Apocalypse Now, Apocalypse When?
Economic Growth and Structural Breaks in Argentina (1886-2003)*

Nauro F. Campos
Brunel University London, ETH Zurich and IZA-Bonn
nauro.campos@brunel.ac.uk

Menelaos G. Karanasos
Brunel University London
menelaos.karanasos@brunel.ac.uk

Michail Karoglou
Aston University
m.karoglou@aston.ac.uk

Panagiotis Koutroumpis
Queen Mary University London
p.koutroumpis@qmul.ac.uk

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Corresponding author: Professor Menelaos Karanasos, Department of Economics and Finance, Brunel University London, UB3 3PH, UK; email: menelaos.karanasos@brunel.ac.uk, tel: +44(0)1895265284.

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1. Introduction

It is a well-known fact that Argentina is the only country in the world that was developed in 1900 and developing in 2000. From a long-run economic growth perspective, Argentina is truly unique. Per capita GDP levels and growth rates in Argentina (and nowhere else) declined over 1900-2000 vis-à-vis countries that were at similar levels of economic development in 1900. As a consequence, a rich debate ensued on the possible underlying causes and timing of such a debacle.

The debate on the timing of the relative decline of Argentina is intrinsically linked to the debate on its underlying causes. Taylor illustrates this point perfectly by asking 'Did Argentine economic decline begin with the First World War – an early retardation hypothesis that could implicate the prevailing liberal policy regime which adhered to openness in trade and maintained an outward orientation from 1913 to 1929? Or, conversely, did retardation begin with the Great Depression, a late-retardation hypothesis that could implicate the inward-looking import-substitution policies of populist and nationalist governments in the thirties, forties and fifties?' (1994, pp. 1-2).

The objective of this paper is to offer a comprehensive and systematic assessment of the timing of the Argentine debacle. In this paper we put forward such an econometric assessment by identifying structural breaks in GDP growth in Argentina since the 1880s. More specifically, we use an extensive battery of state-of-the-art parametric and non-parametric structural break tests on a dozen annual GDP growth series to identify the year(s) in which the Argentine relative decline may have started.

One may ask why so many tests and why so many different GDP series for Argentina? The reasons are simple. As far as the various structural breaks tests are concerned, here we want to complement the more classic approach that is embodied in the Chow and Bai-Perron (1998) frameworks. These frameworks focus on structural breaks in

the mean, while in many situations, breaks in the variance can also be of consequence.[1] In what follows we show that structural breaks are important in the mean of GDP growth rates in Argentina over the very long-run, but there are at least equally important structural breaks in the variance of those series and that these significantly contribute to the understanding of the Argentine debacle.

Regarding the various GDP series, we note that the United Nations system of National Accounts has existed only since the immediate post Second World War. Before the 1940s, GDP has to be estimated using various readily available components (such as imports and exports or government revenues). Hence, different series exist because they were constructed based on different components, periods, methodologies and deflators.[2] Due to the aforementioned data limitations before the 1940s we strongly believe that the use of many different series and the implementation of sophisticated techniques will help us determine a more accurate estimate of the timing of the Argentine debacle.

One last important caveat to be clarified at the outset is whether Argentina is actually the *only* country in the world that was developed in 1900 and developing in 2000. We claim this is the case. Maddison (2003) is arguably the most authoritative source for historical economic data series for data being comparable across countries. For year 1913, it reports per capita GDP data for 65 independent countries (bearing in mind that almost two-thirds of the countries that exist today were colonies at the time.) Argentina has the tenth largest per capita GDP, at precisely USD 3,797.[3] One concern is that other countries (chiefly Uruguay, but also to a lesser extent Chile) could be classified as 'developed' before World War I and, hence, liable to have undergone a similar rich-to-poor transition. According to Maddison's data, GDP per capita in Uruguay was about 10 per cent lower than Argentina's in 1913, and Chile's was substantially lower. Moreover, the gap between Argentina and Uruguay is not inconsiderable: In 1913 France, Austria and Germany had lower per capita

GDP than Argentina's but larger than Uruguay's. Whether a country is considered developed or developing is arbitrary. If one takes the upper quintile as the cut-off point (which would be somewhat similar to today's split share of developed and developing) then the line for 1913 would be drawn at France or Germany on the eve of the First World War, ranked numbers 12 and 14 respectively (out of 65). On this basis, Argentina is unique: it is indeed the only country that was developed before the First World War and is now developing.

This paper contributes to the vast literature on the causes of economic growth. Durlauf et al. (2005) and Acemoglu (2008) provide recent, authoritative surveys which suggest that there is dissatisfaction with the empirical growth literature, while Sen (2013) and Spolaore and Wacziarg (2013) argue that within-country focus and historical quantitative research, respectively, may help to address such dissatisfaction. This paper contributes by focusing on the country that is one of the most undisputed outliers, as opposed to following the more standard practice of studying the 'average' or median country. In this paper we (a) study only one individual country over a very long period of time, (b) use the economic history literature to guide the identification of potential dates and reasons for the Argentine decline, and (c) utilize an econometric methodology that has seldom been used in the empirical growth literature despite the fact that it makes it possible to contrast the effects of various competing explanations directly. Another benefit of this choice of econometric framework is that it helps to shed light on the relation between mean growth rates and their volatility. While Ramey and Ramey (1995) show that growth rates are adversely affected by their volatility, Grier and Tullock (1989) argue that larger standard deviations of growth rates are associated with larger mean rates. Most papers focusing on the growth-volatility relationship seldom assess the effects of the structural breaks and how this information may be helpful in getting at the relative importance of contrasting theories

by fully investigating structural breaks in both the mean and the variance.

The main findings of this paper are as follows. We detect one main structural break for a set of Argentinean GDP per capita growth series for the year 1918. This finding supports the early retardation hypothesis put forward by Taylor (1994, 1998). Yet a more nuanced picture emerges when we examine the ratio of Argentine GDP relative to other countries. Note the 1918 break is for the absolute per capita GDP series, not for the ratio of, say, Argentina's and the Western Offshoots or Western Europe series. For example, focusing on the ratio of per capita GDP in Argentina to per capita GDP in Western Europe, our estimation uncovers two structural breaks: one in 1914 and the other in 1948 (while the former supports the early retardation hypothesis, the latter is consistent with the explanations often associated with Conde, 2009). Relative to the Western Offshoots (United States, Canada, New Zealand and Australia), structural breaks are detected in years 1930 and 1947, with the former now supporting the 'late retardation hypothesis'. Finally, focusing on the ratio of per capita GDP in Argentina to per capita GDP in Latin America, 1948 once again emerges as the detected structural break.

In sum, considering both absolute and relative GDP growth series the main finding we offer is that of two significant structural breaks: one in year 1918 and the other in 1948.

The importance of these findings is that they shed further light on the debate on Argentina's unique decline. Previous research has offered a range of somewhat conflicting dates. As noted, disagreement is seldom about whether the debacle occurred and mostly about the when, and of course the why. Some argue that the decline started with the Great Depression (for example, Diaz-Alejandro, 1985), Conde (2009) associates its beginning with WWII, Taylor (1992) argues for a turning point around 1913, and Villarroya (2005) detects an even earlier structural break in year 1899 (section 2 below discusses these various viewpoints in detail). Previous research sometimes, but far from always, based these

proposed break dates on quantitative or econometric evidence. Our paper is the first to use a range of historical annual GDP series for Argentina and extensive structural break tests to provide a full assessment of this dimension of the debacle. Our results highlight the important role played by the choice of comparator groups. If it is the Western Offshoots that are focused on, the Great Crash of 1929 looms large, as the break is detected for year 1930. However, focusing on Western Europe, 1930 is not a detected break, but 1918 is, in this case, suggesting that the events surrounding the First World War played a major role. Therefore, our results allow for a more nuanced understanding that paves the way to a reconciliation of this set of highly conflicting viewpoints.

The paper is organized as follows. The next section reviews the debate about the timing of the Argentine debacle, that is, of its relative long-term collapse in terms of GDP growth. Section 3 presents the various different Argentine GDP series we collected and use in this paper. Section 4 introduces our econometric methodology and Section 5 discusses our main results. Section 6 concludes.

2. Apocalypse when?

The objective of this section is to take stock of the debate about the timing of the Argentine debacle, that is, of the relative long-term decline of its GDP growth rates. There is a large debate in economic history about the timing of this relative decline (Taylor 2014), with at least five views that differ in their identification of the precise year in which the decline started. These are: 1913, 1929, 1913-1929, 1945 and 1899. We now turn to each of these views.

The view that 1913 is the main structural break (that is, that it marks the beginning of the Argentine debacle) is represented by the early retardation hypothesis put forward by among others Taylor (1992). The reasoning is as follows: Argentina adopted a very

successful export-led growth strategy but it was heavily dependent on foreign markets, on foreign capital and on foreign labour. When the First World War starts in Europe in 1914, these flows are interrupted and Argentina suffers greatly. Foreign labour resumed after the War and export markets recovered to a lesser extent. There were, however, massive changes regarding foreign capital flows as the inter war years is the period in which the financial center of the world moves from London to New York. Another important element in this view of the debacle is the argument that by 1913 the agricultural frontier is starting to close down, with severe restrictions on the availability of high-quality agricultural land in the Pampas. This understanding also blames the relative decline of Argentina on the persistence of liberal policies in the period immediately following the First World War.

Diaz Alejandro is one of the main names associated with the notion that 1929 marks the beginning of the end for Argentina. The contrasts are starker than one would expect. The idea here is that the maintenance of liberal policies towards international trade, capital and labour after the First World War was actually a correct decision. This policy choice helped Argentina navigate the inter war years without any major noticeable relative decline in its international standing. This view proceeds by arguing that Argentina's *Belle Époque* does not end in 1913, but in 1930, the year in which a military coup puts an amalgam of conservative, agrarian, provincial and protectionist forces into power. This corresponds to a radical change in government policy, from extremely open to international trade and capital flows to a more closed stance. Diaz-Alejandro blames the Argentinean debacle on these post-1930 inward-looking policies. Spiller and Tommasi (2007) and Alston and Gallo (2010) also identify 1930 as the turning point, but blame the widespread use of corrupt methods to win political elections used by incumbent governments since, as one main factor in the debacle.

A third view is that offered by Taylor (1994). Although he argues that the Argentinean *Belle Époque* ends in 1913, he also notes that financial factors make the period

between 1913 and 1930 a very difficult one for Argentina as foreign capital dries up, and domestic savings are incapable of filling the gap. Taylor's argument is that this is due to a very low domestic savings rate, which can be explained by a combination of high dependency ratios and a liberal immigration policy. Taylor also attaches blame to the inward-looking policies after 1930 as these aggravated price disincentives that channeled funds away from investment and deliberately supported high relative prices of imported capital goods.

A fourth view we discuss is that of Villarroya (2005, 2007). This differs from all others by being the first to offer an econometric answer to the question of when exactly the Argentinean debacle started. Villarroya uses cointegration analysis and the Bai-Perron methodology to tackle this question. She shows that the Argentinean per capita GDP series 'becomes stationary when modeling its trend with a set of structural breaks fixed at 1913, 1929, and 1974' (Villarroya, 2005, p. 443). She also finds that (a) Argentina started to fall behind Australia in 1899 and behind Canada in 1896, (b) Argentina did catch up to Canada over certain periods before 1900, and (c) Argentina stopped catching up with the OECD countries in 1913. Below we try to improve upon these results mainly in two ways: (a) by directly estimating the years in which the structural breaks occur (instead of setting them ex ante), (b) by examining the ratios between Argentinean GDP and various comparator groups in a more robust way, by checking both the individual series and the ratios themselves, and (c) by using a battery of structural breaks tests that go beyond the Bai-Perron framework and its emphasis on breaks in the means, also to take into account the potential importance of breaks in the variances. This is also done using a uniquely comprehensive set of historical GDP series (so that we can evaluate the relative roles of methodology and underlying data series in identifying differences in break points.)

In summary, this important debate about Argentinean economic history has been

much less about whether a relative economic decline has indeed taken place and more about its timing. Differences in dating the relative decline are associated with different causal explanations. The views favoring 1913 and 1929 argue that these mark the exhaustion of the export-led growth that was so successful in Argentina at the turn of the last century. A third view is Taylor's, which can be interpreted as arguing for a double break in 1913 and 1929, and a fourth distinct view is Villarroya (2005), which places the start of the decline much earlier, in year 1899. Conde (2009) argues that the decline is well established and beyond debate after the end of the Second World War, but also that there are clear earlier signs of it, indeed as early as 1913. The earlier break identified for 1899 makes a lot of sense when we take into account that this is vis-à-vis the group of Western Offshoot countries, which were growing extremely rapidly at the turn of the century. The 1913 dating stresses the role of international integration (trade, capital flows and migration), the 1930 dating highlights some key domestic economic and political effects of the Great Depression, and the 1945 dating stresses the role of misguided populist political choices even more than misguided inward-looking economic policies. In light of this rich disparity of results and their attendant somewhat conflicting explanations, it is clear that a systematic assessment of structural breaks would be a welcome addition to this debate.

3. Data

One constraint hindering the identification of structural breaks in Argentina's economic history is reliable GDP data. A full set of national income account data for Argentina is only available from the mid-1930s. Previous researchers have tried to overcome this limitation by constructing proxy measures of economic activity for the earlier period. The quality of these constructs is, however, very uneven due to the lack and/or the very poor quality of output data for broad sectors of the economy. In particular, official output data in

agriculture, manufacturing, construction, and services only become available from 1900 onwards and, even then, with gaps (Aiolfi et al., 2011, p. 9).

Our paper tries to address these data limitations by substantially broadening the number of GDP variables from which one can derive valuable information on the Argentine debacle. The data were obtained from a number of papers and the compilation of both primary and secondary data sources. In most cases this resulted in new series being created; once combined with their counterparts from the later twentieth century, these series span the entire 1886-2003 period. Overall, we were able to put together a panel of nine individual GDP time series and three relative ones, which, as shown below, may provide an appropriate gauge of Argentine GDP growth. The Appendix provides a detailed discussion of measurement issues underlying the various series and the respective data sources.

Insofar as previous researchers tried to derive an aggregate measure of economic activity from averages of these production data (resorting to linear interpolation to fill gaps in some discontinuous annual series), the resulting indices are bound to be inaccurate. Della Paolera (1989) attempted to overcome these problems by backcasting Argentine GDP based on a handful of production and trade variables by means of linear OLS regressions (Della Paolera, 1989). In this paper we employ two Della Paolera series. The first one (DellapA) is taken from Della Paolera et al. (2003a) which is real GDP per capita at constant 1980 international prices. The second series (DellapB) has been employed in de la Escosura and Villarroya (2009). It is taken from Della Paolera et al. (2003b). They used real GDP per capita in current 1990 U.S. dollars. The next series (Bordo) is real GDP, used in Bordo et al. (2001). The fourth series (Maddison) is taken from Maddison (2003). We have used purchasing power parity adjusted GDP per capita expressed in 1995 US relative prices. The three relative series are also from Maddison (2003). There are the ratios of Argentina to (i)

Latin America (Maddison, LA), (ii) Western offshoots (Maddison, US), and (iii) Western Europe (Maddison, WE).

Aiolfi et al. (2011) point out that while the work of Maddison (2003) has made important strides in filling some gaps and making long-run data more easily accessible, important deficiencies remain. For most developing countries, Maddison's pre-World War II data is either provided only for benchmark years or compiled directly from secondary sources relying on annual data from a very limited set of macroeconomic variables and often using disparate methodologies to build up GDP estimates. As discussed in detail in Aiolfi et al. (2011) for Argentina, this procedure can generate biased measures. Aiolfi et al. (2011) address these data limitations by substantially broadening the number of variables from which one can derive information on the pace of aggregate economic activity. They took into account not only production or foreign trade variables, but also monetary and financial indicators that economic theory suggests should be correlated with economic cycles. Thus the next series (Catão) is a real GDP index (2000=100), used in Catão et al. (2009) and Aiolfi et al. (2011). Aiolfi et al. (2011) point out that backcasting missing GDP data with information extracted from a wide and consistent set of indicators allows them not only to expand the data range, but also to increase the precision of inter-period comparisons of business cycle behavior. They also emphasize that having such a measure of the evolution of economic fluctuations matters for issues related to the international transmission of real and financial shocks, the role of openness and international asset pricing (Aiolfi et al., 2011) and also also put forward predictions about volatility behavior.[4]

The sixth series (Kehoe) is another real GDP index (2000=100), used in Kehoe (2007). The next one (Kydland) is real GDP, in 1986 Argentinean pesos, used in Kydland and Zarazaga (2002/2007). In the next series (Moccero), real GDP was constructed by Moccero (2008). Finally, the ninth series (Prados) is real GDP per capita, in current 1990

U.S. dollars, used in de la Escosura and Villarroya (2009).

Figure 1 (below) plots these series over time and Appendix Table A.1 presents details, sources and the sample period for each series.

Using the remaining three Maddison series (Maddison LA, Maddison US, Maddison WE), we also construct a series of the relative output ratios of Argentina's GDP to each of these comparator groups. Figure 2 below shows these three relative output series over time.

Figure 1. Argentina's GDP growth series over the XXth Century

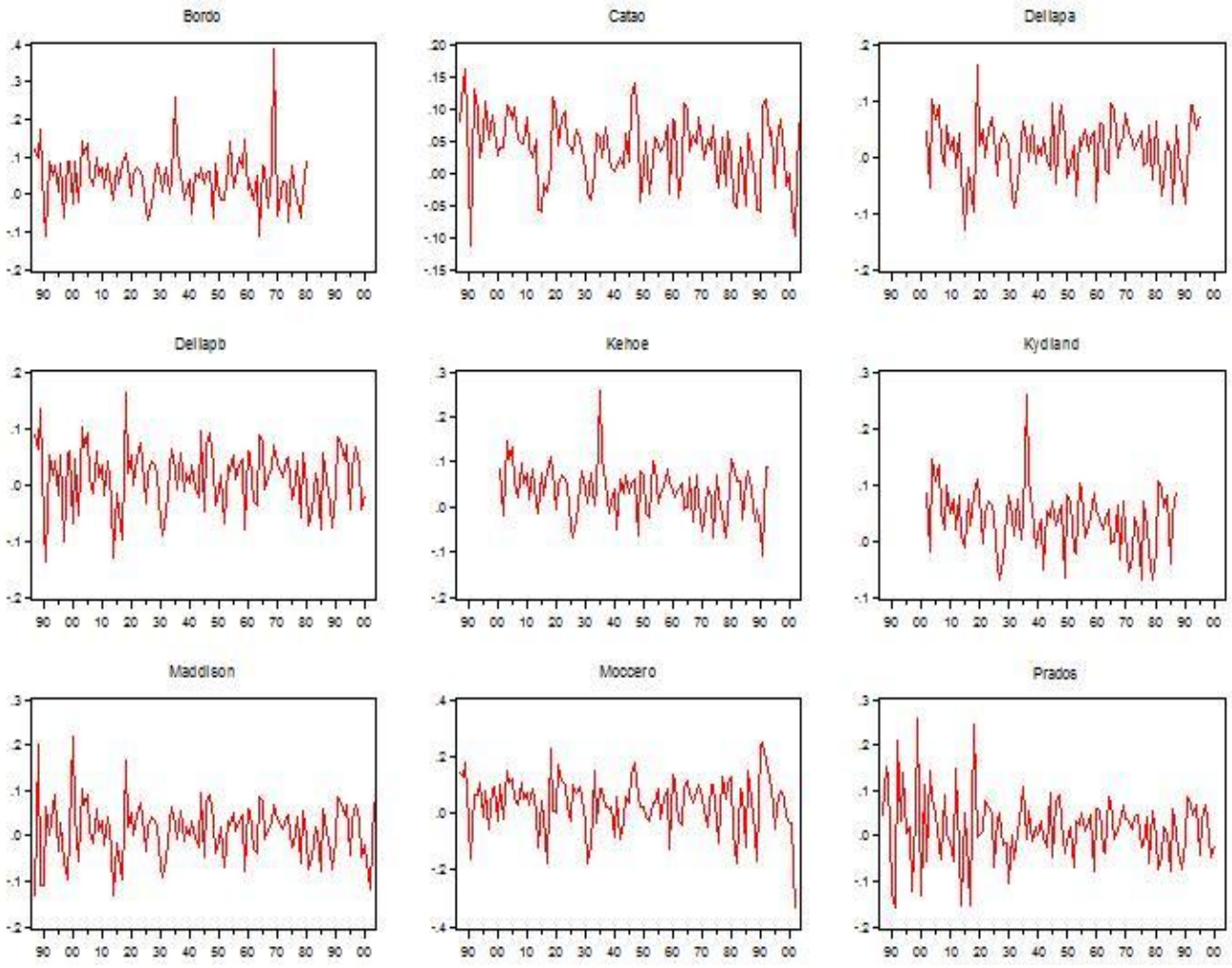
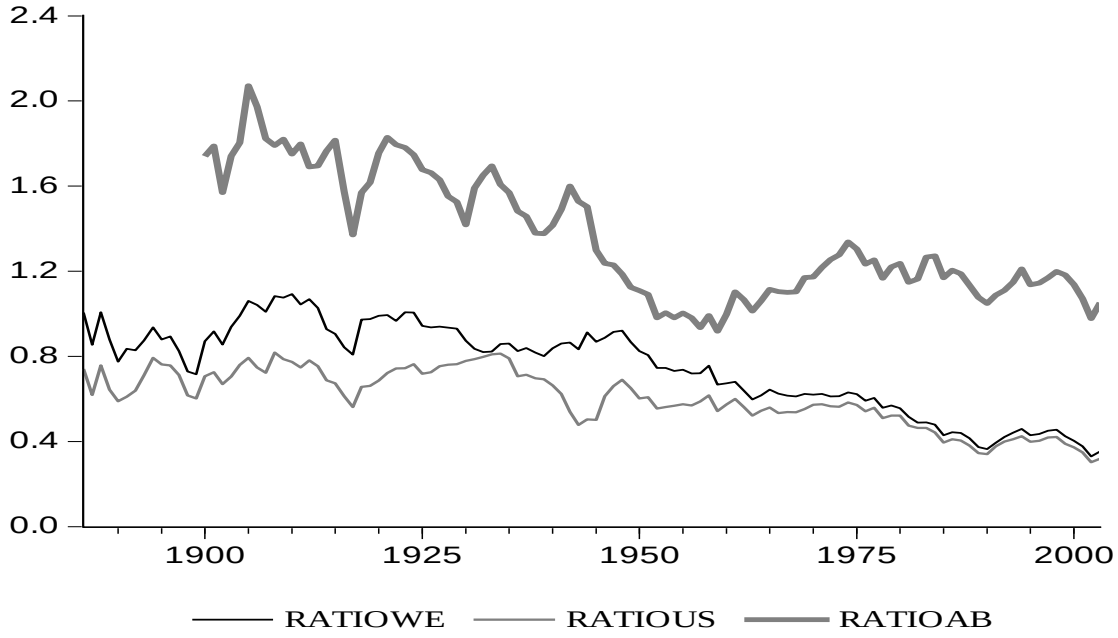


Figure 2. Argentina's GDP growth series
relative to Western Europe, US et al, and Latin America



4. Methodology

The objective of the section is to describe the statistical procedures we use to identify the regimes and/or segments of each series statistically and henceforth their underlying significant structural breaks (Hansen 2000, 2001). We divide the series into two types, which we call absolute and relative for convenience: (a) per capita GDP growth series for Argentina, and (b) the ratio of Argentine GDP to three different comparator groups (Western Europe, Western Offshoots, comprised of the USA, Canada, New Zealand and Australia, and the rest of Latin America). The methodology we use involves two main stages: first, we use a battery of parametric and non-parametric tests to identify or 'nominate' specific years for breakdates (note breakdate is the technical term used in the structural breaks literature) and, second, we use a set of statistical tests to 'award' the breakdate property to selected years.

The 'nominating breakdates' stage involves a specific procedure that can be based on one or more statistical test and/or on exogenous information to identify some dates as possible breakdates. In recent years, a number of statistical tests have been developed for this purpose, several of which are employed in this investigation. [5] Specifically, we use the following tests: (1) IT (Inclan and Tiao, 1994), (2) SAC_1, the first test of Sansó, Aragó, and Carrion (2004), (3) SAC_2^{BT}, SAC_2^{QS}, SAC_2^{VH} which are three versions the second test of Sansó, Aragó, and Carrion (2004) with the Bartlett kernel, the Quadratic Spectral kernel, and the Vector Autoregressive HAC or VARHAC kernel of Den Haan and Levin (1998) respectively, (4) KL_{BT}, KL_{QS}, $KL_{VH,}$ which correspond to the test refined by the Andreou and Ghysels (2002) version of the Kokoszka and Leipus (2000) test with the Bartlett kernel, the Quadratic Spectral kernel, and the VARHAC kernel respectively. Note we also report the results provided by the Bai-Perron test so as to provide us with a common yardstick.[6]

There are various reasons for selecting these tests to identify the structural changes in each of the Argentinean per capita GDP series presented above. First, although all of these tests are designed to detect structural changes in volatility dynamics, Karoglou (2006)[7] shows that many CUSUM-type tests (including all the above) do not discriminate between shifts in the mean and shifts in the variance. For present purposes, this is an important feature since all types of breaks need to be considered in order to determine if and to what extent the distributional properties change when moving from one regime to another. Figure A.1 in the Appendix plots the 'variances' (measured by the squared observations) of the nine absolute GDP series we use. A brief visual contrast of Figures 1 and A.1 suffices to suggest that frameworks focusing solely on breaks in the mean are likely to miss out on probably the most important parts of this story.

A second reason for selecting these CUSUM-type tests is that their properties for strongly dependent series have been extensively investigated (for example Andreou &

Ghysels, 2002; Sansó, Aragó, & Carrion, 2004; Karoglou, 2006) and there is evidence that they perform satisfactorily under the most common ARCH-type processes. Thus, even when there is a break in a conditionally heteroskedastic process, these tests can detect it, that is, the tests do not exhibit size distortions and they have considerable power, even when the assumption of within-segment homoskedasticity is relaxed in order to include ARCH-type structures. In fact, (3) and (4) have some plausible properties even in the presence of IGARCH effects. Nevertheless, Karoglou (2006) shows that the relative performance of each of the above tests depends on the underlying data generating process (DGP).[8] Consequently, since the true DGP is not known, it is preferable to use all of them and select the break date according to an appropriate set of rules.[9]

Another important advantage of this set of tests is that they can be used to identify multiple breaks in a series. This is achieved by incorporating the breaks in an iterative algorithm and applying these breaks to sub-samples of the series. In this paper, we propose the following algorithm (in six steps): in step 1 we calculate the test statistic under consideration using available data. In step 2, if the statistic is above the critical value, we split the particular sample into two parts at the date at which the value of a test statistic is maximised. In step 3 we repeat steps 1 and 2 for the first segment until no more (earlier) change-points are found. In step 4 we assign this point as an estimated change-point of the whole series. In step 5 we remove the observations that precede this point (that is those that constitute the first segment) and in step 6 we consider the remaining observations as the new sample and repeat steps 1 to 5 until no more change-points are found.

The above algorithm is implemented with each of the (single break date CUSUM-type) test statistics described above (that is IT, SAC_1, SAC_2^{BT}, SAC_2^{QS}, SAC_2^{VH}, KL_{BT}, KL_{QS}, KL_{VH}). The main feature of the algorithm (which differentiates it from a simple binary division procedure) is that it guarantees that the existing breaks are detected in a time-

orderly fashion. In other words, the first break proposed by the algorithm is also the earliest break in the series, the second break proposed is the second earliest break, and so forth. This is important when transitional periods exist, in which case, a simple binary division procedure will probably produce more breaks in the interim period. In the absence of transitional periods the two procedures produce the same breaks. In conclusion, the nominated break dates for each series are all those which have been detected by any of the aforementioned tests at 5 per cent significance level and any other that is identified exogenously.

The 'awarding breakdates' stage involves applying a certain procedure to select, from the nominated breakdates, those dates that define a segment. A commonly used chronology in economic history is to separate four periods, one covering the Gold Standard (until around 1913), a second covering the interwar years (until about 1945), a third one for the Bretton Woods period (until 1973), and then a fourth period covering the years since the early 1970s to today. For example, Bordo et al. (2001) focus on the crisis problem (they consider currency crises, banking crises, and twin crises) and analyze a data set spanning 120 years of financial history. They distinguish the Bretton Woods period (1945-1971), the interwar years (1919-1939), and the gold standard era (1880-1913). For each of the GDP growth series we use, we calculate average GDP growth for the three aforementioned periods: gold standard era, 1919-1971 and post-Bretton Woods. We find that average GDP growth for all nine series (described above) is higher in the gold standard era than in the 1919-1971 period and it decreases even more in the post-Bretton Woods period. In particular, in the gold standard era the average growth for the Catão, Moccero and Bordo series is 6.4, 5.9 and 5.4 per cent respectively. In the 1919-1971 period it declines to 4.1, 3.6 and 4.1 per cent respectively. In the post-Bretton Woods period it declines further to 1.5, 2.3 and 1.8 per cent respectively. Similarly, the average growth for the Prados and the two

Dellap series (A and B) in the gold standard era is 3.3, 2.6 and 1.8 per cent respectively. In the post-Bretton Woods period it falls to 0.5, 0.9 and 0.5 per cent respectively.

Kydland and Zarazaga (2002) point out that Argentina suffered a severe depression during the 1980s and that by the end of the 'lost decade', in 1990, Argentina's GDP per capita was a striking 33 per cent below trend. This is why the observed average growth during the period 1980-1989 is negative for all nine series: it ranges between -2.2 per cent (DellapB, Maddison and Prados) and -0.5 per cent (Catão). Kehoe (2007) points out that in 1998-2002, after the boom in 1990-1997, Argentina experienced what the government described as 'our great depression'. It began in 1998 and deepened after 2001. A violent deepening of the recession occurred in the last two quarters of 2001 and the first of 2002. For this period, average quarterly falls of de-seasonalised GDP with respect to the previous quarter of 5 per cent took place.

It is important to point out that despite how illuminating these dates are they remain arbitrary and would clearly benefit from statistical support. Hence, we propose the use of time series techniques to estimate these points in time. The econometric analysis makes use of recent developments in the detection of structural breaks in univariate time series and in comparisons across time series.

The procedure we use involves uniting contiguous nominated segments (that is segments that are defined by the nominated breakdates) unless one of the following conditions is satisfied: (i) the means of the contiguous segments are statistically different (as suggested by the t-test and the Satterthwaite-Welch t-test, which is more robust when the contiguous segments do not have the same variance) or (ii) the variances of the contiguous segments are statistically different (as suggested by the battery of tests which is described below). This testing procedure is repeated until no more segments can be united, that is, until no condition of the two above is satisfied for any pair of contiguous segments.

With regards to the battery of tests discussed above, these involve several procedures designed to test for the homogeneity of variances of different samples and in this case these samples are two contiguous segments. These tests constitute a different approach to the CUSUM-type tests described previously in that they test for the homogeneity of variances of distinct samples, that is, without encompassing the time-series dimension of the data.[10] They include the standard F-test, the Siegel-Tukey test with continuity correction (Siegel & Tukey, 1960; Sheskin, 2003), the adjusted Bartlett test (see Sokal & Rohlf, 1995; Judge et al., 1985), the Levene test (1960) and the Brown-Forsythe (1974) test. The F-test requires equal sample sizes and is sensitive to departures from normality. The Siegel-Tukey test is based on the assumption that the samples are independent and have the same median. The Bartlett test is also robust when the sample sizes are not equal, despite still being sensitive to departures from normality. Its adjusted version makes use of a correction factor for the critical values and the arcsine-square root transformation of the data to conform to the normality assumption. The Levene test is an alternative to the Bartlett test which is less sensitive to departures from normality. Finally, the Brown-Forsythe test is a modified Levene test (substituting the group mean by the group median) which is superior in terms of robustness (when scores are skewed or samples relatively small) and power.

5. Econometric results

For convenience of exposition, we divide the presentation of our results into absolute and relative series. We first report our findings regarding structural breaks for the individual Argentina GDP series, and then we report results using the same methodology and tests but referring to relative GDP series (in comparison to three selected groups of countries.)

5.1 Structural breaks in Argentina GDP growth series

Table A.2 in the Appendix shows the structural break results in the mean and/or in the variance of each series that have been detected by each test. From the table we can see that there is strong support for a single break, namely in 1918 (detected in Maddison, DellapB and Prados). The IT test also suggests one more break (1963 for Bordo). However, the corresponding series are substantially leptokurtic and the IT test exhibits size distortions for leptokurtic data. Therefore, since this break is not detected by any other test, and only detected by the IT at 5 per cent significance level, we discount it. Also notice that the results from the Bai-Perron test are more extensive and also supportive of these results in the sense of suggesting an important structural break around year 1918 for 6 out of these 9 series. However, and in light of the discussion at the end of section 3 above, we decide to also include 1980 as an additional possible breakdate for the nominating stage below.

Consequently, in the 'nominating breaks' stage we suggest we can split each series into three contiguous segments. The first segment starts at the beginning of the sample of each series and ends in 1917; the second segment starts in 1918 and ends in 1979; and the third segment starts in 1980 and ends at the end of the sample of each series. Note that the end of the first period (1917) coincides with the closing of the Gold Standard Era, while the beginning of the third and last period (1980) coincides with the end of the Bretton Woods Era (see Eichengreen, 2008) and includes the lost decade and the great depression.

Table A.3 in the Appendix presents a detailed overview of the properties of each nominated segment. An interesting point that can be made involves the p-values of the Jacque-Bera normality test. In almost all series, the first and last segments appear to be statistically normally distributed. However, in about half series, the second segment is significantly positively skewed and leptokurtic. This, in conjunction with the fact that no growth series exhibits any (linear) dependence in the mean (based on the correlograms and

the corresponding Q-statistics, not reported) suggests that each GDP series actually follows a normal random walk in each segment but with significantly different variances.

Figure A.2 in the Appendix depicts the sample mean and standard deviation of each series for each segment. Overall, most series seem to suggest that Segment 3 has the lowest mean. In other words, it appears that most series seem to agree that Argentina's GDP growth has been at its lowest levels after 1980. Three series (DellapA, DellapB and Maddison) suggest that Segment 2 has the highest mean. However, for all other series the average GDP growth in Segment 2 actually declined after 1918.

Table A.4 in the Appendix shows the results from comparing the means and variances of each pair of contiguous segments statistically for each series. We should note that this approach has clear parallels with the classical Chow framework. The results show an interesting pattern: in four growth series there is evidence supporting a statistically significant change in the mean of these series. In contrast, there is strong evidence that suggests significant changes in the variances. Therefore, the 'awarding breaks' stage confirms that the two nominated breaks can indeed be viewed as breaks for 3 series in the mean and for 5 series as breaks in the variance. In contrast, the evolution of the series volatility (as measured by the sample standard deviation) is less clear despite the fact that in most cases there is a substantial (and statistically significant) change of the standard deviation. In particular, two series (Kehoe and Kydland) suggest that volatility has been continuously increasing; two series (DellapA and Prados) suggest that volatility has been continuously decreasing; four series (DellapB, Maddison, Moccero, and Catão) suggest that it reached its minimum level in Segment 2; one (Bordo) that it reached its maximum level in Segment 2; three (Kehoe, Kydland, and Moccero) that Segment 3 has higher variability than Segment 1; and the remaining six the exact opposite. Therefore, it seems that Argentina's GDP growth volatility generally declined after 1918 and has remained roughly the same

since then.

There seems to be considerable discrepancies in inference when focusing on different GDP measures, which clearly suggests that the substantially different properties of the underlying series constitute a major challenge to the validity of any analysis that does not involve meticulousness in explaining how closely its findings are related to the construction process of each of these series.

5.2 Structural breaks in the ratio of Argentina to Europe, US and LAC GDP growth series

Table A.5 in the Appendix shows the structural changes in the mean and/or in the variance of the weighted GDP growth series of other countries that have been detected by each test. From the table we can derive one break for the Latin American (LA) economies, in 1948, two breaks for the Western offshoots (US), in 1930 and 1947, and two breaks for the Western European (WE) economies, in 1914 and 1948. Note that in the case of Western European economies, we do take into account the results of the IT test since we are dealing with leptokurtic series.

In order to analyse the relative properties of Argentina's GDP with respect to the other countries, we construct the ratios of Argentina's GDP (as measured by the MADDISON series) to the GDP of the other countries, which yields three ratio series. However, to study the statistical properties of these ratio series we need to take into account both the breaks that exist in Argentina's GDP series and the breaks that exist in the series of the other countries. Subsequently, we consider four segments in the ratio series of Argentina's GDP to the GDP of the Latin American countries (1900–1917, 1918–1947, 1948–1969, 1970–2003); five segments in the ratio series of Argentina's GDP to the GDP of the Western offshoots (1900–1917, 1918–1929, 1930–1946, 1947–1969, 1970–2003); and five segments in the ratio series of Argentina's GDP to the GDP of the Western European

countries (1900–1913, 1914–1917, 1918–1947, 1948–1969, 1970–2003). These are shown in Figures A.3, A.4 and A.5 of the Appendix for each one of the three ratios or relative GDP series.

Table A.6 of the Appendix presents the results from comparing the means and variances of each pair of contiguous segments for each ratio series statistically. The ratio series of Argentina's GDP to the Latin American (LA) economies shows statistically significant changes in the mean of the ratios whenever we move to a neighboring segment up to segment 3. The corresponding changes in the variance of the ratios are statistically significant only when moving from Segment 2 to Segment 3. In contrast, the ratio series of Argentina's GDP with the Western offshoots (US) economies show that the mean of the ratios changes only when we move from Segment 3 to Segment 4 and from Segment 4 to Segment 5, while the variance of the ratios is statistically different at each segment up to segment 4. The ratio series of Argentina's GDP with the Western European (WE) economies show changes in the mean of the series when moving from Segment 3 to Segment 4 and from Segment 4 to Segment 5 and very limited signs of changes in the variance of the ratios (mainly when moving from Segment 4 to Segment 5). Therefore, the 'awarding breakdates' stage in the ratio series justifies the selection of all segments apart from Segment 2 with the Western European economies – which is actually expected as it consists of only 3 observations.

5.3 Discussion

This paper provides a first systematic investigation of the timing of the Argentine debacle. We employ a vast array of econometric tests for structural breaks and a set of GDP growth series covering 1886-2003. Our main finding is that of support for two important structural breaks: one around year 1918 and one circa 1948.

We detect one main structural break for a set of various Argentinean GDP per capita

growth series for the year 1918. Our interpretation is that this supports the early retardation hypothesis put forward by Taylor (1994). Yet a much more nuanced picture emerges when we examine the ratio of Argentina's GDP to other countries (what we call the relative series). For instance, focusing on the ratio of per capita GDP in Argentina to that in Western Europe, our estimation uncovers two structural breaks: one in 1914 and the other in 1948. While the former supports the early retardation hypothesis, the latter is consistent with the important explanations offered by among others Conde (2009). With respect to the Western Offshoots countries (United States, Canada, New Zealand and Australia), structural breaks are detected for years 1930 and 1947, with the former now supporting the 'late retardation hypothesis'. Finally, focusing on the ratio of per capita GDP in Argentina to per capita GDP in Latin America, 1948 again emerges as the detected structural break.

The importance of these findings is two-fold. Firstly, they throw further light on the main milestones of Argentina's unique decline and, secondly, they help in pointing future research to the importance of financial and institutional development as serious candidate explanations for the Argentine debacle.

Previous research has offered a range of somewhat conflicting dates for the start of Argentina's relative decline. This disagreement is seldom about whether the debacle occurred and mostly about the when, and of course about its multiple possible underlying reasons. Some authors argue that the decline started with the Great Depression (for example, Diaz-Alejandro, 1985), Conde (2009) associates its beginning with WWII, Taylor (1992) argues for a turning point around 1913, and Villarroya (2005) claims year 1899 as the beginning of the decline. Our results can reconcile these views by highlighting the important role played by the choice of comparator groups and type of series (relative or absolute). If one focuses on the Western Offshoots, the Great Crash of 1929 looms large as the break is detected for year 1930. However, focusing on Western Europe, 1930 is not a

detected break, but 1918 in turn is, suggesting that the events surrounding the First World War played a major role instead. A similar conclusion can be reached by focusing on the absolute (not relative) Argentina GDP series. If more weight is given to comparisons to other New World countries (Latin America or the Western Offshoots) then the dating of WWII as the crucial breakdate can amass considerable support. Therefore, we would like to think our results allow for a deeper understanding and we believe they offer a way of reconciling this set of apparently highly conflicting findings.

In our view, our main finding is that of support for two significant structural breaks: one in year 1918 and the other in 1948. These breaks are consistent with explanations highlighting the slowdown of domestic financial development (which seems to have occurred principally after 1918) and the slowdown of institutional development, in general, and the onset of political populism (Peronism) and its attendant choice of inward-looking economic policies, which took place mostly after 1948[11]. These two explanations for the relative decline of Argentina have been shown by Campos et al. (2012) to enjoy substantial econometric support.

6. Conclusions

In general, this paper provides a rather different and novel approach to why Argentina is the only country in the world that was developed in 1900 and developing in 2000. Using an extensive set of Argentinean per capita GDP (constructed by key scholars in this field) and a comprehensive econometric assessment of the number and timing of structural changes that could potentially exist in each of them, we conclude that there are two key dates in Argentina's economic history (1918 and 1948) that need to be inspected closely in order to further our understanding of the Argentine debacle.

The importance of establishing structural breaks in 1918 and 1948 is the possibility of

thinking about the Argentina debacle in terms of financial, institutional and political developments[12], candidate explanations that have not received as much attention so far as some other more popular or prominent alternatives (such as macroeconomic instability or trade openness).

These findings are of interest in themselves but they also raise a number of new questions that we believe may be useful in motivating future research. We highlight two suggestions. As far as the role of finance in the process of economic development is concerned, our finding supports a large body of previous research in that we also show a positive impact of financial development on growth in the long-run. We also suggest that institutional development and different forms of political instability affect growth through different channels over different time windows, making up for a strong and resilient effect that proves rather powerful vis-à-vis the benefits brought by financial development. Future research should throw light on whether these two reasons play different roles in different countries over the long-run. A second suggestion for future research is that the interrelationship between finance and institutions should be further studied. Future research will surely benefit from investigating more intricate causal chains. This will help further qualify our results in that it will allow us to assess the possibility that we find, say, that a factor 'only' has a secondary effect because the method is not capturing the possibility of indirect effects through other variables.

The objective of this paper was to carry out a comprehensive assessment of the dating of the debacle that has not been tried previously. We hope our results showing the salience of 1918 and 1948 and the related importance of finance and institutions contribute to discouraging mono-causal explanations and motivate future research that focuses on complex interactions and more nuanced inter-relationships among a full set variables that have been identified as competing explanations for the Argentine puzzle.

Notes

[1] For example, breaks in the variance are at the root of the debate on the declining volatility of US growth rates since the 1980s (e.g. McConnell & Perez-Quiros, 2000).

[2] Another reason is that some authors have combined two or more series into a new series. We discuss these differences in detail below in section 3 and in the data appendix. Note that we contacted all the authors involved in this debate and they have kindly shared their data with us so that this potential source of variation can be accounted for here.

[3] Maddison (2003) provides GDP and population data since at least 1800 for a large number of countries. There are nine countries with higher per capita GDP in 1913: Belgium, Denmark, the Netherlands, Switzerland, United Kingdom, Australia, New Zealand, Canada and the United States. France, Austria, Germany, Italy, Norway and Spain were all poorer than Argentina on the eve of the First World War.

[4] "Latin American volatility was high in the high openness regimes of the pre-1930 era, precisely during the formative years of key national institutions. It then dropped sharply during the four decades following the Great Depression. An apparent payoff of the inward-looking growth and highly interventionist policy regimes at a time of higher volatility in advanced countries. Cyclical instability in Latin America bounced back again in the 1970s and 1980s when these economies became again more open to international capital markets but then declined sharply since, amidst continuing financial and trade openness" (Aiolfi et al., 2011, p. 214).

[5] Although we avoid doing this in this paper, it is relatively trivial to condition on observables, that is, in the simplest case by nominating the 'official' or 'widely accepted' breakdates for each series.

[6] A technical appendix briefly discussing each of these tests is available upon request.

[7] This work generalised the results of Bos and Hoontrakul (2002), who refer to the IT test.

[8] For example, the IT is found to be the most sensitive to the existence of volatility breaks for independent and identically distributed data, but suffers severe size distortions for strongly dependent data or for non-mesokurtic distributions. In contrast, the KL and the SAC_2 variants do not exhibit size distortions in these cases but their power is smaller, while SAC_1 does not exhibit size distortions for non-mesokurtic data and, although it does for strongly dependent data, its power is higher than KL and SAC_2. Sansó, Aragó, and Carrion (2004) derive some theoretical results on the properties of IT, SAC_1, and SAC_2 for data generating processes with different levels of kurtosis while Andreou and Ghyssels (2002) provide some simulation evidence for IT and KL.

[9] For example, a selection rule could suggest that a breakpoint can be considered only if two tests have identified it; or a breakpoint can be considered only if the resulting segments contain more than 10 observations.

[10] Therefore, they provide the same value even if the observations of each segment are randomly ordered. In contrast, statistics that are based on sequential methods (such as the CUSUM tests) are influenced by the order of the observations.

[11] At this point it worth's mentioning that the econometric techniques employed in this paper could tell us the date that the decline of economic growth occurred, however this might be due to some other economic, social or political changes that happened some years before (for example 1948) that were only reflected in a systematic and long term way starting in 1948.

[12] For example in 1948 Argentina put forward a new constitution, the Supreme Court justices were impeached, and all these changes promoted attacks against different economic interests, which created divergent institutional path from the previous model of governance.

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Appendix

Figure A.1. Variances of Argentina's GDP growth series over the XXth Century

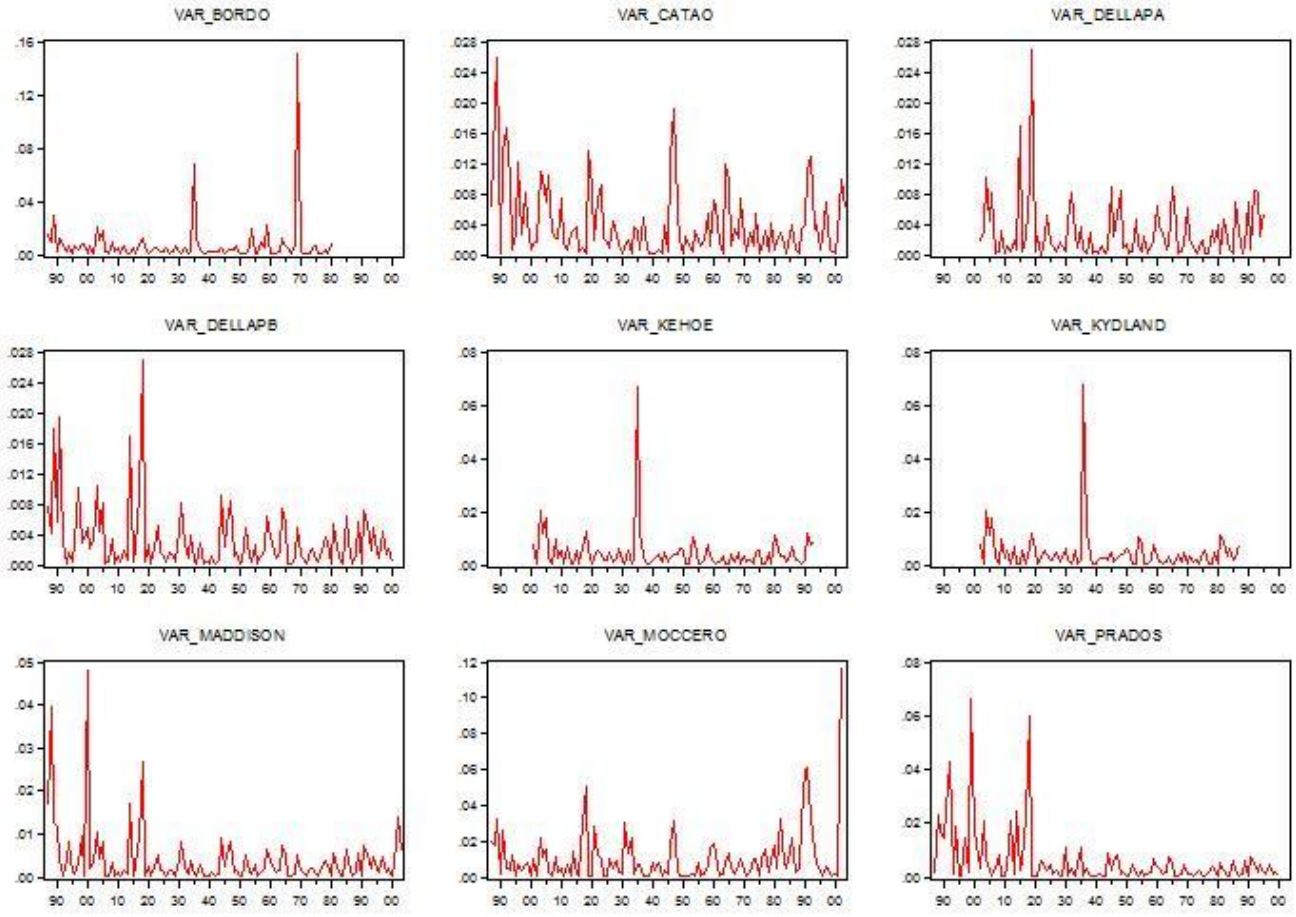

Figure A.2. Sample mean and standard deviation of each pre-determined segment for each of Argentina's GDP growth series

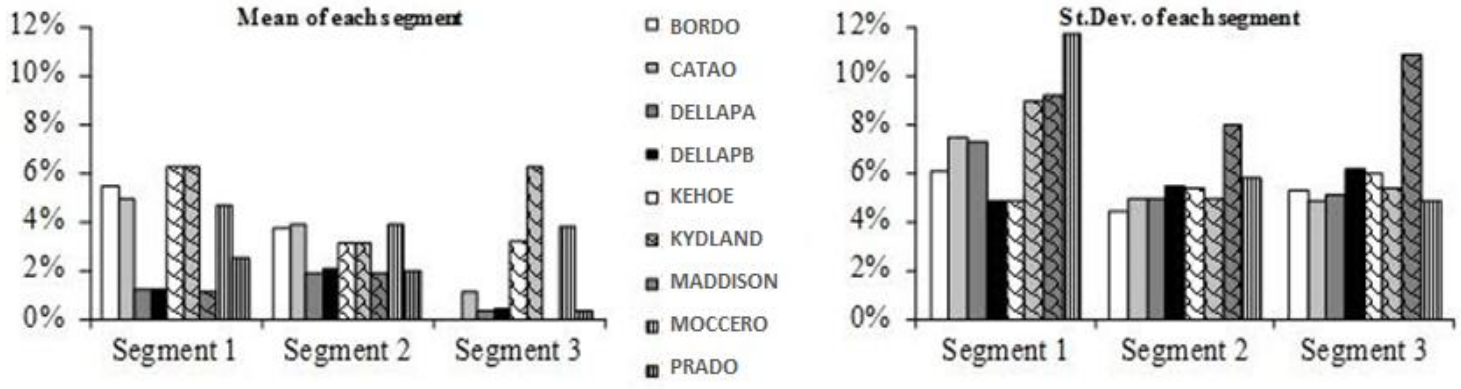

Figure A.3. Sample mean (left axis, bold line) and standard deviation (right axis, dashed line) of the ratio of Argentina's GDP relative to the (population weighted) GDP of Latin American economies

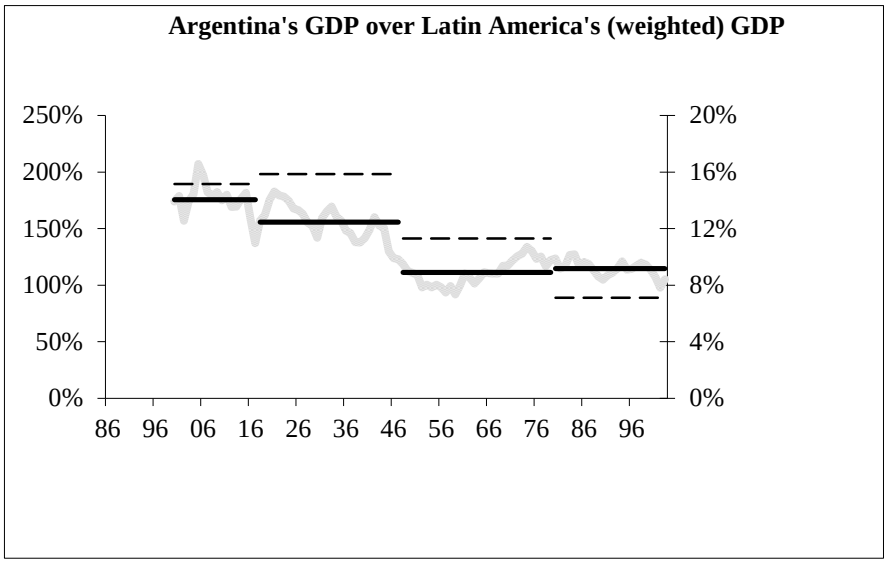

Figure A.4. Sample mean (left axis, bold line) and standard deviation (right axis, dashed line) of the ratio of Argentina's GDP relative to the (population weighted) GDP of Western Off-shoots countries

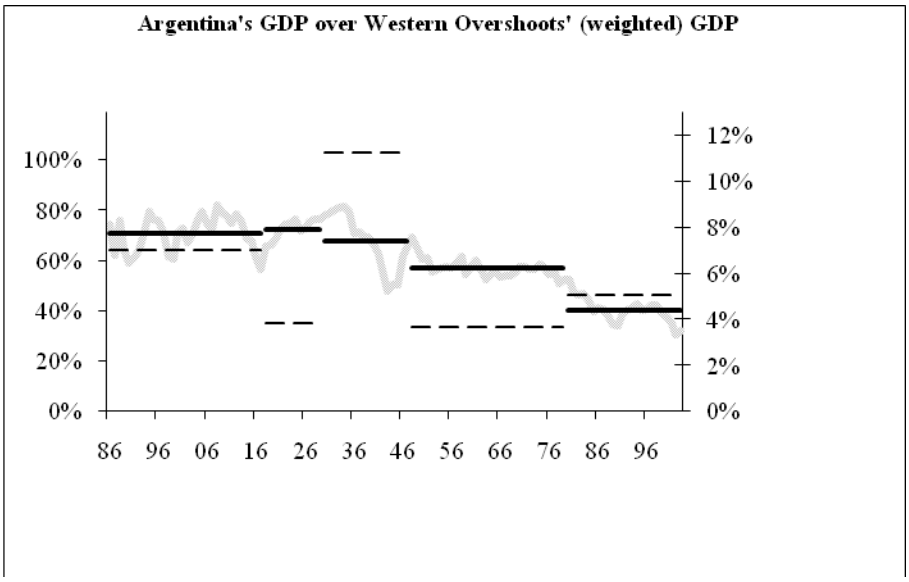

Figure A.5. Sample mean (left axis, bold line) and standard deviation (right axis, dashed line) of the ratio of Argentina's GDP relative to the (population weighted) GDP of Western European countries

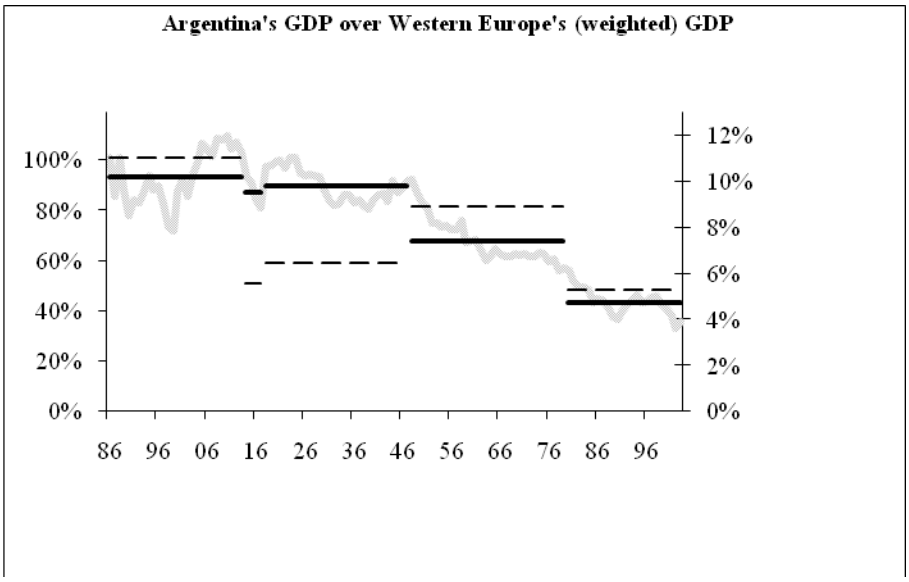

Table A1. Sample sizes

Series name:	Data span:	Found in:
Bordo	1896-2001	Bordo et al., 2000
Catão	1886-2003	Aiolfi, Catão and Timmermann, 2011
DellapA	1901-1994	Della Paolera, Taylor and Bózolli, 2003
DellapB	1896-2000	Della Paolera, Taylor and Bózolli, 2003
Kehoe	1900-2003	Kehoe, 2007
Kydland	1900-1997	Kydland and Zarazaga, 2002
Maddison	1886-2003	Maddison, 2003
Maddison, LA	1900-2003	Maddison, 2003
Maddison, US	1886-2003	Maddison, 2003
Maddison, WE	1886-2003	Maddison, 2003
Moccero	1896-2002	Moccero, 2008
Prados	1896-2000	Prados and Sanz-Villarroya, 2009

Table A.2: Structural breaks detected by each test at 1% and 5% (shaded) statistical level in various Argentina GDP growth series

Series	*Bai-Perron*	*IT*	*SAC_1*	*SAC_2 Bartlett*	*SAC_2 QS*	*SAC_2 VARHAC*	*KL Bartlett*	*KL QS*	*KL VARHAC*	*LMT*
BORDO	**1919**:1934;1959	1963	-	-	-	-	-	-	-	-
CATÃO	1913;**1918**;1974	-	-	-	-	-	-	-	-	-
DELLAPA	1912;**1917**;1924	-	-	-	-	-	-	-	-	-
DELLAPB	1913;**1918**;1925	1918	1918	1918	1918	1918	1918	1918	1918	1918
KEHOE	1924;1931;1936	-	-	-	-	-	-	-	-	-
KYDLAND	1925;1932;1937	-	-	-	-	-	-	-	-	-
MADDISON	1899;1912;**1917**	1918	1918	1918	1918	1918	1918	1918	1918	1918
MOCCERO	1980;1989;1994	-	-	-	-	-	-	-	-	-
PRADOS	1912;**1917**;1924	1918	1918	1918	1918	1918	1918	1918	1918	1918

Table A.3: Descriptive statistics of the three segments of each series

		BORDO	CATAO	DELLAPA	DELLAPB	KEHOE	KYNDLAND	MADDISON	MOCCERO	PRADO
Segment 1	*Mean*	5.46%	4.94%	1.14%	1.16%	6.25%	6.24%	1.07%	4.65%	2.51%
	Std. Dev.	6.32%	6.06%	7.43%	7.23%	4.80%	4.79%	8.94%	9.14%	11.67%
	Skewness	-0.64	-0.64	-0.23	0.05	-0.12	-0.12	0.41	-0.66	0.16
	Kurtosis	3.07	3.43	2.50	2.81	2.06	2.06	2.82	3.30	2.20
	Jarque-Bera	2.20	2.45	0.62	0.03	0.71	0.71	0.95	2.44	0.99
	Probability	33.3%	29.3%	73.2%	98.3%	70.1%	70.1%	62.3%	29.5%	61.1%
	Observations	32	32	32	18	18	18	32	32	32
Segment 2	*Mean*	3.72%	3.88%	1.87%	2.04%	3.05%	3.05%	1.87%	3.89%	1.96%
	Std. Dev.	7.62%	4.24%	4.75%	4.70%	5.57%	5.57%	4.75%	7.86%	5.47%
	Skewness	1.73	-0.05	-0.06	-0.04	0.75	0.76	-0.06	-0.37	0.77
	Kurtosis	9.46	2.57	3.45	3.54	6.02	6.08	3.45	3.10	6.22
	Jarque-Bera	138.39	0.50	0.57	0.76	29.29	30.47	0.57	1.47	32.79
	Probability	0.0%	77.7%	75.3%	68.3%	0.0%	0.0%	75.3%	47.9%	0.0%
	Observations	62	62	62	62	62	62	62	62	62
Segment 3	*Mean*	8.65%	1.12%	0.31%	0.43%	3.19%	6.18%	-0.13%	3.79%	0.31%
	Std. Dev.	0.07%	5.86%	5.24%	5.99%	6.54%	4.94%	5.82%	12.28%	5.24%
	Skewness	0.00	-0.01	-0.06	-0.04	-0.74	-1.37	-0.17	-0.10	-0.06
	Kurtosis	1.00	1.98	1.78	1.77	2.43	3.72	1.95	2.24	1.78
	Jarque-Bera	0.33	1.04	1.31	0.95	1.47	2.34	1.22	0.53	1.31
	Probability	84.6%	59.5%	51.9%	62.2%	47.9%	31.0%	54.4%	76.5%	51.9%
	Observations	2	24	21	15	14	7	24	21	21

Table A.4: Testing the equality of means and variances of contiguous segments

	testing the equality of means		*testing the equality of variances*				
	t-test	*Satterthwaite-Welch*	*F-test*	*Siegel-Tukey*	*Bartlett*	*Levene*	*Brown-Forsythe*
Bordo 1 & 2	1.11	1.18	1.23	1.38	1.45	1.76*	1.36
Bordo 2 & 3	-0.91	-5.08***	0.82	25.85***	1477.6***	1.22	6.25**
Catao 1 & 2	0.99	0.88	0.98	0.78	2.04**	1.07	5.5**
Catao 2 & 3	2.43**	2.11**	5.89**	4.44**	1.91*	1.94*	3.75*
DellapA 1 & 2	-0.58	-0.5	0.33	0.25	2.45***	2.86***	8.68***
DellapA 2 & 3	1.27	1.21	1.6	1.45	1.21	1.23	0.29
DellapB 1 & 2	-0.62	-0.49	0.38	0.24	2.36*	2.03**	5.56**
DellapB 2 & 3	1.13	0.97	1.27	0.94	1.62	1.67*	1.43
Kehoe 1 & 2	2.21**	2.4**	4.87**	5.75**	1.35	1.26	0.55
Kehoe 2 & 3	-0.09	-0.08	0.01	0.01	1.38	1.72*	0.57
Kydland 1 & 2	2.21**	2.4**	4.87**	5.76**	1.35	1.3	0.56
Kydland 2 & 3	-1.43	-1.57	2.03	2.46	1.27	1.42	0.14
Maddison 1 & 2	-0.57	-0.47	0.33	0.23	3.54***	3.12***	17.49***
Maddison 2 & 3	1.64	1.5	2.69	2.25	1.5	1.83*	1.43
Moccero 1 & 2	0.42	0.4	0.18	0.16	1.35	0.5	0.96
Moccero 2 & 3	0.04	0.03	0	0	2.44**	1.98**	6.7***
Prado 1 & 2	0.31	0.25	0.1	0.06	4.55***	4.07***	25.09***
Prado 2 & 3	1.21	1.23	1.46	1.52	1.09	0.85	0.06

Note: * 10%, ** 5% and *** 1% significance level.

Table A.5: Structural breaks detected by each test at 1% and 5% (shaded) statistical level in various ratios of Argentina GDP growth series

Series	*Bai-Perron*	*IT*	*SAC1*	*SAC2 Bartlett*	*SAC2 QS*	*SAC2 VARHAC*	*KL Bartlett*	*KL QS*	*KL VARHAC*	*LMT*
Latin America	1914 1940,1980	1948	1948	1948	1948	1948	1948	1948	1948	1948
Western Offshoots	1914	1930	1930	-	1930	-	-	1930	-	1930
	1940,1980	1947	1947	-	1947	-	-	1947	-	1947
Western Europe		1914	-	-	-	-	-	-	-	-
	1951,1958,1980	1948	-	-	-	-	-	-	-	-

Table A.6: Testing the equality of means and variances of contiguous segments

	testing the equality of means		*testing the equality of variances*				
	t-test	*Satterthwaite-Welch t-test*	*F-test*	*Siegel-Tukey*	*Bartlett*	*Levene*	*Brown-Forsythe*
Ratio with LA 1 & 2	4.28***	4.33***	1.09	1.16	0.04	0.71	0.69
Ratio with LA 2 & 3	12.76***	12.62***	1.97*	0.46	3.35*	2.83*	2.66
Ratio with LA 3 & 4	-1.35	-1.44	2.53**	2.18**	5.17**	6.19**	5.81**
Ratio with US 1 & 2	-0.89	-1.15	3.41***	1.94*	4.73**	6.48**	5.27**
Ratio with US 2 & 3	1.44	1.69	8.73***	2.48**	11.43***	11.04***	8.81***
Ratio with US 3 & 4	4.96***	3.92***	9.42***	4.25***	27.54***	28.36***	23.53***
Ratio with US 4 & 5	14.4***	13.76***	1.91	1.5	2.73*	2.13	2.19
Ratio with WE 1 & 2	1.09	1.78	3.94**	1.11	1.61	3.14*	3.1*
Ratio with WE 2 & 3	-0.78	-0.88	1.36	0.61	0.1	0.6	0.36
Ratio with WE 3 & 4	11.19***	11.31***	1.89*	0.39	2.9*	1.99	0.55
Ratio with WE 4 & 5	11.94***	12.81***	2.85***	1.58	6.49**	7.52***	3.16*

Note: * 10%, ** 5% and *** 1% significance level.

Data description

In this section we describe (in alphabetical order) the GDP series used in this paper and how they are constructed:

Bordo (Bordo et al., 2001)

The real GDP in Bordo et al. (2001) was constructed from three different sources: 1884-1913, Gerardo della Paollera (1989); 1914-1988, International Historical Statistics: The Americas, 1750-2000, (B. R. Mitchell, 2003); 1989-1997, International Financial Statistics (IFS) (1998) (see Bordo et al., 2001).

References:

— Bordo, M., Eichengreen, B., Klingebiel, D., & Martinez-Peria, M. S. (2001). Is the Crisis Problem Growing more Severe?. *Economic Policy*, 16(32), 51-82.
— International Financial Statistics Yearbooks various issues.
— Mitchell, B. R. (2003). *International Historical Statistics: The Americas, 1750-2000 5h Eds.*. London : Palgrave MacMillan.
— della Paolera, G. (1989). *How the Argentine Economy Performed During the International Gold Standard: A Reexamination*. Doctoral dissertation, University of Chicago, Department of Economics.

Catão (Aiolfi, Catão & Timmermann, 2011)

This real GDP index (2000=100) is used in Catão, Fostel and Kapur (2009). It is based on Aiolfi, Catão and Timmerman's (2011) estimates of the output gap superimposed onto the HP-filtered trend growth rate of output figures from Della Paolera, Taylor and Bózolli (2003b).

References:

— Aiolfi, M., Catão, L. A., & Timmermann, A. (2011). Common Factors in Latin America's Business Cycles. *Journal of Development Economics*, 95(2), 212-228.
— Catão, L. A., Fostel, A., & Kapur, S. (2009). Persistent Gaps and Default Traps. *Journal of Development Economics*, 89(2), 271-284.
— della Paolera, G., Taylor, A. M., & Bózolli, C. G. (2003b). Historical statistics. In della Paolera, G., & Taylor, A. M. (Eds.). *A New Economic History of Argentina*. Cambridge: Cambridge University Press, 376-385 (plus CD).

DellapA (della Paolera, Taylor 2003a)

This series is taken from Della Paolera and Taylor (2003a). They have used real GDP pc, Hofman estimate, at constant 1980 international prices.

Reference:

— della Paolera, G., & Taylor, A. M. (2003a). *A New Economic History of Argentina*. Cambridge: Cambridge University Press.

DellapB (Della Paolera, Taylor and Bózolli, 2003b)

This series has been employed in **de la Escosura** and Snaz-Villarroya (2009). It is taken from Della Paolera, Taylor and Bózolli (2003b). They have used real GDP pc, at current 1990 U.S. dollars.

References:

— della Paolera, G., Taylor, A. M., & Bózolli, C. G. (2003b). Historical statistics. In della Paolera, G., & Taylor, A. M. (Eds.). *A New Economic History of Argentina*. Cambridge: Cambridge University Press, 376-385 (plus CD).
— de la Escosura, L. P., & Villarroya, I. (2009). Contract Enforcement, Capital Accumulation,

and Argentina's Long-Run Decline. Cliometrica 3(1), 1-26.

Kehoe (Kehoe, 2007)

Kehoe (2007) used a real GDP index (2000=100). The description of the original data used in Kehoe (2007) is: O.1) GDP, Argentina (millions of 1990 Geary-Khamis Dollars); O.2) GDP, Argentina (1986 pesos); O.3) GDP Volume Index, Argentina (2000 = 100). The sources are: O.1) Maddison (2003), Levels of GDP; O.2) Kydland and Zarazaga (2002, 2007), originally from Meloni (1999); O.3) IFS, 21399BVPZF… The construction of the series is as follows: O.3 spliced with O.2 and O.1.

References:

— Kehoe, T. (2007). What Can We Learn From the 1998-2002 Depression in Argentina?. In Kehoe, T., & Prescott, E. C. (Eds.). *Great Depressions of the Twentieth Century*. Mineapolis: Federal Reserve Bank of Mineapolis, 373-402. Retreived from http://www.greatdepressionsbook.com/datasets.cfm
— Kydland, F., & Zarazaga, C. (2002). Argentina's Lost Decade. Review of Economic Dynamics, 5(1), 152-165.
— Kydland, F., & Zarazaga, C. (2007). Argentina's Lost Decade and Subsequent Recovery: Hits and Misses of the Neoclassical Growth Model. In Kehoe, T. & Prescott E. C. (eds). Great Depressions of the Twentieth Century, Minneapolis: Federal Reserve Bank of Minneapolis, 191-216.
— Maddison, A. (2003). The World Economy: Historical Statistics, Paris: OECD.
— Meloni, O. (1999). Crecimiento potencial y productividad en Argentina. Secretaría de Programación Económica y Regional, Buenos Aires.

Kydland (Kydland & Zarazaga, 2002)

The real GDP series, in 1986 pesos, used in Kydland and Zarazaga (2002, 2007) is from Meloni (1999). The description of the original data used in Kydland and Zarazaga (2002) is: O.1) Real GDP 1900-50 at market prices, million pesos moneda nacional, in 1950 prices; O.2) Real GDP 1950-70 at market prices, australes, 1960 prices; O.3) Real GDP 1970-80 at market prices, australes, 1970 prices; O.4) Real GDP 1980-97 at market prices, thousand pesos, 1986 prices. The sources are: O.1) ECLAC-CEPAL (1958). Data from this source are also posted on the following Website page of the Ministry of the Economy of Argentina: http://www.mecon.gov.ar/secpro/dir_cn/series_historicas/series_pbireal.xls; O.2) ECLAC-CEPAL (1988). Cuadro 1, p. 205; O.3) ECLAC-CEPAL (1988). Cuadro 1, p. 245; O.4) Heymann (2000). Cuadro 1, p. 156. As mentioned above the constructed series is real GDP at market prices, thousand pesos, 1986 prices. The construction of the series is as follows: Period 1980-97: series O.4. Period 1900-79: spliced by applying the annual growth rates of original series O.1, O.2, and O.3 to 1980 level in series O.4.

References:

— ECLAC-CEPAL (Economic Commission for Latin America-Comisión Económica para América Latina) (1958): "El desarrollo económico de la Argentina". Santiago de Chile. Chile.
— ECLAC-CEPAL (Economic Commission for Latin America-Comisión Económica para América Latina) (1988): "Estadísticas de corto plazo de la Argentina: cuentas nacionales, industria manufacturera y sector agropecuario pampeano." Documento de Trabajo 28.
— Heymann, D. (2000). Políticas de Reforma y Comportamiento Macroeconómico, in Heymann, D. and Kosacoff, B. (Eds.). Desempeño económico en un contexto de reformas,. Editorial Universitaria de Buenos Aires (EUDEBA), Buenos Aires, Argentina.
— Kydland, F., & Zarazaga, C. (2002). Argentina's Lost Decade. Review of Economic Dynamics, 5(1), 152-165.
— Kydland, F., & Zarazaga, C. (2007). Argentina's Lost Decade and Subsequent Recovery:

Hits and Misses of the Neoclassical Growth Model. In Kehoe, T. & Prescott E. C. (eds). Great Depressions of the Twentieth Century, Minneapolis: Federal Reserve Bank of Minneapolis, 191-216.
— Meloni, O. 1999. Crecimiento potencial y productividad en Argentina. Secretaría de Programación Económica y Regional, Buenos Aires

Maddison (Maddison, 2003)

This series is taken from Maddison (2003). We have used purchasing power parity adjusted GDP per capita expressed in 1995 US relative prices.
References:
— Maddison, A. (2003). The World Economy: Historical Statistics, Paris: OECD. Retrieved from http://www.ggdc.net/maddison/Historial_Statistics/BackgroundHistoricalStatistics_10-2009.pdf

Moccero (Moccero, 2008)

To construct nominal GDP, Moccero (2008) used the nominal National Accounts presented in IEERAL (1986) for the period 1914-1980. He then extended this series over the future using data from INDEC (nominal National Accounts, methodologies 1986 and 1993). The extension over the past (1885-1913) was based on information from Taylor (1998). Nominal GDP was deflated using the wholesale price index (in australes of 1985). In constructing the wholesale price index three data sources were mixed: Della Paolera and Taylor (2003a) for 1885-1900, Véganzonès and Winograd (1997) for 1901-1993, and the National Institute of Statistics and Censuses of Argentina (INDEC) for the remaining period.
References:
— della Paolera, G., & Taylor, A. M. (2003a). A New Economic History of Argentina. Cambridge: Cambridge University Press.
— IEERAL, (1986). Estadísticas de la Evolución Económica Argentina: 1913-1984. Revista Estudios 39.
— INDEC, (1993). Anuario Estadístico de la República Argentina. Buenos Aires, Instituto Nacional de Estadística y Censos.
— Moccero, D. N. (2008). The Intertemporal Approach to the Current Account: Evidence for Argentina. *Journal of Applied Economics,* 11(2), 327-353.
— Taylor, A. (1998). Argentina and the World Capital Market: Saving, Investment, and International Capital Mobility in the Twentieth Century. *Journal of Development Economics,* 57(1), 147–184.
— Véganzonès, M., & Winograd, C. 1997. L'Argentine au XXe Siécle : Chronique d'une croissance annoncé. OCDE publishing.

Prados (de la Escosura & Villarroya, 2009)

de la Escosura and Villarroya (2009) have used purchasing power parity adjusted GDP per capita estimated by Maddison (2003) expressed in 1990 International Dollars. For Argentina up to 1935 they used Cortes Conde GDP reconstruction (1997).
References:
— de la Escosura, L. P., & Villarroya, I. S. (2009). Contract Enforcement, Capital Accumulation, and Argentina's Long-Run Decline. *Cliometrica,* 3(1), 1-26.
— Cortes Conde, R. (1997). La Economía Argentina en el Largo Plazo (Siglos XIX y XX), Editorial Sudamericana, Universidad de San Andrés.
— Maddison, A. (2003). The World Economy: Historical Statistics, Paris: OECD.