ECONOMIC POLICY

LIETUVOS BANKAS

Banking Crisis Lessons from History: Learning from Emerging Economies' Experiences

Selin Sayek (Bilkent University)
Fatma Taskin (Bilkent University)

Centre for Economic Policy Research

CES

PARIS SCHOOL OF ECONOMICS
ÉCOLE D'ÉCONOMIE DE PARIS

Banking Crisis Lessons from History: Learning from Emerging Economies' Experiences[1]

Selin Sayek   **Fatma Taskin**
Bilkent University   *Bilkent University*

September, 2013

Abstract: Using banking crisis data for 1980-2011, which includes 165 banking crises episodes of which 25 are in the 2007-2011 period, and making use of the early warning systems literature, we match earlier crises (pre-2007) with currently ongoing crises (post-2007). In doing so, we make use of the propensity score estimation and related literature. The application of this technique to this problem, though very straightforward, is part of the novelty. Results point to two important conclusions. First of all, the European crisis is composed of unique country experiences; hence, it will not be easily resolved with a "one-size-fits-all" set of economic policies. Secondly, while each banking crisis has its inherent uniqueness, each crisis also shares sufficient commonalities with one or more of the Asian-5 1996/97 crisis, the Nordic banking crisis of the early 1990s or the Japanese banking crisis of the 1990s. Thus, the extensive knowledge accumulated through these former banking crises could be made use of in designing recovery policies.

JEL Classifications: G01, F30

Keywords: Financial crises, propensity score matching.

I.   **Introduction**

Financial crisis is not a new phenomenon. Countries all over the world have been experiencing economic crises for a very long period of time. The latest of these crises started off as a banking crisis in the US and spread to Europe very rapidly. This crisis evolved from a pure banking crisis into one of an intertwined banking and sovereign debt crisis in Europe within a couple of years and is now labeled as the Euro crisis.

The Euro project is governed by the principles of the distinctive European Monetary Union (EMU), a union that has no historical precedent. This is the thesis put forth in Eichengreen's (2008) paper entitled "*Sui Generis EMU*". Therefore, this thesis begets the question of whether the ongoing crisis of this *sui generis EMU* is a *sui generis Euro crisis*. This question is at the core of the following discussion.

While the EMU project unifies countries in the use of a common currency, speaking of a single Euro area continues to be an unsettled issue among policy-makers and academia. The convergence of several economic indicators in the early 2000s seemed to support the idea that there was actually a single Euro zone. This convergence quickly turned sour with the onset of the banking crisis. The bond yields started decoupling once again.[2] The external imbalances within Europe became a central point of discussions. Similarly, the internal imbalances reflected in productivity adjusted unit labor costs that lie at the core of these external imbalances within Europe have become increasingly common topics. In short, any discussion of the Euro zone is framed to include detailed comparisons between the core and the periphery, which are viewed more and more as separate entities.

---

[2] See Lane (2012) for a detailed depiction of the state and evolution of the European economic crises.

Therefore, an important question is whether in the *sui generis* Euro project there are *sui generis* crises. In other words, this paper will search for evidence on whether the ongoing crisis is a single Euro crisis, or a combination of a set of Euro crises with a focus on the periphery countries.

These questions are not novel. In fact, there is a large literature on whether or not this set of crises is different. What is novel in this paper, however, is the method used in providing evidence for these questions. The existing literature that analyzes this question of whether this time is different can be broadly classified into two. One set of studies present evidence based on detailed historical datasets allowing for narrative discussions of whether or not this time is different; a literature spawned by the seminal work of Reinhart and Rogoff (2009). Another set of studies makes use of the crisis prediction literature, testing whether or not statistically a set of crises differs from alternative sets of crises.

This latter group of studies belongs to those of the early warning systems (EWS) framework in studying crises prediction.[3] The major goal of the EWS framework is to develop a set of stable variables that will signal a crisis before it actually occurs and will assist in avoiding very costly banking crisis outcomes. The underlying assumption of the EWS framework is that new crises provide new information that can be combined with previous information provided by old crises since crisis across different time periods have similar properties. If, however, the EWS analysis does not point to such a stable set of variables then this result is indicative of the changing nature of crises. Studies by Gupta, Mishra and Sahay (2007), Rose and Spiegel (2010, 2011), Frankel and Saravelos (2012) among several others test for such differences making use of the EWS framework. The purpose of these analyses is to explore whether or not these crises are different from each other on average. For example, an EWS framework based on evidence for whether the crises between the Latin American region (or the 1980s) and the East Asia and Pacific region (or the 1990s) are different would provide information on whether, on average, the probability of

---

[3] Such studies have once again come center-stage, with important contributions from Reinhart and Rogoff (2009), Rose and Spiegel (2010, 2011, 2012) and Frankel and Saravelos (2012), among many others.

going into a crisis is different for Latin America (or the 1980s) or East Asia and Pacific (or the 1990s). However, the outcome could hold possible divergences from such average behavior. While the average behavior might differ significantly between regions or across time, it could easily be that an individual country experiences something similar to what an individual country in a different group experiences.

In order to identify such case-specific information, a tool that would not purely rely on the information regarding the relationship between averages but would also take into account individual specific information would be preferable. One such tool is the matching technique. The matching technique aims to statistically match/pair similar observations. As such, it is nothing but a way of clustering observations according to a set of pre-determined dimensions. The clusters are determined based on a metric that is obtained within the matching exercise. Indeed the novelty of this paper is to study the aforementioned commonly asked questions using the matching technique by allowing for identification of similarities of individual Euro zone crises, both among themselves as well as with earlier historical crises.

The evidence resulting from this matching exercise is not only to serve an intellectual curiosity of whether there is a *sui generis* periphery Euro crisis, but also, to provide a framework for policy discussions. Indeed the question of whether or not within the periphery each individual country crisis is unique has a one-to-one mapping to the policy question of whether or not custom-based policies should be designed for individual Euro zone crises. In short, the main question of asking "whether or not the crisis' within the periphery Euro area are *sui generis*" is no different than asking whether "the policy prescriptions should be generic or custom-made".

Ensuing is the framework for the discussion: first identifying similarities and differences across the ongoing Euro zone crises by comparing them with each other and with historically past crises, and then, using this information to discuss the guidelines for a recovery policy plan. Determining the similarities and discrepancies will assist in designing more effective recovery policies. If the

4

evidence suggests that the periphery Euro crisis is not unique, but that it shares sufficient commonalities with several past experiences, then, the policy design will benefit significantly from the vast information available from these past experiences.

The results can be summarized as follows. Each and every Euro zone country crisis experience is different in nature, despite sharing commonalities. These commonalities do not necessarily only lie within the core countries or within the periphery countries. A lot of similarities exist between countries that are classified as core and those that are classified as periphery countries. An interesting and important finding is that the GIIPS[4] crises encompass some very dissimilar crises as well as very similar ones. For example, the Spanish and Irish crises share a significant amount of similarities in their pre-crisis conditions whereas the Greek crisis is very distinct from all other GIIPS crises. This finding per se is the first evidence against a one-size-fits-all policy prescription for the GIIPS countries. Therefore, the policy design of each country's recovery should take into account the particularities of each crisis.

The results in respect of the matches of the current Euro country crises and past crises also present crucial information regarding the nature of the ongoing crises and their build-up period. The periphery Euro zone crises match mainly with the banking crises of the 1990s. Namely, the experiences of several of the big-five crises (Japan, 1992; Norway, 1987; Finland, 1991) and the East Asian crises (Thailand, 1997; Malaysia, 1997; the Philippines, 1997; Indonesia, 1997) are very important sources of information regarding the development/evolution of the ongoing crises in Europe.[5]

Among the GIIPS countries, two of them share sufficient commonalities with the pre-crisis conditions of emerging market crises, namely the 1996/97 East Asian crisis. While the Portuguese crisis shares significant commonalities with the Malaysian and Thai crises, the Greek

---

[4] GIIPS: Greece, Ireland, Italy, Portugal and Spain.
[5] The "big-five" crises include the Japanese banking crisis (1992), the Scandinavian banking crises (Finland, 1991; Sweden, 1991; and Norway, 1987) and the Spanish crisis (1977).

5

crisis shares significant commonalities with the Indonesian and the Philippine crises. On the other hand, the remaining GIIPS crises share commonalities with past high-income country crises. In the case of Italian banking crisis, build up period resembles that of the Norwegian and Finnish crises of the late 1980s/early 1990s. The Irish and Spanish crises, however, share many similarities with the Japanese crisis of 1992.

The individual matches also allow for a discussion of policy guidelines that are custom-made, and the advantage of using the matching technique becomes very clear when discussing the policy prescriptions for the GIIPS.

There are many studies in the literature that use a wealth of panel data to analyze the contribution of alternative macro policies to the post-crisis recovery period. Such studies provide general information that is still valuable. While they are able to identify the effect of certain policies based on a general observation, they are unable to provide information on the discrepancies departing from the general trend that could be inherent in the effects of these policies. In other words, while a policy might be effective in dealing with a crisis of a general nature, certain features of an economy might render this policy ineffective. Or vice versa; while a policy might be ineffective on average, it might turn out to be very effective for a particular country due to its specific characteristics. The matching tool allows for discussion of such specific cases and identification of custom-made policies, rather than broad policy statements that apply to the general cases.

The evidence provided in the following analysis underlines the different policy priorities for each GIIPS country in respect to the resemblance of their respective past crisis. Results point to the need for Italy, Spain and Ireland to concentrate on banking sector restructuring and regulation, whereas for Portugal and Greece to concentrate their efforts in designing policies that will allow for a real exchange rate devaluation either through a radical choice of a nominal exchange rate devaluation, or through a series of policies that will lead to competitive disinflation. Another

important finding concerns the role played by the fiscal sustainability position of each country in leading to differential fiscal policy advice.

The remaining part of the paper is organized to lead to the development of a detailed discussion of policy prescriptions for the GIIPS countries. In section II the measurement and identification of a banking crisis as well as details of the dataset are provided. In section III the analysis and results of the matching of new and old crises are presented, of which the goal of is to seek answers to the question of whether the GIIPS crisis is sui generis or not. The resulting case studies from the matching exercise are presented in section IV. In section V an overview discussion of the post-crisis recovery is carried out. Section VI the policy implications and conclusions from the analysis are outlined.

II.   **Data**

In order to discuss similarities across the current and previous banking crises, it is necessary to identify the dates of the crises. In doing so, we rely on existing studies in the literature, which specifically identify the banking crises' through assessment of qualitative events.[6] These are two of the most recent updates of such datasets by Reinhart and Rogoff (2009) and Laeven and Valencia (2012), who base their crisis dates on the pioneering work of Caprio and Klingebiel (2003) and Demirguc-Kunt and Detragiache (1998, 2005).

We reconstructed a banking crisis indicator identifying a year as a crisis year provided either Reinhart and Rogoff (2009) or Laeven and Valencia (2012) reports that year as a crisis year. In other words, given the qualitative nature of the construction of these two data series, the

---

[6] There are also papers that assess banking crises using information on the evolution of financial conditions that include large changes in asset prices and/or credit volumes. For example, Gourinchas, Valdes and Landerretche (2001) identify crises based on deviations of credit to GDP ratio from its trend; Mendoza and Terrones (2008) identify them as large deviations of real credit growth from its trend, Claessens, Kose and Terrones (2010), on the other hand, refer to the peaks and troughs of the level of real asset prices and credit in identifying crises.

judgments made by these two groups of researchers were equally weighted. If either one of them interprets events in a country as being suggestive of a banking crisis, we took that as signaling sufficient trouble to be labeled as a crisis. In doing this, no loss of information is incurred, given the already ad hoc nature in identifying the start and end year of a banking crisis in the literature.[7] This approach is similar to that used by Gupta, Mishra and Sahay (2007) in classifying a currency crisis and Hutchison and McDill (1999) in classifying a banking crisis. Given that our reference includes only two papers, Reinhart and Rogoff (2009) and Laeven and Valencia (2012), we view it as being significant if even one of them identifies a year as being a banking crisis year.

Reinhart and Rogoff (2008a,b and 2009) see a banking crisis as the occurrence of either one of the following events: first, if the operation of a bank leads to the closure, merging, or takeover by the public sector of one or more financial institutions,, and second, if there are no bank runs but closure, merging, takeover, or large-scale government assistance of an important financial institution takes place. This definition leads to the inclusion of both systemic and non-systemic banking crises in the dataset.

Laeven and Valencia (2012), on the other hand, only include systemic banking crises in their dataset. Systemic banking crises are defined as periods of significant signs of financial distress in the banking system, and periods during which there are significant banking policy intervention measures to counteract significant losses in the banking system. Such policy interventions are viewed as significant if they include at least three of the following policies: extensive liquidity support, high bank restructuring costs, significant bank nationalizations, additional guarantees put in place, significant asset purchases, deposit freezes and/or bank holidays.

The list of countries having experienced a banking crisis according to this reconstruction and the information according to which original dataset the crisis identification is based on is provided in

---

[7] For more details please refer to Reinhart and Rogoff (2009) and Laeven and Valencia (2012) who raise their respective concerns about the difficulty of knowing exactly when a crisis starts and when it ends.

the Data Appendix section. This section also provides summary comparisons across the Reinhart and Rogoff (2008a,b) and Laeven and Valencia (2012) datasets.

Table 1 provides an overview of these crises years and episodes, depicting information over time (panel (a)), across regions (panel (b)) and across different income groups (panel (c)). The sample includes 637 crisis years for a total of 117 countries during 1980-2011. These 637 crisis years correspond to 165 episodes of crisis. A hundred and thirty two of the 165 banking crisis episodes used in this paper took place in the 1980s and 1990s. Of the remaining crises, 25 started in 2007/08 and are still ongoing. Hence, making use of the information provided by the past 132 crises to shed light on the ongoing 25 crises is a very valuable exercise.

The crises that took place in the 1990s are shorter on average than crises that took place in the 1980s. The majority of the crisis episodes took place in Sub-Saharan Africa and Europe, followed by Latin America and the Caribbean. The crises in the East Asia and Pacific region, though a less frequent event in terms of counts of crisis episodes, are much lengthier than crises in other regions. The distribution of these banking crisis episodes across the different income groups of countries is very similar, with around 58% of the crises taking place in upper middle or high-income countries and the remainder taking place in lower-middle and low-income countries.

<INSERT TABLE 1>

III. **Matching New and Old Crises**

Our ultimate goal is to provide an alternative anatomy of the ongoing European financial crisis in light of this globally accumulated banking crisis experience. In order to make use of this vast experience of past crises, it is essential to search for evidence regarding the similarities and/or commonalities across the current and past crises. In other words, if indeed the periphery Euro

crisis is not different than past experiences then, knowing with which past crises the current crises share a significant amount of commonalities would provide very valuable information. The summary statistics presented in Table 1 suggest that banking crises are phenomena that are not restricted to a certain time period, a certain geographic region or a set of countries. As Reinhart and Rogoff (2008a,b) emphasize, these statistics are evidence that the incidence of banking crises in high-income countries is no different from that of middle- or lower-income countries. In our sample, the number of banking crisis episodes in Europe is only two fewer than those in Sub-Saharan Africa. The information summarized in this table lends support to justifying a more detailed statistical analysis of whether indeed the nature of banking crises are similar across time and across country groups.

The discussion of whether a crisis is different than past experiences is one that flares up at the onset of each crisis. Following the late 1990s in respect of emerging market crises, for example, a controversial debate arose of whether the crises were geographically more widespread, deeper crises, or whether models based on past crises at the time could have predicted the occurrence of these, suddenly emerged. In this debate, for example, Eichengreen and Rose (1998) and Berg and Patillo (1999) argued that although past experiences provided some information on the new crises, the predictive power of such general models was limited. They reasoned that this limitation was a reflection of the differences in crises experiences across time and/or across countries. Kaminsky and Reinhart (1998), on the other hand, argued that the existing regional differences between East Asia and Latin America eroded strongly during the 1990s, rendering their crises similar. This is echoed in the findings of Kamin (1999) as well. He argued that the evolving exchange rate, fall in output, current account adjustments and financial sector difficulties were very similar to past episodes of crises despite the larger incidence of emerging market crises at the time. Edison (2003) studied the differences across regions making use of an early warning system (EWS) framework. The findings lent support to the premise that there were no significant statistical differences across regions.

The start of the ongoing crisis also spurred similar discussions, for which Claessens, Kose and Terrones (2010) and Claessens, Kose, Laeven and Valencia (2013) provide an overview. Rose and Spiegel (2010 and 2011) consider a purely cross-sectional analysis to examine the link between the occurrence and severity of crises, and macroeconomic and financial indicators that have been previously identified as relevant indicators for crisis prediction. Their goal is to mainly study whether the crisis incidence differs across regions, rather than focusing on across time differences. They interpret the lack of robust findings as suggestive of crisis experiences differing across regions. By extending the dataset further into the ongoing crisis, Frankel and Saravelos (2012) also conducted an exercise of identifying the relevant variables in explaining the 2008-09 crisis incidence. With some reservations, they argue that despite the differences in financial crisis characteristics across years and regions, their empirical investigation of the 2008-09 crisis lends support to using early warning indicators to explain crisis incidences.

Using historical data, Jorda, Schularick and Taylor (2011) and Schularick and Taylor (2012) were able to show that such crises are simply credit booms that go bust. What is more relevant is that, using extensive information available in these novel historical datasets, just like Reinhart and Rogoff (2009), they were able to argue that analysis over short periods of data creates myopia and is unable to show that indeed similar crises occur over time and across regions. In short, these set of papers argue that crises are alike across time.

Many of these papers make use of a vast literature on early warning indicators in testing for whether this time is different or not. Indeed, the disruptive effects of banking crises have led to an extensive literature on economically predicting these crises. The main goal of this literature is to appraise the relationship between observable macroeconomic and financial indicators, and the probability of a crisis occurring. In doing so the goal is to propose an early warning system. The main assumption underlying this exercise of creating an early warning system is that crises are similar in nature. Therefore, by inclusion of all experiences in the analysis if one can identify a stable set of early warning signals, it would allow the forecasting of future crises. The assumption

that this time is no different implies that inherent in past crises is a wealth of information that can provide sound guidance to help avoid future crises.

In analyzing whether the ongoing crises are different from the past crises, we also make use of this EWS analytical framework. However, it is important to keep in mind that our goal is not to contribute to the literature on predicting banking crisis, but rather to make use of this vast literature to discuss whether the factors that contribute to predicting the crisis have changed across time or across countries.

We follow this main group of studies, leading to the inclusion of the following regressors in the analysis:[8] Output growth is included to capture the general performance of the macro economy.[9] The inflation rate is included as a proxy for macroeconomic instability that might affect the strength of the banking sector. As a general measure of the strength of bank balance sheets and changes in the risk exposure of the banking sector, total credits to private sector and total bank deposits as a share of GDP are also included in the model. M2 compared to a measure of reserves is considered as a predictor of an economy's vulnerability to balance of payments crises.[10] To reflect the financing needs of the government and fiscal balances, the government budget balance variable is included in the analysis. Since our sample of countries includes both developed and developing economies, we avoided using factors that are specific to developing countries, such as proxies for liberalization of the financial sector.

The data sources and definitions of the variables included in the analysis are given in detail in Appendix I. Briefly, to reiterate, the following exercise will make use of around 165 banking crisis episodes in 117 countries over a period of 32 years from 1980-2011. However, given the

---

[8] See Demirguc-Kunt and Detragiache (1998, 2005), Eichengreen and Rose (1998), Kaminsky and Reinhart (1999), Calvo (1996), Laeven and Valencia (2012), among others.
[9] See Eichengreen and Rose (1998), Kaminsky and Reinhart (1999).
[10] See Calvo (1996) and Demirguc-Kunt and Detragiache (1998, 2005).

non-systematic availability of several macroeconomic variables included in the analysis, the

effective sample is smaller.[11] The variables of interest are annual.

Table 2 shows the evolution of the explanatory variables during times of tranquility, defined as no

crisis years as opposed to crisis times. The simple means tests suggest that the growth and

inflation performance of economies, as well as the fiscal balance and credit extensions as a share

of economic activity differ significantly between tranquil periods and banking crisis periods.

<INSERT TABLE 2>

In line with the majority of the papers in this literature we use logit estimation to study the

occurrence of banking crisis and capture the pre-crisis characteristics by use of lagged values of

explanatory variables.[12] Table 3 reports the results of the logit estimation of the contribution of

pre-crisis macroeconomic conditions on the probability of a banking crisis occurring. [13, 14]

<INSERT TABLE 3>

The baseline regression results, reported in column (1) of table 3 are in line with the literature on

early warning systems, providing an overview of factors that contribute to the build-up of banking

crises.[15]

---

[11] This is a problem that affects the whole of this literature on financial crisis. See Gupta et al (2007), Rose
and Spiegel (2010, 2012).

[12] Laeven and Valencia (2008 and 2012) define the initial conditions of a banking crisis as one period
lagged variables that describe macroeconomic conditions and state of the banking system. However, there
are studies, which follow a slightly different procedure in defining a crisis, which essentially translates to a
longer lag length between the explanatory variables and the occurrence of a crisis. For instance Fuertes and
Kalotychou (2006) allow a 3 period window in the definition of a crisis and Bussiere and Fratzscher (2006)
use a multinomial logit which includes tranquil periods in addition to pre and crises periods, both of which
translates to a wider gap between the change in the explanatory variables and the crisis event.

[13] The reported logit regression results are obtained from estimations including fixed effects. The fixed
effect specification is preferred upon the Hausman test as a guiding tool for choosing between the random
and fixed effects models. The Hausman (chi-squared) test statistics is significant, with a value 41.82,
suggesting strongly the use of fixed effects.

[14] In the preceding regressions the world interest rate is included in the analysis to capture the global
business cycles. The results are robust to alternatively including fixed time effects in the analysis instead of
the world interest rate.

What is more relevant for our discussion is to observe whether these governing factors hold across different country groups and/or different time periods. In line with Gupta, Mishra and Sahay (2007), we run the panel logit regressions across regions and across time by inclusion of dummies in the regressions. Since our focus is to identify whether the ongoing crisis in Europe is different than other banking crises, we define the broad dummy variables to capture the two important dimensions of this ongoing crisis as an income dummy and a time dummy.

The income dummy is defined to take on the value 1 if the World Bank classifies the country as a high-income country, and the value 0 otherwise. The time dummies are defined to capture the fact that the occurrence of banking crises has been much less in the earlier parts of the 2000's, when compared to the remainder of the dataset that covers 1981-2011. As such, two dummy variables are included in the analysis. One that takes on the value 1 for the years 2000-2007, and 0 otherwise; and the other dummy that takes on the value 1 for the years 2008-2011, and 0 otherwise. The results for the income groups are reported in column (2) of Table 3, while the results for the different time periods are reported in column (3) of Table 3.

Both sets of results point to the governing factors showing ample similarities across country groups, as well as across time. The role of real GDP growth, the current account dynamics, the fiscal balance, private sector credit and public debt remains unchanged across lower and high-income countries, as well as across time periods. However, alongside these similarities there seems to also be some differences. The role played by inflation and the world interest is found to be different across income groups, and across time. These results are suggestive of the fact that

---

[15] These results are robust across different estimation techniques, including the pooled OLS, fixed effects and random effects estimation. Fuertes and Kalotychou (2006) suggests that if the goal is to understand the data properties then one should prefer models that allow taking into account such heterogeneities by the use of alternative fixed effects. Otherwise, if the goal is to predict or forecast crises then the most parsimonious pooled logit regression should be preferred to such fixed effect panel specifications. Since in this exercise our main goal is to obtain a detailed understanding of the data properties, we prefer using the panel logit regressions to the pooled regressions. The baseline model, on which we will build the remainder of the analysis, is reported in column (1) of table 3, which includes fixed country effects and the world interest rate to proxy for the fixed time effects.

the currently ongoing high-income country banking crises bear, on average, both commonalities and differences with past and lower-income-country banking crises.

However, since this regression analysis provides information on the average, it does not allow us to identify specifically which past and current crises, or which lower-income and high-income crises have commonalities and discrepancies. In other words, while it suggests that overall the past crises' experiences might bear valuable information regarding the ongoing crises; it does not provide guidance on the specificities of these similarities.[16]

The following analysis seeks to provide evidence that takes this comparison one level deeper, allowing for a better identification of specifically which ongoing European crises are similar to which former banking crises experiences. Our goal is to find the similarities of two different sets of countries in their pre-crisis conditions. In essence, this exercise is very similar to the matching exercises conducted in the program evaluation literature. Propensity score matching is a statistical matching technique that allows for matching the entities that received a treatment, or were exposed to a policy/program with those that did not. Unlike the program evaluations our emphasis will be on the first stage of the exercise that determines matches between a "treated" and a "control" group.

In this propensity score matching exercise we define the treated units as the crisis episodes that occur on or after 2007, and the control group as all the crisis episodes that occur prior to 2007. We label the treated group as "new" crises and the control group as the "old" crises. Conditional that a country has been in a crisis at some point, we match the new crisis with the old crisis. This exercise interprets "being in a crisis currently" as a treatment, where treatment is per se nonsensical, but the exercise helps answer the question of whether the crises in the two periods

---

[16] Furthermore, as Jorda, Schularick and Taylor (2011), Schularick and Taylor (2012) and Reinhart and Rogoff (2009) suggest the short time dimension of the dataset renders it difficult to identify differences or similarities across different banking crises. As such it is of value added to tackle the problem using alternative tools.

can be matched sufficiently reliably, and if so, which country pairs match. In order to carry out this matching exercise we first have to estimate the propensity scores, then implement a matching technique to observe the similarities of current and past economic crises.

One important step in this exercise is to determine the variables that will be used in estimating the propensity scores. The propensity scores will provide a metric that will show the economic distance between the different banking crises. The closer the propensity score, the more similar the two crises are in terms of the factors that governed the pre-crisis period. Once the propensity scores are determined the next step is to decide on the matching technique, and determine the old and new crises that indeed match.

The choice of covariates to be included in the propensity score estimation is usually based on former empirical findings in the literature, with guidance from economic theory. As such, we start by including the largest set of variables that would contribute to the prediction of a banking crisis occurring. This set corresponds to the variables we have included in the estimations in section II, following Laeven and Valencia (2012). Testing whether or not this set of variables leads to a good quality of matches between the control and treated group provides a basis on which to decide the final set of covariates to include in the propensity score estimation. The following matching exercise is conducted with a set of covariates that ensure a good quality of match, and the quality of matches are ensured through the use of standard tests following the literature. The details of these tests and their application to this paper are provided in Appendix II. The covariates included in the analysis that ensure a good quality match are the current-account-to-GDP, fiscal balance-to-GDP, inflation, private-sector-credit-to- GDP, bank deposits-to-GDP and the public debt-to-GDP.

Once the set of covariates are determined, in order to discuss the specific pairs of old and new crises, the next step is to determine the matching method. There are many different algorithms to match treated and untreated units/items, which differ in the definition of "neighborhood"; in handling of the common support problem; as well as the weights being assigned to the neighbors.

Lin and Ye (2007) suggest starting by using the nearest neighbor matching with replacement, followed by radius matching. The nearest neighbor matching criteria matches the treated and the untreated units based on the closeness of their propensity scores, with the number of control units that will be matched as determined by the researcher. When replacement is allowed the control unit can be matched more than once. This replacement option has been shown to improve the average quality of matching while reducing the bias.

While with these criteria the treated units are matched to their closest neighbor, it is also possible to impose a tolerance level on the distance between propensity scores, namely, a caliper. Imposing a caliper is also shown to contribute positively to the quality of matches. With caliper matching instead of matching with the closest neighbor a tolerance level on the distance between the propensity scores is imposed. If in the matching process not only the nearest neighbor within the propensity range but all comparison members within this range are used, then this is called radius matching.

Radius matching can lead to multiple matches providing additional and complementary information on the nearest neighbor matching method. As such, we opted to use the nearest neighbor or the radius methods, in both cases with replacement.[17] Since we chose the number of control units to be matched as one, in the following discussion the terms "nearest neighbor" and "one-to-one" matching will be used interchangeably. The main difficulty is the lack of clear guidance a priori on what a reasonable tolerance level is in determining the radius. Rosenbaum and Rubin (1985) suggest that the caliper size be determined as 25% of the standard deviation of the logit of the propensity score to be used, whereas Austin (2011) suggests using 20% of the same value. We adhered to these suggestions in choosing the caliper in the radius matching exercise.[18]

---

[17] All matching reported in the following analysis imposes the common support, focusing on the comparison of comparable crises cases. Imposition of the common support restriction also improves the quality of matches.

[18] The suggested caliper range is 0.08, given the standard deviation of the logit.

The propensity scores obtained from using Set II as the set of covariates are reported in Table 4, in column (3). The matches between the old and the new crises using the nearest neighbor method with replacement are reported in column (5). For example, the ongoing crisis in Spain and Ireland match with the Japanese crisis of the early 1990s. On the other hand, the ongoing crisis in Portugal matches with the Malaysian crisis of the late 1990s. A summary of Table 4, focusing only on the GIIPS crises, is provided in Table 5.

The high-income countries that have been experiencing a crisis since 2007/08, as a group, share statistically significant similarities with mainly the East Asian crisis of 1996/97 (which includes Malaysia, Thailand, Indonesia, and the Philippines), the Japanese crisis that started in 1992 and the Nordic banking crisis of the early 1990s. In other words, the current crises bear much resemblance to the "big five" crises, Japan's 1992 crisis and the East Asian crisis, providing an incredible wealth of information and experience in designing recovery policies for the ongoing crisis based on these past experiences. This finding is in line with one's post ante expectations and also the narrative discussions documented in the literature. However, this finding comprises much more detailed information adding depth to our understanding of the current crises in the light of the past crises experiences.

The EWS exercise suggested that on average the high-income country crises have both similarities with and differences from lower-income country crises. Table 5 adds to this finding an important detail – some of the ongoing high-income crises share similarities with earlier crises of other high-income countries, whereas some of them share similarities with earlier crises of emerging market countries. This result is evidence that the matching exercise provides specific information about individual crisis similarities and adds value to the average information obtained from the EWS exercise.

<INSERT TABLE 4, 5>

The one-to-one matching allowed identification of exact matches of recent and old crises. For example, the GIIPS ongoing crisis matches with a variety of former crises. The Greek and Portuguese crises share significant similarities with different sets of East Asian crises experiences, the Filipino 1997 and Malaysian1996 crises, respectively. The Irish and Spanish crises share significant similarities with the Japanese 1992 crisis, whereas the Italian crisis shares significant similarities with the Finnish 1991 crisis.

Additional information that could be taken from the matching is the metric provided by the propensity scores, which reflects the extent of similarities between treated (new crises) and control (old crises) groups. Making use of this metric one could add to the qualitative discussions from matches by discussing the distance between each pair of new-old crises. Columns (4) and (5) of Table 5 provide this information. In column (4) we report the distance between each new-old pair, providing information on how relatively distant these crises are. The distance of the match between the crises of Greece, 2008, and the Philippines, 1997, at the level 0.003, is much less than the distance between the crises of Spain, 2008, and Japan, 1992, at the level of 0.073. This distance metric indicates the economic similarity of the Greece-Philippines crises is much greater than that of the Spain-Japan crises. In column (5) we report the distance between the GIIPS crises, providing a metric of how similar the GIIPS crises are among themselves. The distance of each crisis is measured from the case of Ireland, as a benchmark. Two results stand out. The ongoing crisis is not a single GIIPS crisis; each crisis within the GIIPS countries is unique in itself. However, the GIIPS crisis also has sub-clusters. The crises of Spain and Ireland are almost identical in this metric, but quite apart from the crisis of Greece. Indeed, the crisis of Greece separates very strongly from the remaining GIIPS crises. The distance between the GIIPS crises is graphically represented on the right-hand-side of Figure 1, showing the dissimilarity of the crisis in Greece from the remainder of the GIIPS crises.

While the one-to-one matching allows for a discussion of individualized pairs, additional information can also be obtained from a radius matching exercise. The results of this radius matching are reported in Figure 1, with special focus on the GIIPS crises that are also summarized in column (3) of Table 5. While the one-to-one matching allows for the discussion of the existence of a match, the radius matching allows for discussion of matches that fall within a range, i.e. somewhat quantify in distance to be among the matches.

Each group of data presented in Figure 1 represents the matched old and new crisis within the radius. The data is divided into eleven sets of matches, four of which include matches with the GIIPS countries, the clusters of which have remained unchanged. That is to say, the one-to-one matches of the GIIPS countries were so distinct from each other that even after carrying out a radius matching the GIIPS countries remained in distinct matched groups. This result reinforces the finding that rather than consider a single periphery European crisis, it is necessary to take each individual crisis on a case-by-case basis.

Even though the GIIPS crises continue to remain apart in radius matching, several of the GIIPS crises are found to share similarities with more than one old crisis. Therefore, the extended clusters allow for a better understanding of the nature of the ongoing crisis. For example, while the 1997 the Philippines crisis is found to be the most similar crisis to the ongoing crisis in Greece, the radius matching analysis allows us to also add the 1997 Indonesia crisis as another close match too. As such, the wealth of information available to better understand the ongoing crisis increases. Similarly, while the crisis in Malaysia (1997) is found to share the most similarities with the ongoing crisis in Portugal, results suggest that the crisis in Thailand (1996) is also relatively similar.

The goal of this section is to seek information regarding the uniqueness of the Euro crisis/crises. The main question that has been posed in this section is whether or not within the periphery Euro area individual country crises are unique. Results indicate that there is no *sui generis* periphery

Euro crisis. Each country crisis in the periphery is different from each other. Table 5 presents clear statistical evidence that what periphery Europe has been experiencing since 2007/08 is not a single periphery European crisis. The variation of crises within the periphery is very large. The results of the radius matching that is illustrated in Figure 1 reflects this high variation – the individual GIIPS crises' are far apart from each other (except for Ireland and Spain), and there is clustering in different subsets.

IV. Case Studies of Matches: Pre-crisis conditions

Now that the pairs of similar old and new crises have been identified, one can look into the details that underlie these similarities and differences. The plots of each variable that contributes to the matching process are reported in Figure 2, for both the new and the old crises that are matched. These figures take the crisis year as time zero for each crisis, and plot the evolution of each variable prior to and after the crisis. The following discussion refers to these plots.

1. **Portugal (2008) – Malaysia (1997) – Thailand (1996):**

The second half of the 1990s was a period of economic growth for Portugal. The average real rate of growth per annum was above 4%. This growth was fed by the positive expectations on account of the prospects of entering the Euro. However, this growth was short-lived. After peaking at 5.18% in 1998, the Portuguese growth rate started decreasing steadily. It has dropped to 0.83% per annum in the first half of the 2000s, and later to 0.45% in the second half of the 2000s. This slowdown is what Blanchard (1997) and Reis (2013), among others have called the slump that the Portuguese economy is in.

This real sector slowdown, which was mainly accompanied by low productivity growth, meant a loss of competitiveness. The growth experience of the late 1990s meant increases in the nominal wages that surpassed any productivity growth (overvaluation), pressuring the unit labor costs to go

higher and inducing a loss in competitiveness. This overvaluation, accompanied by a drop in the

public savings, reflected itself in a worsening current account deficit.[19]

The pre-crisis growth patterns of Portugal and Malaysia or Thailand differ significantly. The

average growth rate per annum in the five years preceding the crisis was around 9.5% for

Malaysia and 8.6% for Thailand (Figure 2, panel A).[20] However, other macroeconomic

imbalances point to significant correlations between the Portuguese case and the Malaysian/Thai

case.

Prior to the 1996/97crisis, both Malaysia and Thailand were accumulating significant current

account imbalances. The trends of these current account imbalances closely follow the case of

Portugal in the early parts of the 2000s. Indeed, among the GIIPS countries up until two years

before the crisis, the current account imbalances in Portugal were the worst. Similarly, among the

Asian-5 countries Malaysia and Thailand were experiencing the worst current account imbalances

two years prior to their 1996/97 banking crisis. This similarity is reflected in the close match of

the pre-crisis conditions of the ongoing crisis in Portugal with the 1996/97 banking crises of

Malaysia and Thailand (Figure 2, panel B).

Alongside the external imbalances, the developing private sector credit also shares significant

similarities with Portugal in its pre-crisis period, and Malaysia and Thailand in their respective

pre-crisis periods. Among the GIIPS countries Portugal had the highest share of private sector

credit to GDP ratio 5-8 years prior to the current crisis. However, despite this very high level,

Portugal differed from Spain and Ireland in the rate of increase of the private sector credit to GDP.

---

[19] Blanchard (2007) discusses the similarity of this boom, overvaluation and slump cycle experienced in Portugal to that experienced in Germany. This similarity could be one of the reasons for the propensity scores being so close for Germany and Portugal, as reported in Table 4. In both Germany and Portugal the wages as well as productivity have been on the drop. Although the real GDP growth rate is not a covariate that influences the matches, given its importance in understanding the macroeconomic evolution of any economy the data is presented in the graphs (Figure 2, panel A).

[20] These trends are the same even if one considers the difference of the growth rates from the tranquil period averages.

Indeed, both Spain and Ireland's private sector credit-to-GDP ratio surpassed that of Portugal's two-three years prior to the onset of this ongoing crisis. Re-examining the 2008 banking crisis, Spain and Ireland's private sector credit-to-GDP was higher than that of Portugal's, and was on a much faster increasing trend. This pattern closely matches that of the Japanese, Malaysian and Thai private sector credit-to-GDP ratios prior to their respective banking crises that started in 1992 and 1997, respectively. The highest private sector credit-to-GDP ratio was experienced by Japan among the control group that matches the ongoing crises. Thailand and Malaysia follow Japan in terms of the level of the private sector credit-to-GDP. This strong similarity underlies the reason for Portugal's its pre-crisis conditions of the ongoing crisis matching those of the 1996/97 banking crises of Thailand and Malaysia (Figure 2, panel C). By glancing at the same graph one can also observe why Portugal does not match with other Asian crises of the same time period. The private sector credit-to-GDP ratio was significantly lower in the Philippines and Indonesia prior to their banking crises, and was increasing at a somewhat slower rate. The average private sector credit-to-GDP ratio for Thailand and Malaysia was around 100% in the years prior to the banking crisis, whereas for Indonesia and the Philippines it was around 30%. This discrepancy between the Asian economies could be an underlying reason for Portugal matching specifically to the Thai and Malaysian crisis, and not to the Indonesia or Philippines crises.

One other feature of the Portuguese economy is that households preferring to hold financial assets to real estate channeled this increased private sector credit into a wealth accumulation. This was different from the case in Spain and Ireland, where the increased financial sector claims fed the housing bubble. This difference is what possibly causes the Portuguese crisis to fall into a different radius set from Spain and Ireland.

2. Spain (2008) – Ireland (2007) – Japan (1992):

Unlike Portugal, Spain and Ireland experienced high growth prior to the 2007/08 crises. In both countries this growth was fueled by the construction sector on account of a housing boom. The growth in the construction sector also contributed positively to the employment patterns, lowering the unemployment rates. The growth also created a cycle of increased income levels leading to increased demand for housing, and a financial market intermediation that focused mainly on the financing of the demand for real estate. Access to cheap international funds allowed for such financial intermediation to take place at relatively low costs. The demand pressures in the housing market were reflected in a significant increase in the housing prices in both Spain and Ireland.

This cycle is no different from the asset bubble experienced by Japan in the latter half of the 1980s, running into the 1992-banking crisis. Asset prices, especially real estate and stock prices were very high and increasing. A steadily increasing and high level of credit availability was contributing to into this asset bubble.

In the asset bubble build-up period in both the former crisis of Japan, 1992, and the recent crises of Ireland and Spain, 2007/08, the role played by access to cheap credit is well documented. The channeling of these funds into the real estate sector can be captured through the private sector credit-to-GDP ratio of all three countries prior to their respective crises. Indeed, this ratio turns out to be a major factor by which these crises have been matched (Figure 2, panel C).

This match in the financial sector intermediation is an important contributing factor to the matching exercise identifying these three crises as being very similar. In all three cases the share of private sector credit in GDP was well above 100% on average in the ten-years preceding the crisis. This ratio was 108% for Ireland, 112% for Spain and 132% for Japan in their respective pre-crisis years.

Looking into the details of the matches, it is clear that the three crises follow a very close pattern in their real GDP growth performance and the private sector credit claims prior to their respective crises. All three countries experienced very high growth rates in the years preceding their crises. In the 10 years preceding the banking crisis of 2007, Ireland's real growth rate per annum was above 6%, Spain's growth rate was around 3.85% while Japan's was around 4.5%. Taking into account the growth rates of other high-income countries allows all three pre-crises cases to be classified as high-growth cases. This similarity is also reflected in the matching of these cases. However, one difference in these three cases is that the real slow-down was initiated much earlier in Japan when compared to Spain and Ireland.

While there are strong similarities in the economic performance and the source of growth in all three countries prior to their crises, and a very strong similarity in the bubble created by the financial sector intermediation, the source of funding for these activities differed somewhat across the three countries. This difference is reflected in the discrepancies in the current account dynamics of the three cases. Ireland, having run a current account surplus from 1991-99 started running a current account deficit in 2000. This deficit continued increasing throughout the 2000's, the period of cheap international/intra-EU fund availability. Spain started running current account deficits in 1987, remaining much below 3.5% throughout the 1990s. However, the availability of increased international funds in the 2000s accompanied by the domestic demand for construction reflected itself in a sharply increasing current account deficit trend. Right before the 2008 crisis the current account deficit of Spain had reached 10% of its GDP. While Spain and Ireland show a strong resemblance in their current account dynamics Japan shows a strong dissimilarity from both cases. Japan has been steadily running a current account surplus (Figure 2, panel B).

The similarity in financial sector outweighs the dissimilarity in the dynamics of the current account in providing important information regarding the matching of these crises. Ignoring where the funds flowed from, i.e., domestic savings in Japan, or international savings in Ireland

and Spain, the exuberant domestic credit expansion that fuelled the property bubble is what matters in understanding the three cases.

3. Italy (2008) – Finland (1991):[21]

Italy, like Portugal, has been experiencing a low growth period. The average annual growth rate of Italy ten-years prior to the outset of the current banking crisis was solely 1.5%. This is even lower than that of Portugal's, whose annual average real growth was 2% over the same time period. The structural problems that underlie this sluggish growth rate in Italy are well documented in the literature. However, it made the current account dynamics very manageable.

Similar to all the other cases, the private sector credit has been on the rise as a share of GDP in Italy as well. Indeed this is the one dimension that matches the pre-crisis conditions of Italy and the Nordic banking crises of the early 1990s.

The Nordic banking crisis of the early 1990s is depicted as one that was driven mainly by financial deregulation, leading to capital inflows and a fast expansion of domestic credit that fueled consumption. In Finland's case, Honkapohja and Kosskela (1999) argue that besides these usual suspects of all banking crises there was a shock caused by the external economic environment. In this specific case this it resulted from the break-up of the Soviet Union.

The major dissimilarity of Italy from all the other cases, except Greece, is its very high public debt to GDP ratio. While this characteristic of the Italian economy is found to matter less in identifying with which former crises it has a significant resemblance to, in this match it remains very high and requires policy interventions. Given the similarity of Greece's case with Italy's in this respect we next broadly discuss Greece's matches.

---

[21] Although Norway's crisis also matches with that of Italy, due to the significance of the developments in the oil market for the case of Norway it is excluded from the remainder of the discussions.

4. Greece (2008) – Indonesia (1997) – The Philippines (1997):

Prior to the onset of the recent banking crisis, Greece's economy was growing in a similar fashion to Spain's. With the aid of cheap EU funds, and the benefits accruing from the monetary union, Greece was able to increase its consumption through borrowing. Both the private and the public sector were heavily involved in this borrowing process.

The repercussions of this debt-driven-consumption behavior reflected itself in the largest fiscal imbalance among the GIIPS countries, at an average of around 7% of its annual GDP for 1990-2007. This is much higher than the annual average for Ireland (0.1%), Italy (5.4%), Portugal (5%) or Spain (2.3%) over the same period (Figure 2, panel D). This corresponded to a very high public debt to GDP ratio, and a steadily rising one since 2007 (Figure 2, panel E).

The inflow of funds, however, was not intermediated to the private sector through the financial system, as is evident in the lowest private sector credit-to-GDP ratio among the GIIPS countries. Indeed, it is this feature of Greece's experience that leads to its match to Indonesia and the Philippines 1996-97 banking crisis experiences. Although the fiscal pre-crisis conditions show strong dissimilarities, the domestic credit dynamics show such a strong resemblance that the Indonesian and Philippines banking crises are found to share sufficiently large commonalities in their pre-conditions with Greece.

The above discussion provides a depiction of how similar each GIIPS' crisis is to an earlier banking crisis. Given that these earlier crises have already come to an end and completed their terms, they provide a wealth of information on how such crises evolve and what role policies might play in the process. As such, we next use the matches to draw insights about possible future courses of action for the ongoing crises of GIIPS.

V. Post-crisis Recovery

Before we go into a case-by-case analysis of the issue, in Table 6 we present summary statistics that depict the evolution of the older crises. What is striking is the length of these matched older banking crises. The duration of these old crises are significantly longer than the average banking crisis for the whole sample. This has important implications for the new crises: the old crises they share commonalities with have experienced much more prolonged crisis recoveries than the average experience.

Alongside the duration of a crisis, indicators that depict the change in economic activity are also reflective of how the crisis evolves. We follow Gupta et al (2007), Lane and Milesi-Ferretti (2010) and Rose and Spiegel (2011) in defining the crisis intensities. Namely, we measure crisis intensities (severity) by either the average growth rate during the crisis years, or the difference of this growth rate from the average over the tranquil period, the years during which the economy does not experience a financial crisis. Alternatively we also calculate these two measures using components of GDP, namely the private consumption, the private investment and the total domestic demand. Given the high correlation among all of these alternative measures, in the remainder of the discussion we report results using the two crisis incidence measures based on the real GDP.

<INSERT TABLE 6>

The discrepancy across the matched countries' experiences in terms of the crisis intensities is reported in Table 6. The real GDP growth rate is lower on average during the episode of crisis in Japan compared to the sample average, while it is higher for the Philippines and Malaysia during their crisis episodes. The deviations of the average growth rate in each country relative to their tranquil period also show a variation across countries.

What is more striking is how costly all of these matched old crises have been. Usually in the post-crisis periods, despite significant output losses, economic growth itself recovers. However, in the majority of the matched old crises the growth rates remain below their tranquil period averages over extended time periods (Figure 3). This is true even for periods that go beyond the dates identified as a crisis by Laeven and Valencia (2012) or Reinhart and Rogoff (2009). As depicted in Figure 3, taking a 14-year window around the crisis, the growth rate remains below that of tranquil periods for very long time periods.[22] Indeed, over the 14-year time frame, in Japan the growth rate is below the tranquil period average for 8 years. In other words, once Japan entered the crisis it remained there throughout the period of analysis.

This broad comparison depicts a strikingly difficult post-crisis period for the matched old crises. As such, at the aggregate level it is suggestive of what awaits the Euro zone countries. However, as the matching exercise has already ascertained, one should not discuss policies at an aggregate level, but should take into account the unique nature of each and every crisis. In the following section we do just this. Given that there is no *sui generis* Euro zone crisis, policies that tackle these individual crises should be unique to each crisis. The discussion of these unique sets of policies should refer to the experiences from older crises that share sufficient similarities to the individual Euro zone crises.

VI.   Policy Implications and Conclusions

The matching exercise allowed for identification of former crises experiences that might shed light on the specificities of the ongoing crises. In the following discussion the growth performance of the matched pairs of current and former crises, relative to their individual tranquil period growth performances, will be compared. Given that enough time has elapsed since the

---

[22] The 15 years include four years prior to the crisis, and 10 after the crisis' first year (given that the Japanese crisis in our dataset is identified as being 10 years long).

older crises took place, information regarding their recovery path can provide some guidance for the current European countries.

In making use of these past experiences as a guiding tool, two conditions that are inherent to the current crises have to be noted. First of all, unlike most of the banking crises in our sample, those in the post-2007 period are part of an extensive global financial crisis that has contributed to a significant world slow-down. The average annual world growth rate was 1.55% for 2008-2011. On the contrary, the average annual world growth rate was 3.23% for 1984-2007.

Secondly, most of the countries at the core of this crisis have structural problems that render real exchange rate devaluation/depreciation very difficult. The use of the common currency limits the ability of independent monetary policy to devalue/depreciate the real exchange rate.

1. **Italy (2008) – Finland (1991):**

Given that Finland and Italy were found to share sufficient commonalities going into the banking crisis of 1991 and 2008, respectively, a comparison of their post-recovery experiences is of interest. Prior to the crisis, Finland was keeping its exchange rate fixed. At the onset of the crisis the authorities raised the interest rates to protect the currency, Markka. However this policy was not enough to stave off the pressures on the currency. Furthermore, the rising interest rates also contributed to the crisis itself through its effects via fuelling of consumption. As such, the authorities decided to devalue the Markka in 1991. Realizing devaluation was not enough to correct the imbalances, finally, in 1992 they allowed the Markka to float. The total loss in the real value of the Markka over these two years was around 35%.

Following the decision to float the currency, the Bank of Finland announced an inflation target. The narrowing of the interest rate differential with Germany signaled that this change in monetary policy framework was actually perceived as credible by the agents.

As for the fiscal policy, the sequence of policy formulation was different. At the onset of the crisis the fiscal policy carried countercyclical features. However, in 1992 the fiscal policy was tightened and it remained unchanged throughout 1993. This policy formulation prioritized the sustainability of the fiscal position more despite the cost of increasing unemployment.

The combination of these policies contributed to a recovery path, as depicted in Figure 5. Finland was able to achieve growth rates above its tranquil period in the third year of the crisis.

Italy, sharing sufficient commonalities with Finland at the onset of the crisis, however, has not been able to implement a strong real depreciation. From 2008 to 2011 the real exchange rate loss for Italy was limited to 2%, and during the same period an active monetary policy was pursued within Europe. The Italian authorities announced fiscal policies aimed at consolidating the deficit. These policies resulted in a decrease of the cyclically adjusted primary balance as a share of GDP from 4.1% in 2009 to 3.5% in 2011.[23] Despite these differences in the ingredients of the policy mix, Italy's growth pattern in the first two years of the crisis remained very similar to that of Finland's. However, this trend seems to have broken in the third year of the crisis. While Finland's growth pattern was on a positive trend, the graph depicts a reversal of this pattern for Italy.

This reversal coincides with the divergence of the crisis experiences of Finland and Italy. Around this time the Italian crisis was no longer perceived as a banking crisis but had transformed into a sovereign debt crisis. Conversely, the crisis in Finland did not evolve into a debt crisis. This divergence in their growth paths could possibly shed light on the importance of fiscal sustainability. In its post-crisis policy framework, Finland emphasized fiscal sustainability as part

---

[23] According to data from the World Economic Outlook, IMF (2013).

of its recovery package and benefitted from a recovery that allowed for growth above its tranquil period averages.

It is also important to note that this analysis by making use of the differential growth rates from the tranquil period averages masks an important difference between Italy and Finland. While Italy and Finland have achieved similar success in having achieved their usual growth rates at the end of the second year of their respective crises, this usual growth rate differs by 1 percentage point between the two countries. As such, any policy prescription for Italy should take into account not only the fiscal sustainability but also the lower tranquil growth rates of the economy.

2. Spain (2008) – Ireland (2007) –Japan (1992):

The commonality of the pre-crisis conditions for Ireland and Spain with Japan could be worrisome given the lost decade Japan experienced in the subsequent years (Figure 6). The policies implemented by Japan could as such be of importance for Ireland and Spain in designing policies that would assist in avoiding a lost decade of their own. The following discussion and evaluation of policies implemented by Japan in the post crisis period follow Hoshi and Kashyap (2004, 2011), and are intended to serve as a guiding framework rather than providing the details of each policy.

The overall policy framework of Japan in the post crisis period can be summarized as being based on three pillars: an expansionary fiscal policy (when conventional fiscal policy measures are taken into account), a monetary policy that hit the lower zero bound interest rate and insufficient financial sector reforms.

The lack of sufficient financial sector reforms is seen as a very significant source of lost growth by Hoshi and Kashyap (2004, 2011). The financial deregulation that started in the mid-70s, they argue, not only contributed to the build up of the asset bubble that led to the crisis but also created

hindrances to the growth prospects of Japan by eliminating any incentive for creative destruction during the lost decade. An in-depth financial sector reform that would eliminate the non-performing loans and lending to what they call "zombie firms" is put forth as a necessary policy to increase the efficiency of financial intermediation (Caballero, Hoshi, and Kashyap, 2008).

Starting in July 1991, the Bank of Japan started cutting its interest rate target, which continued throughout the 1990s. By the end of the 1990s the nominal zero bound was reached. A significant number of researchers argue that mistakes in this monetary policy framework did indeed contribute to a lengthy deflationary period, further deepened by deflationary expectations.[24]

The fiscal policy was structured to be expansionary. However, despite its expansionary nature, as Hoshi and Kashyap (2011) provide detailed evidence based on studies by Doi and Ihori (2009, ch. 3), the composition and content of the fiscal policy was not effective. Excessively inefficient spending programs not only led to misallocation of resources, and hence, created a hindrance to growth, but also contributed to a continuous build up of fiscal imbalances. The significant build up in the public debt of Japan in the post-crisis period is evident in the steep upward trend of the public debt-to-GDP ratio depicted in Figure 2, panel E.

There is much Ireland and Spain could learn from Japan in terms of these policy mistakes. In order to avoid a similar growth trap, following a similar asset price bubble period, Ireland and Spain will have to focus mainly on two important components in their policy design: (1) financial sector reforms, (2) fiscal policies that are designed to take into account both the fiscal sustainability as well as the quality of spending. These policies will have to be

---

[24] Hoshi and Kashyap (2011) evaluate these claims and note that this criticism might be too harsh, that given the information available to policy makers at the time, the policy choices made were meaningful.

implemented with great rigor by Ireland and Spain, given that their economic performance in the first three years of the post-crisis period has been worse than that of Japan's in its respective crisis experience.

The OECD Economic Surveys (2013) provide a detailed list of the policies implemented in these two areas in both Ireland and Spain. In summary, both Spain and Ireland have been emphasizing the restructuring and resolution of banks. However, there are still issues that need attention in light of Japan's experience. For example, non-performing loans continue to increase in Ireland, an issue that bears similarities to Japan's post-crisis period experience at the aggregate level.

On the fiscal front both Spain and Ireland have consolidated their fiscal positions over the past four years; the cyclically adjusted fiscal deficit has decreased from 11.9% of GDP in 2008 to 6.9% of GDP in 2011 in Ireland, and from 7.1% in 2009 to 3.0% in 2011 in Spain. While the evaluation of such efforts is of importance, the Japanese case points to the relevance of also making explicit effort in ensuring that the composition of the fiscal balances are growth generating. In Spain's case, for example, the role played by regional governments in the overall fiscal balance is an important issue that should accompany any fiscal policy decision at the aggregate level.

3. Greece (2008) – The Philippines (1997) – Indonesia (1997):

The following two cases, namely of Greece and Portugal, match with different East Asian country banking crisis experiences from 1996/97. For all East Asian economies significant real exchange rate devaluations were an important part of the adjustment margin, making the following two cases different in terms of their policy discussions compared to the cases of Ireland, Italy and Spain.

Of the East Asian crises, Greece matches with the experiences of Indonesia and the Philippines. Figure 7 provides a comparison of the growth patterns of all three crises, relative to their individual tranquil period growth performance. Two peculiarities stand out: (1) despite their significant commonalities prior to the crisis, all three cases diverge in their growth patterns in the early years of the crisis, (2) Indonesia and the Philippines' growth performance hit a trough in the first year of the crisis, and in the second year of the post-crisis period their growth trends have sufficiently reversed. On the contrary, Greece is yet to reach the trough of the fall in the growth rate, even into the third year of the crisis.

Indonesia and the Philippines' differing growth trajectories in the post-crisis period bear important policy discussions for Greece. The most important difference between the post-crisis period of Indonesia and the Philippines is that there is a level difference in the growth trajectory of the two countries although they share a similar pattern. This difference, which is reflected in a significant contraction in Indonesia compared to the Philippines, is on account of the political instability Indonesia experienced in 1998. The additional loss in growth on account of the political instability meant the policy choices of Indonesia and the Philippines would differ drastically, even though they share significant commonalities pre-crisis.

The stronger contraction in Indonesia created the need for a stronger real exchange rate devaluation compared to that of the Philippines. The recovery of Indonesia required that the Rupiah lose more than 50% of its value in real terms, a very high figure when compared to the approximately 20% real loss in the value of the Philippine Peso. Given that the growth performance of Greece is still to reach its trough, and its level remains between those of Indonesia and the Philippines growth experiences, these figures provide a benchmark range for the necessary real exchange rate adjustment for Greece.

The smaller contraction in the Philippines, on the other hand, generated room for maneuver in terms of fiscal policy choices, once again creating diverging paths for the two countries. Given its limitations in raising resources and funds, due to the strong contraction, Indonesia had no option but to follow more contractionary fiscal policies that were part of the IMF lending program. However, since the Philippines had, room for maneuver, it followed Keynesian countercyclical fiscal policies.

This room for maneuver was also made possible thanks to the much lower accumulated public debt figures in the Philippines. Throughout the post-crisis period the public debt in the Philippines ranged between 50 and 60 percent of its GDP. On the other hand, despite going into the crisis with much lower public debt ratios, once the crisis occurred, the share of Indonesia's public debt increased from 26.4% in 1997, to 72.5% in 1998 and to 95.9% in 1999. The fiscal sustainability issues raised by this trend constrained Indonesia's fiscal policy options and may have contributed to the divergence in the fiscal policy choices among the Philippines and Indonesia.[25] In this regard, Greece shares more similarities with Indonesia than it does with the Philippines. Greece entered the crisis with an already very high public debt ratio, which further picked up pace throughout the crisis to increase from 107.4% of its GDP in 2007 to 165% of its GDP in 2011. The increasing intolerance of debtors in financing Greece's ever-increasing public debt is evident in the accompanying rise in its borrowing cost spread. Therefore, one could interpret this as suggesting that Greece's current situation is similar to Indonesia's in the late 1990s. While one is an advanced country and the other is an emerging market, both faced debt-intolerant lenders. Given the same fiscal sustainability concerns with Indonesia, it is highly probable that Greece will continue facing similar constraints in freely choosing its fiscal policy. With limited resource-generating means it is

---

[25] What Indonesia experienced is actually the reflection of what is referred to as the debt intolerance phenomena by Reinhart, Rogoff, and Savastano (2003). During the 2000s many of the GIIPS countries had public debt ratios much higher than that of Indonesia in 1998, and did not have difficulty in generating resources.

more probable that Greece will be unable to put aside the contractionary fiscal policies, and will share a growth experience that resonates with that of Indonesia rather than the higher-level growth experience of the Philippines.

4. **Portugal (2008) –Malaysia (1997) –Thailand (1996):**

Unlike the post-crisis experiences of the matched group of Greece-Indonesia-Philippines, the growth patterns of Portugal in 2008 and Malaysia and Thailand in 1996/97 share a significant amount of similarities (Figure 8). The imbalances in both Malaysia and Thailand were corrected immediately after the crisis hit. Their growth rates rebounded to the positive range, with Malaysia achieving an annual real growth rate of around 4.2% in the post-crisis period, and Thailand achieving a annual real growth rate of around 3% over the same time period. The correction happened through the help of significant real devaluation (around 30%) of the currencies of both countries.

These significant devaluations were accompanied by countercyclical fiscal policies in both countries, together with rapid bank restructuring policies. Many financial institutions were closed, and for many the capital adequacy limits were strictly enforced. These policies as a package served to help both Malaysia and Thailand, bringing them close to their tranquil growth rates within two years of the crises.

In comparison to Malaysia and Thailand, Portugal has experienced a smaller amount of decline in its growth rate relative to its tranquil period growth rate. As such, the necessary real exchange rate adjustment seems to be less than what Malaysia and Thailand needed in 1996/97. However, regardless of the level of adjustment that is necessary what is important is that Portugal needs to pursue policies that will hasten the real exchange rate devaluation.

Given that the crises of Greece and Portugal match with the East Asian crises, which have mainly been resolved through real devaluations, it is worth digressing a bit more into the possible mechanisms of achieving real devaluations in these two European countries. Since both countries are part of the monetary union, achieving a real devaluation through the exchange rate would require a radical exchange rate regime change, where the countries would opt to leave the Euro area. Given the economic uncertainties and the political difficulties of doing so, it is worth discussing alternative ways of real devaluation.

The real devaluation can also be achieved through competitive disinflation (through a sufficient decrease in nominal wages) or a sufficient increase in productivity that will lead to the correction of macroeconomic imbalances. Detailed policy alternatives that would provide such competitive disinflations are discussed in detail in Blanchard (2007).

Of the two means of carrying out this adjustment, achieving improvements in productivity would necessitate sufficient time for policies to trickle down into the economy. On the other hand, adjustments in nominal wages could possibly happen faster. While the option of nominal wage reductions seems like a more feasible policy in the short run its social and political costs are significantly higher than achieving productivity improvements.

The feasibility of achieving nominal wage cuts would also depend on the extent of real and nominal wage rigidities. In a detailed research program, Dickens et al (2007) collected information on wage rigidities across a wide range of countries. Their analysis concludes that Greece has much less real and nominal wage rigidities than Portugal does. As such, achieving real devaluations through wage cuts would be more feasible for Greece as a policy option. In either case, policies to reduce such rigidities in labor and goods markets also have to be part of policy programs. Indeed, Buti and Turrini (2012) provide a summary of such

rigidity reducing policies undertaken by a sample of European countries in an effort to create competitive disinflation. In short, any fiscal policy discussion will have to include discussions of how the composition of the fiscal policy and budget could lead to structural reforms that would either generate sufficient productivity gains that outweigh nominal wage changes, or reforms that will reduce rigidities in goods and labor markets to allow for nominal wage cuts that are large enough.

The cases discussed so far mainly focus on the post-crisis evolution of the growth performance. However, as is evident in the above figures, the crisis experiences of the old matched crisis extends beyond four years and even longer for the GDP growth rate to revert back to its usual levels. This raises the question of whether policies might influence the overall severity of the crisis.

Figure 9 shows that the severity of banking crises has worsened over the past three decades. The growth rates experienced during the post-crisis period are much lower during the 2000s than for the 1990s. The advanced countries with already low growth rates could be the main reason for this phenomenon, given that the advanced countries dominate the newer banking crisis experiences. However, this does not seem to be the reason for the low growth rates in the 2000s. Even when compared to their tranquil period averages, the growth rates experienced during the post-crisis period in the more recent crises are much lower than those experienced in the 1980s and 1990s. This figure is evidence that the severity of banking crises has been worsening from the 1980s and 1990s to the 2000s. What is of interest next is how long this current crisis will continue.

The average length of banking crises has been on the fall from the early 1980s until the first half of the 2000s. However, this trend seems to have ended with these latest crises, which have already taken longer than the average length of banking crises included in our sample. The latter part of

the graph in Figure 10 is left dashed, indicating that the average length of these most recent crises are yet to be realized as they have not yet come to an end.

The matches of the pre-crisis conditions of the current European crisis with those of relatively long earlier crises, and also the growth performances during the evolution of the current crises diverging further away from these matched crises lead to the expectation that the dissolution of this current crises, unless a radical change in the policy set is implemented as is discussed above, will take at least as long as the dissolution of the East Asian crises and the Japanese crisis.   The specific matched crises of for example, Indonesia, Malaysia and Japan have taken 6, 7 and 10 years to disappear, respectively. Unless a shift in the policy structure is implemented, the dismal growth conditions in the current crises are projected to continue for several years more.

REFERENCES:

Almunia, M., A. Benetrix, B. Eichengreen, K.H. O'Rourke and G. Rua (2010). 'From Great Depression to Great Credit Crisis: similarities, differences and lessons', *Economic Policy*, 25, 219-265.

Alper, C.M., L. Forni, and M. Gerard (2012). 'Pricing of soverign credit risk: Evidence from advanced economies during the financial crisis', IMF Working Paper, WP:1224.

Ardagna, S. (2009). 'Financial markets' behavior around episodes of large changes in the fiscal stance', *European Economic Review*, 53, 37-55.

Austin P. C. (2011). 'Optimal Caliper Widths for Propensity-Score Matching when Estimating Differences in Means and Differences in Proportions in Observational Studies', *Pharmaceutical statistics*, 10, 150–161.

Baldacci, E., S. Gupta and C. Mulas-Granados (2009). 'How Effective is Fiscal Policy Response in Financial Crises?', in S. Claessens, M. A. Kose, L. Laeven and F. Valencia. Eds. *Financial Crisis, Consequences, and Policy Responses*, forthcoming. IMF.

Blanchard, O. (1990). 'Suggestions for a New Set of Fiscal Indicators,' OECD Working Papers, No. 79.

Blanchard, Olivier, (2007). 'Adjustment within the Euro. The difficult case of Portugal.' *Portuguese Economic Journal* 6.1: 1-21.

Benediktsdottir, S., J. Danielsson and G. Zoega (2011). 'Lessons from a collapse of a financial system', *Economic Policy*, 26, 183-235.

Berg, A. G. and C. Pattillo (1999). 'Are Currency Crises Predictable? A Test', *IMF Staff Papers*, 46, 107-138.

Bussiere, M. and M. Fratzscher (2006). 'Towards a new early warning system of financial crises', *Journal of International Money and Finance*, 25, 953-973.

Buti, Marco and Alessandro Turrini, (2012). 'Slow but steady? External adjustment within the Eurozone starts working', VoxEU.org.

Caliendo, M. and S. Kopeinig (2005). 'Some Practical Guidance for the Implementation of Propensity Score Matching', *Journal of Economic Surveys*, 22, 31-72.

Calvo, G. (1996). 'Capital Flows and Macroeconomic Management: Tequila Lessons', *International Journal of Finance and Economics*, 1, 207—223.

Caprio, G. and D. Klingebiel (2003). 'Episodes of Systemic and Borderline Financial Crises', mimeo, World Bank Research Dataset.

Claessens, S., A. Kose, L. Laeven and F. Valencia (2013). 'Understanding Financial Crises: Causes, Consequences, and Policy Responses', *CEPR Discussion Paper Series*, No: 9310.

Claessens, S. and M. A. Kose (2013). 'Financial Crises: Explanations, types, and implications', *IMF Working Paper*, WP/13/28

Claessens, S., A. Kose and M. E. Terrones. (2010), 'The Global Financial Crisis: How Similar? How Different? How Costly?', *Journal of Asian Economics*, 21, 247—264.

D'Agostini, R. B. (1998). 'Propensity Score Methods for Bias Reduction in the Comparison of a Treatment to a Non-Randomized Control Group', *Statistics in Medicine*, 17, 2265-2281.

Demirguc-Kunt, A. and E. Detragiache (1998). 'The Determinants of Banking Crisis in Developing and Developed Countries', *IMF Staff Papers*, 45, 81-109.

Demirguc-Kunt, A. and E. Detragiache (2005). 'Cross-Country Empirical Studies of Systemic Bank Distress: A Survey', *National Institute Economic Review*, 192, 68-92.

Dickens, William T., Lorenz Goette, Erica L. Groshen, Steinar Holden, Julian Messina, Mark E. Schweitzer, Jarkko Turunen, and Melanie E. Ward. (2007). 'How Wages Change: Micro Evidence from the International Wage Flexibility Project.' *Journal of Economic Perspectives*, 21(2): 195–214.

Edison, H.J. (2003) 'Do indicators of financial crises work? An evaluation of an early warning system', *International Journal of Finance,* 8, 11-53.

Eichengreen, B. and A. K. Rose, (1998). 'Staying Afloat When the Wind Shifts: External Factors and Emerging-Market Banking Crises,' NBER Working Paper Series No. 6370, Cambridge.

Eichengreen, Barry (2008). 'Sui generis EMU'. *National Bureau of Economic Research*, No. w13740.

Frankel, J. and G. Saravelos (2012). 'Can leading indicators assess country vulnerability? Evidence from the 2008–09 global financial crisis', *Journal of International Economics*, 87, 216-231.

Fuertes and Kalotychou (2006), 'Early warning systems for sovereign debt crises: The role of heterogeneity', *Computational Statistics & Data Analysis*, 51,1420-1441.

Gourinchas, P. O., R. Valdes and O. Landerretche (2001). 'Lending booms: Latin America and the World, *Economia*, 1, 47-99.

Gupta, P., D. Mishra and R. Sahay (2007). 'Behavior of output during currency crises', *Journal of International Economics*, 72, 428-450.

Honkapohja, Seppo, and Erkki Koskela (1999). "The economic crisis of the 1990s in Finland." *Economic Policy* 14.29: 399-436.

Hoshi, Takeo, and Anil K. Kashyap (2004). "Japan's financial crisis and economic stagnation." *The Journal of Economic Perspectives* 18.1: 3-26.

Hutchison, M. and K. McDill (1999). 'Are All Banking Crises Alike? The Japanese Experience in International Comparison', *Journal of Japanese and International Economies*, 13, 155-180.

Hutchison, M.M., I. Noy, and L.Wang (2010). 'Fiscal and monetary policies and the cost of sudden stops', *Journal of International Money and Finance*, 29: 973–987.

Jomo, Kwame Sundaran, (2009). 'Growth after the Asian crisis: what remains of the East Asian model?.' , G24 Discussion Paper Series, United Nations Conference on Trade and Development.

Jorda, O., M. Schularick and A.M.Taylor (2011). 'Financial Crises, Credit Booms, and External Imbalances: 140 Years of Lessons', *IMF Economic Review*, 59, 340-378.

Kamin, S. (1999). 'The current international financial crisis: how much is new?', *Journal of International Money and Finance*, 18, 501-514.

Kannan, P., A. Scott and M.E. Terrones (2013).'From recession to recovery: How soon? How Strong?', in S. Claessens, M. A. Kose, L. Laeven and F. Valencia. Eds. *Financial Crisis, Consequences, and Policy Responses*, forthcoming. IMF.

Kaminsky, G. L., and C. M. Reinhart (1998). 'Financial crises in Asia and Latin America: Then and now', *American Economic Review*, 88, 444–448.

Kaminsky, G. L., and C. M. Reinhart (1999). 'The Twin Crises: The Causes of Banking and Balance-of-Payments Problems', *American Economic Review*, 89, 473–500.

Lane, P. R. (2012). 'The European Sovereign Debt Crisis', *Journal of Economic Perspectives*, 26, 49-68.

Lane, P. R. and G. M. Milesi-Ferretti (2010). 'The Cross-Country Incidence of the Global Crisis', *IMF Economic Review*, 59, 77-110.

Laeven, E. and F. Valencia (2008). 'Systemic Banking Crisis: A New Database', *IMF Working Paper*, 08/224.

Laeven, E. and F. Valencia (2012). 'Systemic Banking Crisis Database: An Update', *IMF Working Paper*, 12/163.

Lin, S. and H. Ye (2007). 'Does inflation targeting really make a difference? Evaluating the treatment effect of inflation targeting in seven industrial countries', *Journal of Monetary Economics*, 54, 2521-2533.

Mendoza, E. and M. E. Terrones (2008). 'An anatomy of credit booms: Evidence from macro aggregates and micro data', NBER Working Paper No, 14049, Cambridge, MA

OECD, (2013). 'Economic Surveys' of Greece, Italy, Ireland, Portugal, Spain.

Reinhart, C. M and K. S. Rogoff (2008a). *This Time Is Different: Eight Centuries of Financial Folly*, Princeton University Press.

Reinhart, C. M and K. S. Rogoff (2008b). 'Banking Crises: An Equal Opportunity Menace', NBER Working Papers, 14587.

Reinhart, C. M. and K. S. Rogoff (2009). 'The Aftermath of Financial Crises', *American Economic Review*, 466-472.

Reis, Ricardo (2013) 'The Portuguese Slump-Crash and the Euro-Crisis,' *Brookings Papers on Economic Activity*.

Rose, A. K. and M. M. Spiegel (2010). 'Cross-country causes and consequences of the 2008 crisis: International linkages and American exposure', *Pacific Economic Review*, 15, 340-363.

Rose, A. K. and M. M. Spiegel (2011). 'Cross-country causes and consequences of the 2008 crisis: An update', *European Economic Review*, 55, 309-324.

Rose, A. and M. M. Spiegel (2012). 'Cross-country causes and consequences of the 2008 crisis: Early warning', *Japan and the World Economy*, 24, 1-16.

Rosenbaum, P.R. and D.B. Rubin (1985). 'Constructing a Control Group Using Multivariate Matched Sampling Methods that Incorporate the Propensity Score', *American Statistician*, 39, 33-38.

Schularick, M. and A. M. Taylor (2012). 'Credit Booms Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crises, 1870-2008', *American Economic Review*, 102, 1029-61.

Appendix I: Data:

The most important variable of the analysis is the banking crisis indicator. As detailed in the paper, we construct the banking crisis indicator as taking the value 1 if either Reinhart and Rogoff (2009) or Laeven and Valencia (2012) label a year as a banking crisis year, and 0 otherwise. The coverage of the banking crisis across countries in the two relevant data sources is summarized in Table A1.

Table A1: Data coverage - Availability of Data in Reinhart and Rogoff (2009) and Laeven and Valencia (2012)		
	Reinhart and Rogoff (2009)	Laeven and Valencia (2012)
Algeria, Austria, Belgium, Bolivia, Brazil, Central African Republic, Chile, China, Colombia, Costa Rica, Denmark, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Finland, France, Germany, Ghana, Greece, Guatemala, Hungary, Iceland, India, Indonesia, Ireland, Italy, Japan, Kenya, Korea, Rep., Malaysia, Mexico, Morocco, Netherlands, Nicaragua, Nigeria, Norway, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Tunisia, Turkey, United Kingdom, United States, Uruguay, Venezuela, RB, Zambia, Zimbabwe, Angola	✓	✓
Angola, Australia, Canada, Cote d'Ivoire, Honduras, Mauritius, Nepal, Singapore, South Africa	✓	…
Albania, Armenia, Azerbaijan, Bangladesh, Belarus, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cameroon, Cape Verde, Congo, Dem. Rep., Congo, Rep., Croatia, Czech Republic, Equatorial Guinea, Eritrea, Estonia, Georgia, Guinea, Guinea-Bissau, Haiti, Israel, Jordan, Kazakhstan, Kyrgyz Republic, Latvia, Lebanon, Liberia, Lithuania, Luxembourg, Macedonia, FYR, Madagascar, Mali, Mauritania, Mongolia, Mozambique, Niger, Senegal, Sierra Leone, Slovak Republic, Slovenia, Swaziland, Tanzania, Togo, Uganda, Ukraine, Vietnam, Yemen, Rep.	…	✓

The summary statistics of the distribution of crises incidences across decades and income groups, for the Reinhart and Rogoff (2009) and Laeven and Valencia (2012) datasets are provided in the following tables.

Table A2: Banking Crisis Indicators, RR (2009) and LV (2012) datasets.

Reinhart and Rogoff (2009)	Laeven and Valencia (2012)			
	No-crisis (0)	Crisis (1)	N/A	Total
No-crisis (0)	1,385	54	304	1,743
Crisis (1)	202	188	37	427
N/A	1,587	198	94	1,879
Total	3,174	440	435	4,049

Table A3: Tabulation of Crisis Frequencies of Reinhart and Rogoff (RR) and Laeven and Valencia (LV) data sets across decades

	Reinhart and Rogoff (2009)				
	1980	1990	2000	NA	Total
0	570	497	676	0	1,743
1	130	203	94	0	427
N/A	550	550	730	49	1,879
Total	1,250	1,250	1,500	49	4,049
	Laeven and Valencia (2012)				
	1980	1990	2000	NA	Total
0	1,046	903	1,225	0	3,174
1	84	227	129	0	440
N/A	120	120	146	49	435
Total	1,250	1,250	1,500	49	4,049

Table A3: Tabulation of Crisis Frequencies Across Countries of Reinhart and Rogoff (RR) and Laeven and Valencia (LV) data sets

	Reinhart and Rogoff (2009)			
	0	1	NA	Total
High-income OECD members	632	143	217	992
High-income non-OECD members	29	2	129	160
Low-income economies	108	47	613	768
Lower-middle-income	426	101	465	992
Upper-middle-income	548	134	406	1,088
Total	1,743	427	1,830	4,000
	Laeven and Valencia (2012)			
High-income OECD members	774	121	97	992
High-income non-OECD members	89	7	64	160
Low-income economies	621	82	65	768
Lower-middle-income	802	95	95	992
Upper-middle-income	888	135	65	1,088
Total	3,174	440	386	4,000

Current account balance (% of GDP)-Current account balance is the sum of net exports of goods, services, net income, and net current transfers. *Sources*: International Monetary Fund, Balance of Payments Statistics Yearbook and data files, and World Bank and OECD GDP estimates.

Domestic credit provided by banking sector (% of GDP)-Domestic credit provided by the banking sector includes all credit to various sectors on a gross basis, with the exception of credit to the central government, which is net. The banking sector includes monetary authorities and deposit money banks, as well as other banking institutions where data are available (including institutions that do not accept transferable deposits but do incur such liabilities as time and savings deposits). Examples of other banking institutions are savings and mortgage loan institutions and building and loan associations. *Sources*: International Monetary Fund, International Financial Statistics and data files, and World Bank and OECD GDP estimates.

Cash surplus/deficit (% of GDP)-Cash surplus or deficit is revenue (including grants) minus expense, minus net acquisition of nonfinancial assets. In the 1986 GFS manual nonfinancial assets were included under revenue and expenditure in gross terms. This cash surplus or deficit is closest to the earlier overall budget balance (still missing is lending minus repayments, which are now a financing item under net acquisition of financial assets). *Sources*: International Monetary Fund, Government Finance Statistics Yearbook and data files, and World Bank and OECD GDP estimates.

Inflation, GDP deflator (annual %)-Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency. *Sources:* World Bank national accounts data, and OECD National Accounts data files.

GDP growth (annual %)-Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2000 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. *Sources:* World Bank national accounts data, and OECD National Accounts data files.

GDP per capita (constant 2000 US$)-GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant U.S. dollars. *Sources:* World Bank national accounts data, and OECD National Accounts data files.

Real effective exchange rate index (2005 = 100)-Real effective exchange rate is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs. *Sources*: International Monetary Fund, International Financial Statistics, BIS and/or World Bank.

General government revenue as a percent of GDP-Revenue consists of taxes, social contributions, grants receivable, and other revenue. Revenue increases government's net worth, which is the difference between its assets and liabilities (GFSM 2001, paragraph 4.20). Note: Transactions that merely change the composition of the balance sheet do not change the net worth position, for example, proceeds from sales of nonfinancial and financial assets or incurrence of liabilities. *Sources*: World Economic Outlook.

General government total expenditure as a percent of GDP: Total expenditure consists of total expense and the net acquisition of nonfinancial assets. Note: Apart from being on an accrual basis,

total expenditure differs from the GFSM 1986 definition of total expenditure in the sense that it also takes the disposals of nonfinancial assets into account. *Source*: World Economic Outlook.

Money market rates: *Source*: International Monetary Fund, IFS.

World interest rate: The GDP-weighted average of G-7 interest rates. *Source*: International Monetary fund, IFS.

World growth rate: Weighted average of world-wide growth rates. *Source*: World Bank, World Development Indicators.

Bank deposits to GDP: Demand, time and saving deposits in deposit money banks as a share of GDP, calculated using the following deflation method: $\{(0.5)*[Ft/Pet + Ft\text{-}1/Pet\text{-}1]\}/[GDPt/Pat]$ where F is demand and time and saving deposits, Pe is end-of period CPI, and Pa is average annual CPI. *Source*: Financial Structures Database, World Bank.

Public debt to GDP: The target variable is gross general government debt, but in many cases (especially for the period before 1980) only central government data was available and this is what is reported. *Source*: IMF, Historical Public Debt Database.

M2 as a ratio of NFA: Money and quasi money comprise the sum of currency outside banks demand deposits other than those of the central government and the time, savings and foreign currency deposits of resident sectors other than the central government. This definition is frequently called M2; it corresponds to lines 34 and 35 in the International Monetary Fund's (IMF) International Financial Statistics (IFS). Total reserves comprise holdings of monetary gold special drawing rights reserves of IMF members held by the IMF and holdings of foreign exchange under the control of monetary authorities. The gold component of these reserves is valued at year-end (December 31) London prices. *Source*: World Development Indicators, World Bank.

Private consumption as a % GDP: Household final consumption expenditure (formerly private consumption) is the market value of all goods and services, including durable products (such as cars, washing machines, and home computers), purchased by households. It excludes purchases of dwellings but includes imputed rent for owner-occupied dwellings. It also includes payments and fees to governments to obtain permits and licenses. Here, household consumption expenditure includes the expenditures of nonprofit institutions serving households, even when reported separately by the country. This item also includes any statistical discrepancy in the use of resources relative to the supply of resources. *Source*: World Development Indicators, World Bank.

Investment as a % GDP: Gross fixed capital formation (formerly gross domestic fixed investment) includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. According to the 1993 SNA, net acquisitions of valuables are also considered capital formation. Data are in current U.S. dollars. *Source*: World Development Indicators, World Bank.

Appendix II: Quality of Matches

The quality of the matches is assessed using three sets of alternative information.[26] The first of these tests is a simple two-sample t-test of whether there are significant differences in the means of the covariates between the treated group and the remainder of the dataset. This test follows that of Rosenbaum and Rubin's (1985), and prior to the matching significant differences are expected. However, after the match the covariates are expected to be balanced in both groups, leading to 'no significant difference' in their means among the treated and the control group.

The second assessment is based on the reduction in the standardized bias. This test is based on the difference in the sample means of treated and the matched controlled subsample as a share of the square root of the average of their respective sample variances for each covariate in the exercise. Similar to the t-test, such differences are expected to be large prior to the match, but to reduce significantly after the match if the match is a good quality one. Rosenbaum and Rubin (1985) suggest that if this standardized difference is greater than 20, then, the differences are viewed as too large.

The last assessment is based on the pseudo R-squared, as suggested by Sianesi (2004). The propensity score is re-estimated on the matched sample that includes the treated and the matched non-treated observations. If the distribution of the covariates show no systematic differences between the control and the treated then the pseudo R-squared should drop considerably upon the match occurring. Since each test had the potential to give contradictory results, we chose to use all three statistics together in making a choice. The choice is finalized if all three tests consistently produce a similar assessment.

The quality of match tests for alternative sets of covariates are reported in Table A2. This table summarizes the three criteria for assessing the quality of the matches. Columns (1) through (3)

---

[26] For a detailed discussion of the tests for quality of the matches please see Caliendo and Kopeinig (2005).

report on the most encompassing covariate set (labeled as Set I), which includes all the variables

included in the EWS exercise in the preceding discussion. All three assessment criteria suggest

that there is room for improvement in the quality of the matches; necessitating revisiting the set of

covariates used in the propensity score estimation. Next, we discuss these quality-of-match

assessments for Set I.

<INSERT TABLE A2>

In order to provide a basis for discussion we start by presenting the statistics for the unmatched

dataset – the dataset that includes all treated and untreated observations. The large discrepancies

in the covariates between the treatment (new crisis) and control (old crisis) groups prior to

matching are evident in the statistical significance of the differences of means of each covariate,

except for the public debt-to-GDP and inflation. This significance is reported in the odd

numbered rows of column (3) of Table A2, which report the statistics for the unmatched, raw,

dataset. These discrepancies also reflect in themselves highly standardized differences in absolute

terms in the unmatched dataset, as reported in the odd numbered rows of column (1) in the same

table. These standardized biases that range in absolute terms between 23.6 and 126.5 are

consistent with our expectation that the raw data does not necessarily resemble the treatment

group prior to matching.

However, for a match to be classified as a good quality match, these standardized biases should

decrease once the match occurs. That is, once the match takes place if the standardized biases are

reduced, this will point to sufficient correlation between the treatment and control groups in this

dimension. The extent of reduction in the absolute value of standardized biases once matching

occurs are reported in column (2), pointing to considerable reduction in the standardized biases in

the fiscal balance-to-GDP, inflation and the private sector credit-to-GDP variables. Despite the

decrease in standardized biases, for all variables except inflation and the fiscal balance-to-GDP

ratio, the standardized bias remains above 20%. This points to persistent covariate differences

remaining even after the matching sample is selected.

These differences are also reflected in the t-statistics testing of the mean differences of the covariates across the control and the treated groups. The mean difference test results are reported in the evenly numbered rows of column (3). The mean differences are found to be insignificant for the covariates in the matched dataset across the new and the old banking crises, except for the real GDP growth rate variable. This suggests that the matching quality is reduced by the inclusion of the real GDP growth rate as a covariate in the propensity score estimation.

The pseudo R-squared is also supportive of the assessment that the quality of the match could be improved. The pseudo R-squared decreases only very slightly after the match, providing a consistent assessment with the t-test as well as the standardized bias reduction assessment.

On this basis we eliminated the real GDP growth rate from the covariate set, given its insignificance in both the t-test and the standardized bias reduction test, and repeated the process again. The propensity scores are re-estimated for the covariate set that now includes all of the variables from the EWS analysis except for the real GDP growth rate. The tests to assess the quality of the matches with this new set of covariates are reported in columns (4) through (6) in Table A2. The evenly numbered rows of column (4) show sufficiently low levels of standardized biases, all below 20%. Column (5) reports the significant decreases in the standardized biases that bring the levels down to below 20. Therefore, according to the first assessment tool the matches of old and new crises using the covariate set that includes the current-account-to-GDP, fiscal balance-to-GDP, inflation, private-sector-credit-to- GDP, bank deposits-to-GDP and the public debt-to-GDP (labeled as Set II) are deemed as being of good quality and could, therefore, be used for analysis.

The second assessment tool is to test for the mean differences of the covariates between the treated and the control group in the matched dataset. The results are reported in the evenly

numbered rows of column (6). The t-tests point to the sufficient similarity of the means of all covariates for the old and new crises countries in the matched dataset. This assessment is parallel to the findings based on the standardized bias reduction, strengthening the support for the choice of covariates and the quality of the matches obtained.

The final assessment tool is the pseudo R-squared. As is reported in Table A2, the pseudo R-squared decreases from 0.318 to 0.03 when the covariate set is defined as Set II. Therefore, all three assessments strongly support the set of covariates and the resulting matches that are based on propensity scores estimated using these covariates. Given the quality of the matches the analysis proceeds by studying the matches between the old and the new crises.

Table A2: Match Quality Tests

	Variable		Set I			Set II		
			(1)	(2)	(3)	(4)	(5)	(6)
				% reduction in			% reduction in	
			%bias	|bias|	t-test	%bias	|bias|	t-test
(1)	Real GDP growth rate	Unmatched	60.0		2.25**	…		…
(2)		Matched	-67.2	-12.1	*-2.68**	…	…	…
(3)	Current account/GDP	Unmatched	31.1		1.32	31.1		1.32
(4)		Matched	46.7	-49.8	1.65	15.4	50.7	0.55
(5)	Fiscal balance/GDP	Unmatched	79.2		2.95***	79.2		2.95***
(6)		Matched	1.4	98.2	0.05	-9	88.6	-0.41
(7)	Inflation	Unmatched	-23.6		-0.83	-23.6		-0.83
(8)		Matched	0	100	-0.11	0	100	-0.03
(9)	Private sector credit/GDP	Unmatched	126.5		5.19***	126.5		5.19***
(10)		Matched	30.9	75.6	1.13	-11.2	91.2	-0.34
(11)	Bank deposits/GDP	Unmatched	80.7		3.38***	80.7		3.38***
(12)		Matched	48	40.5	1.48	-11.7	85.5	-0.31
(13)	Public Debt/GDP	Unmatched	-24.9		-0.93	-24.9		-0.93
(14)		Matched	23.7	4.8	0.72	17.6	29.6	0.8
	Sample			Pseudo R2			Pseudo R2	
	Raw			0.351			0.318	
	Matched			0.312			0.030	

Table 1: Summary Statistics of Crisis Years and Episodes

Panel (a) - Over time

Decades	Tranquil	Crisis	N/A	Total	Average length of crisis	No. of episodes
1980-89	893	160	9	1,062	4.06	52
1990-99	844	326	10	1,180	3.80	80
2000-12	1,242	151	23	1,416	3.61	33*
Total	2,979	637	42	3,658	…	

Panel (b) - Over regions

Geographic Region	Tranquil	Crisis	N/A	Total	Average length of crisis	No. of episodes
Americas	45	16	1	62	5.33	3
East Asia and Pacific	230	78	33	341	5.07	15
Europe	629	146	0	775	3.84	38
Europe and Central Asia	430	66	0	496	2.87	23
Latin America & the Caribbean	428	129	1	558	3.88	33
Middle East and North Africa	216	31	1	248	3.88	8
Oceania	26	4	1	31	4.00	1
South Asia	110	13	1	124	3.25	4
Sub-Saharan Africa	865	154	4	1,023	3.85	40
Total	2,979	637	42	3,658	…	

Panel (c) - Over Income Groups

Region by Income	Tranquil	Crisis	N/A	Total	Average length of crisis	No. of episodes
High-income countries	829	190	35	1054	4.02	47
Upper-middle-income countries	802	187	3	992	3.90	48
Lower-middle-income countries	746	151	2	899	3.47	43
Low-income countries	602	109	2	713	4.04	27
Total	2,979	637	42	3,658	…	

Notes: Own calculations from the merging of datasets of Reinhart and Rogoff (2009) and Laeven and Valencia (2012).

The income classification follows the World Bank's classification, whereas the geographic regional classification follows that of the UN.

* Of these 33 episodes, 25 episodes take place during 2007-2011.

Table 2: Comparison of Macroeconomic Conditions Between Tranquil and Banking Crisis Periods

Variable name		Tranquil	Crisis	Difference of means & prob.
Current account-to-GDP	Mean	-3.54	3.33	-0.218 (0.62)
	Median	-2.97	-2.48	
	No. of obs.	2488	563	
Fiscal balance-to-GDP	Mean	-2.21	-3.97	1.763 (0.00)
	Median	-2.36	-3.82	
	No. of obs.	1830	348	
M2/NFA	Mean	32.84	16.28	16.567 (0.29)
	Median	3.25	3.77	
	No. of obs.	2350	532	
Inflation	Mean	28.08	146.19	-118.110 (0.00)
	Median	5.78	9.03	
	No. of obs.	2438	554	
Private sector credit-to-GDP	Mean	42.52	55.75	-13.238 (0.00)
	Median	27.11	33.93	
	No. of obs.	2314	516	
Public debt-to-GDP	Mean	65.87	77.89	-12.017 (0.00)
	Median	53.09	60.25	
	No. of obs.	2561	584	
Bank deposits-to-GDP	Mean	40.5	45.92	-5.415 (0.01)
	Median	30.05	31.96	
	No. of obs.	2301	523	
Real GDP growth rate	Mean	3.77	1.25	2.524 (0.00)
	Median	3.91	2.03	
	No. of obs.	2737	616	

Table 3: Crisis prediction - Across income-groups Across Time

Variable	Baseline	Income-groups	Time
Real GDP growth	-0.146***	-0.148***	-0.168**
	(0.000)	(0.000)	(0.001)
Current account-to-GDP	-0.000446	0.0126	-0.0386
	(0.989)	(0.667)	(0.366)
Fiscal balance-to-GDP	-0.108*	-0.0586	-0.0599
	(0.042)	(0.405)	(0.318)
Inflation	0.000432	0.000422	0.000452*
	(0.959)	(0.870)	(0.023)
Credit-to-GDP	0.0649**	0.0807**	0.0418
	(0.009)	(0.006)	(0.081)
Deposits-to-GDP	-0.00559	-0.0546	-0.0116
	(0.862)	(0.085)	(0.667)
Public debt-to-GDP	-0.00294	-0.00628	-0.0103
	(0.706)	(0.426)	(0.346)
World interest rate	0.321***	0.439***	-0.0195
	(0.000)	(0.000)	(0.910)
Dummy 1	…	0.426	-7.119**
	…	(0.826)	(0.005)
Dummy 2	…	…	-7.813*
	…	…	(0.014)
Real GDP growth x Dummy 1	…	0.0159	0.0488
	…	(0.819)	(0.611)
Current account-to-GDP x Dummy 1	…	-0.0610	0.0919
	…	(0.187)	(0.185)
Fiscal balance-to-GDP x Dummy 1	…	-0.163	-0.151
	…	(0.130)	(0.123)
Inflation x Dummy 1	…	0.159**	0.0147
	…	(0.007)	(0.293)
Credit-to-GDP x Dummy 1	…	-0.0406	0.00264
	…	(0.161)	(0.863)
Deposits-to-GDP x Dummy 1	…	0.0598	0.00178
	…	(0.075)	(0.920)
Public debt-to-GDP x Dummy 1	…	-0.0139	0.00219
	…	(0.566)	(0.861)
World interest rate x Dummy 1	…	-0.569**	0.606
	…	(0.008)	(0.082)

Variable	Baseline	Income-groups	Time
		Table 3, continued: Crisis prediction - Across income-groups Across Time	
Real GDP growth x Dummy 2	…	…	0.0745
	…	…	(0.403)
Current account-to-GDP x Dummy 2	…	…	0.104
	…	…	(0.209)
Fiscal balance-to-GDP x Dummy 2	…	…	-0.0526
	…	…	(0.681)
Inflation x Dummy 2	…	…	0.133*
	…	…	(0.047)
Credit-to-GDP x Dummy 2	…	…	0.0529
	…	…	(0.227)
Deposits-to-GDP x Dummy 2	…	…	-0.0106
	…	…	(0.867)
Public debt-to-GDP x Dummy 2	…	…	0.000560
	…	…	(0.988)
World interest rate x Dummy 2	…	…	0.734*
	…	…	(0.032)

Notes: Dependent variable is the binary values of whether there is a crisis (1) or not (0). Dummy 1 in column (2) refers to the hi-income country dummy. The high-income country group is defined according to the World Bank's classification, where the dummy variables takes the value 1 if the country is classified among the high-income countries, and 0 otherwise. Time dummies are introduced in order to capture the phenomena of much lower incidence of crises during the 2000-07 period. Dummy 1 in in column (3) takes on the value 1 if the years are between 2000-07, and 0 otherwise. Dummy 2 in column (3) takes on the value 1 if years are between 2008-2011 and 0 otherwise. Independent variables are described in detail in the Appendix. p-values are reported below the coefficients. *,** show significance at 5% and 1% respectively.

Table 4: Propensity Scores and One-to-one matching

(1)	(2)	(3)	(4)	(5)
Country name	**Year**	**Propensity Score**	**Crisis**	**One-to-one matching**
Bolivia	1986	0.000	1	
Ghana	1982	0.000	1	
Ghana	1997	0.007	1	
Greece	1991	0.020	1	
Ukraine	1998	0.035	1	
Kenya	1992	0.044	1	
Czech Republic	1996	0.053	1	
Congo, Rep.	1992	0.062	1	
Swaziland	1995	0.066	1	
Ecuador	1998	0.070	1	
Colombia	1998	0.076	1	
Slovak Republic	1998	0.093	1	
Guatemala	2001	0.104	1	
Italy	1990	0.105	1	
Guatemala	2006	0.109	1	
Bolivia	1994	0.117	1	
Iceland	1985	0.120	1	
Kenya	1985	0.125	1	
Ukraine	2008	0.131	2	Kenya, 1985
Paraguay	1995	0.143	1	
Togo	1993	0.149	1	
Mexico	1994	0.157	1	
Madagascar	1988	0.158	1	
Bolivia	1999	0.172	1	
Paraguay	2002	0.173	1	
Dominican Republic	2003	0.177	1	
Hungary	2008	0.179	2	Dominican Republic, 2003
Honduras	2001	0.198	1	
Uruguay	2002	0.202	1	
Burundi	1994	0.219	1	
Canada	1983	0.219	1	
Latvia	2008	0.220	2	Canada, 1983
Australia	1989	0.226	1	
Iceland	1993	0.241	1	
Indonesia	1997	0.286	1	
Philippines	1997	0.293	1	
Greece	2008	0.296	2	
Kazakhstan	2008	0.311	2	Philippines, 1997
Mongolia	2008	0.313	2	
Korea, Rep.	1997	0.346	1	
France	1994	0.349	1	

Table 4, cont'd: Propensity Scores and One-to-one matching

(1)	(2)	(3)	(4)	(5)
Country name	**Year**	**Propensity Score**	**Crisis Information**	**One-to-one matching**
China	1992	0.356	1	
Slovenia	2008	0.360	2	China, 1992
Nigeria	2009	0.412	2	Burkina Faso, 1990
Russian Federation	2008	0.414	2	
Burkina Faso	1990	0.422	1	
France	2008	0.550	2	Norway, 1987
Norway	1987	0.568	1	
Finland	1991	0.611	1	
Belgium	2008	0.620	2	Finland, 1991
Italy	2008	0.638	2	
Austria	2008	0.694	2	Thailand, 1996
Thailand	1996	0.701	1	
Malaysia	1997	0.708	1	
Portugal	2008	0.734	2	Malaysia, 1997
Germany	2008	0.734	2	
Sweden	2008	0.833	2	
Spain	2008	0.872	2	
Ireland	2007	0.882	2	
United States	2007	0.901	2	Japan, 1992
Luxembourg	2008	0.902	2	
Netherlands	2008	0.916	2	
Switzerland	2008	0.920	2	
Japan	1992	0.945	1	
Denmark	2008	0.962	2	
Iceland	2007	0.985	2	
Note: In column (4), 1 refers to "Untreated / Old crisis" and 2 refers to " Treated / New crisis"				

	One-to-One Matching	Radius Matching (0.08)	Distance	
(1)	(2)	(3)	(4)	(5)
New Crisis	Old Crisis	Old Crisis	Between pairs	Distance from Ireland
Greece	Philippines, 1997	Indonesia, 1997; Philippines, 1997	0.003	0.447
Italy		Norway, 1987; Finland, 1991	0.027	0.105
Portugal	Malaysia, 1997	Thailand, 1996; Malaysia, 1997	0.026	0.039
Spain	Japan, 1992	Japan, 1992	0.073	0.001
Ireland			0.063	…

Table 5: One-to-one and Radius Matching of GIIPS crises

Variable	No. of crisis	Mean	Japan, 92	Thailand, 96	Malaysia, 97	Indonesia, 97	Phillipines, 97	Norway, 87	Finland, 91
Years in crisis	165	3.84	10.00	6.00	5.00	6.00	5.00	7.00	5.00
Real GDP growth rate	148	1.43	0.84	0.90	3.09	0.91	3.00	1.86	-0.54
Real GDP growth rate deviations from tranquil periods	148	-2.10	-1.77	-6.24	-3.86	-5.40	-1.30	-0.91	-3.50
Real Consumption growth rate	125	1.44	1.71	1.64	3.21	2.66	4.14	1.05	-0.86
Real Consumption growth rate deviations from tranquil periods	125	-3.12	-0.82	-4.46	-3.63	-2.95	0.06	-2.06	-3.84
Real Investment growth rate	121	2.10	-1.01	-9.08	-3.19	-2.45	0.62	-3.83	-6.67
Real Investment growth rate deviations from tranquil periods	121	-42.67	-4.15	-20.65	-12.67	-18.50	12.37	-11.08	-13.97
Real domestic demand growth rate	120	2.44	1.32	-1.06	1.33	2.06	3.89	0.95	-1.52
Real domestic demand growth rate deviations from tranquil periods	120	-42.37	-1.82	-12.64	-8.14	-13.99	-9.10	-6.30	-8.82
Real GDP growth rate, first four year of crisis	113	0.43	0.95	-0.38	7.32	0.91	3.02	1.13	-5.99
Real GDP growth rate deviations from tranquil periods, first year of crisis	113	-1.56	-1.79	-1.94	3.74	-0.68	0.89	-0.99	-1.66

Notes: Own calculations. Variable averages for duration of each individual crisis. Domestic demand is the sum of consumption, investment and public spending.

Figure 1: Radius Matching Sets
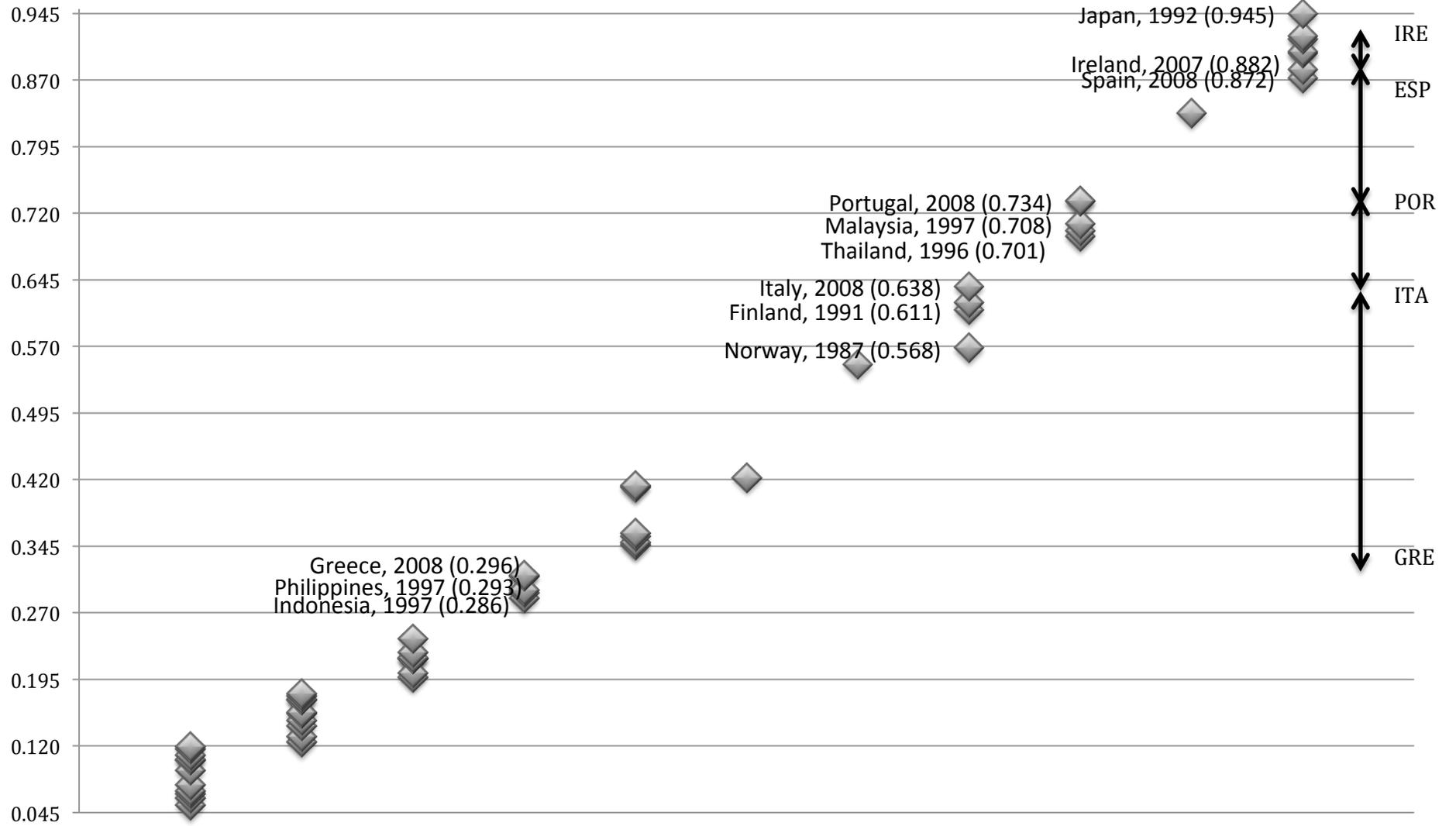
Figure 2 Panel A: Real GDP Growth

Real GDP growth in New Crisis Countries

Legend: Spain ...... Ireland ═══ Portugal ─── Italy ▬▬▬ Greece

Real GDP growth in Old Crisis Countries

Legend: •••• Japan ▬▬• Norway ▬▬▬ Finland

Real GDP growth in Old Crisis Countries

Legend: ═ ═ Thailand ═══ Malaysia ▬▬ Philippines •••••Indonesia
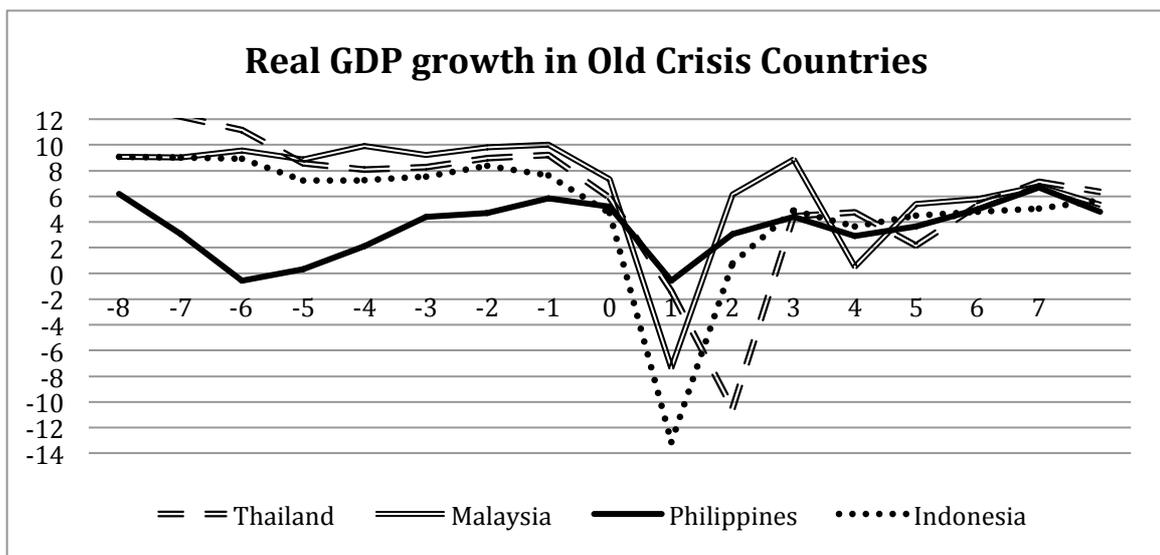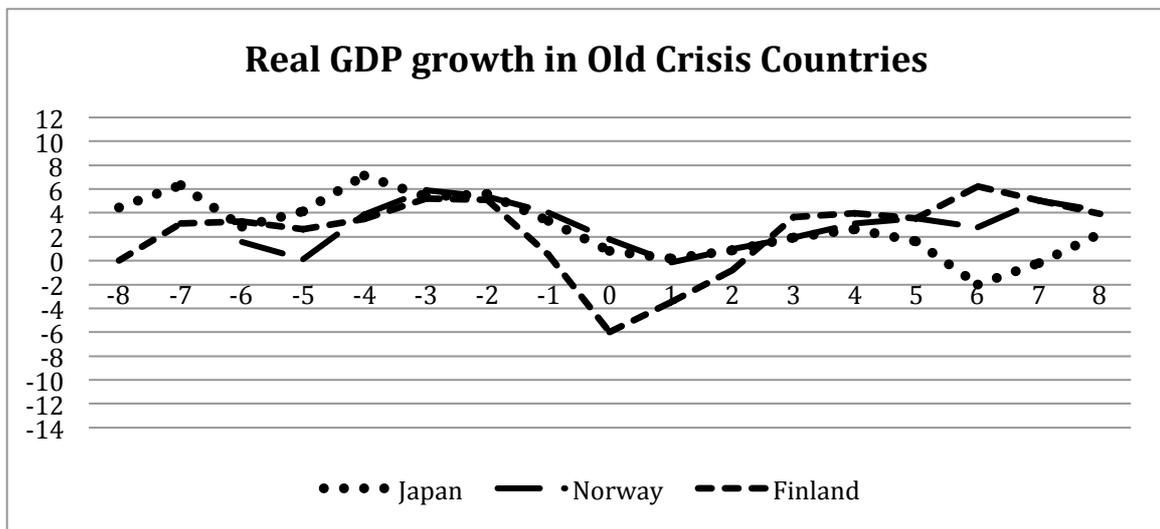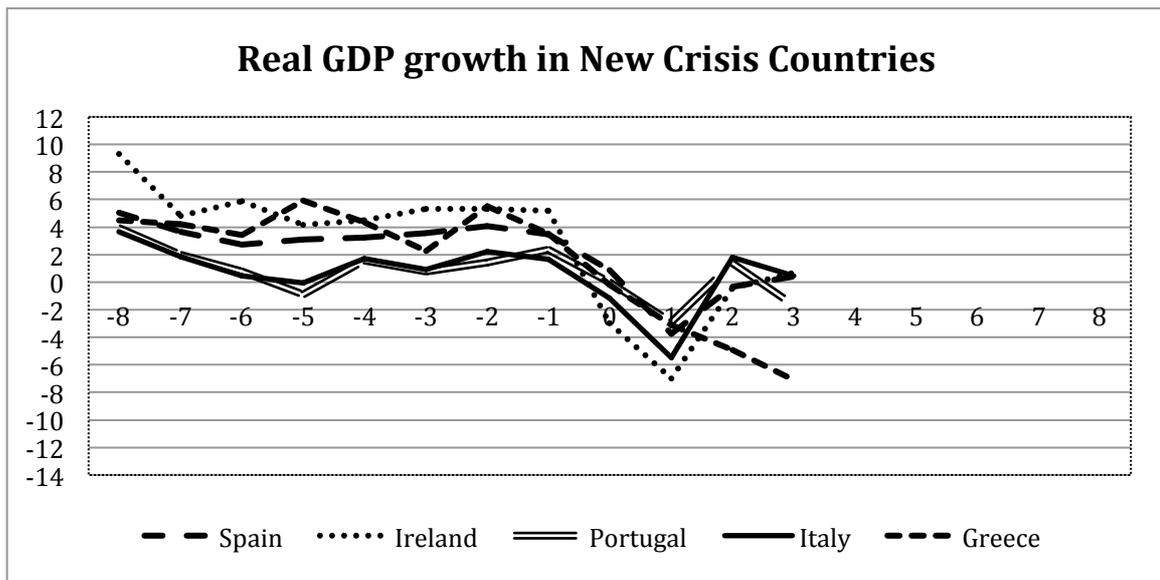
Figure 2 Panel B: Current Account Balance

Current Account in New Crisis Countries

Spain .... Ireland ==== Portugal ——— Italy --- Greece

Current Account in Old Crisis Countries

.... Japan ——— Norway ---Finland

Current Account in Old Crisis Countries

——— Thailand ==== Malaysia --Philippines ..... Indonesia
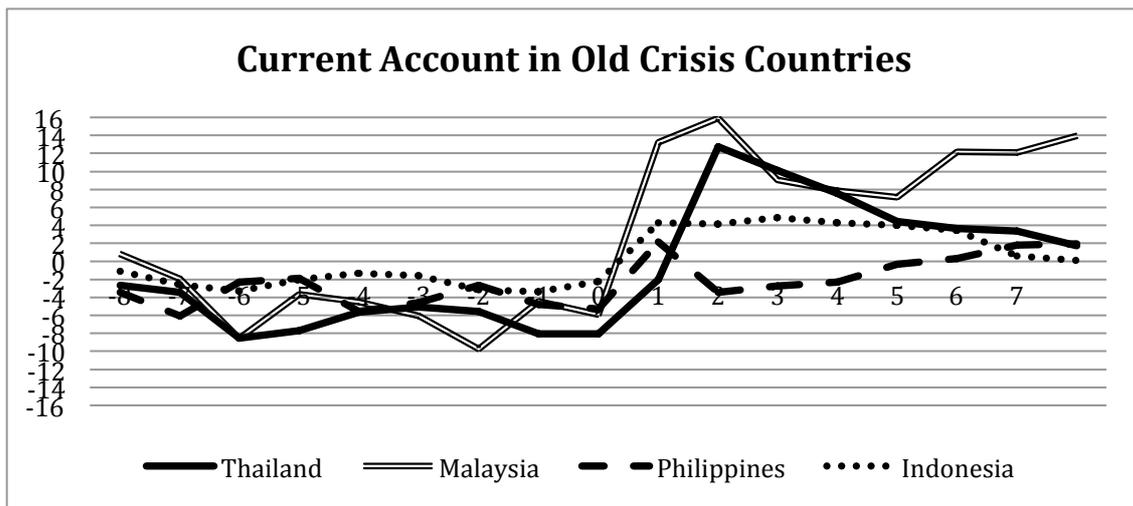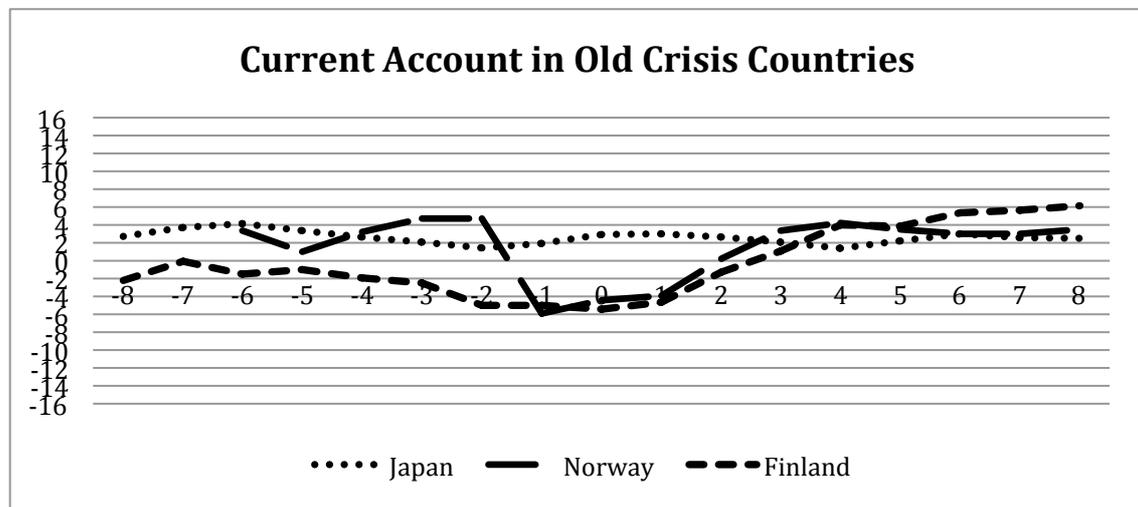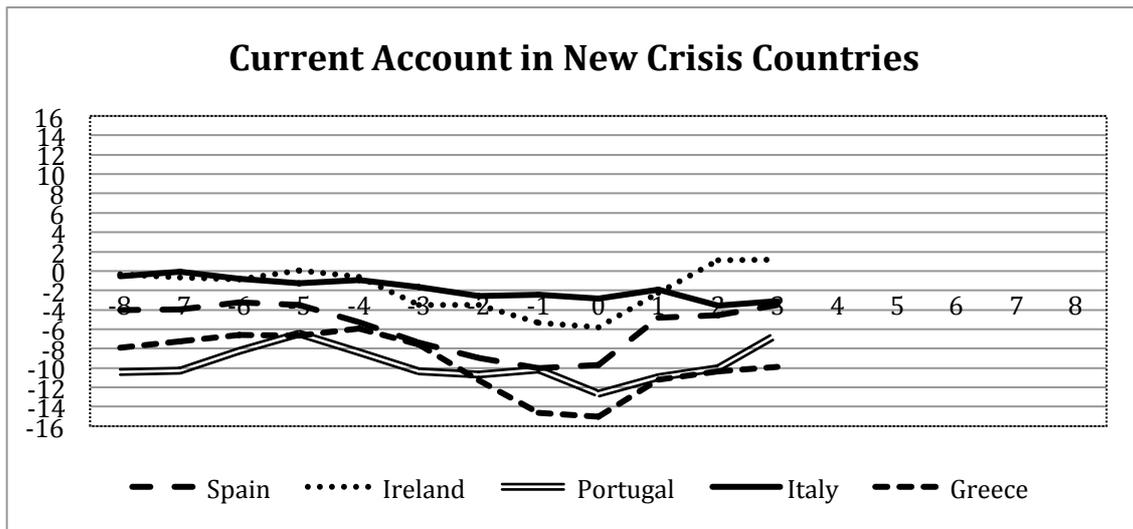
Figure 2 Panel C: Private Credit

Private Credit in New Crisis Countries

- – – Spain   ······ Ireland   ═══ Portugal   ━━━ Italy   - - - Greece

Private Credit in Old Crisis Countries

······ Japan   ━━━ Norway   - - -Finland

Private Credit in Old Crisis Countries

━━━Thailand   ═══Malaysia   - - Philippines   ······Indonesia
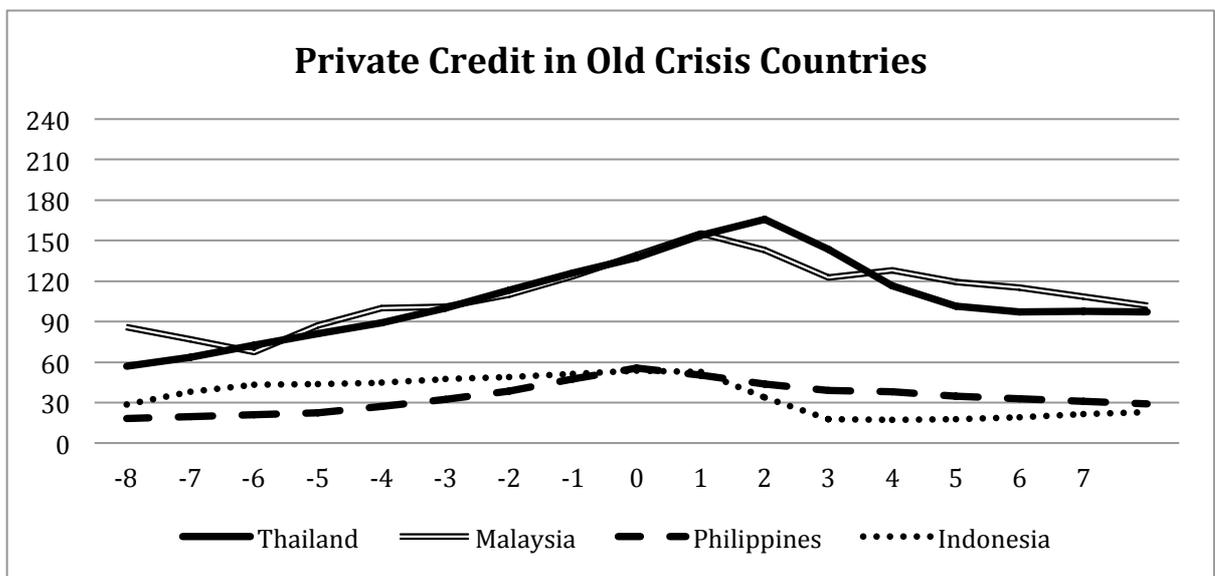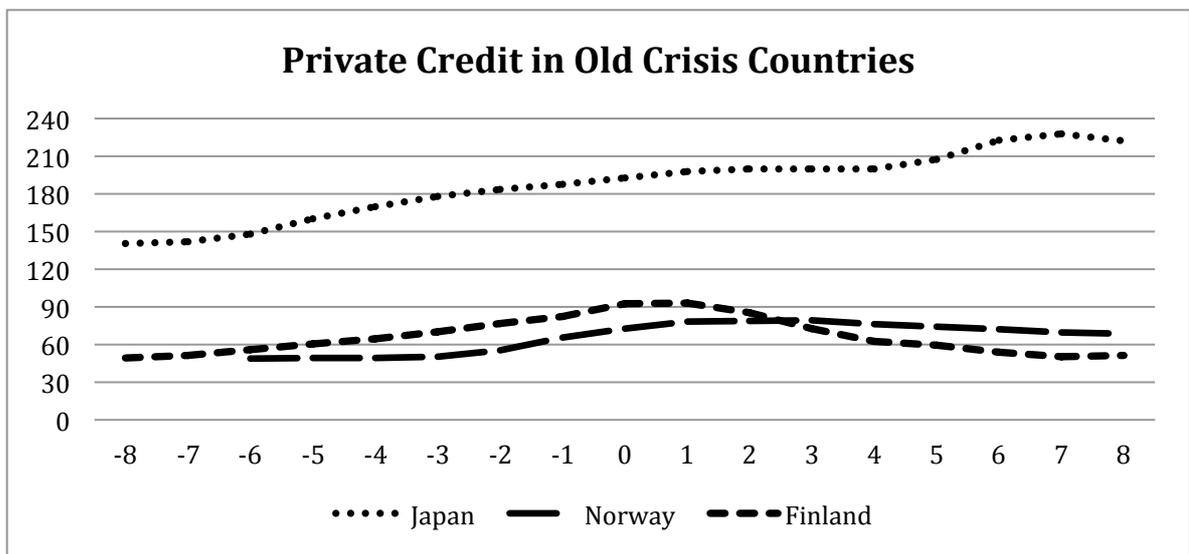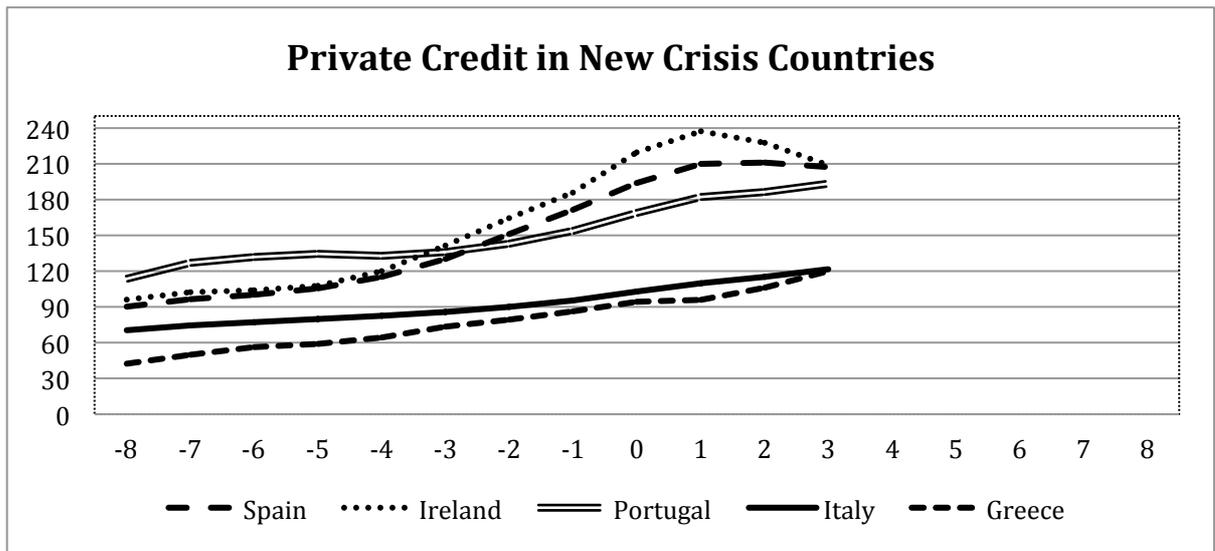
Figure 2 Panel D: Fiscal Balance

Fiscal Balance in New Crisis Countries

Legend: – – Spain ······ Ireland ▬ ·Portugal ▬ Italy ■■■ Greece

Fiscal Balance in Old Crises Countries

Legend: ····· Japan ▬ Norway ■■■ Finland

Fiscal Balance in Old Crisis Countries

Legend: ▬ Thailand ═ Malaysia ■ ■ Philippines ····· Indonesia
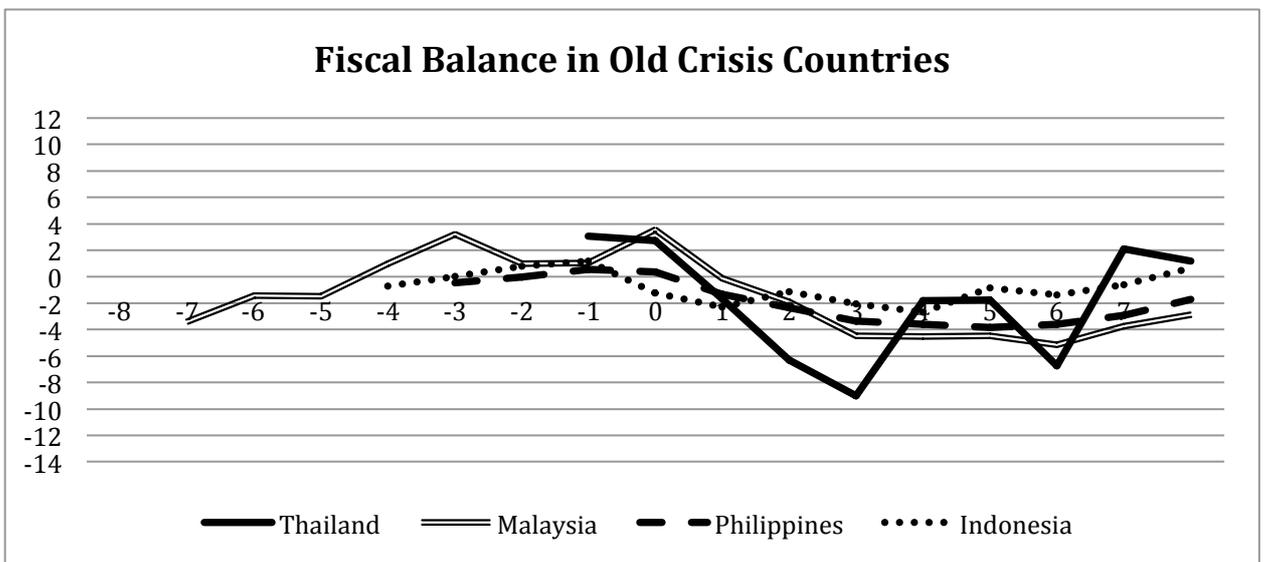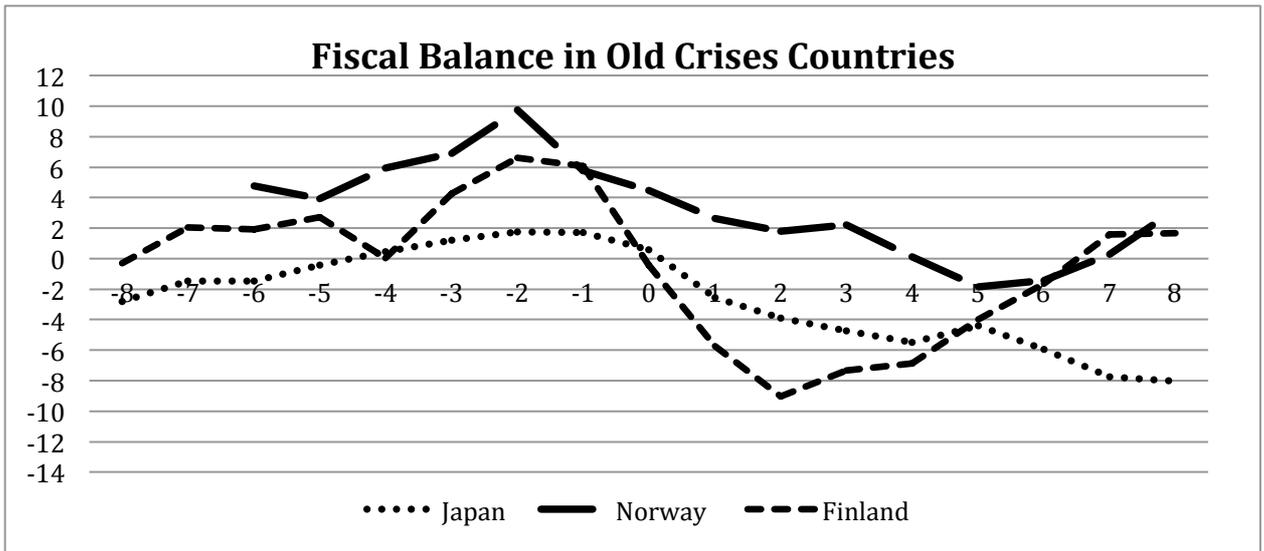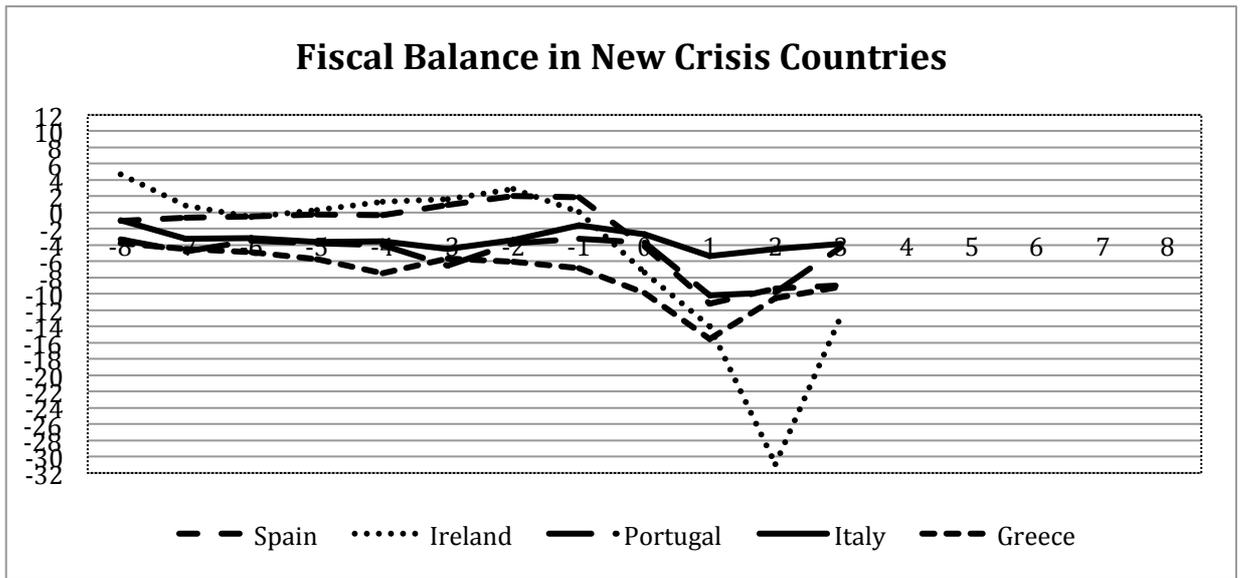
Figure 2 Panel E Public Debt

Public Debt in New Crisis Countries

- - Spain ······ Ireland ═══ Portugal ━━━ Italy - - - Greece - · - Spain

Public Debt in Old Crisis Countries

····· Japan ━━━ Norway - - - Finland

Public Debt in Old Crisis Countries

━━━ Thailand ═══ Malaysia - - - Philippines ····· Indonesia
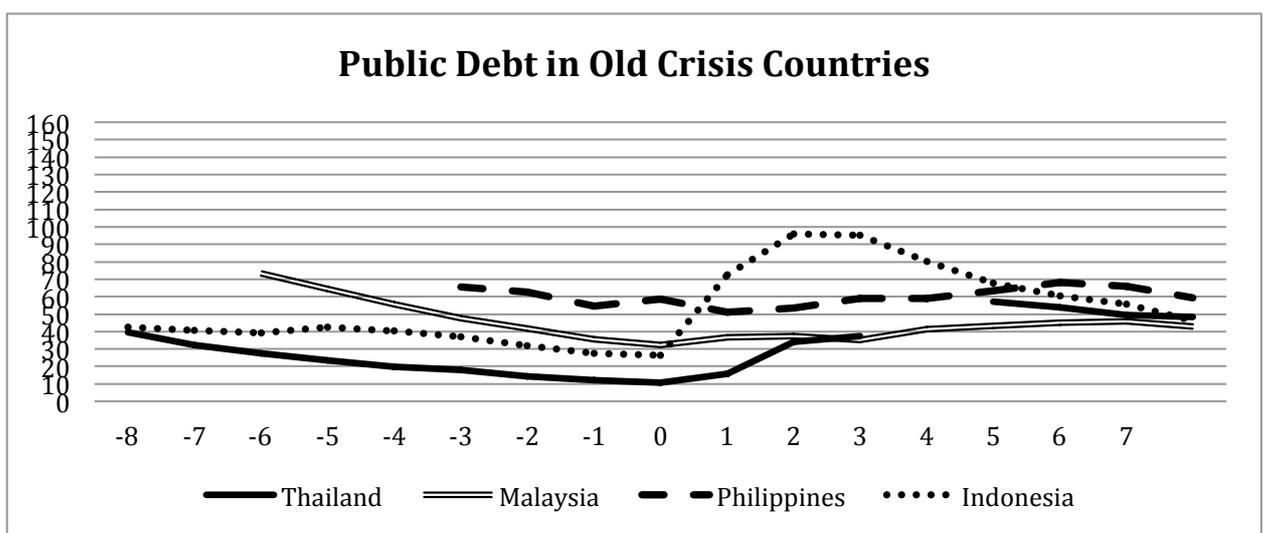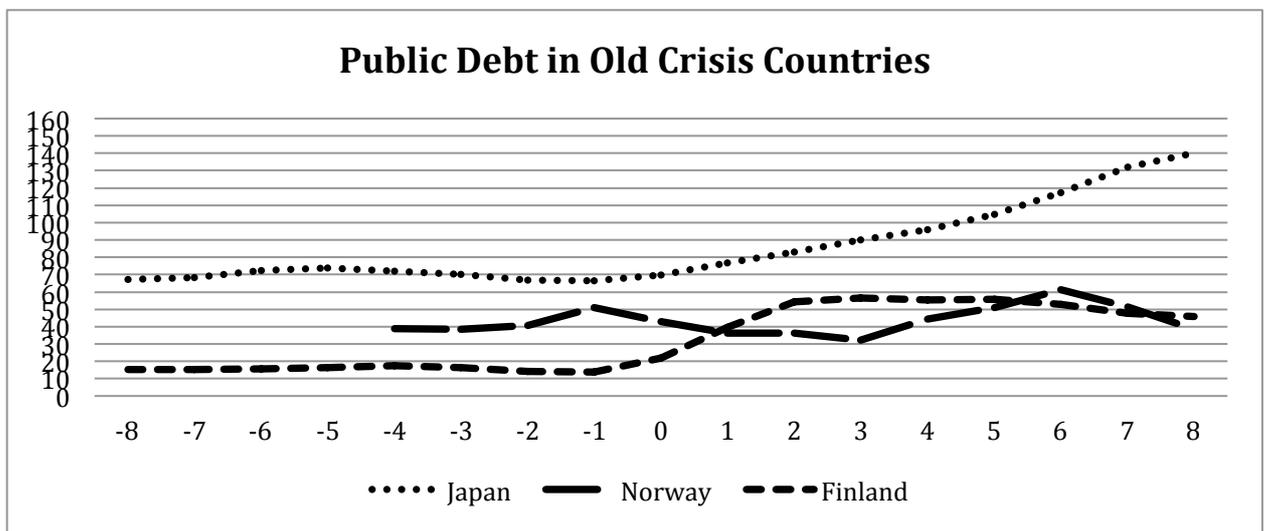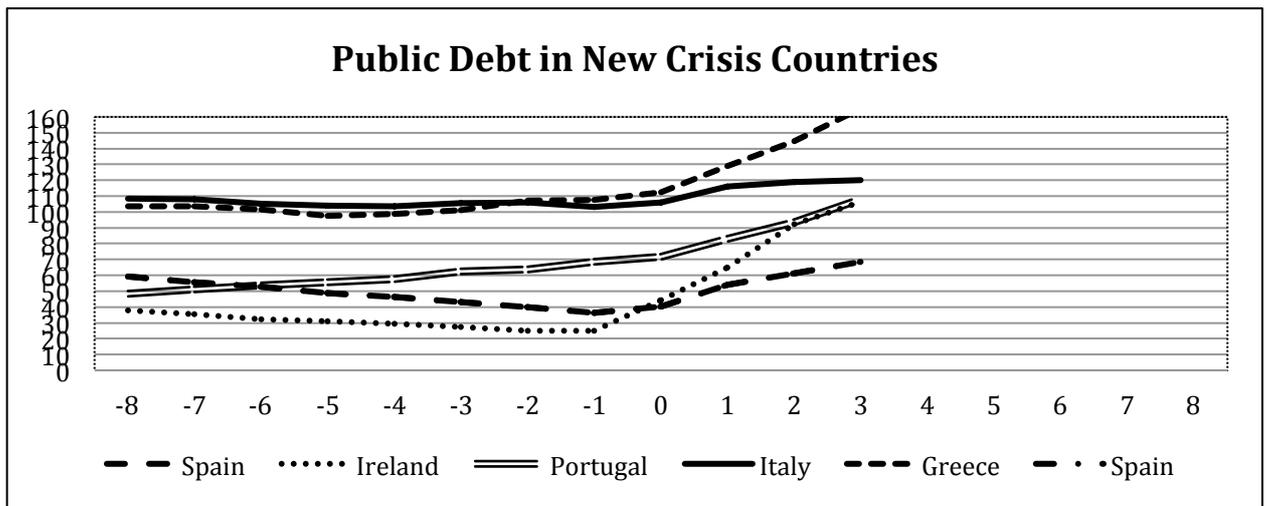
Figure 3: Matched Old Crises - Growth relative to tranquil periods
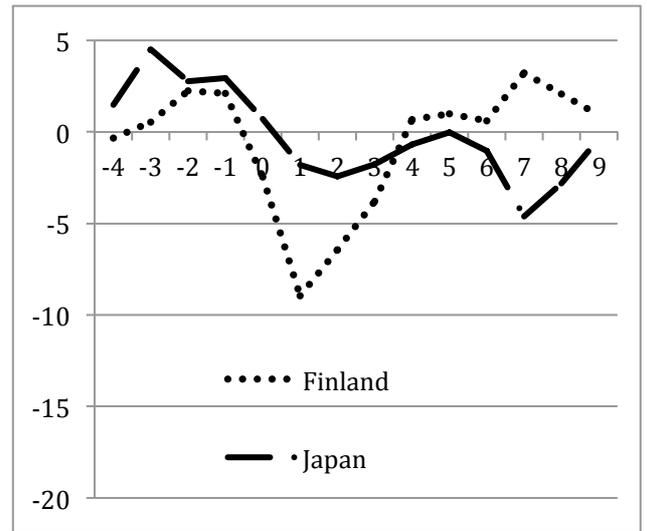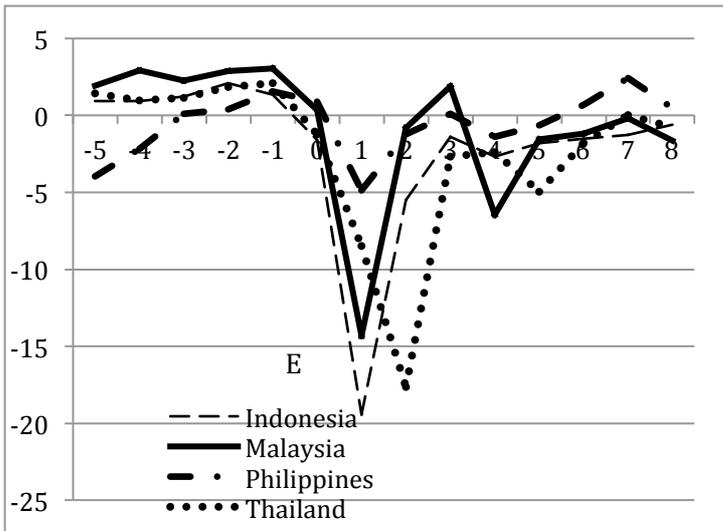
Figure 4: World Growth Rate, 1980-2012
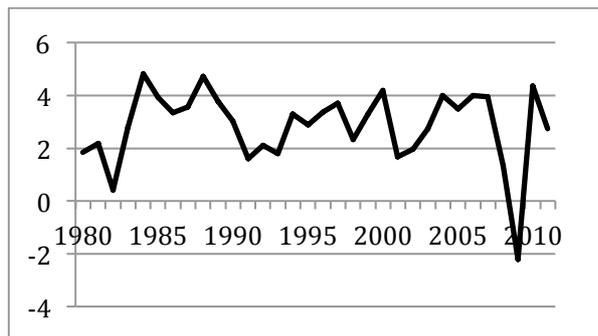
Source: World Bank, World Development Indicators (2013).

Figure 5: Italy (2008) – Finland (1991) Growth Relative to Tranquil Periods
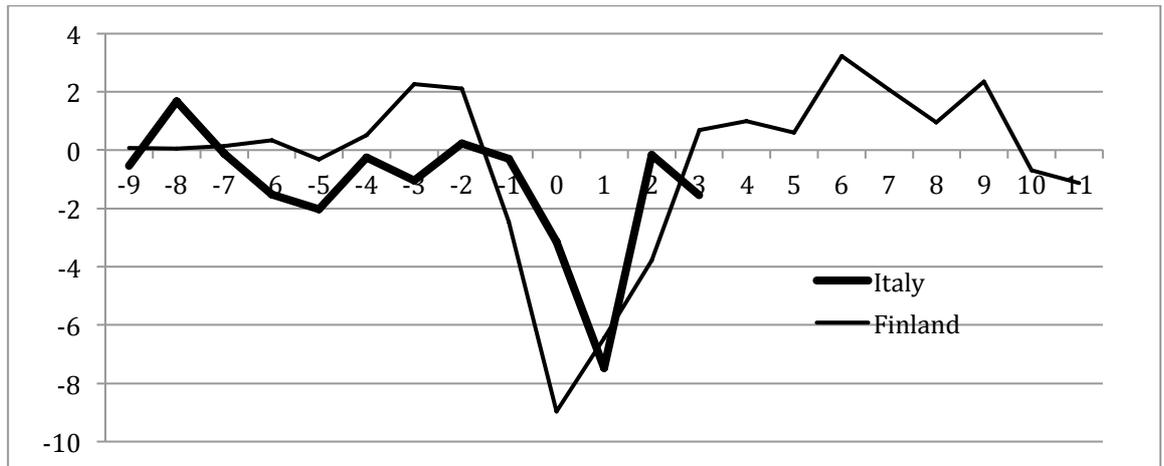
Figure 6: Ireland (2007) – Spain (2008) – Japan (1992): Growth Relative to Tranquil Periods
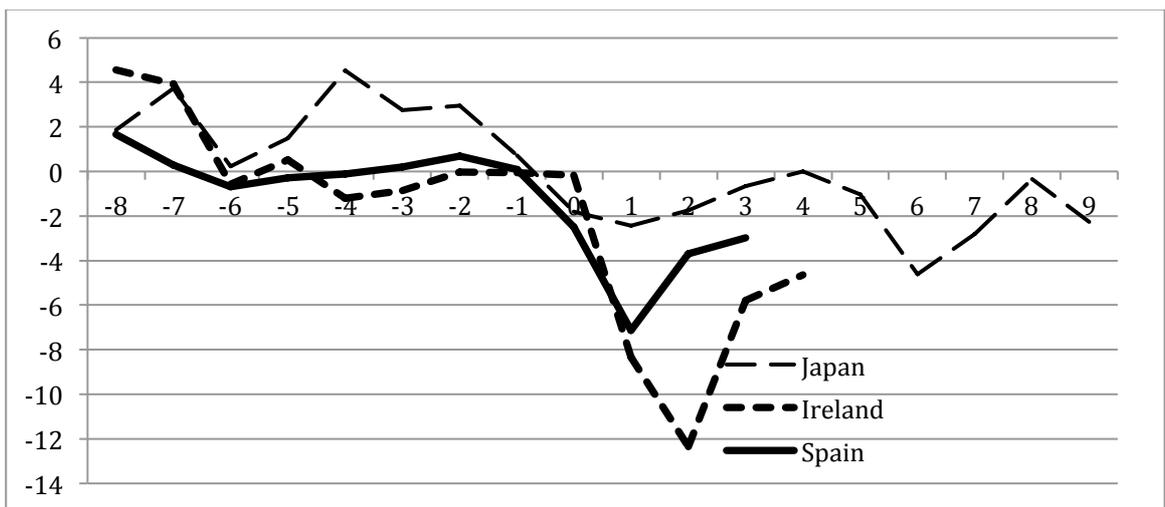
Figure 7: Greece (2008) – Indonesia (1997) – Philippines (1997): Growth Relative to
Tranquil Periods
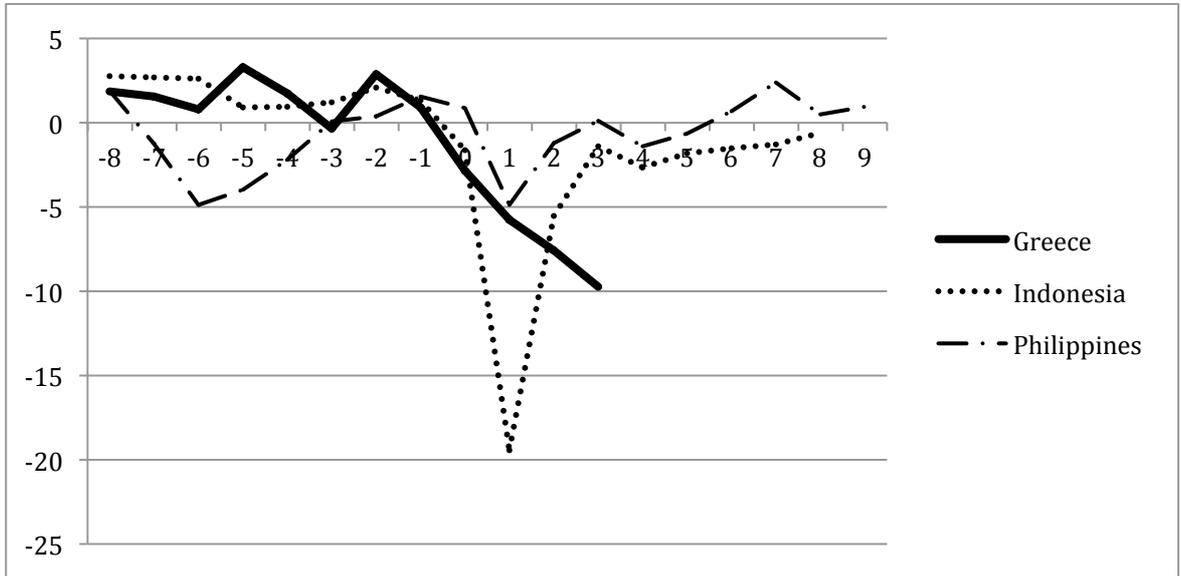
Figure 8: Portugal (2008) – Malaysia (1997) – Thailand (1996): Growth Relative to Tranquil
Periods
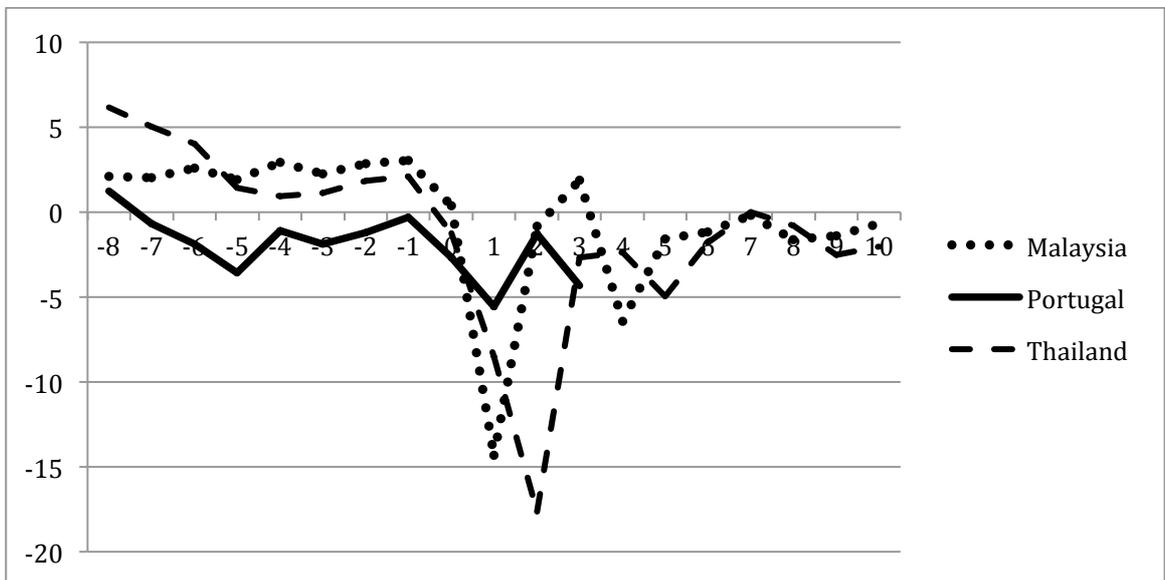
Figure 9: Severity of crises, 1981-2011

Severity of crises'

Legend:
- 1981-85
- 1986-90
- 1991-95
- 1996-2000
- 2001-05
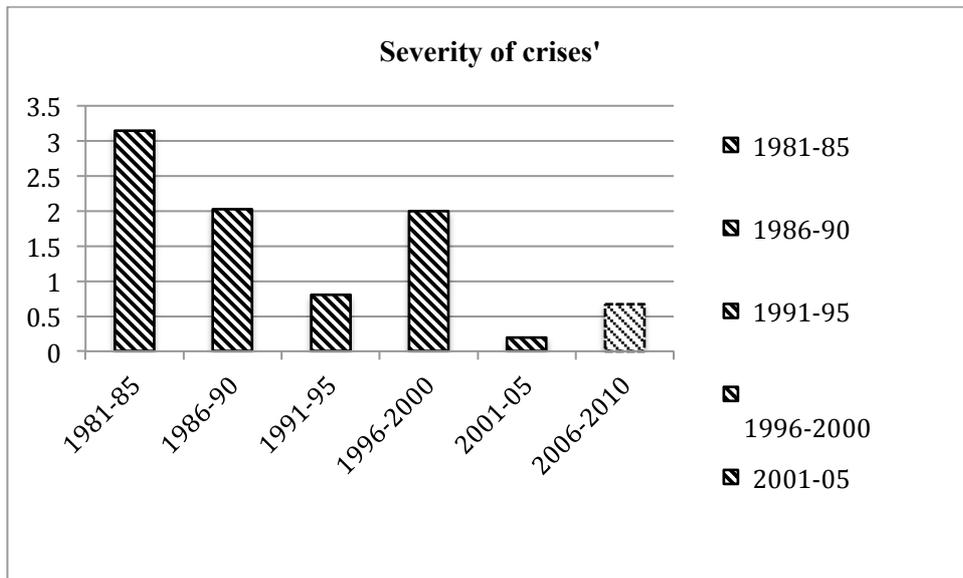
Figure 10: Average length of banking crises - 1981-2011