

Income Distribution and the Business Cycle

Mostafa Shahee

Submitted to the
Institute of Graduate Studies and Research
in partial fulfillment of the requirements for the Degree of

Doctor of Philosophy
in
Economics

Eastern Mediterranean University
September 2014
Gazimağusa, North Cyprus

Approval of the Institute of Graduate Studies and Research

Prof. Dr. Elvan Yılmaz
Director

I certify that this thesis satisfies the requirements as a thesis for the degree of Doctor of Philosophy in Economics.

Prof. Dr. Mehmet Balcilar
Chair, Department of Economics

We certify that we have read this thesis and that in our opinion it is fully adequate in scope and quality as a thesis for the degree of Doctor of Philosophy in Economics

Prof. Dr. Mehmet Balcilar
Supervisor

Examining Committee

1. Prof. Dr. Mehmet Balcilar

2. Prof. Dr. Glenn P. Jenkins

3. Prof. Dr. Hakan Yetkiner

4. Prof. Dr. Zeynel A. Ozdemir

5. Assoc. Prof. Dr. Sevin K. Ugural

ABSTRACT

This thesis consists of six chapters. The first chapter is devoted to the introduction to explore how the income distribution within the countries has become a prominent issue in policy making over time. In the second chapter, the related literature on income distribution, GDP and the relationship between these two variables is reviewed. The methodology used for dating the business cycles is extensively explained in the third chapter. The remaining chapters constitute three self-contained essays. The investigation of a possible relationship between the degree of income equality within the countries, and the severity of recession and expansion phase of business cycles, is examined using two different methods. To carry out the investigation reported in chapters four, five and six we use data collected for 40 years on Gini index values and the GDPs of 36 selected countries.

The main goal in the first essay is to determine how the deepness and duration of cycles of GDP is correlated with the Gini index values of countries and whether this relationship is mainly sourced from consumption or investment. Likewise, an investigation is carried out to determine if the number of cycles in consumption, investment and GDP of countries could be associated with the level of income inequality in those countries. The results of the correlation and the t-test analysis indicates that income inequality leads to a deeper and longer decline of GDP, which causes a greater cumulative income loss of GDP during a recession period, and a somewhat faster speed of recovery during an expansion period. In addition, the result of a correlation between Gini index values and the number of cycles in consumption, investment and GDP indicate that income inequality is associated with a greater

number of cycles in consumption and GDP and a lower number of cycles in investment.

In the second essay, the relationship between income equality and the recession is theoretically examined. Models are presented to show how the movement of four components of GDP as consumption, investment, government spending and net export takes place during a recession period for the countries with different level of income distribution. This shows that the countries with a more equality of income distribution would experience a less costly recession. For empirical analysis the instrumental variable is employed in which the findings of empirical analysis support the theoretical arguments. In the third essay, an instrumental variable analysis is employed to find a possible relationship between income inequality and the intensity of expansionary phase of cycles. Although the signs of the coefficients indicate that a more equal income distribution is associated with a somewhat faster recovery, the results are not statistically significant.

Keywords: Income Distribution, Business Cycle, Recession, Expansion, Instrumental Variable, Cumulative Loss and Amplitude

ÖZ

Bu tez altı üniteden oluşmaktadır. Ülkeler içinde gelir dağılımının zamanla politika geliştirmede nasıl öne çıkan bir mesele olduğunu araştırmak için birinci bölüm girişe ayrılmıştır. İrdelenecek problemi tanımlamak ve analizimize sağlam bir temel oluşturmak için ikinci bölümde gelir dağılımı, gayri safi yurtiçi hasıla (GSYİH) ve bu iki değişken arası ilişki üzerine ilgili literatür (alanyazın) taranmıştır. Üçüncü bölümde iktisadi dalgalanmaları belirlemek için kullanılan metodoloji kapsamlı bir şekilde açıklanmıştır. Geri kalan dört, beş ve altıncı bölümler bağımsız üç makaleden oluşmaktadır. İki farklı yöntem kullanarak bir yanda ülkeler içinde gelir eşitliği diğer yanda iktisadi dalgalanmaların resesyon (durgunluk) ve büyüme safhalarının şiddeti arasındaki olası ilişki incelenmiştir. Bölüm dört, beş ve altıda açıklanan incelemeyi yürütmek için seçilmiş 36 ülkenin Gini katsayıları ve GSYİH'ları üzerine toplanan 40 yıllık veri kullanılmıştır.

Birinci makalede esas amaç GSYİH dalgalanmalarının derinliği ve süresinin ülkelerin Gini katsayıları ile nasıl ilişkili olduğunu ve bu ilişkinin esas olarak tüketimden ya da yatırımdan kaynaklandığını belirlemektir. Aynı şekilde, ülkelerin tüketim, yatırım ve GSYİH'larındaki dalgalanma sayısının bu ülkelerdeki gelir eşitsizliği düzeyi ile bağlantılı olup olmadığını belirlemek için bir araştırma yürütülmüştür. Korelasyon ve t-testi analiz sonuçları göstermektedir ki gelir eşitsizliği GSYİH'nın daha derin ve uzun süreliğine düşmesine neden olmaktadır, ki bu da GSYİH'da daha büyük bir resesyon süresince kümülatif gelir kaybına (CTS), ve kısmen daha yüksek bir büyüme süresince iyileşme hızına (ETS) sebep olmaktadır. Ek olarak, Gini katsayıları ve tüketim, yatırım ve GSYİH dalgalanma

sayısı arasındaki bir ilişki sonucu göstermektedir ki gelir eşitsizliği tüketim ve GSYİH’da daha büyük bir dalgalanma sayısı ve yatırımda daha düşük bir dalgalanma sayısı ile ilişkilidir.

İkinci makalede gelir eşitsizliği ile resesyon arasındaki ilişki teorik olarak incelenmiştir. GSYİH’nın dört unsuru olan tüketim, yatırım, devlet harcamaları ve net ihracat hareketinin farklı gelir dağılımı olan ülkelerde resesyon süresince nasıl yer aldığını gösteren modeller sunulmuştur. Bu göstermektedir ki gelir dağılımının daha eşit olduğu ülkeler daha düşük maliyetli bir resesyon yaşayacaklardır. Bir enstrümantal değişken analizi yapılmıştır. Ampirik analiz sonuçları teorik tartışmalarla gelir eşitsizliği ve resesyon şiddeti arasındaki ilişkiyi konu alan birinci makalenin sonuçlarını desteklemektedir. Son olarak, üçüncü makalede gelir eşitsizliği ve genişlemeci dalgalanma safhasının yoğunluğu arasındaki olası bir ilişkiyi bulmak için bir enstrümantal değişken analizi kullanılmıştır. Katsayıların işaretleri daha eşit bir gelir dağılımının kısmen daha hızlı bir iyileşme ile ilişkili olduğunu göstermesine rağmen, sonuçlar istatistiksel olarak anlamlı değildir.

Dedicated to My Parents for Their Continuous Supports

ACKNOWLEDGMENT

Foremost, I would like to express my sincere gratitude to my advisor Prof. Glenn Paul Jenkins for his insightful comments, his patience, motivation, enthusiasm, immense knowledge and his continuous support of my PhD study and research. His far-reaching knowledge and experience has immensely guided me during the completion of my graduate programs, master and PhD, as well as my research tasks. His contribution to my professional life is certainly enormous. Besides Prof. Jenkins, I would like to thank Prof. Mehmet Balcilar whose support during the completion of this thesis was certainly prominent. Also, my great gratitude goes to Prof. Sevin Ugural for her kind advice and supports as well as her great knowledge and attitudes towards teaching, that I had the chance to take advantage of it, during my PhD program. In addition, my deep appreciation goes to Prof. Serhan Ciftcioglu for sharing his great knowledge with me during the completion of this thesis. Last but not least, my sincere gratitude goes to the external members of examining committee, Prof. Hakan Yetkiner, Prof. Zeynel A. Ozdemir.

TABLE OF CONTENTS

ABSTRACT	iii
ÖZ	v
DEDICATION	vii
ACKNOWLEDGMENT	viii
LIST OF TABLES	xii
LIST OF FIGURES	xiii
LIST OF ABBREVIATIONS	xiv
1 INTRODUCTION	1
1.1 Background	1
2 LITERATURE REVIEW.....	7
2.1 Income Distribution	7
2.1.1 Overviews of Income Distribution.....	7
2.1.2 The Lorenz Curve	8
2.1.3 The Gini Coefficient	9
2.2 Business Cycle	10
2.3 Income Inequality, GDP Growth and Business Cycle.....	13
3 DATING THE BUSINESS CYCLE.....	18
4 INCOME DISTRIBUTION AND THE BUSINESS CYCLE	22
4.1 Introduction	22
4.2 Dating the Cycles	24
4.3 Data	25
4.4 Empirical Approach and Related Arguments	26

4.4.1	Coefficients of Investment and Consumption.....	26
4.4.2	Income Inequality and GDP, Investment and Consumption.....	28
4.4.3	Income Distribution and the Number of Business Cycles	33
4.5	Conclusions	35
5	INCOME DISTRIBUTION AND RECESSIONS	36
5.1	Introduction	36
5.2	The Relationship between the Movement of the Components of Aggregate Demand and the Distribution of Income	37
5.2.1	Consumption	37
5.2.2	Investment	39
5.2.2.1	Transfer to the next period	39
5.3	Empirical Investigation	46
5.3.1	Data Employed and the Cycle Dating Approach	47
5.3.2	Model Specification	47
5.4	Conclusion	55
6	INCOME DISTRIBUTION AND EXPANSIONS	57
6.1	Introduction	57
6.2	Empirical Investigation	57
6.2.1	Data Employed and Dating the Cycles	58
6.2.2	Model Specification	59
6.3	Conclusion	65
7	CONCLUSION	67
	REFERENCES.....	71
	APPENDICES	80
	Appendix A: OLS Estimation of GDPs	81

Appendix B: Dating the Business Cycles	99
Appendix C: Estimation of Random Walk Models	100
Appendix D: Endogeneity Test Result.....	101
Appendix E: Omitted Variable Test.....	103
Appendix F: Estimation of Amplitude of Recessions.....	106
Appendix H: Endogeneity Test Result.....	110
Appendix I: Omitted Variable Test.....	112
Appendix J: OLS Estimations Expansion.....	115

LIST OF TABLES

Table 1: Coefficients of Consumptions and Investments Regressed against GDP....	27
Table 2: Correlations between Coefficients of Consumption and Investment with Gini Index	28
Table 3: Correlations of the Average Gini Coefficients by Country and the Characteristics of the Business Cycle	30
Table 4: The Correlations of Average Gini Coefficients by Country with Ratio of Drift to Standard Deviations of GDP, Consumption and Investment	34
Table 5: Endogeneity Test Results.....	50
Table 6: Omitted Variable Test for the Model in Equation 5.10	52
Table 7: OLS Estimation for Amplitude on the Gini Index.....	53
Table 8: Omitted Variable Test Results for the Model shown by Equation 5.12	54
Table 9: Summary of Estimations.....	55
Table 10: Endogeneity Test Results.....	62
Table 11: Omitted Variable Test for the Model in Equation 6.1	64
Table 12: Summary of Estimations.....	65

LIST OF FIGURES

Figure 1: Lorenz Curve.....	8
Figure 2: Duration, Amplitude and Cumulative Loss of the Phases of the Business Cycle	19
Figure 3: Estimation of Cumulative Loss.....	20

LIST OF ABBREVIATIONS

CTS	Contraction Terminating Sequence
ETC	Expansion Terminating Sequence
NBER	National Bureau of Economic Research

Chapter 1

INTRODUCTION

1.1 Background

The importance of the distribution of output was first considered as a political economy issue by David Ricardo (1911). If we assume that output is produced by a combination of three main factors of production, namely land, labor and capital, the question is how this output must be shared among the owners of those factors to give them sufficient motivation to continue and perhaps expand production.

This question becomes more challenging if we assume that the availability of these factors of production are not limitless and are usually controlled by different individuals with different or sometimes with conflicting interests, who seek to satisfy their own interests. Indeed, if we consider to the definition of economics, which is the science of allocating scarce resources to competing uses, inevitably, it is clear that the modality of this allocation is an important issue. If it is not undertaken in a proper way, it may increase the superiority of one group of factor owners over others.

Despite the possible impact of distributional issues on the well-being of individuals within a country, the distributional issues have not always been a matter of concern among economists. For example, in the postwar period, particularly from the 1950s

to the 1980s, income distributional issues attracted very little attentions among economists, researchers and policy makers. Perhaps because the aim of economists was mainly concentrated on efficiency issues rather than distributional issues at that time. In this regard, they were seeking to respond to welfare economics critiques raised by Pigou (1920), Robbins (1938) and Samuelson (1947), who emphasized the importance of society's social welfare function. Samuelson (1947) further argued that the individuals should not necessarily receive their imputed productivities because the resulting allocation of income might not be consistent with the optimization of society's welfare function.

Because of the great concern in the advanced countries of Europe and North America for achieving full employment the focus of economists shifted away from issues of income distribution to that of increasing employment while controlling inflation.

Indeed, when an economy experiences rapid growth with full employment, it was argued that the people at the bottom would benefit more from the increase in their real wages rather than from redistribution policies that takes income and perhaps wealth away from the wealthy individuals.

In the period following the world war II economic growth was experienced by many developed countries and unemployment rates fell and income inequality was reduced significantly. As a consequence the study of the differences in distributive outcomes of public sector interventions and policies to narrow this gap attracted little popularity among economists and policy makers. It was believed that that the cost of

redistribution policies would be considerable and would have reduced the efficiency of the market economy.

During the period the emphasize of policies of neoclassical economics stressed the role of market signals in determining the factor prices for Pareto optimal resource allocation. In this model of competitive equilibrium to have efficient production all factors should be paid the value of their marginal products. Hence, the final result is a Pareto optimum in which no one can be made better off without making someone else worse off. This notion defines an "efficient" equilibrium that emphasizes on the distribution of initial endowments of income and, without considering the equal distribution of income as a final objective.

Since the early 1990s, many European countries have experienced, on average, a lower economic growth rate as compared to earlier decades. The primary consequence of this economic slowdown was rising unemployment rates. Hence, the policy position of these countries have gradually changed in favor of policies that promotes income equality. In recent years policies have been introduced to ease and support privatization. It was expected that the private sector would be better motivated to increase output by increasing efficiency and ultimately increasing the economic welfare of states. Nevertheless, these policy choices have not worked as expected to reduce income inequality among the individuals within the countries.

As a consequences many economists then have become convinced that they should take income distribution into consideration and analyze it along with the other important economic issues. Nowadays in many public economics debates the

implications of income inequality within the countries attract much attention from economists (Atkinson & Bourguignon, 2000). A good example of this phenomenon is recent studies of the relationship between growth and income distribution, which were undertaken usually by including distribution variables into economic models.

In this regard, economists intend to quantify the trade-off (if any) between income equality and economic growth. This is important since every country desires to achieve a high economic growth, whereas the fair distribution of income cannot be ignored. Meanwhile, not every country can succeed in fulfilling these two (somewhat) contradictory objectives at the same time. There exists a strand of literature, which emphasizes the tradeoff between income inequality and achieving a faster growth rate, which is basically influenced by the primary research conducted by Kuznets (1955) and Kaldor (1956) such that, today, this issue is conventional wisdom among economists.

Today it is a common belief among economists that the study of income distribution improves our understanding of various fields of economics such as political economy and public finance. However, despite this improvement, income distribution, except from Marxist economists' perspective still has not been a variable that plays a central role in economic models. But it is more like a parameter that affects other major variables. It seems that distribution must also be the object of the analysis in some sense to test how a more or less equal income distribution is able to play a fundamental role in our economy systems.

In the study of the determinants and intensity of business cycles, the level of income equality of countries might be an important factor which has not received much attention to date. In this regard, if the income distribution of countries is considered in the center of analysis, it may improve our understanding about the nature and causes of business cycle.

The aim of this research is to theoretically and empirically examine the possible role of income inequality on the degree and intensity of business cycles of countries. To fulfill this aim 36 countries from different categories of income, namely higher income, higher middle income, lower middle income and low income, which all have different levels of Gini index, are chosen and the trends in their business cycles over the last 40 years are closely studied. In Chapter 2, we survey the related literature on income distribution, business cycles and their relationship. In Chapter 3, we explicitly discuss a method of dating business cycles, as proposed by Harding and Pagan (1999). In Chapter 4, an empirical study is conducted to find any possible association of income distribution as measured by the Gini index with duration, amplitude, and cumulative losses and gains of cycles. In addition, we break down the GDP into its two main components, consumption and investment, to date the cycles of consumption and investment and we then investigate the effects of income inequality on consumption and investment separately when the economy enters into recessions and expansions. Finally, assuming that GDP, consumption and investment follow a random walk with a drift model, efforts will be made to investigate the number of cycles of GDP, consumption and investment experienced by those countries over the last 40 years to find any association between the number of cycles in those variables and income inequality. In Chapter 5, we attempt to investigate the

relationship between recession and income inequality by utilizing the instrumental variables as well as a regression model. Then we present a theoretical explanation for the findings based on the mathematical approaches. In Chapter 6, we concentrate on the relationship between income inequality and expansion of cycles using the same empirical approach as Chapter 5 and finally in chapter 7 we present our concluding remarks.

Chapter 2

LITERATURE REVIEW

2.1 Income Distribution

2.1.1 Overviews of Income Distribution

Over the past decades there have been three different theoretical explanations for the differences between the distributions of income between different countries. These concepts mainly can be categorized as 1) functional distribution, 2) the extended functional distribution and finally 3) the size distribution.

The main discussion in the theory of the functional distribution of income is concentrated on the share of national income accrued by primary factors of production such as land, labor and capital. The extended functional distribution of income considers how the income allocated to these factors are divided between different sectors (i.e. agriculture, services,...) and this division will depend on the characteristics of different economies.

In contrast, the size distribution of income, differentiates residents of a country by different income levels, and hence, describes the shares of national income allocated to each group by (e.g. decile, quintile). Residents are classified as individuals, households, total population, economically active population. This definition of

income distribution includes all sources of income, including transfers. To measure the size distribution of income the concept of the Lorenz curve has been proposed.

2.1.2 The Lorenz Curve

In the Lorenz curve, as displayed by figure 2.1, the horizontal axis represents the cumulative population in percentage point from poorest to richest, and the vertical axis represents the cumulative proportion of income received by X percent of population.

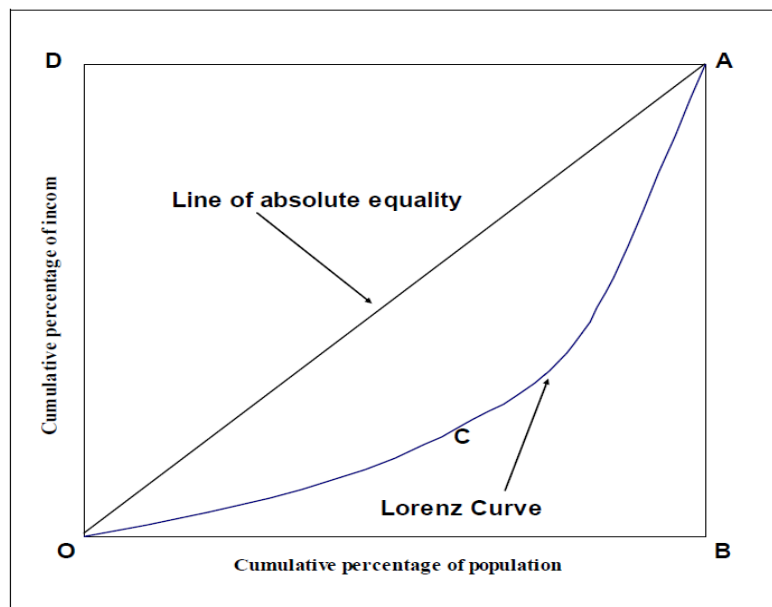


Figure 1. Lorenz Curve

In Figure 1, OA is the egalitarian line that represents the case of perfect equality of incomes. In contrast, when an economy experiences perfect inequality of income, the Lorenz curve coincides with the angle OBA, which indicates that all income is received by only one individual within the society. In that sense, the Lorenz curve captures the inequality of income by exerting the deviation of each individual's


income from perfect equality as represented by the OA hypotenuse in the above diagram.

However, in order to compare the size distribution of income between countries or over time we need to draw a number of such curves for different countries. It is quite possible to observe that the poorest and the richest quintile shares in one country are relatively less than their counterparts in another country. Hence, we need to employ other inequality techniques (present the measures by a unique index) that permit an accurate ranking assessment of countries in terms of their income inequality. For this study, the focus will be made on the Gini index, which has been extensively used in economic research.

2.1.3 The Gini Coefficient

Geometrically, the Gini coefficient, named after the Italian statistician in 1912, can be stated as the total area of the Lorenz Curve. Considering the above diagram, the Gini coefficient can be calculated by the area occupied between the Lorenz curve, OCA, and the diagonal OA, divided by the area occupied by the triangle OBA. Therefore, it is computable by following formula¹

The Gini coefficient = Area between the Lorenz curve and diagonal / Total area under the diagonal

This coefficient ranges from 0, when all incomes are equal, to 1 where the Lorenz curve overlaps the OB and BA line and has a  shape. Hence, a 0 Gini coefficient

¹ The details explanation can be found in

means perfect equality of income distribution whereas a Gini coefficient equivalent to 1 indicates the perfect inequality of income distribution.

2.2 Business Cycle

The concept of classical business cycles, initially presented by Burns and Mitchell (1946), defines the business cycle as the recurrent fluctuations observed in the aggregate economic activity of a nation over time. Therefore, every business cycle consists of an expansion followed by a contraction that is reviving to the next cycle. According to this definition, the duration of a fluctuation usually takes between two to twelve years and a cycle is characterized by its average duration, amplitude and the co-movement between economic variables and business cycles.

The traditional view of business cycles emerges from Keynesian economists who first presented his ideas in the 1930s. They postulate a business cycle as a phenomenon that contains three characteristics. The first states that the business cycles are temporary movements in economic variable such as real GNP. The second is the fact that business cycles hurt a country's economic welfare. Finally, the third indicates that monetary and fiscal policies can be used to stabilize the economy by eliminating some of the ups and downs in economic variables. They further indicated that the fluctuation in the marginal efficiency of capital works as an engine to generate business cycles. In this regard, when optimism expectations about marginal efficiency of capital rise, the response is an excessive investment, which ultimately will end up as an economic boom. The other extreme, when investors become pessimistic about the marginal efficiency of capital, the economy enters a recession. Keynes also mentioned that the existence of inventory costs and capital depreciation

(during the downturn) are two major reasons that cause the recovery of the business cycle after it experiences a downturn.

This postulate leads to the classification of cycles into recessions, troughs, expansions and peaks. The important implication of this classification is that recessions and expansions are a temporary deviation from a long-term trend in real variable such that, for instance, during a recession GDP or GNP falls below its long-term trend. In contrast, it exceeds its long-term trend during an expansion period. Hence, as the economy returns to its long-term trend this loss or gain will be restored. The implication of the third characteristic that underlies business cycles is that active government policies should be used to smooth fluctuations in business cycles. There always has been a dispute about the extent to which monetary policy can be used to reduce the severity of business cycles.

There also exists a strong historical relationship between the growth in money supply and business cycle such that the changes in the rate of monetary growth can be the primary determinant of cyclical variations in employment, income and inflation. Monetarists consider the monetary growth as a factor causing fluctuations rather than a passive reaction to those fluctuations. There are three types of evidence proposed by Friedman and Schwartz (1963) to explain the monetary business cycles: the pervasive influence of money on other economic variables, the persistence of the association between monetary growth and business cycles during periods and the observed timing relationship between changes in the rate of monetary growth and changes in other economic variables.

Friedman and Schwartz believed that money is capable to influence a wide variety of important economic aggregates and hence plays a major role in explaining aggregate economic relationships. They also cited that appreciable changes in the rate of monetary growth have been accompanied by appreciable changes in other aggregate economic variables. These occurred whether the changes in monetary growth was due to an external factor or a policy decision. To support the view that the association between monetary growth and business cycles primarily reflects the independent influence of money on the rest of the economy, they showed that the changes in the rate of growth of the money supply generally precede changes in economic activity and inflation.

While the Keynesians and the monetarists propose the aggregate demand (particularly random and temporary fluctuations in private investment and consumption) and the money supply, respectively, is a primary source of business fluctuations, the real business cycle theories indicate that shocks on aggregate supply is a major cause of economic fluctuations. The supporters of real business cycle theories particularly emphasize the importance of technological shocks and claim that since these shocks are permanent, therefore the supply shocks could also be permanent. According to their viewpoints, to a large extent the business fluctuations can be accounted by for real shocks rather than nominal shocks, and unlike the other precedent business cycle theorists they consider recessions and period of economic growth as the efficient response to exogenous changes in the economy rather than a failure for market to clear.

2.3 Income Inequality, GDP Growth and Business Cycle

In the 1950s Simon Kuznets was one of the first researchers who presented the idea that there exists an inverted-U relationship between per capita gross national product (GNP) and inequality in income distribution. Kuznets, estimated the income distribution in a few countries with different levels of income, and examined the patterns of income inequality in selected European countries over a period of time (Perkins et al, 2001). He developed the idea that as per capita income rises in less developed countries, income inequality also rises to reach a maximum, and then declines as income levels rise further. His results were later popularized as the “Inverted-U Hypothesis.” In the following years, the income inequality began to rise in many developing countries, to support his idea that income distribution will be more equal within the countries as the economic development advances.

Assane and Grammy (2003), using US data, concluded that economic growth causes inequality, Clarke (1995) claimed that if a country experiences severe income inequality, the poor citizens force the government to redistribute the accumulated wealth. This can be made through levying high taxes on wealthier individuals that ultimately lowers the return on individuals’ assets and restricts capital accumulation and eventually slows down the growth rate. Hence, despite the fact that this process might redistribute the wealth more evenly, eventually, the growth rate could be negatively affected by income inequality. These results were supported by Alesina and Rodrik (1991) and Persson and Tabellini (1994) using cross-country growth regression analysis. Similar studies were conducted by Perotti (1996) and Benabou (1996) concerning the income distribution and economic growth.

Barro (2000) presented a theoretical analysis of the macroeconomic mechanisms to support his empirical findings that income inequality is related to economic growth. Bengoa and Sanchez-Roblez (2005) designed an endogenous model to include equality as an argument that increases the utility of a representing agent. They concluded that the relationship between equality and growth was hump shaped, whereas the impact of equality on growth could be different at various stages of development. This conclusion was somewhat supported by Birdsall (2007), who indicated that inequality is more likely to harm growth in countries possessing less than US\$3200 GDP per capita (in 2000 dollars), and this effect emerges at high levels of inequality where the Gini coefficient is greater than 0.45.

Berg et al. (2012), using the multi-decade and multi-country data, proposed that greater equality can sustain growth. They constructed their analysis on a tentative consensus in the growth literature and concluded that inequality can undermine progress in health and education, causing political and economic instability. This undercuts the social consensus required to adjust the economy when a country faces major shocks. Therefore, inequality tends to reduce the pace and durability of growth.

From a broader perspective, Dadkhah (2006) implemented a study of the causality and feedback of the relationship between equality and the growth through the application of a VAR model in conjunction with time-series data on the U.S. economy for the period of 1947 to 2001. He proposed that there is a two-way positive relationship between a more equal distribution of income and a higher rate

of economic growth. In other words, applying any policy that promotes income equality will encourage growth, and vice versa.

With regard to the relationship between business cycles and income distribution, one of the primary researches has been done by Bishob et al. (1991), who applied a stochastic dominance model, to analyze the impacts of growth and recessions on income distribution in the U.S. for the period 1967-1986. Their primary objective was investigating how growth and recessions have influenced the well-being of specific income groups and classes. Their findings indicate that individuals in upper income level positions suffered less from the adverse effects of recessions compared to those in lower income levels. Furthermore, they benefit more than lower income level individuals during the expansion period.

Burkhauser et al. (1999), using kernel density estimation techniques, described the distribution of household size-adjusted real income and explained how it changed over the business cycle of the 1980s in the U.S. and the U.K. They showed that income inequality increased in the two countries and the middle of the distribution was reduced. Also, using a series of statistical tests, they found that while during the expansion period both lower and higher income level individuals took the advantage of this economic growth, the higher income level individuals benefited more than lower income level individuals. In addition, using threshold and momentum models of co-integration, developed by Enders and Granger (1998) and Enders and Siklos (2001), they attempted to test the difference between the impacts of economic expansions and contractions on income distribution. They also employed the impulse response functions based on the Vector Error Correction model to analyze feedback

effects between income distribution and the business cycles. Their findings support the idea that increases in unemployment cause increases in income inequality. In contrast, the negative shocks to unemployment have only short-lived positive benefits to income inequality. Therefore, those individuals with the lowest mean family income (sorted by quintile) are most adversely affected by recessions but are also the quickest to return to the steady state. Hoover et al. (2009) reached somewhat the same results, indicating that during recession periods an increase in unemployment intensifies the income inequality, but during expansion periods a reduction in the unemployment rate has a short-lived effect on reducing income inequality. Maliar et al. (2005) employing a neo-classical growth model showed that in the U.S. economy over time, inequality in both wealth and income follows a counter-cyclical pattern during business cycles.

In this thesis, the cause of income inequality is studied from another perspective to this investigation focuses on the degree of severity of the business cycles that affect countries with different levels of income distribution, and whether this effect is greater in relation to consumption or investment. It seems that the consumption-smoothing behavior of consumers in the countries with a less inequality of income, along with the investment behavior of individuals will help these countries to experience a less costly recession. In addition, it is important to know whether the severity of business cycles emerges from longer durations or deeper amplitudes. Finally, it would be interesting to explore any possible relationship between income inequality and the number of cycles in GDP, consumption and investment that countries might experience. In this regard, the role of uncertainty and the speed of information flow, as well as the degree of effectiveness of fiscal and monetary

policies, might lead us to observe a greater number of cycles in investment and a lower number of cycles in GDP and consumption for countries with less income inequality.

Chapter 3

DATING THE BUSINESS CYCLE

This study of business cycles focuses on the “classical cycle” approach, along with the non-parametric method associated with NBER as a method of dating business cycles. For this purpose as Harding and Pagan (1999) stated, a few steps need to be followed. First, the turning points of the series representing the aggregate activities must be explored. To determine these points, an automated algorithm that performs at least three tasks is required. This algorithm determines the potential turning points in a series, including peaks and troughs. In addition, this procedure must ensure that the obtained peak and troughs alternate over time. Finally, after defining a censoring rule to re-combine turning points established in the previous steps, it should fulfill some criteria to identify the length and depth of phases and complete cycles. These censoring rules ensure that the phases of each cycle have a minimum duration of six months and a complete cycle have a minimum duration of fifteen months. When measuring the severity of a cycle, it is important to focus on three measures (see Figure 3.1.). The duration of Contraction Terminating Sequences (CTS) is shown as AB, and the duration of Expansion Terminating Sequences (ETS) is shown as BC; the amplitude of the phases of the cycle “di” are shown by the vertical lines inside the cycle in Figure 3.1, and the cumulative losses and gains within each phase of the cycles, are shown by the area PTM for the CTS phase and the area MTD for the ETS phase.

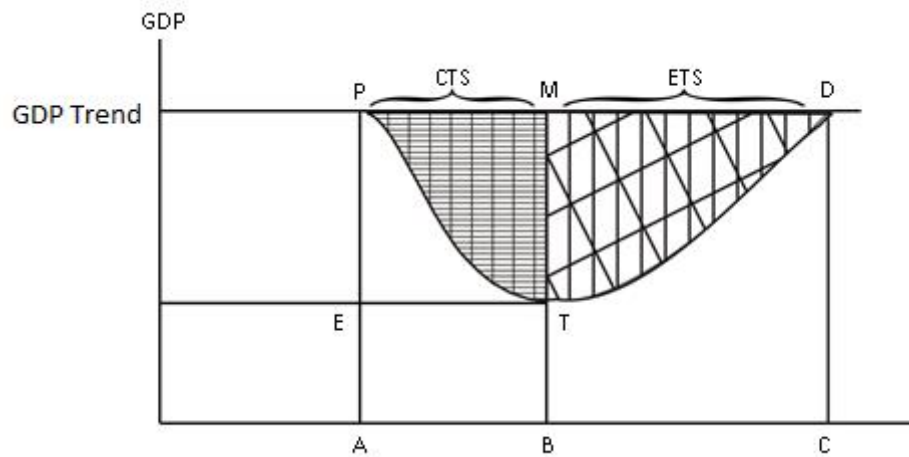


Figure 2: Duration, Amplitude and Cumulative Loss of the Phases of the Business Cycle

As Arthur Okun proposed, a recession must involve at least two quarters of negative growth such that $ETS = \{\Delta Y(t+1) < 0, \Delta Y(t+2) < 0\}$ represents a peak at time t . Likewise, an expansion starts if two quarters of positive growth are experienced, That is, $CTS = \{\Delta Y(t+1) > 0, \Delta Y(t+2) > 0\}$.

To obtain the measures of duration, amplitude and cumulative losses of each cycle, as proposed by Harding and Pagan (1999), we consider a phase as a triangle where the height of the triangle shows the amplitude and its base represents the duration. As soon as these two elements are known, it enables us to calculate the area of the triangle representing an approximate measure of the total losses in GDP from peak to trough, as compared to the previous peak. A typical recession phase of output can be shown graphically as in the Figure 3.2.

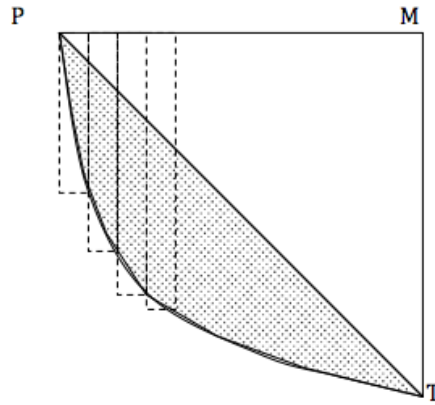


Figure 3: Estimation of Cumulative Loss of a Cycle

The “triangle approximation” as Harding and Pagan (2002) name it, exerts the recession phase where the height of the triangle shows the amplitude A_i (representing the total loss in output from peak P to trough T) and the base of the triangle shows the duration D_i of the phase (representing how long it takes for the recession phase to be completed from peak P to trough M).

Therefore the area of the triangle PMT in figure 3.1 measures the cumulated loss of each cycle of output from peak to trough. Assuming that the base of each small triangle is equal to one unit of duration, the best approximation of the area of PMT can be computed as

$$PMT = C_i - \frac{1}{2} \sum_{t=1}^T a_t , \quad (3.1)$$

Where C_i represents the area of each rectangle as shown by shaded lines, and a_t stands for the height of each small triangle in which its hypotenuses is tangent to the actual path of cycles (figure 3.2). However, in practice, the triangle approximation may be different from the actual path of the phase. Therefore, to catch those

movements fully, we need to introduce an index that represents those excess cumulated movements. This has been calculated by Harding and Pagan (2002) and explained in detail by Vahid and Athanasopoulos (2001) as follows;

$$E_i = \frac{1/2 \sum_{t=1}^T a_t + 1/2 D_i \sum_{t=1}^T a_t - C_i}{D_i} \quad (3.2)$$

The excess index graphically evaluates parametric models of the business cycles and describes the deviation of the actual business cycle from its respective triangle approximation. It worth noting that the cumulative gain and excess of cumulative gain on recovery or expansion phase of a cycle can be calculated by the same manner.

The application of this dating method provides the average durations and amplitudes of all the cycles identified over the period. The algorithm, then, calculates the percentage loss and gain in GDP at each period, compare to its precedent period, and present the result as an average cumulative loss or gain for all the cycles that experienced by every individual country over the period. By the same way, it calculates the excess index or deviation from the cycles and presents the result on average basis.

For this study, to compute these values for each individual country using Gauss program, given that the data employed are annual data, we replace Calculus for BBQ in the formula. Also we employ icensor1, K_ETS=1 and L_LTS=1 to ensure that a minimum length of cycle is one year and y_t is a local maximum relative to the one year on either side of y_t throughout.

Chapter 4

INCOME DISTRIBUTION AND THE BUSINESS CYCLE

4.1 Introduction

Since the 1950s, the study of the business cycle and its impact on income inequality has been the topic of many investigations. Most of this research aimed to study the dynamic or static impact of a business cycle on income distribution within countries. Although some of these studies, theoretically and empirically, highlight these impacts, very little is known about the possible association of income inequality with the severity of business cycles and the number of business cycles that a country may experience over time. Likewise, as an economy enters a recession, how quick and deep the collapses of aggregate demand occur in countries with a less equal income distribution. Finally, does greater inequality of incomes within a country affect the cyclical patterns of business cycles? These relationships may help to understand whether countries with more or less equal distribution of income can cope better with the economic shocks that create recessions. Dating the cycles of GDP, consumption and investment shows how the severity of these cycles are correlated with the Gini index values of countries and how they may affect the cyclical patterns of business cycles.

The initial objective of this study is to find out how the degree of responsiveness of consumption and investment to GDP varies between countries with different levels

of Gini index values. For this purpose, we run an OLS method for a set of 36 countries over a period of 40 years. A correlation is then made between all the estimators of consumption and investment with the average of Gini indices of countries over the past 40 years. This analysis is carried out to determine whether consumption or investment is the leading variable causing fluctuations of GDPs.

The second objective is to find a possible relationship between the degree of income inequality and the severity of business cycles shown as the duration and depth of recessions and expansions for the countries under study. To identify true business cycles that affect GDPs followed by consumptions and investments, we employ the algorithm proposed by Harding and Pagan (1999) to date the cycles of GDPs, consumptions and investments. These are calculated for each individual country during the period 1970 to 2009. A set of correlations is then made between the value of the estimates of these parameters for the 36 countries for 40 years and the average of the Gini index values reported for each individual country. This analysis shows whether income inequality is associated with a more or less intense recession and expansion. This also demonstrates how consumption and investment may play a role in intensifying or alleviating the effects of business cycles in countries with different levels of income inequality.

As a final objective of the chapter, the number of cycles in GDP, consumption and investment is calculated for all the countries over the course of 40 years. For this purpose, a random walk model with a drift for consumption, investment and GDP of each country is separately estimated to obtain the ratio of drift to standard deviation. A correlation is then made between these ratios with the Gini index values of the

countries, to highlight the possible relation between income distribution and the number of cycles in each of the three mentioned variables.

In this study we employ annual data on GDP, consumption and investment for all 36 selected countries over the years 1970 to 2009 reported by the World Bank. Annual data on the Gini index values are also collected from World Bank. It seems that greater income inequality is correlated with less sensitivity of GDP to consumption and more sensitivity of GDP to investment. In addition, more income inequality leads to a longer and deeper recession in which the role of consumption in alleviating the effects of economic shocks that create recessions is less significant for countries with a less equal income distribution. Finally, greater income inequality is correlated with a greater number of cycles in GDP and consumption, and with a lower number of cycles in investment.

4.2 Dating the Cycles

Following the dating method described in the preceding chapter, the turning points of the data series for GDP, consumption and investment must first be explored. To determine these points, the algorithm that determines the potential turning points of the series (peaks and troughs) is employed. This algorithm follows the Okun's rule, which requires a recession to have at least two quarters of negative growth. Likewise, an expansion starts only if two quarters of positive growth are experienced. Then it selects only those episodes where the peaks and troughs alternate. To identify the peaks and troughs, as mentioned before, the concepts of (a) contraction terminating sequences (CTS) and (b) expansion terminating sequences (ETS) are employed.

Over the 40-year period covered by this study the Harding and Pagan algorithm identifies the true cycles for each individual country based on a set of censoring rules. It also calculates the areas of loss accumulated for each phase of the cycles. It then calculates the average (percentage) loss for each phase separately across all the business cycles experienced by a country (1970–2009) with respect to the GDP trend for each country at the time of the business cycle.

4.3 Data

We select 36 countries for which annual data on GDP, consumption and investment are available from 1970 to 2009 from the *World Development Indicators* of the World Bank (World Bank, 2011). Using the GDP deflator, these data are transformed to constant 2000 local currency units (in millions). The data on Gini indices of countries are also collected from the World Bank for the years 1980 to 2009. Given that the applied algorithm for dating the cycles calculates and presents a single average value for the duration, amplitude and cumulative loss of the contractionary and expansionary phase of the cycles for each individual country over the period of 1970 to 2009, for consistency of study we also calculate an average of the estimated Gini indices for each country. All the correlations throughout this study are made between these average numbers. It should be noted that since the Gini indices data of all the countries under study were not available for the years before 1980, we assume that inaccessibility to those data will not significantly harm our results, since the deviation of those data from the mean is assumed to be minor.

4.4 Empirical Approach and Related Arguments

4.4.1 Coefficients of Investment and Consumption

As a first step, an ordinary least square model (OLS) is estimated for GDPs of selected countries in order to obtain the related estimators of consumption and investment (Table 1). We then group our sample into three sets of countries. The first includes the full sample of countries. The second group contains 21 countries that fall into the high and higher middle income group: Argentina, Australia, Brazil, Canada, Chile, Denmark, France, Germany, Greece, Ireland, Japan, Malaysia, Mexico, New Zealand, Norway, South Africa, Spain, Sweden, Turkey, United Kingdom and United States. The third group is the 15 countries that are classified as lower middle income and low income: Benin, Bolivia, Burundi, China, Congo Republic, Gabon, Gambia, Guinea, India, Jordan, Kenya, Morocco, Philippines, Tunisia and Zambia. The negative correlation of those estimators with the average of Gini index of all countries in the first group (Set 1) reveals that the responsiveness of GDP to consumption is greater for the countries with less income inequality (Table 2). This correlation is significant at a 99% confidence level. This responsiveness falls considerably when we compare high and middle income countries (Set 2) with low and lower middle income countries (Set 3), as shown in Table 2. This is consistent with the Keynesian theory which indicates that as the income distribution improves, the average propensity to consume (APC) will rise, leading to higher consumption. However, the positive sign of the respective correlation between the Gini indices and investment coefficients leads us to conclude that responsiveness of GDP to investment falls as income distribution improves. This conclusion, however, is not as strong as the previous conclusion for consumption, since this value is only

significant at the 95% confidence level. Nevertheless, this responsiveness increases considerably when we compare high and middle income countries (Set 2) with low and lower middle income countries (Set 3) as shown in Table 2, showing that GDP in low income countries is more sensitive to variation in investment.

Table 1: Coefficients of Consumptions and Investments Regressed against GDP (Year 1970–2009)

Country	GINI INDEX	CONSUMPTION	INVESTMENT	Country	GINI INDEX	CONSUMPTION	INVESTMENT
Argentina	47.92	0.46	0.31	Turkey	42.78	0.88	0.09
Australia	35.00	0.80	0.22	UK	36.00	0.86	0.11
Brazil	58.46	0.78	0.23	US	41.00	0.82	0.09
Canada	33.00	0.79	0.20	Benin	39.00	0.76	0.08
Chile	55.17	0.75	0.25	Bolivia	54.13	0.59	0.36
Denmark	25.00	0.87	0.08	Burundi	35.25	0.75	0.03
France	33.00	0.84	0.17	China	42.00	0.64	0.39
Germany	28.00	0.91	0.16	Congo	47.00	0.62	0.56
Greece	34.00	0.73	0.23	Gabon	41.00	0.51	0.44
Ireland	34.00	0.91	0.15	Guinea	43.25	0.55	0.24
Japan	25.00	0.77	0.21	Gambia	48.50	0.39	0.36
Malaysia	44.67	0.63	0.26	India	37.00	0.80	0.27
Mexico	48.62	0.76	0.25	Jordan	38.00	0.70	0.23
New Zealand	35.00	0.84	0.14	Kenya	47.67	0.59	0.33
Norway	26.00	0.90	0.34	Morocco	39.44	0.63	0.09
South Africa	58.00	0.83	0.18	Philippines	43.33	0.85	0.13
Spain	35.00	0.83	0.07	Tunisia	41.67	0.81	0.12
Sweden	25.00	0.82	0.10	Zambia	50.25	0.74	0.21

Source: World Bank, 2011

Table 2: Correlations between Coefficients of Consumption and Investment with Gini Index

	Consumption	Investment
	All Countries	
Correlation Coefficient (1)	-0.46	0.36
T-Test	-3.20**	2.39*
	High and Upper Middle Income Countries	
Correlation Coefficient (2)	-0.41	0.29
T-Test	-2.75*	1.84
	Lower Middle Income and Low Income Countries	
Correlation Coefficient (3)	-0.33	0.48
T-Test	-2.18*	3.35**

* and ** represent statistically significant at 95% and 99% levels, respectively.

The reason for this may relate to the fact that owing to a shortage of capital, the rate of return on capital in less developed countries (which mostly have high Gini indices (Garth Frazer 2006)) is higher in comparison to developed countries. Therefore, the GDP in those countries seems more sensitive to investment variation. This clarification will help us to understand how consumption and investment play their role in intensifying or alleviating the effect of business cycles experience by countries with different levels of income inequality.

4.4.2 Income Inequality and GDP, Investment and Consumption

In this step, the dating procedure is undertaken to obtain the average duration, amplitude and cumulative loss for peak to trough (CTS) and trough to peak (ETS) of cycles of GDP, consumption, and investment. The countries are grouped into three categories as previously described, and correlations are made between the average Gini indices of countries with the average values obtained for duration, amplitude and cumulative loss of each phase of the business cycle. The findings of this empirical investigation are reported in Table 3.

In the full sample of 36 countries it can be seen that the correlation coefficients between the Gini indices and the duration, amplitude and cumulative loss in GDP of the contractionary phase of the cycle are positive and significant at either a 95 or 99% confidence level (Table 4, Row 1). This result strongly supports the hypothesis that income inequality (higher Gini index) is associated with longer durations, deeper amplitude, and greater cumulative losses in GDP as economy enters to recession.

Table 3: Correlations of the Average Gini Coefficients by Country and the Characteristics of the Business Cycle

	GDP						Consumption						Investment					
	CTS			ETS			CTS			ETS			CTS			ETS		
	DUR	AMP	CUM	DUR	AMP	CUM	DUR	AMP	CUM	DUR	AMP	CUM	DUR	AMP	CUM	DUR	AMP	CUM
	Full Set of Countries																	
Correlation	0.35	0.53	0.36	-0.22	-0.11	-0.07	0.08	0.52	0.30	-0.41	0.05	-0.10	-0.01	0.33	0.19	-0.28	0.25	0.03
t-Test	2.18*	3.60**	2.28*	-1.31	-0.64	-0.41	0.49	3.51**	1.85	-2.64*	0.29	-0.58	-0.07	2.01*	1.13	-1.71	1.48	0.20
	High and Upper Middle Income Countries																	
Correlation	0.53	0.83	0.67	-0.24	-0.12	-0.17	-0.07	0.73	0.55	-0.45	-0.12	-0.04	0.18	0.39	0.30	-0.37	0.22	0.04
t-Test	2.7**	6.42**	3.95**	-1.09	-0.54	-0.76	-0.28	4.66**	2.89**	-2.19*	-0.54	-0.19	0.79	1.82	1.35	-1.71	0.97	0.16
	Low and Lower Middle Income Countries																	
Correlation	-0.28	-0.17	-0.30	0.18	0.27	0.32	0.18	-0.09	-0.13	-0.10	0.26	0.03	0.38	0.11	0.21	-0.20	0.09	-0.09
t-Test	-1.67	-1.01	-1.81	1.08	1.63	1.97	1.05	-0.51	-0.76	-0.57	1.55	0.20	2.39*	0.64	1.25	-1.20	0.51	-0.50

* and ** represent statistically significant at 95% and 99% levels, respectively.

When we look at the duration, amplitude and cumulative loss of cycles in consumption and investment as major components of GDP for the full set of countries, The positive sign of correlations for duration, amplitude and cumulative loss shows that the income inequality is significantly associated with a longer duration, deeper amplitude and greater cumulative loss of GDP. In addition, the sign of correlations with duration of cycles shows that we may observe longer duration in cycles of consumption and shorter duration in cycles of investment for the countries with less equal income distributions. Likewise, we may observe a larger cumulative loss in cycles of consumption and investment for the countries with less income equality. However, none of these results are significant. But when we look at the amplitude of cycles in consumption and investment, we observe that inequality of income is significantly associated with deeper cycles in consumption and investment, and that this correlation is more significant for consumption than for investment (1% level of significance versus 5% level of significance).

Looking at the second set of countries, we observe that only consumption plays a significant role in alleviating the effects of shocks (0.55), although the sign of the correlation coefficient for investment shows that investment may play some role in this direction (0.30). Another important implication of these results is that, as a shock hits the economy, regardless of whether the upcoming crisis is classified as an inertial or a realistic scenario (Josifidis et al. 2010), both consumption and investment play some role in alleviating its effects for countries that have more equal income distributions. However, this role seems to be more effective for consumption than for investment (0.30 versus 0.19). Given that GDP in countries with less income

inequality is more sensitive to variations in consumption than those in investment, the consumption-smoothing behavior of a large middle income group of consumers as well as better access to the credit market helps those countries to sustain their GDP at a higher level and to experience a less costly recession.

The empirical results of the full set of countries also reveal that there is a negative correlation between the Gini index and the duration, amplitude and cumulative gain of the expansion phase of the cycles of GDP (ETS). Hence, those countries with greater income inequality (higher Gini index) may experience a shorter and less deep period of recovery from a recession, although these numbers are not statistically significant. The reasons behind these facts can be explained by considering the importance of the consumption-smoothing theories such as the permanent income hypothesis and the life-cycle model of consumption for people with different levels of income. As shown by Amorosi et al. (2012), consumption smoothing by middle income households is higher, while investment decisions are affected by the concepts of uncertainty and irreversibility.

The importance of uncertainty has also been emphasized by many researchers, who have concluded that uncertainty suppresses investment, since higher uncertainty actually reduces the responsiveness of investment to demand shocks. This is due to the fact that investment decisions on installed capital must take into account future cost and demand conditions, even though this reaction may be more severe for risk-averse firms. (Holland, and Riddiough 2000; Bloom et al., 2007; Stein and stone, 2012).

4.4.3 Income Distribution and the Number of Business Cycles

Given that output processes in a variety of real business cycle (RBC) models follow a random walk with a drift ($\Delta Y_t = \mu_y + \sigma e_t$) (Cogley and Nason 1995), we estimate such a model for GDP, consumption and investment separately for each country. These are carried out to compute the ratio of the drift to standard deviation (μ/σ) in order to determine the number of turning points of the cycles. According to Harding and Pagan (1999), in this typical model, $\Phi(-\mu_y/\sigma)$ shows the probability that one quarter of negative growth could be obtained, where the cumulative normal distribution is shown by $\Phi(\cdot)$, and (σ) stands for standard deviation. In this case, the ratio of drift to standard deviation shows the number of turning points such that a larger μ_y/σ indicates that fewer turning points can be identified in a series (Don Harding and Adrian Pagan, 1999).

Taking the correlations between the Gini indices and the ratio of drift to standard deviation of GDP, consumption and investment for the entire set of countries reveals that countries with less equal income distributions are likely to experience a higher number of cycles in GDP and consumption. This is shown by the negative sign of their respective coefficient correlations where these correlations are statistically significant at the 95% and 99% confidence levels respectively (Table 4). Looking at the second set of countries (higher income and upper middle income), this effect is stronger for GDP, but almost the same for consumption. However, the correlations for the third set of countries (lower middle and low income) predict the same outcome even though the obtained coefficients are not statistically significant. In contrast, the correlation coefficients for the Gini indices and investment for the first

and second sets of countries have a positive sign, leading to the conclusion that greater income inequality is consistent with a lower number of cycles in investment. The insignificant *t*-test value for investment, however, does not strongly support this conclusion.

Table 4: The Correlations of Average Gini Coefficients by Country with Ratio of Drift to Standard Deviations of GDP, Consumption and Investment

	GDP	Consumption	Investment
	Full Set of Countries		
Correlation Coefficient (1)	-0.33	-0.44	0.15
t-Test	-2.07*	-2.85**	0.94
	High and Upper Middle Income Countries		
Correlation Coefficient (2)	-0.6	-0.49	0.22
t-Test	-3.3**	-2.85**	0.98
	Lower Middle and Low Income Countries		
Correlation Coefficient (3)	-0.11	-0.24	-0.08
t-Test	-0.4	-0.91	0.94

* and ** represent statistically significant at 95% and 99% levels, respectively.

The fact that the numbers of peaks and troughs in consumption and GDP become less as income distribution improves over the countries may be due to the higher degree of effectiveness of fiscal and monetary policies in developed countries. However, in order to understand the reason for observing more volatile investment patterns in countries with a more equal income distribution, we need to examine the relationship between investment and flow of information as well as uncertainty and the flow of information affecting investment decisions in advanced countries.

As Strebulaev et al. (2012) pointed out, the investment decision no matter resourced from equity or debt is sensitive to the flow of information. Emphasizing the role of uncertainty Bernanke (1983) stated that the timing of irreversible investment projects

can be quite sensitive to the arrival of new information. He suggested that if we have a realistic assumption that these uncertainties will be reviewed periodically in the light of new information, we may observe more fluctuations in investment, especially in more developed countries, since the flow of information is faster than that in developing countries.

4.5 Conclusions

From the empirical results it would appear that a less equal income distribution leads to deeper and more costly recessions. Overall, the duration of contraction when going into a recession is longer for countries with a less equal distribution of income, while the sign of estimations show that the speed of recovery during the expansionary phase of a recession (ETS) seems to be somewhat faster. The duration and depth of the decline of aggregate demand in the first phase of the cycle (CTS) results in greater cumulative income losses of GDP for countries that have greater inequality.

Moreover, we show that greater income inequality is associated with a smaller responsiveness of GDP to consumption and greater responsiveness of GDP to investment. In this case we observe that during the recession, consumption in countries with greater income inequality plays a greater role in pulling the economy down compared to investment, while for the countries with less income inequality, consumption alleviates the effects of recession to prevent GDP from entering deeper recession. In addition, a higher level of income equality will lead to a lower number of cycles in GDP and consumption. The same conclusion cannot be drawn as clearly for investment.

Chapter 5

INCOME DISTRIBUTION AND RECESSIONS

5.1 Introduction

In the previous chapter the application of simple correlation and t-test proposed that there is a strong association between the income inequality and the severity of recessions shown by cumulative loss in GDPs. However, in this chapter this relationship is investigated by employing a more advanced empirical method as well as a theoretical justification for the proposed relationships.

Thus, the initial objective of this chapter is to seek for the same relationship between the degree of income inequality and the severity of recessions for the countries under study. For this purpose, we first sketch the theoretical background of this issue based on the models of four components of aggregate demand that move during a recession; namely consumption, investment, net export and governmental spending, to highlight that the income distribution within countries may affect these movements. This theoretical background proposes a solid justification for empirical findings of this chapter and the previous one. To carry out the empirical analysis, we employ the same algorithm proposed by Harding and Pagan (2002) for dating the cycles of GDP for each individual country over the period 1970- 2009. In addition, in order to investigate the effect of Gini index on cumulative loss of GDPs in different countries, two separate methods of ordinary least squares (OLS) and two-staged least

squares (TSLS) are employed assuming that Urban Population (*UPOP*) and the Telephone Lines (*TL*) are instrumental variables (used to run the TSLS method) and the Real Interest Rate (*RIR*) and Inflation Rate (*IR*) are omitted variables from our structural models (OLS and TSLS). This demonstrates how income equality within the countries may play a role in intensifying or alleviating the effects of recessions in countries under study.

For the purpose of this study we employ annual data on GDP for all 36 selected countries over the years 1970 to 2009 reported by the World Bank. Annual data on Gini indices are also collected from World Bank. The theoretical and empirical discussions presented below indicate that countries with a more equal income distribution, on average, will experience a less costly recession.

5.2 The Relationship between the Movement of the Components of Aggregate Demand and the Distribution of Income

The theoretical background for this chapter is based on the methods of four components of aggregate demand that move during a recession, namely consumption, investment, net export and governmental spending, and the possible role that income distribution may play in affecting these movements.

5.2.1 Consumption

The consumption theory of Keynes (1936) proposed that consumption was positively related to income but was a diminishing function of income. This is due to the fact that marginal propensity to consume and average propensity to consume fall as the level of income increases. The implication is that a redistribution of income towards equality has a positive effect on aggregate consumption. Kuznets (1946) challenged Keynes's theory, claiming that in the long run the average propensity to consume is

constant, while in the short run the data support Keynes's theory. Friedman (1956), in putting forward the permanent income hypothesis, argued that households' expenditures in any period are a function of their permanent incomes, which is consistent with Kuznets' results. Although the permanent income hypothesis of Friedman and the lifecycle method of Modigliani prevailed for decades, recent research in the field has placed greater emphasis on the relative permanent income hypothesis proposed by Duesenberry (1948) to explain consumption behavior. The empirical work by Alpizar *et al.* (2005) confirms that it is the relative levels of income and consumption over time that matter for people. Palley (2010) developed a synthetic Keynes–Duesenberry–Friedman method and concluded that low-income households have a higher marginal and average propensity to consume. The primary implication of this result is that the redistribution of income is likely to have a positive effect on aggregate demand. Therefore, tax cuts in countries with a more equal distributive income are likely to have a more expansionary effect than cuts in countries with less equality. Since tax cuts are a common tool for stimulating the economy, particularly during periods of recession, it is anticipated that this policy will work more effectively in reducing the effects of recession in countries with a more equal income distribution. Moreover, as shown by Sun *et al.* (2013), countries with a more equal income distribution suffer less from credit constraints because more of the population in such countries has access to capital markets. This acts to alleviate the intensity of recession in countries that enjoy more equal income distribution.

5.2.2 Investment

In order to explore how investment behavior differs between countries with different income distributions, we need to split our analysis into two parts. First, we need to study how income distribution may affect the transfer of investment to the next period, and second, we need to examine how the trade-off between human capital transfer and physical capital transfer takes place during this process.

5.2.2.1 Transfer to the next period

We analyze the behavior of rich individuals and poor individuals separately, and combine their behavior by including another variable representing the proportion of rich and poor individuals in the model. This determines the aggregate effect of income distribution on transfers to the next period.

Wealthy Individuals

We assume that the income of wealthy individuals within an economy originates from their real wage (W_t^R) in time t , plus the returns earned on bonds (rb_t^R). The wages of wealthy individuals is set equal to the base wage plus a return on his human capital ($W_t^R = w_t + h_t H_t^R$) where w_t is the base wage rate and H_t^R is the human capital and h_t is the rate of return on human capital at time t . Their total outflow will be allocated to current period consumption (C_t^R), and investment in the stock of human capital ($H_{t+1}^R - H_t^R$) and physical capital ($b_{t+1}^R - b_t^R$). Equation 5.1 shows this relationship.

$$W_t^R + rb_t^R = C_t^R + (b_{t+1}^R - b_t^R) + (H_{t+1}^R - H_t^R) \quad (5.1)$$

Rearranging this equation provides the transfer equation for each wealthy individual within a country as follows:

$$b_{t+1}^R + H_{t+1}^R = W_t^R + rb_t^R - C_t^R + b_t^R + H_t^R \quad (5.2)$$

This equation clearly indicates that in each period, rich individuals spend a proportion of their income (whether wage or bonds income) on current consumption, and the rest will be transferred to the next period by increasing their human or physical capital.

Poor Individuals

Similarly, poor individuals spend a proportion of their income on current consumption and may transfer a proportion (if any remains) to the next period. The only difference here is that poor individuals are assumed to have zero wealth and zero human capital accumulated from the previous period. Therefore, their wages are set equal to a base wage rate ($W_t^P = w_t$) Although they are able to increase their base wages by gaining experience over time, it is assumed for now that they have no job experience at all. The transfer equation in this case will be:

$$b_{t+1}^P + H_{t+1}^P = W_t^P - C_t^P \quad (5.3)$$

where $W_t^P = w_t$ in this equation.

Aggregate Transfer

If we assume that λ represents the proportion of rich people in country, the total transfer function will be shown as:

$$\text{Total transfer} = \lambda \sum_1^n (b_{i,t+1}^R + H_{i,t+1}^R) + (1 - \lambda) \sum_i^n (b_{i,t+1}^P + H_{i,t+1}^P)$$

Rearranging this equation will give us equation below (5.4)

$$\text{Total transfer} = \lambda \sum_1^n (b_{i,t+1}^R - b_{i,t+1}^P) + \lambda \sum_1^n (H_{i,t+1}^R - H_{i,t+1}^P) + \sum_1^n b_{i,t+1}^P + \sum_1^n H_{i,t+1}^P$$

Given that $b_{t+1}^R > b_{t+1}^P$ and $H_{t+1}^R > H_{t+1}^P$, as λ increases, the total transfer to the next period will increase. This result clearly indicates that there is an inverse relationship between the inequalities of income across a country and the transfer to the next period. In another words, as the proportion of poor people in a country is reduced, the total transfer (physical or human capital) to the next period will rise.

5.2.2.2 Trade-off between b_{t+1} and H_{t+1}

Today, human capital constitutes the largest component of wealth for most people such that two-thirds of total income is allocated to labor income in most developed countries.

The recent studies on the effect of education on earnings shows that the monetary return on human capital varies from 7% to 12% which is approximately the same magnitude as the returns to financial assets. Palacios-Huerta (2003a) further showed that for the specific groups the return could rise to 20%. Furthermore, Elias (2003) estimated the non-monetary benefits of education around 16% for the total return to human capital assets. All these emphasize the importance of human capital that should be taken into account when the consequences of business cycles are studied.

To discuss how the individual's tendency varies toward investing on human or physical capital during a recession/expansion period, one needs to apply a dynamic utility maximization model that incorporates the individual's consumption and investment behavior.

Wei (2003) constructed a stylized dynamic general equilibrium model proposing one-agent complete-market framework to study of human capital variation during business cycle as well as its asset pricing implications.

The model was studied under three different scenarios including productivity shocks, human capital shocks and the joint productivity and human capital shocks where as Krebs (2003) showed that human capital shocks can occur as a result of changes in labor market conditions.

Wei (2003) incorporated the labor-leisure-education choices into utility function of a representative individual and assumed that her preference is non-separable over consumption and leisure to allow her risk attitude varies towards consumption over time with the relative importance between the two. He also assumed that the economy is populated by a large number of homogeneous agents and markets are complete. Assuming that the individual has one unit of time, which is divided among leisure, education and labor supply, and the firm demands the required labor force through Cobb-Douglas production function, he sets a series of constraints including physical capital accumulation, human capital accumulation and etc. to solve the central planner's problem.

Wei (2003) introduced the hours spent in education in his model and asserted that there is a negative correlation between the education and output. In his empirical estimations of this relationship he found that the correlation is greater (-0.76) when

human capital shocks are the only type of uncertainty in the economy (-0.41 in the case of productivity shocks, and -0.40 in the case of joint productivity and human capital shocks). These results support the empirical findings of Dellas and Sakellaris (2003) and Spilimbergo (2000) who showed that the times spend on education is countercyclical.

The implications from an asset-pricing model proposed by Wei (2003) revealed that during an economic downturn, individuals tend to build up their human capital, with the expectation of a higher wage income and larger non-market benefits from human capital in the future.

These results indicate that although the equality of income distribution is associated with a greater transfer of investment to the next period, during a recession a considerable proportion of these transfers tend to be towards human capital rather than physical capital for the countries with a more equal income distribution. In such countries, these transfers indirectly boost consumption for the subsequent periods and alleviate the intensity of decline in GDP rather than shifting towards internal capital stock to seek for investment opportunities.

5.2.3 Net Export

The positive relationship between equality of income distribution and international trade has been emphasized by Krugman (1981), Helpman and Krugman (1985), Ondrich *et al.* (2006) and Yan (2007). AS Caruana *et.al.* (2000) emphasized, a domestic recession does spur firms to expand their export activities.

If a country is export-led and the recession is assumed not to be a global recession, an exporting firm will suffer relatively less since it may be able to offset the fall in the domestic demand with a rise in volume of exports abroad. In contrast, if the country does not produce goods that are both domestically consumed as well as exported, during a recession when aggregate demand is reduced then the prices of the outputs of the firms must fall causing the firms to reduce their supply to the domestic market. This will further exacerbate the recession. The net result is that if aggregate demand in a country is impacted for some reason its ultimate impact on domestic supply is likely to be relatively greater on those firms who do not have to option to increase their exports.

Indeed, it is evident from the data set used in this study that most of the countries with a high Gini index are still in the early stages of development. These countries do not have many firms, outside of agriculture, that are producing for both the domestic as well as the export markets. In such a situation they are not able to take advantage of foreign trade to maintain their level of production during a domestic recessionary period. Firms in countries with less income inequality have greater capacity to export items such as manufacturing commodities that are sold both domestically as well as abroad.

5.2.4 International Governmental Borrowing

International governmental borrowing is one of the approaches followed to stimulate the economic growth rate when a crisis hits the economy. As it is evidenced, governmental spending in small amounts can stimulate the economy (Tanninen, 1999). However, this opportunity is not available to all countries to an equal extent.

The countries are ranked on the basis of a number of economic, financial, social and political indicators. The integrated analysis of these factors usually determines the countries' position and sovereign credit rating, which indicates their ability to repay debts. DBRS, one of the most prominent institutes that undertakes these integrated analyses to rank countries based on their sovereign creditability, groups risk factors into six categories, namely fiscal management and policy, debt and liquidity, economic structure and performance, monetary policy and financial stability, balance of payments and political environment. Each of these risk factors contains a number of quantitative and qualitative variables that are taken into consideration to determine sovereign credit rating. Among these variables, revenues, expenditures, fiscal balance, budget planning and control, historical growth and its prospects, demography and income equality, and financial system stabilities are the most influential determinants of credit rating, with all of these having a positive effect on creditability of sovereigns.

In fact, a government's ability to generate sustainable revenue in the future to pay off the current debt plays a significant role in evaluating the importance of other variables in this context. However, as Aizenman and Jinjark (2012) showed, higher income inequality is associated with a lower tax base, and hence a lower tax revenue, lower *de facto* fiscal space and higher sovereign spreads. Since tax revenues are considered the most sustainable governmental revenues, a narrower tax base limits the fiscal flexibilities of a government's revenue generation.

Indeed, the data indicate that there is a negative correlation (-0.37) between international debt as a percentage of GDPs and the Gini index of the sample countries studied in this research, with this correlation being statistically significant at the 95% level.

Considering the expected behavior of each of these components of aggregate demand, we should expect to find some empirical evidence of the impact of income distribution on the severity of recession.

5.3 Empirical Investigation

In order to empirically address this question it is first necessary to measure the severity of recessions for each country. The algorithm developed by Harding and Pagan (2002) is used for this purpose; the algorithm not only identifies the potential turning points, but also ensures that these peaks and troughs alternate over time. In this way the true business cycles are identified along with their respective durations, amplitudes and cumulative impacts. These are calculated for each individual country and the result is presented as an average number over the period 1970–2009. Two separate methods are estimated using ordinary least squares (OLS) and two-staged least squares (TSLS) to investigate the effect of the Gini index (as explanatory variable) on duration, amplitude and cumulative loss of the contractionary phase of cycles, as these are carried out under the scenario that the Urban Population (*UPOP*) and the Telephone Lines (*TL*) are instrumental variables (used to run the TSLS methods). The Real Interest Rate (*RIR*) and Inflation Rate (*IR*) are assumed to be omitted variables from our structural models (OLS and TSLS).

5.3.1 Data Employed and the Cycle Dating Approach

For the purpose of this chapter, the annual data on GDP for selected 36 countries from year 1970 to 2009 reported in the *World Development Indicators* (World Bank, 2011) is used. Similar to the previous chapter the data are transformed to constant 2000 local currency units (in millions) using GDP deflator. The data on Gini indices of countries are also collected from the World Bank for the years 1980 to 2009. In this chapter we only focus on contractionary phase (CTS) of the cycle and similar to the previous chapter we apply the same algorithm for dating the cycles to calculate duration, amplitude and cumulative loss of those phases of the cycles for each individual country over the period of 1970 to 2009.

5.3.2 Model Specification

Because the proposed algorithm presents the calculation results of duration, amplitude and cumulative losses of cycles on average basis, for the consistency of our final result the average Gini index for each country over the period of study is estimated. In order to investigate the extent to which income inequality may affect the recession, the effect of the Gini index on each component of duration, amplitude and cumulative loss of the contractionary phase of a cycle is examined. A typical model is formed as follows:

$$Y_i = \beta_0 + \beta_1 * Gini + \varepsilon_i \quad i=1, 2, 3 \quad (5.10)$$

where Y_1 , Y_2 , Y_3 represent duration (*DUR*), amplitude (*AMP*) and cumulative loss (*CUM*), respectively, of the contractionary phase of cycles.

However, this model might suffer from an endogeneity problem (existence of a correlation between Gini index and ε_1 as an error term) in which the application of

the OLS method will eventually produce a bias result (Bullock *et al.*, 2010). In order to avoid such a problem, instrumental variables must be employed. These must satisfy two conditions in order to be considered reliable instrumental variables. First, there must be a strong correlation between each of the instrumental variables and the Gini index. Second, in contrast, there must be no correlation between each of the instrumental variables and the residuals of the Equation 5.10 (ε_1). This requires us to choose two variables, *UPOP* and *TL*, as instrumental variables for this model, in which both variables satisfy the abovementioned conditions reasonably well, where the obtained estimators of the model

$$Gini = b_0 + b_1 * UPOP + b_2 * TL + u_1 \quad (5.11)$$

are significantly different from zero, and where R-squared (0.59) and *F*-statistics (24.138) are high enough to prove that the chosen instruments are not weak for this model (Stock *et al.*, 2002). Hence, Equation 5-10 can be transformed to

$$Y_i = \beta_0^* + \beta_1^* * \hat{Gini}_i + \varepsilon_{2i} \quad (5.12)$$

where the \hat{Gini}_i is the predicted value from equation (5.11) and the TSLS method is used in order to obtain the estimators of this model (Foster and McLanahan, 1996; Greene, 1993).

While our instrumental variables in Equation 5.11 are significant in their explanation of the value of the Gini coefficient, an endogeneity test needs to be undertaken to choose whether the model shown in Equation 5.10 or that in Equation 5.12 should be estimated in order to find an unbiased estimator. For this purpose, a Hausman test is conducted. As Hausman (1978) proposed, in this case, the Gini index is shown to be

exogenous (and instrumental variables could be omitted to obtain more accurate results) if there is no correlation between the error term in Equation 5.11 and the dependent variable of Equation 5.10. To examine this, an OLS method is first conducted for Equation 5.11 and its error term used as an explanatory variable for Equation 5.10. Hence, the following equation needs to be estimated using the OLS method:

$$Y_i = \varphi_0 + \varphi_1 * Gini + \delta * u_1 + \varepsilon_{3i} \quad (5.13)$$

The null hypothesis to be tested is $\delta=0$, which proves that the Gini index is an exogenous variable. If the null hypothesis is rejected so that δ becomes statistically significant, it can be concluded that the Gini index is an endogenous variable. Hence, obtaining an unbiased result necessitates the estimation of Equation 5.12. On the other hand, if the null hypothesis is not rejected, it can be concluded that the Gini index is an exogenous variable, and estimation of Equation 5.10 is sufficient to produce a reliable conclusion. The result of endogeneity tests (Equation 5.13), as shown in Table 5, asserts that the Gini index is an exogenous variable, since the residuals of Equation 5.11 (*RES*) are not significantly related to the duration, amplitude and cumulative loss.

Table 5: Endogeneity Test Results

$DUR = C(1) + C(2)*GINI + C(3)*RES$				
Variable	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
<i>GINI</i>	0.030807	0.001662	18.53846	0
<i>RES</i>	-0.021158	0.012	-1.76313	0.0869
R-squared	0.143991	Adjusted R-squared		0.118814
Prob. (<i>F</i> -statistics)	0.047559	DW	2.053201	
$AMP = C(1) + C(2)*GINI + C(3)*RES$				
Variable	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
<i>GINI</i>	0.356157	0.091163	3.906834	0.0004
<i>RES</i>	-0.217545	0.143068	-1.52057	0.1379
<i>C</i>	-9.545134	3.72064	-2.56546	0.015
R-squared	0.33793	Adjusted R-squared		0.297805
Prob. (<i>F</i> -statistics)	0.001109	DW	2.200317	
$CUM = C(1) + C(2)*GINI + C(3)*RES$				
Variable	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
<i>GINI</i>	0.322157	0.104175	3.092474	0.004
<i>RES</i>	-0.291412	0.163489	-1.78245	0.0839
<i>C</i>	-9.026917	4.251701	-2.12313	0.0413
R-squared	0.225769	Adjusted R-squared		0.178846
Prob. (<i>F</i> -statistics)	0.014687	DW	2.373391	

These results indicate the Gini is endogenous at 10% level of significance for DUR and CUM. Therefore, the instrumental variables should be included (since the coefficients of RES for duration and cumulative loss are not significant at 10 percent level of significance). However, this conclusion can not be made for AMP. Hence, there is a need to estimate both Equation 5.10 (using the OLS method) and Equation 5.12 (using the TSLS method) to compare the results.

In addition, there may be other variables that affect the average duration, amplitude and cumulative losses of the contractionary phase of cycles, but that are excluded from the above models. As King *et al.* (1994) observed, if ‘relevant variables are omitted, our ability to estimate causal inferences correctly is limited’. In order to tackle this problem, it is necessary to run an omitted variable test. For this purpose there is a need to find some variables that affect the contractionary phase of business cycles such that their inclusion in Equation 5.10 or Equation 5.12 may change the

result. In theory, the rate of productivity and the interest rate, *RIR*, lie at the center of the discussion, since they have the greatest effect on the business cycles. Where the data for productivity rate for the selected countries between 1970 and 2009 is not available, *RIR* and *IR* are chosen for the omitted variable test (World Bank, 2012).

Thus, to implement this research both Equation 5.10 and Equation 5.12 are estimated, assuming that *RIR* and *IR* are omitted variables of these models. The omitted variable test is then conducted for both methods to see whether the inclusion of *RIR* and *IR* significantly changes the results. Table 6 shows the estimation results of Equation 5.10 (assuming that the Gini index is an exogenous variable, while *RIR* and *IR* are assumed to be omitted variables).

Table 6: Omitted Variable Test for the Model in Equation 5.10

$DUR= C(1)+C(2)*GINI+C(3)*RIR+C(4)*IR$ (Omitted Variables: <i>RIR IR</i>)				
<i>F</i> -Statistic	12.69816	Prob. (<i>F</i> -Statistics)		0.0001
Likelihood Ratio	21.03279	Prob. (Likelihood)		0
	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
C	0.964976	0.27042	3.568428	0.0012
Gini	0.001434	0.006894	0.207931	0.8366
<i>RIR</i>	0.025594	0.00908	2.818791	0.0082
<i>IR</i>	0.00144	0.000829	1.737072	0.0920
R-squared	0.519962	Adjusted R-squared		0.474958
<i>F</i> -Statistic	11.55378	Prob. (<i>F</i> -Statistics)		0.000027
DW	2.170703			
$AMP= C(1)+C(2)*GINI+C(3)*RIR+C(4)*IR$ (Omitted Variables: <i>RIR IR</i>)				
<i>F</i> -Statistic	1.41788	Prob. (<i>F</i> -Statistics)		0.257
Likelihood Ratio	3.056707	Prob. (Likelihood)		0.2169
	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
C	-5.10115	3.272476	-1.5588	0.1289
Gini	0.220803	0.083433	2.64647	0.0125
<i>RIR</i>	0.156032	0.10988	1.42002	0.1653
<i>IR</i>	-0.00098	0.010033	-0.0973	0.9231
R-squared	0.349214	Adjusted R-squared		0.288203
<i>F</i> -Statistic	5.723763	Prob. (<i>F</i> -Statistics)		0.002973
DW	2.359582			
$CUM= C(1)+C(2)*GINI+C(3)*RIR+C(4)*IR$ (Omitted Variables: <i>RIR IR</i>)				
<i>F</i> -Statistic	3.915704	Prob. (<i>F</i> -Statistics)		0.0301
Likelihood Ratio	7.881114	Prob. (Likelihood)		0.0194
	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
C	-1.63628	3.539782	-0.46225	0.647
Gini	0.095401	0.090248	1.057093	0.2984
<i>RIR</i>	0.224954	0.118855	1.892676	0.0675
<i>IR</i>	0.006115	0.010853	0.563481	0.577
R-squared	0.318109	Adjusted R-squared		0.254181
<i>F</i> -Statistic	4.976097	Prob. (<i>F</i> -Statistics)		0.006032
DW	2.456398			

The implications of these results are that in all models there exists at least one variable that is significantly different from zero. (Shown by *F*-test). However, *RIR* and *IR* could be dropped from *AMP* if the level of significance is chosen to be 10%. Likewise, *IR* could be dropped from *CUM*. The surprising result is that the Gini is not statistically significant for none of above models. The result of endogeneity test and omitted variable test for *AMP* assert that we can safely drop *IVs*, *RIR* and *IR*

from AMP and run an OLS method to see the variation of AMP as Gini changes. The result is presented in table 7.

Table 7: OLS Estimation for Amplitude on the Gini Index

$AMP = C(1) + C(2) * GINI$				
Variable	Coefficient	Std. Error	<i>t</i> -statistic	Prob.
Gini	0.26783	0.071602	3.740535	0.0007
C	-5.99214	2.950741	-2.03073	0.0502
R-squared	0.291543	Adjusted R-squared		0.270706
Prob. (<i>F</i> -statistic)	0.000677	DW	2.356323	

As this result shows, the Gini index coefficient is statistically significant at the 1% level of significance, which indicates that a less equal income distribution will deepen the amplitude of recessions experienced by countries.

On the other hand, if we assume that the Gini index is an endogenous variable, it is necessary to run a TSLS method similar to that represented by Equation 5.12 for duration, amplitude and cumulative loss of the contractionary phase of cycles. As long as there is one explanatory variable (Gini index) and two instrumental variables (*TL* and *UPOP*) in this typical model initially, a Sargan test (J-test) (as proposed by Sargan (1958) and Hansen (1982)) must be undertaken to ensure that the model is not over-identified. The computed restricted J-test for duration, amplitude and cumulative loss regressions prove that the models are not over-identified.² Therefore we can safely run the omitted variable test of TSLS method assuming that *UPOP* and *TL* are IVs and *RIR* and *IR* are assumed to be omitted variables. The results are presented in table 8.

² J-stats are greater than chi-squared (3.84), and therefore the null hypothesis that *TL* and *UPOP* do not belong to the model is rejected.

Table 8: Omitted Variable Test Results for the Model shown by Equation 5.12

<i>DUR= C(1)+C(2)*GINI</i>				
Instrument specification: <i>TL UPOP</i>				
Omitted variables: <i>RIR IR</i>				
	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
C(1)	0.532345	0.312985	1.700864	0.0981
C(2)	0.017793	0.007595	2.342721	0.0251
R-squared	0.138986	Adjusted R-squared		0.113662
<i>F</i> -statistic	5.488341	Prob. (<i>F</i> -statistic)		0.025134
DW	2.18895	Restricted J-statistic		2.413994
		Unrestricted J-statistic		2.00E-38
Difference in J-stats	2.413994	Prob. (Difference in J-stat)		0.2991
<i>AMP= C(1)+C(2)*GINI</i>				
Instrument specification: <i>TL UPOP</i>				
Omitted variables: <i>RIR IR</i>				
	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
C(1)	-5.99214	2.950741	-2.03073	0.0502
C(2)	0.26783	0.071602	3.740535	0.0007
R-squared	0.291543	Adjusted R-squared		0.270706
<i>F</i> -statistic	13.9916	Prob. (<i>F</i> -statistic)		0.000677
DW	2.356323	Restricted J-statistic		5.777965
		Unrestricted J-statistic		2.80E-37
Difference in J-stats	5.777965	Prob. (Difference in J-stats)		0.0556
<i>CUM= C(1)+C(2)*GINI</i>				
Instrument specification: <i>TL UPOP</i>				
Omitted variables: <i>RIR IR</i>				
	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
C(1)	-4.26751	3.412961	-1.25038	0.2197
C(2)	0.203838	0.082818	2.461277	0.0191
R-squared	0.151228	Adjusted R-squared		0.126264
<i>F</i> -Statistic	6.057884	Prob. (<i>F</i> -statistic)		0.019076
DW	2.452886	Restricted J-statistic		4.630676
		Unrestricted J-statistic		0.000000
Difference in J-stats	4.630676	Prob. (Difference in J-stats)		0.0987

The insignificant probability of the difference in J-stats at the 5% level of significance for each of three models (as shown in Table 8) reveals that the inclusion of *RIR* and *IR* will not change the J-stats significantly. This suggests that *RIR* and *IR* should be dropped for all the above three models, since an estimation of a TSLS method for duration, and cumulative loss on Gini index (where *UPOP* and *TL* are defined as instrumental variables) and an estimation of an OLS method for amplitude on Gini index will be sufficient to lead us to the unbiased results.

Table 9 summarizes all these arguments and demonstrates the way in which the Gini index may affect the duration, amplitude and cumulative losses of the contractionary phase of cycles.

Table 9: Summary of Estimations

	Gini Index Coefficients			
	OLS Method		TSLS Method	
	Coefficient	<i>p</i> -value	Coefficient	<i>p</i> -value
<i>DUR</i>	0.001434	0.8366	0.017793 ^a	0.0251
<i>AMP</i>	0.26783 ^b	0.0007	0.26783 ^b	0.0007
<i>CUM</i>	0.095401	0.2984	0.203838 ^a	0.0191

^aStatistically significant at 5% level of significance

^bStatistically significant at 1% level of significance

These results clearly show that a less equal income distribution (or a higher Gini index) will intensify the depth or amplitude of recessions by 0.26783% for one unit increase in the Gini index, regardless of whether the Gini index is considered an exogenous or endogenous variable. However, if the Gini index is assumed to be an endogenous variable (which economically makes more sense), a less equal income distribution is likely to increase the duration of cycles by 0.017793%, and cumulative losses of recessions by 0.203838% for one unit increase in Gini index.

5.4 Conclusion

From the empirical results it would appear that a less equal income distribution leads to deeper and more costly recessions, given that the Gini index seems to be an endogenous variable. Overall, in this case, the length of the duration of contraction when going into a recession is longer and its amplitude deeper for countries with a less equal distribution of income. The results show that the decline of aggregate demands in the first phase of the cycles (cumulative income losses of GDP) is greater

for countries experiencing a greater inequality of income. Given that we applied different empirical approach to investigate this effect, all these results are consistent with findings of previous chapter.

Chapter 6

INCOME DISTRIBUTION AND EXPANSIONS

6.1 Introduction

In the preceding chapter we applied instrumental variable analysis along with an omitted variable test in order to examine the effect of income inequality as represented by the Gini index on the contractionary phase of business cycles. This effect was shown separately on duration and amplitude that jointly together form the cumulative loss of GDP as an economy enters into a recession. In this chapter, the aim is to focus on expansionary phases of the cycles using the same empirical approach to explore the possible relationship between income inequality and the intensity of expansion that a country may experience over time. This relationship may help us to understand how different level of income distribution in different countries can affect the cumulative gains of GDPs when the countries enter into recovery phase of business cycles.

6.2 Empirical Investigation

In this chapter we employ the same algorithm described in Chapter 3 to date the cycles of GDPs. In addition, in order to investigate the effect of the Gini index on the cumulative gain of GDPs in different countries, two separate methods of ordinary least squares (OLS) and two-staged least squares (TSLS) are employed, assuming that Urban Population (*UPOP*) and the Telephone Lines (*TL*) are instrumental variables (used to run the TSLS method), and the Real Interest Rate (*RIR*) and

Inflation Rate (*IR*) are omitted variables from our structural models (OLS and TSLS). This demonstrates how income equality within the countries may play a role in increasing cumulative gains of countries when they actually are in expansionary phases of business cycles.

6.2.1 Data Employed and Dating the Cycles

We selected 36 countries³ for which annual data on GDP in local currency units (in millions) are available for the 1970–2009 period. The data are from the *World Development Indicators* database of the World Bank (World Bank, 2011). Then these data are transformed to real local currency unit (based on year 2000). The data on Gini index values of countries are also collected from the World Bank⁴ for the years 1980 to 2009. Given that the applied algorithm for dating the cycles calculates and presents a single average value for the cumulative gains of the cycles, for each individual country over the 1970 to 2009 period, for consistency we also calculate an average of the estimated Gini index values for each country. The assumption made is that the inaccessibility of the Gini index data for the years before 1980 for all the countries in the study, will not significantly invalidate our results, since the deviations of those data from the mean are assumed to be minor.

Moreover, to identify the peaks and troughs, we employ the concept of Expansion Terminating Sequence (ETS). The corresponding algorithm uses the rule that

³ Argentina, Australia, Benin, Bolivia Brazil, Burundi, Canada, Chile, China, Congo. Rep, Denmark, France, Gabon, Gambia, Germany, Greece, Guinea, India, Ireland, Japan, Jordan, Kenya, Malaysia, Mexico, Morocco, New Zealand, Norway, Philippines, South Africa, Spain, Sweden, Tunisia, Turkey, United Kingdom, United States and Zambia.

⁴ Data are based on primary household survey data obtained from government statistical agencies and World Bank country departments. Data for high-income economies are from the Luxembourg Income Study database. For more information and methodology please see PovcalNet (<http://iresearch.worldbank.org/PovcalNet/jsp/index.jsp>).

requires an expansion to have at least two quarters of positive growth. Similar to contraction, to measure the expansion of a cycle it is necessary to focus on three measures of duration, amplitude and that cumulative gain (which is formed by both duration and amplitude). Further details are presented in Chapter 3. Measuring the duration, amplitude and cumulative gains of the cycles over the period of study for every single country allows us to run a separate regression model for duration, amplitude and cumulative gains of the cycles against the Gini index for further investigation.

6.2.2 Model Specification

To investigate the extent to which income inequality affects the expansion, the effect of the Gini index on each component of duration, amplitude and cumulative gain of the expansionary phase of a cycle is examined. A typical model is formed as follows:

$$Y_i = \beta_0 + \beta_1 * Gini + \varepsilon_i \quad i=1, 2, 3, \quad (6.1)$$

where Y_1 , Y_2 , and Y_3 represent duration (*DUR*), amplitude (*AMP*) and cumulative gain (*CUM*), respectively, of the expansionary phase of cycles.

However, the endogeneity problem (existence of a correlation between the Gini index and ε_1 as an error term) may arise while estimating this model such that applying the OLS method will eventually produce a biased result (Bullock *et al.*, 2010). To avoid such a problem, when the model suffers from an endogeneity problem, the application of instrumental variables may remedy this problem. These instrumental variables must satisfy two conditions in order to be considered reliable variables. The first mandatory condition is that there must be a strong correlation between each of the instrumental variables and the Gini index. In addition, no

correlation between each of the instrumental variables and the residuals of the Equation (6.1) (ε_1) must appear. Therefore to fulfill these conditions, similar to the preceding chapter, the two variables *UPOP* and *TL* are selected as instrumental variables for this model. The obtained estimators of the model

$$Gini = b_0 + b_1 * UPOP + b_2 * TL + u_1, \quad (6.2)$$

are significantly different from zero, and where R-squared (0.59) and *F*-statistics (24.138) are high enough to prove that the chosen instruments are not weak for this model (Stock *et al.*, 2002) and satisfy the conditions reasonably well. Hence, Equation (6.1) could be transformed to

$$Y_i = \beta_0^* + \beta_1^* * \overset{\wedge}{Gini} + \varepsilon_{2i} \quad (6.3)$$

where the $\overset{\wedge}{Gini}$ is the predicted value from equation (6.2) and the TSLS method is used in order to obtain the estimators of this model (Foster & McLanahan, 1996; Greene, 1993).

Given the selection of strong instrumental variables in Equation 6.2, a proper model needs to be selected in order to prevent estimating biased estimators. This can be done with the help of an endogeneity test to decide whether Equation 6.1 or Equation 6.3 is capable of producing the most reliable result. For this purpose, a Hausman test is conducted. As Hausman (1978) proposed, the exogenous Gini index requires no correlation between the error term in Equation 6.2 and the dependent variable of Equation 6.1. In this case, the instrumental variables should be omitted to obtain more accurate results. For the endogeneity test, an OLS method is first conducted for Equation 6.2. Then, its error term is used as an explanatory variable for Equation 6.1.

Finally, the estimation of the following equation using the OLS method reveals that whether Gini is an exogenous or an endogenous variable.

$$Y_i = \varphi_0 + \varphi_1 * Gini + \delta * u_1 + \varepsilon_{3i} \quad (6.4)$$

If the null hypothesis as $\delta=0$ is not rejected we can safely conclude that the Gini index is an exogenous variable. Therefore, the estimation of Equation 6.1 is sufficient to produce an unbiased result. However, if we reject the null hypothesis (i.e., if δ becomes statistically significant), the Gini index is considered an endogenous variable. In this case, Equation 6.3 must be estimated to produce a reliable and unbiased result. Table 10 presents the results of endogeneity tests on Equation 6.4 which clearly show that the Gini index is an exogenous variable at the 5 percent level of significance, since the residuals of Equation 6.2 (*RES*) are not significantly related to the duration, amplitude and cumulative gains. This leads us to ensure that the estimation of Equation 6.1 using the OLS method will produce an unbiased result.

Table 10: Endogeneity Test Results

$DUR = C(1) + C(2)*GINI + C(3)*RES$				
Variable	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
<i>GINI</i>	-0.219248	0.098726	-2.220762	0.0333
<i>RES</i>	0.269485	0.194939	1.739300	0.1113
C	14.90681	4.029345	3.699562	0.0008
R-squared	0.143991	Adjusted R-squared		0.081576
Prob. (<i>F</i> -statistics)	0.093018	DW		2.093370
$AMP = C(1) + C(2)*GINI + C(3)*RES$				
Variable	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
<i>GINI</i>	-0.718329	0.519024	-1.384001	0.1756
<i>RES</i>	1.073456	0.814543	1.317863	0.1966
C	55.65776	21.18303	2.627469	0.0130
R-squared	0.063444	Adjusted R-squared		0.006683
Prob. (<i>F</i> -statistics)	0.339085	DW		1.782474
$CUM = C(1) + C(2)*GINI + C(3)*RES$				
Variable	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
<i>GINI</i>	3.567547	1.088941	3.276161	0.0024
<i>RES</i>	-1.609877	7.863355	-0.204732	0.8390
R-squared	-0.036377	Adjusted R-squared		-0.066859
Prob. (<i>F</i> -statistics)	NA	DW		1.606052

However, we might have excluded some other variables from our model that significantly may affect the average duration, amplitude and cumulative gains of the expansionary phase of cycles. As King *et al.* (1994) observed, if “relevant variables are omitted, our ability to estimate causal inferences correctly is limited”. Therefore, conducting an omitted variable test is required to prevent the occurrence of such a bias. In practice, finding some variables that affect the expansionary phase of business cycles is necessary such that those variables, if included in Equation 6.1, will change the result. In theory the rate of productivity and the real interest rate, (*RIR*), are two variables that they have the greatest effect on business cycles. However, due to lack of reliable data on the rate of productivity for the selected countries between 1970 and 2009, real interest rate, (*RIR*), and inflation rate, (*IR*), are chosen for the omitted variable test. The data for these two variables are from World Bank database (World Bank, 2012).

Thus, the omitted variable test is conducted to see whether the inclusion of *RIR* and *IR* significantly changes the results. Table 11 shows the estimation results of Equation 6.1, assuming that the Gini index is an exogenous variable, *RIR* and *IR* are omitted variables.

Table 11: Omitted Variable Test for the Model in Equation 6.1

<i>DUR</i> = C(1)+C(2)* <i>GINI</i> +C(3)* <i>RIR</i> +C(4)* <i>IR</i> (Omitted Variables: <i>RIR IR</i>)				
<i>F</i> -Statistic	0.597473	Prob. (<i>F</i> -Statistics)		0.5562
Likelihood Ratio	1.319821	Prob. (Likelihood)		0.5169
	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
<i>C</i>	8.902780	3.667001	2.427810	0.0210
<i>Gini</i>	-0.056475	0.093492	-0.604068	0.5501
<i>RIR</i>	-0.038668	0.123127	-0.314050	0.7555
<i>IR</i>	-0.007478	0.011243	-0.665117	0.5107
R-squared	0.088705	Adjusted R-squared		0.003271
<i>F</i> -Statistic	1.038288	Prob. (<i>F</i> -Statistics)		0.388870
DW	2.146817			
<i>AMP</i> = C(1)+C(2)* <i>GINI</i> +C(3)* <i>RIR</i> +C(4)* <i>IR</i> (Omitted Variables: <i>RIR IR</i>)				
<i>F</i> -Statistic	0.717325	Prob. (<i>F</i> -Statistics)		0.4957
Likelihood Ratio	1.578848	Prob. (Likelihood)		0.4541
	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
<i>C</i>	29.90859	18.86227	1.585631	0.1227
<i>Gini</i>	0.007109	0.480901	0.014783	0.9883
<i>RIR</i>	-0.322482	0.633338	-0.509178	0.6141
<i>IR</i>	-0.033599	0.057832	-0.580983	0.5653
R-squared	0.056455	Adjusted R-squared		-0.032002
<i>F</i> -Statistic	0.638221	Prob. (<i>F</i> -Statistics)		0.595951
DW	1.835810			
<i>CUM</i> = C(1)+C(2)* <i>GINI</i> +C(3)* <i>RIR</i> +C(4)* <i>IR</i> (Omitted Variables: <i>RIR IR</i>)				
<i>F</i> -Statistic	1.124528	Prob. (<i>F</i> -Statistics)		0.3373
Likelihood Ratio	2.445232	Prob. (Likelihood)		0.2945
	Coefficient	Std. Error	<i>t</i> -Statistic	Prob.
<i>C</i>	199.5659	223.9433	0.891145	0.3795
<i>Gini</i>	0.379695	5.709522	0.066502	0.9474
<i>RIR</i>	-9.819739	7.519341	-1.305931	0.2009
<i>IR</i>	0.114399	0.686608	0.166615	0.8687
R-squared	0.071753	Adjusted R-squared		-0.015270
<i>F</i> -Statistic	0.824530	Prob. (<i>F</i> -Statistics)		0.490077
DW	1.775078			

In this model, the result of the *F*-test shows that the independent variables are not jointly significant at the 5 percent level for none of the duration, amplitude and cumulative gain of cycles. Hence, the conclusion is that the exclusion of *RIR* and *IR* from the model will not affect the final result. Given that the *Gini* is an exogenous variable at the 10 percent level of significance as shown in Table 10, eventually, the

estimation of Equation 6.1 using the OLS method is quite sufficient to produce a solid result for our analysis. The result is shown in Table 12 below.

Table 12: Summary of Estimations

Gini Index Coefficients (OLS Method)		
	Coefficient	<i>p</i> -value
<i>DUR</i>	-0.109832	0.1699
<i>AMP</i>	-0.282485	0.4895
<i>CUM</i>	-2.293800	0.6399

The negative sign of the coefficients for all three models indicate that equality of income distribution within the countries is associated with a longer duration, deeper amplitude, and hence a greater cumulative gain of the expansionary phase of business cycles. However, none of these coefficients are statistically significant at the 5 percent or even 10 percent level of significance. This deprives us of a solid conclusion on the possible relationship between income equality and cumulative gain in the expansionary phase of the cycles.

6.3 Conclusion

Although none of these results are statistically significant, preventing us from drawing a definite conclusion, however, the sign of the coefficients estimated by suggest that the duration of expansionary phases of business cycles seems longer; its amplitude seems deeper and hence the cumulative gains seems greater for the countries with less inequality of income, given that the Gini index is shown to be an exogenous variable. These results are consistent with the findings in Chapter 4 even though a different empirical approach was undertaken. Overall, we can firmly

conclude that a more equal income distribution not only prevents a costly recession, as compared to the countries with a less equal income distribution, it is more likely that the expansion phase of the business cycle seems more fruitful. Hence, while it is the case that a more equal income distribution is desirable for many social reasons, these results add one more argument in support of policies that would improve the distributions of income within countries over time.

Chapter 7

CONCLUSION

The study was set out to explore a relationship between the level of income distribution within 36 selected countries and the degree of intensity of business cycles experienced by those countries over 40 years time period. The study has also sought whether the equality of income distribution within the countries has any impact on the number of business cycles experienced over the same time span. The main arguments of this study are presented in chapter 4,5 and 6. The findings of this work are examined by two different empirical approaches, namely, correlations along with a *t*-test, and application of OLS and TSLS methods.

The discussions under chapter 4 are allocated to find a possible relationship between the degree of income inequality and the severity of contractionary (CTS) and expansionary (ETS) phases of cycles in GDP, consumption and investment, shown as the duration and depth of recessions/expansions for the countries under study. To identify true cycles that affect GDPs followed by consumptions and investments, we employ the algorithm proposed by Harding and Pagan (1999) to date the cycles of GDPs, consumptions and investments. After the dating the cycles, a correlation between duration, amplitude and cumulative losses of cycles and the Gini index of those countries along with a respective *t*-test for each set of correlations shows that a less equal income distribution leads to deeper and more

costly recessions. Overall, the duration of contraction phase of the cycles when going into a recession is longer for countries with a less equal distribution of income which results in a greater cumulative income losses of GDP. In this regard, the estimation shows that during the recession period (CTS), the cumulative loss in cycles of consumption is greater than that of investment for the countries with a more income inequality. This leads us to conclude that during the recession, consumption in countries with greater income inequality plays a greater role in pulling the economy down compared to investment, while for the countries with less income inequality, consumption alleviates the effects of recession to prevent GDP from entering deeper recession. However, while the sign of correlations between duration of expansionary phase of cycles in GDP show that the speed of recovery is somewhat faster, this effect is not statistically significant.

In addition, assuming that the trends of GDP, consumption and investment follow a random walk with a drift model, the number of cycles in all three variables was calculated. Then, a correlation between the number cycles in GDP, consumption and investment and the Gini index of countries revealed that a higher level of income inequality will lead to a higher number of cycles in GDP and consumption. However, this conclusion cannot be drawn as clearly for investment.

The discussions in chapter 5 is based on more advanced empirical methods to confirm the findings of chapter 4 on the relationship between income inequality and the degree of severity of recessions (CTS) experienced by the countries over the same time span. This effect was shown separately on duration and amplitude that

jointly together form the cumulative loss of GDP as an economy enters into a recession. Therefore after identifying the cycles of GDPs for the selected countries, we examine both ordinary least squares (OLS) and two-staged least squares (TSLS) methods with a series of tests to identify the most possible unbiased results. To carry out both methods, it is assumed that real interest rate (RIR) and the inflation rates (IR) are omitted variables. To estimate the TSLS method, urban population (UPOP) and telephone line (TL), are chosen as instrumental variables.

From the empirical results it would appear that a less equal income distribution leads to deeper and more costly recessions, given that the Gini index seems to be an endogenous variable. Overall, in this case, the length of the duration of contraction when going into a recession is longer and its amplitude deeper for countries with a less equal distribution of income. The results show that the decline of aggregate demands in the first phase of the cycles (cumulative income losses of GDP) is greater for countries experiencing a greater inequality of income.

Given that a different empirical approach is applied to investigate this effect, all these results are consistent with findings of previous chapter.

A set of economic rationales is presented to explain why countries with greater income inequality will tend to have deeper and more costly recessions. These were four components of aggregate demand that move during a recession; namely consumption, investment, net exports and governmental spending.

In chapter 6, the aim is to focus on expansionary phases of the cycles using the same empirical approach employed in chapter 5 to explore the possible relationship between income inequality and the intensity of expansion that a country may experience over time. This effect was again shown separately on duration and amplitude that jointly together form the cumulative gain of GDP as an economy enters into recovery.

Although none of these results are statistically significant, preventing us from drawing a definite conclusion, however, the sign of the coefficients estimated suggest that the duration of expansionary phases of business cycles seems longer; its amplitude seems deeper and hence the cumulative gains seems greater for the countries with less inequality of income. These results are somewhat consistent with the findings in Chapter 4 even though a different empirical approach was undertaken. Overall, we can firmly conclude that a more equal income distribution not only reduces a costly recession, it might result in a more rapid expansionary phase during the recovery. Hence, while it is the case that a more equal income distribution is desirable for many social reasons, these results add one more argument in support of policies that would improve the distributions of income within countries over time.

REFERENCES

- Aizenman, J. and Jinjarak, Y. (2012) Income inequality, tax base and sovereign spreads, NBER Working Paper No. w18176. Available at <http://ssrn.com/abstract=2089248> (accessed October 2013).
- Alesina, A. and Rodrik, D. (1994) Distributive politics and economic growth, *Quarterly Journal of Economics*, 109, 465–90.
- Alpizar, F., Carlsson, F. and Johansson, S. (2005) How much do we care about absolute versus relative income and consumption?, *Journal of Economic Behavior and Organization*, 56, 405–21.
- Amorosi, G., Gosling A., and Ledesma M.L. (2012) Income distribution, household heterogeneity and consumption insurance in the UK: a mixture model approach, Paper Presented at RES 2012 conference, University of Cambridge.
- Antzoulatos, A. (2012) Policy Responses to the European Debt Crisis Treating the ‘Symptoms’ or the ‘Disease’?, *Panoeconomicus*, 59(4): 529-552.
- Arthur C. Pigou, (1920) *The Economics of Welfare*, *Economic Journal* 48: 635-41.
- Assane, J. and Grammy, A. (2003) An assessment of the growth and inequality causality relationship, *Applied Economic Letters*, 10, 871–87.

- Athanasopoulos, G. and Vahid, F. (2001) Capturing the shape of the business cycle with autoregressive leading indicator models, Econpapers. Available at <http://www.buseco.monash.edu.au/ebs/pubs/wpapers/2001/wp7-01.pdf> (accessed 21 September 2011).
- Atkinson A.B., and Bourguignon F. (2000), University of Cambridge, Cambridge UK, Elsevier, Handbook of Income Distribution with number 1
- Bengoa, M. and Sanchez-Roblez, B. (2005) Does equality reduce growth?, Applied Economic Letters, 12, 479–83.
- Berg, A., Jonathan .D, O. and Zettelmeyer, J. (2012), What Makes Growth Sustained?, Journal of Development Economics, 98(2), 149–66.
- Bernanke, B. S. (1983) Irreversibility, Uncertainty, and Cyclical Investment, Quarterly Journal of Economics, 14: 85-106.
- Birdsall, N. (2007) Income distribution: effects on growth and development, International Handbook of Development, 2, 6–45. Available at <http://EconPapers.repec.org/RePEc:cgd:wpaper:118> (accessed 17 October 2011).
- Bishop, A., Formby, J. P. and Smith, W. J. (1997) Demographic change and income inequality in the United States, 1976–1989, Southern Economic Journal, 64, 34–44.

- Bloom, N., Bond S., and Reenen J.V. (2007), Uncertainty and Investment Dynamics, *Review of Economic Studies*, 74 (2): 391-415.
- Burkhauser, R., Crews, A., Mary, C. and Jenkins, S. (1999) Testing the significance of income distribution changes over the 1980s business cycle: A cross-national comparison, *Journal of Applied Econometrics*, 14, 253–72.
- Bullock, J. G., Green, D. P. and Ha, S. E. (2010) Yes, but what is the mechanism? (Don't expect an easy answer), *Journal of Personality and Social Psychology*, 98, 550–58.
- Burns, A. F. och W. C. Mitchell, (1946), *Measuring Business Cycles*, NBER, New York.
- Caruana, A., Ewing, M. T. and Ramaseshan, B. (2000) Effects of economic recession on export activity, *Journal of Global Marketing*, 13, 93–106.
- Clarke, G. (1995) More evidence on income distribution and growth, *Journal of Development Economics*, 47, 403–27.
- Cogley, T., and Nason J.M., (1995) Output Dynamics in Real-Business-Cycle Models, *American Economic Review*, 85: 492-511.

- Dadkhah, K. M. (2006) Income distribution and economic growth in the United States: 1947 2001. Available at www.tcnj.edu/~business/economics/documents/heyse.thesis.tcnj.pdf (accessed 22 December 2011).
- Dellas, H., and P. Sakellaris (2003) On the Cyclicalities of Schooling: Theory and Evidence, *Oxford Economic Papers*, 55(1), 148-172.
- Duesenberry, J. S. (1948) Income–consumption relations and their implications, in *Income, Employment and Public Policy*, (Eds) L. Metzler et al., W.W.Norton & Company, Inc., New York.
- Foster, E. M. and McLanahan, S. (1996) An illustration of the use of instrumental variables: Do neighborhood conditions affect a young person's chance of finishing high school? *Psychological Methods*, 1, 249–60.
- Frazer, G. (2006) Inequality and Development Across and Within Countries, *World Development*, 34(9): 1459-1481.
- Friedman, M., (1956) *A Theory of the Consumption Function*, Princeton University Press, Princeton.
- Friedman, M. and Schwartz A. J. (1963) *A Monetary History of the United States 1867–1960*. Princeton: Princeton University Press for NBER.
- Greene, W. (1993) *Econometric analysis*, 2nd edn, Macmillan, New York.

- Hansen, L. P. (1982) Large sample properties of generalised method of moments estimators, *Econometrica*, 50, 1029–54.
- Josifidis, K., Lošonc A., and Supić N. (2010) Neoliberalism: Befall or Respite?, *Panoeconomicus*, 57: 101-117.
- Harding, D., and Pagan A. (1999) Knowing the Cycle, *Econpapers*, <http://melbourneinstitute.com/wp/wp1999n12.pdf> (accessed 2011/06/17).
- Harding, D. and Pagan, A. R. (2002) Dissecting the cycle, *Journal of Monetary Economics*, 49, 365–81.
- Hausman, J. A. (1978) Specification tests in econometrics, *Econometrica*, 46, 1251–71.
- Helpman, E. and P. Krugman (1985), *Market Structure and International Trade*. MIT Press.
- Holland, S., Ott S.H., and Riddiough T. (2000) The Role of Uncertainty in Investment: an Examination of Competing Investment Models Using Commercial Real Estate Dada, *Real Estate Economics*, 28(1) :33-64.
- Hoover, G. A., Giedeman D.C., and Dibooglu S. (2009) Income Inequality and the Business Cycle *Economic Systems*, 33(3): 278-292.

- Keynes, J. M. (1936) *The General Theory of Employment, Interest, and Money*, Macmillan, London.
- King, G., Keohane, R. O. and Verba, S. (1994) *Designing social inquiry: Scientific inference in qualitative research*, Princeton University Press, Princeton, NJ.
- Krebs, T. (2003) Human Capital Risk and Economic Growth, *Quarterly Journal of Economics*, 118(2), 709-744.
- Krugman, (1981) *International Trade and Income Distribution: A Reconsideration*, National Bureau of Economic Research, NBER Working Papers 0356.
- Kuznets, S. (1946) *National Product Since 1869*, National Bureau of Economic Research, New York.
- Kuznets, S. (1955) Economic growth and income inequality, *American Economic Review*, 34, 1–28.
- Maliar, L., Maliar S., and Mora J. (2005) Income and Wealth Distributions along the Business Cycle: Implications from the Neoclassical Growth Model, *The B.E. Journal of Macroeconomics*, 5(1): 15.
- Ondrich, J., Richardson, J. D. and Zhang, S. (2006) A further investigation of the link between trade and income, *International Economic Journal*, 20, 19–36.

- Palley, T. I. (2010) The Relative Permanent Income Theory of Consumption: A Synthetic Keynes–Duesenberry–Friedman Model, *Review of Political Economy*, 1, 41–56.
- Persson, T. and Tabellini, G. (1994) Is inequality harmful for growth?, *American Economic Review*, 84, 600–21.
- Ricardo, D. (1911), *Principles of Political Economy and Taxation*, Edited, with Introduction Essay, Notes and Appendices, by E.C.K. Gonner, M.A., London; G. Bell and Sons Ltd.
- Lionel Robbins (1938), Interpersonal Comparisons of Utility A Comment, *Economic Journal* 48: 635-41
- Sargan, J. D. (1958) The estimation of economic relationships using instrumental variables, *Econometrica*, 26, 393–415.
- Sakellaris, P., and A. Spilimbergo (2000): Business Cycles and Investment in Human Capital: International Evidence on Higher Education," *Carnegie Rochester Conference Series on Public Policy*, 52(1), 221-256.
- Samuelson (1947), *Foundations of Economic Analysis*, Cambridge, Mass.: Harvard University Press, p. 225.

Stein, L. C.D., and Stone E.C. (2012) The Effect of Uncertainty on Investment, Hiring, and R&D: Causal Evidence from Equity Options, Stanford University.

Strebulaev, I. A., Zhu H., and Zryumov P.(2012) Dynamic Information Asymmetry, Financing and Investment Decisions, Working Paper.
www.mit.edu/~zhuh/SZZ_DynamicMM.pdf(accessed 2014/05/04)

Stock, J. H., Wright, J. H. and Yogo, M. (2002) A survey of weak instruments and weak identification in generalized method of moments, *Journal of Business and Economic Statistics*, 4, 518–529.

Sun, P., Sen, S. and Jin, S. (2013) Equity market liberalization, credit constraints and income inequality, *Economics - The Open-Access, Open-Assessment E-Journal*, Kiel Institute for the World Economy, 7, 1-28.

Tanninen, H. (1999) Income inequality, government expenditures and growth, *Applied Economics*, 31, 1109–17.

Wei, M. (2003): “Human Capital, Business Cycles and Asset Pricing,” Manuscript, Columbia University.

World Bank (2011) World Development Indicators Online (WDI) database.
Available at: <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed 27 February 2011).

World Bank (2012) World Development Indicators Online (WDI) database.

Available at: <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed 15 December 2012).

Yan, B. (2007) International trade as determined by income and income distribution,

International Economic Journal, 21, 633–651.

APPENDICES

Appendix A: OLS Estimation of GDPs

Dependent Variable: LOG(ARG)

Method: Least Squares

Date: 03/10/11 Time: 12:32

Sample: 1 17

Included observations: 17

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.615894	2.284579	1.582740	0.1358
LOG(ARG1)	0.456563	0.253421	1.801600	0.0932
LOG(ARG2)	0.313536	0.093394	3.357127	0.0047
R-squared	0.861987	Mean dependent var		12.58925
Adjusted R-squared	0.842271	S.D. dependent var		0.159751
S.E. of regression	0.063445	Akaike info criterion		-2.518492
Sum squared resid	0.056354	Schwarz criterion		-2.371454
Log likelihood	24.40718	Hannan-Quinn criter.		-2.503876
F-statistic	43.71988	Durbin-Watson stat		0.390551
Prob(F-statistic)	0.000001			

Dependent Variable: LOG(AUS)

Method: Least Squares

Date: 03/10/11 Time: 12:44

Sample (adjusted): 1 44

Included observations: 44 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.465337	0.078050	5.962063	0.0000
LOG(AUS1)	0.804412	0.022405	35.90365	0.0000
LOG(AUS2)	0.218673	0.026330	8.305231	0.0000
R-squared	0.998691	Mean dependent var		12.94578
Adjusted R-squared	0.998627	S.D. dependent var		0.423405
S.E. of regression	0.015690	Akaike info criterion		-5.405828
Sum squared resid	0.010093	Schwarz criterion		-5.284179
Log likelihood	121.9282	Hannan-Quinn criter.		-5.360715
F-statistic	15636.15	Durbin-Watson stat		0.803510
Prob(F-statistic)	0.000000			

Dependent Variable: LOG(BEN)
Method: Least Squares
Date: 03/10/11 Time: 12:46
Sample (adjusted): 1 24
Included observations: 24 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.692239	0.337601	-2.050467	0.0530
LOG(BEN1)	0.995691	0.039210	25.39409	0.0000
LOG(BEN2)	0.075193	0.022505	3.341161	0.0031
R-squared	0.993277	Mean dependent var		14.02230
Adjusted R-squared	0.992636	S.D. dependent var		0.268302
S.E. of regression	0.023024	Akaike info criterion		-4.588121
Sum squared resid	0.011132	Schwarz criterion		-4.440864
Log likelihood	58.05745	Hannan-Quinn criter.		-4.549053
F-statistic	1551.195	Durbin-Watson stat		1.286335

Dependent Variable: LOG(BOL)
Method: Least Squares
Date: 03/10/11 Time: 12:51
Sample (adjusted): 1 36
Included observations: 36 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.287899	0.040729	7.068626	0.0000
LOG(BOL1)	0.985677	0.010323	95.48154	0.0000
LOG(BOL2)	0.015919	0.012246	1.299957	0.2026
R-squared	0.999299	Mean dependent var		7.158241
Adjusted R-squared	0.999256	S.D. dependent var		4.399394
S.E. of regression	0.119966	Akaike info criterion		-1.323562
Sum squared resid	0.474931	Schwarz criterion		-1.191602
Log likelihood	26.82411	Hannan-Quinn criter.		-1.277504
F-statistic	23518.14	Durbin-Watson stat		1.493339

Dependent Variable: LOG(BRA)

Method: Least Squares

Date: 03/10/11 Time: 12:56

Sample: 1 22

Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.671826	0.076935	8.732390	0.0000
LOG(BRA1)	0.778447	0.095736	8.131149	0.0000
LOG(BRA2)	0.229509	0.100066	2.293587	0.0334

R-squared	0.999873	Mean dependent var	12.29196
Adjusted R-squared	0.999860	S.D. dependent var	3.731021
S.E. of regression	0.044199	Akaike info criterion	-3.274119
Sum squared resid	0.037117	Schwarz criterion	-3.125341
Log likelihood	39.01531	Hannan-Quinn criter.	-3.239071
F-statistic	74811.87	Durbin-Watson stat	1.385208
Prob(F-statistic)	0.000000		

Dependent Variable: LOG(BUR)

Method: Least Squares

Date: 03/10/11 Time: 13:02

Sample (adjusted): 1 46

Included observations: 46 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.445659	0.288249	1.546089	0.1294
LOG(BUR1)	0.948996	0.032933	28.81636	0.0000
LOG(BUR2)	0.032035	0.017414	1.839586	0.0727

R-squared	0.985565	Mean dependent var	12.90953
Adjusted R-squared	0.984894	S.D. dependent var	0.374893
S.E. of regression	0.046077	Akaike info criterion	-3.253992
Sum squared resid	0.091295	Schwarz criterion	-3.134732
Log likelihood	77.84181	Hannan-Quinn criter.	-3.209316
F-statistic	1467.933	Durbin-Watson stat	1.149075
Prob(F-statistic)	0.000000		

Dependent Variable: LOG(CAN)
Method: Least Squares
Date: 03/10/11 Time: 13:04
Sample (adjusted): 1 40
Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.959249	0.096816	9.908007	0.0000
LOG(CAN1)	0.788170	0.023776	33.14998	0.0000
LOG(CAN2)	0.197752	0.026745	7.394052	0.0000
R-squared	0.997930	Mean dependent var		13.55988
Adjusted R-squared	0.997818	S.D. dependent var		0.334584
S.E. of regression	0.015628	Akaike info criterion		-5.407451
Sum squared resid	0.009037	Schwarz criterion		-5.280785
Log likelihood	111.1490	Hannan-Quinn criter.		-5.361653
F-statistic	8919.309	Durbin-Watson stat		0.765387

Dependent Variable: LOG(CHI)
Method: Least Squares
Date: 03/10/11 Time: 13:10
Sample: 1 45
Included observations: 45

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.420958	0.254312	1.655279	0.1053
LOG(CHI1)	0.639340	0.055223	11.57745	0.0000
LOG(CHI2)	0.392614	0.039703	9.888858	0.0000
R-squared	0.998853	Mean dependent var		14.97056
Adjusted R-squared	0.998798	S.D. dependent var		1.145205
S.E. of regression	0.039700	Akaike info criterion		-3.550600
Sum squared resid	0.066195	Schwarz criterion		-3.430156
Log likelihood	82.88850	Hannan-Quinn criter.		-3.505699
F-statistic	18285.79	Durbin-Watson stat		0.789246
Prob(F-statistic)	0.000000			

Dependent Variable: LOG(CHIL)

Method: Least Squares

Date: 03/10/11 Time: 13:12

Sample: 1 50

Included observations: 50

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.642354	0.059358	10.82166	0.0000
LOG(CHIL1)	0.752114	0.033013	22.78269	0.0000
LOG(CHIL2)	0.253545	0.031961	7.932993	0.0000
R-squared	0.999868	Mean dependent var		14.47497
Adjusted R-squared	0.999863	S.D. dependent var		4.128211
S.E. of regression	0.048402	Akaike info criterion		-3.160426
Sum squared resid	0.110109	Schwarz criterion		-3.045705
Log likelihood	82.01065	Hannan-Quinn criter.		-3.116740
F-statistic	178199.2	Durbin-Watson stat		0.875565

Dependent Variable: LOG(CONG)

Method: Least Squares

Date: 03/10/11 Time: 13:16

Sample: 1 36

Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.422216	2.072717	-0.686160	0.4974
LOG(CONG1)	0.618691	0.147013	4.208418	0.0002
LOG(CONG2)	0.564582	0.099208	5.690920	0.0000
R-squared	0.675159	Mean dependent var		14.45200
Adjusted R-squared	0.655472	S.D. dependent var		0.359185
S.E. of regression	0.210829	Akaike info criterion		-0.195884
Sum squared resid	1.466812	Schwarz criterion		-0.063924
Log likelihood	6.525905	Hannan-Quinn criter.		-0.149826
F-statistic	34.29406	Durbin-Watson stat		0.630565
Prob(F-statistic)	0.000000			

Dependent Variable: LOG(DEN)

Method: Least Squares

Date: 03/10/11 Time: 13:18

Sample: 1 40

Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.758637	0.271541	-10.15920	0.0000
LOG(DEN1)	1.210723	0.041211	29.37833	0.0000
LOG(DEN2)	0.052835	0.036467	1.448836	0.1558

R-squared	0.990292	Mean dependent var	13.81568
Adjusted R-squared	0.989767	S.D. dependent var	0.241508
S.E. of regression	0.024431	Akaike info criterion	-4.513909
Sum squared resid	0.022084	Schwarz criterion	-4.387243
Log likelihood	93.27819	Hannan-Quinn criter.	-4.468111
F-statistic	1887.063	Durbin-Watson stat	0.657592

Dependent Variable: LOG(EGY)

Method: Least Squares

Date: 03/10/11 Time: 13:21

Sample: 1 50

Included observations: 50

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.126595	0.098306	11.46014	0.0000
LOG(EGY1)	0.861431	0.023482	36.68487	0.0000
LOG(EGY2)	0.081317	0.020485	3.969599	0.0002

R-squared	0.997132	Mean dependent var	11.93806
Adjusted R-squared	0.997010	S.D. dependent var	0.761383
S.E. of regression	0.041631	Akaike info criterion	-3.461797
Sum squared resid	0.081459	Schwarz criterion	-3.347076
Log likelihood	89.54494	Hannan-Quinn criter.	-3.418111
F-statistic	8171.138	Durbin-Watson stat	0.729432
Prob(F-statistic)	0.000000		

Dependent Variable: LOG(FRA)

Method: Least Squares

Date: 03/10/11 Time: 14:13

Sample: 1 40

Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.506858	0.153123	3.310127	0.0021
LOG(FRA1)	0.937152	0.026309	35.62084	0.0000
LOG(FRA2)	0.072765	0.033736	2.156936	0.0376
R-squared	0.996701	Mean dependent var		13.92388
Adjusted R-squared	0.996523	S.D. dependent var		0.265122
S.E. of regression	0.015634	Akaike info criterion		-5.406725
Sum squared resid	0.009043	Schwarz criterion		-5.280059
Log likelihood	111.1345	Hannan-Quinn criter.		-5.360927
F-statistic	5589.375	Durbin-Watson stat		0.329725
Prob(F-statistic)	0.000000			

Dependent Variable: LOG(GAB)

Method: Least Squares

Date: 03/10/11 Time: 14:15

Sample: 1 40

Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.821833	0.995295	1.830445	0.0752
LOG(GAB1)	0.506687	0.051947	9.753877	0.0000
LOG(GAB2)	0.441026	0.062193	7.091299	0.0000
R-squared	0.831362	Mean dependent var		14.90794
Adjusted R-squared	0.822246	S.D. dependent var		0.308691
S.E. of regression	0.130147	Akaike info criterion		-1.168269
Sum squared resid	0.626713	Schwarz criterion		-1.041603
Log likelihood	26.36537	Hannan-Quinn criter.		-1.122470
F-statistic	91.20212	Durbin-Watson stat		1.054701

Dependent Variable: LOG(GAM)
Method: Least Squares
Date: 03/10/11 Time: 20:17
Sample (adjusted): 1 24
Included observations: 24 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.826888	0.381593	7.408116	0.0000
LOG(GAM1)	0.390643	0.065279	5.984236	0.0000
LOG(GAM2)	0.355013	0.085632	4.145780	0.0005
R-squared	0.911359	Mean dependent var		8.326953
Adjusted R-squared	0.902917	S.D. dependent var		0.236247
S.E. of regression	0.073610	Akaike info criterion		-2.263604
Sum squared resid	0.113787	Schwarz criterion		-2.116347
Log likelihood	30.16325	Hannan-Quinn criter.		-2.224537
F-statistic	107.9555	Durbin-Watson stat		1.028166
Prob(F-statistic)	0.000000			

Dependent Variable: LOG(GER)
Method: Least Squares
Date: 03/10/11 Time: 20:19
Sample: 1 40
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.275290	0.195543	-1.407821	0.1675
LOG(GER1)	0.909116	0.022441	40.51227	0.0000
LOG(GER2)	0.161351	0.032269	5.000234	0.0000
R-squared	0.996257	Mean dependent var		14.28124
Adjusted R-squared	0.996055	S.D. dependent var		0.251134
S.E. of regression	0.015774	Akaike info criterion		-5.388834
Sum squared resid	0.009207	Schwarz criterion		-5.262168
Log likelihood	110.7767	Hannan-Quinn criter.		-5.343035
F-statistic	4923.996	Durbin-Watson stat		0.529321

Dependent Variable: LOG(GUI)
Method: Least Squares
Date: 03/10/11 Time: 20:24
Sample: 1 24
Included observations: 24

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.732413	0.740571	5.039912	0.0001
LOG(GUI1)	0.550955	0.077417	7.116684	0.0000
LOG(GUI2)	0.242976	0.098512	2.466451	0.0223
R-squared	0.931704	Mean dependent var		15.39483
Adjusted R-squared	0.925200	S.D. dependent var		0.267946
S.E. of regression	0.073282	Akaike info criterion		-2.272524
Sum squared resid	0.112777	Schwarz criterion		-2.125267
Log likelihood	30.27029	Hannan-Quinn criter.		-2.233457
F-statistic	143.2426	Durbin-Watson stat		1.146464
Prob(F-statistic)	0.000000			

Dependent Variable: LOG(INDI)
Method: Least Squares
Date: 03/10/11 Time: 20:32
Sample: 1 50
Included observations: 50

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.405477	0.434060	-0.934149	0.3550
LOG(INDI1)	0.796846	0.057863	13.77127	0.0000
LOG(INDI2)	0.270532	0.033534	8.067491	0.0000
R-squared	0.999129	Mean dependent var		16.09916
Adjusted R-squared	0.999092	S.D. dependent var		0.728972
S.E. of regression	0.021965	Akaike info criterion		-4.740594
Sum squared resid	0.022676	Schwarz criterion		-4.625872
Log likelihood	121.5148	Hannan-Quinn criter.		-4.696907
F-statistic	26961.30	Durbin-Watson stat		0.476297
Prob(F-statistic)	0.000000			

Dependent Variable: LOG(INDO)
Method: Least Squares
Date: 03/10/11 Time: 20:35
Sample (adjusted): 1 31
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.213085	0.271697	8.145418	0.0000
LOG(INDO1)	0.667871	0.039758	16.79857	0.0000
LOG(INDO2)	0.259228	0.040948	6.330685	0.0000
R-squared	0.994055	Mean dependent var		20.78989
Adjusted R-squared	0.993631	S.D. dependent var		0.471415
S.E. of regression	0.037623	Akaike info criterion		-3.630659
Sum squared resid	0.039633	Schwarz criterion		-3.491886
Log likelihood	59.27522	Hannan-Quinn criter.		-3.585423
F-statistic	2341.053	Durbin-Watson stat		1.395847

Dependent Variable: LOG(IRE)
Method: Least Squares
Date: 03/10/11 Time: 20:39
Sample: 1 40
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.658517	0.238011	-11.16974	0.0000
LOG(IRE1)	1.272639	0.053563	23.75969	0.0000
LOG(IRE2)	0.038198	0.038604	0.989496	0.3288
R-squared	0.994564	Mean dependent var		10.94307
Adjusted R-squared	0.994270	S.D. dependent var		0.590646
S.E. of regression	0.044709	Akaike info criterion		-3.305223
Sum squared resid	0.073961	Schwarz criterion		-3.178557
Log likelihood	69.10446	Hannan-Quinn criter.		-3.259425
F-statistic	3384.713	Durbin-Watson stat		0.644476
Prob(F-statistic)	0.000000			

Dependent Variable: LOG(JAP)
Method: Least Squares
Date: 03/10/11 Time: 20:41
Sample: 1 40
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.999647	0.184003	5.432788	0.0000
LOG(JAP1)	0.772261	0.013207	58.47513	0.0000
LOG(JAP2)	0.214614	0.020761	10.33724	0.0000
R-squared	0.998685	Mean dependent var		19.73913
Adjusted R-squared	0.998614	S.D. dependent var		0.344355
S.E. of regression	0.012822	Akaike info criterion		-5.803285
Sum squared resid	0.006083	Schwarz criterion		-5.676619
Log likelihood	119.0657	Hannan-Quinn criter.		-5.757486
F-statistic	14046.58	Durbin-Watson stat		0.521557

Dependent Variable: LOG(KEN)
Method: Least Squares
Date: 03/10/11 Time: 20:46
Sample: 1 46
Included observations: 46

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.758220	0.137387	12.79759	0.0000
LOG(KEN1)	0.593389	0.034090	17.40650	0.0000
LOG(KEN2)	0.334784	0.035788	9.354588	0.0000
R-squared	0.994054	Mean dependent var		13.29338
Adjusted R-squared	0.993777	S.D. dependent var		0.580291
S.E. of regression	0.045776	Akaike info criterion		-3.267114
Sum squared resid	0.090105	Schwarz criterion		-3.147855
Log likelihood	78.14363	Hannan-Quinn criter.		-3.222439
F-statistic	3594.226	Durbin-Watson stat		0.875776
Prob(F-statistic)	0.000000			

Dependent Variable: LOG(MEX)

Method: Least Squares

Date: 03/10/11 Time: 21:03

Sample: 1 50

Included observations: 50

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.561381	0.060563	9.269423	0.0000
LOG(MEX1)	0.764075	0.033554	22.77159	0.0000
LOG(MEX2)	0.245520	0.032457	7.564567	0.0000
R-squared	0.999823	Mean dependent var		13.40712
Adjusted R-squared	0.999816	S.D. dependent var		2.237947
S.E. of regression	0.030361	Akaike info criterion		-4.093160
Sum squared resid	0.043325	Schwarz criterion		-3.978439
Log likelihood	105.3290	Hannan-Quinn criter.		-4.049474
F-statistic	133089.4	Durbin-Watson stat		0.827800
Prob(F-statistic)	0.000000			

Dependent Variable: LOG(MOR)

Method: Least Squares

Date: 03/10/11 Time: 21:06

Sample: 1 50

Included observations: 50

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.873690	0.255561	-3.418710	0.0013
LOG(MOR1)	1.028327	0.040908	25.13744	0.0000
LOG(MOR2)	0.087091	0.022784	3.822497	0.0004
R-squared	0.997344	Mean dependent var		12.34385
Adjusted R-squared	0.997231	S.D. dependent var		0.600041
S.E. of regression	0.031577	Akaike info criterion		-4.014639
Sum squared resid	0.046865	Schwarz criterion		-3.899917
Log likelihood	103.3660	Hannan-Quinn criter.		-3.970952
F-statistic	8823.195	Durbin-Watson stat		0.627925
Prob(F-statistic)	0.000000			

Dependent Variable: LOG(NEW)
Method: Least Squares
Date: 03/10/11 Time: 21:08
Sample (adjusted): 1 39
Included observations: 39 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.266465	0.177095	1.504650	0.1411
LOG(NEW1)	0.972649	0.034797	27.95229	0.0000
LOG(NEW2)	0.055355	0.033955	1.630213	0.1118
R-squared	0.991044	Mean dependent var		11.43913
Adjusted R-squared	0.990546	S.D. dependent var		0.252553
S.E. of regression	0.024556	Akaike info criterion		-4.501951
Sum squared resid	0.021707	Schwarz criterion		-4.373985
Log likelihood	90.78804	Hannan-Quinn criter.		-4.456038
F-statistic	1991.817	Durbin-Watson stat		0.780134

Dependent Variable: LOG(NOR)
Method: Least Squares
Date: 03/10/11 Time: 21:12
Sample: 1 40
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.979863	0.497396	-3.980457	0.0003
LOG(NOR1)	1.035833	0.053253	19.45101	0.0000
LOG(NOR2)	0.180641	0.072234	2.500769	0.0169
R-squared	0.976391	Mean dependent var		13.84586
Adjusted R-squared	0.975115	S.D. dependent var		0.370494
S.E. of regression	0.058445	Akaike info criterion		-2.769424
Sum squared resid	0.126385	Schwarz criterion		-2.642758
Log likelihood	58.38848	Hannan-Quinn criter.		-2.723626
F-statistic	765.1133	Durbin-Watson stat		0.621118
Prob(F-statistic)	0.000000			

Dependent Variable: LOG(PHI)
 Method: Least Squares
 Date: 03/10/11 Time: 21:26
 Sample: 1 50
 Included observations: 50

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.882711	0.169728	5.200753	0.0000
LOG(PHI1)	0.845692	0.030061	28.13251	0.0000
LOG(PHI2)	0.129409	0.030111	4.297723	0.0001
R-squared	0.992814	Mean dependent var		14.52275
Adjusted R-squared	0.992508	S.D. dependent var		0.530543
S.E. of regression	0.045921	Akaike info criterion		-3.265650
Sum squared resid	0.099112	Schwarz criterion		-3.150928
Log likelihood	84.64124	Hannan-Quinn criter.		-3.221963
F-statistic	3246.733	Durbin-Watson stat		0.225382
Prob(F-statistic)	0.000000			

Dependent Variable: LOG(SPA)
 Method: Least Squares
 Date: 03/10/11 Time: 21:47
 Sample: 1 40
 Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.689954	0.128945	-5.350746	0.0000
LOG(SPA1)	1.031070	0.026422	39.02244	0.0000
LOG(SPA2)	0.068424	0.020132	3.398866	0.0016
R-squared	0.998149	Mean dependent var		13.04033
Adjusted R-squared	0.998049	S.D. dependent var		0.336325
S.E. of regression	0.014857	Akaike info criterion		-5.508695
Sum squared resid	0.008167	Schwarz criterion		-5.382029
Log likelihood	113.1739	Hannan-Quinn criter.		-5.462897
F-statistic	9974.798	Durbin-Watson stat		0.606660
Prob(F-statistic)	0.000000			

Dependent Variable: LOG(SWE)
Method: Least Squares
Date: 03/10/11 Time: 21:49
Sample: 1 40
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.816375	0.150950	-5.408249	0.0000
LOG(SWE1)	1.021868	0.019219	53.17017	0.0000
LOG(SWE2)	0.095179	0.021743	4.377512	0.0001
R-squared	0.996754	Mean dependent var		14.40079
Adjusted R-squared	0.996579	S.D. dependent var		0.245609
S.E. of regression	0.014366	Akaike info criterion		-5.575884
Sum squared resid	0.007636	Schwarz criterion		-5.449218
Log likelihood	114.5177	Hannan-Quinn criter.		-5.530085
F-statistic	5681.273	Durbin-Watson stat		1.069933

Dependent Variable: LOG(THAI)
Method: Least Squares
Date: 03/10/11 Time: 21:52
Sample: 1 50
Included observations: 50

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.794850	0.117751	-6.750273	0.0000
LOG(THAI1)	0.995892	0.024085	41.34988	0.0000
LOG(THAI2)	0.101260	0.017808	5.686240	0.0000
R-squared	0.999163	Mean dependent var		14.46298
Adjusted R-squared	0.999127	S.D. dependent var		0.946413
S.E. of regression	0.027956	Akaike info criterion		-4.258236
Sum squared resid	0.036733	Schwarz criterion		-4.143515
Log likelihood	109.4559	Hannan-Quinn criter.		-4.214550
F-statistic	28054.98	Durbin-Watson stat		0.873848
Prob(F-statistic)	0.000000			

Dependent Variable: LOG(TUNI)
Method: Least Squares
Date: 03/10/11 Time: 21:54
Sample (adjusted): 1 49
Included observations: 49 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.207130	0.078459	15.38542	0.0000
LOG(TUNI1)	0.814497	0.039878	20.42452	0.0000
LOG(TUNI2)	0.120139	0.040136	2.993305	0.0044
R-squared	0.996399	Mean dependent var		9.480187
Adjusted R-squared	0.996243	S.D. dependent var		0.698607
S.E. of regression	0.042823	Akaike info criterion		-3.404235
Sum squared resid	0.084353	Schwarz criterion		-3.288409
Log likelihood	86.40375	Hannan-Quinn criter.		-3.360290
F-statistic	6364.519	Durbin-Watson stat		0.902709

Dependent Variable: LOG(TUR)
Method: Least Squares
Date: 03/10/11 Time: 21:58
Sample: 1 42
Included observations: 42

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.728660	0.063252	11.51993	0.0000
LOG(TUR1)	0.939396	0.045288	20.74270	0.0000
LOG(TUR2)	0.032472	0.044522	0.729342	0.4702
R-squared	0.999847	Mean dependent var		8.693329
Adjusted R-squared	0.999840	S.D. dependent var		3.555831
S.E. of regression	0.045038	Akaike info criterion		-3.293871
Sum squared resid	0.079108	Schwarz criterion		-3.169752
Log likelihood	72.17129	Hannan-Quinn criter.		-3.248376
F-statistic	127764.8	Durbin-Watson stat		1.511434
Prob(F-statistic)	0.000000			

Dependent Variable: LOG(UK)
Method: Least Squares
Date: 03/10/11 Time: 22:00
Sample (adjusted): 1 40
Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.757902	0.160501	10.95263	0.0000
LOG(UK1)	0.855376	0.029990	28.52248	0.0000
LOG(UK2)	0.051060	0.040470	1.261673	0.2150
R-squared	0.996018	Mean dependent var		13.51726
Adjusted R-squared	0.995803	S.D. dependent var		0.279269
S.E. of regression	0.018093	Akaike info criterion		-5.114556
Sum squared resid	0.012112	Schwarz criterion		-4.987890
Log likelihood	105.2911	Hannan-Quinn criter.		-5.068758
F-statistic	4627.329	Durbin-Watson stat		0.295150

Dependent Variable: LOG(US)
Method: Least Squares
Date: 03/10/11 Time: 22:02
Sample: 1 40
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.892269	0.045430	41.65270	0.0000
LOG(US1)	0.816620	0.012865	63.47526	0.0000
LOG(US2)	0.094610	0.014738	6.419224	0.0000
R-squared	0.999639	Mean dependent var		15.74328
Adjusted R-squared	0.999620	S.D. dependent var		0.356872
S.E. of regression	0.006957	Akaike info criterion		-7.026138
Sum squared resid	0.001791	Schwarz criterion		-6.899472
Log likelihood	143.5228	Hannan-Quinn criter.		-6.980339
F-statistic	51295.11	Durbin-Watson stat		0.994882
Prob(F-statistic)	0.000000			

Dependent Variable: LOG(ZAM)
Method: Least Squares
Date: 03/10/11 Time: 22:04
Sample: 1 40
Included observations: 40

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.566146	0.134541	11.64068	0.0000
LOG(ZAM1)	0.736345	0.032772	22.46856	0.0000
LOG(ZAM2)	0.206536	0.038966	5.300430	0.0000
R-squared	0.996596	Mean dependent var		14.53387
Adjusted R-squared	0.996412	S.D. dependent var		1.863151
S.E. of regression	0.111599	Akaike info criterion		-1.475780
Sum squared resid	0.460806	Schwarz criterion		-1.349114
Log likelihood	32.51559	Hannan-Quinn criter.		-1.429981
F-statistic	5416.681	Durbin-Watson stat		1.115131

Appendix B: Dating the Business Cycles

GDP						Consumption						Investment					
CTS			ETS			CTS			ETS			CTS			ETS		
DUR	AMP	CUM	DUR	AMP	CUM	DUR	AMP	CUM	DUR	AMP	CUM	DUR	AMP	CUM	DUR	AMP	CUM
2.5	11.39	13.78	3	16.62	16.3	1.5	17.2	11.4	1	0.19	0.09	2	71.22	116.78	3	27.18	40.06
1	1.8	0.9	7	26.14	17.6	1	1.81	0.91	2	13.8	13.03	1.5	9.53	7.96	4.2	23.68	64.24
3	16.09	18.05	3	19.68	15.36	1	11.29	5.65	2.5	11.4	17.95	2.33	18.62	29.57	1.5	9.91	28.49
1	2.94	1.47	8	27.85	128	1	0.62	0.31	5	18.85	77.79	2	10.86	19.39	3.67	21.33	44.73
1	7.32	3.66	9	21.62	21.87	1.2	6.46	6.23	5.5	34.09	156.76	1.14	14.28	13.29	3.33	39.77	104.37
1	1.21	0.99	4.4	15.57	27.11	1.25	2.13	3.79	6.25	16.64	43.88	2.14	10.83	10	2.71	18.41	34.58
1	2.02	1.01	17	28.78	116.51	1	1.24	0.62	10.5	32.72	140.87	1.83	5.96	5.44	3.4	13.68	34.15
1.25	0.87	0.57	8	21.21	86.77	1	0.63	0.32	7.33	15.82	57.13	2.5	9.21	17.27	3.6	15.5	36.68
1.17	8.2	4.48	2.6	33.12	17.48	1	6.63	3.31	2.8	16.07	26.5	2.17	21.8	27.08	3.5	27.69	70.18
1	0.65	0.32	21	29.97	132.65	1.25	2.64	3.59	4.67	20.29	58.21	2	11.9	33.88	4.6	48.48	77.64
1.25	1.3	1.18	7.25	16.84	177.64	1	0.88	0.44	23	30.52	114.74	1.75	8.63	13.44	4	19.13	62.21
1	4.21	2.11	12	14.7	403.22	1.5	9.73	5.52	10	12.01	166.11	2.25	25.94	36.86	6	72.41	85.88
1.5	6.6	3.3	4.75	14.41	56.65	1	6.34	3.17	4.5	25.17	65.05	1.4	11.09	9.07	2.75	25.32	52.66
1.04	3.46	6.56	5.5	21.63	72.02	1.25	3.56	8.44	5.75	18.08	72.06	2.4	18.57	28.68	3.6	27.3	69.6
1	0.4	0.2	4	20.96	58.5	1.75	4.27	3.48	7.33	26.44	35.99	1.2	11	27.42	3.8	23.17	46.69
1.33	13.89	4.48	2.75	12.2	43.24	1	11.04	3.52	2.33	18.01	28.71	2.14	20.6	11.45	2	22.63	27.59
1	1.78	0.89	5	15.64	63.49	1	2.06	1.03	4	14.84	48.05	1.8	9.44	9.23	4.8	28.83	26.47
1.1	2.14	1.82	8.67	15.4	145.26	1	0.73	0.37	4.6	13.19	66.53	1.17	10.21	13.72	3.4	18.07	42.39
1	9.05	4.52	2.5	15.2	29.84	1.33	8.68	4.37	3.33	23.96	57.1	1.33	29.03	18.6	3.33	38.06	92.41
1.33	1.84	1.14	7	12.66	80.99	1.33	1.56	1.23	6.5	10.18	83.74	1.8	9.95	15.38	4.8	22.02	76.88
1	0.88	0.44	7.5	26.07	152.64	0	0	0	0	0	0	1.6	7.78	5.54	5	31.6	89.28
1	2.15	1.08	1	2.74	1.37	1	1.99	0.99	4.33	20.25	63.74	1	8.99	4.5	4.67	53.39	42.75
1	2.42	1.21	1	3.4	201.7	1.33	1.31	1.14	1	3.4	1.7	1.8	19.03	23.56	2.5	33.05	52.42
1.71	5.49	11.89	3.33	14.73	42.34	1.5	10.36	12.78	3.43	19.04	41.03	1.22	23.84	18.56	1.5	33.33	63.78
1	1.8	0.9	4	28.3	11.84	2	8.05	4.03	1	7.73	3.86	1.5	6.22	3.11	5.5	61.23	94.83
1.25	3	4.3	4.4	27.57	87.11	1.55	14.14	13.4	1.3	15.27	12.99	2.17	36.3	94.34	2.17	51.74	77.62
1.83	13.13	18.06	3	15.45	32.43	1.6	17.24	14.22	1.78	25.38	25.04	1.45	34.88	44.26	1.7	39.72	47.06
1	1.4	0.7	7.5	28.99	100	1.5	5.68	5.81	4	38.99	79.91	1.2	11.83	6.36	2.5	26.37	45.87
1.5	1.22	1.03	7	11.32	28.08	1.5	10.13	7.38	12	71.63	29.86	1.8	12.56	14.05	2	18.51	25.14
1.25	2.84	2.09	4.67	29.77	11.58	1	3.75	1.88	5	23.65	88.71	2	6.04	3.02	8	67.08	88.64
1	15.86	8.84	0	0	0	2.75	10.12	13.06	1	10.82	5.41	1.71	17.74	21.1	2	26.51	38.21
1	4.11	2.06	5.33	21.71	98.24	1.14	5.72	1.93	3.67	27.29	69.72	1.63	13.46	15.43	2.57	25.61	31.38
1.17	3.29	2.28	2	14.44	17.62	1.17	3.77	2.49	2.4	14.55	21.35	1.33	9.58	7.03	2	14.02	18.08
1.25	4.34	4.27	6.67	30.3	104.04	2	2.57	2.59	0	0	0	1.33	22.53	19.42	2.8	24.27	35.08
1	1.53	0.77	12	26.82	46.28	1	2.99	1.5	8	51.41	41.04	2.25	12.86	22.26	4	34.16	58.13
1.25	9.51	7.2	6.33	23.65	26.29	1.67	10.46	10.32	4.2	49.25	90.06	1.5	13.07	11.97	4.33	105.44	52.58

Appendix C: Estimation of Random Walk Models

GDP			Consumption			Investment		
μ	σ	μ/σ	μ	σ	μ/σ	μ	σ	μ/σ
9686.81	17422.81	0.555984368	3881.438	15348.48	0.252887452	2310.375	8653.657	0.266982502
16076.05	10337.52	1.555116701	8354.564	4911.57	1.700996626	4173	7907.367	0.527735718
74461.24	306098.2	0.24325932	45782	184050.1	0.248747488	12457.62	60337.75	0.206464775
21853.67	17836.5	1.225221876	13168.54	8139.146	1.6179265	4726.846	10194.32	0.463674478
142854	1570751	0.090946305	854625.2	1195670	0.714766783	306202.4	802042.1	0.381778463
18090.38	23883.11	0.757454955	7490.256	13412.24	0.558464209	2112.59	16869.51	0.12523126
24298	20369.85	1.192841381	14368.55	9609.664	1.495218771	4432.641	11509.07	0.385143283
30179.03	33593.54	0.898358137	18229	15115.7	1.205964659	2817.821	18365.65	0.153428874
3221.974	6879.57	0.468339446	2434.795	4016.063	0.606264145	448.1026	3100.916	0.144506526
2945.41	3904.265	0.75440832	1325.282	1890.571	0.700995625	407.2051	2798.453	0.145510788
8759279	9934965	0.881661787	5749732	3622342	1.587296837	1093670	6420461	0.170341351
12207.18	11293.49	1.080904131	5980.256	7083.001	0.844311048	2480.744	12148.7	0.204198309
156825.3	305716.9	0.512975567	105716.3	193417.2	0.546571349	34226.79	75336.86	0.454316652
2134.5	2616.03	0.81593101	1152.658	1797.386	0.641296861	440.4737	1790.576	0.245995534
31652.72	19469.1	1.625792666	12082.69	21803.4	0.554165405	6162.564	21933.77	0.28096237
20825.26	47869.07	0.435046263	12828.69	30247.32	0.424126501	4493.256	19209.94	0.233902657
13684.51	13298.59	1.029019618	7383.692	8382.123	0.880885666	3148.051	11162.73	0.282014436
36300.51	47548.7	0.763438538	16922.7	16465.98	1.027737189	4802.744	27148.45	0.176906748
5726.41	13211.51	0.433440992	4096.59	9234.662	0.443610172	965.8462	4712.852	0.204938793
16511.54	17396.92	0.949107083	11325.82	10530.6	1.075515165	1843.538	9687.081	0.190308928
194634.2	158434	1.228487572	145232.9	97072.85	1.496122757	26568.56	95517.85	0.278152827
46448.74	34123.39	1.361199459	33359.35	39877.77	0.836540007	12635.3	38114.73	0.331507005
2503	5504	0.454760174	1219.282	3616.115	0.337180095	412.4828	1299.998	0.31729495
8902.949	22997.91	0.387119917	7702.629	34561.45	0.222867646	2032.538	15287.68	0.132952678
602246.1	650735.7	0.925484955	209036.6	193632.5	1.079553277	279309	408289.1	0.684096147
68795.71	104125.3	0.660701194	26133.74	131477.1	0.19877028	14273.2	131630.4	0.108433918
78750.13	288120.4	0.273323687	33706.38	192663.7	0.174949303	21772.15	306647.5	0.071000579
197.82	157.75	1.254009509	187.61	338.22	0.554698125	37.17	122.44	0.303577262
173139.8	77438.25	2.235843398	307983.1	738056.7	0.417289214	46239.09	146545.9	0.31552633
269.18	255.12	1.05511132	464694.8	481746.5	0.964604413	311155.3	416166.8	0.747669684
879482.6	875946.2	1.004037234	200.45	286.59	0.699431243	29.64	259.99	0.114004385
29295.33	26345.68	1.111959532	24666.51	31879.81	0.773734536	5908.744	15719.45	0.375887452
12522.41	14518.07	0.86253958	6605.231	9389.581	0.703463871	4351.359	7340.333	0.592801308
97609.97	93855.01	1.040008093	74366.28	54661.88	1.360477905	13384.31	67449.06	0.198435827
875.4872	568.5298	1.539914355	547.0769	366.2258	1.493824029	234.4103	362.1392	0.647293361
410353.5	757125.1	0.541989032	243770.4	674087.6	0.36163015	84574.18	188276.8	0.449201282

Appendix D: Endogeneity Test Result

Dependent Variable: Gini
 Method: Least Squares
 Date: 03/30/13 Time: 09:25
 Sample: 1 36
 Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TL	-0.461872	0.071664	-6.444955	0.0000
UPOP	0.189597	0.066646	2.844860	0.0076
C	38.39357	3.225123	11.90453	0.0000
R-squared	0.593981	Mean dependent var		40.22528
Adjusted R-squared	0.569373	S.D. dependent var		9.083354
S.E. of regression	5.960692	Akaike info criterion		6.487905
Sum squared resid	1172.485	Schwarz criterion		6.619865
Log likelihood	-113.7823	Hannan-Quinn criter.		6.533963
F-statistic	24.13846	Durbin-Watson stat		2.473871
Prob(F-statistic)	0.000000			

Dependent Variable: DUR
 Method: Least Squares
 Date: 03/30/13 Time: 10:11
 Sample: 1 36
 Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI	0.030807	0.001662	18.53846	0.0000
RES	-0.021158	0.012000	-1.763130	0.0869
R-squared	0.143991	Mean dependent var		1.248056
Adjusted R-squared	0.118814	S.D. dependent var		0.433509
S.E. of regression	0.409452	Akaike info criterion		1.131662
Sum squared resid	5.532485	Schwarz criterion		1.263622
Log likelihood	-17.36991	Hannan-Quinn criter.		1.177719
F-statistic	3.116826	Durbin-Watson stat		2.053201
Prob(F-statistic)	0.057559			

Dependent Variable: AMP
Method: Least Squares
Date: 03/30/13 Time: 10:12
Sample: 1 36
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI	0.356157	0.091163	3.906834	0.0004
RES	-0.217545	0.143068	-1.520565	0.1379
C	-9.545134	3.720640	-2.565455	0.0150
R-squared	0.337930	Mean dependent var		4.781389
Adjusted R-squared	0.297805	S.D. dependent var		4.505616
S.E. of regression	3.775576	Akaike info criterion		5.574638
Sum squared resid	470.4141	Schwarz criterion		5.706598
Log likelihood	-97.34349	Hannan-Quinn criter.		5.620696
F-statistic	8.421839	Durbin-Watson stat		2.200317
Prob(F-statistic)	0.001109			

Dependent Variable: CUM
Method: Least Squares
Date: 03/30/13 Time: 10:16
Sample: 1 36
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI	0.322157	0.104175	3.092474	0.0040
RES	-0.291412	0.163489	-1.782454	0.0839
C	-9.026917	4.251701	-2.123131	0.0413
R-squared	0.225769	Mean dependent var		3.931944
Adjusted R-squared	0.178846	S.D. dependent var		4.761194
S.E. of regression	4.314477	Akaike info criterion		5.841485
Sum squared resid	614.2856	Schwarz criterion		5.973445
Log likelihood	-102.1467	Hannan-Quinn criter.		5.887542
F-statistic	4.811467	Durbin-Watson stat		2.373391
Prob(F-statistic)	0.014668			

Appendix E: Omitted Variable Test

Omitted Variables Test
 Equation: UNTITLED
 Specification: DUR GINI C
 Omitted Variables: RIR IR

	Value	df	Probability
F-statistic	12.69816	(2, 32)	0.0001
Likelihood ratio	21.03279	2	0.0000

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	2.505889	2	1.252944
Restricted SSR	5.663372	34	0.166570
Unrestricted SSR	3.157483	32	0.098671
Unrestricted SSR	3.157483	32	0.098671

LR test summary:

	Value	df
Restricted LogL	-17.79080	34
Unrestricted LogL	-7.274401	32

Unrestricted Test Equation:
 Dependent Variable: DUR
 Method: Least Squares
 Date: 03/31/13 Time: 17:30
 Sample: 1 36
 Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI	0.001434	0.006894	0.207931	0.8366
C	0.964976	0.270420	3.568428	0.0012
RIR	0.025594	0.009080	2.818791	0.0082
IR	0.001440	0.000829	1.737072	0.0920
R-squared	0.519962	Mean dependent var		1.248056
Adjusted R-squared	0.474958	S.D. dependent var		0.433509
S.E. of regression	0.314120	Akaike info criterion		0.626356
Sum squared resid	3.157483	Schwarz criterion		0.802302
Log likelihood	-7.274401	Hannan-Quinn criter.		0.687766
F-statistic	11.55378	Durbin-Watson stat		2.170703
Prob(F-statistic)	0.000027			

Omitted Variables Test
Equation: UNTITLED
Specification: AMP GINI C
Omitted Variables: RIR IR

	Value	df	Probability
F-statistic	1.417880	(2, 32)	0.2570
Likelihood ratio	3.056707	2	0.2169

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	40.97644	2	20.48822
Restricted SSR	503.3732	34	14.80510
Unrestricted SSR	462.3968	32	14.44990
Unrestricted SSR	462.3968	32	14.44990

LR test summary:

	Value	df
Restricted LogL	-98.56242	34
Unrestricted LogL	-97.03407	32

Unrestricted Test Equation:
Dependent Variable: AMP
Method: Least Squares
Date: 03/31/13 Time: 17:32
Sample: 1 36
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI	0.220803	0.083433	2.646470	0.0125
C	-5.101145	3.272476	-1.558803	0.1289
RIR	0.156032	0.109880	1.420020	0.1653
IR	-0.000976	0.010033	-0.097295	0.9231

R-squared	0.349214	Mean dependent var	4.781389
Adjusted R-squared	0.288203	S.D. dependent var	4.505616
S.E. of regression	3.801302	Akaike info criterion	5.613004
Sum squared resid	462.3968	Schwarz criterion	5.788950
Log likelihood	-97.03407	Hannan-Quinn criter.	5.674414
F-statistic	5.723763	Durbin-Watson stat	2.359582
Prob(F-statistic)	0.002973		

Omitted Variables Test
Equation: UNTITLED
Specification: CUM GINI C
Omitted Variables: RIR IR

	Value	df	Probability
F-statistic	3.915704	(2, 32)	0.0301
Likelihood ratio	7.881114	2	0.0194

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	132.4051	2	66.20257
Restricted SSR	673.4272	34	19.80668
Unrestricted SSR	541.0220	32	16.90694
Unrestricted SSR	541.0220	32	16.90694

LR test summary:

	Value	df
Restricted LogL	-103.8013	34
Unrestricted LogL	-99.86073	32

Unrestricted Test Equation:
Dependent Variable: CUM
Method: Least Squares
Date: 03/31/13 Time: 17:33
Sample: 1 36
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI	0.095401	0.090248	1.057093	0.2984
C	-1.636278	3.539782	-0.462254	0.6470
RIR	0.224954	0.118855	1.892676	0.0675
IR	0.006115	0.010853	0.563481	0.5770

R-squared	0.318109	Mean dependent var	3.931944
Adjusted R-squared	0.254181	S.D. dependent var	4.761194
S.E. of regression	4.111805	Akaike info criterion	5.770040
Sum squared resid	541.0220	Schwarz criterion	5.945987
Log likelihood	-99.86073	Hannan-Quinn criter.	5.831450
F-statistic	4.976097	Durbin-Watson stat	2.456398
Prob(F-statistic)	0.006032		

Appendix F: Estimation of Amplitude of Recessions

Dependent Variable: AMP
Method: Least Squares
Date: 04/01/13 Time: 15:10
Sample: 1 36
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI	0.267830	0.071602	3.740535	0.0007
C	-5.992143	2.950741	-2.030725	0.0502
R-squared	0.291543	Mean dependent var		4.781389
Adjusted R-squared	0.270706	S.D. dependent var		4.505616
S.E. of regression	3.847739	Akaike info criterion		5.586801
Sum squared resid	503.3732	Schwarz criterion		5.674774
Log likelihood	-98.56242	Hannan-Quinn criter.		5.617506
F-statistic	13.99160	Durbin-Watson stat		2.356323
Prob(F-statistic)	0.000677			

Appendix G: Omitted Variable Test

Omitted Variables Test
 Equation: UNTITLED
 Specification: DUR C GINI RIR IR
 Instrument specification: GINI TL UPOP
 Omitted Variables: RIR IR

	Value	df	Probability
Difference in J-stats	2.413994	2	0.2991

J-statistic summary:

	Value
Restricted J-statistic	2.413994
Unrestricted J-statistic	2.00E-38

Restricted Test Equation:
 Dependent Variable: DUR
 Method: Two-Stage Least Squares
 Date: 03/31/13 Time: 18:43
 Sample: 1 36
 Included observations: 36
 Instrument specification: GINI TL UPOP
 Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.532345	0.312985	1.700864	0.0981
GINI	0.017793	0.007595	2.342721	0.0251
R-squared	0.138986	Mean dependent var		1.248056
Adjusted R-squared	0.113662	S.D. dependent var		0.433509
S.E. of regression	0.408130	Sum squared resid		5.663372
F-statistic	5.488341	Durbin-Watson stat		2.188950
Prob(F-statistic)	0.025134	Second-Stage SSR		5.663372
J-statistic	2.413994	Instrument rank		4
Prob(J-statistic)	0.299094			

Omitted Variables Test
Equation: UNTITLED
Specification: AMP C GINI RIR IR
Instrument specification: GINI TL UPOP
Omitted Variables: RIR IR

	Value	df	Probability
Difference in J-stats	5.777965	2	0.0556

J-statistic summary:

	Value
Restricted J-statistic	5.777965
Unrestricted J-statistic	2.80E-37

Restricted Test Equation:
Dependent Variable: AMP
Method: Two-Stage Least Squares
Date: 03/31/13 Time: 18:54
Sample: 1 36
Included observations: 36
Instrument specification: GINI TL UPOP
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.992143	2.950741	-2.030725	0.0502
GINI	0.267830	0.071602	3.740535	0.0007

R-squared	0.291543	Mean dependent var	4.781389
Adjusted R-squared	0.270706	S.D. dependent var	4.505616
S.E. of regression	3.847739	Sum squared resid	503.3732
F-statistic	13.99160	Durbin-Watson stat	2.356323
Prob(F-statistic)	0.000677	Second-Stage SSR	503.3732
J-statistic	5.777965	Instrument rank	4
Prob(J-statistic)	0.055633		

Omitted Variables Test
Equation: UNTITLED
Specification: CUM C GINI RIR IR
Instrument specification: GINI TL UPOP
Omitted Variables: RIR IR

	Value	df	Probability
Difference in J-stats	4.630676	2	0.0987

J-statistic summary:

	Value
Restricted J-statistic	4.630676
Unrestricted J-statistic	0.000000

Restricted Test Equation:
Dependent Variable: CUM
Method: Two-Stage Least Squares
Date: 03/31/13 Time: 18:56
Sample: 1 36
Included observations: 36
Instrument specification: GINI TL UPOP
Constant added to instrument list

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.267513	3.412961	-1.250384	0.2197
GINI	0.203838	0.082818	2.461277	0.0191

R-squared	0.151228	Mean dependent var	3.931944
Adjusted R-squared	0.126264	S.D. dependent var	4.761194
S.E. of regression	4.450470	Sum squared resid	673.4272
F-statistic	6.057884	Durbin-Watson stat	2.452886
Prob(F-statistic)	0.019076	Second-Stage SSR	673.4272
J-statistic	4.630676	Instrument rank	4
Prob(J-statistic)	0.098733		

Appendix H: Endogeneity Test Result

Dependent Variable: DUR1
 Method: Least Squares
 Date: 03/31/13 Time: 13:52
 Sample: 1 36
 Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI	-0.219248	0.098726	-2.220762	0.0333
RES	0.269485	0.194939	1.739300	0.1113
C	14.90681	4.029345	3.699562	0.0008
R-squared	0.134058	Mean dependent var		6.087500
Adjusted R-squared	0.081576	S.D. dependent var		4.266565
S.E. of regression	4.088838	Akaike info criterion		5.734054
Sum squared resid	551.7137	Schwarz criterion		5.866014
Log likelihood	-100.2130	Hannan-Quinn criter.		5.780112
F-statistic	2.554389	Durbin-Watson stat		2.093370
Prob(F-statistic)	0.093018			

Dependent Variable: AMP1
 Method: Least Squares
 Date: 03/31/13 Time: 13:53
 Sample: 1 36
 Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI	-0.718329	0.519024	-1.384001	0.1756
RES	1.073456	0.814543	1.317863	0.1966
C	55.65776	21.18303	2.627469	0.0130
R-squared	0.063444	Mean dependent var		26.76278
Adjusted R-squared	0.006683	S.D. dependent var		21.56798
S.E. of regression	21.49580	Akaike info criterion		9.053247
Sum squared resid	15248.29	Schwarz criterion		9.185207
Log likelihood	-159.9584	Hannan-Quinn criter.		9.099305
F-statistic	1.117735	Durbin-Watson stat		1.782474
Prob(F-statistic)	0.339085			

Dependent Variable: CUM1
Method: Least Squares
Date: 03/31/13 Time: 13:55
Sample: 1 36
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI	3.567547	1.088941	3.276161	0.0024
RES	-1.609877	7.863355	-0.204732	0.8390
R-squared	-0.036377	Mean dependent var		153.8906
Adjusted R-squared	-0.066859	S.D. dependent var		258.1685
S.E. of regression	266.6593	Akaike info criterion		14.06377
Sum squared resid	2417644.	Schwarz criterion		14.15175
Log likelihood	-251.1479	Hannan-Quinn criter.		14.09448
Durbin-Watson stat	1.606052			

Appendix I: Omitted Variable Test

Omitted Variables Test
 Equation: UNTITLED
 Specification: DUR1 GINI C
 Omitted Variables: RIR IR

	Value	df	Probability
F-statistic	0.597473	(2, 32)	0.5562
Likelihood ratio	1.319821	2	0.5169

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	21.68112	2	10.84056
Restricted SSR	602.2902	34	17.71442
Unrestricted SSR	580.6091	32	18.14403
Unrestricted SSR	580.6091	32	18.14403

LR test summary:

	Value	df
Restricted LogL	-101.7918	34
Unrestricted LogL	-101.1318	32

Unrestricted Test Equation:
 Dependent Variable: DUR1
 Method: Least Squares
 Date: 03/31/13 Time: 17:34
 Sample: 1 36
 Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI	-0.056475	0.093492	-0.604068	0.5501
C	8.902780	3.667001	2.427810	0.0210
RIR	-0.038668	0.123127	-0.314050	0.7555
IR	-0.007478	0.011243	-0.665117	0.5107
R-squared	0.088705	Mean dependent var		6.087500
Adjusted R-squared	0.003271	S.D. dependent var		4.266565
S.E. of regression	4.259581	Akaike info criterion		5.840658
Sum squared resid	580.6091	Schwarz criterion		6.016605
Log likelihood	-101.1318	Hannan-Quinn criter.		5.902068
F-statistic	1.038288	Durbin-Watson stat		2.146817
Prob(F-statistic)	0.388870			

Omitted Variables Test
Equation: UNTITLED
Specification: AMP1 GINI C
Omitted Variables: RIR IR

	Value	df	Probability
F-statistic	0.717325	(2, 32)	0.4957
Likelihood ratio	1.578848	2	0.4541

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	688.7246	2	344.3623
Restricted SSR	16050.79	34	472.0821
Unrestricted SSR	15362.07	32	480.0646
Unrestricted SSR	15362.07	32	480.0646

LR test summary:

	Value	df
Restricted LogL	-160.8817	34
Unrestricted LogL	-160.0923	32

Unrestricted Test Equation:
Dependent Variable: AMP1
Method: Least Squares
Date: 03/31/13 Time: 17:35
Sample: 1 36
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI	0.007109	0.480901	0.014783	0.9883
C	29.90859	18.86227	1.585631	0.1227
RIR	-0.322482	0.633338	-0.509178	0.6141
IR	-0.033599	0.057832	-0.580983	0.5653

R-squared	0.056455	Mean dependent var	26.76278
Adjusted R-squared	-0.032002	S.D. dependent var	21.56798
S.E. of regression	21.91038	Akaike info criterion	9.116237
Sum squared resid	15362.07	Schwarz criterion	9.292183
Log likelihood	-160.0923	Hannan-Quinn criter.	9.177647
F-statistic	0.638221	Durbin-Watson stat	1.835810
Prob(F-statistic)	0.595951		

Omitted Variables Test
Equation: UNTITLED
Specification: CUM1 GINI C
Omitted Variables: RIR IR

	Value	df	Probability
F-statistic	1.124528	(2, 32)	0.3373
Likelihood ratio	2.445232	2	0.2945

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	152190.8	2	76095.39
Restricted SSR	2317590.	34	68164.41
Unrestricted SSR	2165399.	32	67668.73
Unrestricted SSR	2165399.	32	67668.73

LR test summary:

	Value	df
Restricted LogL	-250.3871	34
Unrestricted LogL	-249.1645	32

Unrestricted Test Equation:
Dependent Variable: CUM1
Method: Least Squares
Date: 03/31/13 Time: 17:35
Sample: 1 36
Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GINI	0.379695	5.709522	0.066502	0.9474
C	199.5659	223.9433	0.891145	0.3795
RIR	-9.819739	7.519341	-1.305931	0.2009
IR	0.114399	0.686608	0.166615	0.8687

R-squared	0.071753	Mean dependent var	153.8906
Adjusted R-squared	-0.015270	S.D. dependent var	258.1685
S.E. of regression	260.1321	Akaike info criterion	14.06470
Sum squared resid	2165399.	Schwarz criterion	14.24064
Log likelihood	-249.1645	Hannan-Quinn criter.	14.12611
F-statistic	0.824530	Durbin-Watson stat	1.775078
Prob(F-statistic)	0.490077		

Appendix J: OLS Estimations: Expansion

Dependent Variable: DUR1
 Method: Least Squares
 Date: 03/14/14 Time: 21:15
 Sample: 1 36
 Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.50551	3.227668	3.254831	0.0026
GINI	-0.109832	0.078322	-1.402313	0.1699
R-squared	0.054675	Mean dependent var		6.087500
Adjusted R-squared	0.026872	S.D. dependent var		4.266565
S.E. of regression	4.208850	Akaike info criterion		5.766209
Sum squared resid	602.2902	Schwarz criterion		5.854182
Log likelihood	-101.7918	Hannan-Quinn criter.		5.796914
F-statistic	1.966481	Durbin-Watson stat		2.200726
Prob(F-statistic)	0.169887			

Dependent Variable: AMP1
 Method: Least Squares
 Date: 03/14/14 Time: 21:15
 Sample: 1 36
 Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	38.12583	16.66227	2.288153	0.0285
GINI	-0.282485	0.404323	-0.698662	0.4895
R-squared	0.014154	Mean dependent var		26.76278
Adjusted R-squared	-0.014842	S.D. dependent var		21.56798
S.E. of regression	21.72745	Akaike info criterion		9.048983
Sum squared resid	16050.79	Schwarz criterion		9.136956
Log likelihood	-160.8817	Hannan-Quinn criter.		9.079688
F-statistic	0.488129	Durbin-Watson stat		1.880562
Prob(F-statistic)	0.489515			

Dependent Variable: CUM1
 Method: Least Squares
 Date: 03/14/14 Time: 21:11
 Sample: 1 36
 Included observations: 36

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	246.1593	200.2185	1.229453	0.2273
GINI	-2.293800	4.858459	-0.472125	0.6399
R-squared	0.006513	Mean dependent var		153.8906
Adjusted R-squared	-0.022707	S.D. dependent var		258.1685
S.E. of regression	261.0832	Akaike info criterion		14.02151
Sum squared resid	2317590.	Schwarz criterion		14.10948
Log likelihood	-250.3871	Hannan-Quinn criter.		14.05221
F-statistic	0.222902	Durbin-Watson stat		1.682888
Prob(F-statistic)	0.639854			