intensity of dynamic effects of international trade depends simultaneously on the geographic structure of international trade (i.e. on the level of development and absorption capacity of trade partners), on the composition and intensity of international trade, and on the capacity for internal technological adaption. Vamvakidis (2002) is one of the few studies that considered the relationship between openness and growth over a long historical period. Vamvakidis (2002) studied the correlation between openness to international trade and GDP per capita growth. He is quite skeptical with the literature which establishes a positive correlation among the two above stated variables by finding that evidence for the correlation among openness to international trade and GDP per capita growth are available only since the 1970s. He tried to find out the robustness of growth-openness connection in historical perspective – way back from 1870 till 1990 – using cross-sectional data over the periods 1870-1910, 1920-1940, 1950-1970, and 1970-1990. For this purpose, he estimated the growth regressions with the limited historical data that he could collect. Empirically, it was found that during the period 1870 to 1910 no correlation existed between growth and duty ratio and trade and growth showed no robust correlation. During the interwar period from 1920 to 1940, trade openness and growth showed negative correlation. The growth regression so calculated showed no correlation between trade openness and growth during 1950 to 1970, while for the period between 1970 and 1990 this relationship turned positive. Thus, based on his empirical studies he believed that the positive correlation between trade and growth can be observed only in the recent times. Theories suggest that trade plays an important role in the economic growth of an economy. Pomeranz (2000) and Galor and Mountford (2003)

provide for a case in point – the growth and development of Europe in comparison to the East Asian nations. Lockwood (1954) documented the role that trade played in the developmental process of Japan. He stated that Japan's openness to the rest of the world in the second half of the nineteenth century – in trade and assimilation of foreign technologies – contributed to a larger extent towards the growth of Japan. Foreign trade provides access to world markets to small and large countries alike. Smaller countries gain more in terms of market size expansion, and therefore the effect of trade on their income per capita and its rate of growth should be larger. This theoretical observation was supported by the research work of Frankel and Romer (1999) and Alesina, Spolaore, and Wacziarg (2003). In larger size countries, however, additional trade does not contribute to growth, ceterus paribus.

Conversely, Wood and Ridao-Cano (1999) feel that trade may not be developmentally the best policy for backward countries to grow, since it retards their capital accumulation of skills by causing them to specialize in goods of low skill intensity. Myrdal (1956, 1957) believed that for the less developed countries, in the long-run, international trade has a negative effect on the growth of the countries as it (international trade) stimulates production of primary goods subject to irregular prices and demand. Rodríguez and Rodrik (2000) question the method that finds a positive relation between openness and growth and demonstrate that the positive correlation between growth and openness is not robust to various measures of openness.

The traditional development literature considered exports as growth-enhancing because of the positive productivity spillovers from the tradable to the non-tradable sector and because exports encourage more efficient

investment projects (Jakob Madsen, 2009). Bresser Pereira (2010) referred to exports as a form of effective demand that is less constrained economically. He considered a strong increase in exports as a major developmental factor on the demand side. Plümper and Graff's (2001) study for 90 countries reveal that export specialization does matter for the economic growth of a nation. Their empirical results, in a cross-sectional study during 1980-1990, suggested that competitive advantage trade in high-technology goods is most favorable for economic performance of an economy. While trade in mature goods, on the other hand, has the lowest impact on economic growth. Their regression results imply that an increase in the high-technology export to total trade ratio from 0.5 to 0.6 (which according to them requires a 50 percent increase in exports if imports are held constant) would increase the growth rate of an average country at about 0.8 percent. They further believed that technology and trade specialization are positively and significantly related to growth and so are a country's openness and trade specialization. However, in a seminal paper Findlay (1972) stated that if capital goods are imported under conditions of increasing costs, free trade does not provide for an optimum solution for economic growth of a nation. Further, he stated that import substitution for capital goods which serves the regional markets instead of national markets, taking the advantage of economies of scale; initially have unfavorable effects on the growth rate of a nation. Bresser Pereira (2010) while distinguishing old and new developmentalism concur that import-substitution may prove to be damaging for the developmental process of a nation. For the reason that import-substitution – which protects the national industry and focuses on the domestic market – reduces the openness coefficient of an economy and is greatly constrained by the economies of scale.

He found that when import-substitution model was maintained through the 1970s, it led the Latin American economies into a deep distortion. Moreover, under the import-substitution model, inefficient firms may enjoy the benefits of protection while under the export-led model the likelihood of this happening is substantially smaller (p. 97). Furtado (1965) remarked that after the initial import-substitution phase of consumer goods industries, continued industrialization implied a substantial increase of the capital to labor ratio with two consequences: first, income contraction[19] and, second, reduced capital productivity. Conversely, exports can be considered to be strategic to solve the problem of insufficient demand (unemployment) as exports encourage investment. "In the era of globalization, export-led growth is the only sensible strategy for developing countries while they have the competitive advantage of cheap labor. Exports increase employment, wages, and domestic consumption" (Bresser Pereira, 2010 p.134).

Terms of trade movements provide an important mechanism for the international transmission of growth effects (Helpman, 2004 p. 59). Acemoglu and Ventura (2002) pointed out that growth that affects the terms of trade adversely leads to convergence. They also found evidence for negative cross-country correlation between growth of income per capita and the growth of terms of trade between 1965 and 1985. Their estimates show that a 1 percent faster growth rate accelerated the deterioration or terms of trade by somewhat 0.6 percent. Furthermore, they found a negative cross-country correlation between the growth of income per capita and the growth of terms

[19] Income contraction leads to the expansion of production of luxury consumer goods which beside being perverse, contains the seeds of the dissolution of the national pro-development alliance (Bresser Pereira, 2010).

of trade. Krugman (1987) assuming that there are only two countries with many products and unitary elasticity of substitution in demand; showed that the growth rates of income per capita do not converge that is international trade does not lead to convergence.

Many studies have examined the impact that trade policies have on the economic growth of a nation. But the theories that tend to establish the relationship between trade policies and trade are quite complex. In some countries a restrictive trade policy may accelerate the growth rate while for others it may hinder the growth process. European experience of the late nineteenth century can be considered as a case in point where countries like France, Germany, and Sweden benefitted from protection while Italy experience slow growth (Bairoch; 1993). O'Rourke (2000) found positive effect of tariffs on the rate of growth of real income per capita. His growth equation for ten countries from 1875 and 1914 found that an increase of one standard deviation in the average tariff rate raised the annual growth rate by 0.74 percent. Clemens and Williamson (2002) too, find a positive relationship between tariff rates and economic growth for more than thirty countries between 1870 and 1913. They, however, find that this positive relationship turned negative for the post World War II period – when high tariff countries grew more slowly than low tariff countries. Since post World War II, countries started reducing the tariffs and this led to many researchers for using proxies for protection like measures of real exchange distortions, the size of black market premium on foreign exchange, the fraction of imports covered by non-tariff barriers, institutional features of economic regimes, and the deviation of trade volumes from the predictions of trade theory. They found negative

effects of trade restrictions on economic growth of a country using above mentioned proxies for protection.

Foreign Direct Investment (FDI) represents an important dimension of economic integration. FDI is a particular form of investment, as it transfers knowledge as well as finance that may otherwise be unavailable in the domestic economy (Lesher & Miroudot: 2008). It has a two-fold effect up on the receiving economy. Firstly and directly, through capital accumulation FDI is expected to be growth-enhancing by encouraging the incorporation of new inputs and foreign technologies in the production function. And secondly, indirectly through knowledge transfer FDI is expected to augment the existing stock of knowledge through labor training and skill acquisition and introduction of alternative better management practices and organization arrangements (de Mello: 1999). Foreign investment increases the productivity of the receiving economy and hence FDI can be considered as catalyst for domestic investment and technological progress. de Mello (1999) based on his study for a sample of thirty-two OECD and non-OECD countries during the span of 1970-1990 provided empirically that the long-run effects of FDI on the recipient economy can be both growth-enhancing or growth-depressing – based on the absorption capacity of the nation. His empirical testing found a long-run positive effect of FDI on capital accumulation for a group of countries, while, for some, no cointegration was found. Further, there existed both a positive as well as a negative relationship between FDI and TFP growth. His analysis with respect to panel data suggested a dominant complimetarity effect between FDI and domestic investment, and that the

OECD nations were benefited by FDI in terms of technological change while opposite was observed for the non-OECD panel countries.

Institutions and Policy

Among the above factors affecting economic growth of any economy, the institutional factors has a substantial role to play. Since the 1960s, institutions have been a central concern of political scientists and since the 1980s a major research program for economists. Classical, Marxist, German historicists had always attributed a central role to institutions, whereas neoclassical economics practically ignored them for around a century. In the early 1990s institutions were eventually brought back into the mainstream economics. In one of his Keynote addresses, Sala-i-Martin stated, "Institutions affect the "efficiency" of an economy much in the same way as technology does: an economy with bad institutions is more inefficient in the sense that it takes more inputs to produce the same amount of output" (Sala-i-Martin, 2002). Helpman (2004) feels that Institutions (and politics) determine the ability of countries to accumulate, to innovate, to adapt new technologies, and to reorganize in the face of technological change. And they shape the economic policies that either promote or hinder growth. Marx, on the contrary, viewed institutions as an obstacle rather than an incentive to the process of economic development.

North (1990) distinguished between institutions and organizations. According to him organizations are influenced by the institutions (who put forth the rules) and in turn, the organizations affect the evolution of rules to be formulated by these institutions. Grief (n.d., chap. 2; in Helpman, 2004 p.

115) proposed a broader definition of institutions (which embraced North's definition) as "an institution is a system of institutional elements that conjointly generate a regularity of behavior by enabling, guiding, and motivating it". Unlike North, Grief's definition state that institutional elements include organizations. Institutions are more fundamental determinants of economic growth than R&D or physical or human capital accumulation. Helpman (2004) reasons this statement by saying that "...institutions affect the incentive to innovate and to develop new technologies, the incentives to reorganize production and distribution in order to exploit new opportunities, and the incentives to accumulate physical and human capital" (Helpman, 2004 p. 139).

However, Institutions in its broader sense embraces the aspects of law enforcement, markets, inequality and social conflicts, political institutions, health systems, financial institutions, as well as government institutions. These institutions may affect the economy in both constructive and unconstructive ways. While on the one hand, better institutions amplify the incentives to invest in technology, human capital and physical capital, these incentives are grounded by bad institutions, on the other hand. The organizational success and failure account for the progress and retrogression of societies (North, 1981).

Birdsall (2007) expressed that the process of economic growth in developing countries is undermined by the weak markets and poor government. According to her, in developing countries in general, financial and other markets are less complete and public policy is less effective in addressing market failure and imperfections. That is imperfect credit and other markets,

ineffective and corrupt institutions of the state, poor public policy, political instability and social conflict lack the essence to address the issue of market imperfections and failures. In one of his lecture series in India, Sir Arthur Lewis summarized that for developing countries to grow faster, their economic policies must aim at eliminating the constraints in way of growth process. He identified these constraints in the form of shortages of skilled labor, infrastructure, savings and entrepreneurs. It is only through the elimination of these constraints that the productive capacity can be expanded to the ultimate boundary set by full employment. Countries wherein the governments provide an environment that persuade production are comparatively dynamic and successful than those wherein the governments engage and permit diversions (Jones, 2002). And so the main task of plan implementation is to work on the fundamental constraints and to keep the economy buoyant. Moreover, governments can deliberately alter the comparative advantage in specific sectors to the disadvantage of the other sectors. The European Union's 'subsidies to the chosen sectors' is the best example of such policies which alter the competitiveness of an economy. Plumper and Graff (2001) introduced a simple endogenous growth model to show how government can stimulate economic growth by implementing policies that successfully create competitive advantage in favorable sectors. Reappraising the role of national policies in economic growth of a nation, Esterly William (2003) found that the relationship between policies and growth miss out to explain some stylized facts of the post-war period. Emphasizing on the taxation methods in an economy he intends to explain how strong is the relationship between national economic policies and growth rates of the economy. He concludes that though sound macro-economic policy

is a useful tool for the growth of any economy, good macro-economic policies are not the only and cannot be considered a must to create the conditions for high steady state growth. Government policies and decisions with respect to the economic variables have a significant role to play on the growth of a nation. Ghosh and Gregoriou (2008) analytically characterized an optimal fiscal policy with two public goods with differing productivities in 15 developing decentralized economies over a span of 28 years. They identified the bias in government spending that arises due to misperceptions of governments about their priorities. Their use of GMM technique in an endogenous growth model showed that current spending has positive and statistically significant effects on the growth rates of the selected nations, whilst capital spending depicted negative growth effects. Further, the extension of their analysis to the functional components within the above categories of spending showed, that capital spending i.e. expenditure on health and education affected growth in a negative and statistically significant manner. While the current spending i.e. expenditure on operations and maintenance was found to have a positive and significant impact on the growth. Moreover, on the revenue side it was found that tax and non-tax revenue have positive and significant effects in the growth rates, while budget deficit or surplus reported to be statistically insignificant. Baoyun, Martinez-Vazquez, and Xu (2008) develop a theoretical model of fiscal decentralization in China where the objectives of central government is the overall national economic growth and equity in regional distribution of fiscal resources. This model is tested using panel data from 1985 to 1998. They found that fiscal decentralization in China has led to economic growth as well as to significant increase in regional inequality – confirming for a trade-off between economic

growth and regional equity. In addition to this two other findings are noteworthy:

1. Fiscal decentralization significantly affected economic growth – a higher level of decentralization led to a higher growth but this relationship was non-linear and

2. The existence and use of extra budgetary funds helped to alleviate disparities in the distribution of fiscal resources.

Most econometric tests have demonstrated that there is a strong positive correlation between good institutions and the level of economic growth. But in the growth process one cannot find sensible correlations between institutional variables and the yearly percentage increase in per capita income. The tight correlation between the structural and institutional instances is confirmed, whereas the hope that institutional reforms will generate growth is not. Institutional reforms remain essential to development but they do not explain why some countries begin to grow faster than before and, gradually, catch-up (Bresser Pereira, 2010). Bresser Pereira (2010) believed that it is impossible to link institutional reforms to the rate of growth. "Institutional reforms are always necessary, but they rarely precede economic growth: they take time to mature, to be transformed into law, and to be enforced" (p. 126). In explaining his concept of 'new developmentalism', he emphasized upon the importance of macro-economic policies (especially with respect to exchange rate) in the economic growth and development of nations – specially comparing the Asian and Latin American countries.

Economic Integration

The theory of economic growth has its distinguished place in the literature of Macroeconomics. These theories along with the advocates of Customs Union postulate growth enhancing effects of economic integration. Movements toward economic integration in various parts of the world have evoked a considerable amount of economic literature concerning its immediate effects on trade and welfare.

Jacob Viner's (1950) landmark theory of Customs Unions which was further improvised up on by Meade (1955) distinguished the effects of economic integration into trade-creation[20] and trade-diversion[21]. These effects, however, are of a 'static' nature as they provide for justification of customs union in terms of forecast changes in flows of trade. Trade creation and trade diversion, and the improved terms of trade of the integrating nations contribute to a larger market size through their effect on national income. Empirical literature like The Economist and Intelligent Unit (1957), Verdoorn: An Unpublished Paper quoted by Scitovsky (1958), Johnson (1958), Stamp and Cowie (1967) forecasted large increase in trade because of customs union formation. Balassa's (1975) empirical study found trade creation in absolute terms over trade diversion for manufactured goods in EC integrated market, while trade diversion was observed where Common Agricultural Policy (CAP) was followed. Similar results were found by Jacquemin and Sapir (1988a) for

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[20] Trade creation is the new trade between members of the customs union which would replace higher cost production in the importing member hence causing an increase in welfare – as higher cost production is replaced by lower cost production. (Denton: 1969)

[21] Trade diversion is the replacement of imports from non-member countries to member countries which would reduce welfare – as the old imports from a non-member country were of lower-cost then new imports which replaced them because of tariff preferences. (Denton: 1969)

four EC integrating nations viz. France, Germany, Italy and the United Kingdom. EC integration was found to be welfare-enhancing especially for the manufacturing sector which was more liberal in comparison to the temperate agricultural sector which was highly protectionist (where integration generated welfare costs). However, Lipsey estimated the net gains from trade to be less than one per cent of the national income. This is because the 'static gain' to welfare due to increase in trade is not equal to the increment in trade itself but to the increment in trade multiplied by the reduction in cost due to change in the source of production (Denton: 1969, p.149). Thus, these static effects of customs union cannot prove beneficial for practical policy making.

However, Scitovsky (1958), Lipsey (1960), Balassa (1961) and others opined that the static analysis as indicated by Viner's approach is in any case relatively unimportant. The creation of customs union can have a number of indirect or dynamic effects. The dynamic factors are the long-run consequences of increased market size for the growth rate of the integrating region. This may operate through:

1. Internal economies of scale – internal to the plant
2. External economies which include enlarged pool of technological and managerial skills, economies of specialization, inter-industry transmission of innovations, and better use of discoveries and research
3. More competitive market structure
4. Elimination of risks and uncertainty from foreign transactions leading to expanded trade and investment.

What are considered more important for practical policy making are the 'dynamic' effects of customs union on investment, competition, and balance of payments of the member nations. According to Balassa (1961) these dynamic effects of economic integration are rooted in internal and external economies of scale, faster technological progress because of these economies in the research and development (R&D) sector of an economy, enhanced competition, reduced uncertainty, creation of more favorable environment for economic activity and lower cost of capital due to the integration of financial markets.

"Thus, the dynamic gains due to considerations of 'scale' and the 'climate of competition' seem likely to be far more important than the static gains or losses due to trade creation and trade diversion..." (Pinder: 1969, p. 151).

The upshot of economic integration can be well understood from two most influencing theories of economic growth viz. the neoclassical theory of economic growth and the endogenous theory of economic growth.

The neoclassical growth literature was dominated by the exogenous 'Solow-Swan' growth model. As per the neoclassical growth theory, the economy converges towards a steady-state due to diminishing returns to investment in physical capital. Assuming a constant population, the long-run growth rate is solely determined by the exogenous factor – technological change. Hence, as per neoclassical growth theory economic integration and other institutional aspects or economic policy measures have no effect on the steady-state growth rate. Thus, economic integration as per this theory will only have temporary

effects on the growth rates; rejecting the hypothesis of permanent growth effects.

With Romer's (1990) introduction of the endogenous growth models; technological change was now not a public good but endogenous to growth and subject matter of decision-making process at individual firms. According to this theory technological progress depends on the Research and Development (R&D) activities of individual firms.

In endogenous models which assume constant technological parameter – like the AK models – integration would lead to permanent growth effects with an increase in investment-ratio. However, "A stable, endogenous growth rate is only realized, if returns to accumulable factors (*like K in AK models*) are exactly constant; increasing returns would imply explosive growth and the case of decreasing returns would bring is back in the neoclassical world without endogenous growth." (Badinger: 2001, p.7).

Among endogenous growth models with variable, endogenously determined technological progress exhibiting the 'scale effects' imply that the long-run growth rate increases with the size of the economy (Romer (1990), Rivera-Batiz and Romer (1991), Grossman and Helpman (1991), Aghion and Howit (1992), Rivera-Batiz and Xie (1994), Walz (1998)). As per this analysis, the more the number of countries joining the economic integration, the larger would be the scale of integrated economy. This would lead to higher incentives for R&D and, accordingly, higher growth rates.

However, this 'scale effect' characteristic of the above models has been criticized by Jones (1995a). According to his empirical research, labor engaged

in the R&D sector of the OECD countries increased significantly during the post-war period; while the growth rates were found to be relatively stable. "As response, a number of endogenous growth models without scale effects have been developed, e.g. by assuming decreasing returns to accumulabe inputs in the R&D sector (Jones (1995b)), introducing the principle of "equivalent innovation" (Young (1998)) or assuming an increasingly difficult research process (Segerstrom (1998))." (Badinger: 2001 p.8)[22]

But do countries essentially benefit from economic integration is the question that showed the way for the following empirical research.

Firstly, researches were made to compare growth benefits of economic integration for countries joining it with those not a part of such integration model. In such cross-country study, Landau (1995) found no growth bonus for the European Union member countries in comparison to countries that did not join the EU. Moreover, both – European Union member and non-member countries – were at a similar stage of development. DeMelo et.al. (1992) using the Barro (1991) technique in a cross-section of 101 countries, did not find any growth effects associated with the European Union integration.

Secondly, improvements in the data and statistical techniques opened ways to deal with the growth effects of integration.

In view of this, apart from the above two cross-sectional studies, Vanhoudt (1998) focused exclusively on the growth effects for European Union member countries only. Based on a time-series data for the European Union at several

[22] These models are compatible with the neoclassical growth as they show level effects bit bi effects on the steady-state growth rates (Badinger, 2001)

stages, he tested the validity of the neoclassical implications of regional integration. For this purpose, he carried out a panel data regression on 23 OECD countries, only to conclude that "...there is no convincing evidence to support the idea of a long-run growth bonus associated with EU membership, nor with membership length..." (p.18). His study further rejected the hypothesis of scale-effect on growth rate of average EU labor productivity. Yet, "the growth experience during the development of the EU is well described by a textbook neoclassical model which emphasizes the role of investment as engine of growth." (p.17).

Vanhoudt's study was contradicted by the study of Henrekson et. al. (1997). As per their study EC or EFTA membership may increase growth rates by around 0.6 to 0.8 percent point per year; irrespective of its membership to EC or EFTA as an organization. Their results support the hypothesis that regional integration in Europe can have significant growth effects and suggest that further regional integration may be growth enhancing in the long-run. However, the results of the paper are not completely robust with respect to changes in model specification. Sapir (1992) found strong evidence of positive impact of EC integration on growth for the member nations. As per his view, EC led to a substantial multilateral trade liberalization that benefitted the Community and her trading partners. Borota and Kutan (2008) used augmented Solow model to analyze and measure the benefits of regional integration on growth for the EC member nations. Their study, in particular, emphasized the impact of trade and FDI net inflow on economic growth in EU-15 countries over a period of 1973 to 2002. This study sustained the earlier studies when it found no evidence of integration-induced investment-led

growth in EU-15. Further, technological progress was considered as a lead factor for economic progress. Empirically, net FDI inflow was found to have a significant and positive impact on growth. As per their empirical study, a 1 percentage point increase in net FDI inflows in the integrated economy increased the countries growth rate by some 0.3 percentage point.

The study by Crespo-Cuaresma et. al. (2003) focused exclusively on the current EU member states and the issue of convergence within the integrated European economy. Their empirical study found positive and asymmetric effect on long-run economic growth of EU membership which approves European integration of driving convergence. Further, they feel that the longer a country has been a member of the EU, the more it would profit from the membership. However, one can argue that the growth benefits associated with regional integration seem to be due to formal participation in the union. Moreover, objection could be that it is not EU membership itself that enhances growth, but that the accompanying stability measures for nominal macroeconomic variables had a positive impact on growth performance. The regression coefficients support the hypothesis of a positive impact of investment, education and openness to growth; but a negative impact of high inflation rates. Thus, the results conclude for a growth-enhancing effect of EU membership. Moreover, this effect gains importance over the duration of membership. The study further enquiries into the benefits from European Union membership on particular country. In view of this it was found that countries with a higher level of development grew faster the longer they were member of the European Union; this effect was even more pronounced for the less advanced countries. Thus, their study found a positive effect of integration

on economic growth for the present members of the European Union. More importantly, on the basis of the uncertainty surrounding the nature of the driving forces, the study rejects the implications of the basic neoclassical model.

A critical point in all the above studies, as pointed out by Badinger (2001), is the measurement of economic integration which is usually undertaken by dummy variables or proxies for the membership in EC/EFTA/EU. He criticizes the former studies on the ground that "...dummy variables...or proxies for the 'market expansion' as a result of EC enlargement in terms of population, GDP or area. Other frequently employed variables include total or intra-EC trade (as percentage of GDP) or the share of intra-EC trade in total trade. These variables, however, might only be rather poor proxies for the complex and continuous process of integration of the EU countries." (p.8). Thus, his measurements for the said purpose were the tariff reduction in the framework of GATT (General Agreement on Tariffs and Trade) and in the framework of EU (EC/EFTA/EEA/Common Market), and harmonization of external tariff. By using these measures in the endogenous growth framework, Badinger tries to endeavor to find the temporary or 'level' effects of economic integration on growth. His empirical results show positive and considerable level effects of integration on European Union's postwar economic growth. "In terms of growth...without integration, the average growth rate per annum over the period 1950 to 2000 would have been lower by 0.4 percent points." (p. 27). The increased growth rate of EU was found to rest on technology rather than investment. Further, "...two thirds of the total level effects is due to GATT liberalization" while only 7 percent of level effect was observed because of

European integration. Of great consequence, this research rejects the endogenous growth models with scale effects for understanding the effects of economic integration (especially the case of European Union member nations) on economic growth while not essentially supporting the neoclassical model too.

From the above survey and review of economic literature (especially with respect to economic integration) gives an idea with respect to the following research gap:

1. Most of the earlier studies analyzed the impact of EU integration upon both the developed and developing nations, or studied the impact of EU integration upon the member and non-member country, while this study analyses the impact of EU integration upon developed member countries only for a period of thirty-nine years.
2. Further, a comparison between the economic status and performance of the member countries before and after they joined the European Union is also not found in the previous research. As a result, this study intends to compare the economic status and performance of the selected member countries for pre-EU and post-EU time periods.
3. Most of the earlier studies have employed cross-sectional or panel data to validate the hypothesis and not the time series data. Hence, the present study aims to study the hypothesis using time series data for individual countries.

Therefore, this study has been made with a view to bridge the research gap noticed in the previous attempts. The above analysis has put forward the basic variables that tend to explain economic growth in an economy. Based on these

variables, this thesis intends to account for the disparities in economic growth among the selected member nations of the EU. However, it also intends to study the impact of EU membership on these selected member nations.

To serve this purpose it becomes essential to understand the economics behind the formation of the EU. The next chapter takes a ride into this economic area of customs union and how has the EU transformed itself towards a more integrated market economy.