Sovereign debt defaults and currency crises in Latin America

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Chapter 5

The economic impact of sovereign defaults in Latin America *

5.1 Introduction

In this chapter we investigate the impact of sovereign debt defaults on economic growth. We use the definition for sovereign debt defaults from Standard and Poor's, as explained in Section 1.2. There seems to be consensus in the literature on the negative impact of sovereign defaults on economic growth, but the size and duration of the impact are still debated. On the one extreme, De Paoli, Hoggarth and Saporta (2011) find that median output losses following sovereign defaults are 4.4 percent per year, for more than 8 years. On the other extreme, Levy Yeyati and Panizza (2011) find that the economy recovers within one year after a default. Reasons for these disperse outcomes are related to the data set (countries, periods, frequency), to the measure for the impact of financial crises, and to the different mechanisms that the theories describe (see Section 2.3). In boom-bust models the increasingly euphoric sentiments cause the price of assets (such as shares, commodities, or debt of emerging economies) to increase continuously and

* This chapter is based upon Boonman (2013).

interest rates to decrease. Debt lending and borrowing surge as speculative financing increases. This boom may end in a sovereign debt crisis when sentiments change and interest rates increase sharply. Output losses will be relatively large, because economic growth drops from a high pre-default rate to a low or even negative post-default rate. In the sovereign debt default models for emerging economies (for instance Arellano, 2008) sovereign defaults occur in recessions, and when debt is high. In recessions economic activity slows down, the probability of a default increases and as a consequence the interest rates rise. Pre-default real GDP growth is low, since the economy is in a recession. The gap between pre-default and post-default real GDP growth will be relatively small. The main consequences of a sudden stop in capital flows are the real depreciation of the exchange rate, the increase of interest rates and the downturns of economic activity (Calvo, 2003; Catão, 2006). The effects are more dramatic in emerging economies. Most emerging economies face a currency mismatch in liabilities and assets since they borrowed in foreign currency denominated debt, while revenues are denominated primarily in domestic currency (original sin). This makes the country more vulnerable for depreciations of the real exchange rate.

Most cross-section analyses on financial crises rely on standard data sets that go back to 1970 or 1980 (Reinhart and Rogoff, 2011). We quantify the impact of debt crises on economic growth over a long period, for a single region. We choose Latin America, a relatively underinvestigated region with a rich history of sovereign debt crises, a large commodity production and open during most of its history after gaining independence. We extend the work of Aiolfi et al. (2011) on business cycles to sovereign debt defaults for the four largest Latin American economies, Argentina, Brazil, Chile and Mexico from 1870 to 2012. These countries have experienced 14 sovereign debt defaults, and have been in sovereign debt default episodes more than 20% of the time.

Taking into account a longer history allows us to study one region with common features and with a sufficient number of sovereign default observations. The first globalization period (1870–1913) has similar characteristics

as the second globalization period (1972–now), as mentioned by Bordo and Meissner (2007) and Della Paoleri and Taylor (2012). As Rose comments on Bordo, Eichengreen, Klingebiel and Martinez-Peria (2001) it is important to exploit all available data to try to understand financial crises, and that including data going back to the 19th century must be the final frontier. The only work on sovereign debt crisis impact with a similar long time horizon is Tomz and Wright (2007). However, these authors include both developed and emerging economies, and do not distinguish historical periods or historical patterns of recurring defaults in single countries.

We measure the impact of a default in two ways, on real GDP growth and on (cumulative) output losses. Our findings can be summarized as follows. We find a short-lived negative impact of a default on real GDP growth and on the cumulative output loss. In general, two years after the default the output gap starts to decrease and economic growth is not affected in a significant manner. This is in line with Levy Yeyati and Panizza (2011) who propose political reasons: a country postpones a default until avoiding it is no longer possible. By that time the worst of the recession is already over, and the economy recovers fast. A second finding is that crises in the period 1972–2012 tend to have a significant deeper and longer lasting impact than in the other two episodes. This result is in line with Furceri and Zdzienicka (2012). The defaults in the 1980s take place at the end of an extended boom phase, and mark a structural break in growth patterns, particularly in Mexico. The differences between countries can be compared in a similar manner. Defaults in Argentina and Chile fit with the findings of Levy Yeyati and Panizza (2011) of a short-lived impact. Defaults in Mexico fit with the boom-bust model that lead to extended output losses. Brazil is an exception as on average defaults have no significant impact on economic growth and a minimal impact on output losses.

The remainder of this chapter is structured as follows. After a review of the literature on sovereign defaults in Section 5.2, Section 5.3 discusses how we measure the impact and the severity of the default. The data are presented in Section 5.4, followed by the empirical results in Section 5.5.

Section 5.6 concludes.

5.2 Literature review

Most studies find that sovereign debt defaults have a negative impact on economic growth, but the size and duration of the impact vary to a large extent. For instance Sturzenegger (2004) estimates output losses at around 0.6 percentage points of real GDP for 100 countries in the period 1974-1999. De Paoli et al. (2011) investigate the impact of debt crises on output for 35 countries for the 1970–2000 period. They find that sovereign crisis episodes last more than eight years, and have output losses of almost 5 percentage points per year. Mendoza and Yue (2012) present empirical evidence that default events are associated with deep recessions. In a cross-country study with 23 default events in the 1977—2009 period, GDP and consumption fall on average about 5 percentage points below trend after a sovereign default. Levy Yeyati and Panizza (2011) use samples of annual and quarterly data for 40 countries, with ten defaults in the 1980s and ten defaults between 1990 and 2006. They find that output contractions *precede* defaults. In addition economic growth recovers fast: one year after a default economic growth is already positive. Their explanation is based on political economy arguments. Sovereign defaults are postponed as much as possible because of the high political costs. So, once a country defaults, it has already been in a period of low economic growth. Furceri and Zdzienicka (2012) use an unbalanced panel of 154 countries from 1970 to 2008 to estimate the short and medium term impact of debt crises on output. They find that sovereign debt crises have a deep and long-lasting effect on economic output. Eight years after a default the output loss is 10%.

Tomz and Wright (2007) use a data set with 106 countries that defaulted in total 250 times since 1820. They report that output is 1.4 percentage point below trend in default years, and 0.2 percentage point above trend in non-default years. Kaminsky and Vega-Garcia (2014) provide a detailed description of sovereign debt crises in Latin America in the period 1820 to 1931

in which they distinguish different types of defaults. They observe great dispersion in debt default characteristics, such as timing and length of the debt crisis, and losses for lenders. They investigate which country-specific (exports and terms of trade) and global fragilities (international issuance and real interest rate in the UK) trigger the crisis.

5.3 Methodology

Similar to Reinhart and Rogoff (2011) we base our calculations of the economic impact of sovereign defaults on the first year of the default instead of taking the entire official length of the crisis, because there are cases where the final resolution with the creditors takes an unrealistically long time. A sovereign debt default ends when renegotiations have resulted in an agreement. Standard and Poor's defines the end of a default 'when a settlement occurs or when no further near-term resolution of creditors' claims is likely' (Tomz and Wright, 2013). Often this process is dominated by political, legal and institutional factors, and not related to the economical situation. Two famous examples are Honduras, which has experienced only three sovereign debt defaults, but has been in default for 122 out of 179 years since independence, and Russia that defaulted on its sovereign debt in 1918, which was resolved in 1986, 69 years later (Reinhart and Rogoff, 2011).

Following Furceri and Zdzienicka (2012) we measure the medium-term impact for the period up to eight years after the default, unless the default episode ends earlier—then we only take the default episode in account. We focus on real GDP, because we are interested in the overall or total impact of a default on the economy. We do not use real GDP per capita, because we do not have enough data to construct a complete economic development growth model to measure the impact of a default on (long term) economic development or in the approximate loss in living standards (Reinhart and Rogoff, 2014). The majority of the studies focuses on the impact of sovereign defaults on real GDP (Bordo et al., 2001; Sturzenegger, 2004; Tomz and Wright, 2007; Furceri and Zdzienicka, 2012; Mendoza and Yue, 2012; and

Kapp and Vega, 2014). Levy Yeyati and Panizza (2011) measure the impact of defaults on both real GDP and real GDP per capita, and find no difference in the impact. De Paoli et al. (2011) use real GDP per capita.

There are three issues to account for when analyzing the impact of debt defaults on economic growth: (i) economic growth is not only influenced by debt defaults, but by a range of economic, social and political factors; (ii) defaults can be endogenous to economic growth: negative economic growth may trigger a default; and (iii) debt defaults are often accompanied by a currency and/or banking crisis. We focus on the first and second issue, but do not include the third issue explicitly, because the sample does not contain sufficient 'stand-alone' debt defaults that can be compared with twin or triple crises.

We use two approaches to measure the impact of sovereign default on real GDP, the dummy variable approach and the output loss approach. The first approach confines attention to real GDP growth. The latter approach focuses on the difference in actual real GDP levels and real GDP levels if the pre-crisis growth would have continued.

5.3.1 Dummy variable approach

Following Levy Yeyati and Panizza (2011) we specify an economic growth equation with crisis dummy variables and a wide range of control variables (economic growth of the world economy, interest rates, fiscal, debt, trade and monetary variables). Some control variables are included with a lag to mitigate the effects of endogeneity. An alternative approach is Two Stage Least Squares, as applied by Furceri and Zdzienicka (2012). However, for our data set it is not feasible because it is impossible to find enough good instruments due to the limited data availability. We test for autocorrelation and heteroskedasticity and where necessary use robust estimators. We use White estimators, because tests detect only heteroskedasticity. We also test for fixed (country) effects. To evaluate the cumulative impact of debt default on economic growth we use the Wald test, to test the cumulative significance

of the lagged sovereign debt default entry dummies. The null hypothesis is that the cumulative impact is not significant.

5.3.2 Output loss approach

The output loss is defined as the difference between actual real GDP and real GDP if the pre-crisis growth would have continued. The choice of the pre-crisis growth is not unambiguous. The first issue is the length of the pre-crisis period. Using a long time horizon (5–10 years) raises the question whether the pre-crisis period was truly a tranquil period, since crises may recur in some countries. A short horizon (1–3 years) may not be representative due to the relative unstable pre-crisis conditions in the economy (Angkinand, 2008). The second issue is how to estimate the pre-crisis growth. One can use an average as in Bordo et al. (2001), or use the Hodrick-Prescott (HP) filter, as in Tomz and Wright (2007), De Paoli et al. (2011) and Furceri and Zdzienicka (2012).

We use a horizon of 5 years, as in Bordo et al. (2001). We determine the pre-crisis growth in two ways. The first way is the average of the trend (HP filter) economic growth in the 5 years prior to the default entry. The HP-filter has a smoothness parameter equal to 100, which is common for data with annual frequency. The second way is to use compounded annual growth rate of real GDP in the 5 years preceding the default entry ($\bar{g}_{T,5}$).

The output loss is calculated for every year the default continues, with a maximum of 8 years. The output loss in the j-th year after the default entry (year T) is determined as:

$$L_{T+j} = \ln\left[RGDP_{T+j}\right] - \ln\left[(1+\bar{g}_{T,5})^{j+1}\, RGDP_{T-1}\right], \tag{5.1}$$

with $j = 0, 1, \ldots, K$, and $K = \min\{\text{length of default, 8 years}\}$. The second term in equation (5.1) is real GDP if pre-default growth would have continued. The cumulative output loss during the entire debt default episode is determined as:

$$CL_{T+K} = L_T + L_{T+1} + ... + L_{T+K}. \tag{5.2}$$

5.4 Data description

We analyze four Latin American countries, Argentina, Brazil, Chile and Mexico, for the period 1870–2012. For economic growth we use the change in the natural log of GDP, measured in constant local currencies (2006 = 100). As control variables we use financial and monetary variables (inflation rates, domestic real interest rates), as well as fiscal variables (change in government expenses and ratio of government's expenses to revenues), debt variables (gross external debt to GDP), trade variables (terms of trade, ratio of exports to imports) and other variables such as population growth and a political indicator that ranks political systems on a scale from fully autocratic to fully democratic (polity2 of the Center for Systemic Peace). For world economic growth we use the growth of real GDP of four core economies (USA, UK, France and Germany), and for the international credit markets we use the nominal interest rate deflated by the national consumer price inflation on 3-months bills for the UK as our country of reference up to 1920, and the USA thereafter. We use the UK up to 1920 because it was the most important international investor and trade partner in the world up to WW I. The USA took over this position gradually in the years after. Finally, we include prices of ten commodities that are relevant for Latin America and which are available for the entire time horizon. Details on the data definitions and sources can be found in Appendix F.

Sovereign debt defaults

We follow the definition of Standard and Poor's, as reported in Borensztein and Panizza (2009). We choose this definition because it is based on sovereign debt defaults only, unlike Reinhart and Rogoff (2009) who include both external public and private debt, and Purcell and Kaufman (1993) who include also suppliers' credits. We do not include periods of IMF assistance as in Chapter 4, because we want to focus only on the consequences of an actual default, and do not want to bias the results if a debt default was avoided by the use of IMF assistance.

Table 5.1 shows defaults of the four Latin American countries of our interest. Following Reinhart and Rogoff (2009) we use an exclusion window of two years, which implies that debt defaults with two years intervals or shorter are considered the same default.

Table 5.1. Sovereign debt default episodes for Argentina, Brazil, Chile and Mexico, in three historical periods: 1870–1930, 1931–1971 and 1972–2012.

	Period I (1870–1930)	Period II (1931–1971)	Period III (1972–2012)
Argentina	1890–1893	—	1982–1993, 2001–2005
Brazil	1898–1910, 1914–1919	1931–1933, 1937–1943	1983–1994
Chile	1880–1883	1931–1947	1983–1990
Mexico	1866–1885, 1914–1922, 1928–1942	—	1982–1990

Source: Standard and Poor's (Borensztein and Panizza, 2009).
Note: Mexico's series start in 1895, due to missing observations. As a consequence we shall not take into account the 1866–1885 crisis.

5.5 Empirical results

We present the results for the pooled data of Argentina, Brazil, Chile and Mexico from 1870 to 2012 in Section 5.5.1. In Section 5.5.2 we split the sample in three parts, according to the two most important structural breaks in the economic history in Latin America since 1870. In Section 5.5.3 we analyze the impact per country.

Table 5.2. Impact of sovereign debt defaults on economic growth for pooled data (Argentina, Brazil, Chile and Mexico; 1870–2012): dummy variable approach.

Dependent variable: 100 Δ log (real GDP)		
Default entry year	Coefficient	Standard error
+ 1 year	-4.68 ***	1.51
+ 2 years	1.72	1.45
+ 3 years	0.82	1.52
+ 4 years	-2.55	1.75
+ 5 years	-0.33	1.47
+ 6 years	0.99	1.44
+ 7 years	-1.47	2.44
+ 8 years	-0.41	1.11
R^2	0.173	
Adjusted R^2	0.124	

Notes:
*: significant at the 10% level, **: significant at the 5% level, ***: significant at the 1% level. Control variables: change in government expenses, ratio of government expenses to revenues, population growth, ratio of gross central government debt to GDP, inflation, terms of trade, ratio of exports to imports, polity2, U.S. 3 months T-bill rate, world economic growth (real GDP USA, UK, Germany and France), U.S. business cycle dummy and changes in commodity prices (cacao, coffee, copper, iron, maize, oil, silver, sugar, tin, zinc); a constant is also included. The complete regression results are shown in Table G.1 in Appendix G. Variables that are considered potentially endogenous are lagged one period.

5.5.1 Pooled data

Dummy variable approach

Table 5.2 shows the estimated impact of default on real GDP growth for all four countries. Only in the first year after the default economic growth is significantly affected, by -4.7%. In the years that follow the impact is statistically insignificant. We do not find evidence for fixed country effects in the panel. The redundancy test with the null hypothesis that all intercepts are equal is not rejected (F-statistic is 0.172, and corresponding probability is 0.916). We use the White estimator, since we find evidence of hetero–

Table 5.3. Cumulative impact of sovereign debt defaults on economic growth for pooled data (Argentina, Brazil, Chile and Mexico; 1870–2012): Wald tests. The column with the coefficients shows the cumulative impact on real GDP growth.

Default entry year	Coefficient	Standard error
+ 1 year	-4.68 ***	1.51
+ 2 years	-2.95	2.13
+ 3 years	-2.13	2.78
+ 4 years	-4.68	3.54
+ 5 years	-5.01	4.01
+ 6 years	-4.02	4.61
+ 7 years	-5.49	5.44
+ 8 years	-5.90	5.71

Notes:
*: significant at the 10% level, **: significant at the 5% level, ***: significant at the 1% level. For the significance we use the F-statistic from the Wald test on cumulative significance of the lagged sovereign debt default entry dummies. The F-statistic has 1 and $T - N$ degrees of freedom, with T the number of observations and N the number of explanatory variables in the regression.
Control variables: change in government expenses, ratio of government expenses to revenues, population growth, ratio of gross central government debt to GDP, inflation, terms of trade, ratio of exports to imports, polity2, U.S. 3 months T-bill rate, world economic growth (real GDP USA, UK, Germany and France), U.S. business cycle dummy and changes in commodity prices (cacao, coffee, copper, iron, maize, oil, silver, sugar, tin, zinc); a constant is also included. Variables that are considered potentially endogenous are lagged one period.

skedasticity, but not autocorrelation in the panel. To evaluate the cumulative impact of debt default on real GDP growth we use the Wald test on the significance of the cumulative lagged sovereign debt dummies. The null hypothesis is that there is no cumulative impact on real GDP growth. The results are shown in Table 5.3.

The cumulative impact is negative for all the eight years following the default entry, however, with exception of the first coefficient, none of the coefficients is statistically significant at the 10% level, which means that there is no significant cumulative impact after the first year following a default entry.

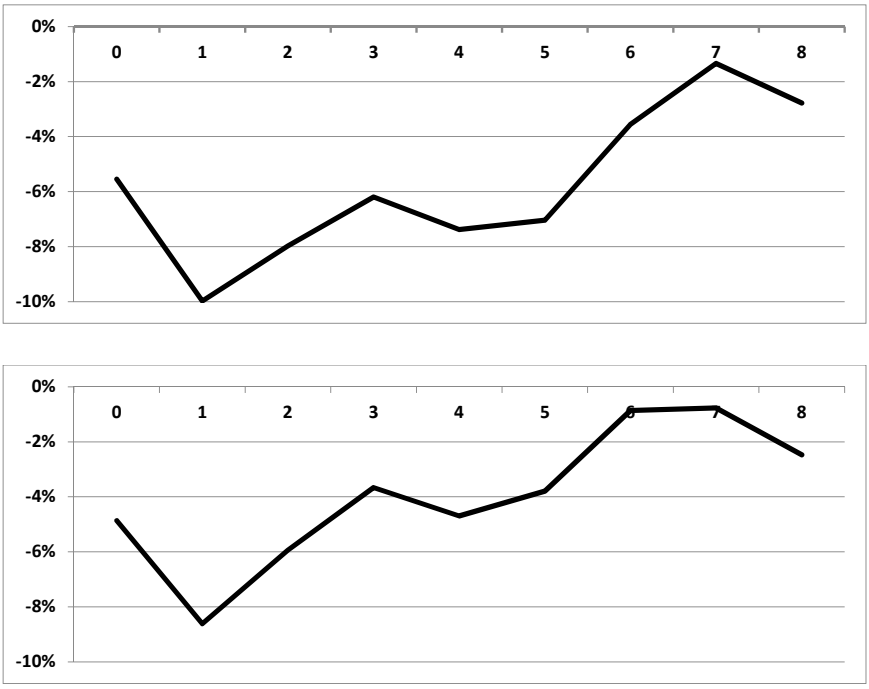
Output loss approach

In the output loss approach the cost of a default is the deviation in the level of actual real GDP from real GDP if it had continued the pre-crisis growth. Figure 5.1 shows the output losses up to eight years after default, for the pre-default 5 year geometric average growth in the top panel, and the pre-default HP filtered trend average growth in the bottom panel. The graphs are similar. Recovery follows two years after the default, with two small setbacks, in the fourth and in the eighth year after the default. The output loss is close to zero after 6 to 7 years. This means that the actual real GDP almost reaches the real GDP that it would have had if the economy had continued to grow at the pre-crisis growth rate.

5.5.2 Zooming in on three historical periods

There have been structural breaks in the sample we consider. Each period has substantial different characteristics in terms of institutions, exchange rate regimes, international trade and finance. We depart from the periods shown in Section 2.1. We follow Grilli (2005), Aiolfi et al. (2011) and Kaminsky (2012) in their choice for structural breaks during the 1870–2012 period. Kaminsky (2012) argues that the first period of financial globalization continues until the collapse of international capital markets in 1931. Although international trade and finance collapse during World War I, trade and finance flows rebounce strongly after the end of the war. In the early 1930s asset prices and international trade (including commodities) collapse and deep recessions follow worldwide. As a reaction international capital and

Figure 5.1. Output losses of sovereign debt defaults for Argentina, Brazil, Chile and Mexico, 1870–2012 (pooled data). The output loss is the percentage difference between actual real GDP and real GDP if it had continued the pre-crisis growth. Pre-crisis GDP growth is calculated as the average of the annual growth rate in the 5 years preceding the default entry year (top-panel), and as the average of the HP filter growth rate in the 5 years preceding the default entry year (bottom-panel).



Notes:
Actual real GDP is based on Barro and Ursua (2008), Aiolfi et al. (2011) and updated with IFS and WDI, and expressed as an index with 2006 = 100. The output loss is calculated for every year while the country remains in default, with a maximum of 8 years.

trade are highly regulated and policies become increasingly inward-oriented (Grilli, 2005). This period ends with the break-up of Bretton Woods in 1972. The world returns to globalization and deregulations of international capital markets. The two structural breaks (1931 and 1972) coincide with institutional changes in the global economy, the end of the Gold Standard in 1931 and the end of Bretton Woods in 1972. Table 5.1 presents the sovereign debt defaults in the three periods that we distinguish, 1870–1930, 1931–1971 and 1972–2012. The number of defaults differs per period, seven in the 1870–1930 period, three in the 1931–1971 period and five defaults in the 1972–2012 period.

Dummy variable approach

We do not find evidence for fixed country effects in any of the three periods. The redundancy test outcomes are shown in Table 5.4. The null hypothesis that all intercepts are equal is not rejected for any of the three periods. We use the White estimator, since we find evidence of heteroskedasticity, and no evidence of autocorrelation.

Table 5.4. Redundancy test outcomes for fixed effects in Argentina, Brazil, Chile and Mexico; 1870–2012.

	Statistic	Probability
1870–1930	0.372	0.773
1931–1971	2.058	0.109
1972–2012	0.261	0.853
1870–2012	0.172	0.916

Table 5.5 shows the impact in each of the three periods. We observe important differences. In the period 1870–1930 there is a significant negative impact on economic growth one year after the default (-4.25%), and no significant impact thereafter. In the other two periods, there is no significant negative impact in the year that follows the default, but in later years there is a significant negative impact on economic growth. In the period 1931–1971

there is a significant impact of −7.05% four years after the default, and in the period 1972–2012 we observe a significant impact on economic growth three years after the default (−4.00%). When we turn to the cumulative impact, in Table 5.6, we observe that debt defaults in the 1972–2012 period have a prolonged cumulative impact on economic growth. Up to year 8 the total economic growth is affected by −17.31%. Up to year 7 the cumulative impact on the economic growth is even −19.18%.

Table 5.5. Impact of sovereign debt defaults on economic growth, in periods 1870–1930, 1931–1971 and 1972–2012 (pooled data): dummy variable approach.

Dependent variable: 100 Δ log (real GDP)

	Period I 1870–1930		Period II 1931–1971		Period III 1972–2012	
Default entry year	coefficient	standard error	coefficient	standard error	coefficient	standard error
+ 1 year	-4.25**	1.76	-3.80	3.26	-4.32	3.65
+ 2 years	1.70	1.77	2.55	3.43	-2.08	2.10
+ 3 years	2.12	2.28	0.49	4.29	-4.00**	2.02
+ 4 years	1.08	3.65	-7.05*	3.59	-2.13	1.82
+ 5 years	0.43	2.87	0.65	3.42	-1.27	1.98
+ 6 years	2.85	2.27	0.63	1.42	-2.08	1.62
+ 7 years	-5.72	5.00	3.31*	1.87	-3.29	2.24
+ 8 years	-1.13	2.26	-1.40	2.30	1.87*	0.99
R^2	0.245		0.319		0.444	
Adjusted R^2	0.105		0.171		0.324	

Notes:
*: significant at the 10% level, **: significant at the 5% level, ***: significant at the 1% level. Control variables: change in government expenses, ratio of government expenses to revenues, population growth, ratio of gross central government debt to GDP, inflation, terms of trade, ratio of exports to imports, polity2, U.S. 3 months T-bill rate, world economic growth (real GDP USA, UK, Germany and France), U.S. business cycle dummy and changes in commodity prices (cacao, coffee, copper, iron, maize, oil, silver, sugar, tin, zinc); a constant is also included. The complete regression results are shown in Table G.2 in Appendix G. Variables that are considered potentially endogenous are lagged one period.

Table 5.6. Cumulative impact of sovereign debt defaults on economic growth, for periods 1870–1930, 1931–1971 and 1972–2012 (pooled data): Wald tests. The column with the coefficients shows the cumulative impact on real GDP growth.

	Period I 1870–1930		Period II 1931–1971		Period III 1972–2012	
Default entry year	coefficient	standard error	coefficient	standard error	coefficient	standard error
+ 1 year	-4.25**	1.76	-3.80	3.26	-4.32	3.65
+ 2 years	-2.56	2.52	-1.26	6.13	-6.41	4.78
+ 3 years	-0.43	3.53	-0.77	10.09	-10.40*	5.68
+ 4 years	0.65	5.27	-7.81	12.07	-12.54**	6.26
+ 5 years	1.08	6.36	-7.16	13.95	-13.81*	7.19
+ 6 years	3.93	6.77	-6.53	14.96	-15.89*	8.06
+ 7 years	-1.79	8.21	-3.22	15.85	-19.18**	8.69
+ 8 years	-2.92	8.48	-4.62	16.53	-17.31*	8.92

Notes:
*: significant at the 10% level, **: significant at the 5% level, ***: significant at the 1% level. For the significance we use the F-statistic from the Wald test on cumulative significance of the lagged sovereign debt default entry dummies. The F-statistic has 1 and $T - N$ degrees of freedom, with T the number of observations and N the number of explanatory variables in the regression.
Control variables: change in government expenses, ratio of government expenses to revenues, population growth, ratio of gross central government debt to GDP, inflation, terms of trade, ratio of exports to imports, polity2, U.S. 3 months T-bill rate, world economic growth (real GDP USA, UK, Germany and France), U.S. business cycle dummy and changes in commodity prices (cacao, coffee, copper, iron, maize, oil, silver, sugar, tin, zinc); a constant is also included. Variables that are considered potentially endogenous are lagged one period.

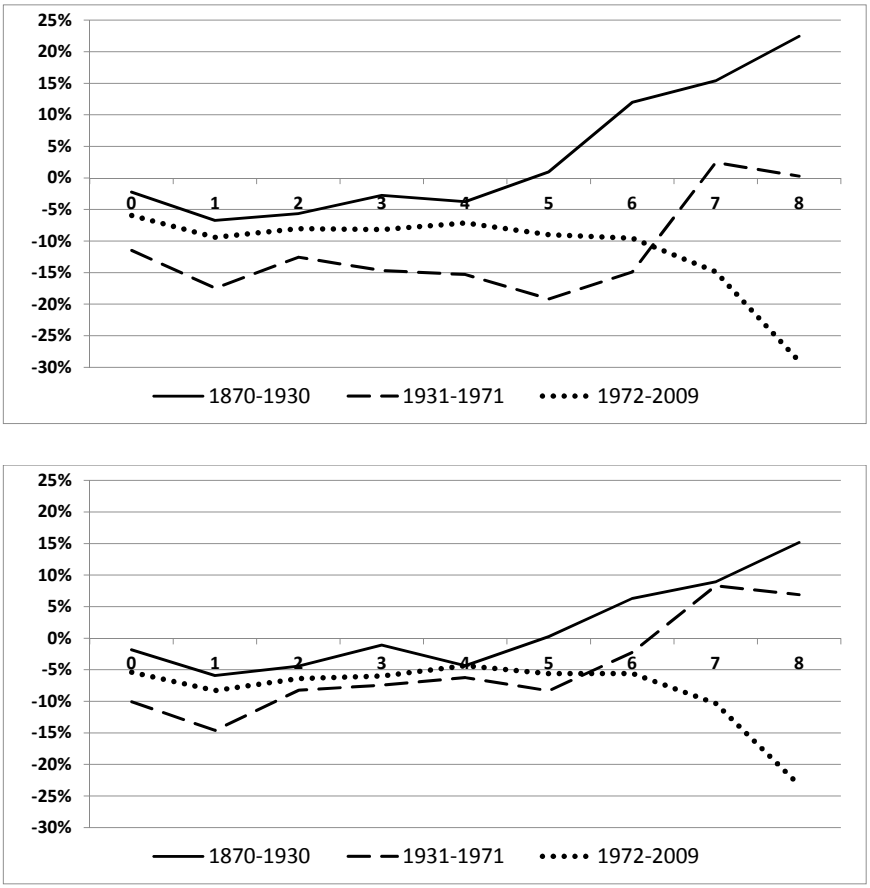
Output loss approach

Figure 5.2 shows the annual output loss in each of the three different periods. The differences between the periods are relatively small in the first four years after a default starts. Ordering for increasing impact in terms of output losses, defaults that occurred in the period 1870–1930 have the mildest impact, followed by defaults that took place in the 1972–2012 period, and defaults that occurred in the period 1931–1971. After the fourth year the differences in impact in the periods become larger. Whereas in the 1870–1930 period real GDP recovers completely after a default (reflected by a positive output loss), defaults in the 1931–1971 period are followed by a mild recovery with an output loss around zero, and defaults in the 1972–2012 period show a deterioration of output losses (reflected by an increasingly negative output loss).

Defaults in the period 1870–1930 have been characterized by a pronounced negative and immediate impact on economic growth in the year after the default initiated. The output losses have been relatively small and short-lived (up to four years after the default entry). The six defaults that occur in the period 1870-1930 show a mixed picture, with some defaults taking place after a period of high growth (Chile 1880-1883, Argentina 1890-1893, Brazil 1914-1919), while for other defaults we observe low or even negative growth in the run-up to a default (Brazil 1898-1910, Mexico 1914-1922, Mexico 1928-1942). For all defaults, except Chile 1880-1883, we observe negative growth for one to two years after the start of the default, then a full recovery. Defaults in this episode seem to have a less severe impact on real GDP growth and output losses.

In the run-up to the three defaults that occur in the 1930s, economic growth is substantially higher than the historical average. After a brief decrease, economic growth picks up gradually through a recovery of home final demand (government investments increases, as well as private investments and consumption), and to a lesser extent by export growth (Bulmer-Thomas, 2003).

Figure 5.2. Output losses of sovereign debt defaults for Argentina, Brazil, Chile and Mexico in three historical periods 1870–1930, 1931–1971, 1972–2012: pooled observations. The output loss is the percentage difference between actual real GDP and real GDP if it had continued the pre-crisis growth. Pre-crisis GDP growth is calculated as the geometric average of the annual growth rate in the 5 years preceding the default entry year (top-panel), and as the average of the HP filter growth rate in the 5 years preceding the default entry year (bottom-panel).



Notes:
Actual real GDP is based on Barro and Ursua (2008), Aiolfi et al. (2011) and updated with IFS and WDI, and expressed as an index with 2006 = 100. The output loss is calculated for every year while the country remains in default, with a maximum of 8 years.

Defaults in the period 1972–2012 feature a negative and long-lasting impact on economic growth and output losses. The latter is in line with the results of Furceri and Zdzienicka (2012), who analyze a very similar period (1970–2008), although for a larger set of countries. Four out of five defaults that occur in the period 1972-2012 take place in the Latin American debt crisis of the early 1980s. Most countries experience high economic growth prior to the debt default, particularly Mexico and Chile. After Mexico announced in 1982 that it was unable to meet payment on its foreign debt, investors withdrew investments from the region, which caused defaults in countries in the region, in what was later baptized a 'sudden stop' of capital inflows (Dornbusch, Goldfajn and Valdes, 1995). During the renegotiations that lasted almost a decade, Latin America was excluded from global financial markets, and suffered from low economic growth, quickly worsening social conditions and hyperinflation. This period became known as the 'lost decade' (Edwards, 2008), and suggests the importance of access to global financial markets, and more in general the importance of fluctuations in world economic growth and international credit conditions (Marichal, 1989). Brazil 1983 and Argentina 2001 show a slightly different picture as economic growth slows down dramatically two years before the default, and surges quickly after default. This confirms Levy Yeyati and Panizza (2011), who find that a country postpones a default until avoiding it is no longer possible. By that time the worst of the recession is already over, and the economy recovers fast. Bordo et al. (2001) observe that currency, banking and twin crises (when currency and banking crises occur simultaneously or when one crisis type triggers another) occur more frequently since 1973 compared to the pre-WW I period, but are not deeper. We find a different result for sovereign debt defaults. The impact is significantly deeper in the post-1972 period than in the pre-1930 period.

5.5.3 Focusing on individual countries

Dummy variable approach

Splitting the sample at the country level (see Table 5.7) reveals that in Argentina and Chile the economic growth in the year after a default entry is highly negative (approximately -9%), while in the years that follow economic growth is not significantly affected, except for a negative impact 7 to 8 years after the default entry. Mexico also has a significant negative economic growth in the year that follows the default entry, but of a lower magnitude (-6%). In the years that follow statistically significant positive economic growth dominates, except for a significant negative growth rate in the fourth year of the default episode. Brazil's economic growth is not affected in a significant way after a sovereign default.

The cumulative impact on economic growth is presented in Table 5.8. Chile stands out from the other countries with a negative and large cumulative impact in the fifth (-14.60%) and eighth (-19.73%) year of the default episode. Argentina, Brazil and Mexico do not have a significant cumulative impacts beyond the first year after the default starts.

Output gap approach

Figure 5.3 shows the output loss after a sovereign default per country. All four countries experience a negative output loss in the year of the default and the following year. The output loss then slowly reduces over time, although not in a smooth manner. Of the four countries, Argentina experiences the deepest impact in the first years, then recovers fast, but falls back after the fifth year. Mexico is not able to reach the high pre-default growth, as the output loss continues to be negative. The 1980s debt crisis plays a role here, because this crisis marked a structural break in economic growth.

Table 5.7. Impact of sovereign debt defaults on economic growth per country (Argentina, Brazil, Chile and Mexico), 1870–2012: dummy variable approach.

Dependent variable: 100 Δ log (real GDP)

	Argentina		Brazil		Chile		Mexico	
Default entry year	coef-ficient	std error	coef-ficient	std error	coef-ficient	std error	coef-ficient	std error
+ 1 year	-8.88**	4.26	2.03	2.10	-9.40**	4.13	-6.03***	1.24
+ 2 years	3.29	5.00	0.69	2.20	1.91	2.19	0.71	3.01
+ 3 years	-4.66	4.50	3.66	2.30	-0.11	1.80	4.49***	1.45
+ 4 years	6.50	4.34	-2.78	1.82	-3.64	3.30	-6.27***	2.33
+ 5 years	0.98	2.89	0.38	2.94	-3.36	2.05	6.17***	2.20
+ 6 years	0.24	3.46	1.72	2.44	0.22	1.97	3.25**	1.53
+ 7 years	-11.99*	6.66	-0.82	2.30	1.97	2.18	3.25**	1.33
+ 8 years	-0.82	3.64	1.18	1.51	-7.32***	1.68	2.48*	1.36
R^2	0.285		0.284		0.371		0.542	
Adjusted R^2	0.088		0.086		0.198		0.389	

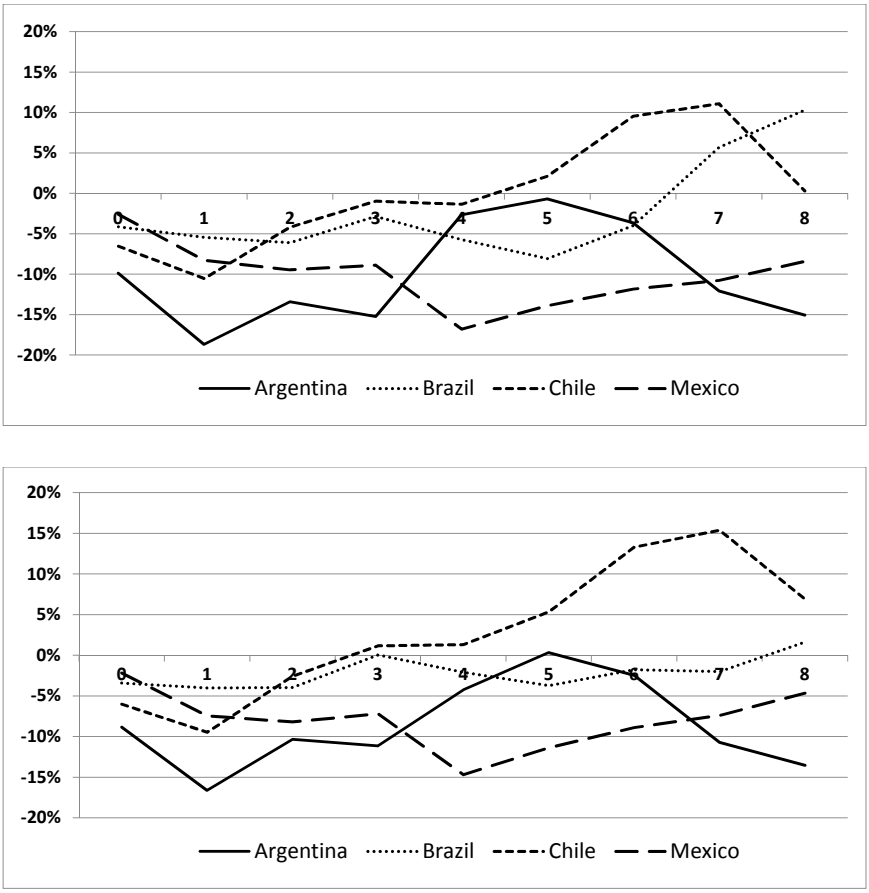
Notes:
*: significant at the 10% level, **: significant at the 5% level, ***: significant at the 1% level. Control variables: change in government expenses, ratio of government expenses to revenues, population growth, ratio of gross central government debt to GDP, inflation, terms of trade, ratio of exports to imports, polity2, U.S. 3 months T-bill rate, world economic growth (real GDP USA, UK, Germany and France), U.S. business cycle dummy and changes in commodity prices (cacao, coffee, copper, iron, maize, oil, silver, sugar, tin, zinc); a constant is also included. The complete regression results are shown in Table G.3 in Appendix G. Variables that are considered potentially endogenous are lagged one period.

Table 5.8. Cumulative impact of sovereign debt defaults on economic growth, per country (Argentina, Brazil, Chile and Mexico), 1870–2012: Wald tests. The column with the coefficients shows the cumulative impact on real GDP growth.

	Argentina		Brazil		Chile		Mexico	
Default entry year	coef-ficient	std error	coef-ficient	std error	coef-ficient	std error	coef-ficient	std error
+ 1 year	-8.88**	4.26	2.03	2.10	-9.40**	4.13	-6.03***	1.24
+ 2 years	-5.59	7.67	2.72	3.32	-7.48	4.95	-5.32	3.58
+ 3 years	-10.26	11.09	6.38	4.42	-7.60	5.69	-0.83	4.40
+ 4 years	-3.76	14.30	3.59	5.53	-11.24	7.33	-7.10	4.93
+ 5 years	-2.78	15.91	3.97	6.82	-14.60*	8.20	-0.93	5.95
+ 6 years	-2.53	17.66	5.69	8.18	-14.38	8.80	2.32	6.61
+ 7 years	-14.52	20.69	4.87	9.04	-12.41	10.07	5.58	7.24
+ 8 years	-15.34	23.37	6.05	9.79	-19.73*	10.64	8.06	7.67

Notes:
*: significant at the 10% level, **: significant at the 5% level, ***: significant at the 1% level. For the significance we use the F-statistic from the Wald test on cumulative significance of the lagged sovereign debt default entry dummies. The F-statistic has 1 and $T - N$ degrees of freedom, with T the number of observations and N the number of explanatory variables in the regression.
Control variables: change in government expenses, ratio of government expenses to revenues, population growth, ratio of gross central government debt to GDP, inflation, terms of trade, ratio of exports to imports, polity2, U.S. 3 months T-bill rate, world economic growth (real GDP USA, UK, Germany and France), U.S. business cycle dummy and changes in commodity prices (cacao, coffee, copper, iron, maize, oil, silver, sugar, tin, zinc); a constant is also included. Variables that are considered potentially endogenous are lagged one period.

Figure 5.3. Output losses of sovereign debt defaults per country (Argentina, Brazil, Chile and Mexico), 1870–2012. The output loss is the percentage difference between actual real GDP and potential real GDP, which is based on pre-crisis real GDP growth. Pre-crisis GDP growth is calculated as the average of the annual growth rate in the 5 years preceding the default entry year (top-panel), and as the average of the HP filter growth rate in the 5 years preceding the default entry year (bottom-panel).



Notes:
Actual real GDP is based on Barro and Ursua (2008), Aiolfi et al. (2011) and updated with IFS and WDI, and expressed as an index with 2006 = 100. Output losses are calculated for every year while the country remains in default, with a maximum of 8 years.

Argentina, Chile and Mexico experience a similar significant economic contraction immediately after the default entry. The recovery that starts after the first year is not smooth, but the output loss decreases over time, and positive and negative economic growth alternate. There are also differences. Although economic growth in Mexico is positive after two years, with a setback in the fourth year, the output losses remain high. The default of 1914 occurred in the midst of the Mexican revolution, which lasted a decade (1910-1920). In the default of the late 1920s real GDP growth is negative, which we attribute to the worldwide drop in commodity prices and the political turmoil (Cristeros War, 1926-1929). The 1982 default followed an extended boom phase in the late 1970s and early 1980s. Without access to international capital markets, and with low exports due to the unfavorable economic situation in the USA, Mexicos main trade partner, economic growth was very low for the remainder of the 1980s. Chile defaulted in 1880 on its debt, while it was in the War of the Pacific (1879–1883). Prior to the 1980s debt crisis Chile did not suffer from any fiscal problem, in sharp contrast to the other countries in the region. Chile's default in 1983 was caused by the nationalization of private debt and the bailout of the banking sector that had accumulated too much foreign debt and invested the proceeds domestically. Brazils experiences with defaults have been different from the other countries, as on average defaults have had no significant impact on real GDP growth nor the output losses. We offer three explanations. First, in the defaults of 1898-1900, 1902-1910 and in 1914-1919, Brazil continued to service the coupon payments and was even able to borrow in the international capital markets while in default (Kaminsky and Vega, 2014). Second, Brazil could recover fast from the 1931-1933 and 1937-1943 defaults through loose fiscal and monetary policy, made possible by the existence of spare capacity and price-elastic supply response in the import-competing sector, and the availability of funding for working capital at low financing costs (Bulmer-Thomas, 2003). Third, with the oil price shocks of the 1980s, oil-importer Brazil improved its terms of trade, which partially explains the relatively weak impact on economic growth (Kaminsky and Pereira, 1994).

5.6 Conclusion

In this chapter we analyze the impact of sovereign debt defaults and GDP growth for four Latin American countries: Argentina, Brazil, Chile and Mexico. These countries have experienced 14 sovereign defaults from 1870 to 2012. We use the dummy approach and output loss approach to get insights in the impact of sovereign debt defaults on real GDP.

In general we observe a negative impact of a default on economic growth in the first year after the default entry, and no significant impact thereafter. The same pattern can be detected in the output loss. Typically, two years after the default the output loss starts to decrease—although the cumulative output losses remain high up to eight years after a default. When we zoom in on different historical episodes and countries, we observe variety in the impact.

Defaults in the period 1870–1930 have been characterized by a pronounced negative and immediate impact on economic growth in the year after the default initiated, but with a fast recovery and with relatively small and short-lived output losses. Defaults in the period 1931–1971 occur in the early 1930s, after a period of high economic growth. After a brief decrease, economic growth picks up gradually. Defaults in the period 1972–2012 tend to have a deeper and longer lasting impact than in the other two episodes. Four out of five defaults that occur in the period 1972-2012 take place in the Latin American debt crisis of the early 1980s. Most countries experience high economic growth prior to the debt default, particularly Mexico and Chile, followed by a decade of slow economic growth, the 'lost decade'. But not all defaults follow this pattern. In the run-up to the debt defaults in Brazil (1983) and Argentina (2001) economic growth slowed down dramatically, while it surged quickly after default. This confirms Levy Yeyati and Panizza (2011), who find that a country postpones a default until avoiding it is no longer possible. By that time the worst of the recession is already over, and the economy recovers fast.

Argentina and Chile experience a significant economic contraction in

the year following the default, which is followed by a 'bumpy recovery', in which the output loss decreases over time, and positive and negative economic growth alternate. Mexico shows a slightly different picture as economic growth picks up after a default, while the output losses continue. We attribute this to domestic political turmoil in the default episodes in the period 1870–1930 and to the high economic growth in the run-up to the 1982 debt crisis. Brazil has handled defaults different than the other countries. It has continued to service part of the debt obligations and maintained access to international capital markets during the debt defaults in the period 1870–1930, and it has implemented loose fiscal and monetary policy during debt defaults in the 1930s.

We find differences in the impact of sovereign defaults between periods and countries. Some defaults, such as the debt defaults in the 1980s, fit with the boom-bust models because real GDP growth is high in the years prior to the default, and low or even negative in the years after the default. Sudden stops also have a dramatic impact in emerging economies, particularly when accompanied by a currency mismatch in the assets and liabilities. Other defaults, such as the Argentina 2001–2005 default, fit with sovereign debt default models for emerging economies (for instance Arellano, 2008), as the sovereign defaults occur in recessions, when debt is high. Output losses are relatively small, because the real GDP growth was low in the run-up to the default. In the next chapter we will explore the diversity in the impact.