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Title: Income Inequality and Economic Growth: The Case of India

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SUMMARY: India's economic climate has experienced significant change since its independence from Great Britain in 1947. After more than three decades of mediocre economic growth, the 1980s ushered in a new era of accelerated growth rates by way of promoting a more efficient pro-business model. Despite the improvement in growth rates, the 1980s were fueled by over zealous public spending, precipitating the well-known financial crisis in 1991. As a result of the crisis, and the IMF supplied aid contingent on the introduction of gradual deregulatory reforms of the Indian economy, the 1990s brought about even greater economic growth rates than the previous decade. Into the 2000s, India's continued and steady opening has afforded even further acceleration in growth rates. Despite these positive developments in the Indian economy, the unfortunate truth is that income inequality has likewise been increasing over this same period, most notably across the states. This dissertation endeavors to apply the established macroeconomic field dedicated to the study of income inequality's effect on economic growth to the case of India, both at the national level and even more critically at the state level. Our research also includes exhaustive coverage regarding the evolution of other relevant macroeconomic variables across states, as well as nationally.

Key Words: Economic Growth, Income Inequality, Income Distribution, Gini Coefficient

Thematic Area: International Economics and Development

Título: Desigualdad de Ingreso y Crecimiento Económico: El Caso de la India

RESUMEN: El entorno económico de la India ha cambiado significativamente a partir de su independencia de Gran Bretaña en el año 1947. Después de más de tres décadas de crecimiento económico mediocre, los 80 marcó el comienzo de una nueva etapa de altas tasas de crecimiento económico a partir de nuevas políticas económicas más orientadas a una más competitiva economía de mercado. A pesar de la mejora en tasas de crecimiento, dicho modelo de crecimiento se basaba en gran medida en un gran protagonismo por parte del gasto público, lo que precipitó la crisis financiera de 1991. Como resultado de dicha crisis, y la asistencia proporcionada por el FMI se introdujeron reformas desreguladoras y liberalizadoras. La década de los 90 fue acompañada de tasas de crecimiento aún más altas que la década anterior. En la década más reciente, los 2000, la apertura estable de la economía India ha permitido tasas de crecimiento más altas que en las décadas anteriores. Desafortunadamente, este gran crecimiento económico ha ido acompañado con un aumento importante de los niveles de desigualdad de ingreso durante este mismo periodo, tanto a nivel nacional como entre los estados que forman parte de la India. Esta tesis se concentra en el estudio de la relación entre crecimiento económico y desigualdad del ingreso, tanto a nivel nacional como entre los estados. Dicho proyecto de investigación también incluye cobertura exhaustiva con respecto a la evolución de otras variables macroeconómicas a los dos niveles: nacional e inter-estatal.

Palabras Claves: Crecimiento Económico, Desigualdad del Ingreso, Distribución del Ingreso, Coeficiente Gini

Área Temática: Economía Internacional y Desarrollo

Titol: Desigualtat de l'Ingrés i Creixement Econòmic: el Cas de l'Índia

RESUM: L'entorn econòmic de l'Índia ha canviat significativament a partir de la seva independència de Gran Bretanya l'any 1947. Després de més de tres dècades de creixement econòmic mediocre, els 80 va marcar el començament d'una nova etapa d'altes taxes de creixement econòmic a partir de noves polítiques econòmiques més orientades a una més competitiva economia de mercat. Tot i la millora en taxes de creixement, aquest model de creixement es basava en gran mesura en un gran protagonisme per part de la despesa pública, el que va precipitar la crisi financera de 1991. Com a resultat d'aquesta crisi i l'assistència proporcionada pel FMI, es van introduir reformes desreguladores i liberalitzadores. La dècada dels 90 va ser acompanyada de taxes de creixement encara més altes que la dècada anterior. En la dècada més recent, els 2000, l'obertura estable de l'economia Índia ha permès taxes de creixement més altes que en les dècades anteriors. Desafortunadament, aquest gran creixement econòmic ha anat acompanyat amb un augment important dels nivells de desigualtat d'ingrés durant aquest mateix període, tant a nivell nacional com entre els estats que formen part de l'Índia. Aquesta tesi es concentra en l'estudi de la relació entre creixement econòmic i desigualtat de l'ingrés, tant a nivell nacional com entre els estats. Aquest projecte de recerca també inclou cobertura exhaustiva respecte a l'evolució d'altres variables macroeconòmiques als dos nivells: nacional i inter-estatal.

Paraules Claus: Creixement Econòmic, Desigualtat de l'Ingrés, Distribució de l'Ingrés, Coeficient Gini

Àrea Temàtica: Economia Internacional i Desenvolupament

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realization of this dissertation was his availability to share expert knowledge of advanced econometrics, which afforded profound improvements in the design of the statistical models employed in our analysis, greatly facilitating past, current and future research. I deeply appreciate the lessons he has provided me, and I look forward to benefiting from his expertise for many years to come.

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PREFACE:

This study primarily endeavors to provide a detailed and exhaustive review of the theoretical literature, the corresponding empirical results and evolutionary trends surrounding the macroeconomic relationships regarding income inequality, economic growth and other relevant macroeconomic variables suggested by the literature to play a significant role in the development of economies. Directly following the abovementioned literature review, econometric exercises will be undertaken to examine the experience of India with the publicly available data. Both the national and state level cases will be considered, with a clear emphasis on the state-wise dissection. To empirically test these abstract relationships, OLS time-series regressions will be estimated for the national level data, while panel data models will be preferred for the state-wise portion. The national study is designed to serve as experimental and to provide a general framework for the more of-interest and in-depth state-wise approach. Careful analysis of the literature suggests that there has been substantial cross-state heterogeneity since India's strong acceleration in development beginning around 1980. This uneven development of economic conditions necessitates an investigation into these trends, and a measurement of income inequality's effects on economic growth. Although analysis at the national level is provided, it should be clear that the primary interest of this study remains with discerning the cross-state relationships regarding the evolution of income inequality and economic growth, along with a host of other macroeconomic variables implied by the literature to leverage an impact on economic development.

Motivation:

The initial curiosity regarding this subject matter originates from a class taken during my undergraduate education in economics, entitled “Developing World”. This course introduced me to ideas meshing classical and contemporary frameworks of economics, applied to developing economies, eventually inspiring a great deal of excitement for the potential research this field offered. Throughout this early introductory chapter in developmental economics, I was introduced to many case studies from Michael Todaro’s book “Economic Development” which provided me with a base knowledge and taste for how formerly impoverished nations were able to, through effectively strategized growth policies, successfully and appreciably improve their prevailing economic conditions. Exposure to these studies supplied me with two tremendously vital cornerstone realizations that would, and continue to, fuel my passion for developmental economics: the shocking prevalence and pervasiveness of global inequalities, and the encouraging success stories involving sustainable growth, which characterizes the power of developmental economics. Applying my doctoral research to income inequality’s effect on economic growth focused on Indian states was a natural selection, and despite the ups and downs of any doctoral candidate’s research experience, I sincerely remain motivated by the research I have realized; I plan to continue with this same line of research for many years to come.

Methodology:

Following the literature review, the national level and state-wise sections will proceed with applied econometric exercises. This study is distinct from much of the growth and income inequality literature, in that it analyzes only one country throughout time, both at the aggregate national level and below the

surface at the state level. Some authors argue against this type of study (Barro (2000)) claiming that the aggregate relationships between inequality and growth must be studied in cross-country models, as national studies are seemingly too shallow to establish identifiable results. However, Fields (1999) claims that, in fact cross-country analyses may be inferior to more in-depth single country studies as a result of the overwhelming heterogeneity between countries, and the unavoidability of omitted variable issues. Knowles (2001) reinforces this position, claiming that studies focused on cross-country data produce results that are highly dependent on the countries included in the analysis. Kanbur (2000) goes as far as to say that early studies using cross-country groupings should be seen as a beginning step, and when possible, the preferred method of extensive single country case studies ought to be used. It is necessary repeat the common warning that results from cross-country studies can be tremendously sensitive to the omission of relevant variables, or inclusion of influential country observations and outlier cases. Thusly, we shall theoretically benefit from eliminating the noise generated by the overwhelming cross-sectional heterogeneity commonly employed by many of the most famous authors in the literature.

The classical growth and inequality analysis conducted by Robert Barro, beginning with Barro (1991), can be looked upon as a gold standard, and can be seen as defining a great majority of our subsequent work. However, works from authors such as Benabou (1996) and Knowles (2001) have also inspired our empirical methodology, and deserve mentioning. Accordingly, this current study will attempt to replicate these works as closely as possible, adapting design differences to the unique case of India, both for the national time-series analysis and state-wise panel data model, while also maintaining a clear consideration for data availability.

The models employed by the aforementioned authors were primarily built around panel data (cross-country samples). Considering that the current endeavor lies with analyzing growth on both a national and state-wise level, the panel specification is only appropriate for the latter assignment. Hence, adopting the similar framework pioneered by these authors, Indian time-series data (national) and stacked time-series panel data (state-wise) will be utilized in

an attempt to study the behavior of the income inequality and economic growth relationship over the period 1980-2010.

With respect to the national study on the Indian growth experience, the time-series design likewise stems from the inspirational works of Barro (1991), Benabou (1996) and Knowles (2001), but has been adapted to accommodate the different econometric focus. Their studies employ a specific list of independent variables assumed to cause variations in the growth rate; therefore, a longitudinal examination of the Indian growth experience is undertaken, controlling for as many of the same classically suggested variables as possible. Our study takes advantage of the more frequent annual observations, but maintains the lagged feature used in the panel data analysis. This lagged feature relates to the underlying growth theories, which predict that *past* levels of income inequality and other macroeconomic variables should affect *future* growth. Ultimately, the national growth regression meshes economic theory with empirical premises extracted from well-known cross-country research to produce an introductory view of the aggregate Indian growth experience.

Regarding methodological notes on the state-wise analysis, Barro (2000) points out that popular economic growth model design comes from the fact that the underlying theory is chiefly concerned with the long-run fluctuations in economic growth; therefore, in order to harmonize with the theoretical relationships, analysis of longer term relationships are preferred. Following his study, lag periods are employed in our analysis. In a dissection of the Indian growth experience, Rodrik & Subramanian (2004) implement lag periods of 5 years. Forbes (2000) also uses a 5-year lag period, but analyzes a wide range of countries. Related to this design, it is also advisable, and frequently employed, to use observations of the explanatory variables as close to the start of the panel period as possible, maintaining the desired lagged design, in order to most completely harmonize with growth theory. Again, this all relates to the assumption that *past* values of income inequality, capital and other determinants affect *future* economic growth. Unsurprisingly, a majority of authors are concerned with the longer run relationship between inequality and

growth[1] (Alesina & Rodrik (1994), Birdsall, Ross & Sabot (1995), Sylwester (2000) and Easterly (2000)), and accordingly orient their relatively ample studies with correspondingly ample longitudinal data coverage, accompanied with lag lengths of the order discussed in Barro (2000). However, some studies do in fact implement a more short-term focus (Li & Zou (1998), Forbes (2000), and Deininger & Olinto (2000))[2]. With respect to the considerable lag length employed in this current, and overall length of the panel data, our focus is clearly on the long-term relationship between inequality and growth, and lag lengths have been chosen both to accord with the abovementioned authors, and also to accommodate rigid data availability.

Data observations for the national study were taken from the United Nations University – WIDER (World Institute for Development and Economics Research (2013)) database for Gini coefficients, and the remaining variables were found in the World Bank (2013) database; although GDP (Gross Domestic Product) data was taken from the Reserve Bank of India (RBI (2013)). The data used in the state-wise analysis were taken from the Planning Commission Government of India Data book (2012) and the Reserve Bank of India (RBI (2013)). It is worth mentioning that all variables selected, for both the national and state-wise studies, were taken from free publicly available databases. Some authors in this field are able to research relationships and trends not explored in this current study as a result of their access to more exclusive databases. Accordingly, the empirical work herein intends to use the highest quality publicly available data to analyze many factors affecting India's economic experience by way of implementing our econometric analysis and applying skills and techniques in the most methodologically appropriate manner possible. We present the current work in an effort to display the applied Indian results based on the acquisition and cultivation of empirically focused research

[1] Knowles (2001) mentions that a typical complete observation window of approximately 25 years is common.

[2] These authors test the short run relationship between income inequality and growth, and their findings yield a positive partial correlation between the two variables (they use periods of 5 years to test the short run relationship).

methods as observed in the literature.

Objectives:

Following the methodological outline established above, the objectives for this dissertation are concerned with exhaustively documenting all relevant literature and corresponding empirical results concerning both the linkages between income inequality and economic growth in general, as well as within the ambit of applied studies for the specific case of India (both at the national level and state-wise). Having developed this comprehensive review, which will facilitate an appropriate context through which we can better understand eventual results, we aspire to accomplish, both at the national level as well as at the state level from approximately 1980-2010, the following specific objectives:

1. Document the intertemporal evolution of income inequality and economic growth, in addition to a host of macroeconomic variables suggested by the literature to play an important role in economic development

2. Discern the effect income inequality leverages on economic growth, in addition to a host of macroeconomic variables suggested by the literature to play an important role in economic development, within the context of both time-series (national) and panel data models (state-wise)

Once we obtain results from our study, it is our express objective to publish the findings in refereed academic journals. The preliminary research extracted from the Master's thesis has already met this goal, having been published in August of 2012 under the title "Income Inequality and Economic Growth: The Case of Indian States 1980-2010" in the 31st volume, number 57 Special Issue from Cuadernos de Economía printed by the Universidad Nacional de Colombia, in collaboration with the United Nations University – Comparative Regional Integration Studies (UNU-CRIS). Further results are currently in the process of

being considered for publication under the title “Convergence Across Indian States: 1980-2010” and have been submitted to the Journal of South Asian Development. Future publications related to these same issues are currently in progress, specifically analyzing state cohort selections’ impact on the empirical results of income inequality’s effect on economic growth rate (along with other macroeconomic variables).

Structure:

This present body of research is divided into four chapters. In the introduction we present the relationship between our primary variables of interest, income inequality and economic growth, alongside the historical evolution of their importance and the general interest in their study. In section two we provide an exhaustive review of the theoretical and empirical works written by the most frequently cited researchers in the field. We take this opportunity to comprehensively explain the theoretical links between income inequality and economic growth, showing both the classical models and the contemporary theories. In chapter three we begin with an introduction of the historical evolution of income inequality and economic growth within India. Specifically, we discuss the political and economic history dating as far back as 1947, the year of its independence from Great Britain. In chapter three, after the introductory remarks, we transition to a dissection of the evolution of income inequality and economic growth at the national level, including the provision on an applied econometric exercise. Further in chapter three, we present the topic of primary interest, the state-wise analysis of income inequality’s effect on growth. Within the detailed coverage of the state-wise experience, we discuss convergence analysis across states as well as present our empirical findings by way of a balanced panel data model. In chapter four we summarize the findings from our applied research both at the national and state level and present our conclusions.

1.0 INTRODUCTION

The relationship between income inequality and its effect on economic growth has occupied the minds of prominent economists for many decades, perhaps most notably beginning with the presentation of the inverted 'U' hypothesis introduced by the work of Simon Kuznets (1955) in his seminal paper "Economic Growth and Income Inequality". After the publication of this influential paper, a great many more economists focused their research on the relationship between inequality and growth, and subsequently the way in which a country can develop while simultaneously maintaining control over income inequality. Throughout the second half of the twentieth century, when many formerly colonized nations became independent and consequently were burdened with the difficult task of electing developmental strategies, it became strikingly apparent that the Kuznets's hypothesis, although introductory and rudimentary in nature, was very much relevant to the central economic question facing these newly independent economies.

The focus in the field of inequality and growth up until the late 1980s was strongly defined by traditional neoclassical growth models, as given in the timeless papers by the authors Solow (1956) and Swan (1956), which maintained strict assumptions concerning the relationship between macroeconomic variables such as income inequality and their effects on economic growth. These admittedly simple models incorporated little of what we assume today to affect the incredibly dynamic growth experience, and for many years the research shadowed this unimaginative focus. Accordingly, much of the neoclassical literature, presented in section 2.1, centers on the importance of the factors included in the most simplistic specifications of these models: capital, labor and technology. The function is given below:

$$Y(t) = F[K(t) + L(t) + T(t)]$$

Where $Y(t)$ is the aggregate output produced at time t, $K(t)$ is capital, $L(t)$ is labor and $T(t)$ is technology or knowledge. Capital in this sense was meant as

physical capital, not as it is commonly used today in an AK model, as either physical or human capital. Further, following the assumption of a closed economy (no purchasing or selling of goods abroad), and with no government spending, all of the output from the above equation is either consumed or invested, modeled accordingly:

$$Y(t) = C(t) + I(t)$$

If consumption is subtracted from the right side of the equation and moved to the left, and we assume that in this closed economy example that output equals income, the model yields:

$$I(t) = Y(t) - C(t)$$

This result implies that the amount of income not used for consumption is exactly equal to the amount of income dedicated to investment (also understood as savings). Therefore, it was reasonably assumed that savings alone was a critically important determinant for the level of physical capital investment undertaken. Unsurprisingly, physical capital was then emphasized to be the principal driver of economic growth. Accordingly, many of the theories explaining the linkages between inequality and growth are examined through an antiquated theoretical lens that considers too few factors in the determination of an economy's growth level. However, considering the above reasoning, centering economic growth analysis on investment rates in physical capital seems logical; although, the unfortunate implication is a myopic dissection of a complex matter, leading to commensurately deficient and often misleading conclusions.

Although due credit is given to these pioneering modeling techniques, the majority of the current study's coverage focuses on the renaissance which growth theory has experienced since the end of the 1980s, beginning most notably with Paul Romer's (1986) introduction of endogenous growth modeling. Given that nearly all of the contemporary work dwells on these fundamentals, it seems logical to dedicate the majority of our research to these techniques, and likewise focus the applied sections in their tradition.

Of the numerous stories regarding high performing developing

economies, there may not exist another more dynamic and intriguing than the experience observed for India. The abovementioned endogenous growth modeling techniques have been applied to economies of all sorts and types, both within and across countries. Although many studies do exist either including rich countries or exclusively studying wealthier regions, it seems that a disproportionately large amount of focus seems to be given to developing economies. As India is still in a stage of economic development, and considering its emergence as one of the world's fastest growing countries, it has received a substantial amount of this attention. Further, it serves as an opportune setting for a decomposition of the income inequality and economic growth experience, among many other reasons, for better than average data availability, with comparison to other developing countries. Our hope is to examine the case of India in order to extract potentially useful conclusions and lessons that could potentially be applied to all developing economies.

India has experienced tremendous advances in economic growth and prosperity since its independence in 1947; these developments have brought about a new era of economic sophistication and progress. Their economy to date can be characterized by: a high prevalence of technology based industries, a trend towards the development of increasingly sophisticated sectors, such as knowledge-based exports (which include service exports) and consistent, strong annual GDP growth.

Although India has been able to achieve astounding levels of economic success with its developmental plans, it is equally relevant to highlight the fact that India's growth, and its inherent wealth benefits, have been confined and experienced by a relative few. The implication of this inequality is the prevention of millions of Indians from being implemented and introduced into the economy in a meaningful and economically productive way. Further, this inefficiency also carries with it serious concerns and repercussions for the Indian people. As the economy develops and the increases in living standards afforded by the economic prosperity are not shared in an acceptably equitable fashion, the result is the condemnation of hundreds of millions of Indians remaining in a cycle of abject poverty. These populations of impoverished Indians habitually lack the structural necessities and resources to participate

fully and meaningfully in the rapidly modernizing Indian economy, almost guaranteeing their inability to emerge from this problematic cycle.

Factors that have contributed significantly to the base issues of income inequality and prevalence of poverty, and that further continue to compound and exacerbate them, are the challenging issues of low overall educational achievement by the poor, shortages of basic natural resources (clean water, subsistence agricultural goods, etc.), the world's second largest population at approximately 1.2 billion and a perpetually high level of population growth.

To be sure, India as a whole has a host of especially troubling concerns that still lie ahead; however, a topic less frequently studied is the challenging issue of cross-state heterogeneity in growth levels and resulting income inequality. Indeed, some Indian states have been tremendously successful both with respect to aggregate economic growth and with regard to the distribution of that growth. Unfortunately, that same experience cannot be claimed to have been the case for all states; in fact, some states have both floundered with respect to achieving higher levels of economic growth, and simultaneously experienced little or no progress towards a more egalitarian distribution of income. Research into the links between the distinct growth and inequality experiences observed in various Indian states can serve as a first step towards remedying this matter.

Ahluwalia (2000) begins his discussion of Indian state-wise inequality by acknowledging the well-known fact that data for Indian state-wise aggregate output suffer from a lack of consistency and comparability with national accounts statistics, thus implying there are likely data quality issues surrounding these state-wise observations. Similarly, it has been widely recognized that the field of developmental economics in general typically suffers from data inadequacies (Barro (2000)), but nonetheless research may still be realized with what data does exist. This scenario is a fitting depiction for the case of a state-wise examination of Indian income inequality and economic growth.

Despite these drawbacks, the strength of this type of analysis is that the familiar omitted variable issue, arising from exceptionally distinct conditions that could not possibly be controlled for in a cross-country regression, should

theoretically be muted. This issue is often cited as corrupting the conclusions made by cross-country regression studies of economic growth and income inequality. Within the context of all observations being taken from one single country, albeit amongst distinct and quite heterogeneous state governments, the effect of the omitted variable issue should be at least diminished, if not mostly eliminated. It can be reasonably assumed that cross-state differences would be less pronounced than cross-country differences for growth and inequality analysis, despite the existence of heterogeneity in the individual and unique state governments. Our hope is that, perhaps by undertaking this method of analysis, more meaningful and accurate links can be uncovered between growth and inequality.

The main body of the dissertation will begin with a concise introduction into the literature, including both the theoretical and empirical links between income inequality and economic growth, followed by a brief summary of the overall recent economic history of India. Following, we proceed with India specific areas of study, beginning logically with an orienting section discussing only the national experience, including an applied empirical section discussing the overall experience of India. The remainder of the research focuses on the sub-national level, specifically across a selection of India's most populous and economically relevant states[3]. Overall, this state-wise dissection represents the largest interest of our current study. As stated, various authors researching in this ambit have highlighted the fact that national accounts data and state-wise data, including comparability between individual states' figures, may not be perfectly comparable, neither among themselves neither with national accounts. This factor should be kept in mind when attempting comparisons of studies, such as this current work, and other more nationally focused research. Among other areas of coverage, the state-wise analysis will use publicly available data in an attempt to track the relationships between growth and inequality within the country, the differences that may be responsible for causing such relationships, and also an investigation into the existence of either convergence or divergence

[3] Most state-wise studies of India select between 14 and 16 of the most populous Indian states/union territories due to data availability and other considerations, see: Sachs, Bajpai & Ramiah (2002), Ravallion & Datt (2001), Ahluwalia (2000)

among individual states.

2.0 REVIEW OF LITERATURE

The effect of income inequality on economic growth has been a widely debated topic over the long history of economic thought specifically applied to this theoretical and empirical question; to date, an absolute ruling on whether or not inequality impedes or augments economic growth has yet to be established. Sophisticated econometric analysis has been undertaken and the empirical results obtained, yet a clear and robust channel through which the two variables are related remains an important but unanswered question among prominent economists. It should remain clear that our research discusses the relationship of income inequality affecting economic growth, and not the reverse. Although empirical literature does exist this reverse, namely the effect growth has on inequality, we focus our study on inequality's effect on growth.

Through casual observation, we seem to advance very little in identifying an absolute ruling on the relationship. An example of this uncertainty could be represented by the fact that many Northern European countries have consistently achieved commendable economic growth and development, all the while maintaining a very egalitarian distribution of income. Meanwhile, the United States has likewise grown quite robustly, but has been defined by significantly higher levels of income inequality. These conflicting examples indicate that both high and low levels of income inequality can allow for subsequent high growth rates. Common case study examples, used as introductions in well-known reviews of the inequality and growth literature (Benabou (1996) & Aghion, Caroli & García-Peñalosa (1999)), however do seem to present some isolated yet relatively straightforward conclusions regarding the relationship between inequality and growth[4].

Research into the process of economic growth can be traced back all the way to, as mentioned in an expansive review by Barro & Sala-i-Martin (2004),

[4] See section 2.4 for relevant material on case studies concerning inequality and growth.

the influential works of authors such as: Adam Smith (1776), David Ricardo (1817), Thomas Malthus (1798), Frank Ramsey (1928), Allyn Young (1928), Frank Knight (1944) and Joseph Schumpeter (1911); however it would not be until much later that income inequality would emerge as a dominant factor within the growth literature. After Kuznets's (1955) famous presentation of his inverted 'U' hypothesis, describing the intertemporal evolution of income inequality with respect to economic growth, the topic dramatically gained in importance and future research proliferated. Generally, the Kuznets hypothesis can be summarized by mentioning that economies at low levels of development will be defined by increasing levels of income inequality, although once a certain level of economic development is achieved, it is assumed that the economy's income inequality will begin to decrease. His comments on this evolutionary relationship held true for the experiences of the United States as well as for many of the OECD nations; however, beginning in the 1970s, his theory began to experience opposition (Adelman & Morris (1973)). During most of the 20th century, these advanced economies appeared to exhibit trends consistent with the Kuznets hypothesis. Specifically, the countries were defined by a trend towards decreased inequality, which had then lead to increased growth, and that increased growth further lead to diminished inequality. However, beginning in the 1980s, this trend seems to have rapidly reversed. Evidence from both the United Kingdom and the United States show this reversal quite clearly: the ratio given by the top 90% to the bottom 10% of the male wage distribution increased 27% in the United Kingdom and 18% in the United States. Nonetheless, around the same time, since the 1970s, Germany has maintained a nearly constant level of income inequality, while France, Italy and Canada have all experienced decreases. As a result of this unpredictable behavior regarding income inequality, the Kuznets hypothesis, and inequality literature in general, has been affected significantly from the resultant uncertainty.

Although the general consensus is that there is no consensus, some trends and empirical regularities do appear to exist. Knowles (2001) mentions the classical belief that higher levels of income inequality can be hypothesized to decrease economic growth in subsequent periods by way of redistributive policies that distort accumulation incentives. Assuming that a progressive tax

rate is to be undertaken to achieve a redistribution of an excessively unequal income allotment, it can reasonably be assumed that incentives to invest and work hard, for individual benefits and the goal of income accumulation, would be diminished. Further, this type of redistributive policy tends to disproportionately affect higher income individuals, whom also are assumed to have a comparatively higher level of savings; and therefore, aggregate savings are also diminished, justifying further the assumed negative impact on economic growth.

Other findings, such as the idea that inequality tends to be negatively correlated with growth in poorer nations while directly related with growth in wealthier countries (Barro (2000)) has been put forward; however, Perotti (1996) finds support for the idea that this negative relationship may not be statistically significant for poor countries. The popular Kuznets inverted 'U' Hypothesis was long ago presented as a means to explain income inequality's tendency to increase at the beginning of an industrialization or developmental period, only to later diminish as the economy matures. Further, it has been postulated that short run and long run relationships between inequality and growth may be distinct. Knowles (2001) provides an adequate commentary on this phenomenon: Li & Zou (1998), Forbes (2000), and Deininger & Olinto (2000) test the short run relationship between income inequality and growth, and their findings yield a positive partial correlation between the two variables (these authors use panel periods of five years to test the short run relationship). Conversely, Knowles (2001) points out that authors testing the same relationship over the long run find the opposite result, a negative partial correlation: Alesina & Rodrik (1994), Birdsall, Ross & Sabot (1995), Sylwester (2000) and Easterly (2000)[5]. As a result of many differing research methodologies that exhibit distinct inclusions and exclusions in cross-country sample selections, or other assorted sources leading to divergent results, and further the resultant dispute among authors, even these general comments have yet to be determined as irrefutable. However, if an over-arching trend

[5] These studies use a somewhat heterogeneous research methodology regarding the window of observation; it typically spans approximately 25 years and includes a relatively expansive, yet variable, selection of countries.

must be named, it would need to be that the most robust empirical result has been a long run negative relationship between income inequality and economic growth.

Aside from this broad commentary on a sampling of various contentious findings in the inequality and growth literature, a handful of generally agreed upon theoretical channels establishing links between income inequality and economic growth are presented. Despite the disaccord regarding the empirical findings and resultant ambiguity, these abstract channels have been widely acknowledged by a multitude of authors researching in this ambit, and appear most frequently in the literature. Barro (2000) underlines this point by explicitly stating that a wide array of theories have been put forth in an attempt to explain inequality's effect on growth; however, he mentions the tendency in the literature to highlight four main theoretical channels through which inequality conjecturally negatively influences economic growth: credit market imperfections (precipitating an inability on behalf of the poor to undertake productive and efficient levels of investments, particularly human capital investment), political economy (damaging and unproductive redistributive tax policy), sociopolitical unrest (volatility and instability), and savings rates (diminished savings rates by the rich resulting from redistributive tax policies and distorted incentives). Knowles (2001) puts forth an additional channel related to the inequality and human capital investment effect. He claims that as income inequality rises, it is likely that fertility will increase in response to the heightened inequality. This rise in fertility would then be expected to cause diminished levels of human capital investment, thereby presumably decreasing economic growth.

These channels are theorized to be principally related to the evolution of income inequality, and its consequent effects on aggregate output. Two well recognized publications provide an expansive literature review of these and other traditional theoretical arguments for the macroeconomic relationships between inequality and growth: Aghion, Caroli & García-Peñalosa (1999) and Benabou (1996). The reading of these two influential articles has greatly facilitated much of the subsequent review of the theoretical and empirical literature, along with the framing of our eventual applied studies for the case of

India.

2.1 CLASSIC ASSUMPTIONS

Before the development of the endogenous growth modeling techniques popularized at the end of the 1980s, most notably beginning with Paul Romer (1986), economists overwhelmingly tended to over simplify the growth process, choosing to focus heavily on the importance of investment in physical capital with regard to their modeling of economic growth. This myopic analysis of the undeniably dynamic process of economic growth implied ignoring factors presently seen as tremendously influential in the developmental process. For example, factors such as: technological progress, research and development efforts, human capital and governmental policies were treated as exogenous from the model, and accordingly were not considered. This historical propensity to aggrandize the effect of investment in physical capital, while implicitly ignoring other factors that presumably play a significant role in the growth process, naturally leads to economic theories with an inappropriately high inclination to underline the importance of savings, investment and accumulation of physical capital goods, while neglecting many of the relationships valued in today's econometric models. Accordingly, these outdated theories popularized by past economic literature, although consistent with results and the prevailing trends of their time, predicted a positive relationship between income inequality and economic growth. The premise was based on the principle that the greater the income inequality, the greater would be the concentration of wealth; given that these beginning theories invariably predicted that larger concentrations of wealth encouraged greater savings and the subsequent large capital investments conducive to higher growth, greater inequality should then naturally lead to higher economic growth rates.

At continuation, Nicholas Kaldor's (1956) savings hypothesis, the indivisibility of investment, and reduced incentive considerations are presented

as the main theoretical channels through which economists typically assumed this positive link between income inequality and economic growth flowed. The seminal work from Aghion, Caroli & García-Peñalosa (1999) begins by asserting this neoclassical observation: in a market economy, the existence of income inequality ought to promote higher levels of economic growth. Naturally, the authors acknowledge the capability of this theoretical preference towards inequality, with the end goal of achieving the maximum level of growth efficiency, to likely harm the seemingly noble cause of pursuing a more egalitarian society and insurance goals.

2.1.1 SAVINGS & KALDOR HYPOTHESIS

The Kaldor (1956) hypothesis regarding savings was formulated in a period of economic thought and research very distinct from the current environment. The prevailing theories concerning economic growth were characterized by an exaggerated emphasis on savings and investment in physical capital. As this was the historical reality within which these related theories were formulated, the predicted direct relationship between income inequality and economic growth, which happens to conflict with the relatively robust inverse relationship commonly discussed today, follows logically and conforms to conventional economic thought of that time.

The Kaldor hypothesis claims that the rich have a higher marginal propensity to save relative to the poor, given that the rich should theoretically dedicate a much smaller portion of their income to consumption, and are therefore able and likely to save a relatively higher amount relative to lower income individuals. If higher levels of savings positively affect economic output[6], then under these conditions more unequal societies should be

[6] See Keynes *General Theory of Employment, Interest, and Money (1936)* for a discussion of the positive effects of savings and investment on an economy's aggregate output.

expected to grow more rapidly as a result of higher levels of aggregate savings, on behalf of the rich. The authors Joseph Stiglitz (1969) and François Bourguignon (1981) used the Solow model and AK production function, respectively, to confirm the existence of this hypothesis and to illustrate that higher levels of inequality indeed yield higher growth by way of augmented savings levels.

2.1.2 INDIVISIBILITY OF INVESTMENT

After the presentation of the Kaldor hypothesis, the indivisibility of investment theory follows as a related abstract channel through which a positive relationship between inequality and growth is established. This theory is constructed on the grounds that, with the absence of model capital markets, large concentrations of wealth must be in existence to fund large investment projects, which represent a sizeable sunk cost. Therefore, heavy centralization and concentration of wealth must be present to accomplish this type of investment. From this view, it can be assumed that higher levels of income inequality would fuel this type of investment, given that as the income distribution is further displaced towards the rich, the more concentrated will be the wealth, and subsequently the large sunk costs of investment in physical capital will be more feasible, which ultimately was assumed to yield higher rates of economic growth. The critical assumption of the indivisibility of investment theory is that credit markets are not perfect, and therefore economic agents cannot secure finances through any other means than their own. Given this restriction on access to capital, the theory of indivisibility of investment follows logically and greater concentration of wealth would be seen as a positive influence on economic growth.

2.1.3 REDUCED INCENTIVES

Finally, the last abstract used to establish a positive link between income inequality and economic growth relates to incentives[7]. The fundamental argument stems from the idea that there exists a balance between maximization of economic efficiency and social justice. Naturally, the trade-off between achieving the highest possible growth rate and providing a more egalitarian distribution of income implies a discussion about redistributive efforts. Redistribution is assumed to negatively affect economic growth in two ways. First, it directly lowers the differences in income and wealth, leading to lower growth rates, given the theories, which we have just summarized in the Kaldor hypothesis and indivisibility of investment theory (establishing a positive relationship between higher income inequality and economic growth rate). Secondly, redistribution funded by income taxes precipitates decreased incentives to accumulate wealth and invest, which we also assume leads to slower economic growth by way of the same principles. Aghion et al. (1999) use a Ramsey-Cass-Koopmans growth model[8], assuming perfect capital markets, to demonstrate the phenomenon of taxes leading to lowered incentives to invest. Their illustration proves that greater taxation reduces returns to saving, which subsequently lowers the incentive to accumulate capital and invest. Accordingly, as stated earlier, these assumptions would lead to the conclusion that there is a clear trade-off between economic efficiency (highest possible economic growth rates) and social justice (greater income equality)[9]. According to this argument, the implied notion is that income inequality in itself is a necessary evil for the promotion of the most efficient levels of aggregate economic output. Further, redistributive efforts are seen as doubly damaging, leading to a general consensus, at the time, that income inequality was good for growth, and any steps taken to correct it were harmful for economic growth rates.

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[7] See James Mirrlees (1971) for a more in-depth discussion of incentive considerations.
[8] See page 1620 of Aghion et al. (1999) for full coverage.
[9] See Arthur Okun's (1975) book *Equity and Efficiency: The Big Tradeoff* for more information.

Taken altogether, these classical theories assumed that high levels of income inequality positively influence economic growth. Mainly, this notion is established through the idea that savings and investment channels are the most important factors in determining economic growth rates, while many other macroeconomic variables commonly studied today, were determined to be exogenous to the model. Given the assumption that concentrated wealth favors savings and investment, higher income inequality naturally follows as a positive feature for improved economic growth. Accordingly, redistribution was cast in an especially unfavorable light, clearly due to its presumed doubly negative effect on economic growth. First, redistribution's effects would directly reduce the income disparity (remembering that the assumption was, ceteris paribus, higher aggregate levels of income inequality created the favorable environment necessary for the heavy investment in physical capital seen as essential for economic growth). Secondly, assuming that redistribution was financed by tax revenue, it was predicted to further decrease economic growth through distortions in the incentive channel to accumulate wealth, save and invest in capital goods promoting growth. Ultimately, a clear understanding of the history surrounding the notion that income inequality was fundamentally beneficial for an economy aids in one's ability to comprehend and make sense of the early literature's preference for higher income inequality.

However, much of the contemporary research calls these classical theories, establishing a positive relationship between income inequality and economic growth, into question. Recently, ample empirical investigation has been published indicating strong evidence finding the existence of an inverse relationship between income inequality and economic growth. This finding has lead to the discrediting of the belief that income inequality is fundamentally good for economic growth. The following section documents this contemporary inverse relationship and the main channels through which it is presumed to flow.

2.2 CONTEMPORARY INVERSE RELATIONSHIP

The theoretical notion that income inequality tends to strengthen economic growth has recently been disputed by a multitude of authors' empirical analysis results. These results provide evidence for the existence of an inverse relationship, rather than the direct relationship between income inequality and economic growth assumed by the classical models. Few authors have been able to produce empirical research yielding an outcome supporting the classically predicted direct relationship, (for authors that find a direct relationship, see: Kristen Forbes (2000) or Li, Squire & Zou (1998)). Although relatively few authors find an explicitly positive relationship, some studies have found that the link between the two variables changes according to income levels. For example, Barro (2000) reports that inequality negatively impacts growth and investment for poor countries, while in rich countries the relationship is positive. Deininger & Squire (1998) also support this finding, stating that initial inequality reduces income growth for poor, but not for rich countries.

Although an important field in economic research for many decades, around the end of the 1980s and beginning of the 1990s there was an important resurgence in awareness for research concerning the relationship between inequality and growth through the contemporaneous popularization of endogenous growth modeling techniques. The empirical results from this type of research have been rather clear: initial income inequality seems to negatively impact subsequent periods' economic growth[10]. A more detailed discussion of some of the pioneers in this field, and most influential articles published, could begin with Alesina & Rodrik (1994). Their research finds that for the period 1960-1985 both measurements of initial land inequality and income inequality are negatively correlated with economic growth. In a similarly focused investigation, Persson & Tabellini (1994) find that income equality[11] over the

[10] Among the many research papers focused on this topic, a sampling of some of the most widely cited studies reaching this conclusion are: Alesina & Rodrik (1994), Benhabib & Spiegel (1994), Bourguignon (1994), Clarke (1992), Deininger & Squire (1995), Keefer & Knack (2002), Perotti (1992, 1994, 1996), (1993) & (1996); Persson & Tabellini (1992, 1994)

[11] The authors select the third income quintile to represent the middle class, and thus a

same period of time, 1960-1985, is positively linked with aggregate economic growth. Both Alesina & Rodrik (1994) and Persson & Tabellini (1994) find their results to be robust and to remain statistically significant with the introduction of other control variables suggested by the literature to play a significant role with respect to growth determination. Given the classical theoretical models establishing that income inequality ought to increase subsequent economic growth, the conflicting evidence provided by a considerable number of authors presents a significant obstacle for the deduction of a clear and true relationship between income inequality and economic growth.

In fact, Michael Todaro (2000) in the seventh edition of his textbook "Economic Development" claims there are five main factors that may explain why greater equality conjecturally would improve growth prospects in developing countries[12]:

> (1) Widespread inequality can limit the poor's ability to access credit and finance their offspring's education; as a result, the parents have many children as an antiquated means of protecting their financial security in old-age, and thereby cause per capita growth to be diminished and create unnecessarily large amounts of stress that could potentially overwhelm the federal government, as a result of such intense population growth. This outcome is contrasted with a scenario defined by greater equality of incomes, and of access to credit markets, yielding less need for poor families to increase family size in an effort to obtain financial security. Consequently, far less explosive population growth would be observed; therefore, the federal government and economy as a whole would enjoy far less stress on its limited means, leading to more stability and greater long-term success.

> (2) Large concentrations of wealth in poor countries do not tend to yield

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representative metric for equality.

[12] These arguments are presented on pages 182-183.

the expected re-investment or savings benefits predicted by the classical theories presented under section 2.1, the Kaldor hypothesis and the theory of indivisibility of savings. Empirical results show that wealthy individuals in poor countries tend to spend a large majority of their saved incomes on imported goods, and realize investments in foreign countries (capital flight); therefore, their wealth is not contributing in a significant way to the furtherance of their own domestic economy. In fact, it is in a way siphoning potential domestic investment, and spending it abroad (low domestic savings rate) on goods and services that have little or no return for the domestic economy. Therefore, in the case of developing economies, many times the wealthy are not using their substantial incomes (savings) to further (invest in) their own economies. Naturally, the argument that greater income inequality theoretically should promote the rich to invest greater levels of their wealth (as a result of having a substantially higher level of income and subsequently savings), thereby promoting economic growth, may not apply to the setting of developing economies.

(3) As the rich have a tendency to demand non-domestically produced goods, and siphon investment out of the domestic context, the poor have an equally strong propensity to demand locally produced goods. Therefore, greater equality is likely to incite a stimulus for local consumption of goods, and subsequently the local production of such goods to meet this increased demand. From both the increased demand and ensuing supply response, the domestic economy is boosted through channels such as: local employment, local investment and conjecturally a greater availability and abundance of necessity products.

(4) Low income levels and the associated low overall standards of living contribute to the overall health and wellness of the poor population in a developing nation. These factors are assumed to negatively affect overall economic productivity. Given that physical ailments or any other

impediment stemming from unacceptably low health standards will affect a workers ability to effectively produce, we can reasonably assume this could indirectly lead to a slower growing economy. Greater income equality would then presumably increase overall productivity and efficiency byway of an overall increase in general healthiness and the well being of the poorer population.

(5) High levels of income inequality can create psychological disincentives to meaningfully participate in the economy, and result in an overall rejection by the masses of frustrated and dejected citizens to wish to contribute. Contrarily, individuals and the economy as a whole can gain from increased equality by the promotion of feelings associated with greater inclusion, by diminishing the poor's sentiment of a disconnect with the goals of the federal or state governments and of feeling that they are being exploited or neglected by the elite classes.

These general remarks about inequality's theorized negative impact on economic growth provoke a natural curiosity for the investigation into redistribution's affect on growth. Accordingly, Easterly & Rebelo (1993) research the effects of redistributive governmental fiscal policy on aggregate growth. They study the marginal tax rate, average tax rate, and social spending in the context of both developed and developing nations. Their results yield evidence in support of the notion that more equality produces higher levels of growth. Aghion, Caroli & García-Peñalosa (1999) go on to mention the contribution of Perotti (1996) to this similar line of research. He investigates the nature of fiscal policies, and more specifically finds evidence that the redistributive effects of the marginal tax rate have a statistically significant and positive impact on economic growth. Finally, Aghion, Caroli & García-Peñalosa (1999) acknowledge the findings of the World Bank's (1993) article "The East Asian Miracle" that redistributive policies allocating land assets and provision of access to an education through governmental reforms seem to have been an integral part in the promotion of economic growth in East Asia. Despite the

existence of a potentially infinite list of justifications for why elevated levels of income inequality may harm economic growth, the following sections attempt to highlight those that appear most frequently in the literature.

2.2.1 POLITICAL ECONOMY

Principally important to the discussion of the contemporary inverse relationship between income inequality and economic growth is the aspect of political economy. It is difficult to argue against the potential importance of this factor given that a country's political regime controls the power to enact economic policy; thusly, the political economy theory discusses a key dynamic concerning the management of both economic growth and income inequality. Typically, marked disparities in the distribution of income are combated through a variety of redistributive channels (transfer payments, health expenditure programs, educational expenditure programs, etc.), with final decisions being discussed and deliberated on by political bodies. However, the fact that political interests, voting and occasionally corrupt practices are intertwined in the efficient management of income inequality and economic growth policy, makes the political economy theory an especially unique and interesting lens through which we can view the relationships between income inequality and economic growth.

Redistribution clearly affects ex-post income inequality, assumedly through the reallocation of resources (by way of taxes funding expenditure programs or explicit transfer payments) from rich to poor, and as a result of this reallocation, the economic growth rate is also affected by way of distortions in incentive channels. It should follow logically that the prevailing level of income inequality exerts an important effect on the redistributive preferences of an economy (assuming that individuals are able to vote or influence the selection of their preferred tax policy). This implies a dynamic whereby the ex-ante level of income inequality is assumed to determine the redistributive tastes for the

eventual redistribution (societies characterized by high levels of income inequality would be assumed to prefer commensurately high levels of redistribution, while the opposite would be true, where highly egalitarian societies would be in favor of comparatively lower levels of reallocation) and thusly the ex-post income distribution. This dynamic in turn affects the rate of economic growth by way of modifying the extant incentive channels; assuming that heightened efforts at redistribution negatively impact the incentives to accumulate wealth or invest large amounts of time or capital into the economy (leading to productive economic expansion), a lower growth rate would be predicted. If redistribution's ex-post effects, through the abovementioned dynamic, were assumed to negatively impact economic growth, then it would also follow logically that heightened ex-ante income inequality would theoretically lead to dampened ex-post economic growth rates (after a redistribution of income had occurred). Given the fact that political bodies are the decision makers behind economic policy, the political economy theory has commanded a substantial amount of the economic literature discussing and analyzing the relationships between income inequality and economic growth.

However, Barro (2000) mentions that this supposed relationship only exists for economies where political power is distributed equally, and where greater economic importance does not mean greater political influence. In a corrupt political system, higher ex-ante income inequality may not necessarily be positively linked with subsequent higher redistribution. Naturally then, this higher ex-ante income inequality would not have caused lower ex-post economic growth rates, given that significant redistribution would not have occurred as a result of the inability of the poor to successfully impose their preferred efforts towards heightened redistribution. Although, he mentions that even in situations where no actual redistributive measures are undertaken, higher income inequality may still precipitate lower economic growth rates through the political system. In instances where the wealthier class uses its economic influence to block redistributive measures (through vote-buying, lobbying or other corrupt measures) it can be assumed that these under-handed practices, in and of themselves, waste resources and promote dishonesty within the economic unit. Ultimately, a furtherance of these trends leads to the same

outcome of lower economic growth. Indeed, achieving overall lower levels of growth, achieving no redistributive efforts to promote social welfare, all the while only squandering resources through corruption, seems to be a losing scenario for all.

The theoretical explanations linking the effects derived from the political economy model to income inequality are vast. The fundamental notion relates the two by assuming higher ex-ante income inequality provokes stronger incentives for the government to enact redistributive policies. Alesina & Rodrik (1994) discuss the wide variety of forms which redistributive policy can take: a progressive income tax system, minimum wage laws, imposition of trade and capital restrictions, or by a broad category of government expenditure plans. Further, a review of this literature is undertaken in Benabou (1996), where even more avenues are presented: health, housing, education, social security, welfare, and transfer payments. The potential list of redistributive channels is endless, and a compilation of an exhaustive list is unnecessary; the conclusion with all of them is that they result from higher levels of ex-ante income inequality, they cause distortions in the incentive channels related to the economy, and as a result of the distortions they precipitate reductions in the ex-post economic growth rate.

The political economy theories typically draw heavily on the 'median-voter' theorem. This theory presents the basic political economy argument, relating the prevailing distribution of income with future economic growth prospects. Principally, this theory supposes that as the distribution of income becomes increasingly unequal, or as the income of the median-voter decreases with respect to the national average, there will be increasing pressure on the federal government to enact more redistributive tax policies to alleviate this elevated prevalence of income inequality. Following Benabou (1996), a redistribution of income by way of increased tax rates should lead to lower aggregate investment. This dynamic precipitated by the increased taxes rates, as elaborated by Persson and Tabellini (1994), ought to act as a negative incentive for the pursuit of productive economic activities as individuals will perceive a relatively lower potential return from their investments, capital and otherwise, in contrast to what would be expected under a comparatively less

redistributive tax structure. Predictably, Benabou (1996) asserts that this notion of an inverse relationship with redistributive policy and ex-post economic growth tends to vary in function of the degree of capitalist sentiment in the political mechanism responsible for agreeing on policy decisions. Accordingly, in his empirical work he discovers that in more democratic or liberal societies, ex-ante income inequality tends to have a more harshly negative effect on economic growth (relatively income inequality intolerant), whereas in more conservative capitalist-oriented regimes, ex-ante income inequality issues tend to have a comparatively less severe impact on economic growth (relatively income inequality tolerant).

This discovery would accord with logic and generally understand principals regarding especially liberal and conservative political regimes. Specifically, the effect documented by Benabou (1996) could be due to the idea that in more liberal societies a greater propensity to adopt and accept social welfare expenditure programs prevails; in contrast, highly conservative political environments (capitalist countries) are much less likely to implement generous redistributive efforts, given their more individualistic and harsh attitudes towards those that are unable to fend for themselves. As such, we can extend the findings of Benabou (1996) concerning liberal and conservative societies' tolerance towards ex-ante income inequality to understand that the inclination to establish redistributive efforts are in fact what determine the effects on ex-post economic growth. If liberal countries are more likely to undertake redistributive efforts to combat an unbalanced ex-ante income distribution, then they will be more likely to suffer from the ills of presumed decreases in ex-post economic growth; alternatively, conservative or capitalist societies will be less prone to dampened ex-post economic growth given that their attitudes will expectedly lead them to undertake comparatively less of the assumed damaging distribution of ex-ante income inequality.

2.2.2 IMPERFECT CREDIT MARKETS

Another central theme in the contemporary inverse relationship theory relates to the inefficient level of investment-undertaken resultant of imperfect credit markets. Models constructed in the neoclassical tradition predict that aggregate economic output (economic growth) is dependent on the aggregate stock of capital. These theories depend critically on the assumption of perfect capital markets. This utopian assumption implies that all worthwhile endeavors receive appropriate funding, and all individuals have sufficient capital resources to undertake their desired level of investment. A significant divergence from this model specification comes from the innovative modification presented by Joseph Stiglitz (1969), which breaks from tradition and introduces the assumption of imperfect capital markets. When imperfections in credit markets are introduced, individuals must rely on their own financial reserves to finance their economic investments, or use collateral to ensure loans taken from lending institutions to advance such endeavors. For those individuals that have neither their own financial resources nor collateral to secure credit, their ability to undertake their ideal level of investment is obviously compromised. Given that the aggregate output of an economy essentially depends on the separate efforts of each individual's own contribution, and if those efforts cannot be maximized given capital market constraints, aggregate output is thereby decreased when individual efficiency is not maximized. Accordingly, and under the assumption of imperfect capital markets, the distribution of wealth becomes a key determinant in the level of investment an individual can realize, and further, the potential level of growth an economy can achieve.

Benabou (1996) lays out a model for credit market imperfections to explain the consequences of an unequal asset distribution, namely the impact on access to the credit market. In a basic sense, an individual who has been born within the context of a low income family, and therefore has little or no inheritance, nor any significant accumulation of valuable assets, will be unable to access credit markets to undertake an efficient level of investment. Accordingly, this inability to achieve an efficient level of productive investment

subtracts from potential aggregate economic growth, naturally leading to the conclusion that an alleviation of these credit market restraints would theoretically precipitate higher levels of economic growth. This credit market inefficiency dilemma has been well documented in the theoretical literature (Benabou (1996)), and also has been tested in the empirical research. Galor and Zeira (1993) have created a well-respected and often cited model that documents this credit market inefficiency with regard to investment in human capital.

Galor and Zeira's (1993) model comes from a series of assumptions, the two starting points are: that credit markets are imperfect, and the second assumption being that investment in human capital is indivisible. From those initial conditions, the notion of wealth inheritance is presented. An individual is said to either be of a rich or poor family, leaving him or her with either a large or small, respectively, level of inheritance. Other than this exogenously determined bequest, individuals are assumed to be homogenous in all other regards[13]. Next, it is assumed that each economic agent will live for two periods. As a result of this predetermined inheritance, an individual will either be capable of the undertaking of human capital investment in the first period, and subsequently will be able to work as a skilled laborer in the second period, or, as a result of insufficient funding, he or she will be forced to forego human capital investment and will work as an unskilled laborer in both the first and second period.

According to these model specifications, individuals who were able to access education will garner a higher wage, while those forced to forego capital investments will logically earn an inferior wage. Next, in the second period of life, both groups' individuals consume and leave an inheritance, (corresponding to their second period income level) for the next generation of their family to utilize for capital investment. It is assumed that educated individuals who earned a higher wage in their second period of life will be capable of leaving an adequately large bequest for their offspring's future human capital investment.

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[13] This assumption implies that there is no inherited intelligence level, nor any other qualifier to complicate the determination of an individual's educational attainment; educational attainment is purely determined by the lack or existence of monetary resources, see Becker (1975)

On the other hand, the unskilled laborers will have earned an insufficiently large sum to provide the same luxury of human capital investment for their family's next generation, thereby determining that their offspring shall likewise be unable to access education.

Aside from the obvious short-run single generation implications, the authors stress the notion that the eventual distribution of wealth is essentially a perpetuation of the initial distribution, which left unchecked, and according to these abstract specifications, would theoretically continue ceaselessly. Individuals that are born within the context of a family characterized by a sufficiently large inheritance will consequently achieve skilled laborer status; later, they will go on to work as a skilled laborer and leave a large inheritance for their children, who will then have the same opportunities for investment in human capital and skilled labor employment that their parents had[14]. Correspondingly, unskilled laborers will earn an insufficient amount of income to be able to leave a sufficiently large inheritance to afford their next generation of children the opportunity to invest in human capital, which will lead to the continuation of an uneducated and unskilled labor force dynasty. The authors conclude then that initial wealth distribution carries with it both short run as well as longer-term ramifications. Clearly, the initial distribution of wealth is a key component for the determination of both the short and long run equilibrium human capital investment level.

After having viewed the theoretical discussion regarding individuals' inability to invest in an efficient level of capital as a result of income restraints and imperfect credit markets, we are naturally led to an interest and inquiry into the overall effects of credit markets and the financial system on the economy as a whole. Related to imperfect credit markets, financial systems in general possess the potential to transmit strong transformations in the alleviation of severe and perpetuating income inequality, improvements in economic efficiency, and ultimately in economic growth prospects.

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[14] It can be reasonably assumed that individuals fortunate enough to achieve higher levels of education, and subsequently employment as a skilled laborer, will earn a higher income, and will therefore be able to leave a large inheritance for their children.

Since the fundamental work of Schumpeter (1911), the idea that financial systems can help promote economic development has been widely debated and occasionally discussed in the literature. Levine (1997) documents some varying opinions regarding the topic of finance and growth; he notes that it has historically been labeled as everything from irrelevant and unimportant, to a critically important piece of the growth puzzle. Within the ambit of developmental economics, many times the subject is completely omitted from the research; Levine (1997) mentions that a review of development economics by Nicholas Stern (1989) does not even mention the issue once, not even in a section that acknowledges potentially relevant omitted topics! These comments provide a general idea on the often-contentious role played by financial systems in the explanation of economic growth, and consequently, of income inequality levels.

Despite the significant disagreement surrounding the relevance of the financial development and economic growth relationship, the theory is that with the implementation of a formalized structure for the allocation and facilitation of funding, economic development could progress at an accelerated pace, as compared to an arrangement lacking such financial infrastructure, leading to a less efficient aggregate investment level. A complete listing of the transactions and operations included in this discussion of financial system sophistication are nicely summarized in the opening paragraph of a seminal article published by King & Levine (1992):

> Financial institutions such as central banks, regional and local banks, mutual funds, investment banks, and brokerage houses use a variety of financial instruments (currency, demand deposits, stocks, bonds, and options) to facilitate trade in goods and services and to funnel resources from savers to investors. By providing payment services, mobilizing savings, allocating credit, and allowing participants to pool, trade, and price risk, financial systems may improve the flow of information, the allocation of resources, and the management of firms in ways that promote economic development (King & Levine (1992) p 1).

This fluent description of the complexity and entirety of the assumed

responsibility of a correctly functioning financial system provides an appropriate framework that highlights the ways in which finance could theoretically improve the efficiency and growth outcomes within an economy. In other words, financial markets could be seen as a type of technology, or economic agent, characterized by the profound multiplier effect it can impart on an economy as a whole. They could be seen as a means for all stakeholders to become more informed and able to make more precise estimations on the merits of a prospective investment, a way in which capital is more efficiently and rapidly allocated to the economy (a type of matchmaker that allows highly prospective endeavors to smoothly secure financial backing for their furtherance and development, both to the benefit of the entrepreneur and investor, and all the while naturally guiding unprofitable enterprises towards disappearance); and a more effectively functioning system whereby the incentives of the manager and stakeholder are aligned, to ensure that managers are acting as efficient stewards of the critically important investments entrusted to them by stakeholders.

For the case of developing economies, it should come as no great surprise that financial depth tends to be lesser than in more developed countries; therefore, in a similar line as the fundamental supposition made in this section, it could be reasonably assumed that upon improving these institutional and or infrastructural flaws, economic output could potentially be expanded through channels listed above: flows of information, allocation of resources and the management of firms.

Supporting these views of finance's positive and growth promoting effects on an economy is King & Levine's (1992) documentation of the broad comment on the findings in the literature: financial depth is typically positively related with economic growth, and the alternative corroborates this conclusion: an inverse relationship is often found between financial repression and growth[15]. Other studies focused at the cross-country level have confirmed the existence of a positive relationship between financial development and growth:

[15] Financial repression is a term used to describe the prevalence of severely negative ex post real interest rates, measured within the context of a single country.

King & Levine (1993A), Levine (1998), Levine & Zervos (1998) and Beck, Levine & Loayza (1999).

King & Levine (1992) present a handful of useful conclusions, regarding the relationship between economic growth and financial markets. Indeed, the initial size of a country's financial system is significantly and positively correlated with subsequent periods' growth rates, while bank deposit performance and the amount of capital allocated to the private sector also share an important direct and significant relationship with economic growth. Additionally, they find that when controlling for which financial institutions are allocating funds to whom, that after a certain point the overall size of the financial system is inversely related to efficiency. Thus, their results indicate that there does appear to be an equilibrium point for credit market efficiency; more specifically, that there appears to be a number of institutions that allow for efficient functioning, while going over that limit appears to be damaging to economic growth.

Further documentation on the relationship between growth and financial development, by way of the resource allocation efficiency channel, Wurgler (1999) finds that there does appear to be a significant difference between the efficiency of allocating finance between financially developed and non-financially developed countries. Non-financially developed countries (as implemented in his study: Bangladesh, India, Panama and Turkey) tend to invest inefficiently with respect to growing and declining industries; investment seems to lag, leading to over-investment in declining industries, while burgeoning and high growth potential industries tend to receive less investment than would otherwise be expected. Financially developed countries (as implemented in his study: Germany, Japan, the United Kingdom and the United States) have a greater elasticity of industry investment, and thusly tend to respond (conjecturally through the comparatively greater sophistication, development and depth of knowledge in financial markets) more efficiently and effectively to investment in declining or growing industries.

Wurgler (1999) also goes on to explain that state ownership of industry is correlated with comparatively poorer capital allocation. These countries tend to

likewise have a difficult time shifting investment from old and out-dated industries and technologies, towards newer and more efficient industries. The reasons for such difficulty in transferring investment may be related to the political implication of such decisions; many people would be out of work as a result of de-funding a certain industry, and therefore those decisions do not get made as a direct result of their political infeasibility. Shleifer (1998) argues in favor of this point in his article “State Versus Private Ownership”, which supports the benefits of privatization of industries, rather than maintaining government or state responsibility for the allocation of capital, in order to maximize incentives for innovation and the containment of costs. These state-led, and politically motivated, capital allocation dynamics tend to fail as a result of their lack of incentive to pursue the most productive and efficient industries or technologies; therefore, Wurgler’s (1999) finding that state ownership is related to poor capital allocation seems to follow logically.

With respect to the management of firms’ condition, Stiglitz (1989) notes that there has been a significant shift with respect paid to the importance of management, and the supervision of incentives provided for managers. These principles date back to fundamental work by Jensen & Meckling (1976), which dealt with the principal and agent dilema. Responsible stewardship of the essential investments made by private firms is a critical component for the straightforward and proper functioning of financial markets, and subsequently for the growth of an economy. If the opposite were to be assumed, and privately allocated funds were to be regularly implemented in any way significantly deviant from the method agreed upon and assumed by stakeholders, it could be reasonably supposed that if such a trend were to become widespread, a severe and systemic failure would almost certainly follow in capital markets. Allocation of credit comes implicitly with the condition that the borrower shall return the creditor’s funds, and without sufficiently strong guarantees and or positive market feedback confirming a creditor is likely to be reimbursed for his investment, significant distortions and or complete failure would be expected. Therefore, financial markets depend heavily on issues associated to management, as well as to specific managers and related matters, stemming from the incentive channel; Stiglitz (1989) mentions that the

terms ‘problems of enforcement’, ‘adverse selection’, and ‘incentives’ are used frequently in the literature (Stiglitz (1989) p. 56).

Stiglitz (1989) goes on further to describe another critical service provided by financial institutions, related to the effects of economies of scale. Stemming from the indivisibility of investment argument, the author points out a critical role played by financial institutions: “they aggregate savings and they allocate funds” (Stiglitz (1989) p. 56) which leads to the ability of leveraging considerable individual investments, comprising an incredibly large amount, that clearly would not otherwise be feasible. Without this vital provision of large scale financing, individuals’ own capital stocks, or the aggregation of a small group’s individual savings, would serve as the bottleneck on investment operations. Smaller scale financing methods would be a significant delimiting factor for the overall level of entrepreneurial investment undertaken; accordingly, returns to these investments would be commensurately small in scale and lead to lower than potential economic growth. Capital markets provide the ability for profitable projects to attain the financing they deserve and need, amplify the returns to scale, and ultimately help boost aggregate economic output.

Demetriades & Hussein (1996) begin their work with an acknowledgment of the main conclusions of two fundamental works, McKinnon (1973) and Shaw (1973), which state that: government intervention in financial markets and the banking system, by way of interest rate ceilings, high reserve requirements and government controlled credit programs, can slow the process of financial development, and consequently diminish economic growth. Demetriades & Hussein (1996) document the corresponding endogenous growth literature findings, where specific financial services (collecting and analyzing information, risk sharing, liquidity provision) are controlled for in the empirical work, and evidence is provided to lend credence to the assumptions made by McKinnon (1973) and Shaw (1973). Greenwood & Jovanovic (1990) and Bencivenga & Smith (1991) find a positive relationship between financial intermediation and economic growth, while King & Levine (1993B) establish that state involvement in financial markets is correlated with negative effects on economic growth. Further supplementing the utility of the McKinnon and Shaw school of thought,

are the findings by Gelb (1989), World Bank (1989), Roubini & Sala-i-Martin (1992) King & Levine (1993A), which accord that the deepening of the financial system is positively correlated with economic output growth.

A careful dissection of the abovementioned findings regarding financial markets' effects on economic growth, leads to Demetriades & Hussein's (1996) mention that the relationship may not be as clear-cut as some past works may have assumed. They introduce the idea, famously noted by Partick (1966), that the positive relationship found between finance and growth does not provide a sufficient amount of information to determine a definite direction of causality. The base issue is related to whether finance leads or facilitates economic growth or if it in fact follows or is a result of higher economic growth. Research on causality of economic growth is particularly scarce, leading to substantial uncertainty with respect to the cause and effect relationship between finance and growth. Further, Demetriades & Hussein (1996) point out that in cross-country studies, it is impossible for distinct country cause and effect results to emerge; therefore, one must take great care in interpreting such results on the 'average country'. However, the authors point out that it is probable that both cause and effect relationships do exist; some countries are likely to provide evidence that financial development leads growth, whereas other countries may lend credence to the theory that financial deepening is a result of increased economic growth. The authors conclude by stating their empirical findings: little evidence is found to support the idea that finance leads economic growth, meanwhile, many countries do show signs that financial development is a response to growth; however, their most compelling result seems to be the support of a bi-directionality between the two indicators.

Overall, access to credit markets has been found to be a critically important variable for increasing economic growth and for alleviating income inequality. Situations where both inequalities of income and imperfect credit markets exist tend to perpetuate the initial distribution long into the future, all the while holding an economy back from its maximum potential level of economic growth. In this way, we can understand the establishment of a negative link between income inequality and economic growth by way of imperfect credit markets. Further research regarding the fundamental linkages between

economic growth and credit markets, including other classifications encompassing the provision of financial services, indicates that there are important features involved that ought to be considered in the analysis of an economy's growth and income inequality experience.

2.2.3 MACROECONOMIC & SOCIO-POLITICAL VOLATILITY

Both the theoretical literature review, as well as results from the applied empirical work, provides support for the notion that macroeconomic volatility may also play a vital role in the determination of aggregate income inequality levels, by way of volatility's negative impact on economic growth and investment. Volatility has been proposed to be a possible agent for the diffusion of income inequality, given, for example the straightforward finding that it has been found to have a positive correlation with income inequality as measured by the standard deviation of annual GDP growth (Aghion, Caroli & García-Peñalosa (1999)). Further, the authors mention that cross-country regressions have found higher levels of macroeconomic volatility are linked with a uniform reduction in average economic growth during the same observation period; these effects are transmitted through the channels of lowered incentives to invest in human and physical capital, leading to aggregate increases in income inequality.

Hausmann & Gavin (1996) provide a more in-depth theoretical, as well as applied, coverage of the topic of macroeconomic volatility within the context of Latin America. To realize this study they measure the magnitude of the departure from the standard deviation of monetary, non-monetary and inflationary outcomes. They find that macroeconomic volatility tends to be very costly through its negative impact on economic growth and negative impact on the motivation to undertake investment in human or physical capital; simultaneously, they find results linking macroeconomic volatility with increasing disparity in the distribution of income as well as precipitating elevated rates of

poverty. Regarding policy decisions, Hausmann & Gavin (1996) claim that shocks contributing to a country's level of macroeconomic volatility can come from both domestic and foreign sources, but they maintain that the most impactful factors are related to sound governmental infrastructure and consistent policy regime choices. Their study reveals that the depth of financial markets may be positively linked with less severe volatility. Fixed exchange rates may be stabilizing for real exchange rates, but that stability comes at the high price of destabilizing real aggregate output. Further, fluctuations in fixed exchange rates are found to be exceptionally destabilizing.

Further, Hausmann & Gavin (1996) present evidence for a strong inverse relationship between economic growth and macroeconomic volatility. They find that, among many other growth inhibiting factors, volatility seems to account for a surprisingly large amount[16]. Of equal importance, they highlight the fact that both growth and volatility are influenced by a myriad of other variables and therefore a discussion of robustness must be involved. Thusly, they have compared their studies to those of other economic works focused on the topic of growth explanation and they find their result of volatility's strong influence on growth to be robust across studies with the inclusion of many related variables[17].

In a related study by Breen & García-Peñalosa (1999), the authors take on the specific issue of macroeconomic volatility and its effects on income inequality. Their study was motivated by the findings of Ramey & Ramey (1995) who found that higher levels of volatility in aggregate output were related to comparatively lower average economic growth rates; Breen & García-Peñalosa (1999) endeavor to discover the relationships between volatility and other macroeconomic indicators, and more specifically income inequality. Taking a 30 year observation window and using cross-country data observations, the conclusion of the authors is that greater macroeconomic

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[16] In the case of Latin America, Hausmann & Gavin (1996) find that annual GDP growth could have been roughly 1% higher, had the countries observed in their study experienced the same levels of volatility experienced in more developed countries.

[17] See Barro (1991) for measurements of political instability and price distortions, Alesina & Rodrik (1994) for income inequality and King & Levine (1993) for financial depth and openness to international trade.

volatility is found to positively influence income inequality through the following abstract channel: higher levels of volatility increase the income share of the fifth quintile, while diminishing the shares of the four lower quintiles. More specifically, heightened levels of volatility tend to shift the distribution of income most powerfully from the second and third quintiles to the wealthiest fifth quintile[18]. Additionally, the authors find that this result is robust to the introduction of a variety of control variables, suggested by the literature to affect income inequality. From this robustness verification, the authors find that relative labor productivity in agriculture and the share of employment in agriculture are the most robust variables impacting the distribution of income.

Breen & García-Peñalosa (1999) conclude their analysis by closely examining a sampling of the theoretical connections with the historical empirical results. They claim that higher income individuals tend to be less risk-averse, and that lower income individuals tend to be more risk averse. When the economy becomes volatile, thereby augmenting risk, income is shifted from lower income individuals (risk-averse) to higher income individuals (less risk-averse). On average, the assumption is that wealthier individuals will be more capable of seizing potentially lucrative opportunities resulting from volatile economic periods, while the poor will be more likely to experience an overall decrease in personal wealth; thusly, we assume that income inequality is associated with a general increase by way of heightened macroeconomic volatility. Second, as previously discussed in section 2.2.2 Imperfect Credit Markets, the authors assume that human capital investments are a large fixed cost and that capital markets are imperfect. In this case, the ability of lower income families to invest in human capital would depend on the level of aggregate output; through this output channel, which relates to personal (or family-wise) wealth, volatility could affect the distribution of human capital. This potential effect on human capital investment would then evidently translate into a divergence of income earning potential frontiers, resulting in overall heightened income inequality.

Finally, the authors look at the case of economic recession, whereby

[18] The authors find only weak changes in the first quintile's share of income.

individuals possessing comparatively lesser ex-ante human capital stocks (and presumably characterized by lower income levels) are more likely to lose their employment. Meanwhile, their counterparts with greater ex-ante human capital stocks (and presumably characterized by higher income levels) are more likely to maintain their positions. In this case, the poorer and less educated individuals, in conjunction with the lost wages throughout the period of unemployment, would additionally lose valuable human capital during their time away from participation in the workforce. Therefore, when this cohort of individuals, defined by initially lower human capital and income levels, resumed work in the period following the recessionary economic shock, there would be a compounding effect of greater inequality for the poor; they would have lost out on all earnings during the recession, while also losing important levels of human capital through missed work experience, making them considerably worse off in the short run. Through this abstract, it can reasonably be assumed that the aggregate levels of income inequality will increase. Further, this difference in human capital levels would further translate into important differences in ex-post recession wages, and thereby result in yet another channel through which income inequality would conjecturally be augmented as a result of amplified macroeconomic volatility.

2.3 KUZNETS HYPOTHESIS

In conjunction with the theoretical channels explaining the relationships that various macroeconomic indicators are assumed to have with income inequality and economic growth, there has naturally been a dialogue on how these theories and relationships evolve over time. One exceptionally well-documented theory is the Kuznets Hypothesis. Introduced by Simon Kuznets in his 1955 article "Economic Growth and Income Inequality", he established the inverted 'U' hypothesis as an explanation of the progression income inequality undergoes as an economy develops from an agriculturally dominant structure, towards a more sophisticated, industrialized or service based economy. This seminal publication laid the groundwork for countless works in the growth and inequality field. His methodology, unique focus, and continued dedication to the field over many years provided an important base from which many of the very same works analyzed and summarized within this current study were born.

A basic summary of the prevailing initial conditions before the inverted 'U' Kuznets hypothesis takes effect could be summarized by the following: first, it can be reasonably assumed that in an agrarian economy, where the majority of aggregate output is agriculturally based, a relatively low per capita income would abound and likely, there would not be a high degree of income inequality within such an agriculturally based economy. Second, the industrial and urban sector of the economy will be small in comparison to the rural agricultural sector, and this industrial urban sector will be characterized by higher per capita income, and plausibly a relatively higher degree of income inequality. Accordingly, the overall inequality in the economy would be low; given that the rural sector would constitute a significant majority of the overall population, which would be defined by relatively low income inequality, while the higher income inequality in the urban sector would not greatly influence the aggregate inequality for a given country. As the economy develops, rural laborers are expected to migrate to the cities in hopes of securing employment within the newly developing urban sector (presumably for the relatively higher wages that characterize the urban employment), whereupon the overall level of income

inequality would presumably rise as a result of the wage difference between these newly introduced urban workers and the remaining rural agricultural workers (that did not move to the cities for higher wages). Further, the overall scheme of employment would begin to shift towards a majority of the workers living and working in the urban environment, which is characterized by an overall greater degree of income inequality.

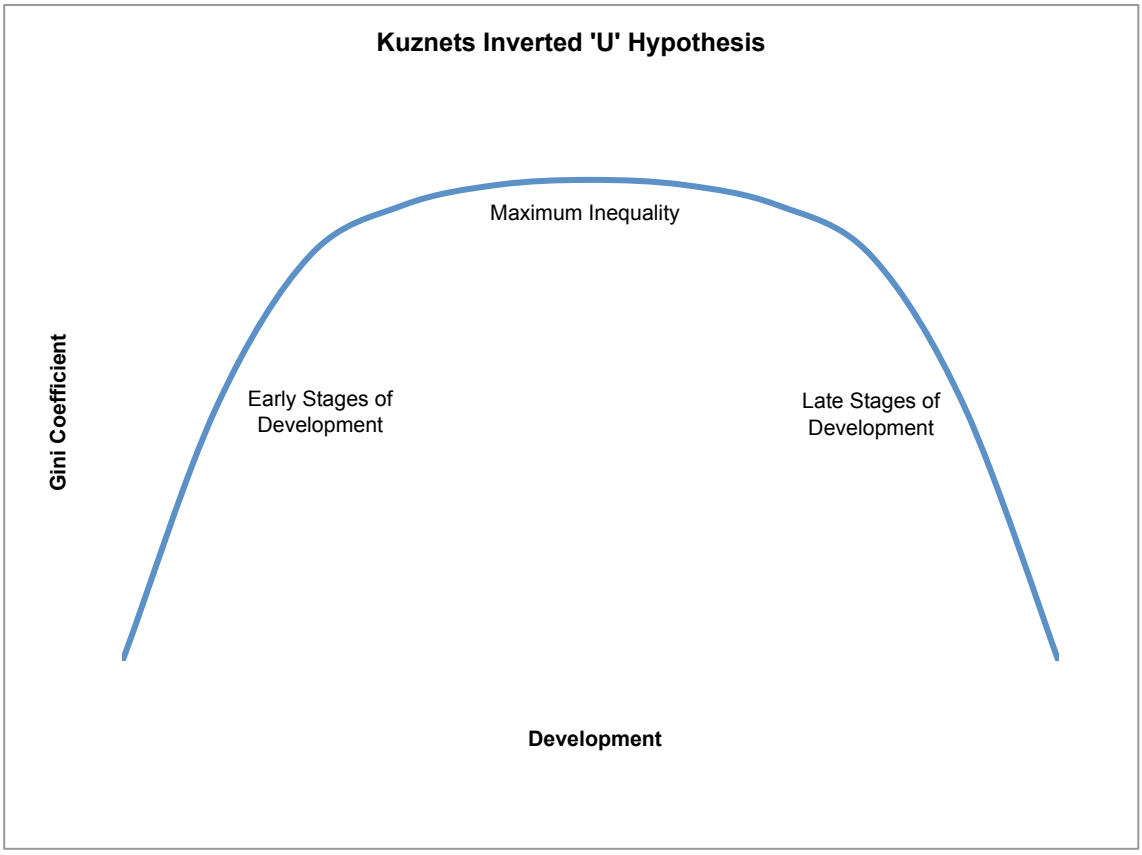
Within this Kuznets model, it is assumed that urban employment pays a higher wage than do rural labor positions. Additionally, a large gap between these new urban workers and their urban managers would further contribute to the aggregate increase in income inequality. As a result, at early stages of development, a positive relationship would be expected between per capita income growth and aggregate income inequality. After this initial phase of heightening income inequality, it is assumed that, once the migration from rural agricultural labor to urban industrial labor reaches an equilibrium level, income inequality should begin to decline. This is presumed to be true, given that, as an ever-increasing number of agricultural workers are able to access the higher wages of the urban industrial sector, and simultaneously as more and more advance in the ranks of urban employment, the initially growing disparity, with respect to the distribution of income, shall begin to stabilize. As rural workers leave their agrarian posts, and flock to the cities in search of higher wages, the relative scarcity of rural workers will help drive up wages within that sector, thusly contributing to further alleviations in the dynamic of aggregate income inequality.

Therefore, considering that a large majority of formerly rural agricultural workers previously earning low wages are allowed access to the urban industrial employment, and its provision of comparatively higher wages, income inequality can reasonably be expected to decline. Further, as initially low-level urban workers advance through the ranks and achieve ever-higher wages, even further downward pressure should be observed with respect to aggregate income inequality. This second force is a result of the equalization of wages, which within the relatively more unequal urban industrial sector, would have been theorized to be greater in the first period of rising income inequality. Consequently, these three factors: the slowing, and eventual arrival at an

equilibrium point, of labor migration from rural to urban sectors (and the ability for a majority of formerly rural workers to access higher wages in the industrial sector), increasing wage rates in the rural sector (as a result of the relative scarcity of laborers), and finally the urban inter-sector trend towards greater income equalization (resultant from a rise in ranks by initially low level urban workers), culminate to explain the predicted decline in income inequality.

Taken altogether, Kuznet's inverted 'U' hypothesis predicts that an indicator of income inequality, for example the Gini coefficient, should first be positively correlated with per capita income growth or economic development, while in a subsequent period, after the economy has reached the apex of the below curve, an inverse relationship between the two variables should be observed. The evolution of income inequality would then take the form presented below in figure 1:

Figure 1



Source: Author's Own Calculation

Regarding the empirical findings of the Kuznets curve, Barro (2000) reports that it was seen as a widely accepted regularity through the 1970s, as evidenced by two studies realized by Ahluwalia (1976A) and (1976B). Papanek & Kyn (1986) confirm a statistically significant relationship, but claim that the inverted 'U' hypothesis does little in the way of either explaining variations related to income inequality across countries or throughout time. Anand & Kanbur (1993) claim that the relationship has weakened over time, while Li, Squire & Zou (1998) assert that the Kuznets relation is most effectively used in representing the variation of income inequality for a cross-country sample at one point in time, and that it is less effective when utilized for longitudinal data within one specific country or region, with many observation years considered. Using a sample of cross-country data Fields & Jakubson (1994) find that the average curve estimated by an OLS model is found to be a statistically significant inverted 'U', exactly as predicted by the Kuznets model. However, when the authors estimate the average curve using fixed effects estimation, the result is a statistically significant 'U'. It could be argued that fixed effects estimation is the more suitable method, in that it allows for heterogeneity of constant terms, which of course is appropriate in the context of the widely diverse cross-country Gini coefficients. Fields (1999) interprets these findings by saying that, when attempting to ascertain the changes with respect to the longitudinal effects in the typical countries' income inequality, 'U' shaped model actually provides a more appropriate fit for the data. Additionally, in similar studies, Ravallion (1995), Deininger & Squire (1998), Schultz (1997), and Bruno, Ravallion & Squire (1998) implemented fixed-effects modeling techniques for each individual country, and found that the resultant coefficients were not statistically distinct from zero.

Despite the disagreement on whether or not the inverted 'U' fits more contemporary data, some authors have taken the evolutionary principles given in the Kuznets hypothesis and related them with other popular facets of economic development theory. Greenwood & Jovanovic (1990) use the idea of the inverted 'U' hypothesis regarding the progression of income inequality, but with respect to the impact of financial development on economic growth, and

subsequently on the income distribution. They argue that at early stages of economic development, an economy has a relatively inefficient financial market, which tends to cause relatively slow economic growth; as economic growth rates begin to accelerate, that increased growth provides the means by which the financial sector can effectively develop and deepen. As a result of this increased financial depth, the economy then tends to grow more rapidly, as capital can then be allocated in a more efficient manner. With the rising level of individual income, coupled with the increased level of financial market depth and sophistication, the economic growth is theorized to become even more rapid. Greenwood & Jovanovic (1990) close out their argument by asserting that this final acceleration in economic growth should significantly increase the income gap between the rich and poor. Eventually, they maintain that this elevation in income inequality ought to eventually reach an apex, and subsequently experience a decline given further financial structure development and economic growth. Thusly, this theory parallels the popular Kuznets inverted 'U' hypothesis on the evolution of income inequality.

Another descendant model borrowed from the principles of the original Kuznets hypothesis has come through the channel of introductions of new technology. Various authors have established that a possible source or driver of aggregate income inequality within an economy could be related to the disparity in technologies employed by the poor and the rich (see, Aghion & Howitt (1997), Galor & Tsiddon (1997), Helpman (1997)). The principle in this case is that the poor have a relative disadvantage with respect to the ability to access newer and more productive technology sectors; specifically, they do not have the same financial resources that the rich have to acquire such goods. Additionally, once the poor have finally accessed the technologies that the rich already fluently operate, the implementation of those technologies by the poor will require a period of becoming accustomed to and re-training for the new equipment, a learning curve of sorts.

Therefore, it would follow logically that each time a new groundbreaking technology is introduced, an initial increase in income inequality could be reasonably expected. The rationalization for this increase would progress as follows: income inequality would initially rise as a result of the rich receiving a

disproportionately high return from their ability to utilize and take full advantage of the new technology, providing them with an especially high rate of return, and allowing them to acquire even greater levels of wealth than before. While the rich are able to access this new technology and leverage the benefits for their personal gain, the poor remain in the same state as before; accordingly, aggregate income inequality is presumed to rise. Subsequently, as the poor are able to both gain access and become familiar with the newly implemented technology, their ability to achieve higher returns than were possible before the new technology would theoretically cause aggregate income inequality to fall. Further, it would be expected that the few people that remained in the old-fashioned sector (absent of the new technology) would benefit from relatively fewer workers in that sector, causing wages to increase. Taken altogether, these effects from new technological introductions would be consistent with the evolution of an inverted 'U' pattern of income inequality.

Regardless of the recent division over the explanatory power, robustness, or directionality of the Kuznets curve, the importance related to the introduction of this seminal theory indeed allow it to remain a central topic in this area of study. The contributions by Simon Kuznets to the growth and inequality field have been enormous; from his own personal research, and well beyond to the myriad research projects his work inspired, the inverted 'U' hypothesis has been, and to a great extent continues to be, a tremendously important piece of the economic growth and income inequality literature.

2.4 CASE STUDY DISCUSSION

Having provided a view of both theoretical and empirical literature concerning the relationship between income inequality and economic growth, the following section will shift into a more pragmatic approach at analyzing a pair of comparative case studies dealing with a variety of both directly and indirectly linked topics. The benefit of case study analysis stems from the fact that a very straightforward, uncomplicated and historically based example is presented, providing a clear picture of what actually happened, what relationships can be observed as having been successful and likewise, what real policies appeared to be failures. This matter of fact style is a welcome departure from the admittedly tangled and often disputed theoretical and empirical literature concerning the topic of income inequality and economic growth. Following a tremendously thorough discussion of the commonly diverse income inequality trends related to economic growth, from a commensurately exhaustive country and regional sampling, Fields (1999) supports case study analysis with the following suggestive commentary:

> What is it about the countries in which inequality has been growing that differentiates them from ones in which inequality has been declining? The way to learn the answer is by doing a number of case studies and then look for similarities and differences in the patterns. It is there that the research frontier lies (Fields (1999) p 9).

Following are two well-known examples of relevant case studies; conveniently, these applied reviews highlight many of the same key aspects from the income inequality and economic growth links discussed throughout the theoretical and empirical portion of the literature review. Additionally, considering the ample nature of this subject matter, and the inherent inability to sufficiently cover all peripheral topics, some aspects of the case study analysis serve to expand upon and supplement relevant areas related to items in the literature review, which previously may have been left either partially or wholly unexplored.

2.4.1 INEQUALITY AND GROWTH: KOREA AND THE PHILIPPINES

In the aptly titled article “Inequality and Growth” Benabou (1996) begins his construction and discussion of the theoretical linkages between economic growth and income inequality by recounting an exemplary case study based on the experiences of two well-known East Asian economies: South Korea and the Philippines. His methodology simply juxtaposes the two economies’ developmental stories, of contrasting levels of success, over time. Summary data for the two countries can be observed below in table 1:

Table 1

Inequality and Growth: Korea and The Philippines

Country	Gini	Q1	Q2	Q3	Q4	Q5	Q3+Q4	Q5/Q1	Q5/(Q1+Q2)
1965									
Korea	34.3	5.8	13.5	15.5	23.3	41.8	38.9	7.2	2.2
Philippines	51.3	3.5	12.5	8.0	20.0	56.0	20.5	16.0	3.5
1988									
Korea	33.6	7.4	12.3	16.3	21.8	42.2	38.1	5.7	2.2
Philippines	45.7	5.2	9.1	13.3	19.9	52.5	33.2	10.1	3.7

Source: Benabou (1996)

The particularly attractive feature of this timeless example is the fact that the two nations were so extremely closely related in many standard macroeconomic indicators around the beginning of the 1960s, only differing significantly in their initial income distribution. The Gini coefficient from 1965 clearly highlights the fact that a significantly higher level of income inequality characterized the

Philippines, having a Gini coefficient exactly 17 points higher. Additionally, the initial quintile data indicates the marked levels of differentiation between the two countries; where South Korea has higher percentage allotments at all of the four lower quintile levels, the Philippines' income distribution displays an exaggerated skewing towards the highest quintile, indicative of the pronounced overall income inequality.

Benabou (1996) highlights the fact that South Korea started out from a much more egalitarian distribution of income, and went on to enjoy an average rate of 6% annual growth, while the Philippines was notably more unequal in its income distribution from the beginning, and subsequently went on to grow at a mere 2% average annual rate. This experiential evidence provides a clear example contradicting the theoretical supposition that income inequality ought to foster growth; certainly in this case, income inequality has appeared to have quite the opposite effect. Further, he goes on to mention the fact that other similarly egalitarian East-Asian economies (as was the case for South Korea) of the same period tended to experience high rates of economic growth as well. Correspondingly, countries with equally skewed distributions of wealth, (as observed in this example through the Philippines) as was commonplace in Latin America, were likewise encountering significantly slower rates of economic development. While it would be impulsive to reference only a handful of contradictory cases as grounds for rejection of the theoretically implied direct relationship between income inequality and economic, the South Korea and Philippines example, along with the practical extension to other regions of Asia and the developmental history of Latin America, at the very least cast a shade of doubt upon its authority, and certainly provide historical evidence of directly conflicting evidence.

2.4.2 GOVERNMENTAL INSTITUTIONS AND INTERNATIONAL TRADE POLICY: THAILAND AND THE PHILIPPINES

Having viewed the above example related to ex-ante income inequality's observed influence on subsequent economic growth, we transition to another interesting example of a two-country study focused more specifically on economic growth policies. This case provided by Michael Todaro (2000) reflects on the differing trade and development strategies pursued by Thailand and the Philippines, and the resulting differences in economic growth achieved by the two countries. Again, this case study compares and contrasts two countries that in many ways are quite similar in initial conditions, but with respect to the management of international trade, and a handful of other factors, indeed had divergent economic experiences.

The author begins the discussion by mentioning some of the similarities and differences of the two countries[19]:

1. Both are from the lower-middle income bracket
   Thailand: $2,740 GNP per capita
   Philippines: $1,220 GNP per capita
2. Both have similar population estimates
   Thailand: 61 million inhabitants
   Philippines: 75 million inhabitants
3. Both are members of the ASEAN free trade association (Association of Southeast Asian Nations)
4. The two countries did have relatively divergent growth rates over the period 1965 – 1996
   Thailand: average annual GNP growth rate of 5.0%
   Philippines: average annual GNP growth rate of 0.9%

[19] The following figures were quoted according to estimates for the years 1996 and 1997 and in accordance with the original example provided by Todaro (2000).

The case study begins with a comment on the widely accepted view that the countries of South Korea and Taiwan were able to realize their tremendous economic growth success largely by embracing and being active in their industrial trade policy, and not simply allowing the whims of the free market to dictate their fate. Accordingly, this case study raises the noteworthy question of whether or not this type of experience can be replicated, whether contrasting policy decisions were equally successful, or commensurately defeating, or if perhaps South Korea and Taiwan had simply stumbled upon their success. The example of Thailand and the Philippines provides a perfect setting to analyze these specific questions, given their relatively similar initial conditions, as well as exposure to similar external economic conditions, given their being from the same region of the world.

One noteworthy distinguishing characteristic between the two nations is the varying levels of debt buildup observed in the two countries. The author notes that the debt levels of Thailand and the Philippines were quite different by the end of the 1980s: the Philippines had amassed $23 billion in debt, in a smaller and slower growing economy, compared to Thailand's $13 billion within the context of a larger and more robust economy. It is also mentioned that the borrowed money was used for relatively more efficient and economically productive projects in Thailand, whereas in the Philippines, high debt levels were not accompanied with commensurately high levels of return on investment, and the money mostly went to wasteful economic investment projects. Todaro (2000) provides a potential explanation for this disparity in productivity of investment: a "relatively more efficient and less corrupt selection of policies and the political will to carry them out.…" (Todaro (2000) p. 613) was thought to be prevailing in Thailand, while noticeably absent for the case of the Philippines.

Thailand underwent an intensive period of economic development through industrialization during the 1960s, by way of heavy protectionism and import substitution policies. Effective rates of protection had been high at all times throughout their developmental process, but notably sharper increases were noticed in the 1970s. By 1992, there were signs that tariffs were coming down, but the average effective rate of protection was still around 60% towards

the end of the 1990s; accordingly, the World Bank listed Thailand as one of the most protectionist countries in East Asia. This import substitution plan mimics the path followed by South Korea and Taiwan, lending support to the idea that import substitution, when properly monitored, controlled and implemented, can perhaps be a successful way to promote a thriving export oriented economy. In contrast, Latin America's economic history provides a plethora of classic examples of failed import substitution policies, as well as a multitude of industry protectionist practices ultimately leading to inefficient and dependent outcomes. However, according to the outcomes in a sampling of East Asian economies, protectionist regulation may have some merit; accordingly, this case study posits that perhaps it should not necessarily be labeled with being a dead-end development strategy.

The analysis provided by Todaro (2000), and given the facts presented, it appears quite clear that Thailand has benefitted greatly from its sustained and gradual developmental process over time. This march towards increasingly higher levels of economic sophistication has been possible due to the relatively controlled manner in which its government invested and borrowed funds, as well as provided protection to infant industries, without allowing such shielding to convert its economic projects into dependent and uncompetitive endeavors. Undeniably, the Thai government stands to take full credit for the abovementioned features that lead to such a successful growth experience. Its remedies for market failures, control of export policy and the management of its economy's track towards upward technological progress was nothing short of remarkable. As Thailand impressively followed the path of its successful East Asian neighbors, namely South Korea and Taiwan, the Philippines struggled with circumstances that caused it to miss out on achieving similarly productive levels of economic development.

In contrast with the Thai experience, strongly characterized by the government's active and productive support of the economy, the Marcos dictatorship in the Philippines did very little to facilitate the further expansion of its economy's. During the reign of the Marcos regime, the Philippine economy was infamous for wasteful spending and unproductive investment. These counter-productive policy setbacks strapped the Philippines with copious

amounts of debt, and with no productive output resulting from these investments, the economy was forced to begin exportation of primary commodities. Efforts to climb the ladder of competitive advantage, and exit an industry famous for unfavorable terms of trade, were put on hold as the economy was forced to focus on the short-term re-payment of debt resultant from poorly planned investment projects. This focus implied the abandonment of longer-term strategies focused on investments for a brighter economic future. Unlike Thailand, whose government managed growth carefully to ensure advancements in technology and skill upgrading, the Philippines was forced into a situation where concentration on future prospects was impossible and all efforts were focused on the fastest way to generate output at the present. This dynamic has caused the Philippines to seriously degrade much of its natural resource supply, make future economic transitions politically difficult, and by far the most important misstep, the country has seriously jeopardized the sustainability of its economic future.

In the end, despite the relatively successful development of Thailand, it is true that both countries leave much to be desired with respect to a variety of both economic and human development metrics. It is also true that, to an extent, Thailand's growth came at an environmental cost; however, that environmental price paid by the Thai government paved the way for technology growth, the burgeoning of high productivity industries and economic sustenance well into the foreseeable future. On the other hand, failed economic policy, overwhelming corruption and suffocating debt levels, resultant from poorly planned investment projects, forced the Philippines into a cycle of natural resource exploitation, abandonment of pursuing potentially favorable future economic prospects and a tremendously bleak economic outlook for its citizens.

Therefore, after observing and analyzing the cases of Thailand and the Philippines with regard to their respective trade histories and economic development policies, a few clear conclusions can be drawn. Governmental institutions possess the potential to foster great success or cause great harm to the current and future of an economy, and therefore successful policy decision-making merits meticulous study (as was the case for Thailand following the success laid out by South Korea and Taiwan). And finally, immediate needs

must be tempered with a rational long-term focus, unlike the hasty decision making undertaken by the Philippines, which has sacrificed great potential advancements in economic frontiers. Economies that fail to maintain a long-term focus, while also adapting to an ever changing economic environment, will stand to lose substantially with respect to future terms of trade, irreplaceable natural resources and real economic output.

3.0 HISTORY OF INDIAN INCOME INEQUALITY AND ECONOMIC GROWTH

Since its independence in 1947, India as a whole has experienced tremendous advances in economic growth accompanied with commensurate increases in standards of living; these positive developments have brought about a new era of economic sophistication and progress in many areas for India. In the early stages of economic development, India was defined by heavy state involvement, low efficiency rates, stagnant growth levels, a heavy concentration of resources in the primary (agricultural) sector with the eventual development of a more industrially focused economy as a result of the second five-year plan[20] (Acharya (2007)). The "Green Revolution" of the late 1960s and early 1970s brought about technological advanced facilitating strong gains in agricultural output, averaging 3% additional growth per annum over the period. These gains were afforded primarily by improvements in crop technology and increases in irrigation resources. During this period of strong agricultural growth, India's wheat production increased from 10 million tons in 1964 to over 45 million tons in 1985, while total grain production increased to over 150 million tons by 1984 (Todaro (2000)). After moving aggressively away from the inwardly focused socialist regime that the country followed for many years, both pro-business and pro-market based reforms have considerably re-shaped and modernized the Indian economy that is now characterized by: a high prevalence of technology based industries, a trend toward knowledge-based exports, which include service exports, and consistent overall improvements in GDP.

Although India has been able to achieve astounding levels of economic success with its developmental plans, most notably since the dawn of economic reforms beginning in the 1980s and being significantly furthered in the 1990s, it is equally relevant to highlight the fact that India's growth, and the inherent wealth benefits, have been experienced by a relative few. The implication of

[20] Second Five-Year Plan 1956-1961

this injustice is the prevention of millions of Indians from being implemented and introduced into the economy in a meaningful way. Further, this inefficient employment of the labor force also carries with it serious concerns for the Indian people. As the economy develops and the increases in living standards afforded by the economic prosperity are not shared in a reasonably equitable fashion, the result is the condemnation of tens of millions of Indians remaining in the cycle of severe poverty and illiteracy. Overall, this section of Indian society is characterized by an overall inability to overcome these barriers to enter into the modern economy and share in the wealth benefits already enjoyed by a fair percentage of Indians. Factors that complicate further the base issue of income inequality and prevalence of poverty are the challenging issues of low overall educational achievement by the poor, shortages of basic natural resources (clean water, subsistence agricultural goods, etc.), the world's second largest population at approximately 1.2 billion coupled with an astronomically high level of population growth, which only serves to exacerbate the severity of the aforementioned challenges.

This unequal development has steered India into troubling waters politically; the BJP (Bharatija Janata Party) had enjoyed significant returns to power beginning in 1989, followed by a substantial victory in the elections of 1999, and looked for support of the Indian people to return the country to its protectionist ways. The party stands to promote a more self-sufficient Indian economic development, and has fed off of the sometimes sensationalized unequal growth experience that has been portrayed to be detrimental to the many impoverished people of India (Britannica (2011)). The party in recent years has seemed to decline in popularity, but its promotion of "Swadeshi", meaning self-reliance, remains a note-worthy obstacle to avoiding a backslide in progress away from the ostensibly successful economic policies towards further deregulation and privatization of the economy.

India's achievement of independence from the United Kingdom in 1947 ushered in a new era of economic autonomy to be handled by the newly liberated Indian government. Poverty and growth rates were appalling up until the time of independence. According to Acharya (2007) GDP growth rates were averaging around 0.9% per year from 1900-1946 and 45.3% of the population

was below the poverty line in 1951; changes were desperately needed to remedy the abysmal economic conditions and to put India on a path towards productive economic development. However, counter-productive policies implemented by future leaders, combined with the negative connotations associated with its colonial experiences would prove to be great obstacles for achieving efficient and sustainable economic progress.

India's first Prime Minister Jawaharlal Nehru tapped into a popularly accepted attitude at the time, which claimed that Indian economic developmental failures were merely an uncontrollable negative side effect resulting from Great Britain's colonization. His propensity to highlight the negative outcomes of foreign occupation, and the high prevalence of exploitive foreign trade at the time, lead to a commensurate formation of anti-foreign sentiment in economic matters. This naturally directed India to a preference towards inwardly focused domestic policies. India's anti-foreign rhetoric cemented an image of India as a victim of the abuses of foreign trade and Nehru thereby took full advantage of this lingering distaste for the foreign manipulation, resultant from nearly a century of British colonial rule. Therefore, governmental policy was naturally guided towards a preference of economic policies characterized by strong protectionism, import substitution and state lead growth. As a result, India established an expansive public sector; accordingly, government employment expanded at an alarming rate, while corruption and inefficiency came to be defining features of the Indian economy. It was around this time that a troublesome mantra "Swadeshi", meaning self-reliance, was beginning to take root and imbed itself into the formation of an identity of the Indian economy. Further, this Indian slogan served as an easy go to saying for justification and provider of credence to these detrimental policy decisions made by the economic planning committees. It would take decades for the Indian people and government to see that these inwardly focused regime choices were not maximizing the potential of the Indian economy and in fact were stifling great potential gains.

Domestically focused and isolated from the remarkable growth of the international economy at the time, the Indian government's economic policy decisions smothered the enormous potential for growth and lost out on this

rapidly expanding global trade market. According to Acharya (2007) India grew at an average rate of merely 3.6% per annum throughout approximately the first 30 years of independence (many other developing countries faced with similar initial conditions as India were achieving steady growth rates twice that of India's observed 3.6%). The greater tragedy of this missed opportunity for economic growth was that it also caused India to lose out on a chance to combat income inequality and meaningfully introduce a great number of its citizens into the economy. Equally important, this missed growth opportunity also implied that a great many Indians remained in impoverished conditions as a result of the disappointing growth levels. According to Acharya (2007), the percentage of people living below the poverty line in India grew 6% during this same period, 1950-1980, from 45.3% to 51.3%. Growth experienced during this first post-independence phase was relatively low, and improvements towards greater equality were shown to likewise be difficult. It is worth noting that this representation is not necessarily conclusive; some research finds that the growth in this period was poverty reducing (see, Ravallion & Datt (2002) or Bruno et al. (1998)).

Since independence, the Indian government had poured considerable amounts of money into its over-grown public sector, but it was believed that India's overwhelmingly expansive government employment up until the 1980's, wrought with inefficiencies and rampant overstaffing, could perhaps be corralled by the profit driving incentives commonly found within the context of a pro-business economy. Accordingly, the measures taken to begin an attempt at higher levels of economic growth and greater efficiency were promoted through an emphasis and encouragement of developing a thriving private sector. A symbolic move towards the deregulation of the national defense sector kicked off an era of privatization and more prosperous economic times. According to Montek S. Ahluwalia (2002), in his paper "Economic Reforms in India since 1991: Has Gradualism Worked?" the Indian economy in the 1980's was expanding at an increased average rate of 5.7% per year, roughly two full percentage points higher than the previous three decades' average. Much of this growth was created by expansion in the industrial and service sectors of the economy. The agricultural sector was shrinking as a contributor to GDP, and

the government's focus on the industrial and service sectors was yielding results.

Since the 1980s, India has experienced a notable acceleration in economic growth by way of promoting a more pro business model, leading to increased domestic competition, and through the relaxation of governmental controls, further guiding efficiency gains by weaning Indian commerce from the long history of heavy state protection. Although the 1980s were a clear departure from the relatively modest growth levels characteristic of the three previous decades, public expenditure remained at unrealistic and unsustainably high levels. These irrational policies set India up for the eventual balance of payments crisis in the spring of 1991. This occurrence paved the way for radical governmental deregulation and marked the beginning of a new chapter for India's economy. More prudent governmental spending plans were adopted by India that cut down the unchecked public expenditure levels that were a defining quality of past Indian budgets. India's experience in the 1990s was one of increased growth brought about by market liberalization policies and additional progressive strides towards a more globally oriented, lean and competitive economy. However, a complete summary of India's growth experience during this era reveals many generally less emphasized underpinnings that lead to this success story.

Primarily, it was the government's overly controlling planning strategies that caused the less than desirable economic growth rates observed throughout this first chapter of post-independence reform, approximately 1947-1980. Ironically, those very same protectionist policies would be the very spark for worries regarding the effectiveness and sustainability of their over extended, inwardly focused and inefficient public sector; the ensuing reforms would eventually lead to progressive, more internationally friendly economic restructuring, precipitating accelerations in growth rates. The fundamental makeup of the inwardly focused protectionist policies and import substitution, along with its innate preference towards national production over international trade, came into question as the global economy was expanding and leaving India further and further behind. Additionally, neighboring East Asian economies, which followed the model of a more internationally oriented open

economy (although still tempered with comparatively less protectionist policy to promote infant domestic industries), were growing at far higher rates, and thusly served as yet another motivating factor supporting change. Accordingly, this paradigm shift of public opinion, which challenged the efficacy of the current regime and its interest in the prospect of a more liberalized economy, led to actual reform.

Ahluwalia's (1994) paper "India's Economic Reforms" highlights the principal changes that came about in the 1980s:

> Several initiatives were taken in the second half of the eighties to mitigate the rigours of the control regime, lower direct tax rates, expand the role of the private sector, and liberalise licensing controls on both trade and foreign investment (Ahluwalia (1994) p.2).

The author highlights and affirms the fact that these changes were implemented in a slow and controlled manner; in fact, this moderate approach of gradual and incremental policy relaxation likely played a key role in the overall success and public acceptance of deregulation. Indians were accustomed to a very high level of governmental economic control; therefore, this approach towards policy reform was designed to wean the Indian economy off of state supplied protective assistance, and to assimilate them carefully into the harshly more competitive global environment. Another important factor was the Indian political dynamic, which according to Ahluwalia (1994), only allowed the introduction of economic reforms when an abnormally strong majority of the population was in support of them. In this case, given the agreement on the doubtful future of the overblown public sector and the strong growth of other more open and internationally oriented East Asian economies, this first step was intended to be gradual enough to be widely accepted and supported, while also being firm and substantive enough to illicit a significantly positive response in the promotion of economic development.

According to Rodrik & Subramanian (2004), the first wave of economic liberalization was intended to be "pro-business" rather than "pro-market"; this distinction is important in that the two terms are often confused by authors documenting the historical evolution of India's economy, but in fact the two

terms are indeed quite distinct. The pro-business policies of the 1980s were advantageous for existing businesses, while the pro-market policies of the 1990s were not seen as being necessarily supportive of pre-existing Indian businesses and industries, nor were the reforms of the 1990s overwhelmingly supported by business owners at that time. It has been claimed that the implementation of both types of polices were successful insofar as they advanced at a relatively gradual pace, allowing many years for the reforms to reach their final maturity.

To be sure, the Indian process of economic liberalization indeed went slowly; for example, as Kohli (2006A) points out: tariffs only began to decline by 1987 and remained at around 30% until the beginning of the 21st century, import quotas were slashed (only disappearing completely by 2001), the currency was devalued, foreign investment restrictions were relaxed to promote easier access and entry by non-Indian investors, while other related restrictions on outside financial operations were correspondingly simplified. Accordingly, Kohli (2006A) goes on to underline the fact that, even into the beginning of the 21st century, Indian foreign trade made up only 25% of its overall GDP. Additionally, Kohli (2006A) has highlighted the fact that political clout held by long-standing companies entered significantly into the decision for the allotment of preferential treatment by the government. Even as the government was beginning to loosen its hold on some economic controls, it was still strongly involved and very much cognizant of the way in which the new economic stage was developing. Having observed the accelerated growth resultant from the reforms of the 1980s, Ahluwalia (1994) notes that these initial successes led to the establishment of a generally positive connotation with economic reform and liberalization; these positive attitudes towards change paved the way for further deregulation and higher levels of economic performance, all made possible by the support and broad acceptance of India's population.

Many factors led to India's balance of payments crisis in 1991, including: high interest payments from excessive borrowing (resultant of the irresponsible spending of the public sector over many years), high dependence on foreign oil (which at that time was becoming drastically more expensive due to the Gulf War) and finally rising trade and account deficits (as a result of their relatively

inefficient and lacking international trade sector). Recognizing the need for immediate funds, the government sold its gold reserves, for an estimated 600 million dollars, to the Bank of England. This would have allowed enough funding for a meager two to three months of support for the tremendously burdensome public sector payments. The government realized that long-term solutions were very clearly necessary in order to re-establish itself on a path towards sustainable economic development; therefore India sought help from the IMF (International Monetary Fund).

The IMF presented India with a plan to solve the balance of payments crisis, but their aid was contingent upon India's further opening of its economy to global trade. This marked a fresh start for the expansion of the new reforms initiated in the 1980's. Tariff rates were dropped, import quotas were raised and other national barriers that had existed since independence began to wane. After so many years of fear of outside control, India finally began to aggressively open its borders to foreign direct investment. According to Kohli (2006B) in his paper "Politics of Economic Growth in India, 1980-2005 Part II: The 1990s and Beyond" these new policies created an environment that both helped and hurt businesses in India. Obviously, a multitude of industries flourished as a direct result of their newfound ability to more easily tap into the global pool of resources, rather than being heavily restricted or simply limited by the borders of India. However, equally relevant is the fact that many formerly protected businesses floundered in the newly diversified market environment. Unsurprisingly, many were proven to be inadequately equipped to compete. Many politically powerful corporations within India were not able to lobby for their interests as they had done in the past, and after so many years of government protection, many businesses were finally exposed for what they had always been: unproductive and inefficient. Despite the minority of firms that were unable to thrive under this new environment, the vast majority of the economy boomed and, despite an initial slow down in 1991 due to the crisis, took off to grow at an average rate of 5.6% throughout the 1990s. The new economic landscape, created by the reforms that resulted from the crisis, began a trend of strong growth performance which continues to date, and is projected to continue well into the future.

The economic development achieved by India beginning in 1947, the year of their independence, up until the present day has indeed been very encouraging. Although the period leading up to the 1980's was not ideal, it very plausibly created a strong foundation from which more robust growth could proliferate. The increased growth likely sparked by policy reform beginning in the 1980's, and further liberalization and privatization after the 1991 crisis, has rapidly brought India to the forefront of the world economic stage. Currently, the Indian economy distinguishes itself by a high prevalence of technology-based industries, a trend toward knowledge-based exports (including a heavy emphasis on service based exports) and consistently high annual GDP growth. However, India's success in growth has been accompanied by pronounced cross-state inequalities (income and otherwise), while the intra-state income distribution has likewise trended towards greater levels of income inequality. Poverty, illiteracy and a great number of challenging issues lie ahead for the Indian government; increasingly pronounced regional disparities require that it combat these politically and socially unacceptable trends. As it can be said with little doubt that future growth prospects for India appear to be strong, and assuming a proper channeling and management of such predicted growth, advances in the aforementioned challenging issues are more likely than ever to improve commensurately.

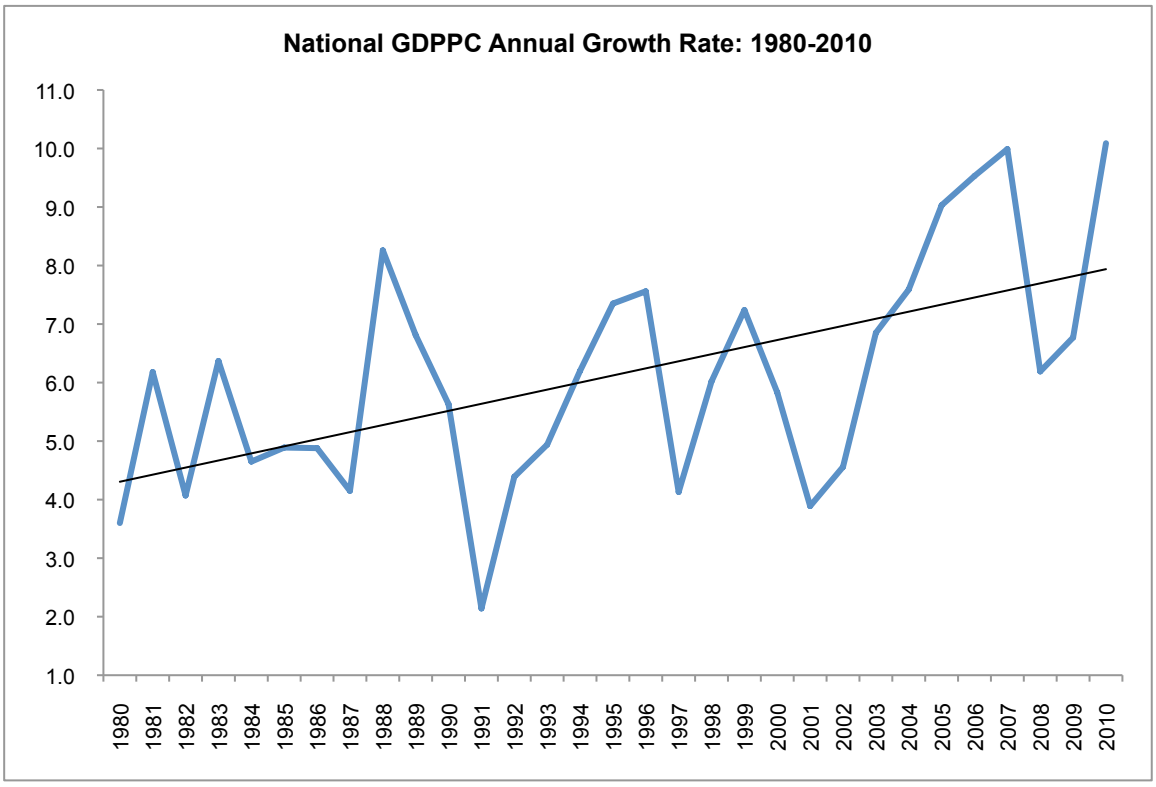
Given the cross-state heterogeneity of endowments accrued from India's robust growth over the last three decades, a state-wise dissection of India's growth is an especially useful tool. Although India has preached to be focused on regionally balanced growth since independence, and a strong component of fiscal federalism, it is important to highlight the autonomy of state governmental bodies in economic decision-making. The nature of the Indian federal government then is relatively subordinate to individual state governments' actions; as such, it is necessary to look more deeply into the individual state-wise decisions, as state-wise policy is indeed not homogenous and affects to a great extent the subsequent state specific economic performance. After the liberalization policies employed after the 1991 balance of payments crisis, the federal government granted even further autonomy on the state level spending. Therefore, when discussing the Indian economic experience as a whole, the

political heterogeneity of the country must be taken into account. Ideally, research into the successful policy decisions of specific economically powerful states may provide model developmental strategies for the less successful states. This study endeavors to highlight some fundamental relationships between Indian state-wise growth, the subsequent rising inter-state and intra-state income inequality and in an overall sense, to bring attention to this critically important economic topic.

3.1 NATIONAL INDIAN INCOME INEQUALITY & ECONOMIC GROWTH

Before entering into a discussion of the individual state-wise experience, an overview of the national economic experience of India can serve as a beneficial and orienting starting point. As documented in the previous section, Indian economic growth has increased steadily beginning in the 1980s, further increasing during the 1990s and continued acceleration persists into the most recent decade. This growth has been aided by an increasing emphasis on encouraging a pro-business attitude, combined with an ever-greater focus on internationalization combined with deregulation and externally oriented economic policies. These modernizations are a clear departure from the inwardly focused state-led import substitution that the Indian Planning Commission famously pursued to a great extent prior to the 1980s, and to a lesser extent, during the 1980s. These policy decisions created an environment where India's economic prosperity was precariously tied to international price shocks, and were almost exclusively to blame for the balance of payments crisis of 1991. To facilitate an overview of India's growth experience throughout the observation window of our current study, below in figure 2 we can observe the summary of the national per capita growth levels from 1980-2010.

Figure 2



Source: World Bank (2013)

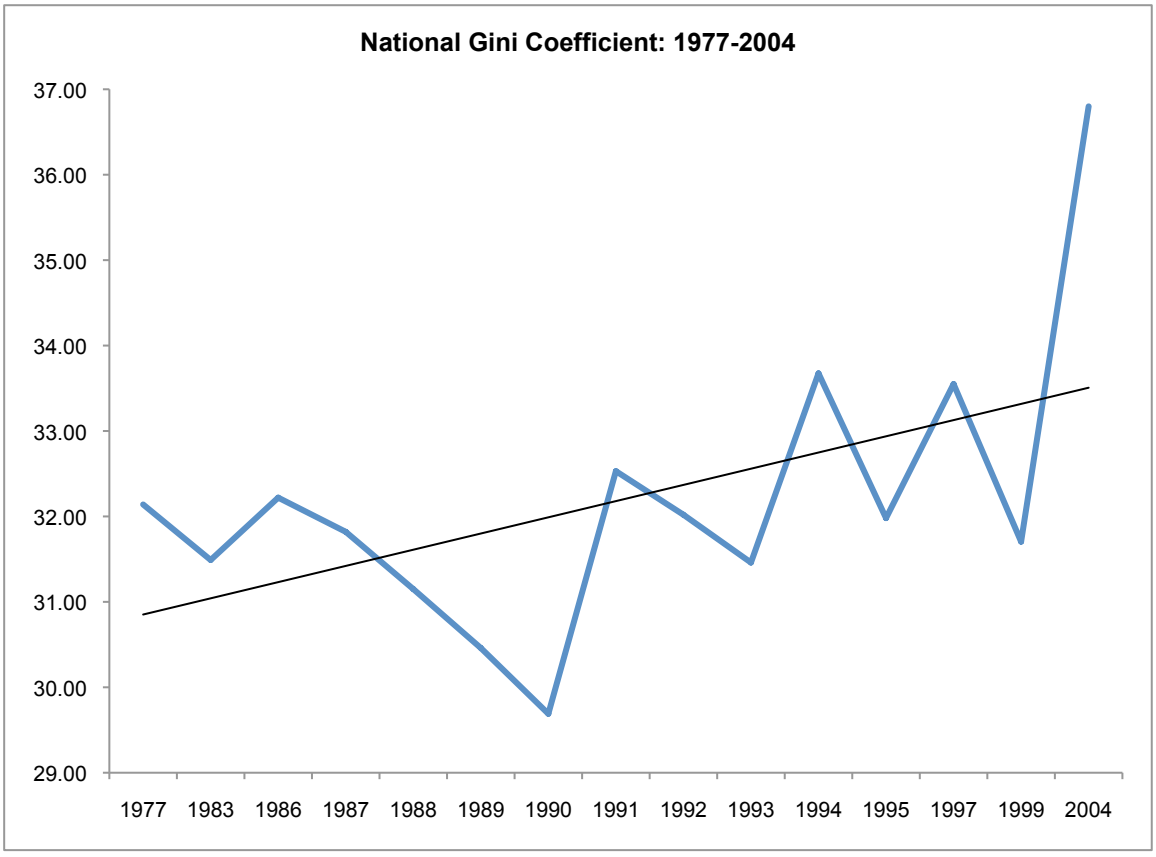
It can be observed that growth levels have over-time tended to increase from somewhat lower pre-reform levels, to more elevated post-reform levels, with respect to the 1991 financial crisis. As demonstrated by the trend line, annual growth has maintained a relatively steep positive trend over the observation period, confirming the notion that growth has continued accelerating across the three-decade observation window. Overall, the growth has been consistently strong, never dipping below 0%, not even for the observation year 1991[21].

Additionally, it is worthwhile to examine the behavior of the Gini coefficients available around the observation window. Gaps in coverage exist, as can be observed through the displayed years in the graph; we only provide

[21] 1991 was a year of extreme financial stress. In the spring of that year, India went through a financial crisis, and therefore a negative growth rate would not have been seen as overly surprising.

official estimates, while linear interpolation is used for the regression analysis to be presented at continuation. Over roughly the same time period, in figure 3 below, a light increase in the income inequality indicator can be observed.

Figure 3



Source: UNU-WIDER Database (2013)

Concurrent with the observation period's trend line, the Gini coefficient has risen over the last several decades. These observed rises in income inequality from the 1980s through the 2000s, and more pronounced increases since liberalization in the 1990s, are confirmed by Sarkar & Mehta (2010). Bhaduri (2008) and Sengupta et al. (2008) likewise conclude that, despite India's clearly successful growth experience, income inequality and aggregate divergence within Indian societal groupings has occurred.

This conclusion of increased inequality is equally concurrent with

research in the ambit of wage inequality, which unsurprisingly has been observed to have likewise risen, leading to elevated aggregate income inequality levels. Sarkar & Mehta (2010) find that the labor market for both rural and urban areas since liberalization in the early 1990s has undergone significant changes that plausibly have affected overall income inequality. They find that the income gap between rural agricultural workers and non-agricultural workers was in fact narrowing, but the wage gap in urban labor widened between the secondary (industrial) and tertiary (services) sectors. This is likely reflective of the rapid development of India's service based industries, which has been at the forefront of their booming economic growth.

In fact, Barro (2000) mentions that a potential explanation for the rise of inequality in a developing country could be due to the result of new technologies having recently been introduced. The argument follows that as the wealthier individuals are the only users capable of purchasing the new and expensive technology, they receive an advantage and benefits, while the poorer individuals are forced to use the older and less efficient technology. As time passes, more and more people are introduced to the new technology, and inequality should decrease. In essence, the trend would follow somewhat of a Kuznets inverted 'U' curve, with a relatively steep left tail, and a flatter right tail (depending likely on the availability of financing for the new expensive technology). Some authors refer to this phenomenon as SBTC (skill biased technological change).

Indeed, the acceleration of growth that India has experienced since deregulation and liberalization in 1991 has affected the overall and between group rises in income. Goel (2009) finds that relative wages for laborers endowed with greater levels of education have increased, even though these workers have also grown in relative supply. However, Goel (2009) also finds that residual wage inequality, which accounts for within group wage inequality, has been reduced. Further, the author finds that the service sector, which has been instrumental in India's enormous GDP growth since liberalization, and accordingly has been an increasingly lucrative industry for laborers, has not experienced a commensurate increase in employment. These observations were likely involved with the increases in wage inequality, but it has been

postulated that wage inequality may have increased despite these trends insofar as there is no clearly discernible pattern in wage or employment tendencies before and after liberalization.

This observation that wage inequality has increased in India after liberalization, runs contrary to the outcome predicted by the Hecksher-Ohlin-Samuelson model. This theory assumes that the liberalization of trade barriers in a developing country ought to allow a country to take advantage of its relatively abundant capital endowment, in the case of India of unskilled labor, and export products intensive in unskilled labor to more developed countries, where unskilled labor is expected to be less abundant. In this way, a developing country can maximize its terms of trades by leveraging its comparative advantage in unskilled labor, and import the items that would come at a comparatively higher cost (e.g. products intensive in skilled-labor).

In his article " HOS Hits Facts: Facts Win; Evidence on Trade and Wages in the Developing World" Robbins (1996) asserts that this outcome, which is contrary to the theoretically predicted result, has likely been caused by the unforeseen effect of the skill-biased technological change. Robbins (1996) asserts that as trade barriers diminish, modern technologies developed in more advanced nations grow to be more readily accessible to poorer nations. When these new technologies are imported and implemented in the poorer nation, they tend to favor the ex-ante skilled and educated individuals; therefore, importation of these skill-biased technologies increases demand for skilled workers, while unskilled laborers tend to not be receiving any direct or immediate benefit. As a result of this skill-biased technological trade, wage inequality is predicted to increase in the short run.

For the case of India, this dynamic has been connected to rising wage inequality (Kijima (2005)). Despite Kijima's (2005) claim, other authors assert that in fact the skill biased technological change has not been affected by trade, but was indigenous (Berman, Somanathan & Tan (2006)). Additionally, Berman et al. (2005) find that capital skill complementarities as referenced by Michael Todaro (2000) "physical capital or experienced management" (p. 54), were found to be a driving source of the increased wage inequality. Even further,

Acharya (2006) claims that trade in general was responsible for the growth in the wage inequality gap. Chamarbagwala (2006) concludes that the increase in wage inequality was a fusion of trade induced skill biased technological change, foreign direct investment and liberalization policies. Goel (2009) closes his arguments by concluding that overall inequality in India has increased enormously, and most notably in the fifth quintile (upper 20^{th} percentile). Mishra & Kumar (2005) find a completely opposing view that trade actually led to decreased wage inequality. Given the clear dissent of opinions and evidence provided for the evolution of wage inequality, it comes as no surprise that there is an equal amount of vagueness surrounding the development of state-wise and male to female wage inequality.

To more exhaustively and explicitly analyze the relationships between income inequality and economic growth, a linear regression equation will be estimated to formally study the relationship between these two macroeconomic variables. Additionally, a host of other relevant control variables suggested by the literature to leverage an important effect on economic growth will be included in the equation. An in-depth discussion of the theoretical channels through which income inequality and economic growth interact has already been presented in previous sections of the current study; therefore, it shall suffice to only briefly summarize those various theories and mediums, when interpreting the output. The following empirical analysis will attempt to incorporate as many of those principally important relationships as data constraints permit.

To be sure, the classical economic growth and income inequality analysis conducted by Robert Barro, beginning with Barro (1991), can be looked upon as a gold standard; accordingly, this current study will attempt to replicate his work as closely as possible, adapting it to the single country study of India, and with consideration for availability of data. A great majority of Barro's models were built around cross-country panel data, and considering that the current endeavor is to use time-series data to analyze the influence of income inequality on economic growth at the national level, the panel specification is obviously inappropriate. However, the same ideas and principles can be applied; hence, adapting the framework pioneered by Barro

(1991), and later replicated in Barro (1997, 2000), Indian time-series data will be utilized in an attempt to study the behavior of the income inequality and economic growth relationship from throughout our approximate observation window 1975-2011. We choose to extend the data to the most recent available year (2011) as augmenting the total number of observations serves to greatly increase the utility of a model primarily handicapped by so few potential data points. Likewise, we take advantage of a short period prior to 1980 data to observe these key relationships just before the horizon of our overall study, as well as for the state-wise analysis (explicitly from 1980-2010).

Additionally, this analysis has been fashioned after and impacted by later empirical works such as Benabou (1996) and Knowles (2001). Although alternate estimates will be presented in an effort to observe the variation in model performance, the inspired full equation resultant from a review of the relevant literature and with due consideration given to the Indian context, will take the following form:

$$\text{Ln GDPPC}_{t+T} - \text{Ln GDPPC}_{t} = \text{Constant} + \beta_1 GINI_t + \beta_2 PFE_t + \beta_3 PME_t + \beta_4 GDS_t + \beta_5 IMR_t + \varepsilon_t$$

The Gini coefficient variables were taken from the UNU-WIDER database (2013), while the male and female specific primary enrollment variables (PFE and PME), savings data (GDS) and infant mortality rate (IMR) were taken from the World Bank database (2013). The dependent variable LnGDPPC_{t+T} - LnGDPPC_{t} was taken from the Reserve Bank of India's database (2013). Summary statistics for the variables included in the regression model are shown below in table 2:

Table 2

National Regression Summary Statistics

	Mean	Maximum	Minimum	St. Dev.
LnGDPPC t+T - LnGDPPC t	0.127	0.178	0.060	0.031
GINI	32.700	36.800	28.900	2.234
PFE	79.636	111.158	61.334	13.979
PME	103.194	114.940	94.836	4.887
GDS	21.968	34.115	15.407	4.532
IMR	88.059	123.520	53.600	21.057

To begin, we can notice our dependent variable, the year on year natural logarithm growth rate of GDPPC, has averaged over 12% for the entire study period, reaching a maximum of over 17%, and never falling below zero. The standard deviation indicates that annual variation was moderate, neither highly pronounced nor very stable. Our Gini coefficients also displayed moderate variation, with a range from the maximum of 36.8 to the minimum of 28.9, although overall the mean and standard deviation indicate only modest variation throughout the observation period. Our sex specific gross enrollment variables (PFE and PME) were shown to generally increase (with few years showing decreases) throughout the entire observation period, although overall, PME exhibited higher values in all respects, and showed lower levels of dispersion (standard deviation). It is worth noting that for both of the enrollment variables, the figure can exceed 100%. Given that gross primary (male or female) enrollment is a ration measuring 'total enrollment in primary education, regardless of age, expressed as a percentage of the male population of official primary education age; gross enrollment can exceed 100% due to the inclusion of over-aged and under-aged students because of early or late school entrance and grade repetition' (World Bank (2013)). The variable gross domestic savings (GDS) showed constant growth over the entire observation period, punctuated by small and occasional decreases, but overall can be seen to have varied due to its constant growth. Similarly, infant mortality rate (IMR) was observed to decrease constantly and consistently over the entire observation period, with all of its variance rooted in that fact. Below in table 3 we can observe the correlation coefficients of the same variables discussed above.

Table 3

National Regression Correlation Coefficients

LnGDPPC	GINI	PFE	PME	GDS	IMR	
1.0000	0.1775	0.2456	0.3964	0.3597	-0.2246	LnGDPPC
	1.0000	0.8604	0.5617	0.7953	-0.8397	GINI
		1.0000	0.8581	0.9441	-0.9356	PFE
			1.0000	0.8654	-0.7214	PME
				1.0000	-0.8570	GDS
					1.0000	IMR

Critical Value 5% : 0.3246
N = 37

From the above table, we are able to observe the fundamental relationships both between the dependent variable (Ln GDPPC $_{t+T}$ – Ln GDPPC $_{t}$) and the independent variables, as well as the linkages among the independent variables themselves. Although the critical value for our correlation coefficient values is 0.3246, which thusly implies that almost all of our independent variables are characterized by a statistically significant (p=0.05) non-zero linear relationship, the overall influence is shown to not be problematic in the post-estimation diagnostics reported with the regression output. Logically, some of the exaggeratedly high correlation values would be expected, such as PME and PFE, would for obvious reasons, be expected to have a strong linear relationship over time. Further, we can notice that GDS has been increasing at a rate in close linear correlation with both of the human capital variables, as well as with GINI. Our IMR variable is negatively correlated with all of our other test variables, and at relatively high values. Regarding issues that may bias our test results, following the full presentation of the regression estimates, explicit discussions regarding classically problematic matters, specifically: autocorrelation, heteroskedacticity, as well as the normality of the distribution of error terms, will be undertaken.

One of the key independent variables of interest is obviously the Gini

coefficient. For national Indian data, there are several gaps in coverage (as can be clearly seen in figure 3 above), however in the interest of using the largest sample size possible, linear interpolation has been used to bridge the gap between official Gini observations. Although not an ideal circumstance, we find that only using the 12 official estimates throughout our observation window far below a reasonably acceptable level; accordingly, adding estimations by way of linear interpolation translates into a significantly larger sample size, and is unquestionably a much preferred method to achieve a more reliable econometric model. Given that one would expect Gini coefficients to develop in a relatively gradual manner, we consider linear interpolation acceptable for this admittedly experimental exercise.

With respect to the human capital variables, in our example both of the primary enrollment figures for males and females, PFE and PME, respectively, have not needed the use of linear interpolation. Data for secondary enrollment however, did exhibit data gaps, and therefore we selected the primary enrollment figures, to avoid any further manipulation of the data employed in our experimental regression. Gross domestic savings (referenced as GDS) data was available for all observation years, although infant mortality rates (referenced as IMR)[22] were only collected at regular gaps throughout the observation period. Accordingly, we also used linear interpolation with infant mortality rate, although it could be reasonably assumed that annual observation of such a variable would follow a very close to linear relationship (especially after viewing the original data observations showing constant and relatively uniform decreases). The dependent variable is the year on year difference of the natural logarithm of GDPPC ($LnGDPPC_{t+T} - Ln\ GDPPC_{t}$). Overall, this national level regression analysis is intended only as an experimental tool; although our main interest remains with the cross-state analysis to be executed in later sections, we assume that investigation into the national trends may provide useful insight into the state specific research.

A lag period for the independent variables will be employed, as has been routinely done in similarly focused empirical works. Many authors note that

[22] Infant mortality rate is defined by the World Bank as infant deaths per 1,000 live births.

essentially the exact length of the lag is arbitrary, and typically determined by data availability, but an at least modest gap in time should be implemented between the independent variable observations, and their corresponding dependent variable values. With data availability for our human capital variables beginning in 1971, and with the interest of extending our sample size as much as possible rather than cutting short potential observations, we have chosen a four-year lag period. A majority of authors are concerned with the longer run relationship between inequality and growth (Alesina & Rodrik (1994), Birdsall, Ross & Sabot (1995), Sylwester (2000) and Easterly (2000)), and accordingly orient their relatively ample studies with correspondingly long lag lengths. Although some studies do in fact implement a more short-term focus (Li & Zou (1998), Forbes (2000), and Deininger & Olinto (2000))[23]. The main methodological difference between these cross-country studies and our current study is the breadth and diversity of data observations. The main issue complicating intra-country analysis is the lack of a sufficiently long time-series to accommodate traditional regression standards. With the lightly extended study period, we still only enjoy 37 observation years, hardly achieving a threshold from which reliable conclusions can be obtained. Author's working with large cross-country samples benefit from the fact they can have large lag lengths, correspondingly few observations per country (but with many countries observed), thusly losing comparatively little significance for the overall model. Within the context of a single country study, this type of analysis is simply not possible, and thusly we justify our use of a less expansive lag-length in preference for greater sample size.

With respect to the moderate lag length employed in this current, and overall scale of the time-series data, our focus is intended to interpret the long-term relationship between inequality and growth. Barro (2000) points out that popular economic growth model design comes from the fact that the underlying theory is chiefly concerned with the long-run fluctuations in economic growth;

[23] These authors test the short run relationship between income inequality and growth, and their findings yield a positive partial correlation between the two variables.

therefore, in order to harmonize with the theoretical relationships, analysis of longer term relationships are preferred. In the context of the Indian growth experience, Rodrik & Subramanian (2004) implement lag periods of 5 years. Forbes (2000) also uses a 5-year lag period, but analyzes a wide range of countries. Related to this design, it is also preferable to employ observations of the explanatory variables as close to the start of the growth period under analysis, in a lagged fashion, in order to harmonize with growth theory. This all relates to the assumption that *past* values of inequality, capital and other determinants affect *future* growth. Additionally, the lag period is employed for comparability reasons; similarly focused studies typically utilize a similar lag length. From a logical and theoretical standpoint, it simply makes sense that sufficiently delayed past values of the relevant independent variables would be those that affect future growth rates.

Gini coefficients observations were taken from the United Nations University WIDER database (2013). First, observations were sorted under the heading of 'Area of Coverage' for the three categories offered: 'Rural', 'Urban' and 'All'; the data employed covered 'All'. Once the data were divided into these aggregated groupings, one observation per year was chosen, and all efforts possible were made to maintain a consistent and uniform selection process throughout[24]. The final grouping considered in this study was labeled as covering: "household', 'person' and 'household per capita'. Overall there is little consensus on how income inequality affects growth rates, but more often than not the relationship is negative within the context of developing countries. Indeed, a majority of authors find there to be an aggregate negative effect of income inequality on economic growth, especially in the context of poor nations. This finding has been very well documented, see the following studies for a discussion of the inverse relationship between income inequality and economic growth: Alesina & Rodrik (1994), Benhabib & Spiegel (1996), Bourguignon (1994), Clarke (1992), Deininger & Squire (1995), Keefer & Knack (2002), Perotti (1992, 1994, 1996), Persson & Tabellini (1992, 1994), Venieris & Gupta

[24] It is worth noting that the UNU-WIDER database contains more than one observation per year for many years, and therefore it is necessary to sort the data, and choose observations that are most like those observations that are most abundant and that have already appeared in the selection group.

(1986). Accordingly, we will loosely predict the coefficient on our Gini variable to be negative, although empirical findings, as documented in section one, are not especially robust.

The measures of human capital concentration, in this case the primary school enrollment rates for both males and females, were taken from the World Bank dataset for India. The variables measure the percentage of individuals enrolled as a percentage of all females, for the indicator PFE, or of males, PME. The hope is to gauge the influence of human capital levels on growth rates for both sexes, studying whether or not the supposed positive relationship holds true for India.

The variable savings has likewise been taken from the World Bank database, and is measuring the gross domestic savings, as a percentage of gross domestic product. With respect to the ample literature regarding savings rates and economic growth, the a priori relationship would assume positive correlation with growth rates[25]. Summarizing the previously reviewed principles, savings is theorized to positively affect growth rates through inequality channels (Kaldor hypothesis, indivisibility of investment and reduced incentives). These three theories predict that higher levels of inequality encourage higher levels of savings on behalf of the rich; as a result of this increased savings, higher growth rates are assumed to follow. Further, beginning with Keynesian economics (Keynes (1936)), investment is considered a heavily influential variable in the determination of growth rates, and given the intimate relationship between investment and savings, it should follow naturally that the inclusion of a savings metric could stand to be a significant explanatory variable for growth levels. In accordance with the above discussion, and the literature regarding investment/savings in the research line of Keynes (1936), an a priori positive relationship would be assumed between savings and growth rates.

The final variable employed in the study was infant mortality rate, as a proxy for the influence of the general level of health of Indian workers; it was also extracted from the World Bank database on India. It would be assumed

[25] For a full coverage of this relationship please refer back to the previous section, review of literature.

that as a country's infant mortality rate drops, the overall level of healthiness for the average worker in the country is increasing. In accordance with Todaro (2000) and other development economists, the health of workers in a developing country can be a significant factor in the determination of its rate of growth; therefore, assuming that infant mortality rate is an acceptable proxy for overall levels of healthiness, a negative a priori relationship would be assumed between growth levels and infant mortality rate. This study is distinct from much of the growth and income inequality literature, in that it analyzes only one country throughout time. Many authors argue against this type of study, Barro (2000), claiming that the aggregate relationships between inequality and growth must be studied in cross-country models, as national studies are too shallow to establish identifiable results. However, Fields (1999) claims that, in fact cross-country analyses may be inferior to more in-depth single country studies as a result of the overwhelming heterogeneity between countries, and the unavoidability of omitted variable issues. Kanbur (2000) goes as far as saying that the literature has begun to mature from the generalist cross-country studies to more focused single country case studies. Knowles (2001) reinforces this position, claiming that studies focused on cross-country data produce results that are highly dependent on the countries included. Accordingly, it is necessary to note that these studies can be tremendously sensitive to the omission of relevant variables, or inclusion of influential observations and outlier cases. Our results would then theoretically be void of this potentially disturbing noise from uncontrolled heterogeneity. Despite the drawbacks of a single country study, the greater control across observations represents a strong advantage. The results from the linear regression model are displayed below:

The time-series models to be estimated are summarized by the equations below, whereby all independent variables only vary in '*t*'. Likewise, the dependent variable, the difference in the natural logarithm of time '*t+T*' GDP and time '*t*' GDP, only varies in '*t*'. The regression equations are given as:

1) $\text{Ln GDPPC}_{t+T} - \text{Ln GDPPC}_{t} = \beta_0 + \beta_1 \text{GINI}_t + \varepsilon_t$

2) $\text{Ln GDPPC}_{t+T} - \text{Ln GDPPC}_{t} = \beta_0 + \beta_1 \text{GINI}_t + \beta_2 \text{PFE}_t + \beta_3 \text{PME}_t + \varepsilon_t$

3) $\text{Ln GDPPC}_{t+T} - \text{Ln GDPPC}_t = \beta_0 + \beta_1 \text{GINI}_t + \beta_2 \text{PFE}_t + \beta_3 \text{PME}_t + \beta_4 \text{GDS}_t + \varepsilon_t$

4) $\text{Ln GDPPC}_{t+T} - \text{Ln GDPPC}_t = \beta_0 + \beta_1 \text{GINI}_t + \beta_2 \text{PFE}_t + \beta_3 \text{PME}_t + \beta_4 \text{GDS}_t + \beta_5 \text{IMR}_t + \varepsilon_t$

The models were run both in GRETL version 1.9.12 as well as with STATA 64/SE version 10.1; below we provide the results obtained from the time-series analysis in table 4:

Table 4

National Regression Output

Dependent variable: LnGDPPC_{t+T} - LnGDPPC_t							
	[1]	[2]		[3]		[4]	
GINI	0.0025	0.0090		0.0074		0.0088	
	0.0023	*0.0057*		*0.0056*		*0.0055*	
PFE		-0.0029	**	-0.0039	***	-0.0063	***
		0.0015		*0.0015*		*0.0021*	
PME		0.0073	***	0.0057	**	0.0075	***
		0.0026		*0.0027*		*0.0028*	
GDS				0.0056		0.0075	
				0.0033		*0.0028*	
IMR						-0.0011	
						0.0007	
P-STAT	0.2934	0.0224		0.0156		0.0125	
R^2	0.0315	0.2490		0.3104		0.3614	

Constants not reported for convenience

Coefficient estimates are reported in larger plain font, while the standard errors are below in smaller italics. Significance levels are reported only for those found to be statistically significant (5% ** or 1% ***). Specifically, the software facilitating the above estimation was STATA version 64SE, utilizing the 'linear regression' function, with post-estimation testing (discussed below) provided by the 'regression diagnostics' section. Various equations were estimated to show the different groupings' effects on the dependent variable, growth rate. As we can see, consistent directionality held across all coefficient estimates for the model classifications displayed. Across the various estimations, the variables that have been shown to be robustly significant in the explanation of the rate of economic growth are only the two human capital variables (PFE and PME). The rest of our test variables were found to be statistically insignificant, although in some cases very near the 10% confidence level for Gini and IMR, while indeed at the 10% level for GDS. The overall models' significance was found to be significant for all but the first equation only including Gini coefficients. However, our low R^2 statistics indicate that much of the explanation of growth rates lies outside the realm of these commonly employed macroeconomic variables. Further, these low R^2 values could be the result of improper lag distances, although re-estimation with varying lag lengths did not significantly change results.

Specifically regarding Gini coefficients, all four equations indicate that the effect income inequality leveraged on growth rates was not statistically significant, although we did consistently find the coefficient on Gini estimates to be positive. However, considering the literature, our findings of a statistically insignificant relationship between income inequality and economic growth are consistent with Barro's (2000) mentioning inequality is neither especially strongly nor robustly related to growth across studies. Likewise, Perotti (1996) supports the notion that the inequality growth relationship may not be statistically significant for poor countries. A common empirical finding in the recent literature is that changes in inequality at the national level in India have virtually zero correlation with rates of economic growth; see, for example, Ravallion and Chen (1997), Ravallion (2002), Dollar and Kraay (2002).

Further dissecting the findings related to our human capital metrics,

namely PFE and PME, the relationships between female and male human capital levels on economic growth are commonly found to be statistically significant and positive for males while occasionally negative for females. When (Barro (1996) and Perotti (1996) test for male and female specific rates, they confirm these findings. Indeed, our results accord exactly with these theoretically robust findings. A wealth of information exists on this topic; a review facilitated by Benabou (1996) yields the following studies that have found positive relationships between human capital (without testing for gender specific effects) and economic growth: Alesina & Rodrik (1994), Alesina & Perotti (1996), Alesina et al (1996), Barro (1996)[26], Benhabib & Spiegel (1996), Bourguignon (1994), Clarke (1992), Deininger & Squire (1995), Easterly & Rebello (1993), Keefer & Knack (1995), Lindert (1996), Perotti (1992, 1996[27]), Persson & Tabellini (1992, 1994), Svensson (1993). The results in our study are indicative of a positive relationship between male levels, while the female indicator shows a negative relationship with growth rate. Regarding the specific finding of a negative relationship between female literacy and growth rate, see Barro (1996) and Perotti (1996) for further discussion and similar empirical results. Barro (1996) notes that this peculiar finding may be related to the backwardness of an economy, typically evidenced by relatively high male to female ratios of human capital. In the case of India, we readily observe this trend by way of figure 17. Within the context of India and applied to the same area of human capital research, Nagaraj et al. (2000) find a positive correlation between growth and primary education, however their results for secondary education were statistically insignificant. Pal & Ghosh (2007) discuss results regarding a related variable, literacy rate. Their findings are consistent with the positive relationship between PME and growth, as shown by an increase from 43% in 1981, to 52% in 1991, and finally to 65% literacy in 2001; despite the fact they are researching human capital levels by way of a different metric, the results appear quite clear that over the years, educational levels have been rising along with growth levels.

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[26] Barro (1996) finds a positive relationship for males, but the correlation turns negative for female human capital levels.

[27] Perotti (1996) also finds that male education levels are positively related while female estimates for human capital are negatively correlated.

The variable “savings” was not found to be statistically significant, but with the predicted sign. With respect to a state-wise study, Ahluwalia (2002) finds an insignificant variation between savings and growth rates. Despite the state-wise focus, his selection of the most influential and most economically relevant states makes his results at least partially comparable to national results. This result is re-enforced by the findings of Chandra & Sandilands (2001), that capital accumulation is insignificantly related with growth in India. The authors conclude that this insignificant relationship could result from the idea, formerly presented by Lipsey & Kravis (1987) and Blomström et al. (1996), that savings and investment is a result of growth, and in fact not a cause. Additionally, Chandra & Sandilands (2001) infer that this insignificant relationship could also stem from India’s long track record of unutilized capacity. Resultant of years of protectionist policy, India’s savings and investment behavior has been characterized by inefficiency and a lack of the correct incentive signals to encourage proper employment of invested resources. Therefore, higher levels of accumulation, by way of savings or investment, would tend to not affect growth in a significant way, as their idleness or inefficient use would have had little or no impact on economic output. With respect to our findings, the statistically insignificant coefficient estimate for savings would corroborate the India specific results. However, given that our results do not include direction of causation analysis (as does the study by Chandra & Sandilands (2001)), perhaps this discrepancy regarding directionality of causation between savings and growth is a potential topic for future research within the ambit of India.

Elaborating on the findings with respect to infant mortality rates, our finding of a negative relationship between infant mortality rate and economic growth is consistent with the literature, despite it being outside of the generally accepted levels of statistical significance. Given that decreases in infant mortality indicate improvements in health standards, the negative relationship with growth rates confirms this presumed relationship. Several other authors control for health conditions’ effects in growth regressions, and typically their results indicate that general improvements in the healthiness of the working population (greater levels of health standards) are conducive to increased

economic output. In Nagaraj et al. (2000), the authors find that a health conditions proxy variable, in this case they also use infant mortality rates, is significantly linked with economic growth. Their results claim that a 10% drop in infant mortality rates would translate into a 3.7% increase in the steady-state level of income. In Pal & Ghosh (2007), regression analysis is not performed, however, a stark contrast is found between the poor (slower) growing states, and the richer (faster) growing states. For example, for life expectancy data dating back to 1997, they find that in Madhya Pradesh (the 3rd from last poorest and slowest growing state in the most recent observation year, 2008-09) was 55 years, while in Kerala (the 2nd richest and 5th fastest growing state from 2008-09) had an average of 73 years. Although valid arguments could be made that health indicators are not a leading, but rather a following, indicator for economic growth, their results seem to speak clearly to a positive relationship existing between economic prosperity and general health. Consequently, our result of a negative coefficient on the infant mortality rate variable is perfectly in line with the expected result.

Taken altogether, our model has been shown to explain little of the overall economic growth India has experienced from approximately 1980-2010. The R^2 values for all estimated equations are far too low to confidently extract conclusions about the variables employed (only 0.3614 for our complete model in column 4), although in an experimental sense we have shed light on some of the relationships between classically employed macroeconomic variables and the growth rate. For the final and most complete model (column 4) that was shown to explain the greatest amount of the global economic growth experience of India, we employ diagnostic tests to confirm that our results, although at a relatively low overall explanatory power, are reliable. Specifically we undertake tests to confirm results for: autocorrelation, heteroskedacticity and normality of error terms; we find that our model passes all tests satisfactorily at the 5% level, although heteroskedacticity may be present at (unable to maintain the null hypothesis at the 10% level). Regarding autocorrelation, the Breusch–Godfrey LM test of the first order obtains a p-value of 0.1222 (with the null hypothesis assuming no autocorrelation); accordingly, we can deduce that our models' results are not biased by issues related to autocorrelation (although at a p-value

approaching the 10% confidence level). White's heteroskedacticity test (with the null hypothesis assuming no heteroskedacticity) obtains a p-value of 0.0818, indicating that at the 10% level we can reject the null; as such, we deduce that heteroskedacticity of error terms appears to exist, albeit only marginally at the 10% confidence level. Finally, we can confirm that the normality of residuals test (with null hypothesis assuming a normal distribution) obtains a p-value of 0.6004, indicating that our residual terms indeed follow a normal distribution. Overall, our econometric modeling of the national level evolution of income inequality's effect on economic growth, along with a host of other macroeconomic variables, indicates a relatively low explanatory power, with potentially biased results due to a heteroskedastic distribution of the error terms (although only at the 10% level). Given that our objective was to employ this technique in a purely experimental manner, we find the results to be at least acceptable.

Issues that could potentially explain the difficulty in obtaining improved results may be caused by a multitude of factors, ranging from the undesirably small sample size to the innate difficulty of selecting the correct lag length between independent variables and the dependent variable growth rate. Overall, issues regarding the specification of our experimental national model could be the source of the overall low explanatory power of the model. Given that no real consensus prevails on the appropriate lag length, and the fact that adapting cross-country panel data practices to a time-series dataset is inherently challenging, the regression output exhibiting consistent directionality according with growth theory is satisfactory.

Despite the outlined flaws with this national level regression, our econometric model provides a beginning idea of the way in which economic growth, income inequality, and other relevant macroeconomic indicators were related, at the national level, over India's explosive period of economic growth from approximately 1980-2010. These general comments on national Indian economic growth and income inequality allow for a basic understanding of the much more profound, and of interest, detail that rest just below the national stage, on the state level; accordingly, the following section continues with commentary and analysis regarding the evolution of income inequality and

economic growth at the state level.

3.2 STATE-WISE INDIAN INCOME INEQUALITY & ECONOMIC GROWTH

Many economic studies have been undertaken for the case of India on a national level, however exceptionally few look below the surface of national statistical data and probe deeper into the matters of inter-state inequality, growth rates, nor the variation of other popular macroeconomic indicators. Even India's economic planning committee continues to set national growth targets and establish other metrics to judge the success or failure of the implemented economic plans, but the government continues to ignore the significant cross-state variations, and fails to work at improving them by not establishing targets for state level production nor facilitating analysis or justification for these cross-state differences (Ahluwalia (2000)). When Indian state size and population are highlighted, this neglect of state-wise research becomes even more curious. When highlighting these facts, both by population numbers and geographical area, Indian states are indeed comparable in scale to medium to large sized countries. The 2011 census data collected by the Indian government and displayed in India's Planning Commission, the average population of 16 major states was 68,316,000 (Planning Commission (2012)). That state average population figure would shockingly rank as the 20th largest country in the world. Further, the average area is 189,573 km^2, which would rank 88th worldwide (CIA (2012)). The great tragedy of Indian economic analysis is that both the Indian government and individual researchers alike seem to be neglecting the vitally important economic issue of cross-state variations in economic experience.

Although the relationship between income inequality and aggregate economic growth has been a relatively well-documented topic in the field of national Indian developmental economics, the puzzling lack of abundance

concerning state-wise or regional dissections of the nationally aggregated indicators has made research difficult. The scarcity of research on this topic is likely a product of the comparatively weak selection, availability and reliability of data for individual states, with respect to the selection of indicators that are readily accessible at the national level. A prominent author working in the field of Indian economics for nearly forty years, highlights a quality issue which seems representative of the overall unsatisfactory circumstances regarding state-wise data issues:

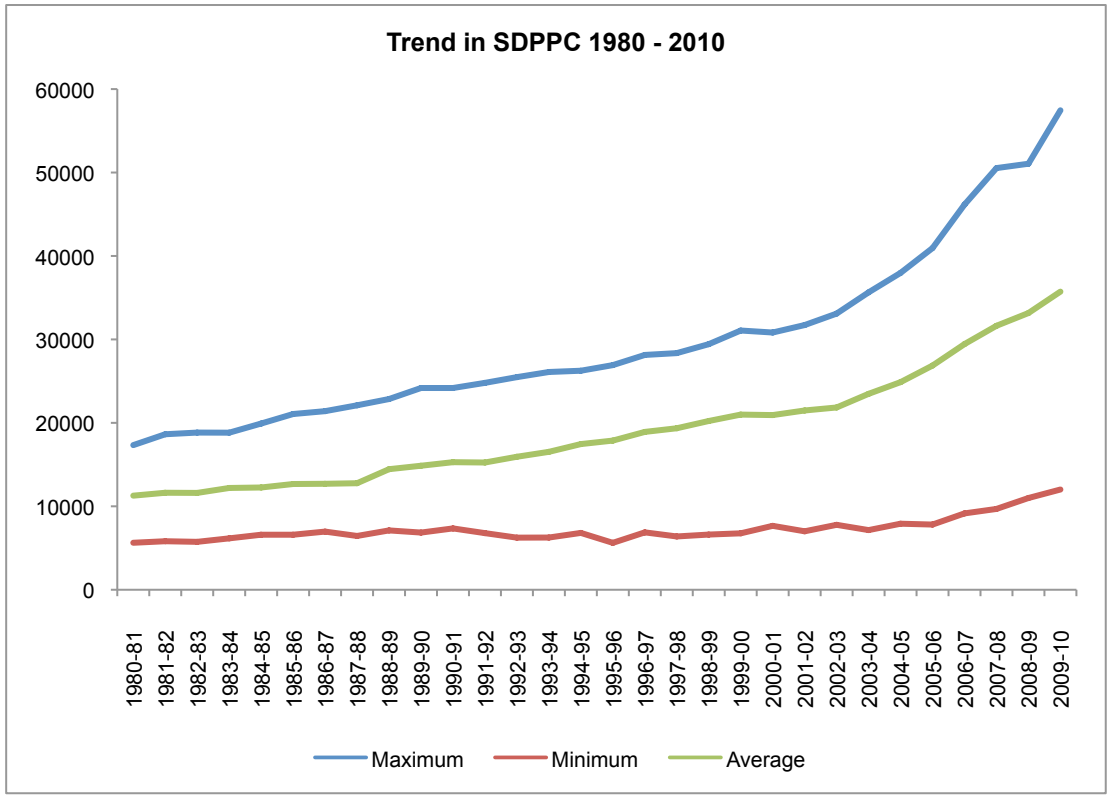
> Ideally, the SDP data series for individual states should be fully consistent with the national accounts estimates of GDP but this…is not possible at present. Information on the SDP…is collected by the CSO…. In this process the CSO takes note of differences in methods of estimating the SDP in different states, but it does not refine the SDP series to make them consistent with each other and with the national accounts (Ahluwalia (2000) pg. 1)

Given this fundamental lack of institutional scrutiny and control for arguably the most important economic indicator, SDP (State Domestic Product), the expectations one can have for other macroeconomic variables and their quality is critically put into perspective. Further complicating matters, observations for all 28 states and the 7 union territories are difficult to come by; thusly, following the methodology of leading authors who use similarly abbreviated samples of Indian states (Purfield (2006), Ahluwalia (2002), Chikte (2011), and Kumar & Subramanian (2012)), this study will only consider 14 of the states that are representative of both a large majority of India's total GDP and overall population. Naturally, this exclusion of more than half of India's states and union territories implies the impossibility of examination, and thusly bleakness for progress byway of economic analysis, of a still significant portion of the Indian population. It has been argued in the literature that India's government must increase efforts to promote improved state-wise data collection practices, and set benchmarks for future achievement, and certainly our firsthand experience with the shortcomings and difficulties that have arisen from data issues would support this view.

A further restriction on the extant potential variables is forced due to a lack of sufficiently longitudinal coverage necessary to accommodate the goals of this lengthy time-series study, namely the period 1980-2010. Accordingly, the following analysis has been adapted to the, and in spite of, the data limitations; a modest grouping of figures have been compiled in order to examine various fundamental relationships between income inequality and economic growth, along with the inclusion of other relevant macroeconomic indicators implied by the literature to leverage a significant effect on the two principally important variables considered in this current work.

In order to provide a snapshot view of the growth experience and evolution of India's inequality over the last three decades, we provide a glance at the divergent growth history observed between India's richest and poorest states. Figure 4 represents the progression of the highest SDPPC level with the lowest level SDPPC across each observation year. From 1980 through 1994, the maximum level of SDPPC belonged to Punjab, although after 1994 the race tightened and Maharashtra owned the maximum for 1995. In 1996, Punjab returned as the richest state, while the two states tied in 1997. Punjab was again the richest in 1998; Maharashtra was the richest in 1999, while Punjab was again richest in 2000 and 2001. For the following three years, 2002-2004, Haryana emerged as the state with the highest SDPPC level. From 2005 onward, Maharashtra has had the highest SDPPC level. For the poorest state, the discussion is very simple: Bihar has had the lowest SDPPC level for all observation years. At continuation, we provide this data graphically to observe this evolution visually. The result shows a clear divergence between the high end and low end of states' experiences in income growth, and equally significant divergence from the average by both the richest and poorest state income levels.

Figure 4



Source: RBI (2013) & Author's Own Calculation

Figure 4 shows a clear trend towards higher levels of divergence between the richest, average and poorest state levels of SDPPC. This separation seems to experience a noticeable acceleration at the beginning of the 1990s, and to demonstrate even further deviation during the 2000s. It is also worth pointing out that Bihar's SDPPC level mostly stagnated over this approximately 30-year observation window, whereas the richest states' SDPPC levels grew robustly[28]. In fact, the increase in Bihar's average SDPPC was only 6,381 crore, while the maximum level of SDPPC increased 40,125 crore over the same period. To be sure, this fact is eye opening; however, more complete analysis incorporating a broadened and more substantive collection of states is necessary to conclusively analyze the growing cross-state inequality.

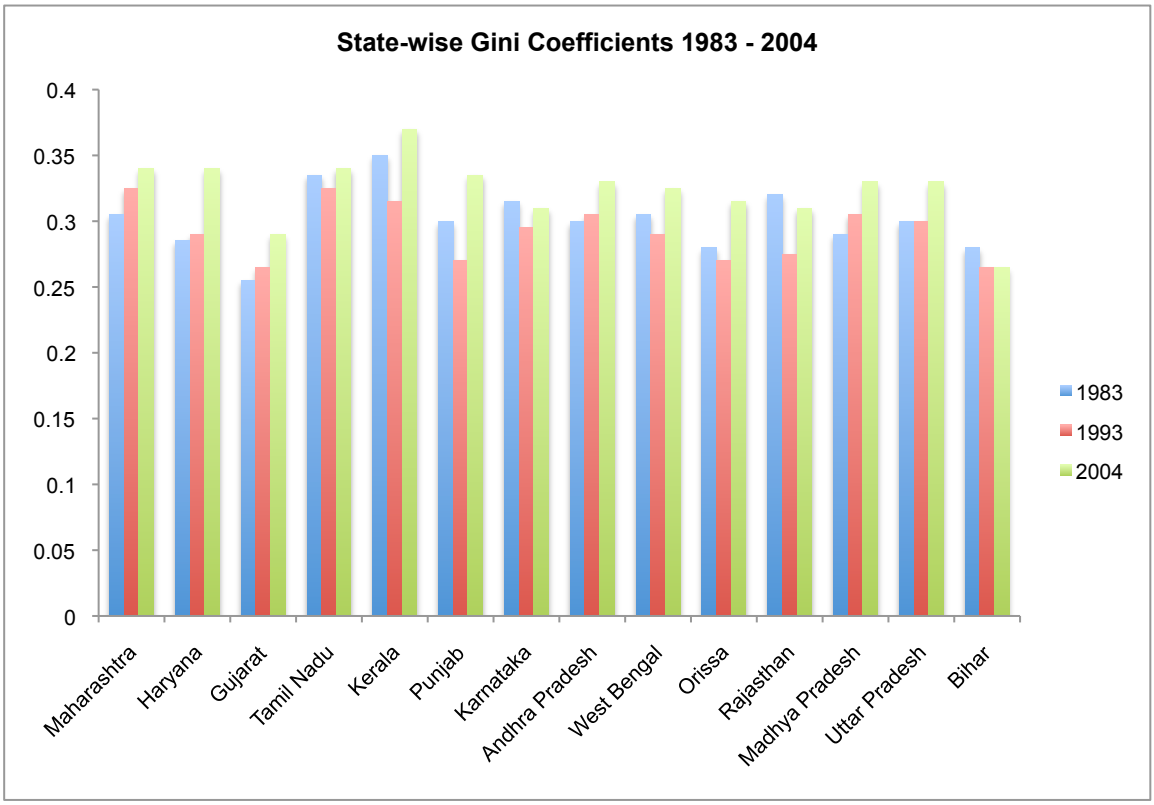
Authors remain somewhat at odds with respect to the prevailing income

[28] This holds true across the three states (Punjab, Maharashtra and Haryana) that competed for the maximum SDPPC levels across all years.

inequality trends observed since economic development accelerated. Singh, Bhandari, Chen & Khare (2003) maintain that some signs of heightened inequality do exist, but they claim they are neither especially prominent nor consistent. However, Singh et al. (2003) find that on a sub-state level, intra-state levels of inequality had increased for some states. Rodrik & Subramanian (2004) find a statistically significant cross-state divergence of incomes beginning in the 1980s and continuing through the 1990s. Their data show that insignificant amounts of divergence were taking place prior to the pro-business attitude paradigm shift characteristic of the 1980s, and that after the increased growth rates of the 1980s, they find an increased rate of inter-state inequality (divergence at an annual rate of 1.2%). Datt & Ravallion (2002) find that, excluding the two richest states, a strong positive relationship existed between 1980s income levels, and 1990s growth rates, which would indicate divergence. Ghosh (2010) confirms this statement in his study, and gives further analysis on the issues behind convergence, along with two different clubs, one converging towards the national average, and the other diverging from. He claims that the heterogeneous stocks of human capital, production structures and infrastructural issues (physical, social and economic) are to blame for the distinct growth experiences. Ghosh (2010) notes that Gujarat, Karknataka, Kerala, Rajasthan and Tamil Nadu are converging towards the national average, while Andhra Pradesh, Assam, Bihar, Haryana, Madhya Pradesh, Maharashtra, Orissa, Punjab, Uttar Pradesh and West Bengal, are all diverging from the national average steady state income. Ahluwalia (2002) calculates an inter-state Gini coefficient; from those results he reports acceleration in income inequality beginning around 1986-87 up to the end of his study, 1997-98. Ahluwalia's measurement of inter-state inequality was reasonably stable until the mid to late 1980s, whereupon there was a noticeable, and according to his reported results, statistically significant increase. In a field of research characterized by theoretical uncertainties and empirical ambiguities, initial results concerning the intertemporal evolution of income inequality and economic growth for Indian states accord with the usual vagueness; however, casual observation seems to demonstrate an overall increase in inter-state divergence, and an increase in the level of income inequality, instep with the robust economic growth over the observational period.

Gini coefficients have been a hotly debated topic over the last several decades of economic analysis. Despite the disaccord, it is true that the majority of authors find there to be an aggregate negative effect of income inequality on economic growth, especially in the context of poor nations. This finding has been very well documented, see the following studies for a discussion of the inverse relationship between income inequality and economic growth: Alesina & Rodrik (1994), Benhabib & Spiegel (1996), Bourguignon (1994), Clarke (1992), Deininger & Squire (1995), Keefer & Knack (2002), Perotti (1992, 1994, 1996), Persson & Tabellini (1992, 1994), Venieris & Gupta (1986). As mentioned by many authors, this finding tends to be especially true for the context of developing economies. However, typically inequality's effect on growth is considered to be neither an especially strong nor robust across studies (Barro (2000)). We present the state-wise data available for Gini coefficients below in figure 5.

Figure 5



Source: Planning Commission (2012)

The states in figure 5 are ordered from richest to poorest in the most recent decade of observation. Casual observation does not seem to yield any obvious result regarding a relationship between high or low levels of income inequality, and high or low levels of SDPPC. Independent of the effect income inequality has on economic growth rates, it does appear that most states have experienced an overall drop in income inequality throughout the three-decade observation window. Regarding the quantitative effects of income inequality on growth, our panel regression equation will endeavor to uncover more specifically the relationship between initial income inequality and period average SDPPC growth rates.

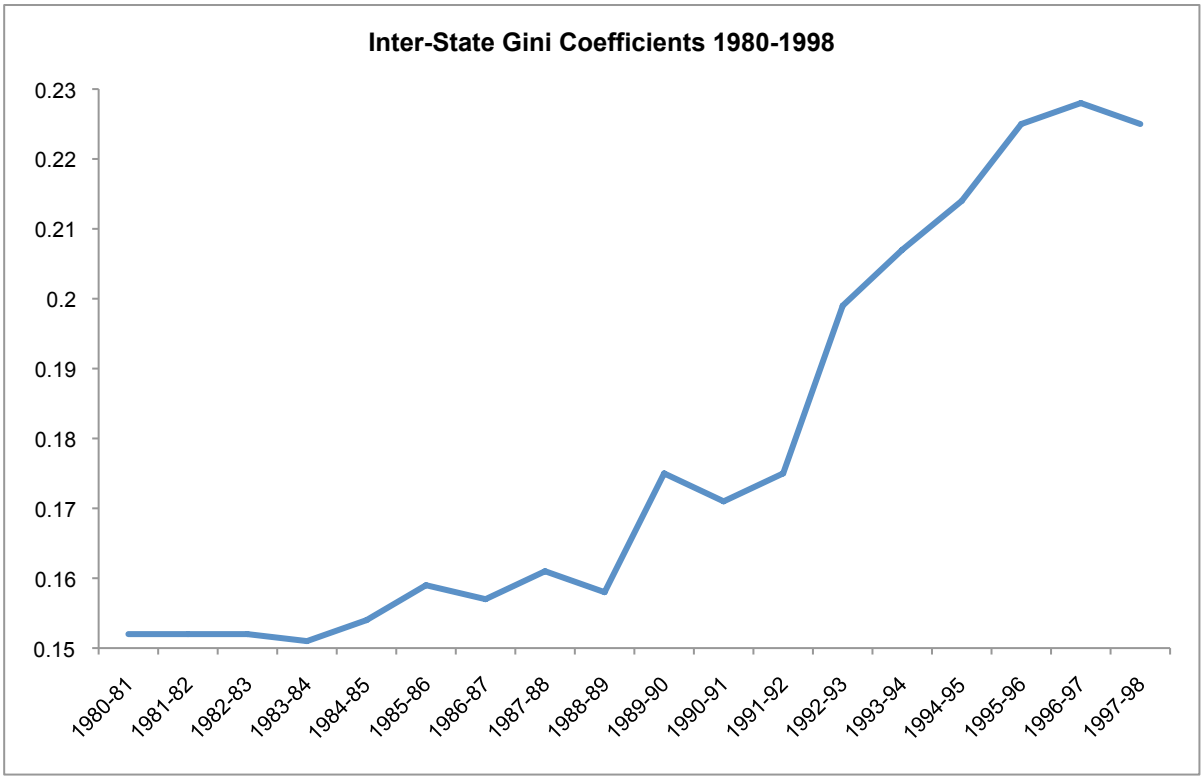
Despite these summarizing comments on the evolution of growth and inequality, agreement in the literature concerning the various effects of India's accelerated growth since the 1980s and more sharply since the 1990s, has occasionally been lacking; equally, consent regarding the resultant distribution of income has been equally indefinite. Bhalla (2003) finds that both rural and urban Gini coefficients decreased during the observation period from 1993-1994 to 1999-2000 for a number of India's most populous states. Singh, Bhandari, Chen & Khare (2003) maintain that some signs of heightened inequality do exist, but they claim they are neither especially prominent nor consistent. However, Singh et al. (2003) find that on a sub-state level, intra-state levels of inequality had increased for some states.

A number of authors claim inequality has stagnated in some states, decreased in others, and yet other authors claim to have found a distinct increase. Rodrik & Subramanian (2004) find a statistically significant cross-state divergence of incomes beginning in the 1980s and continuing through the 1990s. Their data show that insignificant amounts of divergence were taking place prior to the pro-business attitude paradigm shift characteristic of the 1980s, and that after the increased growth rates of the 1980s, they find an increased rate of inter-state inequality (divergence at an annual rate of 1.2%). Datt & Ravallion (2002) find that, excluding the two richest states, a strong positive relationship existed between 1980s income levels, and 1990s growth

rates, which would indicate divergence. Ghosh (2010) confirms this statement in his study, and gives further analysis on the issues behind convergence, along with two different clubs, one converging towards the national average, and the other diverging from. He claims that the heterogeneous stocks of human capital, production structures and infrastructural issues (physical, social and economic). Further, Ghosh (2010) notes that Gujarat, Karknataka, Kerala, Rajasthan and Tamil Nadu are converging towards the national average, while Andhra Pradesh, Assam, Bihar, Haryana, Madhya Pradesh, Maharashtra, Orissa, Punjab, Uttar Pradesh and West Bengal, are all diverging from the national average steady state income. An interesting example of the lopsided developmental trends paralleling this type of divergence can be observed in the poverty rate observed in two starkly contrasting states, Bihar and Kerala. Despite the fact that poverty rates are being compared rather than true inequality measures, Besley, Burgess & Esteve-Volart (2007) provide a nonetheless eye opening statistic: the percentage of people below the poverty line in the state of Bihar had gone virtually unchanged, at over 60%, from 1958 to 2000; meanwhile, over that same time period, the state of Kerala decreased its poverty levels from about the same initial level of 60% to 15% in 2000. Clearly, with such varied state-wise experiences in measures such as poverty rate, the divergence conclusion reached by many authors seems to follow naturally.

Ahluwalia (2002) calculates an inter-state Gini coefficient and from those results he reports acceleration in income inequality beginning around 1986-87. Shown in figure 6 below, Ahluwalia's measurement of inter-state inequality was reasonably stable until the mid to late 1980s, whereupon there was a noticeable, and according to his reported results, statistically significant increase.

Figure 6



Source: Ahluwalia (2002)

This trend towards higher levels of inter-state inequality up to 1998 leaves unanswered the query into the most recent decade's inter-state inequality evolution, however later analysis confirms that the trend towards higher inequality has continued, and even accelerated for the 2000s. Stemming from two very recent works on regional inequality in India, two opposing conclusions are presented, although one is seriously called into question as a result of the data used in its analysis. Ghosh (2010) finds evidence to confirm the continuation of this inter-state Gini inequality trend (divergence), while Das, Sinha & Mitra (2010) find evidence consistent with convergence. Although Ghosh (2010) and Das, Sinha & Mitra (2010) arrived upon different conclusions, both studies were conducted using a panel unit root regression technique. Ghosh (2010) studied the relationship by way of real net SDPPC, while Das, Sinha & Mitra (2010) used per capita consumption data, inequality and poverty indicators. It can be reasonably assumed that the conclusion of convergence by Das et al. (2010) is likely affected by their use of consumption data,

potentially explaining their different results with respect to the abovementioned multitude of studies confirming divergence.

Pal & Ghosh (2007) cite the 2001 National Human Development Report covering the observation period 1993-94 to 1999-2000, as having found that, of the 32 states and union territories reported, seven states experienced an increase in rural inequality[29], 15 states were found to have experienced increases in urban inequality[30], and five states saw an increase in both rural and urban inequality (all five states experiencing an increase in rural and urban inequality were located in the well-recognized impoverished Northeastern region of India)[31]. Overall trends during the observation period show that rural Gini coefficients have decreased from just below .30 in 1983 to below .26 in 1999-2000, while urban Gini coefficients have increased from .33 in 1983 to above .34 in 1999-2000. Additionally, in 31 of the 32 reported states, urban inequality was greater than rural inequality. Complicating the issue of national account survey data comparability, which is used to compute the Gini coefficients, is the fact that surveying techniques were changed in 1999-2000[32]. Therefore, analysis on the variation of inequality before and after the survey year 1999-2000 may suffer from this difficulty, however a metric consistent with the former collection methodology has been calculated, for comparability reasons (the data consistent with prior rounds has been used for all analysis in this current work).

Of the 14 states that Ahluwalia (2002) considers, he finds an acceleration of growth, accompanied by an increase in inequality. For the pre-reform period, 1980-81 to 1990-91, he finds that the aggregate average of the 14 major states considered was a growth rate of 5.2% per annum. For the post reform period, 1991-92 to 1997-98, he finds an average cross-state growth rate of 5.9% per annum. Although these results are consistent with a similar acceleration in

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[29] Increased rural inequality: Assam, Manipur, Mizoram, Nagaland, Sikkim, Chandigarh, Dadra and Nagar Haveli and Arunachal Pradesh (The authors note that Chandigarh and Dadra and Nagar Haveli are union territories, not states).

[30] Increased urban inequality: Assam, Bihar, Gujarat, Haryana, Karnataka, Manipur, Mizoram, Nagaland, Punjab, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, Daman and Diu.

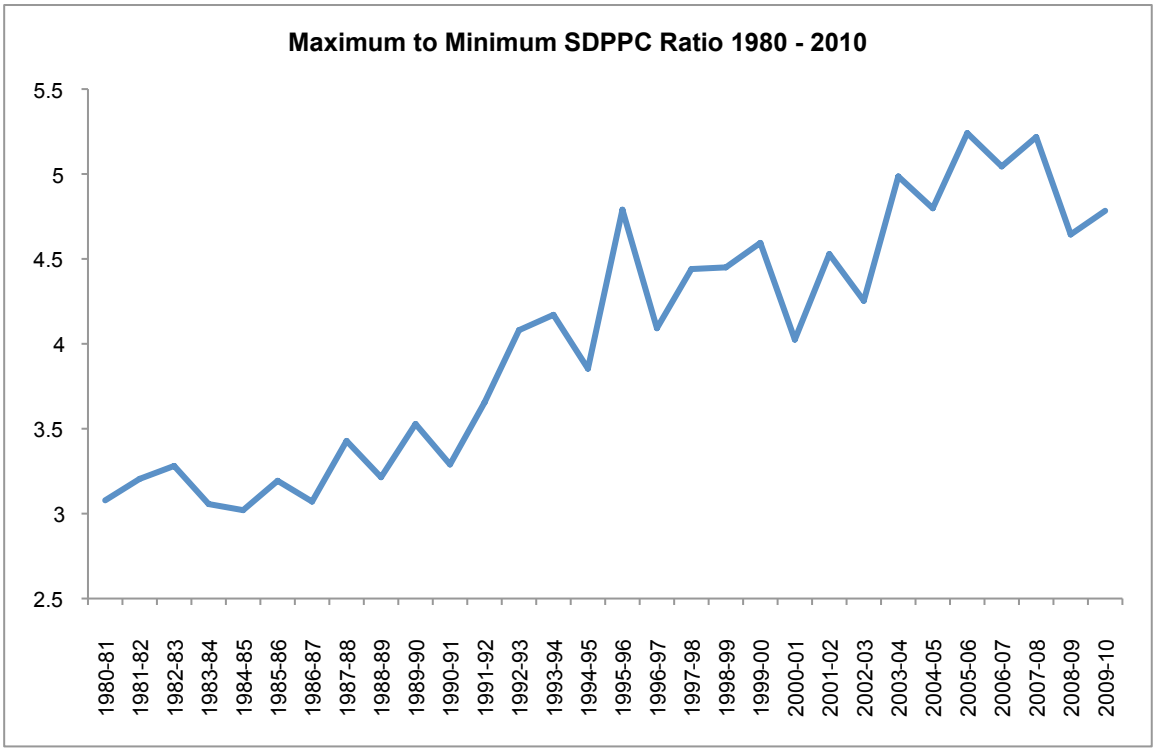
[31] Increased rural & urban inequality: Assam, Manipur, Mizoram, Nagaland and Sikkim.

[32] See Sen (2001), Jha (2004) for an in-depth discussion on the change of recall period from the 55th round (1999-2000).

national GDP, they do highlight a key problem concerning the comparability of state-wise and national data. According to Ahluwalia (2002), national data indicate that India grew at an average of 5.4% during the pre-reform period, and at 6.9% during the post-reform period. He attributes this inconsistency to general comparability issues between state and national accounts mentioned in the quotation from the introduction of this section, and the fact that national accounts data were revised beginning in 1993-94, whereas state-wise data were not.

Apart from the variation between pre and post reform growth rates, there was also substantial cross-state growth rate variance within periods. For the average SDP growth during the 1980s, Ahluwalia (2000) documents the range varying from low to high as 3.6% per annum for Kerala and 6.6% for Rajasthan; during the 1990s that range grew from a low of 2.7% in Bihar to a high of 9.6% in Gujarat. The respective ratios of high to low growth rates are 1.83 for the 1980s (pre-reform) and 3.56 for the 1990s (post-reform). Accompanying this comparison is the addition of the factor of population growth, thusly comparing the average SDPPC growth rates, which provides for an even more contrasting growth history. Ahluwalia (2000) reports the 1980s range to be from 2.1% in Madhya Pradesh to 4.0% in Rajasthan. For the 1990s, he finds it to be from 1.1% in Bihar to 7.6% in Gujarat. These ratios are 1.90 and 6.91, respectively. Following his methodology of high to low SDPPC comparisons, figure 7 below displays this maximum to minimum ratio for the entire observation period.

Figure 7



Source: RBI (2013) & Author's Own Calculation

The observed trend corroborates the findings by Ahluwalia discussed above, albeit with a cross-state Gini coefficient, in that variation of SDPPC increased substantially from the 1980s to the 1990s. His analysis did not include the 2000s, but the above graph shows clearly that the trend of diverse state-wise SDPPC continued to increase. In fact, it can be seen that the minimum to maximum SDPPC only varied by a factor of three around 1980, but nearly reaches a factor of five by the mid 2000s. Figure 7 appears to show rising inequality throughout the entire period, with a most pronounced increase beginning approximately at the time of deregulation, 1991. However, when viewing the data aggregated by decade, there seems to exist a significantly more pronounced relationship of divergence of incomes from the 1980s to the 1990s, and then a further increase from the 1990s to the 2000s.

In consideration of the SDPPC growth rates during the 1980s, the lowest average growth rate was observed in Madhya Pradesh, the third poorest state (of the 14 considered in this study) while the highest growth rate was achieved

by the seventh poorest state, Andhra Pradesh. This further dissection of the high to low growth ratio reveals that, what Ahluwalia claims has been "…an unstated assumption that inter-state differences would narrow with development" (Ahluwalia (2000) p. 1639) would not be possible with these results, as he goes on to state that inter-state differences in income levels would only diminish if the poorer states are growing faster than the richer states. This convergence is clearly not taking place in the 1980s, with the highest and lowest growing states being both relatively poor.

The growth experience of the 1990s was in fact worse in that the highest average growth rate of 4.98% observed in Karnataka and the lowest rate of negative 0.83% for Bihar, were far from the ideal that would achieve convergence. Karnataka had the 7th highest per capita income for the 2010, and grew at 12 times the rate of Bihar, which was the poorest state. Clearly, by this casual metric inter-state inequality seems to have risen during the explosive growth of the 1990s.

The most recent decade exhibits evidence indicative of a further worsening in the trend of divergence of cross-state incomes. Gujarat was the fastest average growing state at 7.19% per year, and Uttar Pradesh was the slowest growing, at 3.04% per year. Gujarat was the 3rd richest state, observed at the last year of SDPPC available for all states 2010, while Uttar Pradesh was the second poorest. Accordingly, with a relatively rich state growing the fastest, and a relatively poor state growing the slowest, the trend for cross-state divergence of incomes seems to be at least not improving, and at worst widening, for the most recent decade.

3.2.1 Convergence Analysis

To investigate this relationship more explicitly, Barro & Sala-i-Martin (1992) convergence testing has been undertaken, incorporating all 14 states over the entire observation period. Under the general heading of income convergence exist two principally important metrics commonly discussed in the literature: absolute β convergence and σ convergence, as termed by Barro & Sala-i-Martin (1992). Fundamentally, absolute β convergence refers to the phenomenon of poorer countries growing at a comparatively faster pace than richer countries, with that process eventually leading to some level of convergence of incomes. Classical growth models predict this outcome given the diminishing returns to capital; as such, the growth rate should vary inversely to the observed initial capital stocks. The following equation given by Barro & Sala-i-Martin (1992) summarises the quantitative underpinnings of absolute β convergence:

1) $$\gamma_{i,t,t+T} = \alpha - \beta \cdot \log(y_{i,t}) + \in_{i,t}$$

Where $\gamma_{i,t,t+T} = log\ (y_{i,t+T} / y_{i,t}) / T$ is the average growth rate of GDP for economic unit *i* between period *t* and *t + T* and $\in$ is an independently distributed error term.

If $log\ (y_{i,t})$ is the logarithm of economic unit *i*'s GDP per capita at time *t* and the coefficient *β* is greater than 0, it can be deduced that absolute convergence is present in the dataset.

Equation 1 gives us a starting point to understand the general concept of β convergence. Following the presentation of the linear equation 1, Sala-i-Martin

(1995) continues to present a non-linear model that allows for the calculation of a speed of convergence among economic units:

2) $$\gamma_{i,t,t+T} = \alpha - \left(\frac{\left(1-e^{-\beta \cdot T}\right)}{T} \right) \cdot \log\left(y_{i,t}\right) + \in_{i,t,\ t+T}$$

In the context of Sala-i-Martin (1995), he uses the above non-linear equation to compute the speed of convergence across data samples that vary in *T*, as well as to accord with neoclassical growth theory[33]. Regarding variation in *T*, the reasoning relates to the coefficient in equation 1. It would be inversely related to *T* due to the fact that, if convergence does exist in the dataset, necessarily an averaging of period growth rates would occur, and distortions taken from the predicted coefficient would result. The output would be a disproportionately small *T* for long periods, and a commensurately distorted large *T* for short sample periods. Although a useful note, our dataset for the states of India will always be homogeneous in terms of *T*, and we therefore will not be overly concerned with the potential confounding of coefficient predictions related to heterogeneous *T* across *i*.

Following the introduction of equation 2, Sala-i-Martin (1995) provides the conditional convergence equation. The fundamental notion behind income convergence across economic units, relates to the neoclassical model's assumption of all units having the same steady state, while only differing in initial capital endowments. Often times, this assumption is not realistic given the typical heterogeneity of economies, and their potential to be at widely varying levels of development; accordingly, the conditional convergence equation attempts to hold constant those parameters that may explain an economic unit's steady state level. The equations is given as:

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[33] Conversion of classically oriented economic growth models near their steady state to log linear form, yield equation 2. In the context of convergence, this is an advantageous feature given that β is then the speed of convergence for a given economic unit moving toward its steady state. See page 8 of section 3 of Sala-i-Martin (1995) for a more detailed explanation.

3)

$$\gamma_{i,t,t+T} = \alpha - \left(\frac{\left(1-e^{-\beta \cdot T}\right)}{T} \right) \cdot \log\left(y_{i,t}\right) + \psi \cdot X_{i,t} + \in_{i,t,\ t+T}$$

We can notice that equations 2 and 3 are very similar, only differing in the addition of the vector $X_{i,t}$. The vector's function aims to control for variation across economic units' steady state. Variables predicted to alter an economy's steady state could be included in vector $X_{i,t}$ (e.g., population growth, human capital stocks, savings, etc.). As with equation 1, and 2, if the value estimated for β is positive, and the variables assumed to alter the steady states controlled for by $X_{i,t}$, then it is assumed that the dataset exhibits conditional β convergence. As will be discussed later, a more straightforward approach to control for sample heterogeneity of steady states is to simply restrict coverage to only those economic units that could presumably share a similar steady state. In that way, the necessity to explicitly control for variance by $X_{i,t}$ is not necessary, and absolute β convergence can be discussed in such a context. Essentially, our state-wise panel data model in section 3.3 is inspired by the theories of conditional convergence, and attempts to analyze this phenomenon through a model derived from its principles.

Having reviewed all of the equations relevant for the measurement of β convergence, we now take a closer look at the fundamentals of σ convergence. The σ convergence hypothesis is in fact quite simple: economic units that show a decreased level of dispersion of income per capita levels over time are said to exhibit σ convergence. Barro & Sala-i-Martin (1992) provide the following equation to summarise the principle:

4) $$\sigma_{t+T} < \sigma_t$$

Where σ_t represents the standard deviation at time *t* of *log* ($y_{i,t}$) for all *i*. If the dispersion of incomes across all *i* between period *t* and *t*+*T* diminishes, we can say that the dataset exhibits σ convergence.

The neoclassical models of economic growth have laid the groundwork for the augmented, or endogenous growth modeling techniques made popular in the late 1980s. The intensified discussion of economic growth issues essentially lead to the popularisation of convergence theory, and the equations presented in this section. Now that we have completed the discussion of all relevant quantitative measures for β and σ convergence, it is useful to explore the more in-depth theoretical discussions underlying these empirical formulae.

Although the abovementioned equations related to β convergence encapsulate the principle, empirical findings have guided the theory to define various types of β convergence. As presented in Galor (1996), the three varieties of β convergence frequently mentioned in the literature are:

i) Absolute Convergence: occurs when per capita income of countries (regions or states) converges to one another in the long-run independently of initial conditions.
ii) Conditional Convergence: occurs when per capita incomes of countries (regions or states) that are identical in structural characteristics (e.g. population growth rates, government policies, preferences, technologies, etc.) converge in the long run independently of their initial conditions.
iii) Club Convergence: occurs when per capita incomes of countries (regions or states) that are identical in their structural characteristics converge to one another in the long run provided that their initial conditions are also similar.

Galor (1996) documents authors such as Romer (1986), Lucas (1988) and Barro (1991) as providing evidence to discredit the hypothesis of cross-country absolute convergence. Arguably the first of the revolutionary papers on modern

endogenous growth theory, Paul Romer's (1986) "Increasing Returns and Long-Run Growth" constructs an argument for sustained long-run economic growth rates by refuting the notion of diminishing returns to reproducible capital. The fundamental construct of absolute convergence is then called into question on the grounds that one of its core premises (related to the neoclassical model's assumed diminishing returns to capital stocks) that growth rate ought to vary inversely with respect to initial capital stocks. That is, if poorer countries no longer have the comparative advantage of higher growth rates due to their comparatively lesser capital stocks, their prospects for converging towards income levels of more capitally intensive countries is severely handicapped. Lucas (1988), through the construct of several theoretical models[34], likewise finds little reason to support the claim that poorer economies, as a rule, should grow faster than their wealthier counterparts. Among other factors, he also mentions that high dispersion of growth rates among countries may persist indefinitely, given constant returns to reproducible capital (including human capital), given an accumulation or spillover effect. Importantly, he notes that said levels should not necessarily depend on initial stocks, further supporting the objection that growth rates do not necessarily vary inversely with initial capital reserves. Barro (1991) provides empirical results showing that the relationship between initial GDP levels and subsequent growth is close to zero; however, once initial human capital levels are controlled for across countries, the correlation becomes strongly negative. The implication is that only those poorer countries exhibiting relatively high levels of human capital stocks will grow faster than rich countries. What is the same, poor countries with low levels of human capital will not be able to grow faster, and will essentially be trapped in a low income low growth cycle.

Concerning the conditional convergence hypothesis, see Barro (1991), Mankiw et al. (1992) and Barro & Sala-i-Martin (1995) for results in favour of this theory. As mentioned with respect to absolute convergence, Barro (1991) finds that once one controls for initial human capital (enrolment rates used as proxy variable) a strong negative relationship emerges between per capita

[34] Speficially regarding this discussion on convergence, see the models and discussions introduced in sections 4 and 5 of his paper.

growth rates and initial income levels. Mankiw et al. (1992) use an augmented Solow model and likewise find that countries' standards of living do tend to converge, when holding population growth and capital accumulation constant. Barro & Sala-i-Martin (1995) also document a variety of empirical results consistent with the conditional convergence theory. When discussing conditional convergence theory findings, it is important to underline that empirical results from conditional convergence are often times also consistent with club convergence theory.

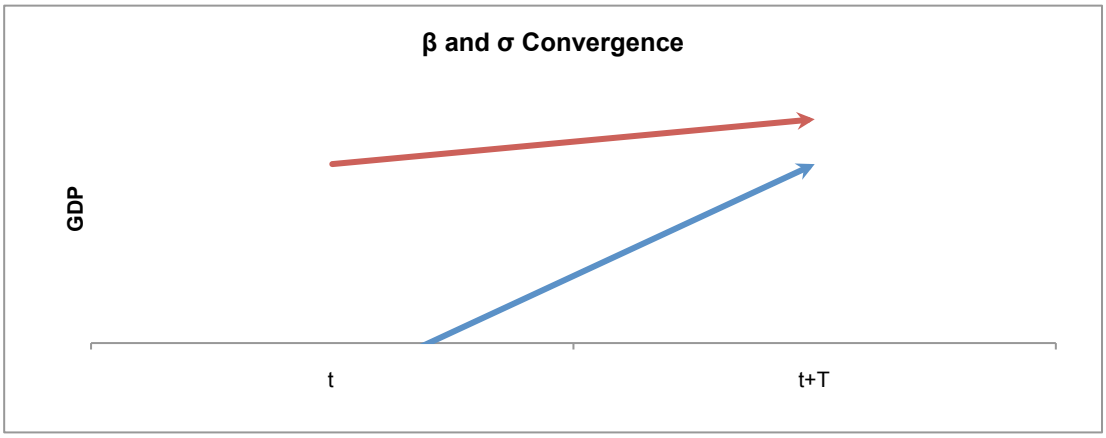
An early paper by Durlauf & Johnson (1995) documents support for club convergence theory. They apply regression tree methods to the Summers & Heston (1991) dataset, and find that initial conditions are indeed important in determination of a country's subsequent growth experience. Their findings stress the inadequacy of a linear approach, showing that explicit groupings, which share a common model, are more useful. Quah (1995) argues that the traditional modelling techniques, for example those employed in Barro & Sala-i-Martin (1992), provide little information on how the commonly large cross-country datasets evolve. In response, he adapts a methodology (termed as dynamically evolving distributions) distinct from measures employed in most convergence studies, and finds evidence for club convergence. Specifically, his analysis yields the interesting result of "twin-peak" distributions and mentions that empirically consistent results can be defined by polarisation, persistence and immobility.

Much of the debate surrounding β convergence centres on the comparability of economic units, based on both initial and structural conditions. The notion that starkly contrasting economies could ever reach the same level of income implies the assumption that the parameters defining their steady state characteristics also converge. That is, for their incomes to converge, they also should exhibit similar governmental institutions, savings rates, population growth rates, tastes, and technologies, along with many other characteristics. Indeed, such an assumption may be difficult to imagine; accordingly, it should come as no great surprise that many authors have found more compelling convergence results by way of studying relatively homogeneous regions, given that their initial economic parameters are similar.

In the case of analysis of a collection of countries or economic blocs that exhibit many shared qualities, the literature supports the notion that realisation of absolute β convergence is more feasible. For like regions, interpretation through conditional or club convergence is also appropriate; although, the distinctions regarding initial conditions and economic parameters innate to their specifications may be redundant. With the case of intra-country datasets, the theoretical advantage is that the steady state parameters are naturally far more comparable. As such, we will enjoy the benefit of being able to at the very least, have reasonable justification to begin by evaluating absolute β convergence, while comparing the results from conditional convergence.

Many researchers fall into the trap of believing that β and σ convergence are both measuring the same phenomenon. One would naturally assume that as a poor country catches-up to a richer country over time (β convergence), that correspondingly the dispersion among those economic units' incomes would fall over time (σ convergence). Although that statement would be true, as depicted by figure 8 below, there is more to the story.

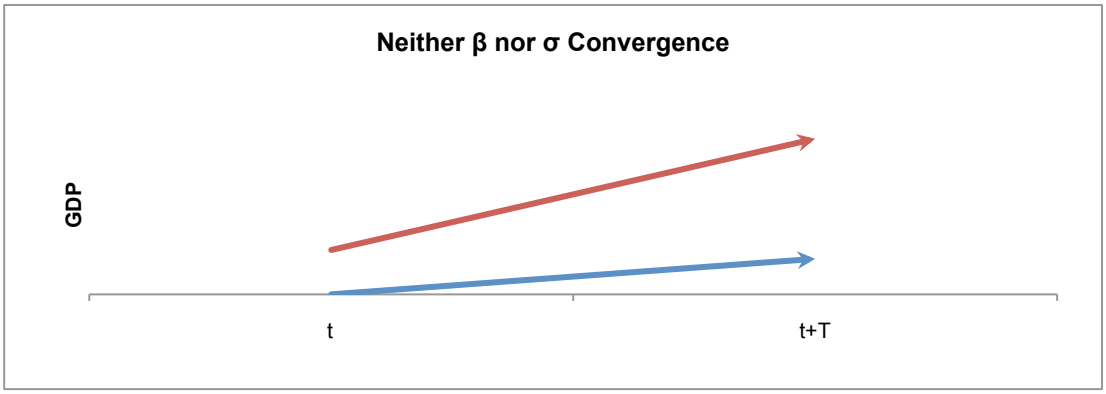
Figure 8



Source: Sala-i-Martin (1995) and Author's Own Calculations

Another fairly easy to imagine scenario is the exact opposite of figure 8, that is where the initially poorer economy fails to grow faster than the initially richer economy. In this case, we observe neither β nor σ convergence.

Figure 9

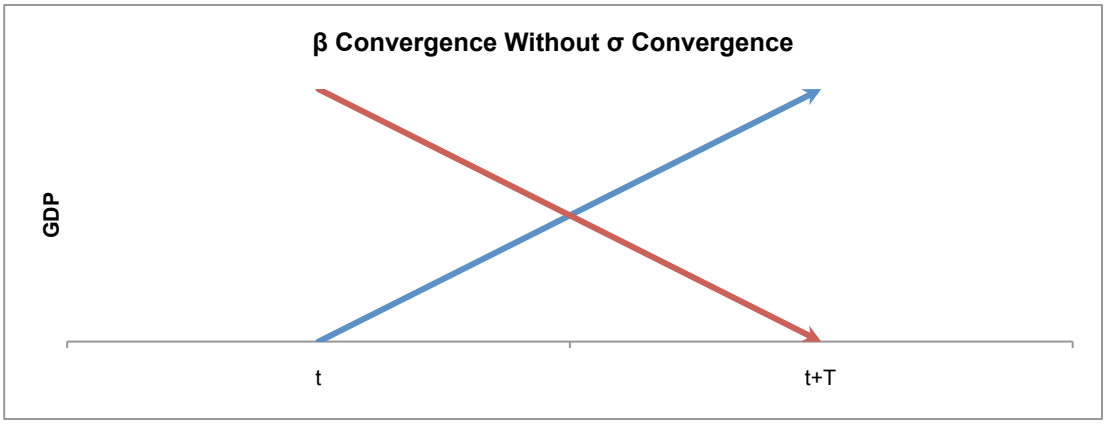


Source: Sala-i-Martin (1995) and Author's Own Calculations

Above in figure 9 we can see that β convergence has not occurred, given that the poorer economy has not grown faster than the richer economy. Correspondingly, the dispersion of incomes over time has, of course, also increased; that is to say that σ convergence has also gone unobserved.

Although the two previous examples would lead one to deduce that β and σ convergence always go hand in hand, let us provide an example first presented in Sala-i-Martin (1995). An abbreviated reiteration of β and σ convergence principles would say that β convergence only refers to the notion of initially poorer economies growing relatively faster than initially richer economies over time, while σ convergence serves only as a commentary on the intra-sample dispersion among economies over time. A demonstrative theoretical example presents a two-economy model, wherein an initially poorer economy grows so much faster than the initially richer economy, such that between period *t* and *t+T*, the initially poorer country has switched positions with the initially richer country.

Figure 10



Source: Sala-i-Martin (1995) and Author's Own Calculations

In figure 10 we can observe that there was β convergence (the poorer economy did in fact grow faster than the initially richer economy) but no σ convergence occurred because at time *t* the dispersion of incomes is equal to the dispersion at time *t* +*T* (the poor economy overshot, or simply exchanged places with the richer economy). Although a rare and unlikely circumstance, the example is illustrative of the fact that β and σ convergence are mutually exclusive, and accordingly are not necessarily observed together.

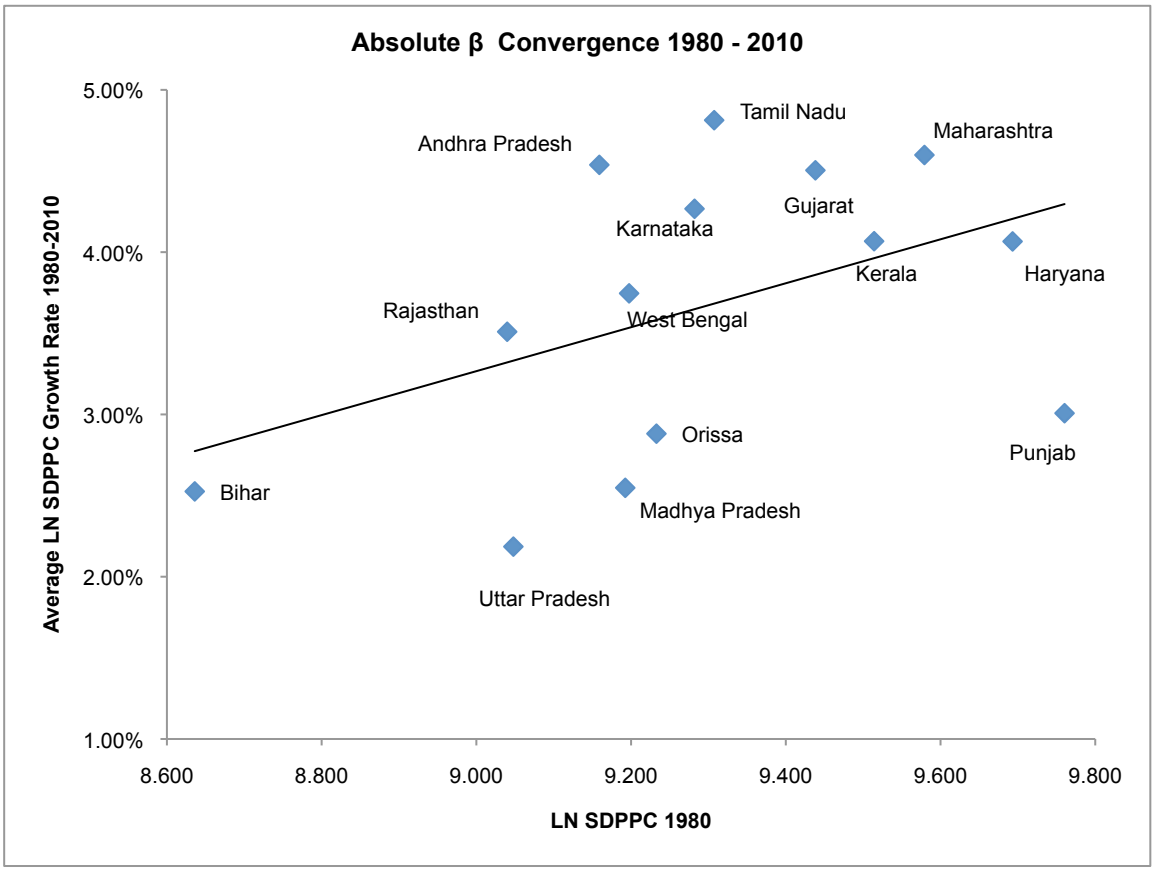
Having reviewed all of the relevant theory and empirics of convergence analysis, the following section will move into coverage of the India specific experience. Since its independence from Great Britain in 1947, India has undergone extreme changes in development. Specifically, we will focus on the 1980s when a more pro-business paradigm was introduced across the economy, through the 1990s characterised by financial crisis in 1991 and subsequent progressive deregulation, and including the most recent decade, the 2000s.

To begin, we start with β convergence testing across the 14 states. Initial SDPPC levels for the observation year 1980 have been graphed alongside their respective average growth rates for the full observation period, 1980-2010. Absolute convergence theory is most fruitful when applied to cases where all individual units compared, in this case the 14 states, are structurally similar and

have fundamentally like macroeconomic parameters. If the units do not have similar theoretical steady state levels, then their differences in macroeconomic variables (those that would be suggested by economic theory to affect their steady state) should be controlled for conditional convergence estimations (Barro & Sala-i-Martin (1995)). These estimations will be made possible in our panel data analysis section, given in a later section.

In this case, despite the improbability of perfectly identical steady state levels, arising from heterogeneous stocks of initial capital, differing savings rates and other macroeconomic conditions, the metric is still appropriate given that the 14 states come from within one single country and would be generally hypothesized to have similar tastes. Overall this metric provides a clear picture of the aggregate trend, with figure 11 below displaying the result of this absolute convergence test.

Figure 11



Source: RBI (2013) & Author's Own Calculation

If absolute convergence were to be observed, the data points showing low levels of SDPPC at the beginning of the period, 1980 (X-axis) should have tended to grow at a comparatively higher average rate over the full observation period (Y-axis). However, the data presented in figure 8 do not adhere to this ideal absolute convergence scenario. In fact, the graph and the accompanying positively sloped trend line, present evidence to support the contrary. This result indicates that the exact opposite relationship was occurring over this period: divergence. Therefore, according to this metric, cross-state inequities in growth and SDPPC levels do not appear to be improving; indeed, the poorest states did not even grow as fast as the initially richest states but actually grew at a slower pace, serving only to widen the gap between the richest and poorest states. We compare our finding of no absolute β convergence with the same results from: Kumar & Subramanian (2012) for the 2000s; Stewart & Moslares (2012) for 1980-2009; Kumar (2011) for both pre (1982-1991) and post (1991-2005) deregulation periods; Kalra & Sodsriwiboon (2010) for 1970-2003; Ghosh (2010) from 1960-2007 with a most pronounced divergence after the implementation of deregulation; Nayyar (2008) from 1978-2003; Purfield (2006) 1970-2004; Rodrik & Subramanian (2004) for both the 1980s and 1990s at statistically significant levels, and for the 1960s and 1970s outside of traditional statistical significance parameters; Datt & Ravallion (2002) for the 1990s; Trivedi (2002) from 1960-1992; and Nagaraj et al. (2000) for 1970-1994. Contrasting these findings, Cashin & Sahay (1996) do find absolute β convergence from 1961-1991. A noteworthy detail related to their study is their inclusion of 20 states, an unusually high number, potentially responsible for the abnormal output; further, some of their reported coefficients were statistically insignifcant. Despite the fact that poorer states are showing signs of progress and higher growth rates, on average the prevailing trend remains to be that the richer states are still growing faster.

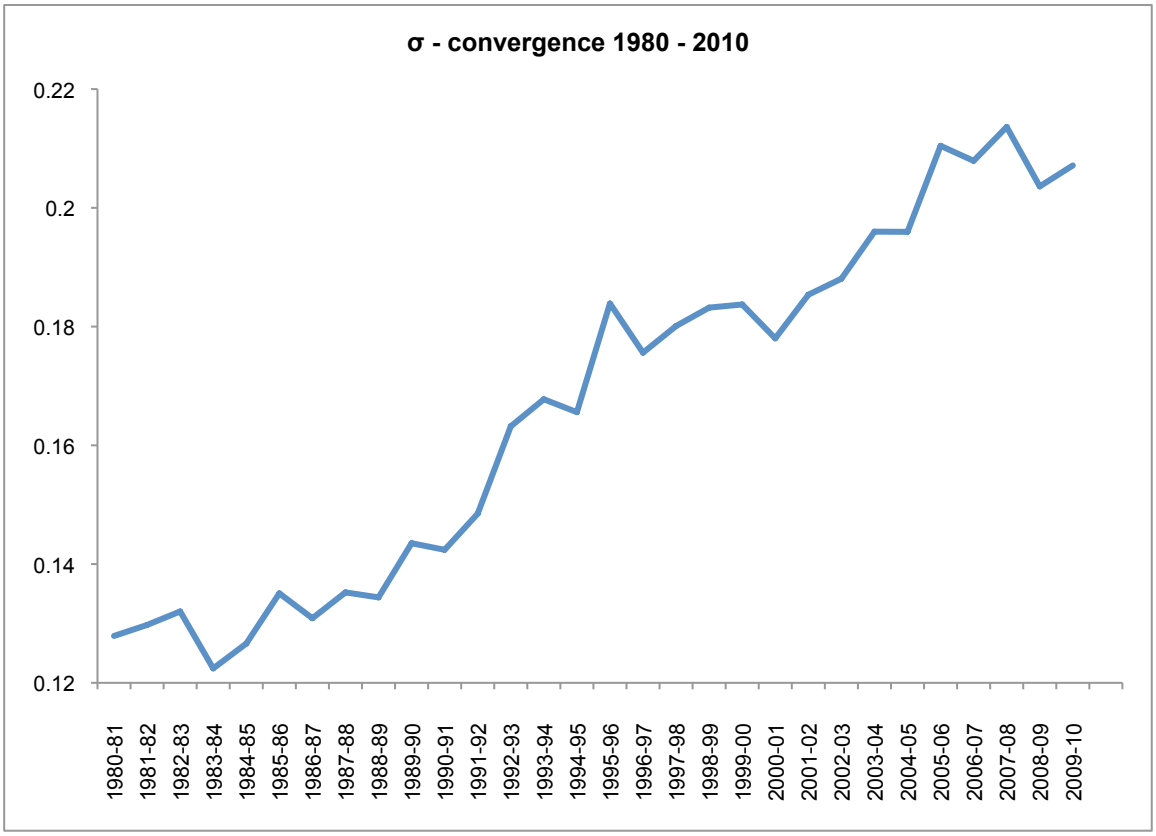
Overall, many authors researching in the Indian context have found results indicative of increased divergence across states. Datt & Ravallion (2002) find that evidence of divergence utilizing a similar technique as the β convergence testing executed in this section. They found a strong positive

correlation with 1980s SDPPC levels and 1990s growth rates, thus indicating divergent trends of state income levels. Likewise, Nagaraj et al. (2000) finds an overall increase in regional income inequality since as far back as the 1960s. They mention the fact that the poorest states haven't been keeping up with the richest states, and not even with the national average growth trends. Given this scenario, these authors also conclude that state-wise income inequality has been on the rise, and continues to be throughout their study period. Ghosh (2010) finds that states have diverged with respect to both β convergence and σ convergence (following section) metrics, and that this experience has been most pronounced since the large-scale economic reforms were put in place.

Rodrik & Subramanian (2004) find a positive relationship between initial income and growth rates for both the 1980s and1990s, despite their being outside of conventional statistical significance ranges. Kumar & Subramanian (2012), through panel regression techniques and other statistical measures, likewise find accelerated rates of cross state divergence in each decade beginning in the 1970s, and continuing through the 2000s. Chikte (2011) finds further evidence for accelerated levels of divergence, with respect to pre (1970s through 1991) and post (1991 through 2000s). By way of income inequality decomposition analysis, Vakulabharanam (2010) finds that inter-state income inequality has been an increasingly significant factor in overall Indian income inequality; this result corroborates our findings in the above graph of accelerated inter-state income disparities.

Next, we evaluate the existence of σ convergence to observe the intertemporal dispersion of incomes across the 14 states of India between 1980 and 2010. We would expect the cross-state dispersion of SDPPC levels to have decreased over time, if the results were to be consistent with σ convergence. The metric employed is quite simple: we present the standard deviation of the 14 states' SDPPC in year t (1980), and compare it to year $t + T$ (2010). In our case, we do not observe σ convergence, given that our results reveal that in fact SDPPC dispersion across states has increased substantially. To display these findings, we have realised the same calculation for all observation years, displayed below in figure 12.

Figure 12



Source: RBI (2013) Data & Author's Own Calculation

Figure 12 above shows quite clearly that cross-state income levels have diverged, and in a rather significant pattern. At the very beginning of the 1980s, σ convergence was taking place, albeit at a gradual pace. The calculation of the standard deviation of incomes across the 14 states was 0.128 in 1980, dropping to the lowest level for the entire observation period of 0.122 in 1983, but finally growing to 0.144 by 1989. However, beginning in the 1990s, we observe strong acceleration in the rate at which states' income levels diverge. In 1990, the standard deviation is 0.142 and over the decade it increases to 0.184 by 1999. The 2000s saw the same figure increase from 0.178 to 0.207 by 2010, although it did peak higher at 0.214 for the year 2007. The σ convergence exercise corroborates the popular finding that divergence in income levels remained relatively flat in the 1980s, while it began to accelerate strongly around 1990. Taken altogether, the results show clearly that the dispersion of cross-state SDPPC levels has increased significantly over the

period 1980-2010; in particular, these increases have been notably more pronounced beginning around 1990, and maintaining high rates for the 2000s.

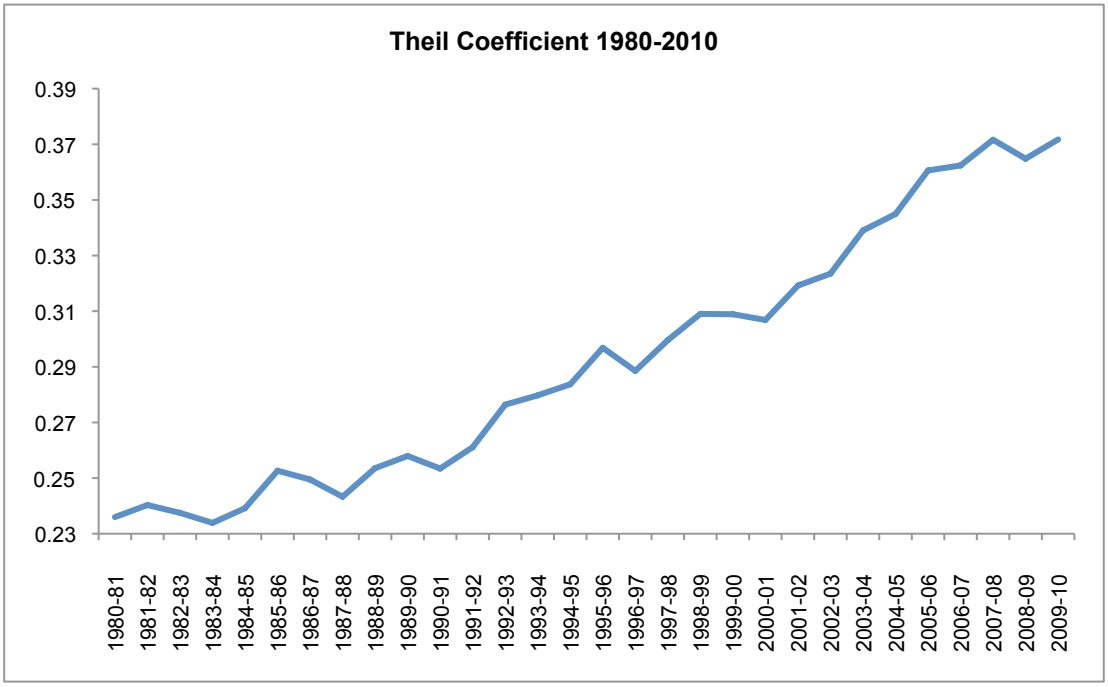
Our results indicate a lack of σ convergence, and in fact a very significant increase in the dispersion of cross-state SDPPC levels. This finding accords with: Kumar & Subramanian (2012) from 1971-2009; Stewart & Moslares (2012) for 1980-2009; Chikte (2011) for both (1970- 1990) and (1991-2004); Ghosh (2010) studying 1960-2007, finding strong σ divergence beginning around 1970-2007; Nayyar (2008) from 1978-2003; Purfield (2006) from 1970-2004; Rodrik & Subramanian (2004) from 1960-2000; Trivedi (2002) from 1960-1992; Ahluwalia (2002) studies 1980s and 1990s, and finds acceleration in σ divergence from 1986 to the late 1990s; and Nagaraj et al. (2000) studying 1960-1993, finding strong σ divergence beginning around 1970. With an exhaustive review of the literature, we have been unable to locate definitive results finding σ convergence across Indian states; therefore, we conclude that σ convergence is not occurring across Indian states.

Further examination of the evolution of inter-state inequality can be had by way of the calculation of the Theil index. Essentially the interest is to observe the state specific dispersion of income, with respect to an aggregated average for the 14 states. The formula summates the collective variance of all individual observations' deviation from a perfectly proportionate distribution of the income. As a result, the formula has the shortcoming of not accounting for intra-state inequalities, as the nature in which the index is calculated treats each state as if all inhabitants were to be homogeneous with respect to income level. However, despite the obvious fact that the wealth distribution within each state is far from homogenous, the index nonetheless gives us a powerful way to measure the level of inequality arising solely from inter-state variations in income. The formula is given by:

$$J = \sum_{i=1}^{n} \left(\frac{P_i}{\sum P_{14\,States}} \right) \ln \left[\frac{\frac{P_i}{\sum P_{14\,States}}}{\frac{Y_i}{\sum Y_{14\,States}}} \right] = \sum_{i=1}^{n} P_i \ln(j_i)$$

Where *P* represents the population, *Y* refers to income, and the *i* subscripts indicate individual states' population and income, respectively. The data used in the calculation of the Theil index was obtained from the India Census for population figures from the Planning Commission (2012), and the SDP data from the Reserve Bank of India (2013). Population data is only available at ten-year intervals, so linear interpolation was used to create annual observations from the 1981, 1991, 2001 and 2011 data, to allow us an observation window from 1980-2010. SDP data is available for all states up until the 2009-10 year, the last year we were able to extend the analysis. Figure 13 below displays the values obtained:

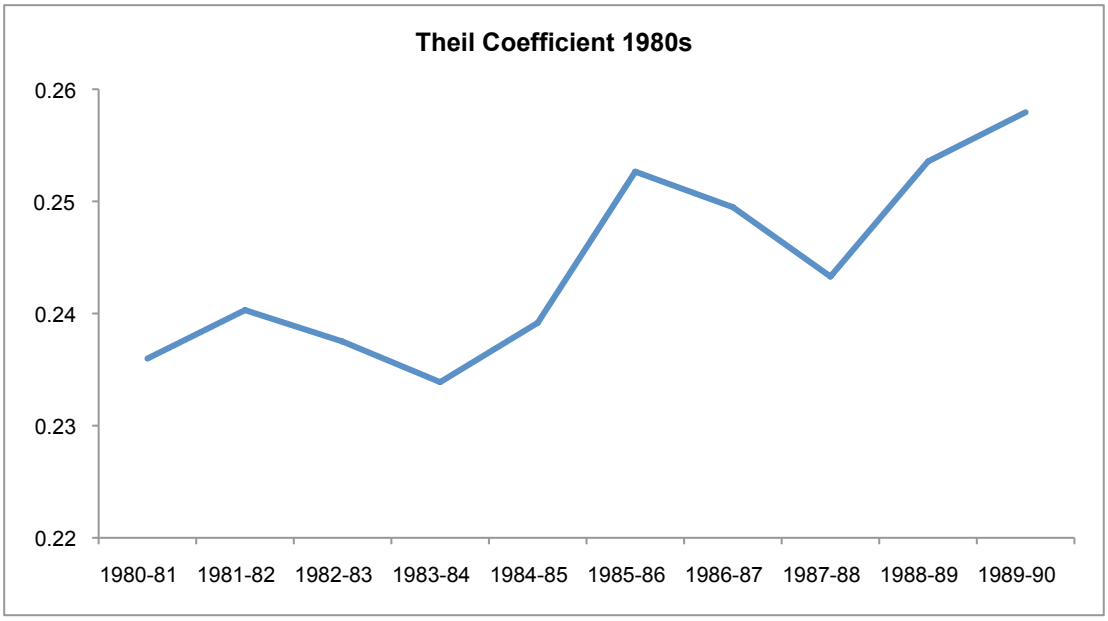
Figure 13



Sources: RBI (2013), Planning Commission (2012) & Author's Own Calculation

Figure 13 above shows the annual variation, which clearly indicates a trend towards greater cross-state income inequality. The index corroborates previous support for the idea that inequality variation remained relatively flat in the 1980s, while it began to accelerate strongly around 1990. The graph shows quite clearly that inequality levels exhibit the beginning of a steep departure from the relatively calm, yet still inclined, slope from the 1980s. Towards the end of the 1990s and on to the 2000s, the line appears to increase even further in slope. These trends are more apparent when we disaggregate the Theil index and provide the decade specific calculations.

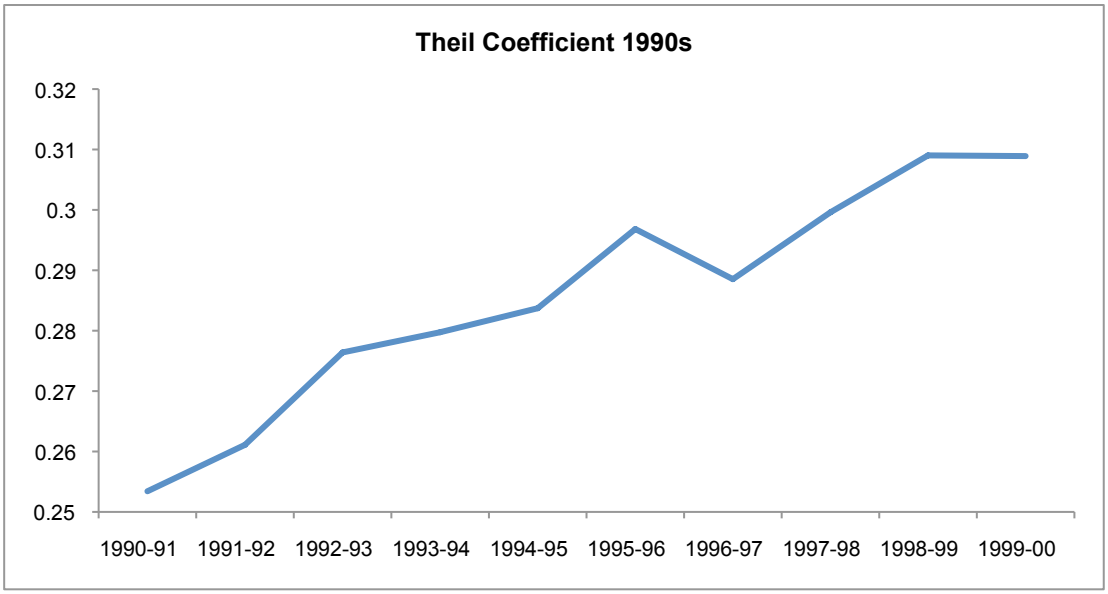
Figure 14



Sources: RBI (2013), Planning Commission (2012) & Author's Own Calculation

Specifically, for the 1980s, the average annual increase was 0.0022, a moderate but still positive trend throughout the first decade.

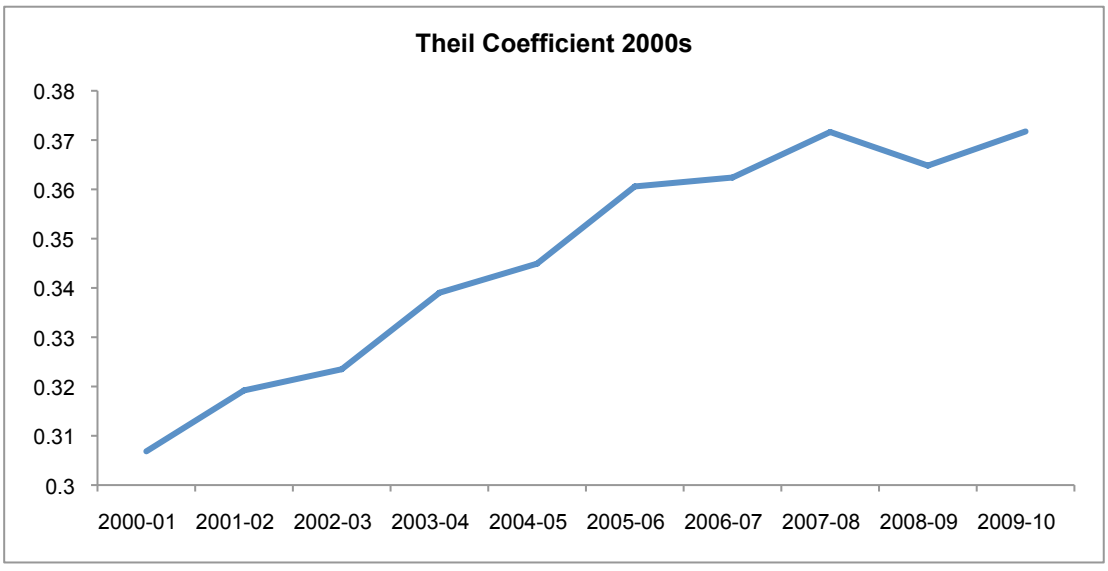
Figure 15



Sources: RBI (2013), Planning Commission (2012) & Author's Own Calculation

For the 1990s inequality trended upwards at more than twice the previous decade's speed; from 1990 to 1999 the average annual increase jumped to a rate of 0.0055.

Figure 16



Sources: RBI (2013), Planning Commission (2012) & Author's Own Calculation

Finally in figure 16 for the 2000s, the Theil coefficient increased further to an annual rate of increase of 0.0065. Taken altogether, the results from this exercise show quite clearly that income inequality arising solely from cross-state variations in income levels has increased significantly over the period 1980-2010. In particular, these increases in income inequality have been notably more pronounced beginning with an acceleration of the trend in the 1990s, while the 2000s brought further intensification.

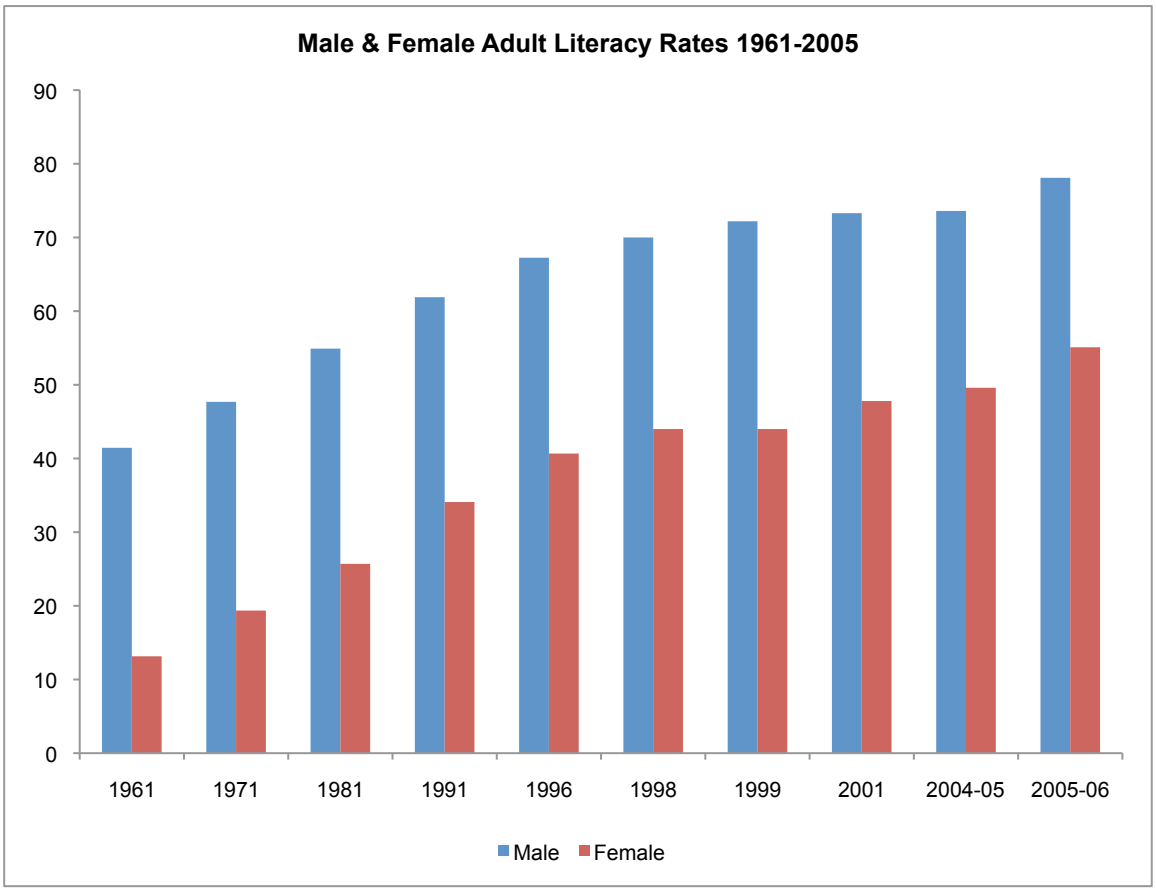
3.2.2 LITERACY RATES

Although the Indian economy has made overall impressive gains in recent years, human capital investment has failed to commensurately improve instep with the aggregate output increases. Dreze & Sen (1995) point out that India's current literacy rates are comparable to those observed in neighboring peer East and Southeast Asian countries 40 years ago, and that India's literacy rates are similar to those recently surveyed in Sub-Saharan Africa. It therefore appears that India's successful economic growth over the last three decades has not been met with correspondingly impressive improvements in literacy rates and presumably overall human capital development.

According to the United Nations Human Development Report (various years), the total adult population (15 years and above) literacy rate in 1980 was just 40.8%, but the most recent data collected shows an improvement of nearly 30%, up to 68.3% for 2010. Although India was ranked just 119th of 169 countries, there has certainly been encouraging progress made with respect to pre-reform to post-reform literacy rates. India's aggressive economic development over the last several decades has fortunately translated into greatly improved levels of literacy rate improvement, despite India having much room for improvement. As mentioned, the literacy rate in 1980 was 40.8%, but

by 1990 the national average had improved to 48.2%. By 2000, an even larger increase to 61.0% was achieved. However, it is noteworthy to highlight the fact that India has traditionally suffered from a significant gap between its male and female literacy rates, but this troubling tendency seems to likewise be improving. Due to a lack of state-wise data observations for male and female specific literacy rates, figure 17 below shows the national evolution of the male and female literacy disparity from 1960 to 2005-06.

Figure 17



Source: Planning Commission (2012)

It is clear that there has been an overall increase in both male and female literacy rates, but figure 17 also shows the trend, albeit modest, towards a more equitable distribution of the literacy rate between the sexes. In 1961 the male and female literacy rates were 41.45% to 13.15%, respectively. The most

recent observations for 2005-06 show male to female literacy rates having grown substantially to 78.1% and 55.1%, respectively. Thus, the gap in literacy rates between males and females dropped from 28.3% in 1961 to an improved 23.0% in 2005-06.

It is important and indeed relevant to highlight this gender gap in literacy rates. Although it is true that literacy rates are not the standard or ideal measure of human capital progress, they shall serve as a sufficiently representative variable to proxy for educational achievement and human resource development. As Todaro ((2000) p. 334) points out, there are four reasons why improvements in female education levels can evoke a disproportionately high boost overall economic development and growth in a country:

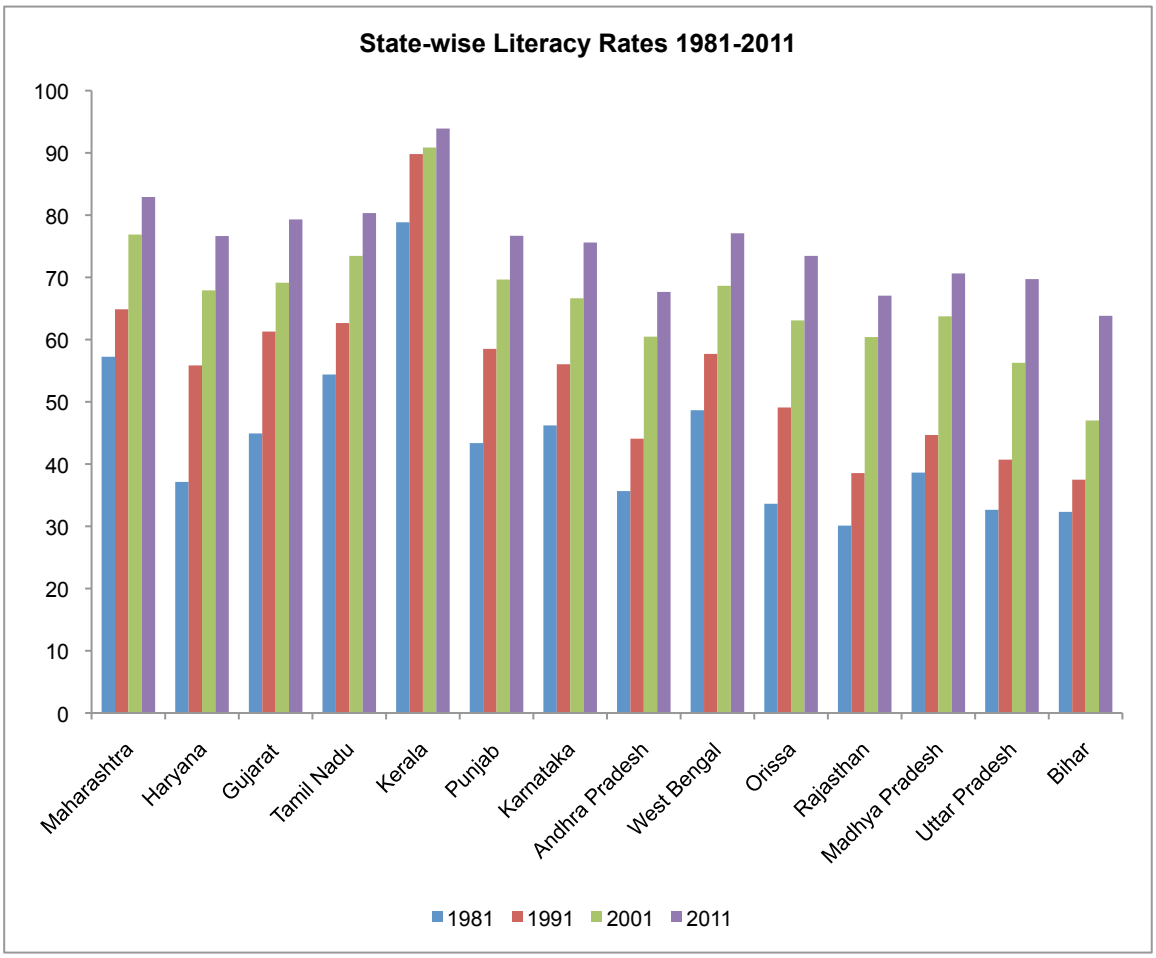
1. The rate of return on women's education is higher than that of men's in most developing countries.
2. Increasing women's education not only increases their productivity on the farm and in the factory but also results in greater labor force participation, later marriage, lower fertility, and greatly improved child health and nutrition.
3. Improved child health and nutrition and more educated mothers lead to multiplier effects on the quality of a nation's human resources for many generations to come.
4. Because women carry a disproportionate burden of the poverty and landlessness that permeates developing societies, any significant improvements in their role and status via education can have an important impact on breaking the vicious cycle of poverty and inadequate schooling.

These observations by Todaro are significant in the consideration of India's gender gap in human resource development insofar as all four issues are highly pertinent in Indian society. Empirical evidence from India provided by Trivedi (2002), and further corroborated by Esteve-Volart (2004), finds that although both male and female human capital exert a strong impact on economic growth

levels, female human capital has a stronger influence on economic growth levels. Thusly, by combating the gender gap in literacy rates by way of especially focused education for females, India would be expected to reap noteworthy gains in economic growth and development, while simultaneously diminishing the current social inequality due to the disparity in female to male literacy rates.

As the literacy rates are indeed distinct between the males and female specific groupings, so are the cross-state comparisons of the same. As with the case of male to female literacy rates, overall improvement has been astounding, but continued efforts must be put forth in order to combat the considerable cross-state differences observed in the figure 18 below.

Figure 18



Source: Planning Commission (2012)

The states have been ordered from highest (Maharashtra) to lowest (Bihar) according to SDPPC from the most recent observation year. Overall, there appears to emerge a pattern of higher income states having higher literacy rates. Ahluwalia (2000) reports that it would be expected that higher performing states would have higher levels of human resource quality (in this case proxied by literacy rates). Figure 18 would corroborate this assumption. However, he finds that there is not a statistically significant correlation between literacy rates and a metric for economic prominence. Despite the lack of a statistically significant relationship, the classically accepted principle that higher levels of education (in this case proxied by literacy rates) promote higher levels of economic development still does indeed apply[35]. Much of the cross-state variation is likely due to the fact that state governments are mostly responsible for their education initiatives. Therefore, increased effort by the individual state governments where lower literacy rates are observed could indeed translate into increased economic performance and further cross-state convergence by way of upgrading the skills of their citizens. Accordingly, this study provides some insight into the tendencies of higher performing states, to potentially serve as a developmental template for the lower performing states.

Although cross-state differences are indeed present, generally speaking, strong improvements have been achieved. The trend in cross-state literacy variance diverged from 1980-81 to 1990-91 but then dropped precipitously from 1990-91 to 2000-01, with even further decreases up to 2011. In all observation years Kerala had the highest literacy rate, and when compared to the lowest rate for the observation year 1981, from the state of Rajasthan, an enormous 48.74% difference is observed. In 1991 Bihar had the lowest literacy rate, and the difference between it and Kerala was an even greater total difference of 52.32%. In 2001 this gap diminished significantly to 43.86% between Kerala and Bihar, while the most impressive equalization has taken place from 2001 to 2011. During this period the difference in literacy rates between the highest and

[35] See the World Bank's "East Asian Miracle" for an anecdotal recount of educational reform propelling East Asian economies into higher stratums of economic development.

lowest state, Kerala and Bihar respectively, fell to just 30.09%. Clearly there have been very encouraging results in literacy rate improvement across Indian states, a positive sign regardless of other trends.

Despite the fact that cross-state divergence in literacy rates appears to be reversing, that is achieving convergence, India must continue to focus resources into this area and make literacy rate improvement a top priority. Human capital investment can be a powerful tool used to strengthen economic development and promote decreased income inequality by way of upgrading the skill-sets of those with lesser initial endowments of human capital. This process eventually allows them access to improved economic outcomes. It is also important to note that states with particularly low literacy rates should be the recipients of special attention in this matter; otherwise, further cross-state divergence in growth rates and income levels would all but certainly be the result.

3.2.3 POVERTY RATES

A discussion of income inequality and economic growth would be incomplete without some discourse on the contemporaneous evolution of poverty rates. Poverty reduction has indeed been high on India's national agenda; therefore, Indian growth analysis ought to observe the progress of poverty rates in conjunction with the development of the economy as a whole. Dr. N.C. Saxena (2001) stated in a published report on poverty estimates for 1999-2000 from the Planning Commission of India that state specific poverty lines have been estimated using original metrics established by the Lakdawala Committee. These poverty line estimates are updated with respect to prices as necessary.

Despite the seemingly logical a priori connection between income inequality and poverty, it should be clarified the two indicators do not

necessarily develop uniformly. It is possible for a country to attain significant improvements in poverty reduction, while not achieving commensurate advances in the distribution of income. Likewise, it is equally possible for a country to realize significant improvements in the income distribution while failing to proportionately alleviate poverty rates.

A study focused on the state-wise reductions of poverty by way of economic growth (Besley, Burgess & Esteve-Volart (2007)), observe that over the period 1958-2000 there was an overall strong tendency for states to reduce poverty through their increased economic growth. Their study uses a poverty elasticity measure to quantify the magnitude of poverty reduction for each percentage increase in economic growth; they find that all of the 16 states had a negative elasticity[36]. This finding confirms the desired inverse relationship between poverty and growth: more growth leads to greater reductions in poverty. These results have been corroborated in other similarly focused works, see: Ravallion (2004), Besley & Burgess (2003), Bourguignon (2002) and Dollar & Kraay (2002). Besley et al. (2007) find that the elasticity average for India was -0.65, but that there was substantial variation across states in their poverty elasticity of growth. Bihar had the lowest at -0.30 while Kerala achieved an elasticity greater than one at -1.23. All of these results were statistically significant at the 1% confidence level. These results indicate that a growth increase of 1% in Bihar would only reduce poverty by 0.30%, while a 1% increase in growth in Kerala would reduce poverty at over 4 times the observed rate in Bihar at a rate of 1.23%.

Besley et al. (2007) go on to estimate a poverty elasticity of inequality indicator, but find a less all-encompassing result. For 10 of the 16 states, a statistically significant poverty elasticity of inequality did not exist. However, for the remaining six states, the results were split equally regarding the signs of the coefficient. The coefficient of elasticity was found to be negative for the states of: Andhra Pradesh (-2.13), Bihar (-0.94) and Karnataka (-1.06)[37]. This finding

[36] The 16 states considered are: Andhra Pradesh, Assam, Bihar, Gujarat, Haryana, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh and West Bengal

[37] These coefficients were significant at the 1% confidence level for Andhra Pradesh and Bihar,

indicates that for these three states increases in inequality lead to decreases in poverty. For the following three states, the poverty elasticity of inequality was positive: Haryana (1.43), Maharashtra (1.25) and Punjab (1.30)[38]. These results indicate that as inequality increased, poverty likewise increased.

For the specific decade of the 1990s, Ahluwalia (2000) reports that 12 of the 14 states achieved reduced levels of poverty; the exceptions were Bihar and Haryana. With the state-wise evidence providing support of overall poverty reductions, it would be expected that the nation as a whole would have likewise achieved a diminished poverty level. However, Ahluwalia (2000) highlights the fact that two nationally focused studies on the issue of poverty in the 1990s, Datt (1999) and Gupta (1999), did not find an overall decrease in poverty. Although these results seem peculiar, it has been proposed that the National Survey Samples used in Datt (1999) and Gupta (1999) may have some underlying issues that may cause poverty levels to be inflated. Deaton and Tarozzi (1999) use a more updated price index[39] than that used to calculate NSS poverty levels, and their findings are in fact lower levels of poverty. This result would be consistent with notion that outdated NSS price indices are indeed inflating poverty counts. Further, Ahluwalia (2000) claims that NSS data undervalue consumption data by up to 40% for the observation year1998; Bhalla (2000) uses this argument as grounds for rejecting the NSS data for the 1990s as reliable. Figure 19 below represents the available years of national survey data for the percentage of each state's population living below the poverty line.

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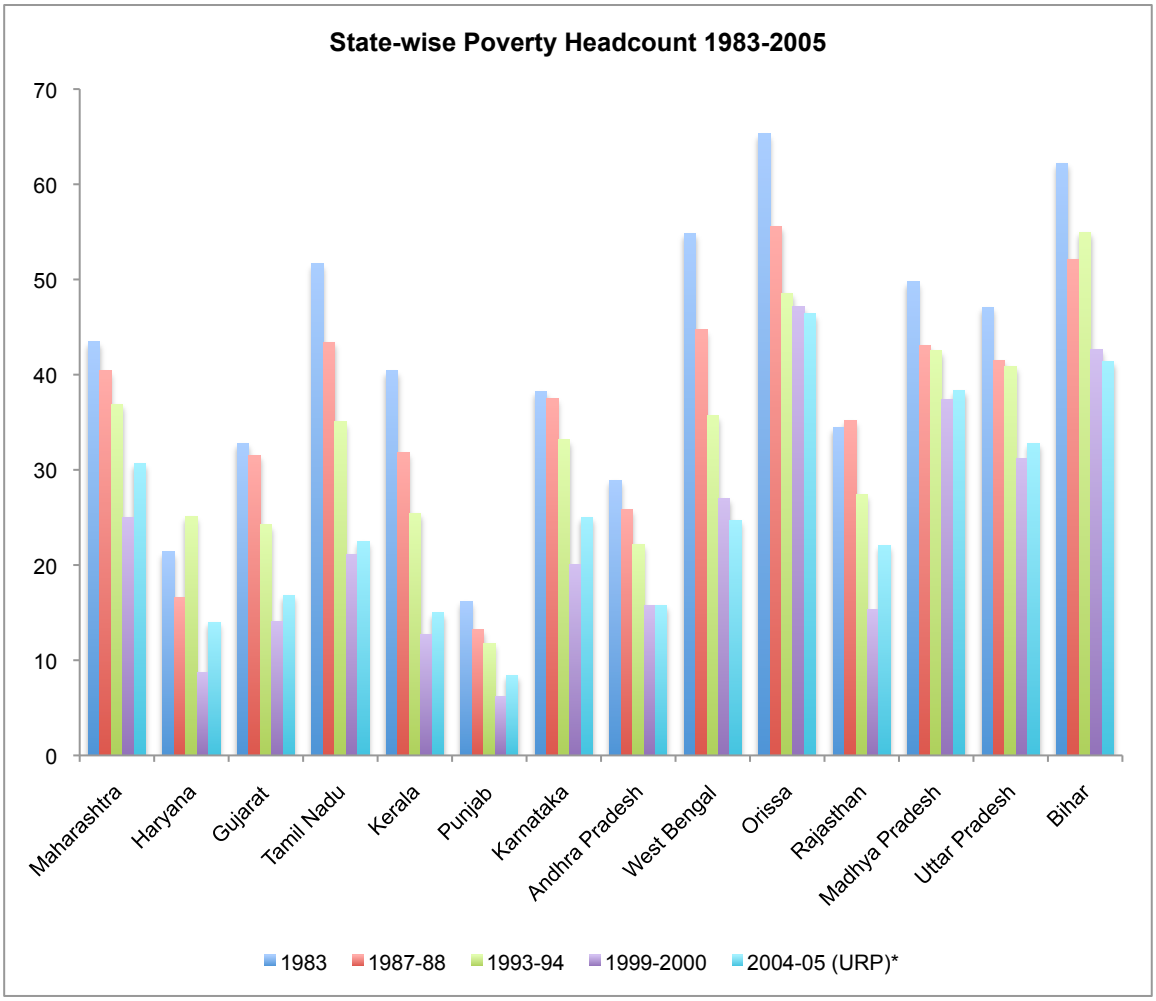
and only at the 5% level for Karnataka.

[38] These coefficients were significant at the 1% confidence level for Haryana, Maharashtra and at the 5% level confidence level for Punjab.

[39] Ahluwalia (2000) points out that the NSS employs a price index based on 1960-61 weights.

Figure 19



Source: Planning Commission (2012)

The states have again been organized from the highest to lowest SDPPC levels from 2010. As can be clearly seen, there exists an extremely wide range between the least and most impoverished states, although the richest state (Maharashtra) surprisingly does not have an especially low poverty rate. In fact, we can clearly see that the lowest rates, across all periods, belonged to Punjab and Haryana. In the most recent observation year the most impoverished state, Orissa at 46.4%, has a poverty rate over five times that of the least impoverished state, Punjab at 8.4%. Over the entire period India experienced a fairly significant drop in overall poverty levels: aggregate poverty levels, considering only these 14 states, decreased from 41.91% in 1983 to 25.28% in 2004-05. The heavy fluctuations in cross-state poverty rate disparities are

indeed concerning; however, progress across all states appears to be occurring, despite the wide disparities.

3.3. STATE-WISE PANEL DATA ANALYSIS

Having given an introduction to the trends and intertemporal evolution of the relationship between income inequality and economic growth over approximately the last three decades, our research focus will now shift to deciphering what factors may have influenced such variations in growth rates. Our previous section's results and discussion of other author's sometimes conflicting findings show quite clearly that a below the surface look at the growth experience is necessary. To that end, we will employ the use of a balanced panel model, with the dependent variable being average SDPPC growth rate for each of the three decades: 1980s, 1990s, and 2000s. Studies employing panel data techniques are especially rare for state-wise or regional dissections of the Indian growth experience, likely due to the aforementioned data restrictions and complete lack of key variables. Accordingly, we present our research in spite of the difficulty of collection of classically employed variables, and with respect to difficulty of comparability of results.

The employment of a classically styled econometric analysis of Indian states is severely handicapped from the onset, due to serious state-wise data availability issues. Typically, the desired variables suffer from one or two common problems that cause difficulties for the variable's implementation in a relatively lengthy longitudinal panel data model, such as the one specified in the current study. In some cases, there is a complete absence of the desired indicator, for all states or at least lacking for some of the 14 states considered in this study, or in cases where observations for the desired variable do exist, an overly short window of observation disqualifies it from eligibility in the current balanced panel model. Fortunately, over the years as India has moved along the development process, their government has correspondingly stepped up

efforts at collecting state-wise data and future research in the classical sense will be far less challenging. However, it will be some time before more complete analysis, now becoming possible at the national level, will be possible at the inter-state level for studies researching pre-reform time periods. Accordingly, this study selected from a relatively limited pool of variables that were both consistently available throughout time, and equally consistent with respect to coverage for all 14 states. Some measures have been selected as proxies for variables that are not observable, and some relationships discussed in the prior sections simply cannot be estimated.

With equal consideration given for classically styled equations and data availability, the explanatory variables employed in our analysis are to be state specific: literacy rates, Gini coefficients and a measure of macroeconomic volatility. The SDPPC information was taken from the Central Statistical Organisation of India's website, while the literacy rates and Gini coefficients were taken from the Indian Planning Commission Data Book. Literacy rates and Gini coefficients were observed as close to the beginning of each decadal panel period as possible, to capture the common design employed in cross-country panel data studies on inequality and economic growth, assuming initial conditions affect future growth rates[40]. It is preferable to employ observations of the explanatory variables as close to the start of the period as possible, in a lagged fashion, in order to further harmonize with growth theory. This all relates to the assumptions that past values of income inequality, capital (either physical or human) and other determinants affect future growth. Given that our study is analyzing state-wise effects, rather than cross-country effects, the design of the panel has necessarily been slightly different, but the fundamental relationships analyzed remain unchanged. With consideration for the final explanatory variable, our study calculated a coefficient of variation for each decade's growth rates, and used it to gauge the level of macroeconomic volatility present for each state[41].

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[40] Work similar to that of Barro (1991, 2000) represents the desired design. Also see Alesina & Rodrik (1994), Birdsall, Ross & Sabot (1995), Sylwester (2000) and Easterly (2000) for discussions concerning the design of similar studies.

[41] The coefficient of variation is given by the standard deviation of the period's growth rates

Based on economic theory and other similarly focused empirical works, it is possible to make some assumptions about the eventual estimates of the model, between the dependent and independent variables. Results on income inequality and growth have come up with quite widely disputed results regarding the empirical relationship between the two indicators; however, there are two main schools of thought extant on the subject: that higher levels of inequality should spur economic growth through incentive and savings channels[42], or the more nuanced stance that maintains an inverse relationship: inequality ought to decrease growth due to a variety of reasons, typically related to taxes, credit markets, macroeconomic volatility and others[43]. The independent variables employed in this study will allow us to discern the impact they are having on growth rates, and make eventual connections to these theoretical assumptions.

However, before entering a detailed description of each variable, table 5 below presents the summary statistics of the variables employed in our panel data model:

Table 5

State-wise Panel Data Summary Statistics

	Mean	Maximum	Minimum	Std. Dev.
$(\text{Ln } y_{i\,t+T} / \text{Ln } y_{i\,t}) / T$	0.036	0.072	-0.008	0.017
Literacy	54.981	90.860	30.110	15.402
Gini	0.291	0.350	0.245	0.024
Coeff.Var	2.389	26.625	0.289	4.160
Initial SDPPC	9.586	10.336	8.636	0.417
Pop. Growth Rt.	0.227	0.330	0.094	0.051

divided by its period average.

[42] See for example the Kaldor (1956) savings hypothesis or indivisibility of investment theorem, see Aghion et al. (1999).

[43] See the political economy argument, credit market imperfections and macroeconomic volatility commonly presented in many articles, for example see Benabou (1996), Aghion et al. (1999), Barro (2000).

From the summary statistics we can observe fairly wide variance in each of the metrics displayed observed across the 14 states included in our study. Beginning with the dependent variable, SDPPC growth, we can distinguish that the decadal panel average economic growth rates ranged from below zero (-0.8%) to over 7%. With respect to literacy, the highest rate observed was 90.860%, with the lowest only slightly above half of the state's population, at 54.981%. Gini coefficients likewise varied heavily across states, from 0.245 to 0.35. The volatility in economic growth rate, measured by the coefficient of variation, also exhibits a wide dispersion. Initial SDPPC (as observed at the beginning of each decadal panel period) has already been shown to have varied widely across states (with respect to 1980 only), which was shown to positively influence growth rates (figure 11). Finally, we can see that population growth rates showed relatively large variation across states, with a wide gap in the maximum and minimum, as well as a sizeable standard deviation from the mean rate. Below in table 6 we provide the correlation coefficients among all variables, facilitating analysis of the inter-variable relationships.

Table 6

State-wise Panel Data Correlation Coefficients

$(\text{Ln } y_{i\,t+T} / \text{Ln } y_{i\,t}) / T$	Literacy	Initial SDPPC	Gini	Pop. Growth Rt.	CoeffVar	
1.0000	0.5915	0.5945	-0.1107	-0.3712	-0.5307	$(\text{Ln } y_{i\,t+T} / \text{Ln } y_{i\,t}) / T$
	1.0000	0.7295	0.1198	-0.6329	-0.2896	Literacy
		1.0000	-0.0652	-0.3729	-0.3917	Initial SDPPC
			1.0000	-0.1984	-0.2171	Gini
				1.0000	0.1108	PopGroRt
					1.0000	CoeffVar

Critical Value 5% : 0.3044
N = 42

Overall we do not observe many overly pronounced correlation coefficients that may confound our panel data models' results, although we do take note of the relatively high correlation between our variable initial SDPPC and literacy (0.7295), as well as population growth rates and literacy (-0.6329). As we will

see in our panel data output, literacy rates are positively and robustly associated with subsequent periods' economic growth rates, and as mentioned, with initial income levels. As expected initial income levels are correlated positively with period average growth rate, consistent with the results obtained in our absolute β convergence test (figure 11). Gini coefficients are weakly correlated individually, indicating that alone their effect leverage a generally unimportant result on both the independent, as well as dependent variables. Population growth rate is negatively correlated with all other variables, with the exception of our macroeconomic volatility variable, the coefficient of variation (although at a statistically insignificant level). As mentioned, we notice a fairly high level of negative correlation between population growth rates and literacy rates, indicating that high population growth shares a fairly strong linear relationship with lower average literacy rates. The macroeconomic volatility variable, coefficient of variation in period average growth rates, unsurprisingly shows up as having a negative relationship with all variables, although as previously mentioned, with the exception of population growth rates. Notably, the volatility indicator was seen to have a moderately negative effect (-0.5307) on our dependent variable. Having discussed all of the summary statistics as well as correlation coefficients of all independent variables, as well as the dependent variable growth rate, we now transition to specific discussions of each of the independent variables.

3.3.1 Human Capital Investment

Considering the recently upgraded economic might of India, human capital investment has failed to commensurately improve instep with the large advances in aggregate output. Dreze & Sen (1995) point out that India's current literacy rates are comparable to those observed in neighboring peer East and Southeast Asian countries 40 years ago, and that India's literacy rates are similar to those recently surveyed in Sub-Saharan Africa. According to the

United Nations Human Development Report (various years), India's total adult population (15 years and above) literacy rate in 1980 was just 40.8%, but the most recent data collected shows an improvement of nearly 30%, up to 68.3% for 2010. Although India was ranked just 119th of 169 countries, there has been some encouraging progress made with respect to pre-reform to post-reform literacy rates. India's aggressive economic development over the last several decades has fortunately translated into somewhat improved levels of literacy rate, despite India having much room for further advancement.

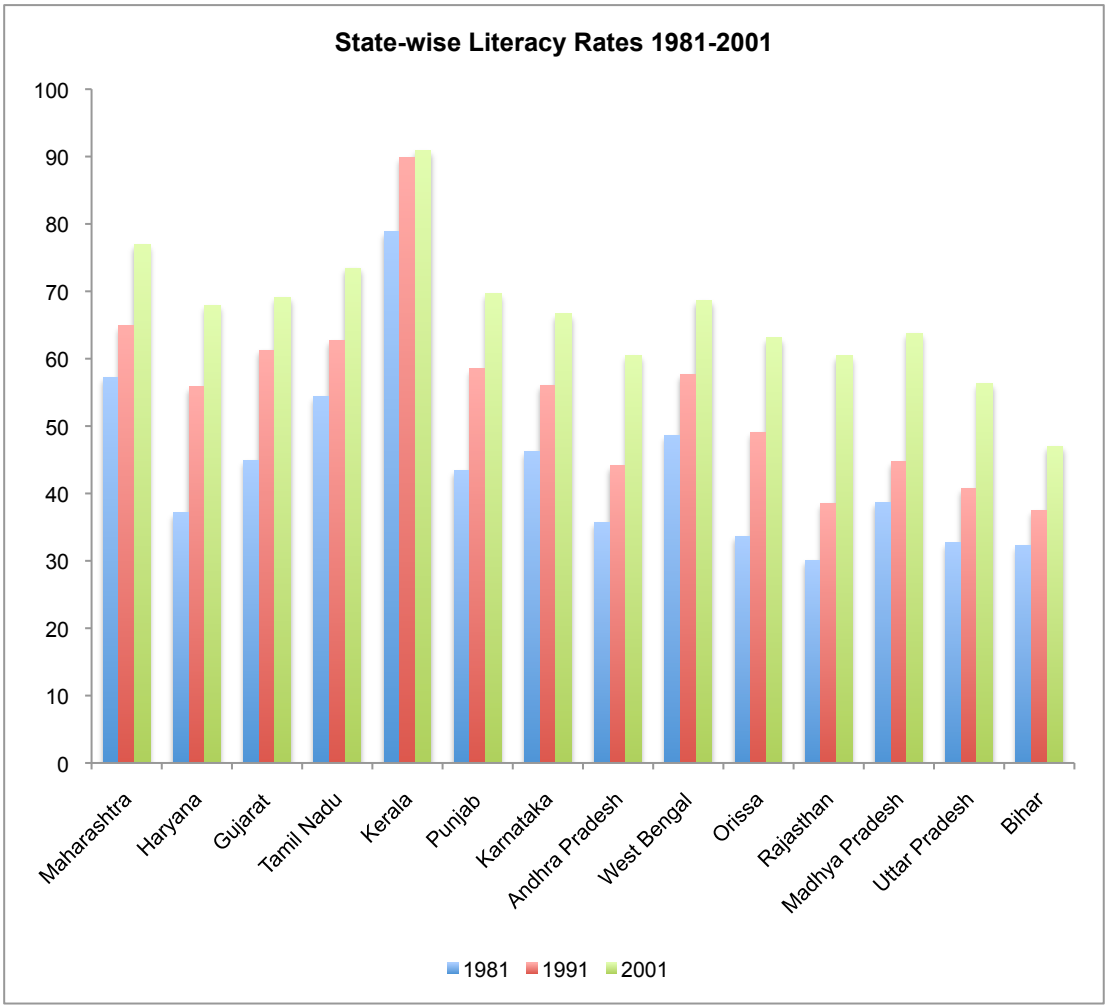
It appears that India's successful economic growth over the last three decades has been met with somewhat disappointing improvements in literacy rates and presumably overall human capital development. Our observation of literacy rates as a proxy for human capital investment is forced by the absence of state-specific enrollment rates data, which are the variable typically preferred and employed in the cross-country regressions inspiring this current study. However, we assume the proxy variable literacy rates to sufficiently capture the essence of human capital prevalence in the states.

The variable literacy is measuring the percentage of literate individuals over the age of 15 years in a state. Given that we employ the variable to capture the idea of human capital investment, we can compare it to the economic literature analyzing the influence of human capital on growth. The relationship between human capital investment and economic growth is found to be tremendously robust: higher levels of education are correlated with higher levels of economic growth, see for example: Alesina & Rodrik (1994), Alesina & Perotti (1996), Alesina et al. (1996), Barro (1996)[44], Benhabib & Spiegel (1996), Bourguignon (1994), Clarke (1992), Deininger & Squire (1995), Easterly & Rebello (1993), Keefer & Knack (2002), Lindert (1996), Perotti (1992, 1996[45]), Persson & Tabellini (1992, 1994), Svensson (1998). Therefore, if one considers literacy rate to be an acceptable proxy for the extent of education or human capital concentration in a state, it would be expected that literacy rates are

[44] Barro (1996) finds a positive relationship for males, but the correlation turns negative for female human capital levels.
[45] Perotti (1996) also finds that male education levels are positively related while female estimates for human capital are negatively correlated with growth.

positively correlated with average per capita growth rates. We take observations from 1981, 1991 and 2001 to capture the beginning of each panel period effect of human capital concentration. Figure 20 below presents the data observed for the 14 states' literacy rates:

Figure 20



Source: Planning Commission (2012)

The states have been ordered from highest (Maharashtra) to lowest (Bihar) SDPPC in the most recent observation period to casually observe the trend between wealthier and poorer states. Overall, there appears to emerge a

pattern of higher income states having higher literacy rates. Ahluwalia (2000) reports that it would be expected that higher performing states would have higher levels of human resource quality. Figure 20 would corroborate this assumption. However, he finds that there is not a statistically significant correlation between literacy rates and a metric for economic performance. Despite the lack of a statistically significant relationship, the classically accepted principle that higher levels of education promote higher levels of economic development still does indeed apply[46]. Much of the cross-state variation is likely due to the fact that state governments are mostly responsible for their education initiatives, and not all states pursue the same strategies. Therefore, increased effort by the individual state governments where lower literacy rates are observed could indeed translate into increased economic performance and improved cross-state convergence by way of upgrading the skills of their citizens. Accordingly, this study provides some insight into the tendencies of higher performing states, to potentially serve as a developmental template for the lower performing states to follow the path of more successful growth states.

Although cross-state differences are indeed present, generally speaking, strong improvements have been achieved. The trend in cross-state literacy variance diverged from the 1980s to the 1990s but then dropped precipitously from the 1990s to the 2000s. Chikte (2011) confirms this by conducting convergence tests on literacy rates across states; indeed, it is found that a statistically significant convergence has been occurring over the period 1970-2005. In all observation years Kerala had the highest literacy rate, and when compared to the lowest rate for the observation year the 1980s, from the state of Rajasthan, an enormous 48.74% difference is observed. In the 1990s Bihar had the lowest literacy rate, and the difference between it and Kerala was an even greater total difference of 52.32%. In the 2000s this gap diminished significantly to 43.86% between Kerala and Bihar. Despite the fact that cross-state divergence in literacy rates appears to be reversing, India must continue to focus resources into this area and make literacy rate improvement a top priority to strengthen economic development and decreased inequality by

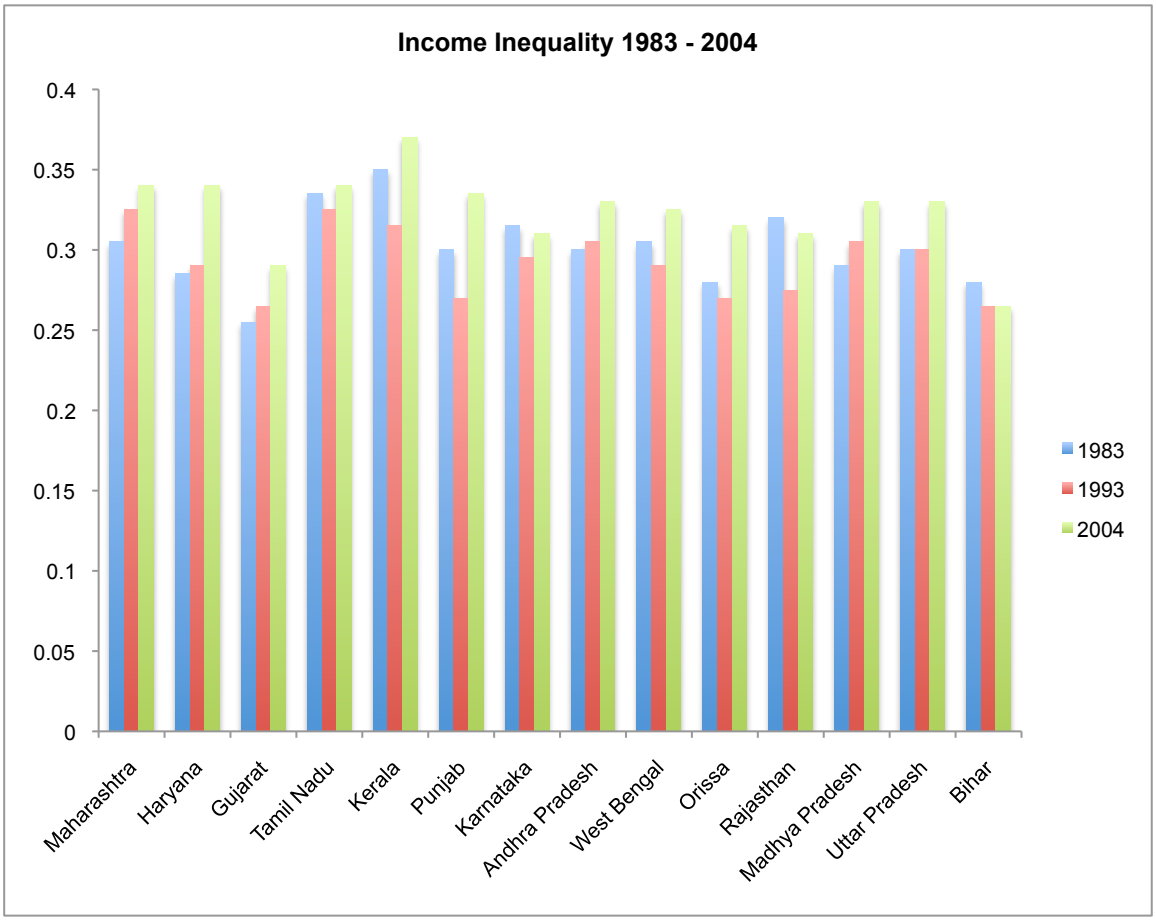
[46] See the World Bank's "East Asian Miracle" for an anecdotal recount of educational reform propelling East Asian economies into higher stratums of economic development.

upgrading the skill-sets of the lesser performing states to provide greater future economic opportunities. Our empirical results endeavor to expose a reliable relationship between higher endowments of human capital investment and economic growth rate performance.

3.3.2 Income Inequality

The variable Gini is measuring the degree of income inequality in each respective state and has been a hotly debated topic over the last several decades of economic analysis. Despite the disaccord, it is true that the majority of authors find there to be an aggregate negative effect of income inequality on economic growth, especially in the context of poor nations. This finding has been very well documented, see the following studies for a discussion of the inverse relationship between income inequality and economic growth: Alesina & Rodrik (1994), Benhabib & Spiegel (1996), Bourguignon (1994), Clarke (1992), Deininger & Squire (1995), Keefer & Knack (2002), Perotti (1992, 1994, 1996), Persson & Tabellini (1992, 1994), Venieris & Gupta (1986). As mentioned by many authors, this finding tends to be especially true for the context of developing economies. However, typically inequality's effect on growth is considered to be neither an especially strong nor robust across studies (Barro (2000)). As a result of the uncertainty, and lack of robustness of directionality regarding the empirical findings, we shall leave the expected sign on the Gini coefficient as unpredicted. We take official Gini observations as close to the beginning of each panel period as possible, namely 1983, 1993 and 2004. We present the state-wise Gini data proxying for income inequality to be estimated in the random effects model in figure 21 below:

Figure 21



Source: Planning Commission (2012)

Again, the states are ordered from richest (Maharashtra) to poorest (Bihar) in the most recent decade of observation. Casual observation does not seem to yield any obvious result regarding a relationship between high or low levels of income inequality, and high or low levels of SDPPC. However, our regression equation will endeavor to uncover the relationship between initial income inequality and period average SDPPC growth rates.

3.3.3 Macroeconomic Volatility

It has long been considered prudent in economic literature to consider macroeconomic volatility as an important factor in a country or region's growth experience. Given the data constraints and difficulty of employing classically focused macroeconomic variables, our study takes advantage of the readily available growth rate levels, and calculates a volatility measure. Few authors have undertaken analysis on the state-wise experience of volatility measures on aggregate output; however, Purfield (2006) does mention in her analysis that growth has been found to be most volatile in the poorest states of India. She calculates a coefficient of variation over 5 year periods for income related groupings of states; her findings indicate that overall volatility has been highest for lower income states. Our analysis seeks to quantify the extent of the related yet specific effect of macroeconomic volatility levels on aggregate output rates.

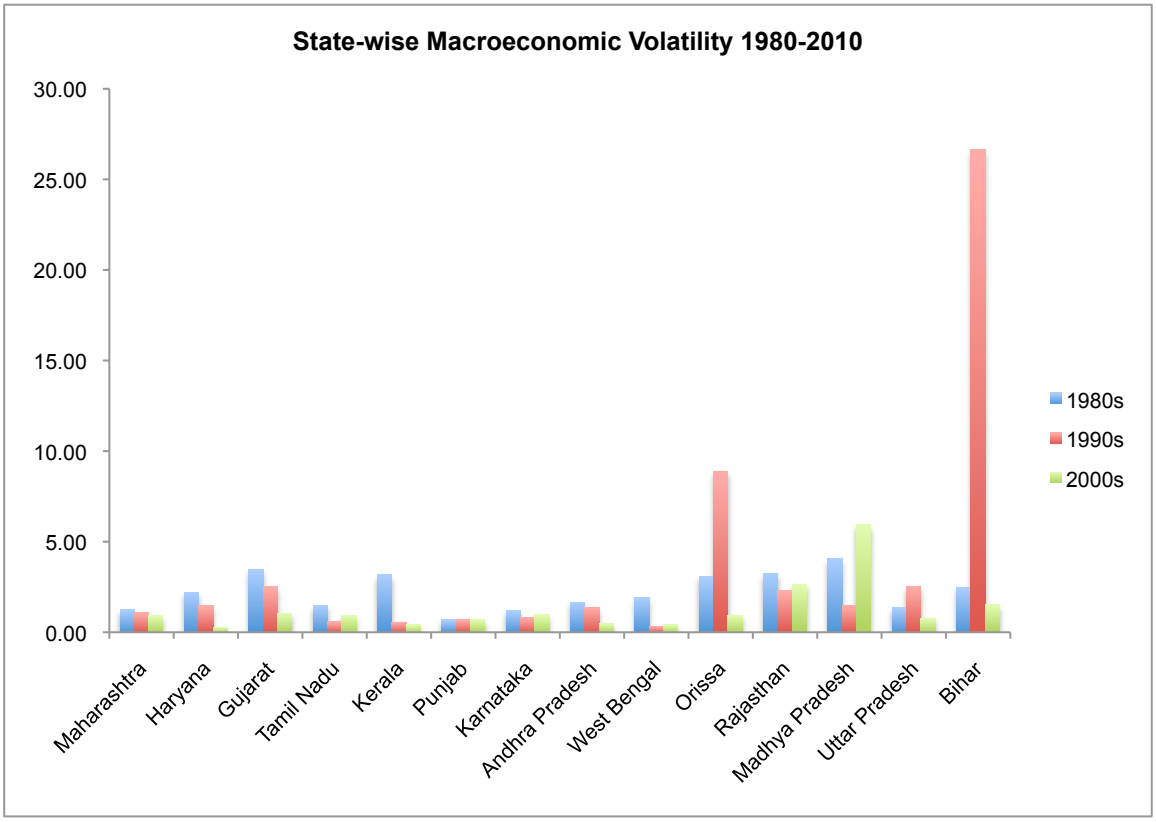
Our study uses a coefficient of variation metric observed over each panel period, to measure the extent of growth rate volatility[47]. Analysis regarding volatility levels and economic growth tend to associate greater volatility with decreased growth rates. For example, Hausmann & Gavin (1996) find that macroeconomic volatility tends to be very costly through its negative impact on economic growth and investment in human and physical capital. Further, Ramey & Ramey (1995) indicate that greater volatility in aggregate output leads to diminished growth rates. Aghion et al. (1999) corroborate this familiar observation by mentioning cross-country growth studies' affirmation that higher levels of volatility are linked with uniform reductions in average growth rate over the same observation period. These reductions in growth rate tend to be tied to reductions in the incentive to invest in both physical and human capital. The design of our volatility metric should then provide information on the relationship between each panel period's volatility rate, and the effect it had on average growth rate.

The coefficient of variation was calculated from the variation in state

[47] The coefficient of variation is calculated by dividing the period standard deviation with the period average growth rate.

specific SDPPC growth rates. The a priori assumption following the above discussed research is that higher volatility in aggregate output rate would be linked with lower period averaged growth rates. This assumption stems from the notion that higher macroeconomic volatility causes decreased incentives for investment; decreased incentives to invest in either physical or human capital would theoretically decrease the average growth rate, thusly establishing the inverse relationship expected between volatility and output rates.

Figure 22



Source: RBI (2013) & Author's Own Calculation

Figure 22 likewise orders the states from richest (Maharashtra) to poorest (Bihar), and a clear trend towards higher volatility observed in the poorer states is observed, a result likewise mentioned in Purfield (2006). Although a relatively calm trend seems to exist, our panel analysis will exhaustively breakdown the relationship, and we will be afforded a more sophisticated and complete means by which to analyze the effect macroeconomic volatility had on growth rates.

3.3.4 Population Growth Rates

The variable population growth rate is measuring the decadal rate of growth for each state's population. It would seem obvious that higher population growth would diminish per capita economic growth. This is so given the fact that higher levels of population, with a constant level of output, would lead to increasingly diminished levels of per capita economic growth. Further, population growth could be considered a proxy for a variable more directly linked to inequality and growth theory: fertility rate. If the population of a closed economy is growing, it is obvious what is happening: families are either producing more offspring than did the previous generation, otherwise defined as a growing fertility rate. Considering that India of course is not a perfectly closed economy, but that India has some of the lowest immigration rates in the world[48], we can see quite clearly that increase in population growth rate are very likely a result of increased fertility rates. Accordingly, our variable measuring population growth could be considered a proxy for fertility rate, which is assumed to increase in step with, or as a reaction to, higher income inequality. Poor families tend to have more offspring as an archaic means by which to access financial security later in life; they assume that by having many children, some or all of the children will take care of the parents in their elder years (Todaro (2000)). This is a phenomenon that occurs only with lower income families; higher income families obtain financial security through the formal economy and financial investment, not through creating larger families. Also as a result of higher fertility rates, inefficient outcomes with respect to human capital investment are assumed, with the final result being dampened economic growth prospects. Perotti (1996) finds a strong negative relationship between greater equality and fertility rates. Further, he shows that this downward pressure on fertility rates causes significant increases for economic growth. These results then imply that the reverse relationship applies: namely, that a

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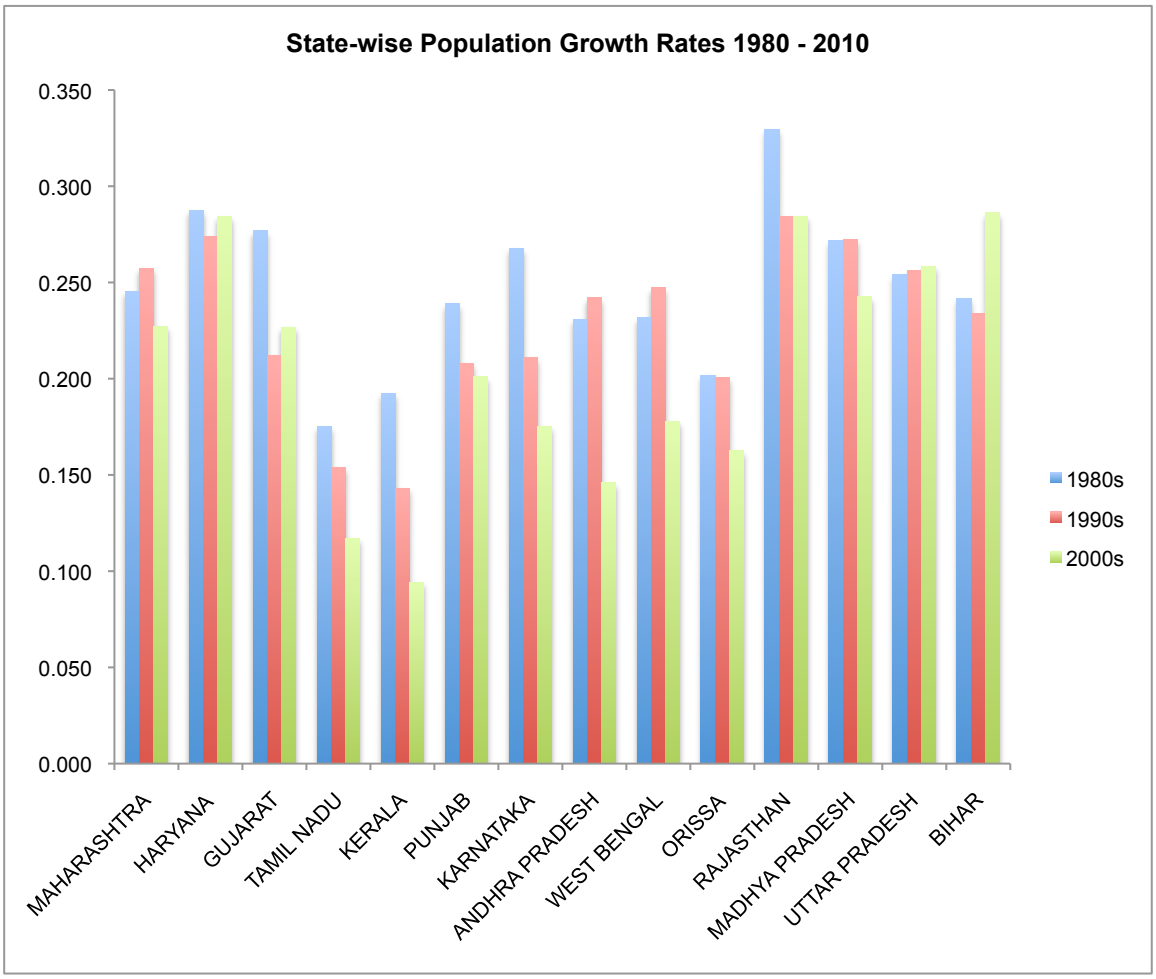
See *Encyclopedia of the Nations* for more information:
http://www.nationsencyclopedia.com/Asia-and-Oceania/India-MIGRATION.html

direct relationship exists between inequality and fertility rates (higher inequality leads to higher fertility rates) and further, that economic growth should be diminished as a result of elevated fertility rates. Of course, these are very long-term trends, and their exact relationship may not show up in this analysis comprising only 30 years of India's economic experience. In any case, a negative relationship between the dependent variable and population growth would be expected.

Figure 23



Source: Planning Commission (2012)

We can see that the states are ordered as always from richest to poorest. The richest states Maharashtra, Haryana and Gujarat seem to have relatively high population growth rates, while still wealthy states Tamil Nadu, Kerala and

Punjab have noticeably lower levels. All of the poorest states are shown to have the highest population growth rates, an unfortunate truth that further handicaps their already struggling economies.

Finally, the last test variable we input is related to the absolute β convergence testing already presented in figure 11. To control for the effect of states that had high SDPPC at the beginning of our observation period, we input an initial SDPPC variable; this variable is inspired by the theories of β convergence, presented in Barro & Sala-i-Martin (1992). The relationship has been observed independently of other factors in figure 11 with our absolute β convergence test, and now the interest in implementing a variable styled after these theories is based in controlling for the relationship between higher and lowers initial income, and observing the relationship with resultant growth rates among other variables. Neo-classical growth theory assumes that regions or states within a country would achieve similar levels of long run per capita income levels, assuming there are no barriers to the flow of capital and labor within a nation. Given that poorer states tend to have initially lower levels of capital stocks, the theory predicts that, by way of diminishing returns to capital and labor inputs, initially poorer states should make comparatively greater gains in per capita income growth, with respect to initially richer states, which should logically experience relatively slower growth rates. However, given the results in our absolute β convergence testing, we would presume that initial SDPPC levels would be positively linked with subsequent economic growth rates. Accordingly, our variable initial SDPPC is of interest, as it will help discern initial wealth's effect on growth rate, when coupled with our other test variables. As we have already seen, initially wealthier states tended to grow faster over the entire observation period; thusly, we expect the initial SDPPC variable to positively impact panel period economic growth rates.

3.3.5 Panel Results

The data was first tested using the random effects estimation specification, and given the post-diagnostic tests to be discussed after the presentation of results, the model was found to be properly specified. Specifically, it was most appropriate to specify the model utilizing the GLS random effects technique, drawing a constant term from a random distribution rather than employing a state specific constant term. When running the Hausman test, defined by the underlying null hypothesis of random effects estimators being consistent, our models (with the exception of equation 2) obtain p-values well outside the range of rejection, indicating that our random effects modeling technique yields a reliable result. Because of data constraints and the necessity of eliminating potential outlier states from the sample, the overall selection is relatively small and the number of observations low. Specifically, we have only 14 states observed over 3 panel periods, yielding a total sample of 42 observations. Despite the difficulties in obtaining data and studying a larger sample, our research provides a unique below the surface look at state-wise growth experiences, and facilitates a discussion into what reasons may explain the heterogeneous economic experiences of 14 of India's most economically relevant states.

The panel equations are summarized by the models below, whereby all independent variables vary both by state, '*i*', and by time period, '*t*'. The dependent variable also corresponds to those changes in state, *'i'*, and time, *'t'*. For all equations estimated, the dependent variable is the ration of a state's natural logarithm of time '*t+T'* SDPPC to its time '*t*', all divided by the period of *'T',* for each of the three panel periods. The random effects panel equations to be estimated are shown below:

1) $(\text{Ln } y_{it+T} / \text{Ln } y_{it}) / T = \beta_0 + \beta_1 \text{ Literacy}_{it} + \varepsilon_{it}$

2) $(\text{Ln } y_{it+T} / \text{Ln } y_{it}) / T = \beta_0 + \beta_2 \text{ Gini}_{it} + \varepsilon_{it}$

3) $(\text{Ln } y_{it+T} / \text{Ln } y_{it}) / T = \beta_0 + \beta_1 \text{ Literacy}_{it} + \beta_2 \text{ Gini}_{it} + \varepsilon_{it}$

4) $(\text{Ln } y_{it+T} / \text{Ln } y_{it}) / T = \beta_0 + \beta_1 \text{ Literacy}_{it} + \beta_2 \text{ Gini}_{it} + \beta_3 \text{ Coeff. Var.}_{it} + \varepsilon_{it}$

5) $(\text{Ln } y_{it+T} / \text{Ln } y_{it}) / T = \beta_0 + \beta_1 \text{ Literacy}_{it} + \beta_2 \text{ Gini}_{it} + \beta_3 \text{ Coeff. Var.}_{it} + \beta_4 \text{ Initial SDPPC}_{it} + \varepsilon_{it}$

6) $(\text{Ln } y_{it+T} / \text{Ln } y_{it}) / T = \beta_0 + \beta_1 \text{ Literacy}_{it} + \beta_2 \text{ Gini}_{it} + \beta_3 \text{ Coeff. Var.}_{it} + \beta_5 \text{ Pop. Growth Rt.}_{it} + \varepsilon_{it}$

7) $(\text{Ln } y_{it+T} / \text{Ln } y_{it}) / T = \beta_0 + \beta_2 \text{ Gini}_{it} + \beta_3 \text{ Coeff. Var.}_{it} + \beta_4 \text{ Initial SDPPC}_{it} + \beta_5 \text{ Pop. Growth Rt.}_{it} + \varepsilon_{it}$

The models were estimated by GRETL version 1.9.12 as well as with STATA 64/SE version 10.1; the results obtained from the balanced panel data models are given below in table 7:

Table 7

State-wise Panel Data Output

Dependent Variable: (Ln yi t+T / Ln yi t) / T All Models GLS Random Effects	[1]		[2]		[3]		[4]		[5]		[6]		[7]	
Literacy	0.0006 *0.0001*	***			0.0007 *0.0001*	***	0.0006 *0.0001*	***	0.0005 *0.0002*	**	0.0005 *0.0002*	***		
Gini			-0.0775 *0.1100*		-0.1345 *0.0918*		-0.1939 *0.0822*	***	-0.1773 *0.0866*	**	-0.1998 *0.0839*	**	-0.1637 *0.0840*	*
Coeff. Var.							-0.0018 *0.0004*	***	-0.0017 *0.0005*	***	-0.0018 *0.0004*	***	-0.0017 *0.0005*	***
Initial SDPPC									0.0054 *0.0076*				0.0128 *0.0054*	**
Pop. Growth Rt.											-0.0304 *0.0509*		-0.0812 *0.0404*	*
R^2 Within	0.4598		0.2251		0.4508		0.6425		0.6517		0.6419		0.6104	
R^2 Between	0.2833		0.0713		0.2784		0.4081		0.4276		0.4261		0.4512	
R^2 Overall	0.3448		0.0133		0.3797		0.5542		0.5595		0.5606		0.5346	
Breusch-Pagan	0.8430		0.7571		0.7047		0.6133		0.7358		0.6449		0.9310	
Hausman	0.5916		0.0185		0.1485		0.5960		0.4630		0.7640		0.4689	

Coefficient estimates for the test variables are presented for each of the seven models, with their corresponding standard errors provided below in smaller font italics. To the right of statistically significant variables are asterisk marks, indicating the corresponding confidence level of their statistical significance (* 10% confidence level, ** 5% confidence level, and *** 1% confidence level). Near the bottom of the output table we provide the within R^2, between R^2 as well as the overall R^2. Finally, the last two rows of our output table have been reserved for the p-values of two commonly employed post-estimation diagnostic tests: the Breusch-Pagan test (heteroskedacticity) as well as the Hausman test (specification and consistency).

Before discussing the specific results and directionality of the coefficient estimates on our macroeconomic variables, we can see that all models tested

passed both the Breusch-Pagan as well as the Hausman test (with the exception of model 2 using only Gini coefficients regressed on economic growth rate). This result signals that our models are properly specified, in that the random effects GLS is a consistent estimator (Hausman), as well as the fact that the unit specific variance is equal to zero (Breusch-Pagan). For the case of our model in column 2, we are not overly concerned with its inability to be considered efficiently estimated by the GLS random effects model. Further, when regressing only Gini coefficients on the dependent variable with the fixed effects specification, the test variable is likewise statistically insignificant, indicating quite clearly that the Gini coefficient alone does not have a clear association with the economic growth rate in our model.

With respect to the within R^2, between R^2 and the overall R^2, our models indicate that across all models, the largest amount of the economic growth rate experience is explained within cross-sectional units. This finding simply means that variation 'within' each of the 14 states of India analyzed herein, with respect to the macroeconomic conditions controlled for by our panel data model, were most wholly capable of explaining economic growth rate. The between R^2 can be observed to explain comparatively less of the overall variation in economic growth rate; the 'between' specification simply means the variation from state to state. The overall R^2, perhaps the easiest to understand, indicates the amount of variation in economic growth rate that our independent variables, without regard for their state specific radix, were capable of explaining. Again, we can see that the within R^2 outperformed both the between R^2 and overall R^2, although the overall R^2 explained an encouragingly high level of the global economic growth picture.

Very few studies for the specific case of Indian state-wise studies have been executed using panel regression techniques, however comments on a sampling of the rare studies are analyzed. Ahluwalia (2002) regresses literacy rates with growth rates, but does not find a statistically significant relationship, and in fact the coefficient had the wrong sign. Nagaraj et al. (2000) however do find a positive relationship between literacy rates and an economic growth variable, thusly alluding to the notion that higher literacy rates tend to potentiate economic growth rates; however, their results were likewise statistically insignificant. Datt & Ravallion (2002) do not explicitly regress literacy rates on

growth rates, however they offer unique insight into the relationship, and promote the idea that low human capital achievement by the poorer states is limiting their economic growth potential. Their argument states that lacking education opportunities prohibit many Indians from fully participating in the opportunities afforded by economic growth; Dreze & Sen (1995) have also made comparable arguments regarding the necessity and importance of upgrading India's poorest citizens' human capital stocks, allowing for greater integration of a larger percentage of India's population. Besley et al. (2007) present the idea that the state-wise diversity of literacy rates, and resultant growth rates, could be in part due to the fact that the Indian constitution leaves educational expenditure up to the responsibility of individual state level governments. Accordingly, the literacy rate improvement has varied widely in function of the commensurately mixed efforts put forth by states to increase educational achievement. The need to further improve the human capital stocks of India's poorest and slowest growing states remains a matter of critical importance.

The first variable presented in table 7, literacy rate, confirms our ex ante assumption of human capital (literacy rates) leveraging a positive impact on decadal panel period averaged SDPPC growth rates. Additionally, the estimator is found to be statistically significant at the 1% level across all equation estimations except column 5 (where it is statistically significant at the 5% confidence level), lending support to the common notion that human capital tends to leverage a strongly positive impact on economic growth rates. Our study has employed literacy rate as a proxy variable for human capital investment (which is a commonly accepted practice in the Indian context). The typical empirical result is that economic growth and education are positively and strongly related: Alesina & Rodrik (1994), Alesina & Perotti (1996), Alesina et al (1996), Benabou (1996), Barro (1996), Benhabib & Spiegel (1996), Bourguignon (1994), Clarke (1992), Deininger & Squire (1995), Easterly & Rebello (1993), Keefer & Knack (2002), Lindert (1996), Perotti (1992, 1996), Persson & Tabellini (1992, 1994), Svensson (1998). Given the consistent positive directionality and statistically significant result, our panel data model provides evidence to support this classical assumption, and is in line with past empirical studies.

The results obtained for the Gini coefficient estimator were found to be negative across all equations, while statistically significant only in the more dynamic panel estimations. When Gini coefficients were regressed solely with the dependent variable economic growth rates, the coefficient estimate was statistically insignificant, and misspecification was indicated by the simple equation's failure to maintain the null hypothesis of the Hausman test. Similarly, when Gini coefficients and literacy rates were the only two independent variables, the resulting coefficient estimate for our Gini variable was again statistically insignificant. However, in equations 4, 5, 6 and 7 we find the variable to be statistically significant, consistently negative and at the 1%, 5%, 5% and 10% levels, respectively. Accordingly, we can reliably deduce that higher levels of initial state specific income inequality negatively affected the corresponding states' period decadal average SDPPC growth rates. In line with the literature review and the often nebulous supposed effect income inequality has on economic growth, empirical findings tend not to be robust, or especially consistent with respect to directionality (Barro (2000)). Perotti (1996) even proposes the notion that the relationship between inequality and growth may not even be significant for poor countries.

Our coefficient estimate for Gini coefficients effect on economic growth was consistently negative, thusly corroborating the more contemporary view of an inverse relationship between income inequality and economic growth. Further, our results would be in line with the first assertion of the common notion that poor countries tend to exhibit an inverse relationship between inequality and growth, while richer countries show a positive correlation. A common empirical finding in the recent literature is that changes in income inequality at the national level in India have virtually zero correlation with rates of economic growth; see, for example, Ravallion and Chen (1997), Ravallion (2002), Dollar and Kraay (2002). Exceptionally few studies explicitly investigate the relationship between initial income inequality levels and the effect they have on subsequent periods' average economic growth rates at the state level by way of panel data models, similar to the one employed in the current study; therefore, comparability of studies with our classically designed methodology, at the state-level, is not possible.

Despite the scarcity of comparable quantitative studies, a sampling of related works covering income inequality at the state level in India can provide useful abstractions for possible policy decisions. A discussion provided by Weisskopf (2011) summarizes a multitude of findings on potentially rewarding avenues Indian state governments could explore to decrease their aggregate income inequality levels, and subsequently improve their economic growth outcomes. Arora (2012) provides definitive results showing that financial development plays a significant role in reducing income inequality in urban areas, while the author also finds rural income inequality may be affected by increasing the accessibility to finance. Both results from Arora (2012) are indeed relevant to our current study, given that we find income inequality has a negative impact on growth; the implication is then that financial development could be an interesting and productive future line of research applied to the noble endeavor of lessening income inequality. Vakulabharanam (2010) argues that Indian growth since the 1990s has not been shared in a sufficiently equitable fashion, and among other policy recommendations, suggests that greater focus on rural public investment and lending may be productive measures to bring about greater equality. Further, Vakulabharanam (2010) mentions that urban work programs should be emphasized, in order to potentially tap into India's tremendous natural endowment and competitive advantage in labor intensive production strategies; he notes that pursuing such policies would likely result in beneficial outcomes due to the trickle down effect of urban economic growth.

Our results for the coefficient of variation variable, as a proxy for macroeconomic volatility, have come out as negatively associated with economic growth rates, indicating that greater fluctuations in the economic growth rate, signaling higher levels of macroeconomic volatility, are associated with lower average economic growth rates. Specifically, we find that the coefficient of variation is robustly negative, with consistent directionality and statistical significance at the 1% level in equations all equations where it is present, specifically: 4, 5, 6 and 7. This is in line with the literature review, the related finding by Purfield (2006) applied to the case of Indian states, and both the theoretical and empirical observations discussed in the previous sections.

The assumption that heightened macroeconomic volatility leads to decreased incentives for investment in human and physical capital is difficult to observe; however, our confirmation of a negative relationship between heightened volatility and period averaged growth may support this idea. Possible lines for productive future research could be investigation into these volatility and incentive channels; ideally such research could further the understanding in the dynamic manner in which these incentive factors affect aggregate economic growth.

Finally, with respect to the peripheral control variables employed, initial SDPPC and population growth rates, we find them to be statistically insignificant when introduced with the other dynamic multi-variable models (specifically columns 5 and 6). However, as we noted in the analysis of the correlation coefficients, both initial SDPPC and population growth rates were highly correlated with literacy rates; accordingly, we estimated equation 7 omitting the variable literacy rate in order to observe these two variables' effects on the dependent variable without allowing literacy rates to absorb their effects. As expected, both variables, initial SDPPC and population growth rates, emerged as statistically significant, at the 5% and 10% confidence levels, respectively. With respect to the initial income variable, we can observe a positive coefficient, consistent with the exhaustive convergence study executed previously. Population growth rates were predictably negatively associated with economic growth, although only statistically significant at the 10% level. This result of population growth rates negatively influencing economic growth rate is indeed troubling, given the fact that the poorest states included in our study, are also those defined by the highest levels of population growth rate; obviously this combination of poor states growing rapidly places a great strain on the already worsening and fragile cross-state inequality situation.

Taken altogether our results would indicate that human capital, as predicted, was positively associated with economic growth, in a consistent and at high levels of statistical significance. Gini coefficients were consistently and negatively associated with economic growth rates, although only statistically significant in the more dynamic equations, specifically: 4, 5, 6 and 7. Macroeconomic volatility, measured by the coefficient of variation, was

consistently and negatively associated with economic growth rates, maintaining the highest statistical significance (always at the 1% confidence level) in all equations where present, specifically: 4, 5, 6 and 7. Initial income level, once estimated in equation 7 where literacy rates were omitted, was shown to be positively and statistically significantly related with economic growth rates, confirming the exhaustive coverage of convergence analysis in previous sections. As with initial income levels, population growth rates were only shown to be statistically significant, in the predicted negative direction with economic growth rates, once literacy rates were omitted from the equation; this result thus corroborates the notion that the poorest states, which are also known to be the slowest growing but with the highest population growth rates, are trapped in a complicated cycle of comparatively lesser output, which must be distributed amongst a comparatively larger and faster increasing population.

With relatively limited data on state-wise macroeconomic indicators, and indeed few studies utilizing panel data methodology applied to cross-state Indian income inequality and economic growth with which to compare results, we have endeavored to uncover the reasons explaining why certain states have excelled and others floundered since the initiation of India's robust economic growth in the 1980s. The relationships between our selection of macroeconomic variables and decadal averaged state-specific economic growth rates explored in this section are designed to dissect the issues behind India's state-wise heterogeneity in economic prosperity. The country as a whole is seen as a success story, while pronounced cross-state inequality has caused a significant portion of the country to lag behind the relatively thin sampling of thriving states. Future research is necessary to broaden the coverage regarding these issues underlying the divergent cross-state experiences and to aid in promoting policies directed at rectifying these disparities.

4.0 CONCLUSIONS

The comprehensive revision of both theoretical and empirical literature regarding the relationships between income inequality and economic growth, in addition to a host of macroeconomic variables assumed to leverage important effects on inequality and growth, both with respect to cross-country studies and to work explicitly focused on India, has provided us with a suitably well developed lens through which to discuss the analysis of income inequality and economic growth throughout the period of intense economic development in India; specifically, our research has focused on the period 1980-2010. The careful revision of all relevant literature has been undertaken, and later, applied econometric exercises have been executed in an effort to provide a study comparable in methodology, yet distinct in its own manner, to similarly focused research in this field. Authors in this ambit, both in developmental economics in general, and those working with the specific case of India, have long complained of the shortcomings of data observations to satisfactorily analyze key macroeconomic relationships; appropriately, this study has been adapted to those difficulties and complications. Our analysis has used publicly available data from the World Bank (2013), United Nations University WIDER database (2012), the Planning Commission of India Data book (2012) and the Reserve Bank of India (2013); some authors have access to private databases that provide other variables of interest, which permit the analysis of variables our study has been unable to discuss.

In a field of research characterized by theoretical uncertainties and empirical ambiguities, initial results concerning the intertemporal evolution of income inequality's effect on economic growth for national level Indian data accord with the usual vagueness. Results regarding income inequality's effect on economic growth in the regression equation were not statistically significant, and therefore no clear relationship emerged. Casual observation of the Gini coefficients in figure 3 did however show an overall trend increase throughout our observation window. Further analyzing the results of the national

regression provide us with encouraging working results that may be beneficial to future empirical research in this area. Specifically, compelling findings were obtained regarding two important and classically relevant indicators used in the national regression model: female and male specific primary enrollment variables, implemented to proxy for human capital concentration. In line with development literature, we find female primary enrollment figures to be negatively linked with economic growth rate, while a direct relationship is established for the male primary enrollment measure. Overall, the explanatory power of our most dynamic national model was low, given an R^2 value not even reaching 0.40. The origin of these issues causing our national model to yield disappointing results is likely involved with the challenging feat of organizing a time-series regression for a single country and the assumed difficulty of capturing the long-run effects of each macroeconomic variable with growth rates. Nevertheless, the results obtained in the national model were intended only as an experimental exercise to lead into the topic of primary importance, cross-state income inequality and economic growth.

Comprehensive observation at the state level demonstrates a clear increase in the levels of cross-state income inequality, rising instep with the robust economic growth experienced by India over the last three decades. Income inequality arising from cross-state heterogeneity in the wealth benefits accrued from India's economic expansion has risen dramatically. Cross-state divergence began at modest levels during the pro-business movement of the 1980s, accelerated during the intensification of deregulatory policies during the 1990s, and further gained momentum into the 2000s, synchronized with the continued internationalization of India's economy. Through a series of classically established testing methods, we empirically confirm that income inequality, arising solely from cross-state differences in the prosperity distributed through India's strong economic growth, has unquestionably increased. This result is robust and clearly demonstrated by our calculation and analysis of: the Theil index (both for the entire observation period as well as for decade specific representations), absolute β convergence as well as σ convergence testing. The results explicitly indicate that disproportionate levels of income are being accrued across the states of India, that states endowed

with initially higher levels of per capita SDP tended to grow faster throughout our entire observation period, and finally that the overall dispersion of SDPPC has increased significantly from 1980 to 2010. These findings confirm the unfortunate truth that India's robust economic growth over the last three decades has been creating an ever larger, and currently accelerating, gap between the richest and poorest states.

Regarding the state-wise results obtained by way of our panel data model, the results accord with the traditional relationships found in the relevant literature. All of our equation specifications (with the exception of column 2), and most importantly the most dynamic models, were properly specified and provided reliable estimates that represented an overall clear picture of the way in which income inequality, along with a host of other important macroeconomic variables, affected economic growth. Specifically, we find that initial intra-state income inequality leveraged a negative impact on subsequent periods of state specific average economic growth rates. Our Gini coefficient variable was found to be statistically significant in the dynamic equations 4, 5, 6 and 7, at the 1%, 5%, 5% and 10% confidence levels, respectively. In addition, we found that literacy rates, as a proxy for initial human capital endowments, were consistently and positively linked with subsequent periods' higher state specific economic growth rates. In equations 3, 4, 5 and 6, literacy rates were found to be statistically significant at the 1%, 1%, 5%, and 1% confidence levels, respectively. As expected, the coefficient of variation, capturing the impact of macroeconomic volatility of economic growth rates throughout each panel period within states, was found to be strongly statistically significant, and negatively linked with subsequent periods' economic growth rates. For equations 4, 5, 6 and 7, we observed levels of statistical significance at the 1% for all models. Once literacy rates were excluded from equation 7, population growth rates and initial SDPPC were found to statistically significant and with the correct directionality. Specifically, population growth rates were found to negatively impact the average panel period economic growth rates, although only at the 10% confidence level. Given our findings related to absolute β convergence, initial SDPPC unsurprisingly was found to be positively linked with subsequent state-specific periods' economic growth rates; initial SDPPC was

found to be statistically significant at the 5% confidence level. In summary, our state-wise econometric model yielded results from which reliable conclusions could be construed. Specifically, we were able to confirm all variables' expected effects on economic growth rates regarding the literature review, not only the negative impact income inequality is assumed to leverage on economic growth in the context of a developing economy, but also with respect to the other macroeconomic variables included.

Ultimately, the goal of this dissertation has been to undertake an exhaustive review of the theoretical and empirical literature concerning the links between income inequality and economic growth, with consideration of other macroeconomic variables universally implied as leveraging important effects on economic growth. Following the review of literature, we endeavored to apply the acquired proficiencies and common methodologies to the case of India, both at the national and state level. We find that macroeconomic conditions have varied widely across Indian states, certainly contributing to the divergent experience documented in the current study. The future of India's economic growth and emergence as a global economic power is critically linked with the ability of both state and federal government bodies to reign in the enormous macroeconomic disparities across states.

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