LONG TERM ECONOMIC IMPACT OF CRISES - ARE THERE BENEFICIAL EFFECTS OF CRISES IN THE LONG TERM?

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ABSTRACT: Countries which endure more frequent and more severe crises appear to perform better economically than countries which are less affected by crises. This paper provides empirical support for this statement. To do so this thesis documents the relationship between certain types of crises and the economy. There are five different crisis types defined, which are economic crises, currency crises, banking crises, sudden stops and sovereign debt crises. Whenever a crisis event occurs a single type or multiple types can be applied to it. It is found that economic crises and banking crises have a positive relationship with long term economic development. Meanwhile debt crises appear to have a negative impact on the economy on the long run, while sudden stops and currency crises give mixed results. Two mechanisms, "learning by mistake" and "purging of the economy", are coined in this thesis as ways to improve future growth via crises. These mechanisms appear to be especially prevalent in economic and banking crises, while for the other types of crises these mechanisms are not strong enough to overcome the initial loss due to a crisis event in the long run.

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Chapter 1 Introduction

1.1 Introduction to main theme

An extensive amount of research has gone into determining the causes and short term effects of specific economic crises. The results often indicate poor practices and policies as the cause and economic decline as the consequence (Furceri, 2012; Radelet, 2000). However it is also possible that crises are in a way related to higher levels of economic activity and welfare. This is suggested by the notion that parts of the worlds that seem to have crises relatively often, such as North and South America, Western Europe and East Asia, generally enjoy higher and more explosive growth than countries that endure little or no crises such as those in Eastern Europe and in the Middle Eastern. This could suggest that crises in the long run somehow have a positive impact on the future well being of the affected populations. Another possibility is that crises are symptoms of economic (over)growth and thus a correction for excessive investments or risk taking. If overgrowth were to be observed it might be possible to predict crises. The goal of this thesis is to find out what the long term relationship is between crises and economic development.

1.2 Motivation, argumentation and relevance of research topic

A possible explanation for the argument that crises can cause long term growth is that crises oblige businesses to focus more on profitable and core activities and to end loss making activities, and thus to increase the efficiency of production. Also poorly managed businesses are more likely to be exposed during economic downturn and are more likely to go bankrupt. Thus, by virtue of a crisis the economy of a country ensures that only useful and profitable activities are maintained (Caballero, 1991; Mitton, 2001). Countries that have relatively small crises do not have such checks of the employed activities and therefore remain lagging in their potential. Gorton (2012) also argues that crises increase our understanding of the economic system and policy making. Crises are therefore "a opportunity to address long overdue problems in a major way" (Gorton, 2012, p22). Meanwhile Claessens & Kose (2013a) argue that history shows that many Western developed countries experienced financial crises in their process of economic emergence and that the emerging markets of the last few decades like Asia and Latin America also show higher frequencies of financial crises.

However, it is also entirely possible that the positive effects of economic crises do not compensate for the negative effects in the long run (Cerra & Saxena, 2005ab). This would indicate that economic crises are not in any way good for the economy of a country. For example, during crises it is common that unemployment increases, which decreases purchasing power, which in turn could limit the potential growth of a country in the long run. This would be in line with the theoretical business cycle model of Hamilton (1989) which predicts a lower long run level of GNP caused by a recession. Economic downturn can also lead to worse scenarios like political instability and civil conflict (Cerra & Saxena, 2008). Abiad et al. (2012) show that medium term output loss is about ten percent relative to the pre-crisis trend after a financial crisis and therefore state that output loss is not recovered within seven years. The medium term output loss might be indicative of the long term output losses.

Claessens et al. (2013b) also argue that macroeconomic stabilization policies implemented in the recent crises (like loan guaranties) might displace or delay necessary financial restructuring, meaning that fundamental flaws in the economic (banking) system remain unaltered. Think for instance about the persistence of too-big-to-fail financial institutions and risk encouraging bonus incentive schemes. In an article in The Economist (January 11, 2014) Harvard researchers Reinhart and Rogoff suggest also that the lack of stronger actions by governments is responsible for the current persistent low rate of recovery of the recent crisis in the Western World.

Reports on financial instability and economic downturn have become quite common in the news bulletins for the past years. While the reports are often focused on the short time impact it would be relevant to also investigate the long term effects of those events and crises. We know for instance that the Eurozone has caused the euro crisis which indeed has negatively affected the economy in recent years, however one might wonder whether economies would have been better off without the Eurozone and its appeared inherent financial instability observed from a longer term point of view.

1.3 Research question

The proposed thesis will be on the dual sided effects of crises on the economy, therefore the main research question will be:

"What are the long term economic effects of crises?" or alternatively: *"Are there beneficial effects of crises in the long term?"*

It seems that little research has gone into the long term effects of economic crises. Although some papers do investigate the matter of a single economic crisis (Barro, 2001), no paper known to the author examines *multiple* crises in a global and extended time period context and their lasting effect on the affected economies compared worldwide. The aim of this thesis would be to do so and therefore contribute to the existing knowledge on the long term effects of crises.

1.4 Main findings

In order to unravel the relationship between crises and economic development three empirical models are used. The first model relates the number of crises to economic growth in a cross country model. The second model relates the level of economic activity to crises until 25 years in the past and future, while the third model investigates the impact of a crisis on the annual growth rate until 20 years after the crisis. The first model thus uses only country observations, while the second and third models use country-year observations. Not all crises are the same therefore five different types are defined and included into the models. These crisis types can occur separately, but also simultaneously. The crisis types are: economic crises, currency crises, banking crises, sudden stops and sovereign debt crises.

The main findings of this paper are as follows. The results show that economic crises and banking crises have a positive relationship with long term economic development. Meanwhile debt crises and sudden stops appear to have a negative impact on the economy in the long run, while the results for currency crises are mixed. Two mechanisms, coined in this thesis, are "learning by mistake" and "purging of the economy", these mechanisms are suggested ways in which future growth improves via crises. These mechanisms appear to be especially prevalent in economic and banking crises, while for the other types of crises these mechanisms are not strong enough to overcome in the long run the initial loss due to a crisis event.

1.5 Structure of the paper

This thesis consists of ten chapters including the introduction, references and appendix. Chapter 2 is a narrative of past crisis to give a sense of how crises elapse and what their impact is on the economy. This section is also used to show similarities and differences in crises. Chapter 3 discusses prior research on the effect of crises on the economy. Papers are discussed in favor and against this thesis' hypothesis of a positive relationship between crises and economic development. Subsequently in chapter 4 the hypotheses are detailed and supported with arguments. Chapter 5 elaborates on the data, while chapter 6 is on the empirical models and their results. Subsequently chapter 7 is on the analysis of the models and interprets the results. Chapter 8 is the conclusion and summary of this thesis. Chapter 9 and 10 are respectively the references and appendix.

Chapter 2 Background

2.1 Overview of past economic crises forms and causes

There have been numerous different crises in almost every form and shape. However in order to give some examples of the characteristics of crises this section will review a diverse selection of well known crises of the 20th and 21th century to discuss it forms and causes. I will not go further in-depth by explaining the relevant mechanisms as this is not within the scope of this paper. However I will name the factors related to the crises.

Probably the best known economic crisis of the twentieth century is the Wall Street Crash of 1929 which was followed by the Great Depression. The crisis started in the United States, but affected other industrialized countries as well. Although there is still debate on the magnitude of different factors on the severity of the crisis, there is a general view on its main causes. For instance Van Zanden (1988) notes that debt levels increased most likely due to cheap credit and an increasing number of (American) civilians willing to buy stocks during the roaring twenties with borrowed money. However overproduction (due to overinvestment) of commodities and agricultural products (like wheat) depressed profits and subsequently the stock prices. The decline in stock prices, often

bought with borrowed money, therefore resulted in the stock crash of 1929, as the economy of the United States was not flexible enough the absorb the shock otherwise. In the aftermath of the crash it is also argued that the government carried out counteracting monetary policies, which all ultimately caused the greatest depression of the 20th century which lasted almost 10 years. (Bernanke, 2000)

A different crisis in nature and impact was the Black Monday crisis in 1987. On Monday October 19 1987 several stock markets of mostly industrialized countries dropped 20 to 60 percent in value in a short period of time. It was the largest drop in value of the DOW Jones in history. However the sudden drop had comparatively little effect on the US economy apart from the decline in stock value as, for example, real GDP per capita level of the US still showed growth in the years directly surrounding 1987 and 1987 itself. The crash was contributed to computerized program trading, which over valuated the stock prices in the preceding month and the crash is thus regarded as a sudden quick correction also by computerized trading, which at that time was a novelty and apparently still underdeveloped. Another potential cause was market psychology which caused overvaluation of the stocks in early 1987 and its overcorrection later that year. These misjudgements were increased in magnitude by computerized trading. (Bookstaber, 2007)

The third crisis reviewed in this section is the East Asian financial crisis of 1997. Prior to the crisis the East Asian countries, which were involved in the crisis, enjoyed high economic growth of between 8 and 12 percent annually. The crisis started in Thailand where the Thai currency was fixed to the US dollar exchange rate. However the Thai government was not able to sustain the fixed exchange rate due to a lack of foreign currencies and therefore had to devaluate the Thai currency. Meanwhile Thailand had a large amount of foreign debt, which it would not be able to repay with the devaluated currency. This event started the crisis which also affected large foreign debt countries like Malaysia, Indonesia, Philippines, Singapore and South Korea as (Western) investors who had invested in these former growth markets were pulling their money out of Asian markets in fear of inflation and declining growth and profits, and invested that money in other parts of the world with the then highest profit rates. Despite the help of the International Monetary Fund (IMF) some affected economies (such as Thailand, Indonesia and Malaysia) still had worse real GDP per capita ratios in 2005 compared to the peak of 1997 based on IMF data. The severity of the crisis therefore is comparable to that of the crisis of 1929 in the Western world. Although there was fear the crisis would spread to the rest of the world through financial contagion, it turned out that the crisis remained relatively isolated to East Asian countries. Poor financial regulation and government policy in combination with the liberalization of the financial sector in East Asian are considered to have been contributing to the severity of the crisis. (Hunter, Kaufmann, and Krueger, 1999)

The next crisis discussed in this section is the subprime mortgage crisis of 2008 in the United States. This crisis was caused by the housing bubble where Americans en masse bought too expensive houses with mortgages with therefore high default risks. Default was not considered a problem at that time as the underlying value of the houses appeared to be ever increasing. But as more and more Americans defaulted on their mortgages, there arose an oversupply of houses and the house prices started to decline. This meant that the underlying value of subprime mortgages also decreased. And the mortgages lost value. Before the wave of defaults the mortgages were traded in packages (mortgage-back securities, or MBSs) and sold to financial institutions around the world. These financial institutions had different risk profiles and some wanted more risky MBS and some

wanted less risky MBS. Investment bankers therefore created collateralized debt obligations (CDOs) which broke the MBS packages down in senior and subordinate parts (in order of getting paid) and sold those parts to, for instance, pensions funds (risk adverse) and hedge funds (risk seekers). Another way of redistributing risk was by using credit default swaps (CDS). This is a kind of financial insurance for a security. CDS were issued on MBS by insurers which were economically vital institutions for the American economy. Subsequently, as soon as the housing bubble burst, all financial institutions (of all risk levels) involved in trading with these securities endured severe loss of investment value (mortgages). This event led to financial contagion as many banks and financial institutions (also those not directly trading in these securities) depend on loans between each other. Some large banks and financial institutions went bankrupt, which meant loss of credit for other banks which had lend to them. The, subsequently, sudden decrease of available credit to banks also affected the willingness of banks to lend to other businesses and consumers and thus this initiated a worldwide recession as more and more firms went bankrupt or were put in financial distress. Also in case of this crisis it is argued that regulators and financial institutions were unable to comprehend the trade in very complex financial products and that this contributed to the severity of the crisis. Since the crisis is relatively recent it is yet unknown what the long term effects exactly are however global unemployment rates have increased significantly afterwards. (Financial Crisis Inquiry Commission, 2011)

The last selected crisis in this section is the European sovereign debt crisis of 2009. Although it closely follows the subprime mortgage crisis of 2008 it has a different cause. This crisis started when Greece, member of the Eurozone, had troubles to pay for its sovereign debt. The Greek economy had been suffering under the worldwide subprime mortgage crisis. While tax income had been declining, the costs of financial rescues and unemployment payments increased. This caused large governmental deficits and increased sovereign debt of Greece. Due to its poor financial position Greece had to pay higher interest on new debt and debt that needed to be refinanced, which worsened its financial position even further. This initiated a downwards spiral of higher debt levels and higher interest rates on debt. Greece could not counter this problem by devaluating its currency, because the valuation of the euro is not under control of the Greece government. This had a financial contagion effect on banks in the Eurozone. As they saw their earlier investments in Greece decrease in value due to the increased risk of Greek default, which affected their liquidity and they were afraid other banks would suffer financially also. Therefore interbank loaning decreased, and subsequently, loaning to European businesses and consumers. This affected the European economy negatively, which already was in a slump since the subprime mortgage crisis. This in turn gave fear that other nations like Ireland, Italy, Spain and Portugal would also default on their sovereign debt, which would lead to failures of European banks of other nations who invested in these countries. The crisis was tackled with support of the IMF and countries of the European Union with better financial positions like the Netherlands and Germany. Support at first was insufficient because the lack of cooperation between the different monetary union nations, which indicated that the solution to the crisis had an important international political element in it. Due to the slowdown of economies in European countries unemployment, especially among young people, has risen and is undermining recovery growth. (Arghyrou & Tsoukalas, 2010)

2.2 Common factors and differences of reviewed crises

In the previous section this thesis discussed five well known but different economic crises. This section will present a comparison of these crises. First the common factors (factors relevant for this thesis) will be discussed, and later on the differences and nuances in characterisations.

2.2.1 Common features of reviewed crises

One of the most interesting common factors within these crises is that all of them had (financial) innovation as core cause of the crisis. In case of the 1929 it was the wide spread practice of using loaned credit to buy stocks which led to overvaluation of the markets. This speculative boom was something that had not occurred before on this size and level. As prior to this period only professionals invested in stock markets, however during the 20's millions of ordinary Americans also started to engage in speculation and just before the crash small investors had lent more than two-third of the face value of the stocks they were buying. This meant that more than 8.5 billion was out on loans, which was unprecedented (Lambert, 2008). Financial leveraging can be considered as a financial innovation that was popularized during the 20's.

In the case of the crisis of 1987 computerized trading, which was a novelty at time, is considered a major cause of the crises. While in case of the East Asian crisis high global market liquidity and international investment are considered to be contributing to the crisis. So again this shows that novelties, like computerized trading and high global market liquidity, were at the core of such crises.

At the core of the subprime mortgage bubble were complex financial innovations like MBS's, CDS's and CDO's. And lastly in the case of the Eurozone crisis it was the practices of the European economic and monetary union which were key points of the crisis. The European economic and monetary union is a relatively new union among industrialized countries in Europe. The increased economic integration between the member states can be regarded as a novelty for countries in this part of the world and also a part of the problem that caused the Eurozone crisis.

Thus a common factor in these five economic crises is that (financial) innovation is at the base of the crisis. In macroeconomic models (like Solow and its iterations) innovation (or total factor productivity) is often argued as the cause of economic growth. This would suggest that economic crises are related to economic growth, as a higher innovation rates would increase the possibility of crises. However note that this is only an indication which needs further research, as will be done in this thesis. It is, for instance, possible that the relation is given by a false positive, because innovations are done every day and thus will relate to crises, but also to times of economic growth and to cases of neither growth nor decline etc. However if the relationship between crises and future growth does hold, then crises would be symptoms of the "learning by mistake" mechanism[1]. The latter is what this thesis is trying to uncover. After all, many of the practices that were at the core of the reviewed crises are still being used today, although more responsible and better regulated to

[1] A more detailed review of this mechanism, which connect crises events to future growth, will follow in chapter 4 on the hypotheses and argumentation of this thesis.

avoid repetition of the failure. Also by virtue of crisis bad polices (which are electorally sensitive) or poor practices will be addressed[2]. Like for example in Greece, which had a low pension age and large public sector. Both of which have proven to be unsustainable. Also tax evasion occurred frequently and on large scales. To modernize itself Greece was obliged to fix these flaws to prevent further economic decline after the crisis.

Another common factor in these economic crises is the abnormal high levels of debt[3] by either (ordinary) stock investors, firms or governments, often because of the wide availability of cheap credit. Debt is a form of finance needed to facilitate growth. An overextension of debt can however result in failure as can be seen. Cleassens et al. (2013b) also argue that Eastern European countries during the great recession (2007-) and Asian countries during the Asian crisis had large amounts of debt denominated in foreign currencies. This made the loans dependent of exchange rate stability and this increased systemic risk. Unfavourable exchange rate developments would directly affect the cost of maintaining the foreign denominated debt and subsequently exchange rate fluctuations would cause a high correlation across loan default risks.

Claessens et al. (2013b) reviewed recent papers on financial crises and found four major similarities across crises: *Rapid increase in assets prices, credit booms, an expansion in marginal loans and regulation and supervision that failed to keep up with developments.* The authors argue that these events increase the risk of a financial crisis, but do not per se predict one. Examples of these events of the recent financial crisis (2007-) are the quick rise in housing (assets) prices, high debt levels due to low interest rates (credit booms), mortgages to home owners who could not actually afford them as soon as the economy would turn unfavorable (marginal loans) and increase of off balance sheet vehicles of banks which were unregulated (failed regulation and supervision). However for other crises these four similarities can be pointed out as well, according to Claessens et al.

2.2.2 Differences of reviewed crises

First, different crises have different impacts on a country. For instance there were crises that affected the real economy (labour markets, capital markets, good and services markets) and crises that only affected the financial sector (capital markets). Note however that crises in general originate in the financial sector. The crisis of 1929, East Asia and subprime mortgages are crises that affected the real economy. With 'real economy' it is meant that either welfare decreases or unemployment rate raises, production declines etc. Cecchetti (2009) describes seven channels[4] by which the real economy is connected to the financial system. An example of such a channel is the research of Dell'Aricca et al. (2008) and Klingebiel et al. (2007) who find that after a banking crisis, industries that

[2] This is an example of the second mechanism "purging of the economy" through which crises could relate to higher future growth. Also on this mechanism is elaborated in detail in chapter 4.

[3] Reinhart and Rogoff (2013b) warn that researchers should consider the differences between domestic and external debt; and also the differences between public and private debt. This paper however does not go not into further detail on debt differentiation due to data limitations and focuses instead on sovereign debt default.

[4] These seven channels are Funding costs (higher interest rates), Credit availability, Risk aversion, Firms' net worth, Household net worth, Exchanges rates and Confidence. These channels and mechanisms are listed in table 1 of the paper 'Financial Crises and Economic Activity by Cecchetti et al.

naturally need more external finance grow slower likely due to the impaired lending capacity of the financial sector. The before mentioned mechanisms however do not always connect the 'real economy' and the financial markets. For instance the crisis of 1987 mainly affected the financial sector and stock markets (i.e. paper wealth) and the real economy not so much. The Eurozone crisis had real effects on some Mediterranean countries. While for other European countries the effect was mostly felt in the financial sector and only to a lesser extend in the real economy, although the contemporary subprime mortgages crisis makes it harder to isolate its impact to verify such a statement. It must be noted that this characterization is not black and white and is subject to arbitrary judgement. However the main point of this paragraph is that some crises mainly affect the financial sector (banks and stock markets) and others the real economy (welfare, production and unemployment) as well. The difference might be due to the notion that not all crises are followed by recessions or depressions.

Claessens and Kose (2013a) argue that there are four different types of crises[5]. These types are: currency, sudden stop, debt and banking crises. The first two are based on quantitative definition and the last two on judgemental analysis. A currency crisis involves a large depreciation of the currency value and/or fast increasing interest rates. A sudden stop is a crisis involving a deteriorating balance of payment, due to a decrease of foreign capital inflow (external financing). A debt crisis occurs when a country is unable to service its debt, which includes the inability to pay interest rate, to refinancing debt, to acquiring additional debt or to fulfil its real domestic fiscal obligation. And finally a systemic banking crisis is a crisis where there is actual or potential failure of financial institutions on a market wide scale, often due to liquidity, confidence and/or capital problems. These crisis types also differ in their impact on the economy. For instance Abiad et al. (2012) find that output losses after a banking crisis are three times as large compared to output losses due to currency crises.

Secondly there are differences in the contagions of the crisis over different markets and countries. The crises of 1929, 1987 and the subprime mortgages crisis spread worldwide. On the other hand the East Asian crisis, the Eurozone crisis or *Argentine economic crisis* were isolated to the countries directly involved in them despite of fear of financial contagion.

Lastly crises differ in duration. Especially financial crises are short term, while real economy crises are often followed by recessions or depressions lasting several years.

Claessens et al. (2013b) reviewed the literature on differences between the recent financial crisis (2007-) and other crises. They find four major unique elements of the most recent financial crisis. These elements are: *good macroeconomic conditions prior to the crisis, opaqueness of financial transactions and a large roles of non-banks, a high degree of international financial integration and major roles played by advanced countries* (which would affect economies worldwide via international trade). These elements show that even modern crises have important aspects which previous had not been decisive determinants of financial crises. Also large roles of non-banks (SPV) can be

[5] This thesis will use these four categorizations in the model. This thesis also adds a fifth type, which is a crisis in which the GDP per capita drops more than five percent in one year. In chapter 5 is more information on the types of crises in the model.

considered a financial innovation to increase a bank's competitiveness, however it achieved that by avoiding regulations and supervision.

For an detailed overview of financial crises on basically everything including history, mechanisms, types, implications, predicting crises and recent academic papers this thesis recommends the paper Financial Crises: Explanations, Types and Implications by Claessens & Kose (2013a) and Understanding Financial Crises: Causes, Consequences and Policy responses by Claessens, Kose, Laeven & Valencia (2013b).

2.3 Terminology and definition

In this section a few terms are discussed and defined in order to make clear what exactly is meant when those terms are used in this thesis. The first section is on the several terms for economic downturn, while the second section is on several terms used for economic upturn.

2.3.1 Terminology and definition: economic recession, depression & crisis

The term 'financial crisis' does not have universal definition accepted by researchers as of yet (Ceccehtti et al., 2009). There is however literature which defines certain types of financial crises. Claessens & Kose (2013a) define four types of crises, which they think most financial crisis can be categorised in. These types are: currency crisis, sudden stops, foreign and domestic debt crises and banking crises. All of these definitions have in common that financial assets lose much of their value in a very short time.

This thesis also uses the term 'economic crisis'. This is the fifth and last defined crisis type of this thesis. An economic crisis is a year in which the GDP per capita decreases with more than five percent. Such fast drops are quite uncommon in the data and can therefore be considered to be quite impactful in the daily lives of those affected. It is therefore the heaviest and most tangible type of crisis.

A recession is a slowdown of economic activity for an extended period. It is part of the theorem on business cycles. The National Bureau of Economic Research (NBER, 2007) defines it as "a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales". The definition of a recession is close to that of the economic crisis defined before. Both do have overlap in their criteria, however their main difference would be that an economic crisis is more sudden and has a larger drop in real GDP per capita.

A depression can be defined as a recession with a drop of 10% in GDP per capita or a recession which duration is longer than 2 year. (The Economist, December 30 2008). Only the 1870s and 1930s are commonly referred to as economic depressions. (Krugman, June 27 2010, New York Times.) Because it is such a little frequent occurrence, there is no further elaboration on depressions in this thesis.

This thesis is on the long term impact of distress caused by either financial or economic crises. In which distress is defined by certain thresholds of selected indicators (like drop in GDP, drop in exchange rate etc.), which will be stated later on. And this distress is in this paper called a crisis. i.e. a *crisis is a financial crisis and/or economic crisis*. Where financial crisis has four different types (currency, banking, sudden stops and debt crisis) and where economic crisis is the fifth separate type. These types can occur simultaneously in any combination or just on its own. The Great Depression would for instance be an economic and a banking crisis, meanwhile the Asian crisis was foremost a sudden stop, but also a currency crisis and economic crisis. The 2008 financial crisis would be a banking crisis and the Eurozone crisis would be an economic and debt crisis for Greece. Black Monday would however not fall in any category.

Often crises proceed severe recessions (Kaminsky et al. 1999) as the events have similarities. Claessens & Kose (2013a) also argue that recessions which started with a crisis are more severe (measured by cumulative output loss) and have a longer duration than recessions which are due to the usual business cycle. The authors, subsequently, state that the decline in consumption during recessions with a crisis is more than seven times larger than during recessions without a crisis for developing countries. Kannan et al. (2013) find that also the recovery after a recession with a financial crisis is slower than from a regular recession. To avoid confusion about the distinction of economic crises and regular recessions proper thresholds will be put into place. In this way the model will not mark regular recessions as an economic crises.

2.3.2 Terminology and definition: economic development, level of economic activity and level of economic growth

The previous section was on the definition of the independent factor of this thesis: crises. However the dependent factor, which is the economy, also requires further definition clarification. In this thesis there will be three models. All of them have as dependent variable the state of the economy. There are two ways in which the state of the economy is displayed. The first one is *the level of economic activity* and the second one is *the level of economic growth*. The first measure reflects the level of real GDP per capita, while the second measure displays the annual growth level in percentages[6]. The difference between the two terms is most clear when developing (fast growing) and developed (high welfare) countries are compared. *Economic development (or performance)* in this thesis is an umbrella term and refers to either *the level of economic activity* or *the level of economic growth*.

[6] This section is just to inform readers of the terminology used in this thesis. Further explanation on the two measures follows in chapter 6.

Chapter 3 Literature review

3.1 Prior research

Tornell et al. (2005) already wrote about the paradox where countries that suffer from more economic volatility also show faster economic growth. The authors researched middle income countries that liberalized their financial markets. The liberalization led to increased uncertainty and unstable boom bust cycles. However an interesting finding in their research is that countries which had the most and severe booms and busts also had the fastest growth. Subsequently, the authors observe that factors which contribute to financial fragility also appear to be a source of long run economic development as well. The authors argue that sophisticated credit markets are essential to realize economic growth, and that the liberation of financial markets helps to overcome market imperfections. However the authors also argue that liberalization leads to increased financial fragility and therefore that financial crises are a result of developed (credit) markets. Growth and instability thus go hand in hand. Jorda et al. (2012) come to a similar conclusion on financial liberalization and financial fragility. They report no financial crises in developed countries during the Bretton Woods period of highly regulated financial markets and capital controls.

Van Zanten (1988) sees parallels between the depression of 1920's and 30's in the Netherlands and the Dutch stock market crash of 19 October 1987. He contributes the long negative effects of the crisis of 1930 to poor policies and the disability of the Dutch government to let go the gold standard until 1936. This prevented devaluation of the Dutch currency and, consequently, the Dutch economy in becoming competitive as fast as some of its surrounding countries which did drop the gold standard in 1931. The British, for instance, did drop the gold standard for the, in that time regionally dominant currency, pound-sterling.

An important point that Van Zanten makes in his argument is that the Netherlands in the several crises that it endured (the stock market crises of 1973 is also mentioned) was slow to adapt the right policies and therefore had more trouble to get out of depressions compared to its peer countries. The same seems to hold true for the current recession in the Netherlands. This would indicate that countries deal differently with economic setbacks and therefore that crises have different impacts on long term growth in different countries. And thus that countries that adjust better to new situations are more prosperous.

Ben David & Papell (1998) compare economic slowdowns and meltdowns of 74 countries in the post war period. The researchers determine per country in the dataset a break point in real per capita GDP development using a break point test developed by Vogelsang (1997). The break point is a year between 1950 and 1990. The test's critical values depend on whether the series is stationary or contains a unit root, for which the researcher proceeds to test for. Interestingly they find that 54 countries do contain unit roots in the development of their real GDP development while other (20 countries at 10%) do not. Subsequently the research find per country a *break point year* of the real GDP development. Important is to note that some break points are not significant (for example the USA) this indicates that these countries had no clear break point in the given period (1950-1990) and therefore did not start to do better or worse economically at some point. However of the break

points that were significant there were three different categories: category one did better economically after the break point year (mainly Asian countries). Category 2 did worse than before break point, but growth was still positive and therefore the researchers argue that these countries endured economic slowdown (Mostly Western developed countries). And finally in category 3 were countries that did worse after break point and also had negative economic development which, the researchers argue, is equal to economic meltdown (mostly Latin American countries).

After the researchers had divided the countries in several categories they proceed to explain the differences in long term growth between the different countries. For the developed Western countries they quote (p569) Baumol et al. (1989), "Worldwide explosion of productivity growth [following the war], probably represented a catch-up in the utilization of accumulated technological ideas - inventions whose utilization was held up by the Depression and the war, as well as a backlog of savings that had previously gone uninvested in productive capacity." And thus right after the war the economic growth was high. However this high growth could not be maintained and therefore a break in the growth trend prevailed around 1971 and 1973 when the Bretton-Woods accord collapsed and the OPEC oil embargo came. For the Latin American countries the researchers argue that mismanagement, decreasing trade and poor monetary policies resulted in debt problems which ultimately decreased the level of real GDP per capita. The last category of Asian countries which saw an increase in GDP levels is contributed to the increase of trade and external competiveness.

Mitton (2001) analyses the impact of corporate governance on the East Asian financial crisis in 1997-1998. He finds that firms with higher disclosure quality generally performance better during crisis time, while this relationship is less prevalent in periods without economic turbulence. The author argues that this is because firms which have higher disclosure quality protect individual investors better from expropriation of the firm's assets by the firm's management. However these findings might also support this thesis' argumentation that economic crises are instruments to renew the economy of the affected countries by getting rid of or severely devaluate *poorly managed* firms. In which it is assumed that poor management is defined as perverse managerial incentives in the case of lower disclosure quality as is predicted by the agency cost concept.

In addition to this finding the author also finds evidence that more *diversified* firms suffered more during the East Asian financial crisis. The author argues that diversified firms generally have lower transparency (due to more complex reporting) and thus have larger amounts of asymmetric information towards stakeholders compared to firms which employ activities in only one industry sector. This lowered transparency would induce investors to faster retract their investments during economic crises decreasing the value of the less transparent firms. However an alternative explanation of this phenomenon would be that firms which employ additional less profitable activities are less efficient with their capital. Mitton shows that, while one could argue that diversification in economic prosperous times improves capital allocation, highly diversified firms support distressed divisions inefficiently with capital from divisions active in less adversely affected sectors in crisis time. And this results in worse stock returns of (inefficient) diversified firms compared to less diversified or not diversified firms. This alternative explanation would be in line with this thesis' reasoning that economic crises would force firms to focus more on core activities and efficiency and drop less profitable activities.

While Mitton's paper is on the firm level in a single crisis and this thesis will be on the country level and long term growth, he argues that his paper shows (p219) "a link between corporate finance and macroeconomic events." He, subsequently, concludes his paper with the following statement (p240): "Stronger corporate governance was especially important when it should have been important - during an unexpected period of extreme economic distress when the risk of expropriation of minority shareholder was high." Which raises an interesting question whether legal protection or corporate governance might be an important determinant of the severity of financial crises or financial market development, unfortunately this is out the scope of this thesis.

Ben-David et al. (2002) investigate the presence of unit roots in the long-run growth of several industrialized countries. Prior research was often unable to reject the unit root in real GDP trend null hypothesis for more than 50% of the investigated countries. The authors argue that this is due to the fact that previous research did not allow for multiple structural breaks within the GDP development per country. Therefore, the authors test for unit roots while also allowing for one or two structural breaks in the GDP trends (aggregated and per capita) of 16 countries (thus 32 instances). They find that, with the additional structural breaks included, for 24 of the 32 instances they can reject the unit root hypothesis on the real GDP (aggregated and per capita) trend from 1870 till 1990. For the remaining countries the unit root is neither accepted nor rejected. These results are in favour of this thesis argumentation that the long term effects of economic crises might be positive. The rejection of unit roots in the GDP trends indicates that GDP trends in the long run are stationary and thus that short term negative effects of economic crises on the GDP levels are temporary and will be compensated over time, i.e. negative growth shocks have no permanent effect on the affected economies.

Jones et al. (2005) give a macroeconomic overview of booming periods of growth and decline in GDP levels over industrialized countries and developing countries. The authors argue that growth accelerations and growth collapses are asymmetrical. While the first is related to increasing international trade, the second is associated with monetary instability and civil conflict. This would indicate that the fundamentals of episodes of economic decline (such as crises) do not relate to higher levels of economic performance. The authors also show that most episodes of economic growth booms are not simply recoveries, since in only 6% of the cases countries have lower income levels at the end of a booming period compared to their prior peak in income levels. Subsequently, the authors use a test by Pai & Perron (1998, 2003) to indentify structural breaks in growth. An interesting finding in the paper is that there are more structural breaks (as percentage of country-year) among richer countries compared to poorer countries (however breaks are not necessarily crises, because that depends on the specification of the break). This is in line with this thesis argumentation. However the difference in percentage is small.

Cecchetti et al. (2009) investigate the output costs of banking crises since 1980. They find that different types of crises had different long term effects on the economy. Both currency crises and crises after a period of low growth are worse for the economy than crises due to sovereign debt default. On the other hand whether a country is poor or rich or has a small or large financial sector does not seem to affect the severity of a crisis (however it is unknown whether these variables affect the long term growth after the crisis). The authors also note that high growth just before the crisis is related to less severe crises. The authors also look into the long term economic effects of crises for real input. To do this they use a simple model to see whether there is a break in the trend and level

of the log of GDP. To find the break point year the authors use a Quandt-Andrews test (Andrews, 1993), about 50 percent of the crisis periods are associated with breaks in GDP levels and/or trends. The results show that some countries had significant drop in GDP level, some a significant rise in GDP and most countries had not a significant effect on GDP *level* after the crisis (graph 9 in paper). On the other hand the estimated growth *trends* were in most cases significantly higher after a break point associated with a crisis. The authors subsequently fear that the growth recovery period after the crisis could bias their results and therefore do two additional tests in which they set the break point year 3 years after the start of the crisis and a test where they set the break point after the duration of the crisis, which is when the GDP is back to the level it was just before the crisis. However the results of these two additional tests do not differ much from their original break point test. Although for many countries crises have had no significant effect on GDP level or trend, in some cases the GDP level and trend were higher (lower) after the crisis, which would support (oppose) this thesis' hypothesis. The paper therefore does not yet provide conclusive answers to the questions of this thesis. An issue the paper does answer is how long it takes for certain countries, with higher GDP growth but lower GDP levels due to a crisis, to recover their losses in GDP levels. The authors find that it takes on average 22 quarters after the crisis for those countries to reach the level of GDP implied by their pre-crisis GDP level and growth. While after that point their economic activities would continue to grow faster.

Cerra and Saxena (2008) research the effects of political and financial shocks on long term economic growth. Political shocks are out of the scope of this thesis. However the financial shocks defined greatly resemble financial crises. The authors use an impulse response function to estimate the effects of economic shocks. The model is similar to that of Cecchetti (2009) in design with the use of a dummy to define the post shock effects of an autoregressive (4 lags) model for growth rates. The authors find that financial crises lead to persistent loss of output. Finally Cerra & Saxena also note that there might be a third variable driving both economic growth and economic crises, however they do not know what variable that might be.

Abiad et al. (2013) research the behaviour of output seven years after 88 different banking crises during the last four decades. Their main findings show a persistent decline in output level with no rebound to pre-crisis trend level output. The growth rate however does on average return to its pre-crisis trend. The authors however do note that these results vary much per country and crisis. They also find that initial loss in output, the occurrence of a simultaneously banking and currency crisis and a high pre-crisis level of investment are strongly associated with high medium term losses due to a crisis. The authors also break down the effects of banking crises into factor components: total factor productivity, capital and labour markets as to show the mechanisms at work that link the effects of a financial crisis to the real economy. Also the effect of a financial crisis on the demand-side factors: consumption, investment exports and imports is evaluated. A detailed review of this theoretical framework is however out of the scope of this thesis.

The authors argue that their findings (a decline in output level with no rebound to pre-crisis trend level output within seven years) might indicate that economic crises have persistent negative long term effects on the economy. This thesis however refutes this inference as a decline in medium term growth does not necessary imply a decline in long term growth (which this thesis is all about). This has to do with looking at the events from a further distance, as in: in a longer time span *and* across countries. This thesis argues that growth is higher as *average* during the pre-, during and after crisis

period compared to countries in the same period which did not have an economic crisis. However the paper by Abiad et al. (2013) looks at a shorter time span and subsequently looks only to the effects on the economy of a single country after a single crisis. That the negative effects of a single crisis are not compensated with in seven years after the crisis, does not necessary indicate that over the longer period building up to the crisis the economy benefited from the for instance more instable though more efficient financial markets (or other economic features which increased the risk of an economic crises) and thereafter benefited from the crisis as being forced to evaluate the situation and restructure policies and practices in all levels of the economy. Therefore statements on *medium* and *long term effects* of economic crises cannot be based on the same framework and reasoning with just an extrapolated horizon. Moreover the authors already bring forth the example of Mexico, which after the crisis of 1994 had a higher long-term growth trend than before the crisis and subsequently no output loss due to the crisis, but already an output gain in seven years. All without considering the pre-crisis effects of the larger time span.

Another issue which might biases Abiad et al. their results is that the research excludes transition countries, because "the output developments observed in these economies were strongly related to the shift away from central planning rather than to financial crises" (Abiad et al., 2012, p5). However, as mentioned before, it is the development of economies (like financial liberalization) which contributes to increased financial instability and economic growth.

3.2 What of prior research will be used for this thesis?

The prior literature shows that there are different point of views by different researchers on the relationship between crises and the economy. Tornell et al. (2005) for instance argue that that financial fragility and long run growth go hand in hand, while Abiad et al. (2013) argue that crises cause a persistent decline in GDP. Another point that the prior literature makes clear is that different researchers used different methods to infer their conclusions from. Ben-David (2002) and Cecchetti (2009) use break point tests, Cerra & Saxena (2008) use impulse response functions, Tornell et al. (2005) look at country level impact and Mitton (2001) looks at the firm level impact of crises. It is therefore no surprise that the different approaches result in different conclusions. This chapter is used as an illustration for the variety in approaches and mixed inferences on the relationship between crises and the economy. Chapter 6 and 7 of this thesis cover the models, results and analyses, whenever it is applicable the discussed prior research is linked to either this thesis' methodology or its inferences. For instance the model used by Cerra & Saxena (2008) is similar to model 3 in this paper, however with extended crisis lags. Other examples are the two mechanisms through which crises might improve future growth that will be discussed in chapter 4. Tornell et al.'s (2005) paradox of financial fragility and long run economic growth is the source for the argumentation of the "learning by mistake" mechanism, while Mittons' (2001) paper is the foundation for the "purging of the economy" mechanism. More detailed use of prior literature is thus mentioned later on in the appropriate sections.

Chapter 4 Hypotheses

4.1 First hypothesis

The main question of this thesis is: *"What are the long term economic effects of crises?"* or alternatively: *"Are there beneficial effects of crises on the long term?"* The hypotheses that will be tested are therefore:

Hypothesis 1: *Countries which endure more frequent crises have better economic performance.*

Sub hypothesis 1.1: *Countries which endure more frequent crises have higher levels of economic activity. (Level of economic activity is measured with the increase in absolute levels of real GDP per capita over whole sample period.)*

Sub hypothesis 1.2: *Countries which endure more frequent crises have higher levels of economic growth. (Level of economic growth is measured with the increase in relative (%) level of real GDP per capita over whole sample period.)*

Higher level of economic activity refers to the actual level of GDP, while higher level of economic growth refers the compounded average growth rate. Thus there is a distinction between (rich/industrialized) countries that are already prosperous and remain so and (poor/developing) countries that have higher economic growth, and their relationship to crises. On the distinction is elaborated more in a respective sub hypothesis test sections in chapter 6.

4.2 Argumentation first hypothesis

This thesis argues that there are two mechanisms through which crises will improve the economy. The first mechanism is the relationship between on the one side experimentation, innovation and progress and on the other side overextension and failure. This mechanism is called "learning by mistake" and it is believed that this relation also holds for economic development and crises. The second mechanism through which crises will benefit the economy is that crises "purge the economy" by condemning poor businesses and practices. In this case the crisis helps in freeing up inefficiently used labor and capital, which after the crisis and be used for more profitable activities.

If both the learning by mistake and the purging mechanisms are at work it seems as if the economy has failed, but it also creates opportunities for the future. Imagine that new innovations have been tested, possibilities will arise and boundaries have been found so progress can continue from the point of failure.

That is why it is hypothesized that countries that suffer more of crises (any type) have higher levels of economic activity and/or growth. For example economic crises allow businesses to lay off bad performing employees who might be better off in other jobs. Banking crises would stem from financial innovation, while currency crises can make the exchange rate more competitive (Glick &

Hutchison, 2011) or purge the country from an expensive currency/production. Debt crisis on the other hand are likely to force governments to change economic policies. Finally, for sudden stops however it is hard to imagine any positive impact other than that it would have helped countries to get to a higher level of economic development before the crisis, however it is expected that afterwards this level of growth will not be reached again.

This thesis is however not on the exact mechanisms through which crises are beneficial to the economy, because that would be through numerous of different ways. This thesis is meanwhile on just the relationship that there is between economic development and crises.

4.3 Second hypothesis

Hypothesis 2: *Crises have a positive effect on the development of an economy in the long term.*

Sub hypothesis 2.1: *Crises are a symptom of (over)growth and discipline the course of business afterwards. Therefore, ceteris paribus, in an extended period of 25 years before and 25 years after a crisis the level of economic activity will be higher just before the crisis and higher at the end of the period compared to a similar country in the same period which did not endure a crisis.*

Sub hypothesis 2.2: *Crises are the result of (financial) innovation, therefore after some point the in future growth will be higher due to the "lesson learned" because of the crisis compared to a similar country which did not endure a crisis, even after considering recovery growth.*

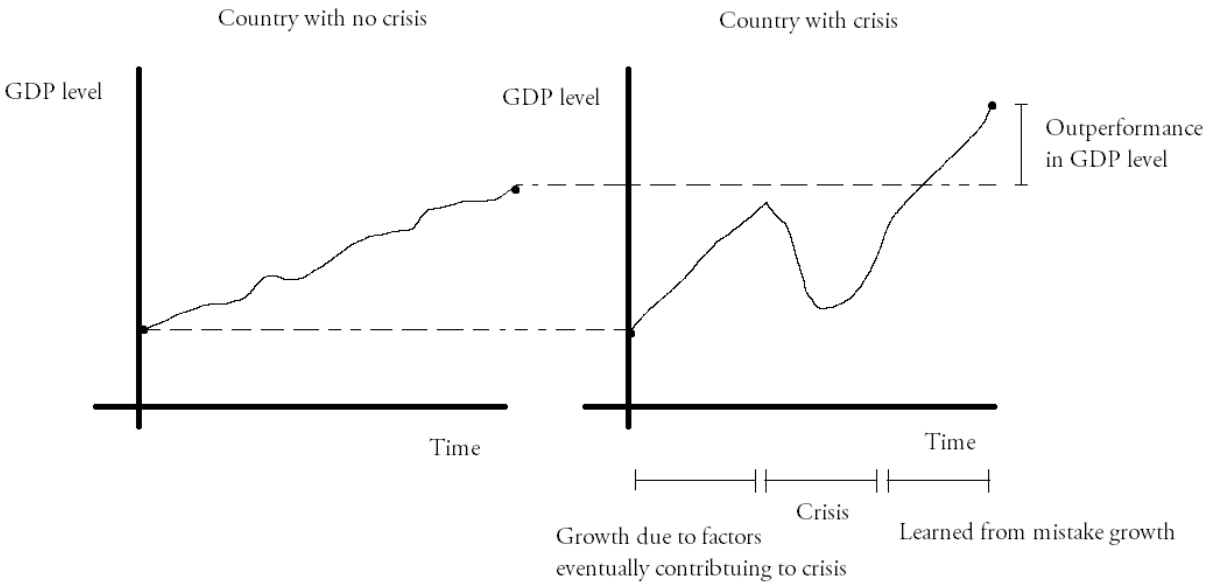
Note that there are five different crisis types considered in this paper: economic crisis, currency crisis, banking crisis, sudden stop and debt crisis and that all these types might have different results or effects on the long term economy. Also for both sub hypotheses the same distinction applies with regard to level of economic activity and growth, or being at the top or getting there (catching up) and its relationship to crises.

4.4 Argumentation second hypothesis

For the second hypothesis the same mechanisms apply as mentioned in the argumentation for the first hypothesis. However instead of looking at the economic development crisis from a cross country point of view, this hypothesis looks at it from a time trend point of view.

It is expected that crisis, apart from having a negative impact, to also have a over the long term even more dominant positive effect on the economy of a country. To illustrate that the below figures are sketched.

Figure 1 - GDP Development and Crises



The same mechanisms as in hypothesis 1 apply here. It is expected that countries that innovate more are more likely to have higher levels of economic activity and/or growth, but also are more likely to be affected by crises. The above figures show how this over time would be expressed. The figures also show that reverse causality that will be present in the models. Not only crises increase long term growth, but higher long term growth is supposed to be accompanied by more frequent crises. This would thus result in an overestimation of the supposed positive effects of crises on long term growth. However this should not be an issue, because the expected relationship between economic development and crises is supposed to go two ways. i.e. More growth leads to more crises and more crises lead to more growth.

Both sub hypotheses 2.1 and 2.2 try to catch such growth patterns around the event of a crisis. The first sub hypothesis states that crises are more associated with countries that lead the pack and thus have higher levels of economic activities, while the second sub hypothesis states that growth should accelerate after a crisis and remain on a higher level even after recovery growth has passed.

4.5 Novelty of hypotheses and proposed research

As can be derived from the prior literature there are numerous arguments in favor or against the positive effects of crises on the long term economy. Depending on the way researchers measure or define crises, one could argue that crises have inherent beneficial features or not, apart from the

obvious and more notable downsides. This thesis hypothesized that crises do have these inherent benefits which are in the long run even greater than the obvious short term downsides. On basis of prior research it would thus be hard to predict which results the cross-country model and crisis dummies models approach of this thesis would have. This uncertainly on its own warrants additional research.

The approach in this thesis differs from other research by using regular growth models and subsequently adding crises dummies to them, while other research often only look at single crises or single breakpoints and their effect on a single country. Another way in which this research is different from other research is that more crises per country and over an extended period are considered and that these crises are divided in five different types. This should thus help in unraveling in more detail the effects that different kinds of crises truly have on the economy of a country.

Chapter 5 Data

5.1 Data for dependable variable: long term growth

The dataset consist of 167 countries in the world and covers 1950 till 2011. This gives enough observations for a number of crises that affected some countries (more/more often) and other countries not (less). This will enable us to compare the effects of the crises on long term welfare.

As can be noted from the previous chapter on the hypotheses there are four dependent variables for the four different models that will be tested. For hypothesis 1.1 and 1.2 the dependent variables are (1) the increase in level of GDP per capita from 1950 till 2011 per country and (2) the average growth rate in GDP per capita from 1950 till 2011 per country. For hypothesis 2 country-year observations will be needed for (3) the level of economic activity and (4) the annual growth rate.

As can be derived from the previous all required information will be derived from a GDP measurement. However it is important to note that there are databases on several different measurements for GDP per country-year. Think for instance whether GDP is expressed in nominal or real values, local currency unit or constant US dollar, corrected for purchase power parity (PPP) or not etc.. It is therefore necessary to select the correct measure of GDP to be used in the model.

Feenstra et al. (2013) wrote the user guide for the Pennsylvania World Tables (PWT) 8.0. They state that the central element of the PWT is "the real GDP per capita, a measure of relative living standards across countries at different points in time" (p2). Subsequently the authors argue that the measure "expenditure-side real GDP at chained PPPs (in million 2005 US$)" is best used for comparing relative living standards across countries and over time, while the measure "Output-side real GDP at chained PPPs (in million 2005 US$)" is best used for comparing relative productive capacity across countries and over time. Therefore the models for hypothesis 1 (model 1) on the

relationship between the frequency of crises and standard of living uses the expenditure side[7], while the models (2 & 3) for hypothesis 2 on the relationship between crisis and (future) production uses the output side.

5.2 Data for independent variable of interest: economic crisis

The independent variables of interest are the crisis types. Crises can be defined and measured in several ways. Some types of crisis are defined and derived mathematically in this thesis, while other types are extracted from databases constructed by other researchers. This thesis in total considers five crisis types: the (real) economic crisis and four other financial crisis types. This thesis defines the most important type of crisis, the (real) economic crisis, as follows:

1. The start of a crisis is an annual drop of real GDP (expenditure-side, at chained PPP) of more than five percent.
2. The length of the crisis is the number of years until real GDP level (expenditure-side, at chained PPP) returns to the same level of the year before the crisis started.
3. The maximal duration of a crisis is 5 years. A shorter time span would not adequately express GDP losses, while a longer time span could conjoin two different economic crises.[8]

On the crisis conditions of the four remaining financial crisis types is elaborated in the next section.

5.3 Data for independent variable of interest: four financial crisis types

In line with Reinhart and Rogoff (2009) a currency crisis is defined as an event in which there is an annual depreciation of the local currency of more than 15 percent or an annual inflation of more than 20 percent. If either condition is met the specific country-year observation will be marked as a currency crisis year. The maximum duration for a currency crisis (or any other crisis type) is also 5 years; two crisis years within 5 years are therefore marked as a single crisis with the first crisis year marked as crisis start.

Laeven & Valencia's (2012a) systemic banking crises database is used as source for the crisis type on banking crises. This database provides a list of countries and years in which banking crises took place according to the authors. They argue that there is an systemic banking crisis when the following two conditions are met: (1) There are "significant signs of financial distress in the banking system (as indicated by significant bank runs, losses in the banking system, and/or bank liquidations)" and there are (2) "significant banking policy intervention measures in response to significant losses in the banking system" (p4). In the database of this thesis the country-years observations of banking crises

[7] For some countries GDP data start earlier than for other countries. Therefore the first and last observed level of real GDP at chained PPP are subtracted and divided by the number of years which are observed minus 1. This gives an annual average long term increase in GDP level per year measure. For the compound average growth rate this correction is not necessary.

[8] The last crisis condition is similar to the crisis conditions set by Leaven & Valencia (2012b).

have been put in. Again maximum crisis duration is 5 years, with the first banking crisis year marked as crisis start. And lastly, it is tracked whether a banking crisis coincides with an economic crisis. This is either when there is a banking crisis during the economic crisis or when the banking crisis is one or two years before the economic crisis. According to Leaven & Valencia banking crises are generally associated with significant output losses.

The third crisis type is the sovereign debt crisis or sovereign default (Cleassens & Kose, 2013). It may appear as if sovereign default does not immediately has effects on the economy of country, since countries cannot legally be forced to pay and it is not possible to seize collateral. However the threat of cutoff of future lending or currency deterioration will impose countries to obey their debt obligations. Without access to international financial markets countries are no longer able to smooth idiosyncratic income shocks or engage in international trade and this would negatively affect their economies. This is why sovereign default can result in debt crises which impede economic growth. Note that countries can also default in other ways, like hyperinflation and manipulating the exchange rate. These other forms of sovereign 'default' might therefore be marked as currency or economic crisis, while they are in fact the results of sovereign debt problems (Cleassens & Kose 2013). The data for sovereign default in this thesis are compiled by Reinhart & Rogoff (2008 & 2009). These researchers made an overview of default, restructuring or rescheduling of sovereign debt per country-year. Rescheduling and restructuring of debt is often the result of a nation unable to fulfill its obligations and the goal is to stabilize its financial situation through renegotiating and loosening the debt terms. Hence, rescheduling and restructuring of debt are also considered as forms of defaulting on sovereign debt. Also necessary financial aid like that by the IMF to Greece is considered to be sovereign default. If a debt crisis coincides with an economic crisis this is also marked in the database. A debt crisis is linked to an economic crisis if the debt crisis starts during the economic crisis or one or two years before the economic crisis. The difference in starting point of the crises might be contributed to timing differences of the events and definitions.

The last and fourth type of financial crises is the sudden stop. Sudden stops are unexpected disruptions in private capital inflows often to emerging countries, which frequently already have current account deficits. Sudden stops end periods of high growth of emerging markets followed with periods of economic contraction. In general the initial high growth attracted capital of international markets, however at some point in time these funds are easily transferred out of the country to other regions with new higher growth leaving the former countries with a shortage of capital. The data used in this thesis for systemic sudden stops is compiled by Calvo et al. (2008). Their sample consists of 110 developed and developing country for the period of 1990-2004. In this timeframe the most prominent sudden stops took place such as those of the Asian tigers and Argentina. The authors define a sudden stop as a phase where there is a fall of the capital inflow of at least two standard deviations below its sample mean. The beginning and end of the phase are the first time the capital inflow is either below or above one standard deviation of the mean. A sudden stop crisis is linked to an economic crisis if the sudden stop starts during the economic crisis or one or two years before the economic crisis. The difference in starting points of the crises might be contributed to timing differences of the events and definitions.

Identifying the type(s) of a crisis event is a subjective process. Some crises have overlapping characteristics (for example a debt crisis can cause a banking crisis, like in Greece), while other crises are hard to put in a category at all due to the broad and vague definitions. It is thus important to

note that the identification of the type(s) can be an arbitrary process, however the determination has been done as exact and unbiased as possible by the given methods and information.

5.4 Additional notes on the sample data

The sample data starts in 1950; this is just after World War 2. Since there are no worldwide extraordinary events directly affecting economic growth since the 50's, it is a good starting year of the sample. Also data is more precisely and available from this point on compared to databases going further back in time. Two final notes on the data are that Bermuda is dropped out of the dataset due to apparent erroneous data and elaboration on the data for control variables can be found in appendix 1.

Chapter 6 Methodology

6.1 Model

The methodology is an empirical comparative research between the level of economic activity and growth rates of countries that were differently affected by economic and financial crises.

6.1.1 Crisis variable

There are five crises variables: One variable for an economic crisis, which is a decrease in RGDP of more than 5 percent in one year and four variables for the four financial crisis types: currency crisis, banking crisis, sudden stop and (sovereign) debt crisis. It would be interesting to know how often these types occur at joint crisis events. Therefore in the table below are descriptive data on this subject.

Keep in mind that over the whole sample of 167 countries between 1950 and 2011[9] (a total of 10355 observations) there are 498 economic crises, 751 currency crises, 137 banking crises, 63 sudden stops and 118 debt crises. Also, crises are defined to have a maximum duration of five years.

[9] The data on occurrences of banking crises, sudden stops and debt crises is expected to be complete over the period of 1950-2011. Data for economic crises and currency crises is lacking in the early years for a number of countries. Although the databases used for banking crises and sudden stops do not investigate all years from 1950 till 2011, there is no indication (from other sources) that for the years outside the investigated period of the databases but inside the 1950-2011 period there were occurrences of sudden stops or systemic banking crises.

Table 1 - Occurrences of Joint Crises				
Crisis type A:	Crisis type B (max 2 years before or after type A):	Observations:	Probability joint crisis (%), given crisis type A or B	
A	**B**	**C**	**C/A (Type A is given)**	**C/B**
Economic crisis	Currency crisis	295	59.24	39.28
Economic crisis	Banking crisis	90	18.07	65.69
Economic crisis	Sudden Stop	28	5.62	44.44
Economic crisis	Debt crisis	70	14.06	59.32
Currency crisis	Banking crisis	90	11.98	65.69
Currency crisis	Sudden Stop	39	5.19	61.90
Currency crisis	Debt crisis	66	8.79	55.93
Banking crisis	Sudden Stop	17	12.41	26.98
Banking crisis	Debt crisis	21	15.33	17.80
Sudden Stop	Debt crisis	5	7.94	4.24

For the above table it is possible that a crisis type started one or two year before or after the other crisis type. The above table shows that for every crisis type it is possible to be a joint event with any other type of crisis. However some combinations are more common than others. Especially the likelihood of a crisis type to be also accompanied with either an economic or currency crisis is relatively large. More than two crisis types is also possible, however this is not tabulated.

6.1.2 Overview of variables related to long term growth

Control variables are necessary to avoid omitted variable bias in the models. Control variables are variables that relate to both welfare (y) and economic crises (x). There are several papers which investigate numerous variables that possibly relate to long term growth. Below is an abstract of the considered variables and in the next section the control variables which need to be included are selected. These would be the variables that could make the relationship between growth and economic crises spurious and are therefore added as control variables.

Otani (1990) finds, using a sample of 55 developing countries, that the savings rate, export performance, expenditure on human capital development, population growth and the real interest rate on external debt strongly (last one insignificantly however) relate to the economic long term growth of a country.

Barro (1991) also considers a number of variables to determine which relate the most to economic growth for 98 countries between 1960 and 1985. He argues that initial level of GDP relates negative to long term growth since economies tend to converges and that initial rates of school enrollment relate positive to long term growth as they measure the human capital in a country which appears to be determining factor for economic growth. Barro subsequently adds additional variables, extracted from theoretical models, to his regression in order to find more determinants of long term growth. Accordingly he finds (p407) that "higher levels of human capital are related to lower fertility rates and higher ratios of physical investments to GDP" and "Growth is inversely related to the share of

government consumption in GDP, and insignificantly to share of public investment." Which indicate that government consumption impedes market mechanisms and introduces market distortions via e.g. taxes. A prime example of this would be Greece, where government malfunction is the cause of its debt problems and ultimately the Eurozone crisis. Finally Barro finds (p407) that "Growth rates are positively related to political stability and inversely to market distortions".

Sala I Martin (1997) wrote the paper "I Just Ran Two Million Regressions" in which he argues that previous research seemingly arbitrary selected variables in order to determine long term growth, while other research had too strict conditions for which variables would be considered as explanatory for growth. In response he ran a large amount of different OLS specifications to see which variables would (more or less) consistently relate to long term growth. However in accordance to prior literature (Levine & Renelt, 1992) he limited the specification to 3 fixed variables (level of income, life expectancy and primary school enrollment; all three initial levels are there due to convergence of economies) and added to that four other variables in all different combinations of the 59 remaining possibly explanatory variables. Sala I Martin subsequently finds that 22 variables appear to be significantly explanatory (according to his standard) to long term growth. Of these 22 variables (see table 1 in his paper) this thesis will select the variables which intuitively would also relate to the occurrence of economic crises and include them as control variables (without being redundant, as some explanatory variables are very similar). The variables fall in the categories: regional variables, political variables, religious variables, market distortions and market performance, types of investment, primary sector production, openness, type of economic organization and former Spanish colonies.

Sala I Martin et al. (2003) extended the research on finding relevant variables for economic long term (for 88 countries between 1960 and 1996) growth with a Bayesian averaging of classical estimates approach. They found out of 67 variables mentioned in the literature that 18 were robustly and 3 were marginally related to long term growth. The strongest evidence was for the relative price of investment goods at the beginning of the sample, primary school enrollment and the initial level of real GDP per capita. The other relevant variables are listed in table 2 of their paper. This method also allowed for fixed variables in every specification, these variables were: initial level of income, the investment rate, the secondary school enrollment rate and the rate of population growth.

6.1.3 Selected control variables

There are many variables related to long term growth. However in order to obtain as many observations as possible it is necessary to select the most relevant control variables for the model. On basis of the literature review on long term growth the following variables have been consistently been mentioned by the researchers and are therefore included into the models: Openness of trade, savings rate, level of life expectancy, population (necessary for scale effects and model weighting), share of government consumption to GDP, investment to GDP, school enrollment, initial level of welfare, conflict or political instability and share of natural resources. Elaboration on the data (sources) of the control variables can be found in appendix 1.

Not selected long term growth explaining control variables are thought to have low additional information content, to be not related to crises or are left out due to data constraints.

6.1.4 Weighting of the models

Countries and thus economies differ in size. Important variables in this thesis (such as the level of GDP) are scaled by population, this is done to make the different economies comparable on an individual person level. However if, subsequently, no weighting to the models is applied then an individual living in a small country would have a larger impact on the results than an individual living in a more populated country[10]. In order to achieve that inhabitants of small countries have an equal effect as inhabitants of large countries on the results the model needs to be weighted. In this case it is chosen to weight the models by population. Models weighted with the level of total economic activity[11] would yield similar results, however the models weighted with population yield slightly higher explanatory power values for the majority of the models[12].

6.2 Multicollinearity of long term growth explanatory variables and the crisis variables.

The model in this thesis will include control variables to isolate the effect of economic crisis on long term growth. Openness and investment-to-GDP are examples of such variables. These variables however are intuitively[13] strongly correlated, not only to long term growth, but also to the economic crisis variable. This situation where the correlation between two explanatory variables is high is called multicollinearity. It is expected that the model used in this thesis will thus contain some multicollinearity which might make it hard to identify the individual impact of each of the variables. This should not be surprising since both the dependent and independent variables of interest (long term growth and economic crisis) are determined with the use of real GDP values (although the first variable is a long term measurement and the second is a short term variable for the first model). Since both variables are so similar it can be expected that additional control variables that relate to long term growth are also likely to be related to the economic crisis variable and thus subject to multicollinearity. For example, countries which engage in more international trade would be more severely affected by international crises; and more open countries generally have higher economic growth. Including openness as a control variable would thus result in an underestimation of the effect of an economic crisis (due to the country being very open to trade) on long term growth.

[10] As an individual in a small country represents a larger proportion of that country's total population.
[11] For model 1 this is the level of GDP in expenditure, while for model 2 and 3 this would be the level of GDP in output.
[12] Results not tabulated. However models weighted by total GDP would yield even more positive results of crises on long term economic development; especially for economic and banking crises in model 2 and 3. This indicates that the positive long term economic effects of these crises is even larger for inhabitants of more developed countries.
[13] More openness of trade makes a country more vulnerable to external economic shocks. Higher investment-to-GDP not only increases growth but also risk, since more debt is needed to finance those investments.

However this control variable can also not be left out since openness is related to both long term growth and the chances of an economic crisis.

However as can be derived from appendix 2 there is no correlation higher than 0.5 between the control variables and the crisis type variables, so the multicollinearity issue is tolerable. Still, it is good to keep in mind that the control variables will mute the positive effects that crises have on the economy as the control variables will capture some of the inherent positive characteristics that crisis are related to. Abiad et al. (2012) makes this relation more clear, his paper is discussed below.

Abiad et al. (2012) clearly show why some variables (such as investment-to-GDP) are not only related to growth over a longer period, but also indicative of crisis severity. In their paper the authors review several factors - (1) pre-crisis conditions and (2) after crisis counter measures - which would be associated with (1) *greater* medium-term output losses and (2) *smaller* medium-term output losses due to financial crises. The robust 5 percent significant factors are: (1) first-year output change, pre-crisis output position (mixed results), investment-to-GDP and (2) real government consumption growth. Through discussing the determinants of crisis severity the paper of Abiad et al. also give two examples of multicollinearity.

First this thesis considers the pre-crisis conditions (factors) which cause *greater* medium term output loss due to a financial crisis. The first year (short-term) output change factor seems to be a great predictor of also the medium term output change, it is therefore a good measure of overall (multiple year) crisis severity. The, with mixed results, significant variable pre-crisis output position coefficient indicates that a low level of output relative to the trend just before the crisis increases the medium output losses due to a crisis. Also it shows that not all crises are preceded by a boom, but more often with already declining economic performance. The investment-to-GDP coefficient indicates that excessive (wasteful) investments further slow recovery. Meanwhile, other papers[14] have related higher investment-to-GDP to higher long term growth. This is an example of multicollinearity where investment-to-GDP (of the control variables in the model of this thesis) is not only related to higher long term growth but also closely related to larger crisis severity.

There are also factors, three policies and a number of structural reforms, which make the losses in medium-term GDP output due to the crisis *smaller*. The policy variables are measured for the crisis year and the following three years. The only robust and 5 percent significant policy is real government consumption growth; this factor indicates that reserves of the government are used to stimulate the economy. While stimulating the economy is positive for the medium-term growth, there are researchers who argue that governmental intervention via policies could negatively affect long-term economic growth as it prevents deeper financial restructuring (Claessens et al., 2013b). Think for instance on loan guaranties by governments instead of bankruptcy of bad banks or fundamental changes in the functioning of the financial system that led to the financial crisis. Empirical research would be able to give statistical evidence for this statement. Note again the problem of multicollinearity, since government consumption relates not only (negatively) to long term growth[15], but it also relates strong inversely (i.e. positively) to crisis severity. Of the structural reforms factors, investigated by Abiad et al., none are robustly significant with medium-term growth. This might be different when considering the effects of these structural reforms on the long-term

[14] An example is Sala i Martin (1997).
[15] According to Barro (1991) and Sala I Martin (1997)

growth. However data limitations on the structural reform indexes will prohibit inclusion of these factors into this thesis.

Thus the model is expected to suffer from some level of multicollinearity which might make it hard to identify the individual impact of each of the variables. However there is no other choice than to include all the explanatory variables. Mildly correlated explanatory variables are generally not a statistic deficiency.

6.3 The cross country model and country-year model

In this chapter three models are used to show the long term effect of crises on the economy. The first model is a cross country regression with either (1) the increase of economic activity or (2) compounded average growth rate per country over the sample period as dependent variable. The second model is a country-year regression with (3) the level of economic activity as dependent variable and the third model is a country-year regression with (4) economic growth as dependent variable. This thus gives a total of four different regressions that will be use to answers each of the four sub hypotheses.

6.3.1 Cross country model

The first model to test this thesis' hypothesis is a simple cross country regression in a similar fashion to Sala I Martin (1997) with crises variables added. Model 1 is as follows:

Equation/model 1:

$$LTG_i = \alpha + \beta_1 EC_i + \beta_2 CC_i + \beta_3 BC_i + \beta_4 SS_i + \beta_5 DC_i + \beta_6 IY_i + \beta_7 HC_i + \beta_8 POP_i + \beta_9 I_i + \beta_{10} G_i + \beta_{11} OP_i + \beta_{12} NCON_i + DD + CONTD + \varepsilon_i$$

Where *LTG* is long term level in expenditures per year of country *i* either in relative terms (compounded average growth rate) or in the natural logarithm of the absolute terms (end minus begin level of GDP divided by total years observed minus 1), α is the constant, *EC* is the number of economic crises per country, *CC* is the number of currency crises, *BC* is the number of banking crises, *SS* is the number of sudden stops, *DC* is the number of debt crises, *POP* is the initial population level, *IY* is the initial GDP level, *HC* is the initial human capital, *I* is initial investment to GDP, *G* is initial share of government consumption of GDP, *OP* is the initial openness of trade, *CON* is number of conflicts per country, *DD* are decade dummies for in which decade the country observation starts, *CONTD* are continent dummies and β_n are the coefficients. Initial savings rate, initial life expectancy and natural resources to GDP are left out due to data limitations.

All initial variables use the beginning of sample value for the associated country. The data observation of countries may start at different points in time. According to Sala I Martin (1997) this can cause endogeneity. Therefore it is necessary that the starting point of the data per country is before 1971. In the appendix 2 and 3 are the descriptive statistics and the correlations of the

covariates. There is no correlation of 0.9 or higher within the independent variables thus there is no multicollinearity problem.

6.3.2 Cross country model results

In order to expose the relationship between crises and long term growth, additional variables will be gradually added to the cross country model. In the first set of regressions the dependable variable is long term growth measured in compounding growth percentage per year[16]. In the first model only the number of economic crises will be used to explain the long term growth. The frequency of the financial crisis types will be added in the second regression. The third regression will also include control variables commonly used in academic research on long term economic growth. All variables (except the number of conflict years) are the initial values per country observation. Note that initial life expectancy, initial savings rate and initial share of natural resources variables are omitted due to data limitations. In the fourth regression dummies are added for the decade of first country observation. The decade dummy is used to correct for the difference in data between countries whose initial values are from a more recent times than the 1950's, although countries with observations starting after 1970 are already dropped out of the data. In the last regression continent dummies are added. All regressions are weighted by population. Due to the low number of observations a p-value of less than 0.10 is considered to be significant.

[16] The relative measure of long term growth rate (*LTG*) is calculated as follows: $End\ of\ sample\ GDP = Begin\ of\ sample\ GDP * (1 + ltg)^{number\ of\ observed\ years - 1}$. Thus the growth percentage is the compoundable growth rate of GDP per country.

Table 2 - Cross Country Frequency of Crises					
Dependent variable is long term growth in compounded average growth rate (eq.1)					
Regression	**1**	**2**	**3**	**4**	**5**
Observations:	143	143	118	118	118
Adj. R-square:	0.0149	0.2115	0.6799	0.6931	0.7326
Constant	**0.0325**	**0.0279**	**0.0597**	**0.0664**	**0.0801**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
EC	**-0.0011***	**-0.0024*****	**-0.0011***	**-0.0011****	**-0.0006**
	(0.08)	(0.00)	(0.05)	(0.04)	(0.25)
CC		**0.0025*****	**0.0015*****	**0.0015*****	**0.0015*****
		(0.00)	(0.00)	(0.00)	(0.00)
BC		**0.0006**	**-0.0030***	**-0.0025**	**-0.0021**
		(0.74)	(0.08)	(0.14)	(0.23)
SS		**-0.0057****	**0.0056*****	**0.0058*****	**0.0024**
		(0.03)	(0.01)	(0.01)	(0.26)
DC		**-0.0044*****	**-0.0019**	**-0.0022****	**-0.0008**
		(0.00)	(0.03) **	(0.01)	(0.45)
ln(POP)			**0.0045**	**0.0044**	**0.0029**
			(0.00)	(0.00)	(0.00)
ln(IY)			**-0.0111**	**-0.0115**	**-0.0138**
			(0.00)	(0.00)	(0.00)
HC			**0.0182**	**0.0183**	**0.0175**
			(0.00)	(0.00)	(0.00)
I			**0.0217**	**0.0156**	**0.0132**
			(0.12)	(0.26)	(0.32)
G			**0.0193**	**0.0170**	**0.0217**
			(0.18)	(0.24)	(0.14)
OP			**0.0071**	**0.0106**	**0.0098**
			(0.05)	(0.01)	(0.01)
NCON			**-0.0002**	**-0.0002**	**-0.0002**
			(0.01)	(0.01)	(0.01)
DD	NO	NO	NO	YES	YES
CONTD	NO	NO	NO	NO	YES
Weighted by	*POP*	*POP*	*POP*	*POP*	*POP*
*Significance levels are in parenthesis, *=10 percent significance level, **=5 percent significance level & *** = 1 percent significance level; only for variables of interest.*					

The first regression shows us that just the number of economic crises has a small significant effect on long term growth rates. This thesis hypothesized that more crises however would increase the long term growth. That statement however does not seem to hold. Since the R-square value is low this

only might be due to the model not being specified correctly. It might be possible that different types of crises have different effects. Therefore in regression 2 the four financial crisis types are added to the model. The results now show that an additional economic crisis, sudden stop or sovereign debt crisis per country has a significant negative impact on the long term growth. On the other hand an additional currency crisis has a significant positive impact on the long term growth. An additional banking crisis does not have a significant impact on the long term growth.

As can be derived from table 1 joint crisis events often occur. An economic crisis coincides for almost 60 percent of the times with a currency crisis. It is therefore plausible that most of the time that a country has an additional economic crisis it also has an additional currency crisis. The effect of such a joint event on the long term growth would thus be: -0.24% of the additional economic crisis plus +0.25% of the additional currency crisis which equals +0.01% on the (compoundable) long term growth rate per year of the country. A similar point estimation reasoning would hold for other combinations of joint crises or even crisis events which involve three or more types.

For the third regression a number of control variables are added to the model. These control variables help to increase the explanatory power of the model of 0.21 to 0.68 which is considered to be substantially. The number of observations however dropped due to data limitations of the variable for human capital. All control variables (except investment to GDP and share of government spending) are significant and have the expected sign. Due to the inclusion of the control variables some coefficients of the crisis types also changed. The coefficient for an additional sudden stop changes sign while remaining significant, also the coefficient for number of banking crises becomes significant with a negative sign. This change indicates that effective controls need to be in place in order to untangle the actual effects of a crisis on long term growth. Meanwhile the sign and significance of the number of economic crises, currency crises and debt crises remain the same. This last observation increases the confidence that the right controls for these variables are in place and that the isolated effects of the crises are measured.

In the fourth regression the inclusion of decade dummies barely changes the coefficients and significance of the previous regression. This indicates that there should not be any substantial problems with the data starting for some countries at different points in time.

In the last cross country regression dummies for continent are added to the model. This model has a slightly higher R-square than the two previous models. Due to the inclusion of the continent dummies the coefficient for number of sudden stops is not longer significant. This is probably due to the fact that most sudden stop crises where in Asia. And it is likely that the continent dummy captures more accurately the economic rise of East Asian countries at the end of the 20th century instead of the sudden stop variables in the previous regressions. Note however that there have also been sudden stops in other part of the world outside Asia such as in Argentina in 1995. Still the coefficient for number of sudden stops has become insignificant due to the inclusion of the continent dummies. Meanwhile the coefficients for economic crises and debt crises have also become insignificant. The previous model suggested that these crises negatively affect long term growth. However if continents are also taken in consideration it appears as if these crisis types do not longer matter with respect to long term growth. This could indicate that parts of the world that suffer of more these crises have lower economic growth, but the lower growth is not because of the crises itself but more probable due to other unobserved characteristics in those areas. The coefficient and

sign for the number of currency crises does not change and is still positive and significant. Finally the coefficient for banking crises also remains insignificant.

In general is very difficult to model economic growth since so many factors are involved. It was therefore expected that it would be tough to derive robust estimated coefficients for the crisis variables. However the sign and significance of most coefficients were fairly consistent over the different model specifications. Whenever there would be a change it would be relative easy and intuitive to reason why a certain coefficient had changed. Meanwhile most control variables consistently had the expected sign and significance. Therefore the results of the fifth regression can be considered to be quite robust.

This means that for crisis variables in relation to long term growth that the number of economic crises, banking crises, sudden stops and debt crises are insignificant, while the number of currency crisis is significant and positively related to long term growth. Thus an additional currency crisis would increase the average long term growth per year of a country with 0.15 percent, while any other type of crisis would not affect the long term growth negatively at a significant level. To put the added benefit of an additional currency crisis into perspective: the average long term growth per year per country is 2.04 percent over the whole sample.

The results show that crises indeed positively affect long term economic development, however it is yet unknown whether the additional growth expressed itself before or after the crisis. And thus it is unknown whether a currency crisis is the result of a correction of overgrowth or whether a currency crisis disciplines the economy and causes higher growth rates after the crisis. Also for other types of crises can be wondered whether the crisis is the results of a poor performing economy or whether the crisis depresses future growth somehow. The cross country-year models will be used to investigate these causality questions with the use of crisis leads and lags.

6.3.3 Cross country model growth versus level of economic activity

In appendix 4 the same model can be found with the natural logarithm of the level of absolute increase in GDP as the dependent variable. In the above model the dependent variable was a growth percentage, therefore the above model does not differentiate as much between countries already performing better than other countries. In the model in appendix 4 the absolute increase in GDP level is the dependent variable, thus rises in long term economic activity due to crises in richer countries would be more prominent in the model (as increases in economic activity are no longer scaled by GDP). Subsequently, the results show that the positive effects of an additional currency crisis are an approximately 16.5 percent increase in absolute non-compounding long term GDP growth per year[17]. Meanwhile all other crisis types are insignificant in the alternative specification, which is a similar result to the model above.

[17] The dependent variable absolute level of GDP is measured as follow: $\frac{End\ of\ sample\ GDP - Begin\ of\ sample\ GDP}{number\ of\ observed\ years - 1}$. Note that the long term growth in GDP (in US dollars, it is not a rate) is constant and non compoundable over the years.

6.3.4 Cross country-year model with crisis lags

As can be derived from the previous section crises have, depending on the specification, an effect on long term economic development in a cross country model. In this section two models which use panel data are evaluated. Model 2 is a regression used to investigate the effect of a crisis on the level of economic activity before and after the start of the crisis, while model 3 will be used to find the effects of crises on economic growth paths.

Equation/model 2:

$$\ln(GDP_{it}) = \alpha + \sum_{l=0}^{4}\left(\sum_{j=1}^{4}\beta_{j+l*9}\, ljBEFC_{it} + \beta_{5+l*9} lBEGC_{it} + \sum_{k=6}^{9}\beta_{k+l*9}\, lkAFTC_{it}\right) + \beta_{46} ln(RPOP_{it}) + \beta_{47} HC_{it} + \beta_{48} I_{it} + \beta_{49} G_i + \beta_{50} OP_i + \beta_{51}\ln(LI)_{it} + \beta_{52} YCON_{it} + CD_{it} + YD_{it} + \varepsilon_{it}$$

Where *GDP* is the real GDP in output per capita and *α* is the constant. *BEFC* stands for "*before crisis*", *BEGC* stands for "*begin crisis*" and *AFTC* stands for *"after crisis*". These last three variables are dummies which indicate whether the country-year observation is a year in which a crisis started or a defined period before or after a crisis. The first capital sigma is for the five different types of crises; *l*=0 is for economic crises, *l=1* is for currency crises, *l=2* is for banking crises, etc. The second capital sigma is for the four distinguished periods before a crisis which for *j*=1 is 20 to 16 year before the crisis, for *j*=2 it is 15 to 11 year before the crisis, for *j*=3 it is 10 to 6 year before the crisis and for *j*=4 it is 5 to 1 year before the crisis. Meanwhile, *k*=6 stands for 1 to 5 years after the crisis etcetera until *k*=9 which is a dummy which stands for the country-year observation being 16 to 20 years after a crisis.

The control variables are RPOP which stands for total population number (R stand for actual numbers, thus not in thousands or millions), *HC* is an index for human capital, *I* is the investment to GDP ratio, *G* is the share of government spending to GDP, *OP* is a measure of openness of trade, *LI* is the life expectancy and thus a measure of general health and lastly *YCON* is years since last conflict.

With regard to *YCON* the following applies: data for all countries start at 1950, therefore 1950 has value 5, since it was 5 years ago that world war 2 ended which affected the world economy and thus more or less every country in the world. After 1950 each year there was no conflict the YCON value is incremented with one until there is a conflict and for that year will the YCON value be reset to 0. In this way the variable is more informative about the political stability of a country compared to a simple conflict dummy.

The savings rate and share of natural resources to GDP variables are left out of this and following specifications due to lack of data. Including the variables would increase data bias as only relatively more prosperous countries report these data.

The above model relates the level of economic activity (or welfare) to the occurrence of crises. It however does not report the short term impact that crises have on the development of economic growth. This thesis hypothesized that more crises improve overall economic activity. Therefore level

of economic activity would be positively related to country observations with relatively more crises. Thus the relationship between level of economic activity and crises (before, during and after) should be positive in general over all the country-year observations in the sample. However that is not intuitive if you consider that crises have a negative effect on economic activity on the short term. Therefore in the next model the short-to-long term impact or impulse response effects of crises are investigated. This autoregressive growth model can be used to check how long it takes for a country to profit from the "learned lessons" of a crisis, if ever.

Equation/model 3:

$$g_{it} = \alpha + \sum_{l=0}^{4}\left(\beta_{1+l*5} lBEGC_{it} + \sum_{k=2}^{5} \beta_{k+l*5}\, lkAFTC_{it}\right) + \sum_{m=1}^{4} \beta_{m+25} g_{i,t-m} + \beta_{30}(POP\%_{it}) + \beta_{31}\Delta HC_{it} + \beta_{32}\Delta I_{it} + \beta_{33}\Delta G_i + \beta_{34}\Delta OP_i + \beta_{35} LI\%_{it} + \beta_{36} CON_{it} + CD_{it} + YD_{it} + \varepsilon_{it}$$

In the above model *g* is the annual growth of GDP per capita in percentages. Dummies for a crisis event beginning in or prior to the country-year observation are included in the model. The third capital sigma depicts the autoregressive growth path with the use of 4 economic growth lags[18]. Also the same control variables are used as in the previous model. However instead of levels, these control variables are expressed in either annual first differences or annual percentage changes compared to previous year. An exception is the variable for conflicts. In this case the variable is simply a dummy for a conflict in the given country-year observation, instead of the number of years since last conflict, like it was in the previous specification.

These are the two models used to investigate the effects of crises on the economy on a country year basis. To make the distinction between the two models with *level* versus *growth* of economic activity more clear: Imagine that the *level* of economic activity model is on the long overall term relationship between crises and welfare, while the *growth* of economic activity model is on the short-to-long after term relationship between crises and welfare. In the next section the results of both models are reviewed.

[18] Cerra & Saxena (2008) also use a four year autoregressive model to investigate the impulse response function of crises on the economy.

6.3.5 Cross country-year level of economic activities model with crisis lags results

Table 3 - Level of Economic Activity and Crises: Partially Specified						
Dependent variable is natural logarithm of level of economic activity (eq.2)						
Regression:	**1**	**2**	**3**	**4**	**5**	**6**
Observations:	6107	3455	3455	2956	3455	2956
Adj. R-square:	0.8054	0.8675	0.9814	0.9854	0.9775	0.9821
BEFORE CRISIS 20-16		**0.0961*****	**0.0327*****	**0.0103**	**0.0541*****	**0.0419*****
		(0.00)	(0.00)	(0.36)	(0.00)	(0.00)
BEFORE CRISIS 15-11		**0.1214*****	**0.0949*****	**0.0436*****	**0.0901*****	**0.0644*****
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
BEFORE CRISIS 10-06		**0.1427*****	**0.1338*****	**0.1110*****	**0.0848*****	**0.0920*****
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
BEFORE CRISIS 05-01		**0.0758*****	**0.1360*****	**0.1525*****	**0.0742*****	**0.0699*****
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
BEGIN CRISIS		**-0.1133*****	**-0.0375****	**-0.0006**	**0.0703*****	**0.0506*****
		(0.00)	(0.02)	(0.97)	(0.00)	(0.00)
AFTER CRISIS 01-05		**-0.3896*****	**-0.1622*****	**-0.1115*****	**0.0592*****	**0.0396*****
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
AFTER CRISIS 06-10		**-0.3919*****	**-0.2093*****	**-0.1846*****	**-0.0576*****	**-0.0414*****
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
AFTER CRISIS 11-15		**-0.3628*****	**-0.1772*****	**-0.1409*****	**-0.1344*****	**-0.1439*****
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
AFTER CRISIS 16-20		**-0.3281*****	**-0.1067*****	**-0.1149*****	**-0.1076*****	**-0.1641*****
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
AFTER CRISIS 21-25				**0.0525*****		**-0.0369*****
				(0.00)		(0.00)
Type crisis		*economic*	*economic*	*economic*	*currency*	*currency*
Control variables	YES	YES	YES	YES	YES	YES
YD	NO	NO	YES	YES	YES	YES
CD	NO	NO	YES	YES	YES	YES
Weighted by	*POP*	*POP*	*POP*	*POP*	*POP*	*POP*
Significance levels are in parenthesis, *=10 percent significance level, **=5 percent significance level & * = 1 percent significance level**						

The statistics summary related to the above table is in the appendix 5. The first regression shows the level of economic activity related to the control variables. The high R-square value gives us confidence that the main variables that contribute to economic activity are included in the model. Furthermore, all the variables have the expected sign and most of them are significant. In the second regression the dummies for the country-year observation being a before, begin or after observation of an economic crisis are added. As would be expected before an economic crisis the level of economic activity is significantly higher. In the year an economic crisis has started the level of economic activity is lower and in the following 20 years the level will also be significantly lower due to the crisis. The after crisis negative impact on level of economic activity is much larger than the benefits that were before the crisis. More precisely, six to ten years after a crisis the level of economic activity would be 40% lower according to model compared to a similar economy which would not have had an economic crisis six to ten years before. This is against what this thesis hypothesized. Adding country dummies and decade dummies, as in regression 3, however lessens the negative long term effects that economic crises have on the level of economic activity. Still the long term result of an economic crisis would be 11% lower level of economic activity after 20 years. The outcome starts to change when a dummy for after 21 to 25 years after crisis is added. In regression 4 that coefficient is positive and significant. This is according to what this thesis hypothesizes. This shows that countries with more and more severe crises in the end have more growth, since innovation, progress and pushing the limits goes hand in hand with failure. Not tabulated is a regression with 26 to 30 years after an economic crisis, this coefficient would however also be significant and positive.

The last two regressions, number 5 and 6, dummies of currency crises are used in the specification. However such a crisis does not seem to have a positive effect on the level of economic activities as both the coefficients for 16 to 20 years and 21 to 25 year after currency crisis remain negative and significant. However the magnitude of the coefficients suggests that if there would be a joint currency and economic crisis there would be a positive effect on the economy more than 20 years later. To further investigate this issue a larger regression is run, of which the results are below.

Table 4 - Level of Economic Activity and Crises: Fully specified								
Dependent variable is natural logarithm of level of economic activity (eq.2)								
	economic crisis:	***currency crisis:***	***banking crisis:***	***sudden stop:***	***debt crisis:***		***controls:***	
BEFORE CRISIS 20-16	**0.0080**	**0.0080**	**0.0502*****	**0.0341***	**0.1707*****		***constant***	**19.0186**
	(0.49)	(0.36)	(0.00)	(0.07)	(0.00)			(0.00)
BEFORE CRISIS 15-11	**0.0277****	**0.0121**	**0.1010*****	**0.0757*****	**0.1311*****		***ln(RPOP)***	**-1.1074**
	(0.01)	(0.23)	(0.00)	(0.00)	(0.00)			(0.00)
BEFORE CRISIS 10-06	**0.0819*****	**0.0115**	**0.1122*****	**0.1149*****	**0.1182*****		***HC***	**0.0640**
	(0.00)	(0.26)	(0.00)	(0.00)	(0.00)			(0.16)
BEFORE CRISIS 05-01	**0.1183*****	**-0.0318*****	**0.1839*****	**0.0548***	**0.0418****		***I***	**0.7909**
	(0.00)	(0.00)	(0.00)	(0.07)	(0.01)			(0.00)
BEGIN CRISIS	**-0.0074**	**0.0065**	**0.1751*****	**0.0717****	**0.0672*****		***G***	**-0.4950**
	(0.61)	(0.55)	(0.00)	(0.03)	(0.00)			(0.00)
AFTER CRISIS 01-05	**-0.1034*****	**-0.0033**	**0.1283*****	**-0.1269*****	**0.0303****		***OP***	**-0.0156**
	(0.00)	(0.73)	(0.00)	(0.00)	(0.04)			(0.66)
AFTER CRISIS 06-10	**-0.1743*****	**-0.0416*****	**0.0852*****	(-)	**0.0235***		***ln(LI)***	**0.6632**
	(0.00)	(0.00)	(0.00)		(0.10)			(0.00)
AFTER CRISIS 11-15	**-0.0807*****	**-0.1042*****	**0.2105*****	(-)	**0.0513*****		***YCON***	**0.0030**
	(0.00)	(0.00)	(0.00)		(0.00)			(0.00)
AFTER CRISIS 16-20	**-0.0728*****	**-0.1192*****	**0.2946*****	(-)	**0.0386****		**Country Dummies:**	YES
	(0.00)	(0.00)	(0.00)		(0.01)		**Year Dummies:**	YES
AFTER CRISIS 21-25	**0.0279****	**-0.0453*****	**0.1109*****	(-)	**-0.0488*****		**Weighted by:**	*POP*
	(0.04)	(0.00)	(0.03)		(0.00)		**Observations:**	2956
							Adj. R-square:	0.9885

*Significance levels are in parenthesis, *=10 percent significance level, **=5 percent significance level & *** = 1 percent significance level; Significance levels are only displayed for variables of interest. "(-)" Stands for omitted variable*

In the above table the results of the fully specified regression are displayed. The first most notable result is that also in this case 21 years after an economic crisis there is a positive effect on the level of economic activity due to the crisis. The point estimate shows that the level of economic activity would be 2.8 percent higher compared to a similar country which did not have a crisis 21 to 25 years ago. This greatly supports this thesis' hypothesis since this type of crisis is most common (also as joint event with other types) and also the most tangible in the real economy. And therefore would most likely impose significant changes in the course of businesses; increasing their efficiency and reconsidering their practices. After about 6 to 10 years the comparative low is reached at around 17% lower economic activity compared to similar countries, after which the economy will grow faster and around 10 years after that it would surpass the level of economic activity of similar countries who did not suffer of an economic crisis.

Currency crises do not appear to impose significant higher levels of economic activity before the crisis. And as it appears that even in the long term the impact after the currency crisis on the economy is negative. This is not in the line with the cross country model in the previous chapter. The discrepancy might result from the fact that currency might be more frequent in developing countries, which have lower levels of economic activity (table 4), but possibly higher growth rates (table 3).

For the presence of a banking crisis the coefficient is in almost every instance significant and positive. This thus clearly shows the positive relationship between a highly developed financial system and higher economic activity. As Goldstein & Turner (1996), Leaven (2003), Galbis (1993) and Kaminsky & Reinhart (1996) argue that financial liberalization increases economic growth as well as the excessive risk taking, fraud and consequently banking crises. Interestingly there seems to be a timing discrepancy where the effects of a banking crisis become more apparent in level of output after the crisis then in the year the crisis starts.

Furthermore, Goldstein & Tuner (1996) also argue that banks that contribute to higher upswings in the business cycle also suffer of larger mismatches as soon as the growth deteriorates. More developed financial systems are also more orientated on short term profits compared to more regulated financial institutions, which thus increases the chances of financial crises when prudence is limited. Goldstein & Turner finally argue that banking crises help increase the safeguarding and monitoring of the financial system and thus that crises are often opportunities to fix shortcomings in the financial system and economy.

Sudden stops are quite recent forms of crisis types and there is not enough data to see what effect these crises have on long term economic development. However what can be clearly seen is that prior to the crisis the level of economic activity is about 7 percent higher[19] compared to similar countries not going to have such a crisis, while in the following years the level economic activity will be 12 percent lower. These numbers are illustrative of the characteristics of a sudden stop.

Most debt crisis dummies are significant and positive. The dummy coefficients from after the crisis are smaller in magnitude. What is notable is that the coefficients are getting worse over time. Debt crisis are associated with central planned or rich countries whose governments are required to borrow large amounts of money in order to finance government expenditures. So it might be that

[19] The timing of the start of the crisis can vary depending on the definition, when the begin crisis county-year dummy is positive it can be assumed that economical impact has yet to come.

this kind of crisis does not immediate change the course of business and therefore has little positive difference making impact on the level of economic activity after the debt crisis. The relatively small coefficients however suggest that the impact is relatively small on the economy compared to the other crisis types.

The next section will not use the level of economic activity as dependent variable, but will look at annual growth rates and the effect crises have on them.

6.3.6 Cross country-year annual growth rate model with crisis lags results

This section elaborates on the results of another method of displaying the effects of crises on the economy during or after the crisis. This method uses equation/model 3, which was introduced in chapter 6.3.4. In appendix 6 are the descriptive statistics of the data. This model uses an auto regressive model to predict the economic growth path. The first regression shows just that. The F-value of 212.09 shows the joint significance of the lagged variables to predict growth. In the second regression dummies for during and after an economic crisis are added. It is not necessary to also include before crisis dummies, since this model will be used to see how countries recover from crises and whether the long term growth can be elevated to a higher level. Dummies for 21 years or later after the crisis do not seem to be of added value (as the coefficients show neither return to lower annual growth nor continuation of increasing annual growth; the (higher) growth rate levels appear to be maintained from that point) and are therefore left out of regression. Below the table is a description of the results of this model, in chapter 7 follows a more detailed inference of the results.

Table 5 - Economic growth path and Crises: Partially Specified				
Dependent variable is annual growth in percentages (eq.3)				
Regression:	**1**	**2**	**3**	**4**
Observations:	7402	6641	5380	0.314
Adj. R-square:	0.1024	0.2451	0.3789	0.2887
Crisis type:	*none*	*economic*	*economic*	*currency*
AR(4)	**212.09*** **	**227.92*** **	**77.52*** **	**78.38*** **
Wald test	(0.00)	(0.00)	(0.00)	(0.00)
BEGIN CRISIS		**-0.1183*** **	**-0.1058*** **	**-0.0146*** **
		(0.00)	(0.00)	(0.00)
AFTER CRISIS 01-05		**0.0107*** **	**0.0059*** **	**-0.0077*** **
		(0.00)	(0.01)	(0.00)
AFTER CRISIS 06-10		**-0.0034* **	**-0.0010**	**0.0018**
		(0.06)	(0.63)	(0.31)
AFTER CRISIS 11-15		**0.0174*** **	**0.0177*** **	**-0.0051*** **
		(0.00)	(0.00)	(0.00)
AFTER CRISIS 16-20		**0.0018**	**0.0050** **	**0.0064*** **
		(0.33)	(0.02)	(0.00)
Control variables	NO	NO	YES	YES
YD	NO	NO	YES	YES
CD	NO	NO	YES	YES
Weighted by	*POP*	*POP*	*POP*	*POP*
Significance levels are in parenthesis, *=10 percent significance level, **=5 percent significance level & * = 1 percent significance level. AR(4) is a autoregressive function with 4 lags. The Wald test is for the joint significance of the 4 autoregressive variables.**				

Regression 2 and 3 show the effect of an economic crisis on the annual growth until 20 years after the crisis. Regression 3 has dummies and control variables added, but the coefficients of the crisis dummies remain similar. According to regression 3 the year the crisis starts the annual growth is around 11 percent lower. In the five years after that the growth rate is 0.6 percent higher every year compared to the autoregressive prediction based on the previous four annual growth rates. This is very small, although compounding, recovery growth. Six to ten year after an economic crisis annual growth will not be any different, while in the years after that until 20 year later the growth will significantly consistently increase compared to the prediction based on the previous four years. The annual growth would be around 0.5% to 1.8% percent higher each year due to the earlier economic crisis. This thus shows that crises on the long run are good for increased economic growth.

The fourth regression has dummies for currency crises instead of economic crises. Currency crises appear to have a negative effect on growth for all dummies except the one dummy for growth after

16 to 20 years. So again on the very long term growth is significantly higher although before that growth had kept declining for quite some time.

In the table on the next page is the fully specified regression of this model which includes all crisis types:

Table 6 - Economic growth path and Crises: Fully Specified								
Dependent variable is annual growth in percentages(eq.3)								
	economic crisis:	***currency crisis:***	***banking crisis:***	***sudden stop:***	***debt crisis:***		***controls:***	
BEGIN CRISIS	**-0.10179*** **	**-0.00426***	**-0.01260*** **	**0.00081**	**-0.02099*** **		**AR(4) [+]**	**60.73000**
	(0.00)	(0.09)	(0.00)	(0.92)	(0.00)		Wald test	(0.00)
AFTER CRISIS 01-05	**0.00918*** **	**-0.00353** **	**-0.00246**	**-0.01811*** **	**0.00003**		***constant***	**0.03294**
	(0.00)	(0.04)	(0.33)	(0.00)	(0.99)			(0.75)
AFTER CRISIS 06-10	**0.00541** **	**-0.00159**	**-0.00435**	**-0.02153*** **	**0.00279**		***POP%***	**-1.05028**
	(0.02)	(0.38)	(0.11)	(0.00)	(0.32)			(0.00)
AFTER CRISIS 11-15	**0.02053*** **	**-0.00814*** **	**0.00292**	**-0.01570*** **	**-0.00546** **		***fdHC***	**0.05192**
	(0.00)	(0.00)	(0.30)	(0.00)	(0.04)			(0.46)
AFTER CRISIS 16-20	**0.00758*** **	**0.00021**	**-0.00436**	**-0.01543** **	**-0.00947*** **		***fdI***	**0.22641**
	(0.00)	(0.90)	(0.20)	(0.05)	(0.00)			(0.00)
							fdG	**0.01321**
								(0.76)
Country dummies	YES						***fdOP***	**-0.07581**
Year dummies	YES							(0.00)
Adjusted R-square	0.3912						***LI%***	**0.14961**
Weighted by	*POP*							(0.17)
Observations	5380						***CON***	**-0.00408**
								(0.06)

*Significance levels are in parenthesis, *=10 percent significance level, **=5 percent significance level & *** = 1 percent significance level; Significance levels are only displayed for variables of interest. AR(4) is a autoregressive function with 4 lags. The Wald test is for the joint significance of the 4 autoregressive variables. [+] First three lags are positive and significant and the fourth lag is insignificant.*

The results in the table above for the economic crisis dummies are roughly the same as in the previous specifications. In the year of the crisis the annual growth is about 10% less according to the autoregressive estimation. After that the growth keeps on increasing significantly, even after 20 years. An economic crisis is the most prominent and tangible form of crisis, similar to the previous model the after years show strong and durable recovery growth and even higher additional growth. For this crisis type this thesis' hypothesis is also right according to this model.

Currency crises have a small but significant negative impact on growth that dies out in around 16 years. Meanwhile, banking crises do not seem to have an impact on economic growth after the initial year of the crisis.

For sudden stops the growth keeps on declining after the start of the crisis. Sudden stops are often a joint event with economic crises. However the positive coefficients of economic crises are smaller than the negative coefficients of the sudden stops. This shows that sudden stops really put a stop to high economic growth like it did in South East Asia. This type of crisis has no dominant inherent positive aspect for the future.

The last crisis type is the sovereign debt crisis. After the initial drop in GDP due to the crisis, it seems as if there is no effect on the annual growth for 10 years. While after that there is a small but negative effect on the annual growth. Debt crises seem to be not very invasive into the real economy. It could be that countries who suffered of debt crises have not learned from their mistakes or sufficiently changed poor practices, which could be why they make the same mistakes over and over again[20]. This could explain why the annual growth starts to decline again in the long run. On the other hand debt crises might be more likely to occur in central planned or already industrialized economies and therefore are associated with lower long term growth. Either way, the effects of debt crises on annual growth do not appear to be very large.

6.4 Robustness tests

Dropping all countries in the continent Africa (some might say that many of these countries are no real economies) does not largely change results of model 2 and 3. The magnitude of some coefficient changes, but significance and sign remain largely the same. The same holds for dropping all countries with an end of sample GDP per capita that is under 9000, as the results would remain similar. These results are not tabulated but available at the author. Model 1 is robust for "non-economies" already since continent dummies were included.

Including a variable for life expectancy in model 1 also resulted in the number of currency crises being positively related to long term growth. However the total number of observations was less than 50, therefore the results are not further displayed or discussed in this paper. It does however show the robustness of the relationship between number of currency crises and long term growth.

The regression of model 2 has also been run with separately *savings rate* and *share of natural resources* included into the specification. Although the number of observations decreased due to the

[20] Appendix 7 shows the distribution of countries which have multiple debt crises.

inclusion of the variables the crisis dummies remained very similar to the results of the original specification of model 2 and would therefore not lead to any differences in inference.

An interesting consequence of including continent dummies in the cross country model in table 3 (regression 5) is that the number of sudden stops becomes insignificant as regressor for long term growth. To exclude the assumption that the Asia continent dummy interferes with the sudden stop effect on long term economic development the regression is rerun with all Asian countries dropped. However after doing so the coefficient for number of sudden stops remains insignificant in both the model on the increase of the level of economic activity and the model on the level of compounded average growth rate per country. All the results of this section are not tabulated in this thesis, but available at the author.

6.5 Attainability & limitations

There are many factors related to long term growth. It is therefore hard to control for all possible factors that might render the relationship between crises and the development of economic activity spurious. However in general the estimated coefficients do not show strange large swings in sign, significance or magnitude this gives confidence that no significant omitted variables are overseen. Therefore it is justified to assume that the right specifications of the model are used and that the estimates of the coefficients are the correct ones.

It is best for regressors to be exogenous since then they would not be related to the error term. Most economic crises are considered to be suddenly and unexpected by most economists (Claessens et al. 2013b) and therefore one could say that crises are exogenous. In some sense the 'treatment' of a crisis could be considered to be a natural experiment as some countries are more or less affected. However it might also be that crises are in fact the outcome of the how the economy works and how growth develops and therefore endogenous. It is important to keep this in mind, when deriving strong statements of this paper. The best way to deal with this is to use an instrumental variable approach to unravel the relationship between crises and the development economic activities. This is recommended for further research.

Another limitation of this thesis is that the data spans from 1950 (in the best case) until 2011. For research on long term economic development this is a limited amount of years. What makes it worse is that for example in order to include a dummy for "20 years before an economic crisis" for a given country-year observation the data used by the model cannot start before 1970, since it was impossible to determine whether there was an economic crisis 20 years before 1969. Remember there is no information on GDP development from 1949. Observations from before 1969 will be marked as having missing data and will be dropped for the regression. This thus led to a significant amount of observations being unused. The same holds also for a dummy for "20 years after a crisis". In this case observations after 1991 have to be dropped, since for 1992 is not possible to determine whether there will be an economic crisis in 2012 with the available dataset.

A last limitation is that (historic) data for more prosperous countries is more detailed and more complete. There are thus more complete data observations of those countries. This means that data of less prosperous countries is underrepresented, which could affect the results.

Chapter 7 Analysis

This thesis provided three models to investigate the effect of crises on the economy. The first model was a cross country model, the second model was on the effect of crises on the level of economic activity and the third model was on the effect of crises on growth paths. This chapter will aggregate the results of these three models and compare them to prior research and this thesis' expectations.

7.1 Prior research and expected results

Although there are papers (Cerra & Saxena, 2005ab; Abiad et al., 2012) that argue that crises have a negative impact on the long term economy, the prior literature also reviewed papers that do see positive effects of crises in the long term. For instance, Tornell et al. (2005) wrote about the liberalization of the financial markets which preceded both economic growth and financial instability. Mitton (2001) is also a good example in the literature on how the Asian crisis "condemned" poor managed or performing business and consequently freed labor and capital that later on would be used in more efficient and profitable activities. Meanwhile there are also papers who argue that crises do not have a lasting effect on the economy. An example of that would be the paper by Ben-David et al. (2002) who show with the use of unit roots that shocks or crises have no permanent effect on economies.

Thus there are enough arguments in favor or against the positive effects of crises on the long term economy. Ceccechtti et al. (2009) also finds with the use of a trend break test that crises sometimes has positive, negative or no significant effects. On basis of prior research it would thus be hard to predict which results the cross-country model and crisis dummies models approach of this thesis would have.

7.2 The hypotheses and results of this thesis

Depending on the way you measure or define crises one could argue that crises have inherent beneficial features or not, apart from the obvious and more notable downsides. This thesis hypothesized that crises do have these inherent benefits which are in the long run even greater than the obvious short term downsides. The hypotheses are therefore that there is a positive relationship between economic development and crises.

The approach in thesis differs from other research by using regular growth models and adding crises dummies to them, while other research often only look at single crises or single breakpoints and their effect on a single country. Another way in which this thesis is different from other research is that more crises per country and over an extended period are considered and that these crises are divided in five different types. This should thus help in unraveling in more detail the effect that different kinds of crises truly have on the economy of a country.

The first hypothesis and the two sub-hypothesis for the cross country model were:

Hypothesis 1: *Countries which endure more frequent crises have better economic performance*.

Sub hypothesis 1.1: *Countries which endure more frequent crises have higher levels of economic activity. (Measured by increase in absolute levels of real GDP per capita over whole sample period)*

Sub hypothesis 1.2: *Countries which endure more frequent crises have higher levels of economic growth. (Measured by relative (%) level of real GDP per capita over whole sample period)*

The results showed that for hypotheses 1.1 and 1.2 the statement is true for currency crises. The more currency crises a country endured the higher the long term growth was in the measured period. The frequency of other types of crises did not seem to affect the long term growth significantly. These results should serve as indication that there are long term benefits of crises. The proposed mechanisms for this relationship are the "learning by mistake" and "purging of the economy" mechanisms. In the next hypothesis the level of economic activity and growth paths in relation to crises are investigated more in-depth, to see whether those are in line with the two before mentioned mechanisms.

The second hypothesis and sub hypothesis[21] for the country-year model were:

Hypothesis 2: *Crises have a positive effect on the development of an economy in the long term.*

Sub hypothesis 2.1: *Crises are a symptom of (over)growth and discipline the course of business afterwards. Therefore, ceteris paribus, in an extended period of 25 years before and 25 years after a crisis the level of economic activity will be higher just before the crisis and higher at the end of the period compared to a similar country in the same period which did not endure a crisis.*

Sub hypothesis 2.2: *Crises are the result of (financial) innovation, therefore after some point in the future growth will be higher due to the "lesson learned" because of the crisis compared to a similar country which did not endure a crisis, even after considering recovery growth.*

With regards to hypothesis 2.1 the statement seems to be true that prior to a crisis the level of economic activity is higher for every type of crisis except currency crises (without considering joint crisis events) compared to countries not 'treated' with crises. A crisis can thus be regarded as a method of correction for overgrowth due to, for example, overinvestment and excessive risk taking which in the short term would be pushing economic activity up before collapsing.

[21] For both sub hypotheses of hypothesis 2 the same distinction applies as before with hypothesis 1 with regard to level of economic activity and growth, or being at the top or getting to the top and its relationship to crises.

To assess the after effects of crises it is necessary to investigate the after crisis dummies in model 2 and 3. The results of both model 2 and 3 are partly supportive of hypothesis 2.1 and 2.2. Model 2 shows that for economic crises and banking crises there are positive after effects on the economy, although it takes more than 20 years for the economic crisis benefits to become larger than the losses caused by that crisis. To the occurrences of banking crises applies that those affected countries already do relatively better (about 18 percent), however due to the crisis there is a dip in the level of economic activity of which it takes more than 10 year to recover to the same relative level of (higher) economic activity of just before the crisis. Still it appears as if these two types of crises do improve the future economy. For currency crises and debt crises the reverse is true; 25 years after the crisis there is still a negative effect to be measured due to those crises. For economic and banking crises the results of model 2 are in line with hypothesis 2.1, however for the other crisis types this is thus not the case.

Model 3[22] shows for economic crises a continuously growing growth path after the crisis[23]. However the growth path for a currency crisis is continuously declining until after 16 years its effect on growth becomes insignificant. The growth path after sudden stops is also continuously declining. The after effects of debt crises on the growth path are either small and negative or insignificant. Banking crises however have no effect on the growth path after the crisis has taken place. Thus results of model 3 are thus only for economic crises in line with hypothesis 2.2. For the other types of crises hypothesis 2.2 is to be rejected.

7.3 Aggregation of the results

The research question of this thesis is: “What are the long term effects of economics crises?” or alternatively: “Are there beneficial effects of economic crises in the long term?”. The two mechanisms for this relationship would be: "Learning by mistake" and "purging of the economy". Both these mechanisms would show higher growth before and after a crisis to compensate the disadvantages of a crisis and to achieve even higher levels of overall economic development. The question is did the models used in this paper provide results in line with this reasoning? Below every crisis type and its results in the three models is reviewed. Keep in mind that according to table 1 it is common that more crisis types occur at the same moment.

7.3.1 Aggregation of the results: economic crises

While the frequency of economic crisis has no significant effect on growth, the models on the event of an economic crisis did show positive effects on the growth path immediately after the crises and also showed there would be a higher level of economic activity after 25 years. Therefore this thesis

[22] Of the fully specified model the first 3 autoregressive lags are positive while the fourth lag is small and insignificant.

[23] It is difficult to indicate where recovery growth ends and addition growth due to a past economic crisis starts. However looking at model 2 is it clear that at some point in time the level of GDP of a ‘with a crisis treated’ country will surpass the level of GDP of a similar ‘not with a crisis treated’ country.

concludes that the research question of this thesis can be answered positive and that economic crises are beneficial for an economy in the long run when considering both the circumstances in which such crises originate and to what such crises lead in the long term. What however is still noteworthy in model 2 is that immediately prior to the crisis the level of economic activity is 12 percent higher, while 25 years later it is 3 percent higher compared to similar countries with no crisis event, recovery and consequently overshoot in economic activity are thus slow and small. Reinhart and Rogoff also found evidence of slow recovery according to an article in The Economist (11 January, 2014). They investigated the 100 most severe crises in the last 200 years and found that it takes an average of 20 years to regain the pre-crisis level of output. This thesis however finds that if one continues to look further the loss due to the crisis is not only recovered, but also a higher level of economic activity will be reached.

7.3.2 Aggregation of the results: currency crises

The first model showed that a higher frequency of currency crises would relate to a higher level of economic development, however this result could not be reproduced in the second or third model which was on the event and not on the frequency of a crisis. Currency crises have as advantage that the exchange rates become more competitive, however this effect does not seem to overcome the disadvantages of currency crises. Therefore it is concluded that there is not sufficient empirical evidence that currency crises can beneficial for an economy in the long term.

7.3.3 Aggregation of the results: banking crises

Both model 1 and 3 show that banking crises are barely related to long term growth. However model 2 shows that banking crises are strongly related to higher levels of economic activity. Thus banking crises are a feature of already further developed countries. This is in favor of the argument that financial innovation and liberalization goes hand in hand with financial instability and accelerated growth. To stay ahead of the pack the financial system of a country must continue to develop itself. This consequently results in higher levels of economic activity before and after banking crises. Therefore banking crises and high levels of economic activity are believed to be inseparable.

7.3.4 Aggregation of the results: sudden stop

The first model showed before controlling for continent that the frequency of sudden stops is positive related to long term growth. However both models 2 and 3 can only show negative after effects of such a crisis. The results of the last two models make it clear that prior to a sudden stop the respective economies are flourishing; however after the crisis there are no such beneficial effects anymore. The sudden stop can therefore be considered as a true correction for overgrowth. Since such crises are relatively new is not easy to determine its long term after effect. However it looks like

the same levels of growth of before the crisis will be hard to attain. This crisis is therefore considered to be illustrative of a catch up to other developed countries after which growth will cease to reach such high magnitudes.

7.3.5 Aggregation of the results: sovereign debt crises

Of the last type of crisis, the debt crisis is mainly associated with countries doing continually, relatively worse. This suggests that these crises are the result of poor government policies that do not affect the real economy that much and subsequently do not do much to improve long term growth. This type of crisis however does appear to be more common in more developed countries whose governments are required to borrow large amounts of money in order to finance government expenditures. This would explain the positive (although declining) crisis dummy coefficients in model 2. It thus appears as if that these kinds of crises do not immediately change the course of business and therefore have little difference making impact on growth patterns. Countries who suffer of these crises could be countries which were prosperous but fail to stay economically at the top due to a lack of innovation and thus continually fall in level of economic activity. However apart from this last reasoning there is little in the results to be found to be supportive of this thesis' hypothesis. The frequency of this crisis type appears to be uninformative for long term growth according to model 1. It is thus more likely that these kind of relatively harmless crises show that crises are just bad for the economy without any benefits.

7.3.6 Aggregation of the results: all crisis types

As mentioned at the start of this chapter multiple crisis types may apply to a single crisis event. Especially the likelihood of also an economic and/or currency crisis as a joint event is large. According to table 6 the positive impact of economic crises is larger than the negative impact of currency crises on the economy in the long run. Thus the impacts of the separate crisis types discussed above are allowed to be interpreted with a somewhat upward bias.

In order to predict the effect of a crisis event all involved crisis types need to be identified. Per crisis event the types might also vary in intensity. This makes doing predictions over the long term effects of crises complex. However the results indicate that economic and banking crises somehow are positively related to economic development, while debt crises and sudden stops appear to be the reverse. For currency crises the results are mixed, but most likely those are also negatively related to future growth.

7.4 Added value of thesis - what new did we learn?

As already mentioned in chapter 4 prior literature has presented ambiguous results on the relationship between crises and the long term economy. This uncertainty on its own warrants additional research.

The approach in thesis differed from other research by using regular growth models and subsequently adding crises dummies to them, while other research often only investigated single crises or single breakpoints and their (supposed negative) effect on short to medium term growth. In this thesis numerous crises over an extended time in all parts of the world were investigated and evaluated from a long term macroeconomic point of view. What was also different from prior research is that the crises were divided in five types, this enabled more detailed and accurate impact analysis per crisis type on long term economic development.

The above approach increased our knowledge in several ways. Instead of just focusing on one crisis and its effects on selected economies this thesis is set up in a much broader scope. That allowed us to compare countries that were 'treated' differently with different crisis types not only in their aftereffect, but also in level of economic performance before the crisis and *relative*[24] to other countries. This allowed the inherent beneficial features of crisis susceptible countries to be revealed.

As it appears countries susceptible to both banking and economic crises have inherent features which not only cause these crises but also allow those countries to come out stronger relative to other countries in the long run.

Since this thesis made a difference between crisis types it was possible to answer why the results of prior literature appeared to be contradicting as different types appear to have different inherent lasting effects on the economy. As this thesis shows currency crises, debt crises and sudden stops are not like economic and banking crises and have no inherent beneficial effect on future growth; these three crisis types are more associated with a correction of overgrowth.

Thus this thesis' approach of an extended time before and after crises effects on economic development around the world did not only expose the downsides of crises but also the less clear, but definitely there, dominant upsides. These upsides however are only associated with two types of crises and expressed over an extended time and from an international comparative point of view.

The above mention different approach and results are the added value of this thesis to the existing literature on crisis and its (positive and negative) relationship to economic development.

[24] In this case 'relative' is a keyword. On its own it appears as if crises are bad for an economy. Only if you compare crisis immersed countries to non-affected countries it becomes apparent that the crisis immersed countries over time reach relatively higher levels of economic activity.

7.5 Recommendations for future research

This thesis proposes two different mechanisms in which crises might be beneficial for future growth. These mechanisms are "learning by mistake" and "purging of the economy". In this thesis the mechanisms are generally treated as black boxes, as they are not specified or investigated in detail. Future research could try to further unravel these mechanisms. It might also be possible that other mechanisms are present which were overseen in this thesis.

The other recommendation of this thesis is to redo the same models in the future in order to have more data and observations to determine the long term effects of crises with. As of now a relative small sample was available for measuring the after effects of crises and especially of sudden stops. However also for the other crisis types it would be recommended to extend the available dataset in the future by collecting more data on the long term effects, like 30 to 35 years and later, which is not possible at the time of this writing due to data limitations.

Chapter 8 Conclusion and Summary

This thesis documents the relationship between certain types of crises and the economy. There are five different crisis types defined, which are the economic crisis, currency crisis, banking crisis, sudden stop and sovereign debt crisis. Whenever a crisis event occurs multiple types can be applied to it.

It is found that economic crises and banking crises have a positive relationship with long term economic development. Meanwhile debt crises and sudden stops appear to negatively impact the economy in the long run, while the relationship between the economy and currency crises appears to be mixed. Two mechanisms, coined in this thesis, are "learning by mistake" and "purging of economy". These are proposed ways in which crises improve future growth. These mechanisms appear to be especially prevalent in economic and banking crises, while for the other types of crises these mechanisms are not strong enough to overcome in the long run the initial loss due to a crisis event.

Chapter 9 References

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Chapter 10 Appendix

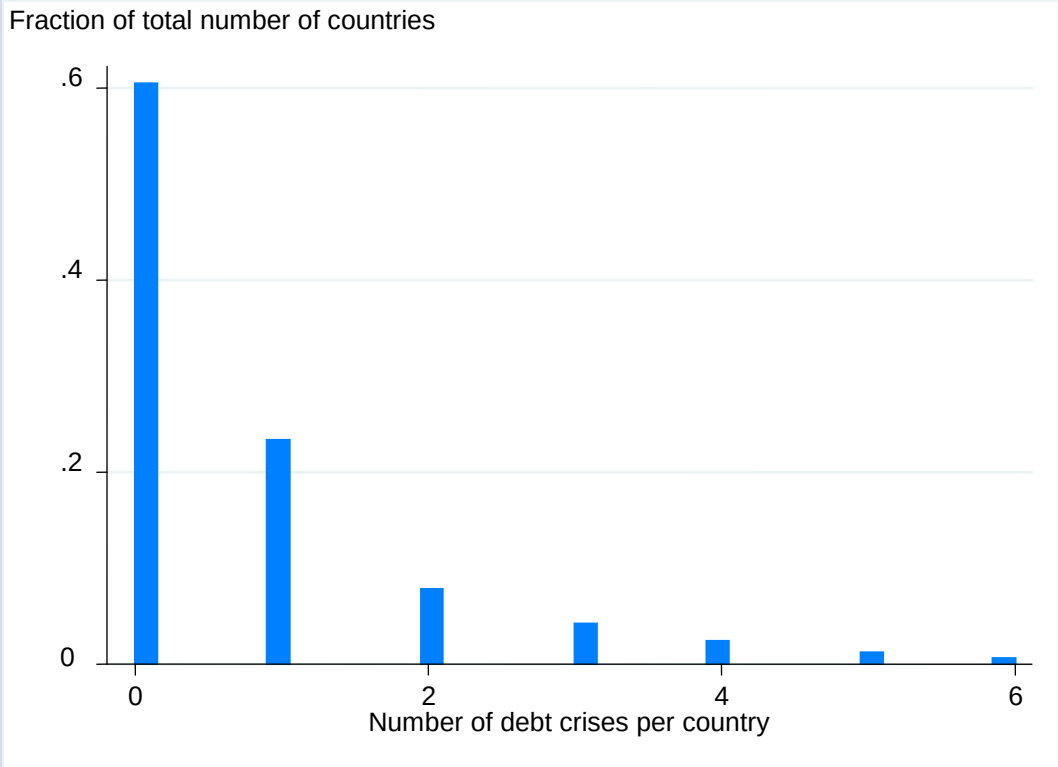
Appendix 1 - Data control variables	
Control variables:	In chapter 6 is elaborated on the selection of control variables to be included in the growth models. In this appendix their measurement and sources are reviewed. The source of the data is the Pennsylvania World Tables unless otherwise mentioned.
Openness of Trade	The first control variable *openness of trade* is measured with trade ratios. It is the merchandise export plus merchandise imports divided by GDP. This is a common measure in the literature for openness of trade (David, 2007).
Savings Rate	The *savings rate* is measured with the use of the gross domestic savings (as percentage of GDP). The gross domestic savings is calculated as GDP less final consumption expenditure. The data source is the WDI database, since this database provided the most year-country observations of this measure.
Initial Level of GDP	For the *initial level of GDP* for the growth regression model this thesis uses the earliest observation per country of real GDP at chained PPPs of the PWT database.
Human Capital	The index for *human capital* is based on the years of education of the paper by Barro & Lee (2012) and it is based on the returns to education by Psacharopoulos (1994). This is a widely used index in empirical research and both the PWT and WDI provide this data.
Life Expectancy	For the *life expectancy* this thesis uses the life expectancy at birth data as given in the WDI database. It is the number of years a newborn is expected to live if born in that country-year observation. *Population* is the number of people living in that country in that specific year.
Share of Government Consumption	The *share of government consumption* of GDP is provided by the PWT. This data is used to give insight in the level of government involvement into the economy.
Investment to GDP	*Investment to GDP* data is retrieved from the PWT database. It is the share of gross capital formation of the GDP. This measure shows the relative level of investment in a country. Investments consist of outlays on fixed assets (including machinery), inventories and such.
Conflict	The model of this thesis will also include dummy variables on *conflict*. The data source of this variable is the UCDP/PRIO conflict database. All conflicts with more than 25 deaths in one year are included. The conflict observation is linked to the geographical location of the conflict. So the Vietnam war is marked as a conflict for Vietnam in the 60's and 70's but it is not marked as a conflict for the United States, although both sides suffered losses and were primary actors in the war.
Total Rent on Natural Resources	The last control variable is the *total rent on natural resources* as a percentage of the GDP. The rent of a natural resource is equal to the price of the natural resources minus the costs of producing it. The source of this data is the WDI database. This variable is included since natural resources profits can have an offsetting growth effect in oil producing economies.

Appendix 2 - Correlations cross country model (eq.1)							
	ILEA	***CAGR***	***EC***	***CC***	***BC***	***SS***	***DC***
ILEA	1						
CAGR	0.1987	1					
EC	-0.4357	-0.0371	1				
CC	-0.2202	0.2013	0.4037	1			
BC	0.2117	-0.0986	-0.0666	0.055	1		
SS	-0.0178	-0.0845	0.0762	0.4768	0.2729	1	
DC	-0.2598	-0.3164	-0.1287	0.0836	0.3233	0.1721	1
IY	0.7219	-0.3071	-0.3377	-0.4266	0.3134	-0.0438	-0.06
HC	0.8517	-0.0051	-0.4444	-0.3621	0.2922	-0.0481	-0.1023
I	0.6769	-0.0257	-0.1889	-0.065	0.239	-0.0686	-0.0625
G	0.3046	0.4584	0.0133	0.1107	-0.1216	-0.0896	-0.3082
OP	0.1609	-0.1581	0.0381	0.1415	-0.1116	0.218	0.0888
NCON	-0.6213	-0.182	-0.0226	-0.1369	-0.1804	-0.1039	0.363
ILEA stands for increase in level of economic activity; CAGR stands for compounded average growth rate. Red is high to medium correlation; blue is mild correlation.							

Appendix 3 - Descriptive statistics cross country models (eq.1)					
	Observations	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
Variable:					
ILEA	143	201.3937	260.5349	-73.4332	1564.5
CAGR	143	0.021889	0.017112	-0.02342	0.070443
EC	143	3.174825	2.127336	0	10
CC	143	4.72028	2.237345	0	12
BC	143	0.804196	0.714623	0	4
SS	143	0.363636	0.550869	0	2
DC	143	0.748252	1.20134	0	6
POP	143	16.5404	58.28428	0.044887	560.2104
IY	143	4163.657	8406.112	285.0365	79686.53
HC	118	1.573789	0.453292	1.018154	2.84396
I	143	0.174997	0.143806	0.008637	1.044848
G	143	0.165358	0.1171	0.012237	0.772552
OP	143	0.482314	0.787547	1.62E-05	7.510192
NCON	143	8.321678	13.16237	0	59
ILEA stands for increase in level of economic activity; CAGR stands for compounded average growth rate.					

Appendix 4 - Cross Country Frequency of Crises (eq.1)					
Dependent variable is the natural logarithm of the entire increase in level of economic activity per year					
Regression:	**1**	**2**	**3**	**4**	**5**
Observations:	133	133	111	111	111
Adj. R-square:	0.1189	0.255	0.7341	0.7433	0.7703
EC	**-0.2699*** **	**-0.2793*** **	**-0.0182**	**-0.0083**	**0.0162**
	(0.00)	(0.00)	(0.72)	(0.87)	(0.75)
CC		**0.0843***	**0.1329*** **	**0.1478*** **	**0.1645*** **
		(0.09)	(0.00)	(0.00)	(0.00)
BC		**0.6839*** **	**-0.1817**	**-0.1799**	**-0.1734**
		(0.00)	(0.21)	(0.21)	(0.26)
SS		**-0.1113**	**0.3925** **	**0.4198** **	**0.1971**
		(0.64)	(0.03)	(0.02)	(0.28)
DC		**-0.3857*** **	**-0.0998**	**-0.1312* **	**-0.0001**
		(0.00)	(0.19)	(0.08)	(0.99)
Control variables	NO	NO	YES	YES	YES
DD	NO	NO	NO	YES	YES
CD	NO	NO	NO	NO	YES
Weighted by	*POP*	*POP*	*POP*	*POP*	*POP*
*Significance levels are in parenthesis, *=10 percent significance level, **=5 percent significance level & *** = 1 percent significance level*					
Note that the CAGR model has more observations because some countries actually had higher levels of welfare at the beginning of sample compared to their end state. Subsequently the negative value observations are dropped for the natural logarithm based regression. This may cause tilted data, similar to survivorship bias.					
Debt crises are in fact present in different continents and different starting decades, so it is unclear why the variable is so insignificant with the inclusion of the dummies.					

Appendix 5 - Descriptive statistics country-year level of economic activity model (eq.2)					
	Observations	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
Variable:					
ln(GDP)	8232	8.356548	1.242202	4.889033	13.35702
ln(RPOP)	8273	15.56507	1.883694	10.61475	21.00419
HC	6946	2.094762	0.623457	1.018154	3.618748
I	8232	0.205373	0.125777	0.001906	5.02874
G	8232	0.199863	0.122291	0.010637	2.885595
OP	8200	0.521024	0.661899	0.000819	24.68241
ln(LI)	8340	4.125722	0.201243	2.970667	4.444572
YCON	10292	22.15439	18.82679	0	66
GDP stands for level of economic activity.					

Appendix 6 - Descriptive statistics country-year level of economic growth model (eq.3)					
	Observations	**Mean**	**Standard deviation**	**Minimum**	**Maximum**
Variable:					
g	8066	0.021601	0.112235	-0.87681	4.905865
POP%	8107	0.018268	0.014995	-0.18065	0.204282
ΔHC	6812	0.017188	0.013618	-0.04622	0.098872
ΔI	8066	0.000778	0.079927	-4.05054	4.408154
ΔG	8066	4.78E-05	0.052528	-2.44892	2.5181
ΔOP	8033	0.006163	0.420283	-20.9675	22.05347
LI%	8166	0.00533	0.009436	-0.15627	0.219177
CON	10292	0.122231	0.327568	0	1
g stands for level of economic growth					

Appendix 7 - Distribution of countries which have multiple debt crises