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Sovereign debt defaults and currency crises in Latin America

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Chapter 1

Introduction

1.1 Motivation

The Global Financial Crisis (GFC) that started in 2008 and the European sovereign debt crisis that followed have renewed interest in financial crises. Sovereign debt crises are recurring and there is no reason to believe that defaults will not occur any more. It is therefore important to understand and learn from past experiences.

We approach financial crises from the viewpoint of Latin America, a relatively underinvestigated region (Aiolfi, Catão and Timmermann, 2011) with a rich history of financial crises. The GFC led to a collapse in asset prices (including currencies) in Latin America, but did not lead to banking or debt crises, as had been the case with previous global shocks. Were the characteristics of this crisis different than earlier currency crises? This is one of the research questions that we focus on in this thesis (see Section 1.3). Originally, ‘Latin America’ had only a geographical significance—it refers to all countries south of the Rio Grande, the river that forms the current border between the USA and Mexico, in which a Latin-derived language is predominantly spoken. A map of the region is shown in Figure 1.1.

Figure 1.1. Map of Latin America.



However, it has become clear that the countries have much more in common than location and language origin. The shared colonial experiences and the pattern of development in the nineteenth century bind Latin American countries more than nations in Africa, Asia or Europe. Furthermore, there have been much less interstate conflicts, border changes or annexations since independence than on other continents (Bulmer-Thomas, 2003). The region has not met its high expectations after independence. Almost two hundred years later the countries find themselves from an economic perspective in between the high-income countries of North America and Western Europe and the poorest countries of Sub-Saharan Africa and South Asia (Bulmer-Thomas, 2003). In 1914 Argentina ranked among the ten richest countries in the world in terms of GDP per capita, after for instance Australia, Britain and the United States, but ahead of France, Germany and Italy. Its income per head was 92% of the average of the 16 richest economies (The Economist, 2014). In 2013, the country ranks 60 in the world according to the IMF World Economic Outlook database in terms of GDP per capita in US dollar. All Latin American countries have experienced recurring financial crises since independence in the early 19th century. Other common characteristics of the region are the high rate of urbanization (75% of its inhabitants live in cities or towns, as compared to 50% in other middle-income countries), the importance of primary commodities for exports and government budgets, and the high income disparity (Bulmer-Thomas, 2003).

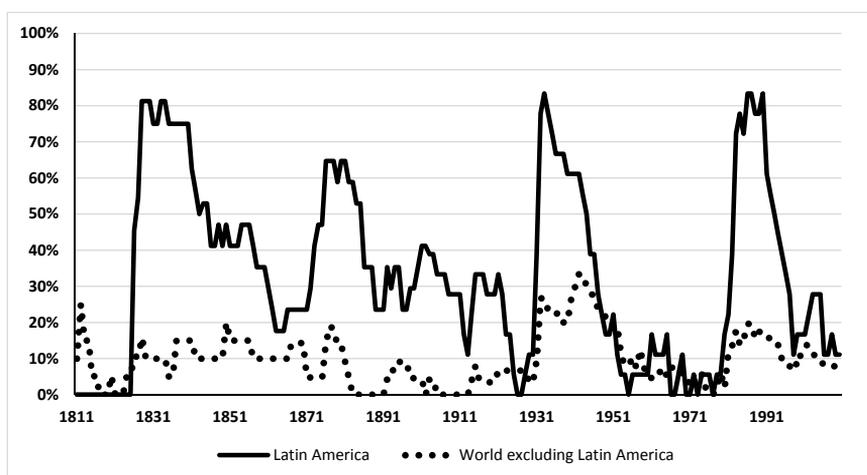
There are also differences between the Latin American countries, such as the level and development of GDP per capita per country, and types of economic policy. While Chile ranks 45th in the world with an average GDP per capita of more than USD 16,000, Bolivia, Honduras and Nicaragua rank below the 120th place with an average GDP of less than USD 3,000 per capita according to the 2013 IMF World Economic Outlook database. Many countries experienced extended periods of hyperinflation, such as Argentina, Brazil and Chile, while others did not—for instance Mexico. During the so-called inward-looking period (1940s to 1970s), the world was characterized by low international trade and finance, and a high level of self-reliance. In

this period, six Latin American countries (Argentina, Brazil, Chile, Colombia, Mexico and Uruguay) focused on import substitution policies, while the other countries in the region stuck to an export-led policy. While Argentina and Chile started market reforms in the early 1970s, Brazil and Mexico started almost a decade later. Political systems have changed over time and amongst countries. After the market-oriented reforms in the 1990s, initiated by the IMF and World Bank, at the start of the new millennium in some countries (Argentina, Bolivia, Ecuador, Nicaragua and Venezuela) governments came to power that were highly critical towards the 'Washington consensus', while in others (Colombia, Mexico and Chile) more market- and international oriented political parties came to power (Edwards, 2007).

Latin America has a rich past of financial crises. Figure 1.2 presents the percentage of countries in default for Latin America and for the rest of the world. The difference is striking. Whereas Latin America experience four episodes of massive defaults in which more than 60% of the region's countries are in default, the rest of the world is characterized by minor percentages. Only in the Great Depression and World War II the percentage of countries in default surpasses 30%.

Although the region has its particular characteristics compared to other parts of the world, the experiences with financial crises can be useful for other regions. The sovereign debt crisis that hit peripheral euro zone countries has similarities with past sovereign debt crises in Latin America, such as a high public debt risk premium, distress in the banking system, sudden stops of capital flows, low growth and low competitiveness (Cavallo and Fernandez-Arias, 2012). Sub-Saharan African countries share similar features, such as a strong reliance on commodities and a lending boom after independence that resulted in a debt crisis (Sturzenegger and Zettelmeyer, 2007). Africa has a history of dictators and single-party rules, high indebtedness, mismanagement in implementing industrial policies, governance deficiencies and corruption, which is comparable to Latin America (Young, 2010). Even the critics on the 'Washington consensus' (IMF and World Bank's programs) are similar.

Figure 1.2. Countries in default or restructuring: Latin America and the rest of the world, 1811–2010.



Source: Reinhart and Rogoff (2009)

Notes:

The vertical axis represents the number of countries in default as a percentage of all countries. The sample includes countries that were independent states in the given year (from 21 in 1811 to 69 in 2010).

The sample includes 18 Latin American countries (solid line). An adjustment was made for the period 1828 to 1837. Five Central American countries (Guatemala, Honduras, El Salvador, Nicaragua and Costa Rica) that defaulted on the debt in this period are included, although they gained independence in 1838. The rest of world (dotted line) consists of 8 Asian countries, 13 African countries and 30 countries from Europe, Oceania and North America.

In this thesis we analyze financial crises in the four largest (measured by GDP) Latin American economies, Argentina, Brazil, Chile and Mexico, that cover roughly 70% of Latin America's GDP (Aiolfi et al., 2011). Apart from the size and similar economic development paths that these four countries share, our choice is influenced by data availability. We investigate two types of financial crises, currency crises and sovereign debt crises. We do not analyze other types of crises such as bank crises, bank runs or stock market crashes.

Various definitions exist for currency crises, sovereign debt and sovereign debt crises. It is essential to provide the definitions that we use to be

able to compare results with other studies. In the next section we provide an overview of the most commonly used definitions.

1.2 Definitions

This section presents an overview of definitions of two types of financial crises: currency crises and sovereign debt crises. For the latter we make a further distinction between sovereign debt crises and sovereign debt defaults. We also present an overview of sovereign debt definitions. In this thesis we analyze currency crises and sovereign debt crises separately. In other words, we do not focus on so-called 'twin' debt and currency crises.

1.2.1 Currency crises

How to identify currency crises has been debated since the mid 1990s. Two approaches can be distinguished: the successful attack approach and the speculative pressure approach.

Successful attack approach

In the successful attack approach a currency crisis is identified when a currency depreciates significantly. Frankel and Rose (1996) identify a currency crisis when two conditions are met: (i) the depreciation of the nominal exchange rate of the currency is larger than 25% in a year, and (ii) the rate of the nominal depreciation must be 10 percentage points larger than it was in the previous year. They use an exclusion window of three years, which means that if a new crisis begins three years or less after completion of the previous crisis then this is not considered a new crisis, but a continuation of the earlier crisis. In later research numerous authors have proposed variations, in particular whether to use real or nominal depreciation (Esquivel and Larrain, 1998; Goldfajn and Valdes, 1998), and how large and rapid the depreciation must be to qualify as a crisis (Esquivel and Larrain, 1998; Goldfajn and

Valdes, 1998; Catao, 2006). For an overview, we refer to Kaminsky, Lizondo and Reinhart (1998), Abiad (2003) and Frankel and Saravelos (2010).

Speculative Pressure approach

The speculative pressure approach, inspired by Girton and Roper (1977) and later used by Eichengreen, Rose and Wyplosz (1995) and many others for currency crises, does not only take into account actual devaluation or depreciation of the currency, but also includes periods of great stress of the exchange rate. The latter occurs when the monetary authorities avoid a devaluation or depreciation through the use of its international reserves or by increasing the interest rates. Although the 'currency attack' was unsuccessful, one may argue that this should be considered a crisis. In order to capture all attacks—successful and unsuccessful—the Exchange Market Pressure Index (EMPI) includes a weighted average of exchange rate changes, changes in the international reserve and changes in the interest rates. The formal definition is shown in Appendix A. The constructed index is then used to identify a currency crisis period. If the index exceeds a pre-determined threshold, then a currency crisis is identified. The choice of the threshold is rather arbitrary. Eichengreen et al. (1995) use a threshold of two standard deviations from the mean, while Eichengreen, Rose and Wyplosz (1996) use a threshold of 1.5 standard deviations from the mean. Furthermore, they use an exclusion window of 2 quarters, to rule out measuring the same crisis more than once.

Kaminsky et al. (1998) propose an adjusted version, in which they define a crisis as a situation in which an attack on the currency leads to a sharp depreciation of the currency, changes in international reserves or a combination of both. The formal definition is shown in Appendix A. Compared to Eichengreen et al. (1995), they do not include the interest rate in the formal expression. Their argument is that in emerging economies interest rate spreads are not always available or useful. Periods with hyperinflation are separated from episodes without hyperinflation: for each subcategory

an index is constructed and threshold exceedences determined (here: three times the standard deviation).

For a survey on exchange market pressure indexes see Kaminsky et al. (1998) and Lestano and Jacobs (2007).

1.2.2 Sovereign debt

Before turning to definitions of sovereign debt defaults and crises, we first review definitions of sovereign debt. In general terms, sovereign debt refers to debt issued or guaranteed by the government of a sovereign state (Das, Papaioannou and Trebesch, 2012). Other authors use the term ‘total gross government debt’, or ‘total public debt’ (Reinhart and Rogoff, 2011). Following Panizza, Sturzenegger and Zettelmayer (2010) and Reinhart and Rogoff (2011) we can distinguish different types within this group. Debt can be classified by differences in the issuer (central government versus total government, which also includes lower government and explicitly guaranteed debt), the currency (foreign currency denominated versus local currency denominated debt), the place of issuance (issued in foreign countries and under foreign legislation versus issued in the own country under national legislation), and the creditor (domestic lender versus foreign lender). All combinations are feasible, such as central government foreign currency denominated domestic debt (Reinhart and Rogoff, 2011), or central government debt (foreign and domestic currency denominated debt, under foreign or national legislation).

1.2.3 Sovereign debt defaults and sovereign debt crises

In the literature there is no single definition of a sovereign debt default or crisis. It depends both on the focus of research and information available, which is one of the reasons why it is difficult to compare the results of different studies. Another reason is that the chosen data set (countries, period and/or frequency) varies widely.

The following list of definitions is partially based on Pescatori and Sy (2007). For an overview of older definitions we refer to Peter (2002).

- Moody's defines a default when the issuer has a missed or delayed disbursement of interest and/or principal, even if the delayed payment is made within the grace period, or when the issuer offers a new security that leads to a diminished financial obligation (for instance a lower coupon or par value).
- Standard and Poor's rates sovereign issuers in default if a government fails to meet principal or interest payment on external obligations on due date, or when a rescheduling of principal and/or interest is at less favorable terms than the original obligation.
- Purcell and Kaufman (1993) define a default when all or part of interest and/or principal payments due were reduced or rescheduled. They depart from the previous definitions, because they consider not only bonds and bank loans to sovereign nations, but also supplier's credit. They exclude intergovernmental loans.
- Detragiache and Spilimbergo (2001) define a debt crisis if (i) there are arrears of principal or interest on external obligations towards commercial creditors (banks or bondholders) of more than 5 percent of total commercial debt outstanding; or (ii) there is a rescheduling or debt restructuring agreement with commercial creditors as listed in the World Bank's Global Development Finance database.
- Manasse, Roubini, and Schimmelpfennig (2003) not only consider as a debt crisis outright default, but also situations where default was avoided through the provision of large scale official financing by the IMF. They define a debt crisis if (i) Standard and Poor's definition of a debt default holds, or (ii) the country receives a large non-concessional IMF loan, defined as access in excess of 100 percent of quota and uses part of the loan in the first year. The quota is based broadly on its relative position in the world economy, and the amount of financing a

member can obtain from the IMF is based on its quota. Under stand-by and extended arrangements, a member can borrow up to 200 percent of its quota annually and 600 percent cumulatively. However, access may be higher in exceptional circumstances.

- Ciarlone and Trebeschi (2005) define a debt crisis if one of five conditions is satisfied: (i) a country has officially declared a moratorium on public or external debt payments, (ii) a country has incurred a missed payment of interest and/or principal on external obligations towards official and commercial creditors which adds up to more than 5% of the debt service ratio paid by year-end, (iii) a country has accumulated arrears of interest and/or principal on external obligations towards official and commercial creditors, which add up to more than 5% of the total external debt outstanding by year-end, (iv) a country has signed a debt restructuring or rescheduling agreement with an official and/or commercial creditor, and (v) a country has received a large assistance package from the IMF, where large is defined as access in excess of 100 percent of the country's quota.
- Catão, Fostel and Ranciere (2011) make an explicit distinction between sovereign debt *defaults* and sovereign debt *crises*. The latter is defined as episodes of either an outright default or a near-default. Near-default episodes are periods of large IMF assistance to avoid a possible default. Debt defaults are thus a subset of debt crises.
- According to Sy (2003) and Pescatori and Sy (2007) the relative low number of sovereign debt crises since the 1990s can partly be attributed to the definition of debt crises. Default on debt was common in the 1980s, but since bond markets developed strongly in the mid 1990s the number of debt defaults has diminished, while numerous countries faced difficulties in their debt servicing. For this reason they propose an alternative definition of debt crisis: 'sovereign stress'. There is sovereign stress when bond spreads are trading 1,000 basis points or more above U.S. Treasuries. The threshold is chosen as it is considered

a psychological barrier for investors. The problem is that the data do not always fit this rigid definition: some Asian countries did not even exceed the threshold in the Asia crisis, while various Latin American countries exceed the threshold also in tranquil times. As an alternative they take the 90th percentile, based on Extreme Value Theory and kernel density estimation. However, also under this definition it is possible that a debt crisis is identified for a country with a relative high country spread, while it is not experiencing any debt servicing difficulties.

1.2.4 The definitions that we apply

In this thesis we follow the definition of Kaminsky et al. (1998) for currency crises. We use the speculative pressure approach, because this works well under both fixed and floating exchange rate regimes. Frankel and Saravelos (2010) state that the inclusion of reserves is particularly relevant for countries with fixed exchange rate regimes, because capital flight and crisis incidence are present through larger drops in reserves rather than exchange rate weakness.

For the sovereign debt we use total (external and domestic) gross central government debt. The choice is mainly motivated by data issues. First, the definition provides consistency between countries and over the years, because alternative definitions lead to differences in interpretation and data availability. For example, if we consider only external government debt, the data can be inconsistent over time or between countries, because there are different ways of defining external debt: currency, place of issuance and residence of the creditor (Panizza et al. , 2010). Even that much of economic theory has looked at the debt of sovereigns as external debt, owed to non-residents, the focus on external debt is problematic for several reasons. First, since the late 1990s several countries have retired public external debt, substituting it with domestically issued debt (in domestic and foreign currency, which can be purchased by both national and foreign investors). Second, most countries have no way of knowing who holds their debt (Panizza

et al., 2010). By focusing on the central government, instead of also including lower government debt and explicitly government guaranteed debt, we avoid further definition inconsistencies and data availability problems. A second reason for our choice is that data on total central government debt are available for a long time span (Reinhart and Rogoff, 2011), which allows us to focus on a single region.

For sovereign debt crises we use the definition of Manasse et al. (2003), and for sovereign debt defaults we use the definition of Standard and Poor's. This implies that we follow the same distinction as in Catão et al. (2011). We use the debt crisis definition to identify periods of increased pressure on the sovereign debt position (Chapter 4). We construct a continuous index that reflects the pressure on the servicing of sovereign debt. The index is calibrated on the sovereign debt crisis variable. For the impact on real GDP growth and output losses (Chapters 5 and 6), we prefer to focus on debt defaults only, because the dynamics and mechanisms are different for a near-default compared to a default.

1.3 Research questions and contributions

In this section we list our research questions on currency crises, sovereign debt defaults and sovereign debt crises in Latin America. We also present the main contributions to the literature.

For currency crises we examine two research questions:

1. Up to 2007, what were the main determinants for currency crises and the run-up to currency crises?
2. Does the Early Warning System that we develop pick up the crisis in the aftermath of the fall of Lehman Brothers in September 2008, and more generally how did the countries perform in the run up to and in the aftermath of the 2008 event?

For sovereign debt defaults we examine the following research questions:

3. Can we construct a continuous debt crisis index (a combination of economic, financial and political indicators) that reflects debt servicing difficulties?
4. Is there a relation between sovereign debt crises and business cycles? Can we use the DMPI to analyze a (Granger) causal relationship between business cycles and sovereign debt crises?
5. What is the impact of sovereign debt defaults on GDP growth and on the output loss? Does a default affect GDP for a long time, or is the effect short-lasting? Does the impact depend in which of the three historical periods with distinct features (1870–1930, 1931–1971, 1972–now) it takes place?
6. Is the timing of defaults related to business cycles, or is there a closer relationship with international and domestic conditions prior to the default? For example, is a default more likely when international economic growth is (historically) low? Do defaults take place in recessions? Are defaults more likely to occur in autocratic or democratic political systems?
7. Is the impact of defaults related to business cycles, international or domestic conditions prior to and during the default? For instance, is the impact of a default more severe after a commodity price boom? Is the impact of a default more severe when the debt overhang is high?

Our contributions to the literature are presented next. The Early Warning System (EWS) of currency crises that we develop in Chapter 3 combines a static factor model with an ordered logit model such that the severity of the currency crises is accounted for. This combination is new in the EWS literature. The factor model allows us to include a wide range of variables in explaining currency crises, without pre-specifying explanatory variables. Other studies on the currency crises during the Global Financial

Crisis (2007–2009) have focused mainly on the question why some currencies are hit harder than others. These studies have assumed that currency crises in the GFC are fundamentally different from earlier currency crises. We do not make this assumption, and use information from the period 1990–2007 to predict the 2008–2009 currency crises. For Argentina and Brazil, two countries with a large number of currency crises, our EWS does a reasonably well job in indicating a currency crisis, although it indicates a more severe crisis than actually occurred. Our EWS does not perform well in predicting the currency crisis in Mexico.

In Chapter 4 we construct a Debt Market Pressure Index (DMPI), which is more informative than the standard binary sovereign debt default dummy. The index represents debt servicing difficulties—rather than a sovereign debt default and provides a tool for further investigations. The construction of the index is our main contribution to the sovereign debt crisis literature.

We quantify the economic impact of sovereign debt defaults for four large Latin American countries for the period 1870–2012 in Chapter 5. Most cross-section analyses on financial crises rely on standard data sets that go back to 1970 or 1980 (Reinhart and Rogoff, 2011). Taking into account a longer history allows us to study one region with common features and with a sufficient number of sovereign default observations. By analyzing a prolonged period we remain closer to the idea that sovereign debt defaults are recurring events.

In Chapter 6 we explore the differences in the impact of the sovereign debt default events on real GDP growth. To explain these different impacts, we search for patterns with economic indicators such as business cycles, government expenditures, debt levels and external trade, with political indicators such as democracy, and with international indicators such as global economic growth, global interest rates and commodity prices. To the best of our knowledge the differences in impact (severity and contraction period) of sovereign debt defaults have not been analyzed. We do not discuss causality, but we provide insights through stylized facts. Our findings may be useful for policy makers to smooth the impact of debt defaults. High negative im-

pact of sovereign debt defaults on real GDP growth and on the output loss is associated with high government expenditure and high commodity prices prior to the default. We provide three policy recommendations. First, the government should implement budgetary restrictions which ensure that temporarily high fiscal revenues (windfalls from commodities) are saved rather than spent. Second, the countries should continue with the countercyclical fiscal policy and maintain low debt. Third, by diversifying their economies away from reliance on a few primary commodities Latin American countries can reduce the vulnerability for external shocks.

1.4 Outline of the thesis

This thesis is structured as follows. Chapter 2 provides background information on the economic history of Latin America since 1870. We pay special attention to the history of currency crises and sovereign debt defaults in the region. The chapter also presents a theoretical framework for currency crises and sovereign debt defaults. This chapter serves two purposes. First, for readers that are not familiar with Latin American economic history this chapter serves to get a better understanding. Second, over time new crisis types and new features have led to the development of new theories and models. Latin America's experiences with currency crises and sovereign debt defaults have played an important role in this process.

Chapter 3 focuses on currency crises in Argentina, Brazil and Mexico since the early 1990s. We answer the first research question by examining which economic, institutional, political, banking, debt and global characteristics are the determinants of the currency crises in the years prior to the Global Financial Crisis. We estimate an Early Warning System, consisting of a static factor model and an ordered logit model, using monthly data for 1990–2007. We find that for the three countries debt, banking and commodities indicators are associated with currency crises. Also, including institutional indicators improves the model's fit. We use the constructed model to predict the currency crises in the aftermath of the fall of Lehman Brothers

in September 2008. We find that *ex ante* forecasts for 2008–2009 produce currency crises in the fall of 2008 for Argentina and Brazil, but our model overestimates the severity of the crises. For Mexico the early warning signal does not pick up the crisis that occurred in reality.

Chapter 4 answers our third and fourth research questions. We construct a continuous sovereign debt crisis index for four large Latin American countries for the period 1870–2012. To obtain the optimal set of indicators and the optimal value of the threshold for dating crises we apply the so-called Receiver Operating Characteristic (ROC) curve. Our sovereign debt crisis index is a weighted average of three indicators: the debt-to-GDP ratio, the external interest rate spread and the exports-to-imports ratio. The continuous index allows a more advanced analysis of sovereign debt crises than with the standard sovereign debt default binary dummy. This is illustrated with an investigation of the relationship between sovereign debt crises and business cycles in Latin America. We find that a negative shock to economic activity (business cycle) increases the probability of a debt crisis in the following two years, which answers our fourth research question.

Chapter 5 answers the fifth research question by quantifying the impact of sovereign debt defaults on real GDP growth and the output losses. We analyze four Latin American countries—Argentina, Brazil, Chile and Mexico—for the period 1870–2012, covering 14 sovereign debt defaults. We find that for 80% of the sovereign debt defaults the impact on GDP growth and the output loss is negative, but short-lived. Within two years recovery sets in. We analyze the impacts in three historical periods, 1870–1930, 1931–1971 and 1972–2012. Most defaults in the so-called second globalization period (1972–now) show deep and long-lasting impacts. The features are in line with boom-bust models. There are also differences among the four countries. Defaults in Argentina and Chile have a very deep impact, followed by fast recovery. These defaults are in line with the political economy argument that governments prefer to postpone crises until default is the only way out. Mexico's defaults had deep and long-lasting effects on output losses. Two defaults coincide with periods of domestic unrest (the 1914–1922 de-

fault during the Mexican revolution and the 1928–1942 default during the Cristeros War), and all three defaults coincide with global economic slowdowns in 1914 (WW I), 1928 (Great Depression) and 1982 (Latin American debt crisis). Additionally, the impact is relatively stronger for the 1982–1990 crisis, due to the high pre-default economic growth. Defaults in Brazil have a relatively mild impact. Brazil has continued to service part of the debt obligations during defaults up to the 1920s, it has implemented loose fiscal and monetary policy during debt defaults in the 1930s, and it has benefited from the improved terms of trade in the 1980s.

Chapter 6 answers our sixth and seventh research questions. We examine the diversity in the impact of sovereign debt defaults on the output losses during the crisis contraction period, which is defined as the period from the default until the trough of the business cycle is reached. We find that most sovereign defaults start in recessions and in unfavorable international circumstances. We observe a narrow relation between the output losses during the crisis contraction period and a range of indicators. Deeper and longer-lasting contraction periods are associated with increasing commodity prices in the years prior to the default, increasing government expenditure and higher economic growth. This pattern is in line with the boom-bust mechanism, and the political economy theory which states that in autocratic political systems windfalls in commodity prices are used to increase government expenditure. Under certain circumstances (for instance high debt levels) decreasing commodity prices trigger a process that ends in a sovereign debt default.

Chapter 7 summarizes the main findings and limitations, and indicates directions for future research.

