



Documento de Trabajo

ISSN (edición impresa) **0716-7334**

ISSN (edición electrónica) **0717-7593**

The Impact of Government Spending on the Duration and the Intensity of Economic Crises: Latin America 1900-2000

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Documento de Trabajo N° 365

Santiago, Noviembre 2009

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Rodrigo A. Cerda*

November 10, 2009

Abstract

We study the role of fiscal expenditure during episodes of economic crises using one century data from 20 Latin American countries. We use output drops as way of indicating the irruption of economic crises and we are able to document episodes of large output drops and large duration of economic crises, which are characteristics that vary considerably among countries. We study the duration of crises by means of count data and hazard models while we study the intensity of the crisis by means of growth regressions. Our main findings suggest that fiscal expenditure has low power to shorten economic crises but it might act as an effective instrument to smooth output-drops during crises.

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1 Introduction

Fiscal expansion is a policy widely used when countries face an economic crisis. In fact, during the 2008 economic crisis governments of the G-20 countries have implemented fiscal policies which should increase fiscal deficits on average by 5.5 percentage points of GDP in 2009 and 2010. Further, fiscal spending represents a large part of fiscal stimulus; accounting three quarters of the fiscal plan by 2009 and two-thirds by 2010, see Horton, Kumar, and Mauro (2009).

The use of these significant fiscal packages corresponds to the vision that an expansive fiscal policy might shorten or attenuate the negative effects of the economic crisis on economic activity in line with the more traditional Keynesian results concerning fiscal policy in the short run. However, in the literature related to fiscal policy and economic expansions there is still debate concerning how big are the fiscal multipliers and, the different empirical results range from negative impacts to multipliers larger than one - see Ilzetzki, Mendoza, and Vegh (2009), Blanchard and Perotti (2002), Mountford and Uhlig (2008), Giavazzi and Pagano (1990).

These studies usually relate to evidence obtained from developed economies in the second half of the twentieth century. For instance, Mountford and Uhlig (2008) studies the impact of fiscal shocks in economic activity since 1955 in the US by means of a VAR system while Romer and Romer (2009), using also US data, focuses in studying the impact of taxation in the US economy by using the narrative approach in the period 1945-2007. Giavazzi and Pagano (1990) studied the experience of Denmark and Ireland in the 1980s while Perotti (1999) studied a sample of nineteen OECD countries since 1965 to 1994.

Our paper relates to the above literature but it also differs in important aspects. Firstly, even though our focus is the impact of fiscal expenditure on economic activity, we study that mechanism during economic crises and we try to obtain evidence concerning whether fiscal expansion might shorten the duration of economic crises or whether fiscal expansion might attenuate the drops in output during crises. Secondly, and in contrast to the above studies, we focus in developing Latin American countries during the period¹ 1900 to 2000. This is one of the novelty and strength of the paper as there is still quite small evidence on the topic in developing economies but also, and maybe more importantly, because in the period under analysis, Latin America presents various periods of economic crises and fiscal expenditure had varied widely during these years. That variation in the data might allow us to obtain consistent evidence of the impact of fiscal expenditure on economic activity during economic crises.

In our sample we face a considerable number of periods and countries in which economic activity face a downturn and in which GDP and aggregate demand decrease which contrast to the studies that focus on developed countries in the second part of the 20th century where economic activity has generally faced periods of economic expansions and in which economic crises are scarce in number. This is an important distinction in the methodology as the impact of fiscal expansion might be more accentuated during periods in which overall economic activity and private aggregate demand face a considerable downturn.

¹The use of historical data to study economic crises is becoming recently more extended among economic researchers. Barro and Ursúa (2008) studied US historical economic crises in terms of duration and intensity since 1870. Similarly Barro and Ursúa (2009) extends the analysis to stock-market crashes.

Our approach distinguish between the impact of fiscal expenditure on the duration of the economic crisis and on its intensity. To deal with the duration of the crisis we use count data model while to deal with the intensity of the crisis, we estimate growth regressions *à la* Barro, in which we allow for different impacts of fiscal expenditure during periods of economic crises. One of the problem we face is the potential endogeneity between fiscal policy and economic crises, as government might react to the irruption of economic crises by expanding fiscal expenditure. To break this possible endogeneity, we use fiscal expenditure decisions taken before the crisis occurs as instrument. We argument that this instrument should correlate with effective fiscal expenditure but should not be correlated with the crisis, as these decisions were taken before the irruption of the crisis.

The remainder of the paper is organized as follows. Section (2) discusses the way we measure economic crises and explain how it relates to other studies in the literature. Section (3) describes the data set while section (4) discusses the methodology to analyze the duration of economic crises. In that section, we propose the use of count data models, plus hurdle and hazard models to provide empirical evidence on our variable of interest. Section (5) discusses the results when we analyze the impact of fiscal expenditure on the intensity of economic crises. To do so, we use the methodology of growth regression in which we allow the impact of fiscal expenditure to differ between periods of economic crises *vis-à-vis* economic expansions. Section (6) discusses and provides estimates when we use instrumental variables to break the potential endogeneity between fiscal expenditure and economic crises. Section (7) provides sensitivity analysis of our results when we use more stringent definitions of economic crises. Finally section (8) concludes.

2 Measuring Economic Crises

Recession might be the more vague and broad term used by economists lately. A clear definition has not yet been adopted and many economists have come with their own definition and have proposed different ways of measuring crises. Among these definitions of crisis, one of the most commonly used is the one adopted by the NBER. According to the NBER committee,

“A recession is a significant decline in activity spread across the economy, lasting more than a few months, visible in industrial production, employment, real income, and wholesale-retail trade².”

Leamer (2008) provides an algorithm to identify a crisis, imitating the procedure of the NBER committee. He uses monthly data on payroll enrollment, civilian employment, industrial production and the unemployment rate to find peaks and troughs, reproducing almost all episodes of crisis announced by the NBER.

There are other definitions broadly used as well. With the advance of computers, researchers have been able to use advanced computational techniques to identify crisis looking at variables like GDP growth, inflation rate, and unemployment. The aim here is to identify the cyclical and long run components of these variables, to detect peaks and troughs, and therefore, measure the duration and deepness of the crisis. The most common procedure to measure this is the use of filters, such as HP-filter or band-pass filter, or moving average techniques.

²See <http://www.nber.org/cycles.html>

In this line of work, McKay and Reis (2008) follows a double technique strategy: They use a modified HP-filter³ and the Bry and Boschan algorithm. The former is for de-trending the data, since “series (like output) that trend up will automatically have longer expansions and shorter contractions, since it rarely declines” (McKay and Reis (2008)), while the latter is used for detecting peaks and troughs, and therefore, the duration of expansion and contraction. They apply this procedure to US quarterly data from 1948 to 2005 to test whether contractions on output are briefer and more violent than expansions or not. Their findings are the followings: i) Contractions in employment are briefer and more violent than expansions in employment, ii) they do not reject the hypothesis of equal duration and violence of expansions and contractions in output, and iii) employment coincides with output at troughs but lags at peaks.

In another line of research, Calderón and Schmidt-Hebbel (2008) study the impact of trade and financial openness on output volatility using annual data for a sample of 82 countries over the period 1975-2005. They use two definitions of crises. As a first insight, they use the concept of *output drop*, which is the distance between real output in period t , and the local maximum up to period t ,

$$y_t^{drop} = \left(\frac{\bar{y}_t^{max} - y_t}{\bar{y}_t^{max}} \right) \times 100$$

then, a crisis is determined by an output drop is greater than a certain level k , which they define to be 5% and 10%. Second, they use the concept of *crisis volatility*, which declares a crisis when the output volatility falls a certain level⁴. Overall, they find that trade openness might have a stabilizing effect on output the more developed the financial market is, but it might have a desestabilizer effect on output if the higher specialization of production due to trade more than offsets the low correlation of traded sectors with the rest of the economy. On another hand, they find that financial openness may have stabilizing effect when countries have low debt-equity ratios.

Conway (2000) use quarterly data over the period 1974-1992 for 90 developing countries to evaluate the impact of participation on IMF programs on overcoming a crisis. He use three definitions of a crisis: i) the ratio of foreign exchange reserves to imports being under a value of .67, ii) the growth rate in foreign exchange reserves being over a value of 10.2%, and iii) the inflation rate being over 4.2%⁵. He finds is that participation on IMF programs increases the probability of leaving a crisis (or alternatively, to shorten it), while a longer participation in a program makes the next crisis be closer.

While the previous papers focused in a relatively short term analysis, Reinhart and Rogoff (2008) gather data for 66 countries, starting back from the 12th century⁶. They study frequency and duration of crises to find fundamental regularities, using five definitions for it: i) external default, ii) domestic default, iii) banking crises, iv) currency crashes, and v) inflation outbursts. To identify crisis episodes, they use two approaches:

³It is modified in the sense that it finds the smoothing parameter λ such that the constructed cycle is uncorrelated with the difference between the current trend and the average of the trend v periods before and v periods hence.

⁴This level is set to be one standard deviation downward of the world distribution of overall volatility measures.

⁵These values are chosen to categorize a 34.1% percent of the sample as being in crises. This is done since a 34.1% of the observations was characterized by being participating in an IMF program.

⁶Although, their dataset is most complete from 1800.

one quantitative (inflation crisis, currency crashes and debasement) and other based on a chronology of events⁷ (banking crises, external debt crises, and domestic debt crises).

Similarly to the work of Reinhart and Rogoff (2008), our paper studies crises for 20 Latin American countries using data over the period 1900-2000 which is obtained from the Oxford Economic Latin American History Database. Our measure of economic crises follows the idea of Calderón and Schmidt-Hebbel (2008) as we construct episodes of economic crises by focusing on periods of output-drops. We follow that strategy rather than following others such as the ones of Conway (2000) or Reinhart and Rogoff (2008) because we have lack of some of the economic series they use to define an economic crisis. In the next section, we explain the way we proceed to measure economic crises.

3 The data

Our main source of data is the Oxford Economic Latin American History Database. That dataset contains information on twenty Latin American countries concerning demography, labor market, national accounts, international trade, public finance and prices. The database has been compiled by merging data from the Comisión Económica para América Latina (CEPAL), the International Financial Statistics (IMF) and the World Development Indicators (Worldbank). The data on Chile has been updated from the Wagner and Díaz (2008) historical database. The information mainly spans from 1900 to 2000 at a yearly basis.

Figure (1) shows the graphs of selected countries comparing local maximum GDP vis-à-vis the effective real GDP in each year. The difference between these series corresponds to yearly output-drops. Figure (2) shows the time-series of the average output-drop while figure (3) provides plots of output-drop per country. As it can be seen in the figures, we can identify different sub-periods according to the intensity of output-drops. First, before 1929 some of the countries shows moderate output-drops, and the average output-drop reached a maximum near 7% by the end of the I world war. The second period corresponds to the irruption of the great depression in 1929 and extends approximately until to 1940. In that period, average output-drop almost quadruplicate reaching a maximum of 20% by the beginning of 1930s and in the case of some countries such as Chile, Costa Rica and Nicaragua, the increase in output-drop was persistent and took some years to regain the local maximum GDP before the 1929 crisis. The third period ranges approximately from 1940 to 1979 and corresponds to a period of more stable growth in which output-drops became smaller than 1% on average by the beginning of the 1950s. Finally, the fourth period corresponds to the period 1980 to 2000 which starts with the irruption of the 1980s debt crisis in Latin America. Output drop increased significantly in a few years, reaching more than 5% on average by the beginning of the 1980s and remained quite stable near 5% until mid 1990s.

As it can be seen in the figures, the great-depression produced large output-drops in many Latin American countries -such is the case of Chile, Costa Rica, Cuba, El Salvador, Guatemala, Honduras, México, Nicaragua, Perú, Uruguay and Venezuela. A similar pattern, but less accentuated, can be observed during the crisis of the 1980s in countries such as Argentina, Bolivia, Brazil, Chile, Costa Rica, Guatemala, Haiti, Paraguay, Perú,

⁷Mostly, an archaeological work.

Uruguay and Venezuela. There are also countries with large and long output-drops in other periods. That is the case of Bolivia in the 1950s and 1980s, Costa Rica in the 1940s, Cuba during large part of the 20th century, El Salvador in the 1980s, Haiti in the 1990s, and Nicaragua since the 1980s. These last episodes of large output drops correspond typically to periods of internal agitation such is the case of El Salvador (internal civil war in the period 1980-1992); Nicaragua (short but intense civil war in 1979); and Haiti (since 1988 Haiti had a sequence of 5 overturned presidents between 1988 and 1991). The case of Bolivia in the beginning of the 1980s seems to have a different source: it suffered the consequences of weak macroeconomic policies that caused hyperinflation and a large external debt.

[Insert Figures (1) to (3) about here]

We will use definitions of economic crisis that depend on the size of the output drop. Following Calderón and Schmidt-Hebbel (2008) we set three different thresholds levels $k = (0\%, 5\%, 10\%)$ concerning the intensity of output drop required to be defined as an economic crisis. Our first definition relies on $k = 0\%$, which means that any output drop (output drop larger than 0%) qualifies as an economic crisis. The idea of using this definition is that decreases in GDP should also measure decreases on well-being. This measure could have a potential drawback. Consider the case of a country in a stable growth path in which its growth rate is positive but small and faces for one year a small drop in GDP. That case might correspond to a transitory shock, in which the growth rate of GDP is moderately depressed for a short period of time, due to a random but not persistent disturbance that will not be likely repeated in the near future. If we consider an economic crisis as a major event in the economic history of a particular country, the short and non persistent disturbance should probably be not counted as an economic crisis. To deal with the problem we use the threshold levels $k = 5\%$ and $k = 10\%$, which are cases of large output drops.

Figures (4) plots the average duration of economic crisis in Latin America, where duration of an economic crisis is defined as a sequence of consecutive years in which a country face a positive output drop ($k = 0\%$). The average duration of economic crises varies widely over time. In the period 1900 to 1929, the average duration is small, ranging near 0.5 years. The irruption of the great depression increased considerably the average duration of the crises to almost 2.5 years in the period 1930-1940. By contrast the period 1940 to 1979 shows a consistent and gradual decrease in the average duration of crisis, being its mean near 0.5 years similar to the period 1900-1929. Since 1980 to 2000, and in fact in the beginnings of the 1980s, the average duration of economic crises increased significantly and sharply to almost 3 years. That figure remains with almost no change until the beginning of the 90s when it decreased to 2 years, still a large number. By the end of 1990s, with the irruption of the Asian Crisis, the average duration increased to 3 years. Figure (5) plots the duration of economic crises by countries. Countries with large output-drops tend to be also countries with larger economic crises, such is the case of El Salvador, Haiti and Nicaragua during their internal conflicts. Episodes of macroeconomic instability such as Argentina by the end of the 80s plus Bolivia and Perú during eighties have also longer economic crises.

[Insert Figures (4) and (5) about here]

Figure (6) compares the average duration of economic crisis when set $k = 0\%$ vis-à-vis $k = 5\%$ and $k = 10\%$. In the more stringent definitions the average duration of economic crises becomes smaller as expected; however in general the series describe a similar pattern. Figure (7) plots average output-drop in Latin America vis-à-vis output-drop in the US, where that series might be a measure of external economic crisis. As it can be seen in the table, while there are some coincides such as the great depression, there are also important differences such as the crisis in the US during the second half of the 1940s or the crises in Latin America in the period 1980s to 2000.

[Insert Figures (6) and (7) about here]

Tables (1) and (2) provide summary statistics of the variables, including information by sub-periods. GDP growth rates vary widely across countries and across periods. The years 1900-1929 and 1941-1979 are periods of average high growth while 1930-1940 and 1980-2000 have much smaller growth rates probably due to the negative influence of the large external economic crises (the great depression, the 1980s debt crisis and the Asian crisis of the end of the 1990s). Openness, which is defined as the ratio of the sum of exports and imports over GDP, has varied on averaged between 32% and 42%. In the beginning of the 20th century, it ranged at the 36% on average and but varied among countries and across years (it standard deviation was 22%). Since 1930 to 1979, average openness decreased to 32-33%, and it also showed a much smaller standard deviation. In the period 1980-2000, it increased from 33% to 42%. The evolution of terms of trade, ratio between exportable prices and importable prices, shows a quite favorable position of Latin America in the period 1930-1940 and 1980-2000. Note that the standard deviation of the terms of trade index is quite large, probably indicating that some of the countries might have had unusual prices for their exportable goods such is the case of Petroleum in Venezuela or Cooper in Chile and Perú.

[Insert Tables (1) and (2) about here]

Table (2) also shows the fraction of countries with a fixed exchange rate regime. In the data fixed exchange rate regime corresponds to a situation in which nominal exchange rate has been held fixed between two consecutive years⁸. It seems to be two different periods concerning exchange rate regimes. In one hand, during 1940 to 1979 almost 70% of the data corresponded to fixed exchange rates. The situation is quite different in the other periods, being the case of the periods 1930 to 1940 and 1980 to 2000 the opposites as approximately only 30% of the data corresponded to fixed exchange rate.

Population growth rates are quite stable on average; however there are episodes of significant decreases in population. These last episodes can be explained by the internal wars that some of our Latin American countries faced. Finally, the table also shows data on debt (defined as total debt of the country measured as a fraction of GDP). Total debt remained at small levels until the end of 1970s. Since the beginning of the 1980s, the average Latin American debt almost triplicate.

Figure (8) plots the evolution of average government expenditure measured as fraction of GDP. Government expenditure corresponds to all types of central government budgetary expenditure excluding debt redemption.

⁸This definition discards situation in which countries had fixed exchange rate for less than two calendar years.

Government expenditure represented approximately 7% of GDP between 1900 and 1930, when it started to raise continuously to achieve a 15% of GDP by the beginnings of 1970s when there was a second significative impulse of fiscal expenditure that brought the figures to almost 25% of GDP on average. With the irruption of the 1982 crisis fiscal expenditure went back to approximately 22% of GDP.

[Insert Figure (8) about here]

4 The duration of economic crises

We start by analyzing the impact of fiscal policy on the duration of economic crises. To do so, we assume that the length of an economic crisis depends on different fundamentals such as in:

$$y_{it} = f(g_{it}\alpha + x'_{it}\beta + \eta_i + \gamma_t + \epsilon_{it}) \quad (1)$$

where y_{it} corresponds to the duration of economic crises (measured in years) in country i at time t while the variables $(g_{it}; x_{it}; \epsilon_{it})$ are determinants of the length of economic crisis. In the above specification, $f(\bullet)$ is a function indicating that y_{it} depends on the above variables. The variable g_{it} corresponds to real government expenditure while x_{it} are other exogenous variables that might affect the duration of economic crises. The term η_i is a country-fixed effect while γ_t is a time effect and ϵ_{it} is a well-behaved error term. The country-fixed effect allows to control for factors specifics to each country while the time effect controls for common changes that vary over time.

In our estimates we use the natural logarithm of real government expenditure as a measure of the variable g_{it} . The variable is constructed by dividing nominal government expenditure by the GDP price index. In addition, we include several other variables as control; which corresponds to x_{it} . As variables measuring external influences we include the terms of trade, the degree of openness of the economy - measured by the ratio of the sum of export and imports over GDP -, the exchange rate regime of the economy -measured as an indicator function equals to one if the nominal exchange rate was fixed and equal to zero otherwise-. In addition we include the population growth rate to proxy for the growth in the labor force, a measure of macroeconomic instability⁹ and we include an interaction between government expenditure and a country's debt. In that case debt proxy for government's debt and the interaction should capture the effectiveness of fiscal policy for countries with different debt position.

4.1 Count Data model

The duration of an economic crisis corresponds to the number of years the economic crisis lasts which is a variable that consists of non negative integers. The Poisson regression model is usually the common starting point for

⁹We follow Fuentes, Larraín, and Schmidt-Hebbel (2004) by proxying macroeconomic instability by means of the ratio inflation rate/(1+inflation rate).

count data analysis. We start our analysis by using that type of models. We assume that the duration's conditional mean follows

$$\mathbb{E}[y_{it}|g_{it}, x_{it}] = \exp(g_{it}\alpha + x'_{it}\beta + \eta_i + \gamma_t) \quad (2)$$

and since the real government expenditure is measured logs, the estimated coefficient corresponds to an elasticity.

Table (3) provides results in 6 different columns. The initial three columns shows the results when we estimate using the Poisson method. The first column includes year dummies and the real government expenditure. The second column includes in addition variables concerning the degree of openness of the economy plus the exchange rate regime plus the variable macroeconomic instability to measure erroneous internal economic policies, the population growth rate to measure the expansion of the labor force and the agriculture and the manufacture share of the production to proxy for the internal structure of the economic production. The third column includes in addition the interaction between government expenditure and debt to allow for a different effect of the fiscal expenditure in more indebted countries. In that case, the number of observations drops to almost half of the initial sample due to the lack of data concerning debt. Columns 4 to 6 provide similar estimates but using fixed effect poisson models.

The coefficient of real government expenditure is negative and significant in all the cases. The estimated elasticity implies that an increase of 10% on real government expenditure should decrease the duration of an economic crisis in between 2.4% and 6.9%. As shown in table (1), the average duration of an economic crisis is 1.2 years in the period 1900-2000 and raises to 2.5 years in the period 1980-2000 which imply that if we assume the increase of 10% on real expenditure, this variable should shorten the duration of the crisis in between one and two months in the period¹⁰ 1980-2000. Note also that an increase in a country's debt is associated with a smaller effect of fiscal expenditure. The standard deviation of debt in the period 1980-2000 is almost one, which would indicate that a increase in debt in one standard deviation in that period would depress the elasticity of fiscal expenditure from -0.49 to -0.47 (column 8 of the table). Others results are as follows. According to our estimates, more open economies face shorter economic crises. The elasticity is approximately -1 when we use fixed effects in our regressions which indicates that a 10% increase in openness should depress the duration of economic crisis in about a $1\frac{1}{2}$ month during the 20th century. Also economies with a fixed exchange rate regime would have shorter crisis, with the semi-elasticity estimates ranging from zero (non-significant) to -0.58, where the point estimate indicates a crisis more than half shorter compared to countries with other exchange rate regimes. Larger macroeconomic instability is generally associated with a larger duration of an economic crisis while population growth decreases the duration of economic crises. We interpret this result as indicating that larger population growth should be associated with a larger labor force which allows to increase output and shorten the duration of the crisis. Finally, the structure of the production sector seems to be also an important factor explaining the

¹⁰If we focus on the mean crisis duration of the period 1900-2000 the effect is half of these estimates.

duration of a crisis. In economies with larger agricultural sector, the crisis tends to last longer while in economies with larger manufacture sector, the crisis tends to be shorter.

[Insert Table (3) about here]

Table (4) provides similar estimates but in the the table we allow for interactions between government expenditure and the exchange rate regime. The idea of allowing for these interactions is that we have obtained results suggesting that economies with fixed exchange rates face shorter economies crises. A possible explanation for that result is that fiscal policy is more effective in open economies with fixed exchange rate regime. In fact, according to the tradition mundell-fleming model - Fleming (1962), Mundell (1960), Mundell (1962)-, in open economies with fixed exchange rate regime the impact of the fiscal policy is at its maximum. The results on the table suggest that countries with fixed exchange rate regimes face a larger impact of fiscal expenditure on the duration of the economic crisis. In the table we include an interaction of fiscal expenditure with an indicator function equal to one if the country has a fixed exchange rate and in addition, we include a second interaction in which fiscal expenditure is multiplied by an indicator function equal to one if the economy has a fixed exchange rate regime and if the economy belongs to countries with more open economies to international trade¹¹. The estimates indicates that countries with fixed exchange rate would have a larger elasticity of government expenditure, increasing the impact of a 10% increase on government expenditure on the duration of the economic crisis from -5.8% to -7.2%. This is a significant effect but economically is small: if we take the period 1980-2000, when the average economic crisis duration was 2.5, the difference between both type of countries represents less than a month. Note that while the effect of the exchange rate regime through the larger elasticity of fiscal expenditure is small, it still remains the direct effect of the exchange rate regime which is still significant and negative as we include fixed effect in the count model and its point estimate remains high (-0.45 in column 6 of the table). This result suggests that the impact of the fixed exchange rate regime on the duration of economic crisis might be large and its transmission mechanism seems to occur by channels different than the government expenditure expansion. The rest of the effects ar similar to the ones on table (3).

[Insert Table (4) about here]

The above estimates tend to suggest various interesting results. In one hand, the impact of fiscal expenditure is significant and shorten the duration of the crisis but the magnitude of the effect is not large in that dimension. In another hand, the structure of the economy in relation to the size of its manufacture and agricultural sector might have an important effect on the duration of the crisis. The point estimates - see table (4)- indicate that an increase of 5% in the size of the agricultural sector -which means that the agricultural sector should shift for instance from representing a 10% of the economy to a 15% of the economy- should increase the duration of the crisis in almost 9.6 months (this is a 70% larger) while an increase in similar magnitude in the manufacture sector should shorten the crisis by almost 4 months (35% shorter). These are quite important effects that state that more industrialized

¹¹We define economies more open to international trade as economies in the superior third when ranked as function of their openness.

economies face much shorter economic crises compared to less developed economies with larger agricultural sector. Other results are related to the internal policies such is the case of the variables macroeconomic instability which is a proxy for erroneous internal macroeconomic policies. That variable is constructed as a non-linear function of inflation rate and its associated coefficient is around -0.4 and the result can be read as follows: if we compare two countries that face an economic crisis, one of them with relatively low inflation (20% per year) vis-à-vis another with a moderately larger inflation (40% per year), the country with the larger inflation should face a crisis almost 5% larger. Finally, the openness and the exchange rate regime of the economy are also important determinants of the duration of the crisis. We interpret these results as indicating that more open economies might take faster advantage of external take-off. In fact, according to figure (7) output-drops in Latin America are much more frequent than in the US suggesting that one way of escaping crises in Latin America might be by taking advantage of external demand.

4.2 Hurdle model

The above results were obtained in traditional poisson count data models. We used that type of model as our dependent variable corresponds to non negative integers. Alternatively, we may think that our dependent variable reflects a two-stage process, in which a first process determines whether there is an economic crisis and the second process determines the duration of the economic crisis given that the economic crisis lasts at least one year. It seems natural to model the duration of the economic crisis and the impact of government expenditure on the duration of the crisis by means of a two-stage process. In fact, fiscal stimulus might have different impacts during periods of expansions compared to periods of recessions since during recessions aggregate private demand is depressed while during expansions private demand is vigorous. Similar arguments could be given for other variables in our analysis such as the expansion of labor force (which we proxy by the growth rate of population) which in periods of recession, and thus of low total factor productivity, should have probably a lower impact in economic growth.

The two-stage process can be accounted by the hurdle model. In this subsection we follow that strategy and we provide estimates using the hurdle model which can be written as:

$$\mathbb{E}[y_{it}|g_{it}, x_{it}] = Pr(y_{it} > 0|g_{it}, x_{it})\mathbb{E}_{y_{it}>0}[y_{it}|g_{it}, x_{it}] \quad (3)$$

where the hurdle model consists on estimating initially the probability of an economic crisis and latter, conditionally on the existence of the crisis, we estimate the duration by using count data models. In this subsection, to model the probability of the crisis, we use standard logit models and to model the duration rather than using poisson models as above, we provide estimates using the negative binomial model as a way of providing some sensibility in our count data models.

Table (5) shows the results in the logit model. An increase in 10% in government expenditure depress the probability of a crisis in between 0.3% and 0.7%. Further, as above, a larger the country's debt the smaller the

effect of government expenditure on the probability of a recession. Note that in our sample, economic crisis represent almost 30% of observations, thus the impact of government expenditure is not large.

Other results are as follows. The larger is the population growth rate, the smaller is the probability of the economic crisis. That result probably follows since a larger population growth expands the labor force and allows to alleviate output-drops. Note that according to the estimates on the table a 1% increase in population growth depresses the probability of a crisis by almost 3% (with the exception of the third column of the table where the coefficient has half of the magnitude on other columns and it is non significant). The variable macroeconomic instability also plays an important role. If we compare two countries with different levels of inflation as proxy of macroeconomic instability (20% versus 40% inflation per year), the country with larger macroeconomic instability should face a higher probability of recession of around 10%. The variable openness has a negative impact but generally non significant. In another hand, the agricultural share of production has a positive impact on the probability of a crisis: a 5% larger agricultural share should increase the probability of a crisis by 3%. These results are generally in line with the results found in tables (3) and (4), with the exception of the coefficient on the exchange rate regime. In this case, a fixed exchange rate regime increase the probability of the crisis in between 10% and 22%.

Table (6) provides the estimates on the second step concerning the duration of the crisis, conditional on occurring the economic crisis. The impact of government expenditure is negative and significant. Even though the magnitude of the elasticity (-0.4) tend to be closer to zero, compared to tables (3) and (4), the impact is marginally larger because, while the elasticity is smaller in absolute value, the absolute impact is larger¹² implying that 10% increase in government expenditure produces a decrease in between 2 and 3 months in the duration of the crisis that has already started. Macroeconomic instability becomes non significant and the fixed exchange rate regime becomes negative and significant as in tables (3) and (4).

[Insert Tables (5) and (6) about here]

The results on subsection (4.1) plus the results in this subsection show that fiscal expenditure has a small (moderate) impact in shortening the duration of the economic crisis. The impact of fiscal expenditure on the duration of the crisis might be divided on the impact concerning the probability of occurring a crisis and the impact on the duration of the crisis when the crisis has already been initiated. The impact on the probability of the crisis of the fiscal expansion is small and thus fiscal expansion does not seem an adequate instrument to prevent the irruption of the crisis. The impact on the duration of the crisis is such that fiscal expansion might shorten the crisis in 2 to 3 months.

4.3 Duration / Hazard model

We have analyzed count model as a way of obtaining empirical regularities concerning the impact of fiscal expenditure on the duration of economic crisis. An alternative way of looking to the problem is to rely on duration

¹²We are estimating conditional on occurring an economic crisis, the average duration of our left-hand side variable increase to 4.15 years between 1900-2000 and to 5.52 years between 1980 and 2000

models which tend to focus on estimating the hazard function of a crisis. The hazard function in our empirical exercise corresponds to the probability of ending the crisis at year t , conditional on having been experimenting an economic crisis until period $t-1$. Our time period corresponds to one year as in preceding subsections. The analysis in this subsection complements the above estimates. In fact, the analysis is similar to the second step of the hurdle model, as we use construct probability of ending the economic recession conditional on being experimenting a crisis. In this case the hazard function to be estimated is:

$$\lambda(g_{it}, x_{it}) = \lambda(g_{it}\alpha + x'_{it}\beta + \gamma_t) \quad (4)$$

where $\lambda(g_{it}, x_{it})$ is the hazard rate which depends in the usual time-varying covariates plus time dummies to capture common time effects. Table (7) shows the results when we estimate the hazard function. Note that the number of observations drops considerably as we are using only data of countries that are experimenting a crisis. In the estimates fiscal expenditure is positive and thus should increase the probability of ending the recession but when we include the time varying covariates the coefficient becomes non significant. Macroeconomic Instability seems to be the main determinant in raising the duration of the economic crisis as it decrease the hazard rate. Overall, the results on government expenditure indicates in the case of the hazard function, and in the case of the second step of the hurdle model, a low power to fasten the end of the economic crisis.

[Insert Table (7) about here]

5 The intensity of economic crises

We have analyzed the impact of government expenditure on the duration of economic crises. In this section we focus on the impact of government expenditure on the intensity of the economic crises. By intensity, we mean how large is the economic contraction. In this case, rather than focusing on whether the fiscal policy may shorten the duration of the crisis, we focus on whether the fiscal policy might produce a less accentuated contraction of GDP.

In our empirical analysis we plan to obtain evidence concerning the impact of government expenditure growth on GDP growth rate. In addition, we would like to determine whether government expenditure has a different impact during economic crisis compared to periods of normal economic conditions. To do so we propose a relation in which GDP growth rate follows a growth regression à-la Barro - see Barro (1991) - as in:

$$Y_{it} = \beta(L)Y_{it-L} + \gamma(L)G_{it} + \theta(L)1(Crisis)G_{it} + \rho(L)X_{it} + \eta_i + \psi_t + \epsilon_{it} \quad (5)$$

where the indexes (it) indicate country i and time t while $(\beta(L), \gamma(L), \rho(L))$ correspond to lags' polynomials of order L . The variable Y_{it} is the growth rate of GDP, G_{it} is the growth rate of real government expenditure,

$1(Crisis)$ is an indicator function equal to 1 when the country is facing an economic crisis and zero otherwise, X_{it} is a set of control variables and (η_i, ψ_t) are country and time effects respectively. The variable ϵ_{it} is a well behaved error term. In equation (5), the coefficient on the variable G_{it} corresponds to the effect of government expenditure on the growth rate of GDP while the coefficient on the variable $1(Crisis)G_{it}$ corresponds to the additional effect of the government expenditure during economic crises.

In our set of control variables X_{it} , we include variables similar to those included in the growth literature such as the lagged level of real GDP (lagged in 5 years), the ratio investment to GDP, openness, the growth of terms of trade, the growth in real exchange rate, population growth, agriculture and manufacture share, macroeconomic instability and year dummies.

The specification in (5) follows the traditional specification in the growth literature but allows for a non symmetric effect of fiscal expenditure on GDP growth during periods of economic crisis vis-à-vis periods of economic expansion. Further, we include lags in the effects of fiscal expenditure to allow for dynamic effects in the response of GDP when fiscal expenditure expands.

Table (8) shows the results as we estimate equation (5). We find that investment rate has a positive and significant effect on GDP growth. A one percentage point in investment rate tends to increase GDP growth by 0.4%. Macroeconomic instability and agriculture share have a negative impact in GDP growth. A country with a larger macroeconomic instability, as above we might compare a country with a 20% yearly inflation vis-à-vis a country with 40% inflation rate, should face a 1% smaller GDP growth while a country with a 1% larger agriculture share of total production should face a 0.4% smaller GDP growth, indicating that less industrialized countries tend to growth at lower rates. Concerning the impact of fiscal expenditure we find a negative but small impact during periods of expansions while a positive and significant impact during periods of economic crises. In fact, note that the sum of the coefficients on fiscal expenditure growth is around 0.29 in column 2 and around 0.1 in columns 2 and 3. The results on columns 2 and 3 would indicate that a 10% increase in real government expenditure should impact positively GDP growth in almost 1% (according to columns 2 and 3) which is an important effect if we consider that the average output drop in Latin America is around 9% in countries experiencing an economic crisis after the 1930 great depression.

[Insert Table (8) about here]

Our results suggest that fiscal expenditure tend to have a significant but small impact in shorten the duration of economic crises but tend to have a significant positive impact in smoothing the negative cycle in GDP during the crisis.

One of the problems of the conclusion is the potential simultaneity between the duration and the intensity of the economic crises and government expenditure. In fact, government might react to the irruption of an economic crisis by increasing fiscal expenditure to expand aggregate demand and increase economic activity. Further, the more intensive the crisis, the more likely could be the reaction of the government. Next section addresses that problem.

6 Addressing potential simultaneity

As it was shown in figure (8), fiscal expenditure has expanded considerably during the 20th century in Latin America, measured as a fraction of GDP. The long run trend in government might be explained by different factors such as income growth (Ram (1987), Easterly and Rebelo (1993)), income inequality (Meltzer and Richard (1989)), country size (Alesina and Wacziarg (1998)), pressure groups (Becker (1983)), political rights (Aidt and Eterovic (2007)) and political institutions (Mulligan, Gil, and Sala-i Martin (2004), Persson and Tabellini (2000)).

In this paper, as we have argued above, there might be potential simultaneity between fiscal expenditure and economic crisis. The simultaneity should arise at the business cycle frequency rather than at the long run frequency as government should react to the irruption of the crisis by increasing fiscal expenditure during the crisis but latter typically governments adjust fiscal expenditure to avoid substantial deficits. Some evidence concerning the potential simultaneity at the business cycle frequency is shown in figures (9) and (10). In the figure we plot the residuals from a regression between the ratio of government expenditure to GDP and a time trend. These residuals represent the deviations from the long run trend of government expenditure as fraction of GDP. Figure (9) plots the fiscal expenditure residuals vis-à-vis output drops and as shown in the figure there is clearly a positive association between the variables, suggesting that in periods of large output drops government might react by increasing fiscal expenditure above its trend. Figure (10) tends to confirm that idea. The figure plots the deviations of fiscal expenditure when average output drops are larger and it shows that fiscal expenditure tends to deviate above its long run trend in episodes of large output drops. Furthermore, deviations might be quite large, as in the 1982 crisis when fiscal expenditure deviated more than 4 percentage points as fraction of GDP during a period of 4 years. Similarly, during the great depression for a period of nine years Latin American countries experienced fiscal expansions that accounted for more than 1% of GDP in each year.

[Insert Figures (9) to (10) about here]

To break the potential simultaneity between economic crisis and government expenditure, we look for a variable that could be used as instrument. The instrument should be associated with government expenditure but not directly related to economic crisis. We propose as instrument a series of expected government expenditure; GE_{it} ; that contains the data on observed government expenditure in periods that cannot be classified as periods of economic crisis while, during periods of economic crises, it contains the level of government expenditure observed the year before the crisis took place. The idea of using the level of government expenditure observed before the economic crisis is that it represents the governments expenditure decisions when the economic crisis was not yet part of the economic environment; and hence does not depend on the irruption of the crisis. It also corresponds to a time period that is sufficiently near to the period of the crisis to be representative of the fiscal decisions during that period. The variable is constructed as follows:

$$GE_{it} = \left\{ \begin{array}{ll} G_{it} & \text{if no crisis} \\ G_{it-k} & \text{if Current Crisis Spans } k \text{ years} \end{array} \right\} \quad (6)$$

where G_{it} is government expenditure at time t . Figure (11) provides plots of the (average) expected and the observed government expenditure, both measured as fraction of GDP. As seen on the figure, there is a large correlation between both variables; but there is some differences mainly in periods of significative economic crises. The Figure (12) shows the difference between both variables, measured in percentage points. That difference is positive and quite significative during the 1980s economic crises, indicating that government expanded government expenditure further more than expected before the irruption of the crisis, which tends to corroborate the idea that government policy reacts when the economic crisis irrupts. Notably in the second half of the 1980s, the figures reversed indicating that countries face a large adjustment in their fiscal positions. Overall, both variables tend to coincide but in the periods of economic crises, when both series might have significant differences.

[Insert Figures (11) to (12) about here]

We next discuss our results when we instrument government expenditure. Table (9) present the results of the first step in our instrumental variable approach. The variable expected government expenditure is highly significant and its coefficient is slightly smaller than one. In the table, we include also other exogenous variables that will be included in the second step of the approach. We found that the coefficient on the level of GDP is positive and significant, even after controlling for expected government expenditure, which gives some evidence on Wager's law. Openness is also positive and significant, in line with the results in Cameron (1978) and Rodrik (1998). Tables (10) to (13) shows the results of count data, hurdle model and hazard function when we use expected government expenditure as instrument. In general, the results obtained above are confirmed. The estimates of the impact of government expenditure are slightly smaller but remain significant in all the cases in tables (9) to (12). The estimates in table (13) confirm the results indicating low or non significant power of the government expenditure to end the crisis once it has started while it indicates that the probability of ending the recession decreases with macroeconomic instability.

[Insert Tables (9) to (13) about here]

7 Sensitivity analysis

We have shown that fiscal expenditure has low power to shorten the duration of the crisis but has a significative impact in smoothing output drops. These above results correspond to economic crises defined as output-drops. As we have discussed, alternative and more stringent definitions of economic crises corresponds to cases in which we define economic crises as output-drops larger than 5% or 10%. In this section, we plan to perform a similar analysis compared to sections (4), (5) and (6) but comparing the effects vis-à-vis cases in which we define economic crises by setting $k = 5\%$ and $k = 10\%$.

Table (14) shows the results of count data models when we use the three different definitions of crisis. Columns (1) to (3) of the table use real government expenditure while columns (4) to (6) use the instrumental variable approach. In both cases, we find that the impact of fiscal expenditure tends to be larger the more intense

is the crisis definition. In fact, when the crisis is defined by setting $k = 10\%$, the elasticity of fiscal expenditure is in between -0.8 and -1.5. Tables (15) and (16) complement the finding by providing estimates of the hurdle model, i.e. by estimating the probability of the crisis and later the duration of the crisis. Fiscal expenditure does not show additional power to avoid the occurrence of the larger crisis, as the coefficients on fiscal expenditure in the logit estimates do not differ across different definitions of economic crisis. The coefficient do differ when we estimate the duration of economic crises in the second step of the hurdle model and the elasticity of fiscal expenditure is almost twice larger in the case we set $k = 10\%$ vis-à-vis the case $k = 0\%$, confirming the finding in table (14). These results would imply that while fiscal expenditure has quite low impact in decreasing the likelihood an economic crisis for any of the definition of economic crises here used, fiscal expenditure seems to have a small impact in decreasing the duration of economic crises and that impact is larger the more intense is the definition of economic crisis used.

Table (17) provides a similar analysis concerning the impact of fiscal expenditure on the intensity of the crisis. The table measures the impact of fiscal expenditure on GDP growth during episodes of economic crisis. The table has 6 columns. The first two use the definition of economic crises based on $k = 0\%$ while columns 3 and 4 use the definition based on $k = 5\%$ and columns 5 and use the definition based on $k = 10\%$. In each of the cases, the first column do not use expected government expenditure as exogenous instrument while the second column does. If we compare the sum of significative coefficients on the polynomial of government expenditure during crisis, we observe that the figures tends to be similar in the three cases. A similar result is obtained when we use the instrument.

[Insert Tables (14) to (17) about here]

These results tend to indicate that fiscal expenditure has slightly more power to shorten more intense economic crisis while the impact on the intensity of the crisis is similar for the different definitions of economic crisis here used. The result seems to indicate that fiscal expenditure during intense economic crises allows countries to smooth their GDP drops such that they are more likely to leave the state of intense economic crisis but the fiscal impulse is not large enough to increase considerably the probability of ending moderate economic crises.

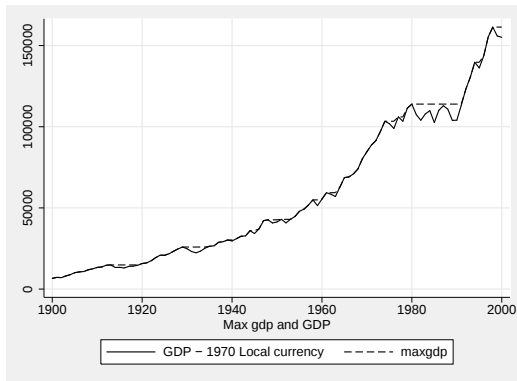
8 Conclusions

Fiscal expenditure is widely used during economic crises. The evidence concerning its impact is still mixed. In this paper we revise fiscal expenditure policy during episodes of economic crises in Latin America.

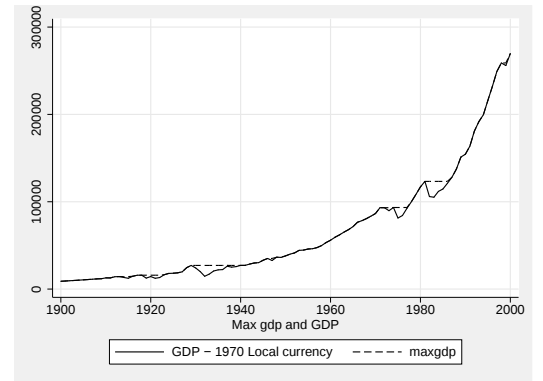
The paper provides a complementary vision to the evidence currently reported in the economic literature. There are two main differences with other studies. Firstly, our database consists on a century of data across twenty different countries. This characteristic of the data allows us to include in our data set larger crisis such as the great depression or small and mild crisis, such as the one experienced by Latin American countries during the period 1940 to 1979. Secondly, our empirical design focus in economic crises which differ with the traditional

analysis of government spending multipliers. We do so because we think that the impact of fiscal policy might differ across different part of the business cycle. Our results tend to ratify that idea.

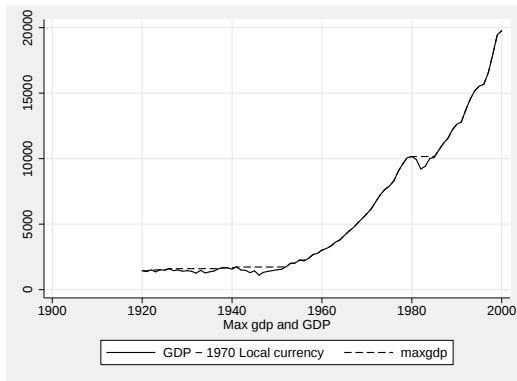
We found that fiscal policy has a small impact on shortening the duration of the economic crisis, as we define it. The impact of fiscal expenditure is asymmetric on the intensity of crises: during economic expansions is negative or near to zero while it is positive during economic crises. Further our estimates indicates that a 10% increase in fiscal expenditure generally tend to increase GDP growth by 1% during crises.



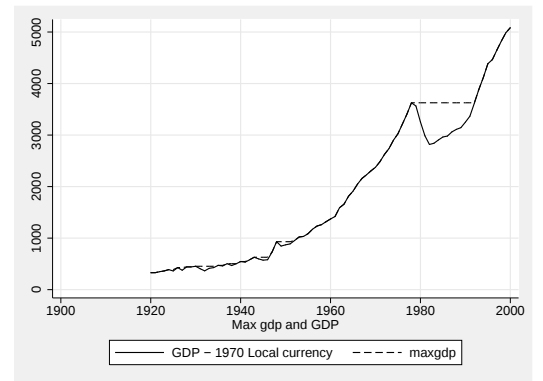
(a) Argentina



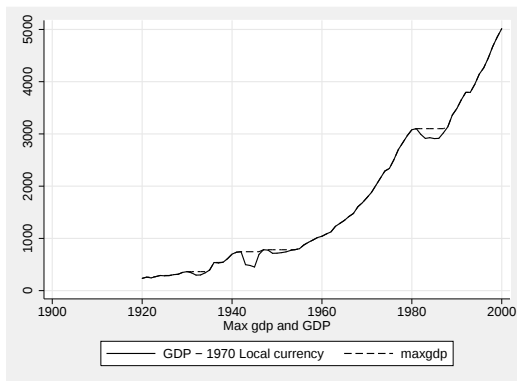
(b) Chile



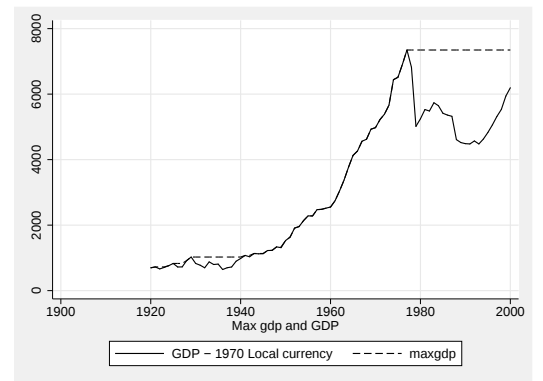
(c) Costa Rica



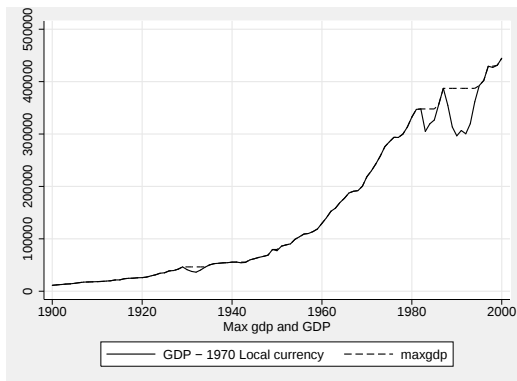
(d) El Salvador



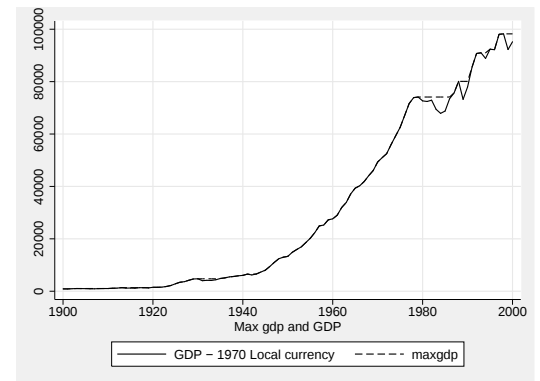
(e) Guatemala



(f) Nicaragua



(g) Perú



(h) Venezuela

Figure 1: GDP and local maximum GDP, selected countries

Figure 2: Average Output drop, fraction of GDP

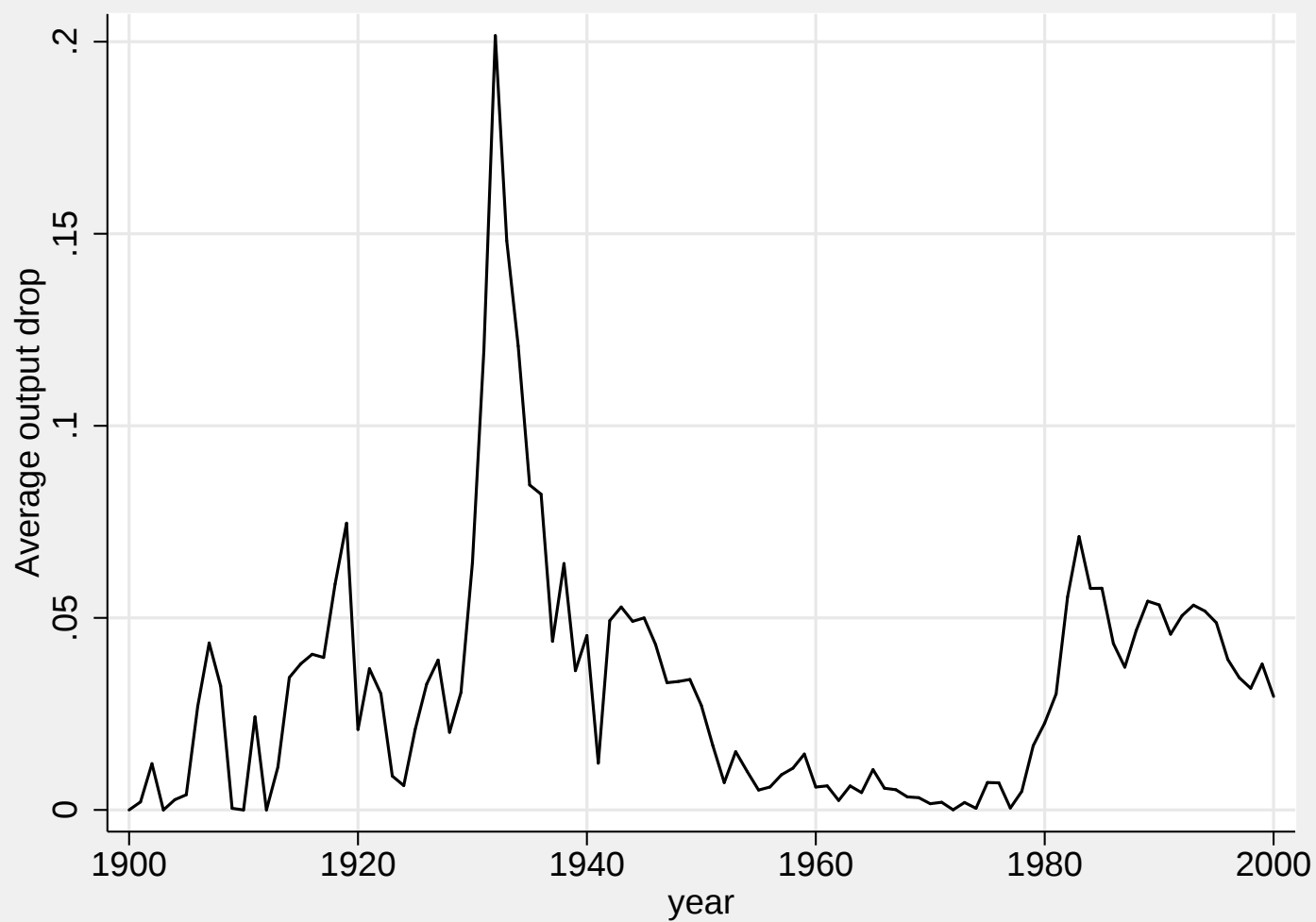


Figure 3: Output drop, fraction of GDP, by country

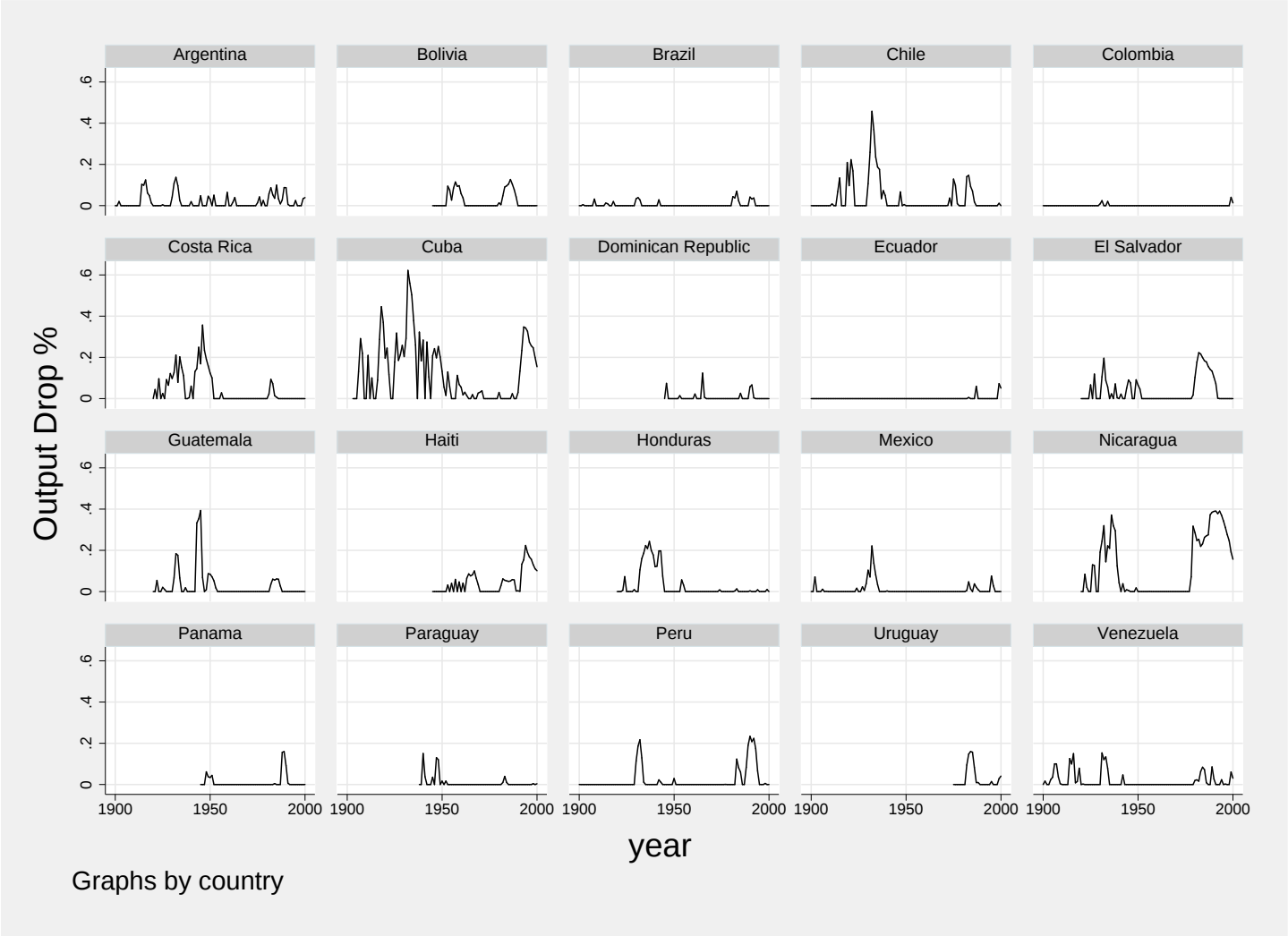


Figure 4: Average Economic Crisis Duration

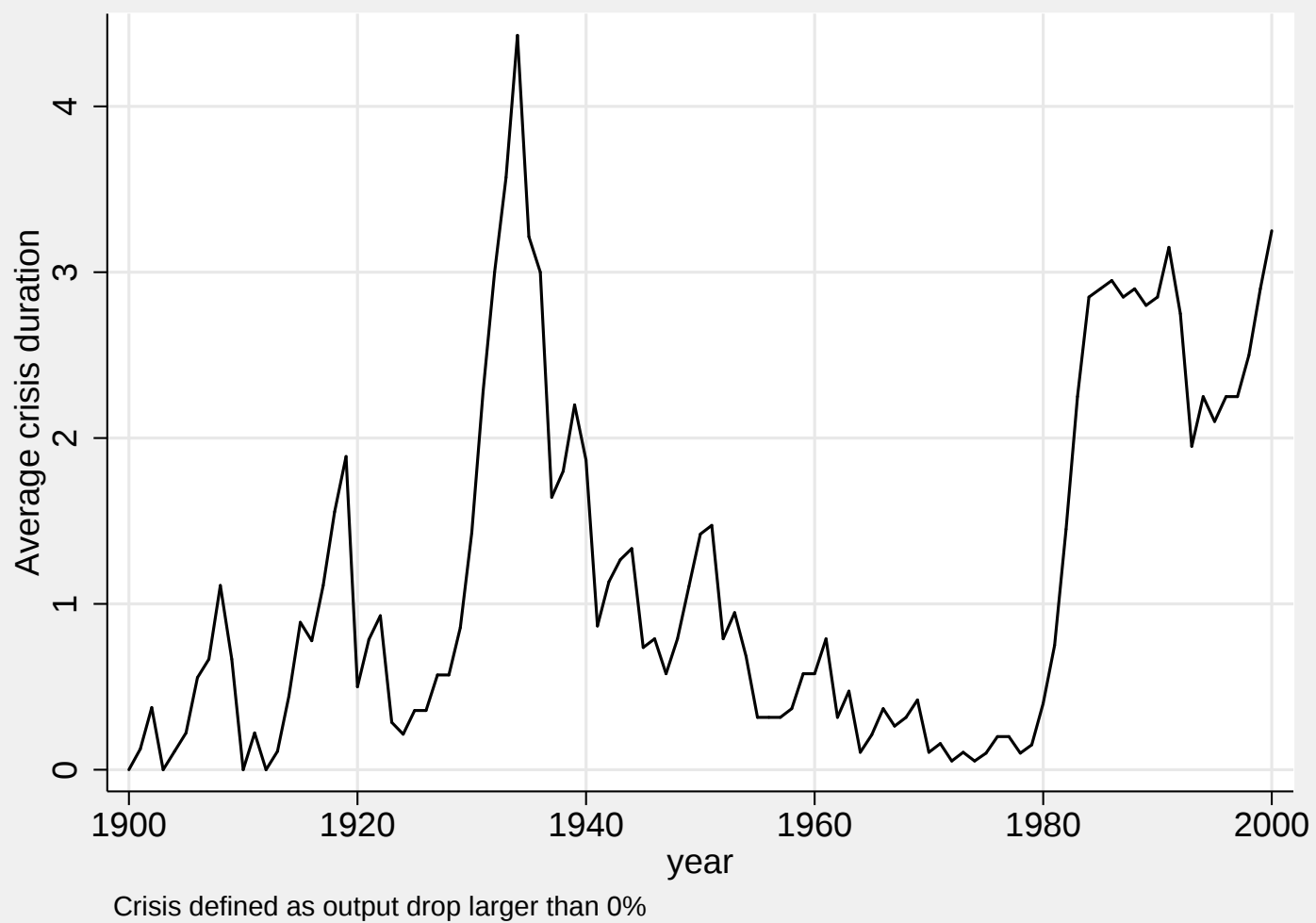


Figure 5: Economic Crisis Duration, by country

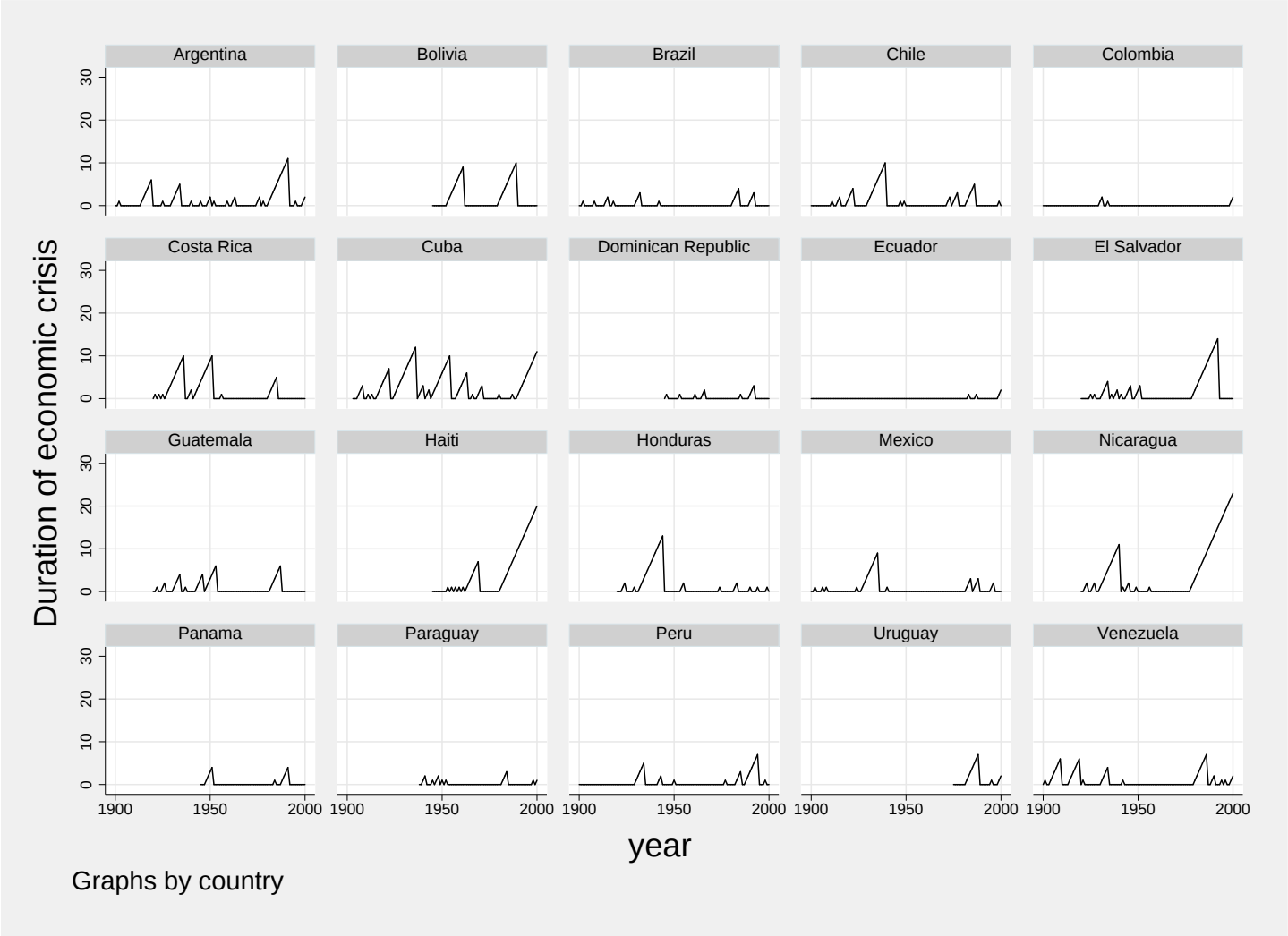


Figure 6: Duration of Economic Crises, different definitions

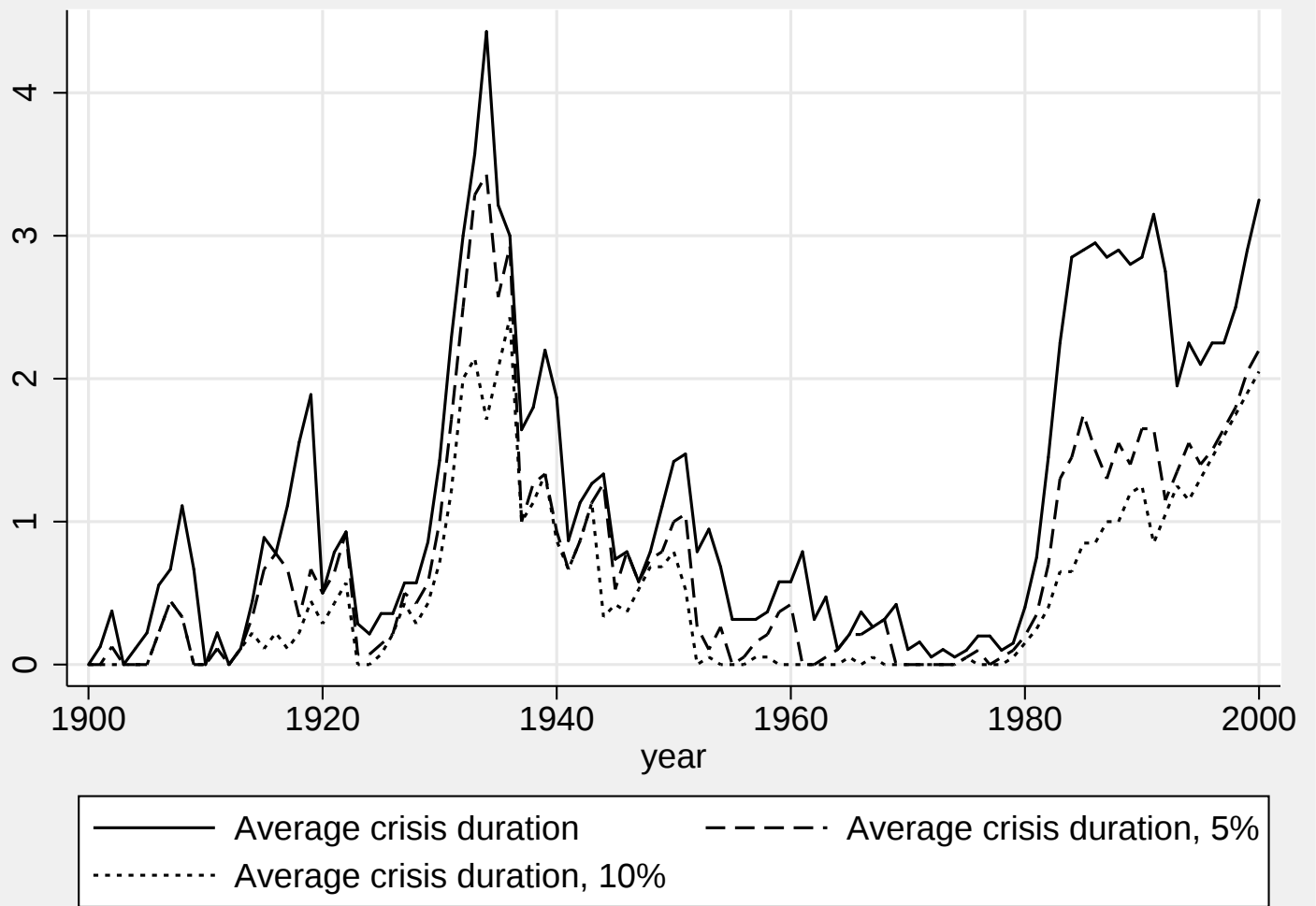


Figure 7: Output Drop, Latinamérica and the US

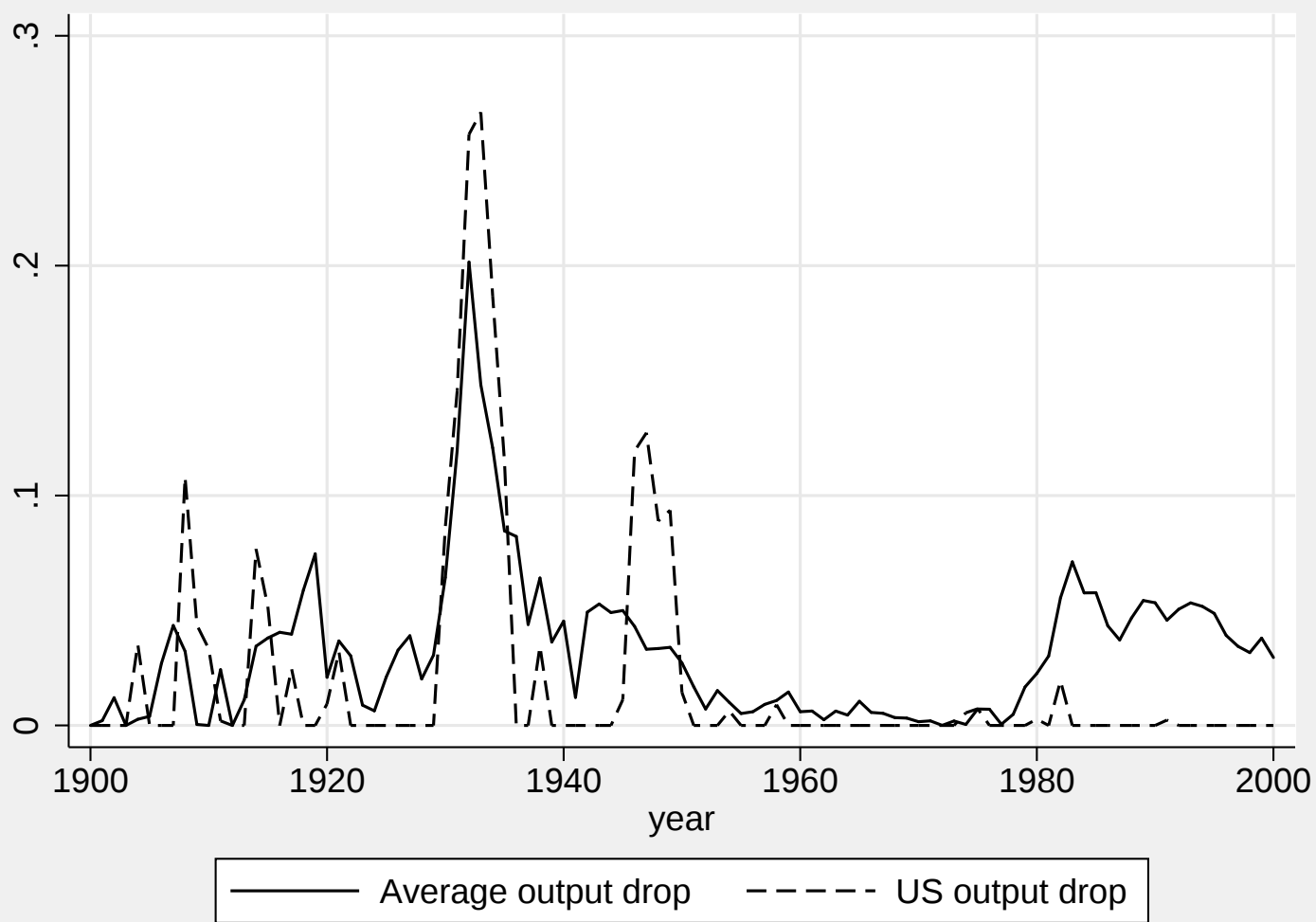


Figure 8: Average Government Expenditure, fraction of GDP



Figure 9: Fiscal expansions and output drop, Latinamérica

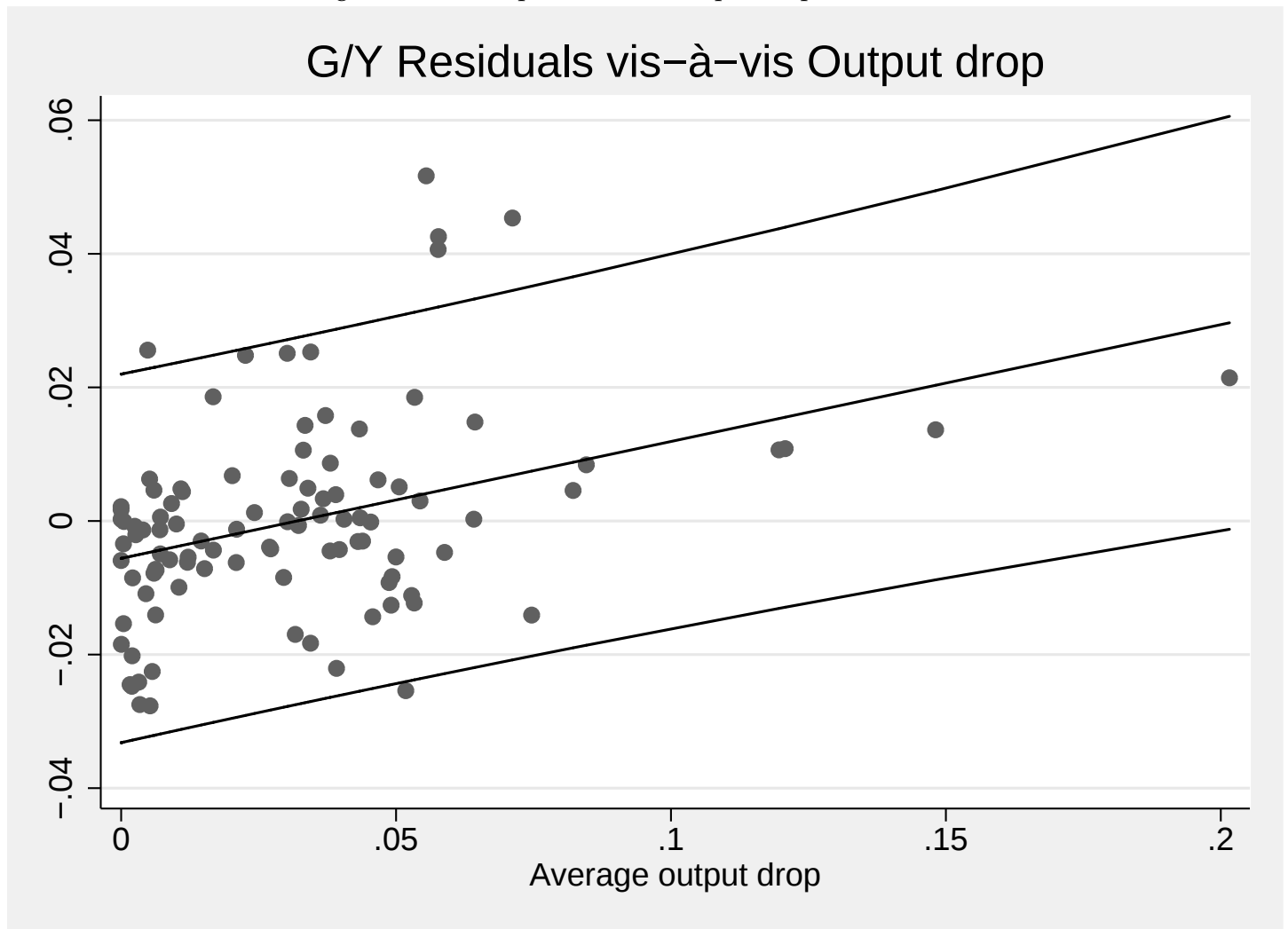


Figure 10: Fiscal expansions above trend, Latinamérica

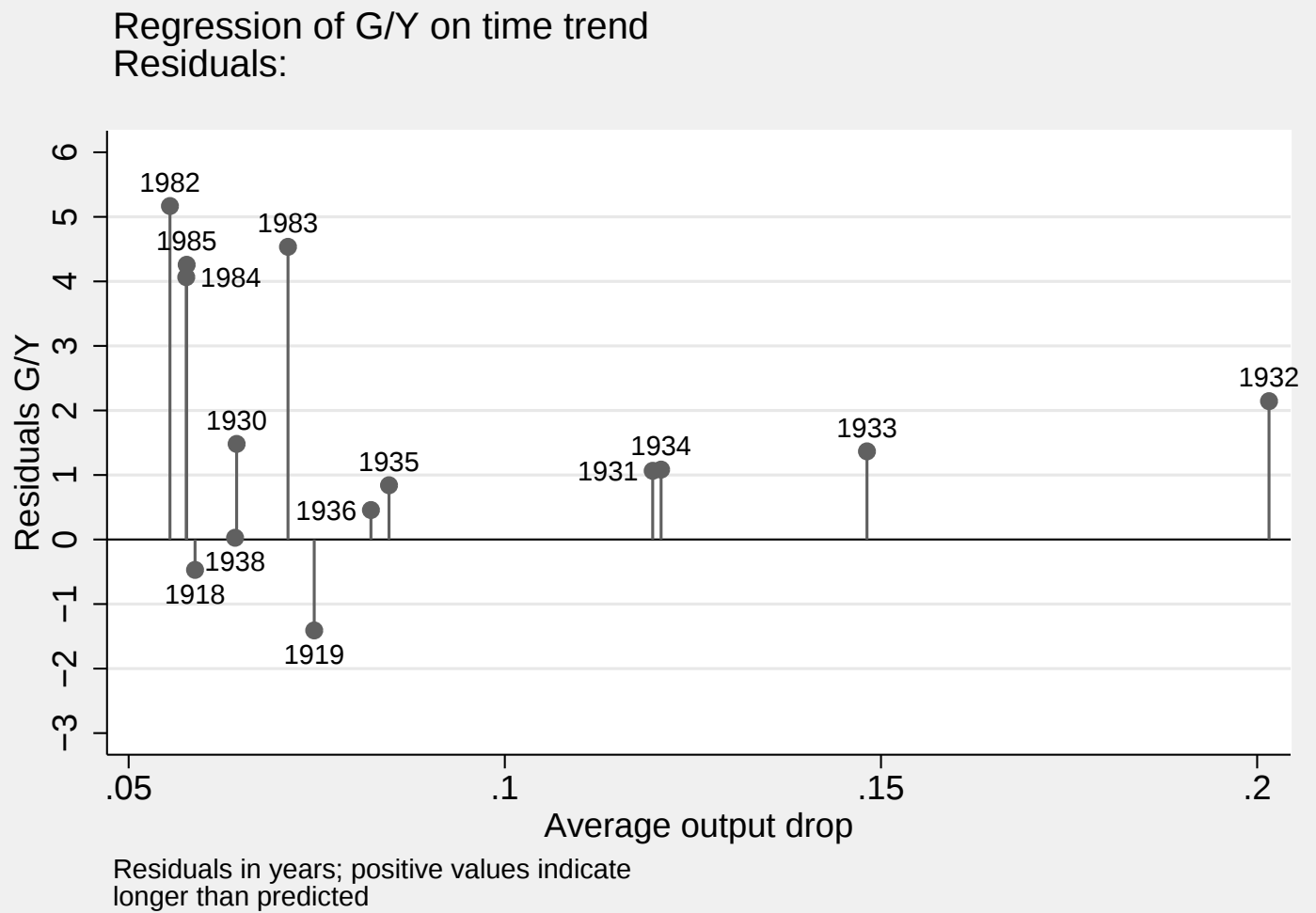


Figure 11: Government Expenditure and Expected Government Expenditure, Latin America

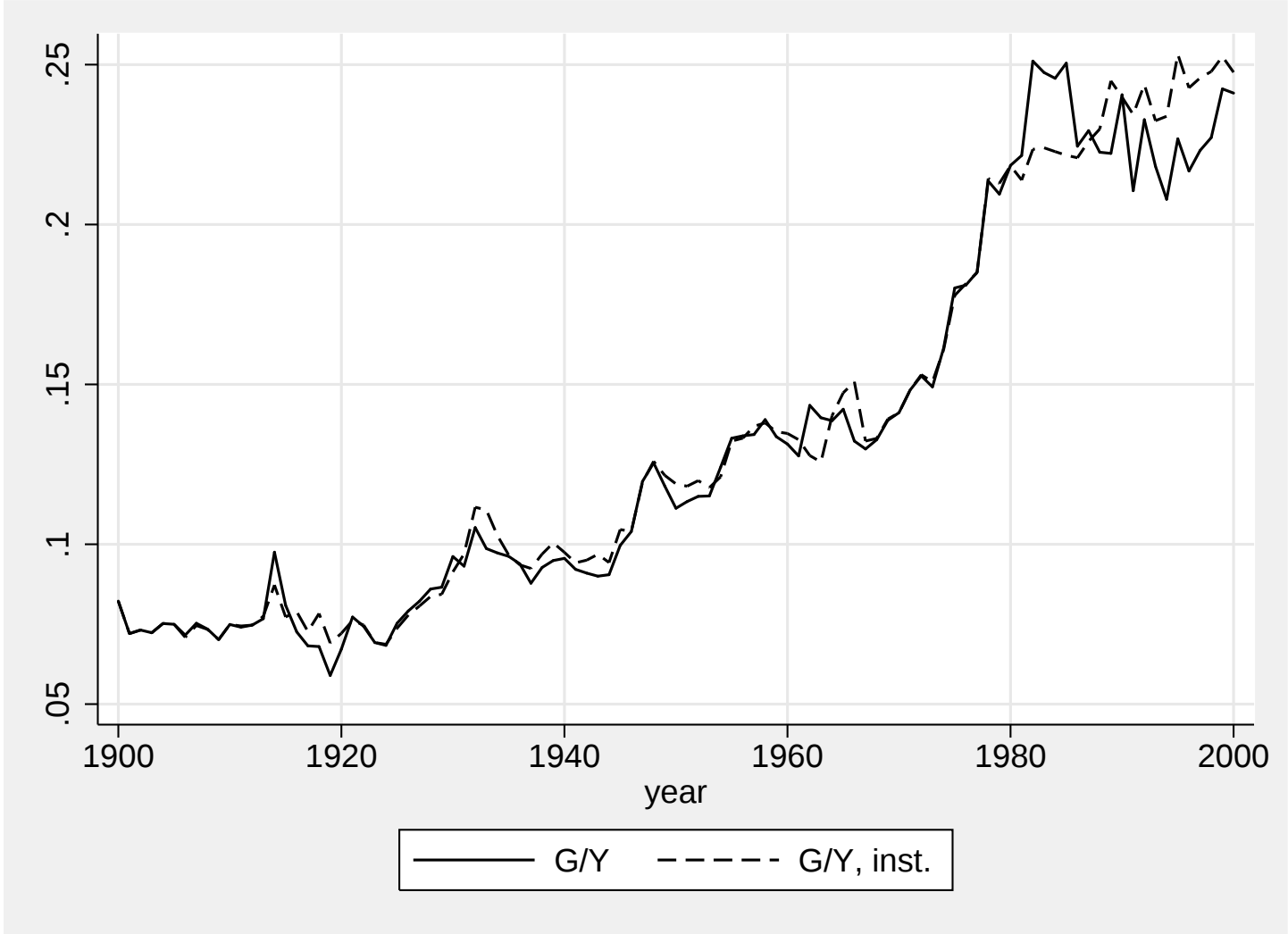


Figure 12: Differences Government Expenditure and Expected Government Expenditure, Latin America



Table 1: Summary Statistics, 1900-2000 and sub-periods

years	Mean	Min	Max	Std	Obs.
Output drop					
1900-2000	0.031	0.00	0.62	0.07	1624
1900-1929	0.024	0.00	0.45	0.06	317
1930-1940	0.091	0.00	0.62	0.12	157
1941-1979	0.014	0.00	0.39	0.05	730
1980-2000	0.045	0.00	0.39	0.08	420
Duration of Economic Crisis, Output drop>0%					
1900-2000	1.208	0.00	23.00	2.88	1624
1900-1929	0.546	0.00	7.00	1.25	317
1930-1940	2.573	0.00	12.00	3.22	157
1941-1979	0.519	0.00	13.00	1.62	730
1980-2000	2.395	0.00	23.00	4.37	420
Duration of Economic Crisis, Output drop>5%					
1900-2000	0.755	0.00	23.00	2.33	1624
1900-1929	0.315	0.00	7.00	0.96	317
1930-1940	1.981	0.00	12.00	2.96	157
1941-1979	0.310	0.00	13.00	1.32	730
1980-2000	1.402	0.00	23.00	3.55	420
Duration of Economic Crisis, Output drop>10%					
1900-2000	0.540	0.00	22.00	2.10	1624
1900-1929	0.192	0.00	6.00	0.74	317
1930-1940	1.503	0.00	12.00	2.71	157
1941-1979	0.175	0.00	12.00	1.08	730
1980-2000	1.076	0.00	22.00	3.31	420
GDP growth rate, %					
1900-2000	0.038	-0.47	0.58	0.07	1604
1900-1929	0.042	-0.22	0.57	0.09	303
1930-1940	0.024	-0.47	0.45	0.11	156
1941-1979	0.048	-0.33	0.58	0.06	725
1980-2000	0.024	-0.16	0.18	0.05	420

Table 2: Summary Statistics, 1900-2000 and sub-periods

years	Mean	Min	Max	Std	Obs.
Openness					
1900-2000	0.36	0.01	2.32	0.18	1348
1900-1929	0.36	0.01	2.32	0.22	169
1930-1940	0.32	0.15	0.61	0.12	98
1941-1979	0.33	0.08	0.82	0.14	661
1980-2000	0.42	0.08	1.12	0.22	420
Terms of trade					
1900-2000	1.19	0.15	5.39	0.56	1592
1900-1929	1.11	0.47	2.57	0.40	292
1930-1940	1.43	0.50	4.38	0.61	169
1941-1979	1.05	0.22	3.05	0.34	717
1980-2000	1.37	0.15	5.39	0.81	414
Fixed Exchange Rate					
1900-2000	0.50	0.00	1.00	0.50	1943
1900-1929	0.48	0.00	1.00	0.50	569
1930-1940	0.33	0.00	1.00	0.47	208
1941-1979	0.69	0.00	1.00	0.46	746
1980-2000	0.25	0.00	1.00	0.43	420
Population Growth Rate, %					
1900-2000	0.02	-0.07	0.18	0.01	1925
1900-1929	0.02	-0.04	0.06	0.01	551
1930-1940	0.02	-0.02	0.08	0.01	209
1941-1979	0.03	-0.07	0.11	0.01	745
1980-2000	0.02	-0.04	0.18	0.02	420
Debt					
1900-2000	0.51	0.00	9.89	0.77	677
1900-1929	0.17	0.00	0.45	0.15	10
1930-1940	0.23	0.00	0.50	0.17	8
1941-1979	0.26	0.00	1.03	0.21	243
1980-2000	0.68	0.00	9.89	0.93	416

Table 3: Duration of economic crises, Count model - Poisson

VARIABLES	(1) Poisson	(2) Poisson	(3) Poisson	(4) Panel-Poisson	(5) Panel-Poisson	(6) Panel-Poisson
ln(G)	-0.26*** (0.01)	-0.24*** (0.02)	-0.24*** (0.02)	-0.69*** (0.05)	-0.54*** (0.07)	-0.49*** (0.07)
ln(G)*Debt			0.04*** (0.00)			0.02*** (0.01)
Openness		-0.23 (0.16)	-2.02*** (0.23)		-0.91*** (0.25)	-1.05*** (0.34)
Fixed exchange rate		0.08 (0.09)	-0.28*** (0.10)		-0.23** (0.10)	-0.58*** (0.12)
Agriculture share		6.88*** (0.41)	7.14*** (0.53)		15.74*** (1.16)	12.07*** (1.60)
Manufacture share		5.60*** (0.91)	6.04*** (1.04)		-4.45*** (1.44)	-6.28*** (1.98)
Macroeconomic instability		1.65*** (0.14)	0.53*** (0.17)		0.42** (0.17)	-0.16 (0.19)
Population Growth rate		-10.30*** (2.36)	-17.15*** (2.75)		-0.02 (2.95)	-0.03 (3.56)
Observations	1324	1163	647	1324	1163	647
R ²	0.295	0.406	0.445			
log-l.	-2282	-1723	-1082	-1512	-1102	-788.2
Number of Countries				20	20	20

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Duration of economic crises, Count model - Poisson - Exchange rate regime

	(1)	(2)	(3)	(4)	(5)	(6)
ln(G)	-0.68*** (0.05)	-0.51*** (0.06)	-0.49*** (0.07)	-0.70*** (0.05)	-0.58*** (0.07)	-0.48*** (0.07)
ln(G)*1(Fixed)	-0.03*** (0.01)	-0.25*** (0.06)	-0.10 (0.08)			
ln(G)*Debt			0.02*** (0.01)			0.02*** (0.01)
ln(G)*1(Fixed/Open)				-0.08*** (0.02)	-0.14*** (0.03)	-0.08** (0.03)
Openness		-0.91*** (0.25)	-1.04*** (0.34)		-0.39 (0.26)	-0.93*** (0.35)
Fixed exchange rate		1.52*** (0.41)	0.10 (0.55)		-0.04 (0.11)	-0.45*** (0.13)
Agriculture share		14.27*** (1.19)	11.70*** (1.63)		14.08*** (1.21)	11.59*** (1.63)
Manufacture share		-4.74*** (1.46)	-6.88*** (2.04)		-7.51*** (1.54)	-7.20*** (2.02)
Macroeconomic instability		0.35** (0.17)	-0.19 (0.19)		0.40** (0.17)	-0.10 (0.19)
Population Growth rate		0.18 (2.95)	0.14 (3.58)		1.04 (2.91)	-0.25 (3.52)
Observations	1324	1163	647	1324	1163	647
Number of countries	20	20	20	20	20	20
log-l.	-1508	-1091	-787.3	-1498	-1086	-785.1

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Hurdle Model - Logit, Probability of an Economic Crisis

	(1)	(2)	(3)	(4)
ln(G)	-0.03*** (0.01)	-0.04*** (0.01)	-0.04*** (0.01)	-0.07*** (0.02)
ln(G)*1(Fixed/Open)			-0.01 (0.01)	
ln(G)*Debt				0.06*** (0.01)
Openness		-0.08 (0.09)	-0.06 (0.11)	-0.76*** (0.20)
Fixed exchange rate		0.09** (0.04)	0.10** (0.04)	0.22*** (0.08)
Agriculture share		0.63*** (0.19)	0.61*** (0.19)	0.57 (0.36)
Manufacture share		0.44 (0.45)	0.42 (0.45)	0.29 (0.78)
Macroeconomic instability		0.74*** (0.12)	0.74*** (0.12)	0.99*** (0.18)
Population Growth rate		-2.77** (1.19)	-2.75** (1.18)	-1.34 (1.85)
Observations	1236	1052	1052	585
R^2	0.202	0.277	0.277	0.331
log-l.	-589.4	-441.4	-441.3	-251.2

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Hurdle Model - Negative Binomial, Duration of Economic Crisis>0

	(1)	(2)	(3)	(4)
ln(G)	-0.22*** (0.03)	-0.42*** (0.09)	-0.43*** (0.09)	-0.40*** (0.08)
ln(G)*1(Fixed/Open)			0.14** (0.06)	
ln(G)*Debt				0.04*** (0.01)
Openness		0.14 (0.49)	-0.37 (0.56)	-1.85*** (0.65)
Fixed exchange rate		-0.32 (0.27)	-0.55* (0.30)	-0.86*** (0.21)
Agriculture share		4.37*** (1.47)	5.31*** (1.53)	6.66*** (1.35)
Manufacture share		9.46*** (2.04)	11.03*** (2.15)	10.63*** (2.07)
Macroeconomic instability		0.47 (0.34)	0.44 (0.35)	-0.35 (0.37)
Population Growth rate		-6.86 (7.50)	-5.23 (7.85)	-21.81** (8.50)
Observations	360	298	298	205
R^2	0.136	0.139	0.142	0.186
log-l.	-728.9	-617.3	-615.3	-417.8

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: Hazard Function - Weibull

	(1)	(2)	(3)
ln(G)	0.20*** (0.06)	0.14 (0.11)	0.15 (0.12)
ln(G)*1(US output drop)			-0.09 (0.18)
ln(G)*1(Fixed/Open)			-0.08 (0.09)
Openness		0.14 (0.85)	0.47 (0.94)
Fixed exchange rate		-0.88** (0.41)	-0.77* (0.44)
Agriculture share		-2.36 (1.86)	-2.78 (1.94)
Manufacture share		-1.07 (3.58)	-1.14 (3.65)
Macroeconomic instability		-2.18** (0.89)	-2.17** (0.89)
Population Growth rate		-5.07 (10.16)	-4.82 (10.35)
Observations	472	387	387
log-l.	-77.48	-56.09	-55.61

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 8: Impact of Fiscal Policy on the Intensity of the Crisis

VARIABLES	(1) Exog.	(2) Exog.	(3) Exog.	(4) Endog.	(5) Endog.
Gov. Exp., Growth		0.005 (0.005)	-0.003 (0.005)	-0.003 (0.002)	-0.003 (0.002)
Gov. Exp., Growth, Lag (1)		0.001 (0.007)	-0.006* (0.004)	-0.008*** (0.002)	-0.008*** (0.002)
Gov. Exp., Growth, Lag (2)		0.006 (0.005)	-0.003 (0.005)	-0.003* (0.002)	-0.003 (0.002)
Gov. Exp., Growth, Lag (3)		0.001 (0.005)	-0.002 (0.003)	-0.004*** (0.002)	-0.004*** (0.001)
Gov. Exp., Growth in crises		0.067*** (0.025)	0.041*** (0.016)	0.017 (0.013)	0.018 (0.013)
Gov. Exp., Growth, Lag (1), Crisis		0.112*** (0.040)	0.055* (0.029)	0.026** (0.012)	0.026** (0.012)
Gov. Exp., Growth, Lag (2), Crisis		0.079** (0.038)	0.049 (0.034)	0.026*** (0.010)	0.026** (0.011)
Gov. Exp., Growth, Lag (3), Crisis		0.038** (0.018)	0.037 (0.026)	0.026*** (0.008)	0.026*** (0.007)
GDP, Lagged	-0.129 (0.088)	-1.500*** (0.330)	-0.852*** (0.234)	-0.511*** (0.127)	-0.478*** (0.149)
Openness	0.060 (0.052)	0.041 (0.048)	-0.030 (0.062)	0.002 (0.038)	0.001 (0.037)
Terms of trade, Growth			0.003 (0.008)	0.004 (0.007)	0.003 (0.007)
Macroeconomic instability			-0.101*** (0.031)	-0.105*** (0.016)	-0.105*** (0.016)
Investment rate				0.004*** (0.001)	0.004*** (0.001)
Agriculture share				-0.428** (0.179)	-0.425** (0.182)
Manufacture share				0.343 (0.246)	0.345 (0.258)
Real exchange rate, Growth				-0.001 (0.001)	-0.001 (0.001)
Population Growth				-0.014 (0.109)	-0.015 (0.109)
Observations	957	905	838	838	838
Number of countries	19	19	18	18	18
N	957	905	838	838	838
Groups	19	19	18	18	18
Max. Observations	69	69	69	69	69
Min. Observations	24	21	21	21	21
Chi squared	1664	6.328e+08	2.778e+10	1268	9.674e+09
Autocorr. (1)	-2.432	1.228	0.383	-2.162	-2.170
Autocorr. (2)	0.172	0.748	-0.799	-1.294	-1.160

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 9: Instrumental variables - First Step

VARIABLES	(1) Gov. Exp.	(2) Gov. Exp.	(3) Gov. Exp.
Instrument, Ln(G)	0.98*** (0.01)	0.96*** (0.01)	0.94*** (0.01)
Openness		0.29*** (0.04)	0.26*** (0.04)
Fixed exchange rate		0.01 (0.01)	0.00 (0.01)
Agriculture share		0.24 (0.16)	0.42*** (0.16)
Manufacture share		0.87*** (0.21)	0.81*** (0.21)
Macroeconomic instability		-0.02 (0.03)	-0.02 (0.03)
Population Growth rate		-0.51 (0.37)	-0.39 (0.37)
Real GDP, ln			0.12*** (0.02)
Observations	1314	1154	1154
Number of country_code	20	20	20
Obsertvations	1314	1154	1154
Countries	20	20	20
Observ. maximum	101	100	100
Observ. minimum	26	18	18
Observ. average	65.70	57.70	57.70
R^2 Overall	0.995	0.995	0.995
R^2 Within	0.987	0.986	0.987
R^2 Between	0.999	0.999	0.998

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 10: Duration of economic crises, Count model - FE-Poisson - Instrumented

	(1)	(2)	(3)	(4)	(5)
	Poisson	Poisson	Poisson	Poisson	Poisson
Real Gov. Exp., Instrumented, ln	-0.49*** (0.06)	-0.17* (0.09)	-0.11 (0.09)	-0.22** (0.09)	-0.29*** (0.09)
ln(G)*1(Fixed), Inst.			-0.25*** (0.06)		
ln(G)*1(Fixed/Open), Inst.				-0.13*** (0.03)	
ln(G)*debt, Instrumented					0.02*** (0.01)
Openness		-0.99*** (0.25)	-1.05*** (0.25)	-0.49* (0.26)	-1.17*** (0.34)
Fixed exchange rate		-0.37*** (0.11)	1.39*** (0.44)	-0.19* (0.11)	-0.62*** (0.13)
Agriculture share		14.77*** (1.22)	13.28*** (1.27)	13.21*** (1.27)	12.91*** (1.61)
Manufacture share		-7.62*** (1.54)	-7.74*** (1.58)	-10.25*** (1.61)	-7.71*** (1.98)
Macroeconomic instability		0.56*** (0.17)	0.48*** (0.17)	0.58*** (0.17)	-0.01 (0.19)
Population Growth rate		-2.18 (3.09)	-2.39 (3.11)	-1.39 (3.05)	0.29 (3.54)
Observations	1154	1154	1154	1154	645
Number of countries	20	20	20	20	20
log-l.	-1222	-1069	-1060	-1057	-800.4

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 11: Hurdle Model - Logit, Probability of an Economic Crisis - Instruments

VARIABLES	(1) All	(2) All	(3) All	(4) All
ln(G), Instrumented	0.02 (0.03)	-0.03*** (0.01)	-0.03*** (0.01)	-0.06*** (0.02)
ln(G)*1(Fixed/Open), Inst.			-0.00 (0.01)	
ln(G)*debt, Instrumented				0.06*** (0.01)
Openness		-0.06 (0.09)	-0.03 (0.11)	-0.71*** (0.19)
Fixed exchange rate		0.08** (0.04)	0.09** (0.05)	0.23*** (0.08)
Agriculture share		0.68*** (0.19)	0.66*** (0.19)	0.65* (0.36)
Manufacture share		0.40 (0.45)	0.38 (0.45)	0.09 (0.78)
Macroeconomic instability		0.70*** (0.11)	0.70*** (0.11)	0.98*** (0.18)
Population Growth rate		-2.85** (1.21)	-2.85** (1.20)	-1.28 (1.84)
Observations	1026	1026	1026	583
R^2	0.358	0.267	0.267	0.325
log-l.	-381.0	-435.1	-435.0	-252.1

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 12: Hurdle Model - Negative Binomial, Duration of Economic Crisis>0, Instrument

	(1)	(2)	(3)	(4)
ln(G), Inst.	-0.33*** (0.04)	-0.33*** (0.08)	-0.32*** (0.08)	-0.76*** (0.16)
ln(G)*1(Fixed/Open), Inst.			0.09* (0.05)	
ln(G)*debt, Inst.				0.08*** (0.02)
Openness		-0.31 (0.39)	-0.68 (0.46)	-4.03*** (1.25)
Fixed exchange rate		-0.53*** (0.20)	-0.68*** (0.23)	-1.51*** (0.40)
Agriculture share		4.88*** (1.15)	5.56*** (1.21)	12.23*** (2.73)
Manufacture share		8.31*** (1.67)	9.28*** (1.75)	17.04*** (3.89)
Macroeconomic instability		0.13 (0.27)	0.09 (0.27)	-0.65 (0.72)
Population Growth rate		-13.15** (6.55)	-11.97* (6.53)	-47.10*** (16.37)
Observations	289	289	289	203
R^2	0.126	0.150	0.152	0.166
log-l.	-606.6	-590.1	-588.6	-425.0

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 13: Hazard function, Probability of an ending the economic crisis - Instrument

VARIABLES	(1) Weibull	(2) Weibull	(3) Weibull
ln(G), Instrumented	0.22*** (0.07)	0.11 (0.12)	0.13 (0.13)
ln(G)*1(US output drop), Inst.			-0.07 (0.20)
ln(G)*1(Fixed/Open), Inst.			-0.08 (0.09)
Openness		0.12 (0.85)	0.47 (0.95)
Fixed exchange rate		-0.82** (0.42)	-0.71 (0.45)
Agriculture share		-2.75 (1.87)	-3.19 (1.96)
Manufacture share		-1.41 (3.61)	-1.64 (3.70)
Macroeconomic instability		-1.96** (0.87)	-1.93** (0.87)
Population Growth rate		-3.40 (10.03)	-2.99 (10.23)
Observations	378	378	378
log-l.	-60.10	-54.99	-54.59

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 14: Count Models - Different definitions of crisis

VARIABLES	(1) Positive drop	(2) 5% drop	(3) 10% drop	(4) Positive drop	(5) 5% drop	(6) 10% drop
Real Government Expenditure, ln	-0.518*** (0.064)	-0.911*** (0.131)	-1.504*** (0.191)			
Real Gov. Exp., Instrumented, ln				-0.158* (0.089)	-0.066 (0.185)	-0.794** (0.310)
Openness	-0.886*** (0.245)	-0.743** (0.344)	-1.731*** (0.483)	-0.957*** (0.245)	-0.810** (0.339)	-0.896* (0.509)
Fixed exchange rate	-0.224** (0.104)	-0.012 (0.161)	0.038 (0.231)	-0.349*** (0.107)	-0.148 (0.164)	-0.183 (0.226)
Agriculture share	14.952*** (1.154)	16.916*** (1.595)	13.591*** (2.174)	13.904*** (1.218)	15.068*** (1.686)	6.752*** (2.460)
Manufacture share	-4.377*** (1.421)	-1.188 (2.263)	-8.043** (3.559)	-7.287*** (1.522)	-8.927*** (2.276)	-23.326*** (3.663)
Macroeconomic instability	0.435*** (0.165)	0.517** (0.229)	0.321 (0.319)	0.569*** (0.165)	0.581** (0.229)	0.166 (0.320)
Population Growth rate	-0.713 (2.928)	-2.182 (4.554)	-11.348* (5.840)	-2.993 (3.068)	-4.812 (4.766)	-14.861*** (5.602)
Observations	1163	1163	1163	1154	1154	1154
Number of countries	20	20	20	20	20	20
log-l.	-1224	-774.3	-460.7	-1189	-754.7	-431.9

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 15: Logit - Probability of Crisis - Different definitions of crisis

VARIABLES	(1) Positive drop	(2) 5% drop	(3) 10% drop	(4) Positive drop	(5) 5% drop	(6) 10% drop
Real Government Expenditure, ln	-0.04*** (0.01)	-0.03*** (0.01)	-0.02*** (0.01)			
Real Gov. Exp., Instrumented, ln				-0.03*** (0.01)	-0.03*** (0.01)	-0.01** (0.01)
Openness	-0.08 (0.09)	0.04 (0.07)	0.09* (0.05)	-0.06 (0.09)	0.05 (0.07)	0.10* (0.06)
Fixed exchange rate	0.09** (0.04)	0.05 (0.03)	0.04 (0.03)	0.09** (0.04)	0.05 (0.04)	0.05 (0.03)
Agriculture share		0.67*** (0.14)	0.73*** (0.13)	0.69*** (0.19)	0.77*** (0.15)	0.79*** (0.13)
Manufacture share		0.37 (0.35)	0.76*** (0.29)	0.40 (0.45)	0.29 (0.36)	0.72** (0.30)
Macroeconomic instability		0.44*** (0.07)	0.25*** (0.05)	0.70*** (0.11)	0.45*** (0.08)	0.26*** (0.05)
Population Growth rate	-2.77** (1.19)	-1.73** (0.87)	-1.50* (0.77)	-2.88** (1.21)	-2.00** (0.90)	-1.85** (0.80)
Observations	1052	880	679	1026	855	660
R^2	0.277	0.283	0.253	0.267	0.277	0.250
log-l.	-441.4	-305.5	-203.9	-435.1	-300.1	-199.8
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Table 16: Negative Binomial - Different definitions of crisis

VARIABLES	(1) Positive drop	(2) 5% drop	(3) 10% drop	(4) Positive drop	(5) 5% drop	(6) 10% drop
Real Government Expenditure, ln	-0.22*** (0.05)	-0.15** (0.06)	-0.23*** (0.08)			
Real Gov. Exp., Instrumented, ln				-0.24*** (0.05)	-0.21*** (0.07)	-0.37*** (0.09)
Openness	0.05 (0.29)	0.80*** (0.31)	0.80*** (0.28)	-0.21 (0.28)	0.67** (0.30)	0.47 (0.29)
Fixed exchange rate	-0.31** (0.15)	-0.11 (0.17)	0.21 (0.21)	-0.37*** (0.14)	-0.19 (0.17)	0.00 (0.21)
Agriculture share	2.76*** (0.81)	4.42*** (0.93)	4.58*** (1.09)	3.38*** (0.81)	3.91*** (0.94)	3.59*** (1.20)
Manufacture share	5.26*** (1.46)	9.45*** (1.64)	10.29*** (1.71)	5.75*** (1.37)	9.38*** (1.53)	10.81*** (1.66)
Macroeconomic instability	0.11 (0.25)	-0.02 (0.26)	0.03 (0.29)	0.08 (0.24)	-0.02 (0.25)	0.04 (0.30)
Population Growth rate	-5.63 (4.88)	0.90 (5.27)	-1.61 (4.38)	-9.15* (4.78)	-4.07 (5.38)	-4.88 (4.88)
Observations	298	169	96	289	165	94
R^2	0.133	0.169	0.250	0.150	0.177	0.277
log-l.	-621.8	-342.9	-194.3	-590.0	-329.9	-182.4
Standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						

Table 17: Impact of Fiscal Policy on the Intensity of the Crisis

VARIABLES	(1) Pos. drop	(2) Pos. drop	(3) 5% drop	(4) 5% drop	(5) 10% drop	(6) 10% drop
Gov. Exp., Growth rate	-0.003 (0.005)	-0.003 (0.002)	-0.001 (0.004)	-0.003* (0.002)	-0.001 (0.004)	-0.001 (0.002)
Gov. Exp., Growth, Lag (1)	-0.006* (0.004)	-0.009*** (0.002)	-0.005* (0.003)	-0.007*** (0.002)	-0.004 (0.003)	-0.006** (0.003)
Gov. Exp., Growth, Lag (2)	-0.003 (0.005)	-0.003* (0.002)	-0.003 (0.005)	-0.002 (0.002)	-0.002 (0.005)	-0.001 (0.003)
Gov. Exp., Growth, Lag (3)	-0.002 (0.003)	-0.005*** (0.001)	-0.002 (0.003)	-0.004** (0.002)	-0.001 (0.003)	-0.004* (0.002)
Gov. Exp., Growth, Crisis	0.041*** (0.016)	0.018 (0.014)				
Gov. Exp., Growth, Lag (1), Crisis	0.055* (0.029)	0.028** (0.013)				
Gov. Exp., Growth, Lag (2), Crisis	0.049 (0.034)	0.029** (0.012)				
Gov. Exp., Growth, Lag (3), Crisis	0.037 (0.026)	0.029*** (0.009)				
Gov. Exp., Growth, Crisis, 5% drop			0.065** (0.028)	0.027 (0.018)		
Gov. Exp., Growth, Lag (1), Crisis, 5% drop			0.083** (0.040)	0.030* (0.018)		
Gov. Exp., Growth, Lag (2), Crisis, 5% drop			0.065 (0.044)	0.030** (0.014)		
Gov. Exp., Growth, Lag (3), Crisis, 5% drop			0.046 (0.036)	0.031** (0.014)		
Gov. Exp., Growth, Crisis, 10% drop					0.057* (0.029)	0.030 (0.021)
Gov. Exp., Growth, Lag (1), Crisis, 10% drop					0.067* (0.040)	0.017 (0.024)
Gov. Exp., Growth, Lag (2), Crisis, 10% drop					0.054 (0.044)	0.030 (0.024)
Gov. Exp., Growth, Lag (3), Crisis, 10% drop					0.040 (0.035)	0.029** (0.012)
GDP, Lagged	-0.852*** (0.234)	-0.347** (0.154)	-0.965*** (0.272)	-0.374* (0.215)	-0.957*** (0.254)	-0.370* (0.204)
Macroeconomic instability	-0.101*** (0.031)	-0.110*** (0.015)	-0.097*** (0.032)	-0.122*** (0.016)	-0.106*** (0.033)	-0.119*** (0.019)
Investment rate	0.005*** (0.001)	0.004*** (0.000)	0.005*** (0.001)	0.004*** (0.000)	0.005*** (0.001)	0.004*** (0.000)
Agriculture share	-0.255 (0.309)	-0.369* (0.192)	-0.242 (0.314)	-0.361* (0.205)	-0.241 (0.335)	-0.367 (0.232)
Manufacture share	0.280 (0.283)	0.326 (0.235)	0.296 (0.293)	0.293 (0.226)	0.298 (0.293)	0.243 (0.202)
Observations	838	838	838	838	838	838
Number of countries	18	18	18	18	18	18
Max. Observations	69	69	69	69	69	69
Min. Observations	21	21	21	21	21	21
Chi squared	2.778e+10	875.8	2.969e+08	146.1	2.134e+08	213.2
Autocorr. (1)	0.383	47 -2.147	0.543	-2.307	0.481	-2.092
Autocorr. (2)	-0.799	-0.965	-0.770	-0.701	-0.732	-1.025

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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