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DISINFLATIONS IN LATIN AMERICA AND THE CARIBBEAN: A FREE LUNCH?

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Abstract

This paper challenges the conventional view according to which disinflations in Latin America —even from low and moderate peaks— have been carried out at no cost to output. After suggesting a new methodology that overcomes some of the shortcomings of the traditional methods used to measure the costs of disinflations, large sacrifice ratios are obtained for the 1970s and 80s. While the disinflation costs for the 90s remain negative, it is shown that an unusual combination of circumstances —i.e., factors related to capital inflows, structural reforms, and the peculiar recent inflation history— can explain this fortunate result.

Keywords: Inflation, Growth, Disinflation costs, Sacrifice Ratios, Latin America.

JEL clasificación: E00, E31, E32, E52, F43.

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DESINFLACIONES EN AMÉRICA LATINA Y EL CARIBE: ¿UN ALMUERZO GRATUITO?

MARC HOFSTETTER[*†]

Resumen

Este artículo controvierte la noción generalizada de que las desinflaciones en América Latina, aún desde picos inflacionarios bajos y moderados, no tuvieron efectos nocivos sobre la actividad económica. Después de sugerir una nueva metodología para medir costos desinflacionarios, el artículo muestra que los coeficientes de sacrificio de los 70s y 80s tienen una magnitud considerable. A pesar de que los costos desinflacionarios en la década de los 90s resultan negativos, se muestra que una combinación de eventos inusuales (ingreso masivo de capitales del resto del mundo, reformas estructurales y la reciente historia inflacionaria) explica este afortunado resultado.

Palabras clave: Inflación, costos de desinflación, coeficientes de sacrificio, crecimiento, América Latina.

Clasificación JEL: E00, E31, E32, E52, F43.

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"The evidence suggests that...such [moderate] inflations can be reduced only at a substantial short-term cost to growth." [9, Dornbusch, R. and S. Fischer (1993), p.1]

"There are little evident output costs of disinflation in the stabilization from moderate inflation".[6, Burton, D. and S. Fischer (1997), p.18]

1 Introduction

During the 1990s, after almost a quarter of a century enduring high inflation rates, Latin-America and the Caribbean (LAC) countries were finally able to pursue successful disinflationary processes. This disinflation was a remarkable accomplishment. Indeed, in 1990 at the peak of the inflation era, half of the nations had inflation rates above 40%. The average was 1152% and not a single country had annual price increases below 15%. In contrast to that, since 1997, more than half of the nations have had annual inflation rates in single digits, and the average has been below 15%, a combination of events not seen since 1971 (see Figure 1).

Driven by the infamous inflation history of the LAC countries during the 70s, 80s and early 90s, economists studied the stabilization attempts from *high* inflation rates, as well as the consequences of enduring high inflation. With respect to the latter, the evidence points at a negative relationship between high inflation and growth. In fact, the relationship between inflation and growth loses significance when data from countries with inflation rates above 40% are excluded (e.g., Bruno and Easterly, 1998). As for stabilization attempts from high inflation, the evidence shows that the output performance during stabilization is actually good (Hamann, 2001).

Nevertheless, under the new inflation scenario, the challenges faced by Central Banks in the LAC countries both currently and in the near future, are mainly attached to the handling of low and moderate inflation rates. Unfortunately, very little research has been devoted to studying the experiences of the region when dealing with inflation rates in this range. Furthermore, the few papers analyzing LAC disinflations from low and moderate peaks (e.g., Partow and Yuravlivker, 1998) find the puzzling result that they were costless in terms of output. The LAC countries seem to have

enjoyed a free lunch. This outcome challenges the conventional wisdom shared by most economists, i.e., "When economies reduce their rate of inflation, they almost always experience a period of high unemployment and low output" (Mankiw, 2004, p. 523). Indeed, costless disinflations are also inconsistent with the results obtained for OECD countries by Ball (1994), or more recently Zhang (2001) and Boschen and Weiss (2001) where substantial output costs are associated with disinflation.

This paper is aimed at filling part of the gap in our knowledge about disinflations from low and moderate peaks in the LAC countries. As such, the paper is mainly empirical. It focuses on identifying a sample of disinflations, quantifying the costs of bringing down the respective inflation rates, and understanding the determinants of those costs. In the process of achieving those goals, the paper also makes a contribution to the methodological literature as to how to measure the costs of disinflations. Of course, disentangling the puzzle of costless disinflation– crucial for LAC policy-makers– is also one of the main goals of this article.

The remainder of the paper is organized as follows: Section 2 identifies a sample of disinflations initiated form low and moderate peaks in LAC countries and studies the main stylized facts. Section 3 calculates the disinflation costs and proposes a new methodology for overcoming some of the shortcomings in the traditional methods used to calculate disinflation costs. Section 4 assesses which variables explain the disinflation costs, while section 5 explores why we did not observe growth slowdowns during disinflations in the 90s. Finally, part 6 concludes and discusses the implications for policymakers.

2 Disinflations in the LAC countries

2.1 Selection of Episodes I: The rule

The literature has followed two alternative approaches to selecting disinflations. The first one, the episodic approach, identifies a disinflation based on the announcement by economic authorities of

an *attempt* to disinflate, regardless of the policy's outcomes. The second alternative, the rules-based approach, identifies episodes based on the *actual* behavior of the inflation rate.[1] The former method is often criticized because the timing of the starting and ending dates is subjective. Additionally, since the episodes are identified based on the announcement of disinflationary plans, there is often controversy among researchers as to which episodes should actually be considered in the sample (e.g., should short-lived or non-credible programs be included?). That said, the main criticism of the rules-based perspective is that it ignores episodes where the economic authorities have tried to disinflate but have not succeeded. Given that our focus is on less well studied disinflations and that timing is crucial to the analysis, this paper follows the rules-based approach. From an interpretative standpoint then, it is important to keep in mind that failed disinflationary attempts are not registered in the sample.

Following the method proposed by Ball (1994), episodes are identified on a trend version of the inflation rate, constructed with the purpose of smoothing out short-run supply shocks. Specifically, trend inflation for year t is the average of the annualized inflation rates of the four quarters of that year, the last two quarters of year $t-1$, and the first two quarters of $t+1$.

We next limit the search of episodes by focusing on disinflations initiated from low and moderate peaks. What are low and moderate inflation rates? Dornbusch and Fischer (1993, updated by Burton and Fischer 1998) define *moderate* episodes as periods of at least 3 years with inflation in the 15-30% range. Fischer *et al.* (2002) regard the 25-50% range as *moderate to high*, whereas Bruno and Easterly (1998) define *inflation crisis* episodes as having annual inflations above 40% for two consecutive years. The consensus seems to be that peaks above 30% fall beyond the moderate range. Based on this consensus, and given the objective of studying disinflations in the range currently relevant for LAC policy-makers, this paper focuses on disinflations with a 30% peak limit.

Inflation peaks are labeled as period 0 and troughs as period T. The peaks (troughs) are years

[1] The first approach is followed by, among others, Kiguel and Leviatan (1992) and Calvo and Végh (1999); the second, by Ball (1994), Bruno and Easterly (1998), and Hamann (2001).

where annual inflation is above (below) the adjacent observations. A disinflation occurs if (i) the peak is 30% or less; (ii) the inflation rate drops by at least 1.5% points between the peak and the trough, and (iii) inflation falls 1/4 or more from its initial level (e.g., if the peak is 28%, we require inflation to drop to at least 21%).

The definition is similar to Ball's (1994). One main difference is that Ball only considers peaks below 20%. Nevertheless, given this paper's interest in studying moderate peaks, I have opted for a higher peak limit. Furthermore, Ball does not include requirement *iii.* Such an omission might be irrelevant with low peaks; with a 30% peak, however, a fall in inflation to 28.5% would be classified as a disinflationary episode. This might be the consequence of short-run supply shocks rather than reflecting an attempt by authorities to bring inflation down. Hence, to address this concern, condition *iii* is imposed.[2] This constraint plays an important role with higher inflation peaks, whereas for low peaks, *ii* is still the determinant factor.[3]

2.2 Selection of Episodes II: Application of the rule

The rule is applied to a sample of 18 LAC countries, covering the period 1973-2000. The countries –non-dollarized, market-driven economies with populations above 2 million– are: Argentina, Bolivia, Brazil, Costa Rica, Chile, Colombia, Dominican Republic, Guatemala, Honduras, Nicaragua, Jamaica, Peru, Uruguay, Paraguay, Venezuela, Ecuador, El Salvador and Mexico.[4] The application of the rule leads to a sample of 41 episodes. Three of them had not concluded by 2000 (Colombia 1997-, Chile 1990-, and Honduras 1995-), and are therefore discarded. A detailed historical research is performed on the remaining 38 with the goal of establishing whether the monetary authorities were indeed pursuing disinflationary policies. Based on this criteria, an additional four episodes are

[2] I have experimented with different numbers for this requirement. A 1/4 fall in inflation appears to be appropriate for separating price variations that are not related to traditional disinflations.

[3] Condition *(ii)* is only binding for inflation peaks below 6%. In our LAC sample, this requirement would not be necessary, as all episodes have peaks above 6%. Nontheless, I keep it in place, as it will become relevant in future disinflations.

[4] Recently, El Salvador and Ecuador dollarized their economies. Nevertheless, the disinflations identified for those countries occurred prior to dollarization. On the other hand, Haiti is not included in the sample, as the questionable reliability of the data makes it hard to analyze in pooled crossed-country samples.

discarded: (i) Dominican Republic, 1994-1998 (strong supply shocks, particularly weather shocks, are found to be driving the results); (ii) Venezuela, 1975-1977 (disinflation is found to be driven by temporary subsidies put in place after the oil boom); (iii) Paraguay, 1985-1987 (the smoothing technique joins two adjacent peaks, thus generating an artificial disinflation); and (iv) Guatemala, 1980-1982 (the methodology for measuring the CPI was changed at the time, thus triggering a mismeasurement of the inflation rate).

Figure 2 depicts the 34 remaining episodes. Note that not all the countries in the sample have disinflations in the range addressed by the paper. Table 1 reports the characteristics of each episode: the length in years, the rate of initial inflation, changes in the inflation rate and speed (i.e., points dropped per year).

2.3 A first look at the episodes

Table 2 presents the summary statistics of the most relevant aspects of average disinflations. On average, disinflations last close to three years, a number that matches the evidence from OECD countries reported in Ball (1994)– i.e. he finds that they last exactly 3 years. On average, inflation is cut by a bit more than half at a speed of 3.4 points per year (for episodes with peaks below 20%). This speed is well above the average speed of the OECD disinflations identified by Ball (1.8 points per year). Of course, the change in inflation is larger for the LAC countries –8.8 points for peaks below 20%, compared to the 4.9 points found in Ball's sample–. Table 2 also shows that the LAC disinflations of the 90s were longer and stronger than those of the 70s and 80s. The fact that the peaks are virtually identical suggests that the difference in strength is not explained by distinct starting points.

Figure 3 plots the average inflation across episodes for the periods (-2, 4), where period 0 corresponds to the inflation peak. Thus, for instance, the inflation rate for period 1 for that figure is obtained by averaging the inflation rates for period 1 across episodes. Furthermore, the graphs are

built with only two and three year long episodes. This allows us to focus on the "representative disinflation" (almost 3/4 of the LAC episodes last between two and years). The most prominent fact emerging from Figure 3 is that, during the 70s and 80s, the inflation rate does pick up considerably after episodes conclude, whereas during the 90s, the post-episode inflation rate appears to stabilize below the starting point. This reflects the gains in the sustainability of disinflations during the latter decade (e.g., Hofstetter, 2005).

Finally, Figure 4 takes a first look at the behavior of output during LAC disinflations. It depicts the average real GDP growth rate across two and three year long episodes. More specifically, the plot presents "de-meaned growth rates," derived by substracting from each episode (periods -2 to 4) respective average growth rates of periods -1 and -2. Such a strategy allows us to control for differences in the initial growth rates across episodes. A dashed line going through zero and 90% confidence intervals are also depicted.

As Figure 4 shows, during the 70s and the 80s, there was a significant reduction in the GDP growth rate corroborating the conventional wisdom that disinflations are contractionary. The slowdown in growth is large. At the trough, there is a 2.2% gap between the dashed line and the average growth rate over the episodes. Another important finding for the 70s and 80s, is that when inflation reached its peak (period 0), the GDP growth rate had already fallen. Given the relevance of this finding, I verify whether it extends to disinflations in G7 countries.[5] Figure 5, demonstrates that this pattern is also present in developed countries. We use this finding later in the paper, and label it "inflation inertia." In contrast to the GDP slowdown of the 70s and 80s, there is no evidence of a slowdown during the episodes of the 90s. An explanation for this surprising finding is provided in section 5.

[5] In order to do this, I apply the rule for selecting episodes to G7 nations, for the period 1973-2000, and identify 22 disinflations. The exact sample is available from the author upon request.

3 The Costs of Disinflations: The Sacrifice Ratio

The sacrifice ratio (SR) measures the output losses –expressed as percentage deviation from trend output– per inflation point. The crucial element in calculating SRs is the estimation of the output loss. This requires a measure of trend output, usually interpreted as the income that would have occurred had there not been a disinflation. Ball's (1994) method is the most popular one in the literature. He assumes that actual and trend output are equal at the time that disinflation starts (0), and that output returns to its trend level one year after the episode is over $(T+1)$. He also assumes that trend output grows log-linearly between the two points. The sacrifice ratio is then defined as the sum of the output losses –i.e., the sum of the differences between trend and actual output– divided by the change in inflation during the episode. Applying this strategy to OECD countries, Ball finds that the average SR is 1.4 when using quarterly data, and 0.8 when using annual data.

To my knowledge, there are no papers that focus on LAC SRs. A few studies have been done, however, that include episodes from that region in their samples. For example, in Partow and Yuravlivker's (1998) dataset, composed of disinflations from intermediate inflation rates, we find that more than half of the episodes in the LAC countries have negative SRs.[6] Of course, it is conceivable that some of their episodes are actually stabilizations from higher inflation rates, in which case, it is not surprising to find output expansions.[7] Nevertheless, the average SR of their LAC episodes with peaks below 30% is 0.07, a tiny number when compared to the OECD results.[8]

At the theoretical level, Zhang (2001) shows that Ball's method underestimates the SR if disinflations have long-lived effects. The idea is that if disinflationary measures affect output beyond the duration of the episode, one should not force trend output to catch-up with actual output by $T+1$. Zhang (2001) proposes a new methodology, wherein the trend output is assumed to grow

[6] Intermediate inflation is defined as at least three consecutive years of inflation in the 15-50% range.
[7] Bruno and Easterly (1998) and Hamann (2001) show that stabilizations from high inflation rates generate output expansions.
[8] Similar results are found in Junguito (1998) and Sanchez *et al* (2001).

at a constant rate during the disinflation, and is calculated as the growth of the HP filtered series of output at the episode's peak. The main point is that trend output is not required to catch-up with actual output by $T+1$, thus avoiding the underestimation of the costs if there are long-lived effects. Zhang (2001) obtains an average SR for the G7 countries of 2.5, and interprets the results as evidence that disinflations do have long-lived effects on output.

We highlighted that by period 0 the output slowdown had already started (what we called "inflation inertia"). This regularity is crucial, as SRs could be underestimated if we assume that trend and actual output are equal during period 0 (as Ball and Zhang do). The method can be easily corrected by lagging the equality between trend and actual output by 1 year. This timing issue is most likely not crucial with quarterly series; with annual data, however, the underestimation is potentially significant.

Based on the above discussion, we derive results using the following three methods: (i) Ball's method; (ii) Zhang's method (correcting for potential long-lived effects) and (iii) the long-lived effects and inflation inertia method (LL&II, which allows for output losses to begin during period 0 in combination with Zhang's method). Figure 6 illustrates how the different methods work under a scenario where both "inflation inertia" and long-lived effects are present. The estimated SRs using the three methods are reported in Table 3. As suggested by the GDP growth plots, the results for the 70s and 80s are very different from those for the 90s.

The 70s and 80s: The SRs are positive, indicating that the disinflations were costly. Not surprisingly, the cost is higher if we focus on peaks below 20%. Intuitively, at higher inflation rates, the role of nominal rigidities is eroded, thus reducing the output losses (Ball *et al,* 1988).[9] Moreover, if we move from Ball's method to Zhang's and then to the LL&II methods, we observe that the SRs increase. Put another way, allowing for long-lived effects and then for "inflation inertia" increases the SR. In fact, we obtain an average SR of 1.68 using the LL&II method. This result doubles the one

[9] Higher peaks tend to represent episodes with a larger fall in inflation, which mechanically should also reduce the SRs. Nevertheless, one can calculate the SR measured with proportional changes in inflation. Those results, available from the author upon request, show that it is not the mechanical aspect that explains why the SRs with higher peaks are smaller.

obtained using Ball's technique, confirming the suspicion that the traditional method underestimates disinflation costs. Once the methodology is adjusted to account for long-lived effects and inflation inertia, the SRs are substantial.

The 90s: The SRs are, on average, negative regardless of which method we employ in the estimations. Can policymakers count on future costless disinflations? We demonstrate in section 5 that this fortunate result can be explained by a peculiar and hard to repeat set of circumstances.

4 The Determinants of the SR

SRs vary across episodes. What determines these variations? Ball's (1994) is the first paper to systematically address this question. After Ball's paper, many authors followed similar strategies (e.g., Zhang 2001, Temple 2002, and Boschen and Weiss 2001). Speed, initial inflation and openness compose the set of explanatory variables commonly used in most papers in the relevant literature. I call these variables "traditional determinants," and test their explanatory power for our sample in the first part of this section. Other determinants potentially important when considering LAC countries –structural reforms, exchange rate regimes and inflation history, among others– are tested in the second part of this section.

4.1 The traditional determinants

Ball (1994) finds that greater speed reduces SRs, a result that Zhang (2001) proves to be robust to the inclusion of long-lived effects. The findings support the cold turkey approach to disinflations, i.e., that fast disinflations should be less costly. The idea is that a sharp policy change increases credibility and changes the mindset of price and wage setters and the way expectations are formed (Sargent, 1983). For our LAC sample, the results using Ball's method and LL&II method are presented in Table 4. For robustness purposes, several specifications of the model are reported.

Throughout the regressions, speed is a significant determinant of the SR. The sign of the coeffi-

cient is analogous to Ball's; hence, fast disinflations are associated with smaller SRs. The relation seems to be non-linear.

Initial inflation is often thought to capture a New Keynesian idea –higher inflation reduces nominal rigidities, thus weakening the inflation-output trade-off (Ball *et al.*, 1988). Nevertheless, empirically, this variable has only received weak support. That is also the case in Table 4 where, even though the sign is correct, the coefficient is insignificant.

As for openness, Romer (1993), using the time consistency theory of inflation, argues that Phillips curves in more open economies should be steeper (i.e. that the SR should be smaller). Despite its theoretical appeal, this idea is poorly substantiated in the empirical literature (Temple, 2002). In Table 4, openness –measured as the ratio of imports to GDP– is also mostly insignificant and here even has the wrong sign.

4.2 Some alternative determinants

Inflation history: In Ball (1994) and Boschen and Weiss (2001), nominal wage rigidities are a significant determinant of SRs; i.e., more flexible wage regimes are associated with lower SRs. Wage rigidity indices for our LAC sample do not exist. I will use inflation history as a proxy for nominal rigidities: Countries with recent high inflation develop mechanisms that allow prices and wages to adjust frequently. They therefore should exhibit lower nominal rigidities. Inflation history is here defined as an average of the (log) inflation rate of the 10 years preceding the episode. The expected sign of the coefficient is negative: The larger the inflation rate in the past, the smaller the nominal rigidities and the SRs.

Results: All results in this section are summarized in Table 5. Since in the previous subsection the only traditional determinant that proved mostly significant was speed, I drop the rest of them from the analysis. Additionally, Table 5 reports several alternative specifications in order to better assess the robustness of the results. As for inflation history, it has the expected sign and presents significant

coefficients in all regressions. Inflation histories characterized by high average rates decrease the output costs associated with disinflations.

Structural reforms: Since the mid 80s, the standard LAC development model based on protecting national markets and state intervention was replaced by policies seeking to improve efficiency, facilitate the operation of markets, and reduce the distorting effects of state intervention in economic activities (e.g., Lora, 2001). Structural reforms might impact the SR in a number of ways. (i) The trade liberalization component, characterized by reductions both in the tariff rates and their dispersion, might reduce inflation trough the impact on the domestic prices of imports. *Ceteris paribus*, this would reduce the SR. (ii) Other reforms could boost output. In particular, Escaith and Morley (2001) find that (only) tax reforms have significantly affected the growth performance in the LAC countries.

Note that although (ii) should not affect the *true* SR (i.e., the difference between trend and actual output caused by the disinflation), it could cause an underestimation of trend output; if so, tax reforms would show up as causing smaller SRs. To illustrate the point, suppose, as in Figure 7, that in period 0 a disinflation starts and reforms are introduced (the events do not need to be simultaneous). The latter will boost trend output. Actual output starts catching-up, but remains below the new trend during the disinflation episode, thus generating a positive true SR.[10] As the chart illustrates, the methodologies used to calculate the SR adjust slowly to changes in trend output. Indeed, the *estimated* trend output is below the actual trend, thus underestimating the SR. Using Zhang's method, the bias would be even larger. Interestingly, the results obtained for the SRs of the LAC countries during the 90s are consistent with the latter argument.

Lora (2001) and Morley *et al* (1999) have built a series of indices that measure the strength of reforms. For each category (in our case, trade and tax reforms), the indices go from 0 to 1, and increase with the depth of reforms (see Lora (2001) and Morley *et al* (1999), for measurement

[10] Consistent with the shape of trend and actual output in Figure 7, Lora and Panizza (2002) find that the effects of the reforms on growth were strong during the initial phases and then became diluted over time.

details). Here, I calculate the changes in the average index during the episode vis-a-vis the average of the four years preceding it. Larger outcomes in the variable imply bigger reforms. We therefore expect negative signs for the reform coefficients.

Results: Trade liberalization is insignificant in all regressions. Nevertheless, the tax reforms have a negative and statistically significant impact on the SRs, which is consistent with Escaith and Morley's results.[11]

Real exchange rate: Fischer (1988) shows that a real exchange rate appreciation typically reduces the SR through the favorable effect of cheaper imports on consumer prices. Note that this effect could be particularly important as far as explaining the results for the 90s, as the huge wave of capital inflows to the LAC countries during the first part of that decade appreciated many currencies in the region (Calvo *et al*, 1993). On the other hand, it could also be the case that the real exchange rate affects the behavior of output. The empirical evidence for the LAC countries concerning the effects of the RER on economic activity is mixed. Some authors (e.g., Rogers and Kamin, 1997) claim that real devaluations have led to economic contractions, while others find that it has had a positive impact on economic activity (e.g., Galindo *et al*, 2005). Nevertheless, notwithstanding the direction in which the real exchange rate affects economic activity, this channel should not impact the *true* SR– i.e., it should not affect the gap between trend and actual output caused by the disinflation.

To test the impact of the RER on SRs in the LAC countries, for each episode I calculate the log difference between the average real exchange rate *during* the episode (periods 0 to $T-1$), and the average real exchange rate *prior* to the disinflation (periods -2 to -1).[12] Negative (positive) numbers reflect appreciations (depreciations). The variable is pre-multiplied by the import to GDP ratio to control for different degrees of openness in the sample.[13]

[11] There is some evidence suggesting that tax reforms could coincide with periods of recovery from inflation crises (Tanzi, 2000)– i.e., there could be a spurious relation between SRs and tax reforms. Nevertheless, this evidence is more relevant for stabilizations from high inflation rates than for disinflations from low and moderate peaks. A good example of the latter is Colombia, maybe the best illustration of prolonged moderate inflation rates. During the last 20 years, the country underwent eight major tax reforms. The timing of the reforms coincided, indistinctively with periods of high and low growth, and rising and falling inflation.

[12] In a sense, this real exchange variable is lagged. This is consistent with models *a la* Ball (1999) or Mishkin and Savastano (2001). The results are similar if the definition is changed to a contemporaneous version.

[13] This is not essential. On its own, the real exchange rate variable yields very similar results.

Results: The sign of the coefficients in all of the regressions is positive– i.e., appreciations of the exchange rate are associated with smaller SRs, as predicted by Fischer's model. The result is significant for Ball's SRs, but less so when using the LL&II method.

Exchange Rate Regimes and Exchange Rate Based Stabilizations (ERBS): For openness to affect SRs through a channel *a la* Romer (1993), it is necessary to observe an appreciation of the exchange rate following a disinflationary shock. This appreciation will only occur, however, if the exchange rate regime is flexible– that is, all other things being equal, a more rigid regime should be associated with larger SRs, as the exchange rate appreciation channel becomes restricted. Using Reinhart and Rogoff's (2004) indices, I construct average exchange rate regime indices for each episode to test this idea. Since larger numbers represent more flexible regimes, the expected sign of the coefficient is negative.

On the other hand, Kiguel and Leviatan (1992) and Végh (1992), –while studying stabilizations initiated from *high* inflation rates– claimed that, during ERBS, output follows a boom-recession cycle– i.e., that initially the economy boomed, and it was only later that a recession occurred. Subsequent papers by Bruno and Easterly (1998) and Hamann (2001) showed that stabilizations initiated from high inflation rates generate output expansions independent of the nominal anchor used. Does the nominal anchor play a role in disinflations initiated from *low and moderate* peaks? To address the question, I use Reinhart and Rogoff's (2004) index of exchange rate regimes in order to build a dummy variable that takes the value of 1 if, during periods [–1,1], the exchange rate regime switches to a more fixed version. Such a change could be evidence of a disinflationary strategy based on the exchange rate.[14]

Results: Note that in several specifications, the regime and ERBD are not included simultaneously to make sure that their potential collinearity is not driving any of the conclusions. As for the

[14]This method might underestimate the number of ERBD, as it is possible for a country to remain in the same regime and yet persue a disinflationary strategy based on the exchange rate. For example, the monetary authorities could attempt an "ERB" disinflation by changing the slope of an exchange rate band. If the *de facto* exchange rate stays within the band and the band's width does not present an important change, such episodes would not be counted as a new regime in Reinhart and Rogoffs's method. The results should be viewed keeping this potential problem in mind.

regime, the sign of the coefficient is negative, suggesting that flexible regimes lead to smaller SRs. Nevertheless, its statistical significance is low. For the ERBD dummy, the coefficients in all of the regressions have a positive sign. If anything, it appears that ERB disinflations increase the SR. The variable is only significant when using Ball's method.

Other supply shocks? It is conceivable that the SRs are affected by supply shocks. For instance, Boschen and Weiss (2001) include oil shocks as an explanatory variable of SRs and find that increases in oil prices make disinflations more costly. I have tested the impact of oil shocks in our sample, but found that they are not even close to significant (not reported in the table).

5 The puzzle of the 90s

Why was it possible for the LAC countries to disinflate during the 90s without having to pay the cost of a growth slowdown? One hypothesis is that the explanatory variables of the SRs exhibited a peculiar behavior during the 90s. To test if this is plausible, I first report (in Table 6) the fitted SRs for the 90s and the earlier decades, based on the actual values of the explanatory variables for both periods. The results, based on the last two regressions of Table 5 –i.e., a model that excludes trade reforms on the grounds that this variable is not significant in any of the previous regressions– confirm that our empirical model does indeed predict negative SRs for the 90s.[15]

Next, in Table 7, I report the *changes* in the fitted SRs for the 90s, if each explanatory variable were to take the value it had during the 70s and 80s instead of its actual value during the 90s. Three variables exhibit positive changes –i.e., had they taken values during the 90s similar to those held during the earlier decades, the SRs would have been larger. In particular:

(i) Tax reforms: The results show that the impact of tax reforms alone (correcting for the underestimation of SRs) is enough to overturn the negative sign of the SRs.

[15] Those fitted values only make sense if there is no structural shift in the parameters of the model. I have performed several tests to verify if there is a structural change in the parameters of the model between the two periods. Results, available from the author upon request, show that the parameters are stable.

(ii) Real Exchange Rate: During the first half of the 1990s, a rapid recuperation of the capital inflows in the LAC countries was "accompanied by an appreciation in the real exchange rate" (Calvo *et al*, 1993). The results in Table 4 show that the appreciation of the real exchange rate during the 90s also is partly responsible for the negative SRs. Had this variable behaved as it did during the 70s and 80s, the average SRs for the 90s would have been between 0.16 and 0.23 larger.

(iii) Inflation history: The disinflations of the 90s started following a decade of very high inflation rates. In the previous section, we showed that a recent history of high inflation reduces nominal rigidities and allows for less costly disinflations. The numbers in Table 7 indicate that this effect is quantitatively relevant. Had the 90s been preceded by a decade of lower inflation (as was the case for the 70s and 80s) then the fitted SRs would be between 0.54 and 0.97 larger.

Finally, we note that the disinflations during the 90s were slower. Disinflations as fast as those during the 70s and 80s would have reduced the SRs even further. Regime related variables also increased SRs during the 90s compared to what they would have been under the regimes of the 70s and 80s.

6 Conclusions and Discussion

The challenges faced by Central Banks in the LAC countries, at present and in the near future, concern how best to handle low and moderate inflation rates. That said, very little is known about the past experiences of the region in dealing with inflation rates in this range. Furthermore, the scarce information available concerning such episodes points at the puzzling result of costless disinflations in terms of output– the LAC countries seem to have enjoyed a free lunch. This paper fills part of the gap in the literature by studying the costs of LAC disinflations –from both low and moderate peaks– and attempts to address the 'free lunch' puzzle.

We identify 34 episodes for the period 1973-2000. In that sample, it is shown that there was a GDP growth slowdown in the 70s and 80s, coinciding with episodes of disinflation. It is also

shown that the GDP growth rate slowed down before the inflation rate did. This, together with the possibility that disinflations have long-lived effects on output, are factors the methods used to calculate disinflation costs usually ignore. A new methodology incorporating these elements is proposed. Based on the results from its application to the LAC sample, it is demonstrated that the disinflations of the 70s and 80s were achieved at the cost of large sacrifice ratios, i.e., there was in fact no free lunch.

Nevertheless, the disinflation costs of the 90s are on average negative. The puzzling result contradicts the evidence for developed countries and stands in sharp contrast with the SRs for the LAC countries for the 70s and 80s. We show in this paper that there are three elements that are able to quantitatively explain most of this puzzle. First, the structural reforms of the 90s increased trend output. Since the techniques used to calculate SRs are likely to miss such a shift in trend growth, they mismeasure the SRs. Correcting for that underestimation leads to SRs that are positive, though still very small. Second, the exchange rate appreciation –fueled by the capital inflows that the region experienced during the early 90s–, facilitated less costly disinflations. Finally, the recent inflation history (lagged inflation was much higher during the 90s than during the earlier decades) eroded the nominal rigidities, thus enabling inflation reductions with a lower output trade-off. Had these elements remained at levels comparable to those held during the 70s and 80s, the disinflation costs would have been similar across all three decades.

Several important implications emerge for policy-makers. Looking ahead, they cannot count on costless future disinflations. Indeed, given the new inflation scenario, nominal rigidities are likely to become larger, thus reinforcing the output-inflation trade-off. This is quantitatively an important effect. Furthermore, while spans of time with large capital inflows will probably occur again, it is hard for policy-makers to predict their length and magnitude. It is therefore very difficult to match a disinflations' timing with that of inflows. Another policy implication relates to reforms. If a new wave of structural reforms is pursued in the region, our results suggest that matching the timing of

disinflations with that of reforms might mitigate the impact on growth associated with disinflations. Finally, the evidence in this paper favors the *cold turkey* approach– i.e., that fast disinflations are the preferable strategy.

The LAC disinflations of the 70s and 80s were by no means a free lunch. A combination of events allowed the region to pursue low cost disinflations during the early 90s, but it is unlikely that such a benign scenario for disinflating will be encountered again in the future. Central Banks should be prepared to face trade-offs resembling the ones of the 70s and 80s, rather than the expansionary disinflations enjoyed during the 90s. As Dornbusch and Fischer (1993) stated, "the evidence suggests that...such [moderate] inflations can be reduced only at a substantial short-term cost to growth."

A Appendix

Data sources: Most of the variables come from the International Financial Statistics (IMF, various issues). The growth rates were complemented using data from the World Development Indicators (World Bank, various issues). The reform indices come from Lora (2001) and Morley et al (1999). Samuel Morley kindly provided the data used in the construction of the indices. The real exchange rate measures use the data from the IFS, which is available for most of the countries from 1980 on. When data on the effective real exchange rate was not available, the bilateral rate against the US dollar was used. The ERBS and the regime were built using the data from Reinhart and Rogoff (2002). For oil prices, Spot Oil Price (West Texas Intermediate) was used. That data in turn came from the IFS.

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Tables and Figures

Country	Initial Year	Final Year	Length	Initial Inflation	Drop of Inflation	% drop of Inflation	Speed
Honduras	1973	1975	2	9.7	4.3	45	2.2
Paraguay	1973	1975	2	19.6	14.6	74.5	7.3
Dominican Rep	1974	1978	4	13.3	9.6	72.2	2.4
Ecuador	1974	1976	2	19.4	9.2	47.7	4.6
El Salvador	1974	1976	2	17.3	8.4	48.6	4.2
Guatemala	1974	1976	2	14.7	4.1	28.2	2.1
Mexico	1974	1975	1	19.1	5.4	28.5	5.4
Honduras	1979	1987	8	14.5	11.4	78.8	1.4
Dominican Rep	1980	1982	2	14.3	8.1	56.6	4
El Salvador	1980	1982	2	15.9	5.1	32.2	2.6
Venezuela	1980	1983	3	18.6	10.6	56.8	3.5
El Salvador	1989	1991	2	19.5	9.6	49	4.8
Bolivia	1990	1993	3	19.3	11.7	60.7	3.9
El Salvador	1993	1999	6	15.7	14.9	94.6	2.5
Paraguay	1993	1996	3	18.9	10.1	53.5	3.4
Bolivia	1995	1999	4	11.2	8.1	72.3	2
Costa Rica	1995	1998	3	19.5	9.4	48.3	3.1
Guatemala	1996	1998	2	10	4.6	45.8	2.3
Jamaica	1974	1976	2	21.6	11.6	54	5.8
Colombia	1976	1978	2	25.2	7.1	28.4	3.6
Mexico	1977	1978	1	22.6	5.9	26.3	5.9
Jamaica	1978	1982	4	29	21.2	73	5.3
Paraguay	1979	1982	3	24.1	15.9	66.2	5.3
Colombia	1980	1983	3	24.9	7.7	31	2.6
Dominican Rep	1984	1986	2	29.6	20.4	69	10.2
Jamaica	1984	1987	3	24.9	18	72.1	6
Chile	1985	1988	3	24.1	9.6	39.7	3.2
El Salvador	1986	1988	2	27.3	11.2	41.1	5.6
Guatemala	1986	1988	2	25.6	15.7	61.4	7.9
Colombia	1990	1996	6	27	9.4	34.7	1.6
Honduras	1990	1992	2	26.7	17.8	66.7	8.9
Mexico	1990	1993	3	22.8	14.6	64.1	4.9
Costa Rica	1991	1993	2	24.8	14.7	59.4	7.4
Jamaica	1994	1998	4	26.2	19.2	73.3	4.8

Table 1. Disinflationary episodes in the LAC countries.

Summary Statistics		
	LAC 1973:2000	
	Inflation Peaks Below 20%	Inflation Peaks 20%-30%
Number of episodes	18	16
In the 70's and 80's	11	11
In the 90's	7	5
Average Length of Episodes (in years	2.9	2.8
In the 70's and 80's	2.7	2.5
In the 90's	3.3	3.4
Maximum Peak	19.6	29.6
Average Peak	16.1	25.4
In the 70's and 80's	16.0	25.4
In the 90's	16.3	25.5
Average drop in inflation	8.8	13.8
In the 70's and 80's	8.3	13.1
In the 90's	9.8	15.1
Percentage Average drop in inflation	55.2	53.8
In the 70's and 80's	51.7	51.1
In the 90's	60.6	59.6
Average Speed	3.4	5.6
In the 70's and 80's	3.6	5.6
In the 90's	3.1	5.5

Table 2. Summary statistics.

		Peaks <30%	Peaks 20-30%	Peaks <20%
Sacrifice Ratios, Ball Method	Whole sample:	0.27	0.04	0.48
	70s & 80s:	0.47	0.08	0.86
	90s:	-0.10	-0.06	-0.12
Sacrifice Ratios, Zhang Method	Whole sample	0.34	0.00	0.64
	70s & 80s	0.75	0.11	1.39
	90s	-0.40	-0.22	-0.53
Sacrifice Ratios, LL&II Method	Whole sample	0.42	0.10	0.67
	70s & 80s	0.98	0.22	1.68
	90s	-0.61	-0.18	-0.92

Table 3. The SR under alternative methodologies

	Dependent variable: SR (Ball method)				Dependent variable: SR (LL&II method)			
			(1)	(1)			(1)	(1)
constant	1.53	1.40	1.83	1.69	2.91	2.49	4.00	3.28
	(1.76)	(1.81)	(2.20)	(2.38)	(1.83)	(1.75)	(2.81)	(2.67)
speed	-0.62	-0.65	-0.70	-0.74	-0.80	-0.90	-0.87	-1.04
	-(2.02)	-(2.22)	-(2.46)	-(2.77)	-(1.43)	-(1.67)	-(1.77)	-(2.26)
$speed^2$	0.05	0.05	0.05	0.06	0.07	0.07	0.07	0.08
	(1.80)	(1.84)	(2.17)	(2.27)	(1.35)	(1.42)	(1.65)	(1.85)
Inflation 0	-0.01		-0.01		-0.04		-0.06	
	-(0.33)		-(0.32)		-(0.58)		-(0.97)	
Openness	0.02	0.02	0.03	0.03	0.01	0.01	0.02	0.02
	(1.49)	(1.48)	(2.32)	(2.33)	(0.28)	(0.26)	(1.11)	(1.14)
Adj R^2	0.09	0.11	0.22	0.24	-0.02	0.00	0.24	0.25
(1): Regression includes time dummies								

Table 4. SR (traditional) determinants. *t-statistics* in parentheses

	Ball	LL&II	Ball	LL&II	Ball	LL&II	Ball (+time effect)	LL&II (+time effect)	Ball	LL&II
constant	3.76	4.98	3.15	4.25	3.54	4.96	4.17	6.15	3.87	5.08
	(5.26)	(3.71)	(4.52)	(3.37)	(5.01)	(3.82)	(5.75)	(4.94)	(5.44)	(3.83)
Speed	-0.85	-1.10	-0.63	-0.84	-0.85	-1.10	-0.83	-1.16	-0.89	-1.15
	-(3.38)	-(2.34)	-(2.58)	-(1.91)	-(3.31)	-(2.34)	-(3.27)	-(2.66)	-(3.63)	-(2.50)
Speed sqd.	0.05	0.07	0.04	0.06	0.05	0.07	0.05	0.08	0.06	0.08
	(2.30)	(1.75)	(1.74)	(1.43)	(2.15)	(1.75)	(2.27)	(2.08)	(2.55)	(1.90)
Tax Ind.	-3.48	-9.22	-3.71	-9.50	-3.47	-9.22	-3.26	-7.86	-3.14	-8.90
	-(1.99)	-(2.81)	-(2.00)	-(2.82)	-(1.94)	-(2.81)	-(1.84)	-(2.58)	-(1.83)	-(2.78)
RER	0.09	0.06	0.08	0.05	0.08	0.06	0.08	0.03	0.08	0.06
	(3.75)	(1.43)	(3.22)	(1.17)	(3.54)	(1.43)	(3.30)	(0.66)	(3.63)	(1.36)
Inf. Hist.	-0.30	-0.55	-0.20	-0.43	-0.34	-0.55	-0.29	-0.44	-0.31	-0.56
	-(3.07)	-(2.96)	-(2.18)	-(2.57)	-(3.55)	-(3.13)	-(2.59)	-(2.27)	-(3.17)	-(3.03)
Regime	-0.06	-0.01	-0.08	-0.04			-0.08	-0.08	-0.05	0.00
	-(1.23)	-(0.06)	-(1.79)	-(0.44)			-(1.77)	-(0.98)	-(1.08)	(0.02)
ERBS	0.78	0.93			0.91	0.94	0.78	1.10	0.88	1.02
	(2.12)	(1.34)			(2.51)	(1.41)	(2.08)	(1.70)	(2.49)	(1.55)
Trade Ind.	1.74	1.66	3.19	3.37	1.21	1.61	2.03	2.55		
	(0.81)	(0.41)	(1.47)	(0.86)	(0.56)	(0.41)	(0.98)	(0.72)		
R2 adj	0.38	0.27	0.32	0.26	0.38	0.30	0.38	0.39	0.39	0.30

Table 5. SR Determinants (alternative). t statistics in parentheses.

Fitted SRs		
	70s&80s	90s
Ball	0.42	-0.01
LL&II	0.72	-0.23

Table 6. Fitted SRs.

	***Change* in fitted values of the 90s**				
	if speed 90s = speed 70s&80s	if Tax Ind. 90s = Tax Ind. 70s&80s	if RER 90s = RER 70s&80s	if Inf.Hist 90s = Inf.Hist 70s&80s	if ERBS&Regime 90s = ERBS&Regime 70s&80s
Ball	-0.19	0.14	0.23	0.54	-0.3
LL&II	-0.22	0.41	0.16	0.97	-0.37

Table 7. Change in fitted values of the 90s.

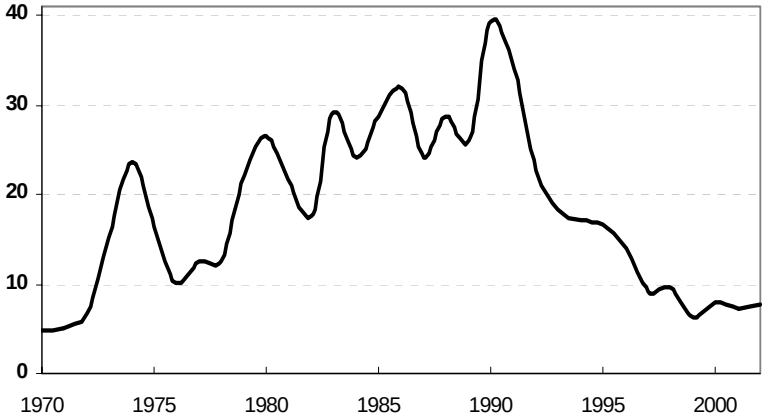

Figure 1: Median Inflation rate in LAC 1970-2002. Source: Author's calculations based on International Monetary Fund, *International Financial Statistics*, various issues.

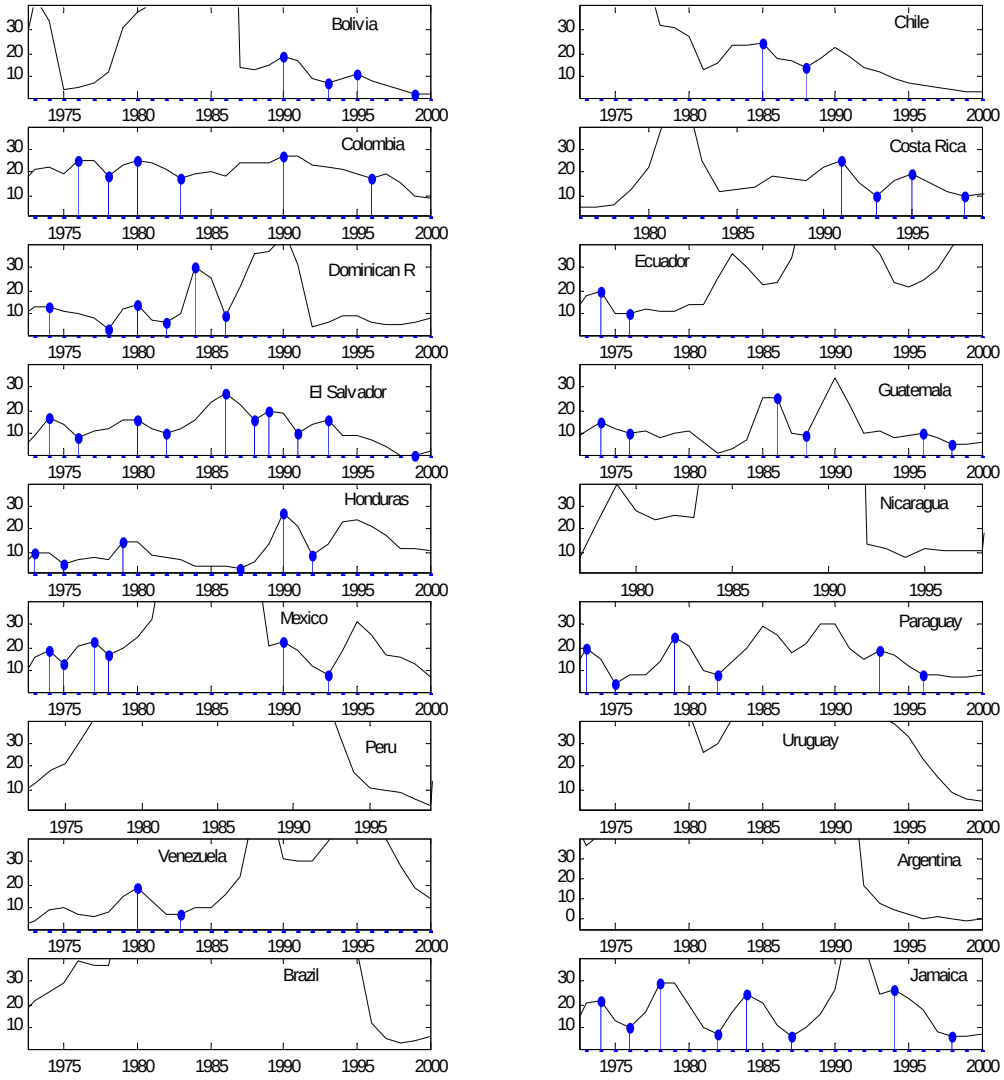

Figure 2: Disinflation episodes in LAC, 1973-2000. Source: See appendix.

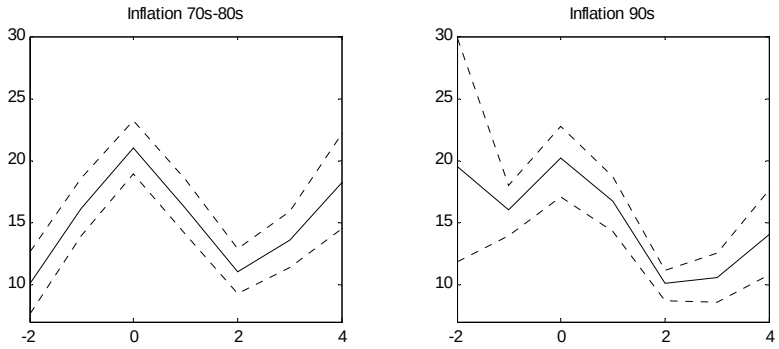

Figure 3: Inflation in 2-3 year long episodes. Dotted lines are 90% confidence intervals.

Figure 4: Average De-meaned GDP growth rates. Shaded areas: 90% confidence intervals.

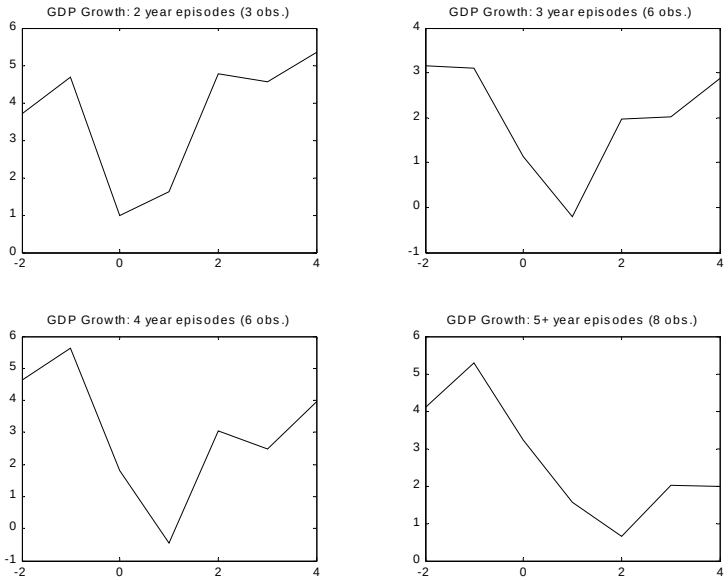

Figure 5: GDP growth rates during G7 disinflations, 1972-2000. Period 0 corresponds to the inflation peak.

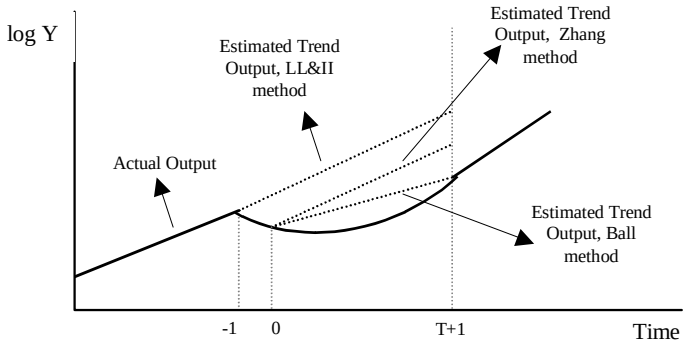

Figure 6: SR under the alternative methodologies.

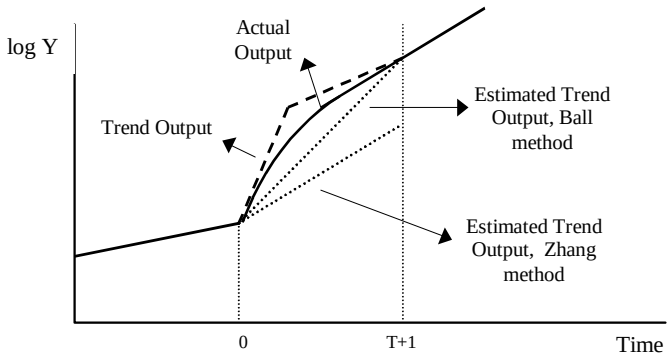

Figure 7: Structural reforms and the SR measurement.