

MONETARY POLICY IN CHILE: INSTITUTIONS, OBJECTIVES, AND INSTRUMENTS

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Inflation seemed to be an endemic disease of the Chilean economy for most of the 20th century, with its presence being felt even before the creation of the Central Bank in 1925. However, things seemed to change drastically in the mid 1990s, when the country began to experience a sustained process of convergence toward inflation rates similar to those prevailing in industrialized economies. While convergence has not been completely smooth, and inflation concerns managed to get back to the spotlight as recently as 2008, Chile's long inflationary tradition seems to be a thing of the past, and the country now enjoys the benefits of price stability.

Table 1. Inflation in Chile, 1931-2010

| <i>Decade</i> | <i>Average Annual Inflation Rate (%)</i> |
|---------------|--|
| 1931-1940 | 7.2 |
| 1941-1950 | 18.6 |
| 1951-1960 | 37.3 |
| 1961-1970 | 27.8 |
| 1971-1980 | 174.8 |
| 1981-1990 | 20.3 |
| 1991-2000 | 8.5 |
| 2001-2010 | 3.2 |

Sources: Central Bank of Chile and EH-Cliolab.

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Chile's history of inflation highlights the role played by the institutional framework in which economic policy is developed, and particularly the priorities and restrictions faced by economic authorities over time. This study discusses the main changes in the institutional framework of monetary management over the last 50 years, as well as the evolution in the consensus among economists regarding the causes and consequences of inflation. We also provide an empirical description of the behavior of inflation in Chile, and link it to recent evidence for industrialized economies using the state-space methodology presented in Stock and Watson (2007).

A recent and interesting contribution to the inflation literature, related in spirit to the research agenda we plan to start with this paper, was made by Cecchetti, Hooper, Kasman, Schoenholtz and Watson, in the context of the 2007 "U.S. Monetary Policy Forum". The authors present an empirical analysis of inflation cycles in G7 economies over the recent decades, and attempt to disentangle the institutional, structural, and methodological factors that underlie those fluctuations.¹ Hence, Cecchetti, and others review the explanations proposed by the literature to account for the dramatic rise in inflation in the United States beginning in the late 1960's, which was followed by a period of macroeconomic stability that began at the end of the 1980's and lasted until the middle of the past decade, with the burst of the "subprime crisis". The first phenomenon is known in the literature as "The Great Inflation" and the second is referred to as "The Great Moderation."

Similarly, the sharp reduction in Chilean inflation has been explained by several (complementary) hypotheses which emphasize some particular change in the macroeconomic environment during the last 15 years:

i) The 1990 constitutional bill stating the independence of the Central Bank with a clear mandate to preserve price level stability, which can be interpreted as maintaining a low rate of inflation.

ii) The gradual adoption of an explicit inflation targeting scheme by the Central Bank of Chile. This framework became full-fledged with the adoption of a (mainly) floating exchange rate at the end of the 1990s.

iii) An exogenous external shock, reflected in a worldwide process of disinflation, associated to the entry of China, India, and former

1. The same question is analyzed, but from a different perspective, in Romer and Romer (2002).

Soviet republics in the international market, and its impact on the global supply of goods.

The first part of the paper reviews the discussion about the sources of inflation fluctuations in developed economies during the last four decades, with a particular focus on the U.S. More specifically, we examine the explanations behind the so called “conquest of American inflation” since the mid 80s.

The second part of the paper discusses analytically the Chilean inflation experience, reviewing the Central Bank’s institutional framework as well as the domestic literature on the causes and consequences of inflation. We also provide a preliminary discussion of the stylized facts surrounding the different hypotheses explaining the reduction of inflation in the 1990s.

The third part of the paper provides a formal analysis of the empirical properties of inflation over the last 30 years, using the methodology to identify structural breaks developed by Bai and Perron (1998, 2003), as well as the state-space representation proposed by Stock and Watson (2007) and recently applied by Cecchetti and others to the G7 economies, to identify changes in the inflation process of the Chilean economy between 1977 and 2011. This allows us to put the Chilean experience on an international context, and to disentangle the contribution of temporary and permanent shocks to the behavior of inflation. We interpret this evidence as preliminary, and as the starting point for a more exhaustive analysis about the structural foundations for the evolution of inflation in recent decades.

1. INFLATIONARY CYCLES: A LOOK AT RECENT LITERATURE

Modern interpretations of inflation cycles experienced by industrialized economies over the last 40 years—particularly in the United States—highlight: i) changes in the level of knowledge prevailing in the profession—and consequently among government authorities—about the nature of restrictions and trade-offs faced in exercising monetary policy; ii) information problems caused by unexpected and significant shocks, which led to errors in estimation by the authorities regarding the “speed limits” of monetary policy;² iii) “tactical” or “strategic” monetary policy movements based on changes

2. In the case of the United States this point relates with the estimation of the “potential output” and then with the estimation of the “output gap”.

in the authorities' perception of the nature of the trade-off between inflation and unemployment, which is recognized as important for a certain period of time; iv) changes in the institutional framework for monetary policy and particularly, its relationship with fiscal policy;³ and v) exogenous shocks, unrelated to monetary management—good or bad luck—which led to fluctuations in inflation.

Regarding the first explanation, some theories have emphasized the profession's relative ignorance in the late 1960s about the nature of the trade-offs faced by monetary policy, summarized in the shape of the "Phillips curve," as a driving force behind the policy decisions that lead to the inflation outburst. For Romer and Romer (2002), who review the memoranda and statements of the U.S. Federal Reserve over a long period of time, the institutional perspective on the options and tradeoffs associated to monetary policy changed significantly over time. In the 1950s, the consensus view on the relationship between inflation and economic activity was fairly similar to what was later identified as the "natural rate hypothesis",⁴ with the additional insight that distortions would make the relationship between inflation and unemployment positive if inflation exceeded an upper threshold.⁵ By the mid-1960s, however, the idea of a stable "Phillips curve" began to take root. This initially stimulated the application of expansive policies and later delayed the adoption of stabilization policies. Thus, the general perception of a negative and stable relationship between inflation and unemployment first nurtured the application of expansive policies—to stimulate economic activity and employment—and later impeded the application of stabilization policies, which generated fear of a politically unsustainable rate of

3. In the United States, which has a strong influence on the development of the academic agenda, this does not appear to be an attractive line of analysis for explaining inflation cycles in that economy since the mid-1960s, insofar as the institutional framework of the Federal Reserve did not undergo major changes in that period. However, this was not the case in Chile and other economies in the region, as is thus an hypothesis to explore in the future.

4. Friedman (1968) and Phelps (1968).

5. A perspective similar to the dynamic behind the monetary policy decisions causing inflation cycles is found in Milton Friedman's Nobel Lecture of 1977. Here, Friedman poses the existence of a third stage within the discussion of the Phillips curve, where the first stage is that which suggests a stable trade-off between inflation and unemployment and the second one is the vertical curve that emanates from the "natural rate hypothesis." The third would be a Phillips curve with a positive slope, originated in the difficulties encountered by an economy in efficiently assigning resources, in a context in which inflation is accelerating. During this period of adjustment—which according to Friedman could be prolonged—inflation stabilizes at a certain level and society learns to coexist with it as best it can.

sacrifice. This was particularly true after the traumatic experience of the Great Depression of the 1930s, which provoked a high level of implicit penalization for episodes of high unemployment and contraction of economic activity.

While the high level of inflation in the United States towards the end of the 1970s was sufficient reason to implement a stabilization program—especially considering the special feature of the dollar as international medium of exchange and store of value—the process was reinforced by the environment generated in the academic economic discussion by the proposal of the “natural rate hypothesis” first and the “rational expectations hypothesis” later. While the first hypothesis established that there wasn’t a long-run trade-off between inflation and unemployment, the “rational expectations hypothesis” severely questioned the effectiveness of stabilization policies for variables such as aggregate output and employment, recommending that monetary policy be focused on achieving low inflation.⁶

In mid-1979, with U.S. inflation peaking at an annual 13%, the Federal Reserve under Paul Volcker’s leadership began an aggressive anti-inflation program, through a strong increase in interest rates. By 1982, inflation reached 3.8% in 1982, its lowest in a decade. The U.S. stabilization program was subsequently followed by other similar experiences, such as that implemented in Great Britain by Margaret Thatcher’s government.

While the policy implications of the “rational expectations hypothesis” gave rise to a heated academic debate,⁷ which ultimately enriched the initial conclusions, a broad agreement was achieved among economists that the essential objective of monetary policy should be to control inflation, because any real gains from an expansive monetary policy would be essentially temporary. In this perspective, the gains achieved by numerous economies in controlling inflation would be fundamentally lasting, reflecting a kind of “technological progress” caused by a better understanding of economic phenomena.

Since the mid-1990s the so-called “Taylor principle”—a monetary rule proposed by economist John B. Taylor⁸—became popular among central bankers of industrialized economies. According to this rule,

6. In this regard, see Lucas and Sargent (1981) and Sargent and Wallace (1975).

7. A cause of the debate was the high and prolonged unemployment that generated this stabilization program, despite having been announced with a great deal of publicity by the Federal Reserve.

8. Taylor (1993).

inflation control could be achieved through an elastic response—more than one to one—of the monetary policy rate (MPR) to changes of the inflation trend (π^T) over the relevant horizon. For Taylor (1999), the progress achieved in numerous economies in controlling inflation—since the mid-1980—was the result of applying what he calls the “new monetary policy”, which is simply the timely and elastic adjustment of the MPR given changes in π^T , as previously described.

On a similar vein, the “inflation targeting” scheme became a popular framework to organize the monetary management.⁹ According to this concept, the long-term neutrality of monetary policy implies that monetary policy should aim for an inflation trend that is coherent with an explicit target. On the other hand, the existence of sluggish adjustments in the goods and factors markets would support defining the target as a medium term objective, leaving room for such adjustments to be completed.

The adoption of institutional regimes aimed at protecting the central bank from a potential subordination to fiscal policy,¹⁰ the application of monetary strategies inspired by “Taylor’s principle,” and the adoption of some form of “inflation targeting” are the outcomes of an intellectual environment stimulated by the “rational expectations revolution” that began in the mid-1970s and in that sense, reflects true progress in economic theory and policy. According to this optimistic perspective, gains in inflation control should be permanent, a scenario that Sargent (1999) calls “the triumph of the natural rate hypothesis.” This concept summarizes the influence of the mentioned theory of short-run aggregate supply, incorporating into it the rational expectations hypothesis.

However, as discussed earlier, this triumphant interpretation is not accepted universally. As indicated in point ii), other theories of inflation cycles in industrialized economies—particularly the U.S. economy—have stressed the existence of information problems and the associated mistakes by the Federal Reserve in identifying inflation pressures, which lead to reaction that was both slow and timid. In particular, Orphanides (2002) and (2003) points out that if the Fed’s monetary policy is evaluated with the information that was effectively available at the time decisions were made, there are no major changes between the policy applied in the 1960s and a good part of the following decade—a period associated with the gestation and

9. Mishkin and Schmidt-Hebbel (2007).

10. Regarding this experience, see Cukierman, Neyapti and Webb (1993).

subsequent development of the “Great Inflation” in that economy—and the policy later followed by Volcker and Greenspan during the period of greater stability known as the “Great Moderation.” In other words, monetary policy management, conditional on the information held by the authorities, didn’t differ greatly in the “Great Inflation” and the “Great Moderation” periods. Under this view, authorities did not become wiser or more enlightened in time.

The empirical research of Cecchetti and others refutes this analysis by extending the experiment proposed by Orphanides across time and countries. According to their results, since the 1980s the Fed showed a more hawkish attitude in combating inflation, manifested by stricter adherence to “Taylor’s principle,” reflected in a elastic response (greater than 1) of the monetary policy rate to inflation.

The review of different episodes of inflation cycles suggests that in each economy there is a certain critical level of inflation (π^*) above which the benefits of a stabilization program compensate for the possible real costs of applying it. However, below π^* the monetary authorities place a greater weight on the costs—both economic and political—of the stabilization program, and as a result discard its implementation. This “equilibrium inflation rate”¹¹ is specific to each economy and depends on numerous factors which have been treated extensively in the literature, beginning with research on the characteristics of aggregate supply, which emphasizes its changing character as a function of the inflation level and the global macroeconomic environment. Another interesting line of analysis, suggested by Posen (1993) and more recently by Acemoglu and collaborators,¹² is related to the distribution of winners and losers caused by a certain macro environment. According to this view a certain critical level of inflation would produce significant political support for the implementation of a stabilization program.

This line of analysis coincides with that posed by Sargent (1999), which highlights the essentially strategic character of monetary policy adjustments undertaken by the central banks of the G7 starting in the early 1960s, which caused the above mentioned inflation cycles. Thus, the expansionary management of aggregate demand during the 1960s reflected the period’s expectation on the slope of the Phillips

11. See, for example, Barro and Gordon (1983).

12. For example, Acemoglu, Johnson and Robinson (2004).

curve.¹³ Later, as policymakers revised their priors regarding the nature of the trade-off, this turned less convenient to policymakers and then a more vigorous stabilization policy was advisable.

Following this line of reasoning, the succession of favorable supply shocks¹⁴—including the deflationary effect of the definitive incorporation of China, India, and the former Soviet republics into international trade—would have shaped a scenario that lead to low inflation, even in the context of monetary management by the Fed that, during much of what has been called the Great Moderation, could be considered expansionary.

As can be seen in table 2, inflation in 1990 reached 5.8%¹⁵ in the United States and then began a gradual decline until the end of that decade, in the context of vigorous output growth. While the traditional monetary indicators show modest growth at the beginning of the inflation deceleration process, their growth accelerates in the context of strong GDP growth and declining inflation. Of course, this does not prove that favorable supply shocks caused inflation to fall. However, this view seems consistent with the Federal Reserve's public discourse, which did not include concerns for inflation during the period, but rather warnings of the possible effects of the Asian crisis, the risks associated with the collapse of the Long Term Capital hedge fund in 1997 and the "millennium effect" associated with the year 2000.¹⁶

According to Sargent (2002), regardless of changes in perceptions on the interactions between nominal and real variables, a rigorous analysis of the results shown by the U.S. economy should take into consideration that the nature of the shocks faced in the macro environment in each decade was quite different. This hypothesis has also been defended by Stock and Watson (2003), who have attributed the Great Moderation—which started in the early 1990s and lasted through the middle of the last decade—more to the different nature and magnitude of the macroeconomic shocks seen in each period, than to variations in the degree of effectiveness and/or the monetary policy approach.

13. In other words, it was possible to achieve a substantial improvement in activity and employment levels with only a moderate inflation increase.

14. On this topic, see IMF (2006).

15. The average of the three prior years was 4.5%.

16. Regarding the Fed's perspective, see Greenspan (2007).

Table 2. Macroeconomic Performance of the U.S., 1990-2005

| | <i>GDP growth (%)</i> | <i>Inflation (end of period) (%)</i> | <i>6-month LIBOR 6 months (%)</i> | <i>Money (M2), annual growth (%)</i> | <i>Money and quasi-money, annual growth(%)</i> |
|------|---------------------------|--|---|--|--|
| 1990 | 1.9 | 5.8 | 8.4 | 5.5 | 2.7 |
| 1991 | -0.2 | 2.9 | 6.1 | 3.7 | 1.5 |
| 1992 | 3.4 | 3.1 | 3.9 | 1.8 | -0.2 |
| 1993 | 2.9 | 2.7 | 3.4 | 1.0 | 0.6 |
| 1994 | 4.1 | 2.7 | 5.1 | 1.3 | 0.4 |
| 1995 | 2.5 | 2.7 | 6.1 | 2.1 | 6.9 |
| 1996 | 3.7 | 3.0 | 5.6 | 4.8 | 7.9 |
| 1997 | 4.5 | 1.7 | 5.9 | 5.0 | 8.0 |
| 1998 | 4.4 | 1.6 | 5.6 | 7.1 | 9.6 |
| 1999 | 4.8 | 2.9 | 5.5 | 7.4 | 9.5 |
| 2000 | 4.1 | 3.4 | 6.6 | 6.0 | 8.1 |
| 2001 | 1.1 | 1.6 | 3.7 | 8.7 | 7.5 |
| 2002 | 1.8 | 2.6 | 1.9 | 7.5 | 4.4 |
| 2003 | 2.5 | 1.9 | 1.2 | 6.9 | 4.5 |
| 2004 | 3.6 | 3.2 | 1.8 | 4.7 | 5.7 |
| 2005 | 3.1 | 3.7 | 3.8 | 4.3 | 8.2 |

Sources: Federal Reserve and International Monetary Fund.

Sims (1980) and Bernanke and Mihov (1998) provide important evidence on the influence of the macroeconomic environment on the activist policies to manage aggregate demand in the U.S. In line with the results of Sargent and Stock and Watson, their evidence suggests that changes in the Volcker-Greenspan period correspond essentially to differences in the magnitude and variance of the macro innovations that took place in that period. It is important to consider this hypothesis, both for analyzing the U.S. experience—in terms of the changes observed in indicators of macroeconomic stability—as well as in small economies such as Chile, where a qualitatively similar process has been observed in recent decades.

2. AN OVERVIEW OF CHILE'S INFLATION HISTORY

Even prior to the creation of the Central Bank in 1925, inflation was a characteristic trait of the Chilean economy. In fact, in the first quarter of the 20th century—before the Central Bank was founded—average inflation rate was close to 6%.¹⁷ The inflation trend became steeper in the mid-1950s, as monetary policy became subordinated to the public finance situation. To gauge the magnitude of the inflation process in Chile, it is interesting to note that while cumulative inflation in the U.S. was close to 188%¹⁸ in the period known as the “Great Inflation”—from 1967 to 1982—, in Chile it topped 1,300%,¹⁹ an extraordinarily high figure that highlights the complete absence of monetary discipline.

Chile's monetary history in the 20th century contains numerous episodes of stabilization programs²⁰—more or less one in each government—, reflecting that inflation was a persistent topic on the public agenda. Nevertheless, this concern on the costs of inflation was never strong enough so as to generate sustained support for stabilization, so once the real costs of any given program became evident, those programs were abandoned.

Of course, the fight against inflation became easier during periods in which the price of copper was high, which reduced the need for monetary support for fiscal policy and made it possible to withstand a delay in the pace of currency devaluation. Intuitively, the reverse held during periods in which terms of exchange deteriorated.

In the early 1970s, inflation began to accelerate rapidly in Chile as a result of a dramatic monetary expansion which was largely explained by a significant increase in the fiscal deficit. Evidently, the economic authorities of the socialist government that took office in 1970 were not followers of the monetarist theory of inflation, as money expanded by 438% between 1971 and 1972²¹. The use of international reserves, supported by the availability of external

17. Source: Cliolab UC.

18. The average inflation rate in the U.S. economy was 7.4% in the cited period, a figure that is indeed high for an economy whose currency is used as a medium of exchange in international trade.

19. This results in an annual average around 128%.

20. On this topic, see for example Ffrench-Davis (1973) and Arbildúa and Lüders (1968).

21. If 1973 is included, this growth – also from December to December of each year – is 2,196%: Source, Central Bank of Chile, *Indicadores Económicos y Sociales 1960-2000* (Economic and Social Indicators 1960-2000).

resources resulting from the unilateral default on payments to service external debt instituted by the government in the second half of 1971, delayed the inflationary outburst but left the country at the edge of hyperinflation in 1973.

It is difficult to explain, from a strictly economic perspective, the rationale behind monetary policy in this period. It probably involves the government's objective of installing a socialist economy as quickly as possible, as well as a certain degree of ignorance and/or carelessness about the consequences of a large-scale fiscal deficit—25% of GDP in 1973—and an unprecedented monetary expansion, which reached growth of 326.7% that year.

Given the magnitude of these inflationary pressures, inflation control became a priority for the military government installed in September, 1973. This led to a significant fiscal adjustment in 1975,²² jointly with a more complex process of controlling monetary expansion and inflation expectations. The main difficulties for monetary supply arose from the expansionary pressures associated to an incipient financial market, whose development was part of the package of reforms promoted by the government. New financial intermediaries—the so called “financieras”—contributed to an abundant supply of liquid liabilities, which generated several episodes in which some institutions collapsed, including several banks. Controlling their growth represented a significant challenge for the Central Bank.²³

Different stabilization strategies were implemented since the mid 70s.²⁴ A common denominator across these stages was the primary role given to nominal exchange rate. In effect, the implementation of a preannounced rate of devaluation first, followed by two revaluations of the peso, and the adoption of a fixed exchange rate, were all designed to make inflation converge to a low, stable level through a break in the inflation expectations dynamic. This objective seemed within reach in 1981, when the economy began to suffer the consequences of the drastic monetary shock applied in the United States in mid-1979. In particular, the sharp increase in international interest rates that followed the U.S. stabilization program was a huge shock for the Chilean economy, whose Current Account Deficit was close to 14% of GDP in 1981. The other side of this rapid growth in external liabilities was a weak position of the financial sector.

22. In this regard, see Edwards and Edwards (1991).

23. On this topic, see De la Cuadra and Valdés (1992).

24. A description of this plan can be found in Edwards (2000).

The fragility of the financial system forced the government to devalue the peso in 1982, abandoning the fixed exchange rate. In that scenario, controlling inflation—which had declined drastically in the first months of 1982—was no longer a priority, as overcoming a severe financial and balance-of-payments crisis became the main policy concern.

In 1983, an indexed exchange rate was adopted as a device to stimulate exports, with inflation returning to annual rates around 20%. Specifically, the authorities targeted a high real exchange rate, after the successive devaluations in the aftermath of the collapse of the exchange rate peg. Despite the implementation of rigorous fiscal discipline from 1985 to 1989,²⁵ the growing wealth of households and private firms—whose counterpart was a significant decline in external debt as a percentage of GDP²⁶—led to a recovery in domestic demand, and in turn to a decline in the equilibrium real exchange rate. The existent “real exchange rate rule” led to an increasing imbalance between supply and demand conditions of an economy in recovery and the real exchange rate level,²⁷ causing an increase in inflation towards the end of the 1980s.²⁸ A significant real revaluation of the peso became inevitable in the early 1990s.

In December 1989 a new institutional framework establishing the independence of the Central Bank—was set in place.²⁹ At that time, only a few weeks after taking office, the new authorities of the now independent Central Bank implemented a severe monetary adjustment to restrain an accelerating inflation rate, in a context of strong growth in domestic spending. The strategy used was a sharp

25. In this adjustment process, an active agenda of “supply policies” was carried out to increase the aggregate productivity of the economy. In addition, there was a major program to reconvert external debt to internal debt or assets, which contributed to a rapid adjustment process in the problem of high indebtedness seen in the Chilean economy.

26. This was a consequence of an active “supply policies” agenda, in addition to an effective program to convert external debt to capital. On this topic, see Fontaine (1988).

27. As is logical, in a context of widespread indexation of salaries and the exchange rate, inflation remained unanchored and was determined fundamentally by the shocks that could affect both prices. Let’s consider this case in an inflation equation such as $\pi_t = \lambda\pi_{t-1} + \alpha x_t + u_t$, where x_t is the “foundations” of inflation in period t , and u_t is a random cost shock with a mean of zero and finite variance. In this case, the trajectory of inflation will be defined by $\pi_t = \alpha \sum_{i=0}^t \lambda^i x_{t-i} + \sum_{i=0}^t \lambda^i u_{t-i}$. The stability of the system requires that $\lambda < 1$.

28. An analysis of this scenario can be found in Rosende (1985).

29. This institutional framework closely resembles the prestigious Bundesbank’s mandate and organization.

increase in the real interest rate of long-term internal debt of the Central Bank.³⁰

Table 3 shows how the relationship between aggregate expenditure (AE) and GDP grew—first gradually and then more rapidly—between 1986 and 1989, which according to the most common real equilibrium exchange rate models should have led to a decline in that rate. However, the reverse occurred, as the table 3 illustrates. In a context of decreasing unemployment, inflation surged, with the exception of 1988, when the value-added tax was reduced from 20 to 16%, and average tariffs fell from 20 to 15%.³¹

The combination of a significant undervaluation of the peso and high real interest rates on the Central Bank's long-term debt accentuated a process of capital inflows that could no longer be contained by a declining flow of debt conversion operations.³² In this scenario, a significant drop in inflation and the real exchange rate, as the one that actually occurred, seemed highly probable.³³ On the other hand, regardless of the efficiency of the monetary strategy it adopted, the energy and speed of the response of the Central Bank Board probably contributed to build a "hawkish" reputation, coherent with the price stability mandate granted by the new legal text.

The process of inflation reduction in Chile was accentuated in the 1990s, until inflation converged to the levels observed in the industrialized world. This decline was contemporary to strong GDP and domestic demand growth. As mentioned, the reduction in inflation was stimulated by persistent capital inflows, which appreciated the exchange rate in a global context in which inflation pressures seemed to be contained.

30. As expected, a consequence of this decision was an important increase in capital inflows to the Chilean economy, increasing the degree of misalignment of the real exchange rate. On this topic, see Rosende (1990).

31. That year, the international price of oil fell substantially, by almost 30%, contributing to deceleration of inflation. For more information on this process, see Rosende (1990).

32. The attraction of debt conversion operations led to high demand for dollars in the "unofficial" currency market for the purpose of repurchasing external debt. This scenario can be viewed as one of a high premium for this type of saving—reduction and/or transformation of liabilities—which temporarily supported a higher real exchange rate.

33. The existence of a managed exchange rate scheme, in terms of a floating band around a central level of the same that was adjusted according to a real exchange rate rule, conspired against monetary policy in that a gradual decline in the dollar in relation to the development unit (*unidad de fomento*, or UF) accentuated the influx of capital in this period. Among the government's reactions were to establish a reserve of the influx of short-term capital and make periodical adjustments to the exchange rate rule. On this subject, see Valdés and Soto (1996).

Table 3. Macroeconomic Performance of Chile, 1985-1991

| | <i>GDP growth (%)</i> | <i>AE/GDP (1985=100)</i> | <i>Real Exchange Rate (1985=100)</i> | <i>Inflation (%)</i> | <i>Unemployment rate (%)</i> |
|------|-------------------------------|------------------------------|--|--------------------------|----------------------------------|
| 1985 | 3.5 | 100.00 | 100.00 | 26.4 | 12.0 |
| 1986 | 5.6 | 99.35 | 110.06 | 17.4 | 10.4 |
| 1987 | 6.6 | 102.32 | 114.84 | 21.5 | 9.6 |
| 1988 | 7.3 | 102.65 | 122.35 | 12.7 | 8.0 |
| 1989 | 10.6 | 105.18 | 119.47 | 21.4 | 7.1 |
| 1990 | 3.7 | 104.35 | 124.04 | 27.3 | 7.4 |
| 1991 | 8.0 | 102.60 | 117.08 | 18.7 | 7.1 |

Source: Central Bank of Chile.

Note AE: is aggregate expenditure.

Table 4 shows some indicators related to the disinflation process in the 1990s. It illustrates the persistent lag of variations in the nominal exchange rate with respect to inflation, which was only reversed when external financial turbulence associated with the “Asian Crisis” erupted at the end of the decade, the Chilean economy with significant excess aggregate expenditure. The direction of monetary policy was initially described by the rate of its 90-day debt, or PRBC³⁴—defined in real terms³⁵—which began to decline in 1991 and remained below real GDP growth. After the “Asian Crisis”, which forced a significant monetary adjustment between 1998 and 1999, monetary policy rates—this time using the nominal rate of overnight interbank loans, expressed in annual terms, as the reference rate—dropped sharply, coinciding with a new drop in inflation and positive GDP growth.

As shown in table 4, the reduction in inflation coincided with a persistent surplus in the balance of payments—in response to large capital inflows—and also with a prolonged government surplus, which only changed sign, temporarily, with the Asian Crisis at the end of that decade.

To put these events in perspective, it is important to analyze what was going on in the rest of the world in terms of inflation and GDP

34. The Central Bank’s indexed promissory notes.

35. In development units (UF).

growth. According to International Monetary Fund estimates (table 5), the global economy reduced its inflation rate from 25.8% in 1990 to 4.5% in 2000 and 4.1% in 2010. Similarly, the group designated by the IMF as “Emerging and Developing Economies” reduced inflation from 82.4% in 1990 to 8.1% in 2000 and 6.6% in 2010. As shown in table 6, this global disinflation occurred in a context of sustained GDP growth in the global economy. In some cases, such as Brazil and Chile, there was a virtuous combination of disinflation and high output growth, a rare event under demand driven stabilization process.

Table 4. Macroeconomic Performance of Chile, 1990-2005

| | <i>Inflation</i> (end of year) (%) | <i>GDP</i> growth (%) | <i>Nominal</i> <i>exchange</i> rate, mean devaluation (%) | <i>General</i> <i>government</i> payments (% of GDP) | <i>Balance</i> <i>of</i> payments (% of GDP) | <i>Interest rate</i> <i>Monetary</i> <i>policy</i> rate (%, annual)* | <i>Central</i> <i>Bank</i> bonds PRBC (%, annualized)** |
|------|---|-----------------------------|--|--|--|---|---|
| 1990 | 26.0 | 3.8 | 14.3 | 0.8 | 7.8 | - | 7.6 |
| 1991 | 21.8 | 7.9 | 14.6 | 1.5 | 3.8 | - | 6.1 |
| 1992 | 15.4 | 12.2 | 3.9 | 2.3 | 6.0 | - | 5.4 |
| 1993 | 12.7 | 7.0 | 11.5 | 2.0 | 1.3 | - | 6.5 |
| 1994 | 11.4 | 5.7 | 4.0 | 1.7 | 6.2 | - | 6.4 |
| 1995 | 8.2 | 10.5 | -5.6 | 2.6 | 1.6 | - | 6.1 |
| 1996 | 7.4 | 7.4 | 3.9 | 2.3 | 1.7 | - | 7.3 |
| 1997 | 6.1 | 6.6 | 1.71 | 2.0 | 4.1 | 6.87 | 6.8 |
| 1998 | 5.1 | 3.3 | 9.8 | 0.4 | -2.8 | 9.01 | - |
| 1999 | 3.3 | -0.7 | 10.6 | -2.1 | -1.0 | 5.87 | - |
| 2000 | 3.8 | 4.5 | 5.9 | -0.7 | 0.4 | 5.26 | - |
| 2001 | 3.6 | 3.3 | 17.7 | -0.5 | 0.9 | 5.07 | - |
| 2002 | 2.5 | 2.2 | 8.6 | -1.2 | -0.3 | 4.05 | - |
| 2003 | 2.8 | 4.0 | 0.3 | -0.4 | 0.5 | 2.73 | - |
| 2004 | 1.1 | 6.0 | -11.9 | 2.1 | 0.0 | 1.87 | - |
| 2005 | 3.1 | 5.6 | -8.2 | 4.7 | 1.5 | 3.44 | - |

Sources: Central Bank of Chile and Chilean Budget Division.

Note: In August 2001 the Central Bank of Chile introduced a change in the scheme of monetary policy rate setting. Instead of using a real rate—through adjustments in the nominal rate in order to achieve the given real target—the new procedure sets the nominal interest rate as the main instrument and indicator of monetary policy.

Column * corresponds to the new monetary policy regime. Column ** corresponds to the old monetary policy regime, where the real rate of 90 days central bank's domestic debt was the key reference.

Table 5. CPI Inflation in Selected Regions and Countries, 1990-2005 (%)

| | <i>World</i> | <i>Developed countries</i> | <i>Emerging countries</i> | <i>Chile</i> | <i>United States</i> | <i>Brazil</i> |
|------|--------------|----------------------------|---------------------------|--------------|----------------------|---------------|
| 1990 | 25.9 | 5.9 | 82.4 | 27.2 | 5.8 | 1,621.0 |
| 1991 | 18 | 4.0 | 52.4 | 18.8 | 2.9 | 562.2 |
| 1992 | 36.8 | 3.0 | 129.5 | 13.0 | 3.1 | 1,119.1 |
| 1993 | 37.2 | 2.9 | 128.3 | 12.6 | 2.7 | 2,477.2 |
| 1994 | 22.7 | 2.5 | 69.3 | 9.2 | 2.7 | 916.4 |
| 1995 | 11.4 | 2.5 | 29.1 | 8.3 | 2.7 | 22.4 |
| 1996 | 7.5 | 2.5 | 16.7 | 6.6 | 3.1 | 9.6 |
| 1997 | 5.4 | 1.9 | 11.7 | 6.0 | 1.7 | 5.2 |
| 1998 | 6.5 | 1.4 | 16.0 | 4.7 | 1.6 | 1.7 |
| 1999 | 4.5 | 1.8 | 9.4 | 2.3 | 2.9 | 8.9 |
| 2000 | 4.5 | 2.5 | 8.1 | 4.6 | 3.4 | 6.0 |
| 2001 | 3.6 | 1.4 | 7.3 | 2.7 | 1.6 | 7.7 |
| 2002 | 4 | 2.1 | 7.0 | 2.9 | 2.6 | 12.5 |
| 2003 | 3.3 | 1.6 | 5.9 | 1.1 | 1.9 | 9.3 |
| 2004 | 3.9 | 2.3 | 6.2 | 2.4 | 3.2 | 7.6 |
| 2005 | 3.8 | 2.5 | 5.6 | 3.7 | 3.7 | 5.7 |

Source: International Monetary Fund.
 Note: inflation rates at end of year.

The global combination of high growth³⁶ and rapid disinflation suggests that, at least partially, the reduction of inflation in Chile in the 1990s was associated to external factors linked to supply shocks, and not exclusively to a drastic decrease in the Central Bank's tolerance to inflation. Something similar seems to have occurred in other economies, in light of the global nature of the disinflation process described in table 5.

As Alan Greenspan pointed out in 2005:

“Over the past two decades, inflation has fallen notably, virtually worldwide, as has economic volatility. Although a complete understanding of the reasons remains elusive, globalization and innovation would appear essential elements of any paradigm capable of explaining the events of the past ten years”.³⁷

36. With the exception of 1999, when the effects of the Asian crisis manifested themselves in an economy that showed signs of excess expenditure in its current account position in terms of balance of payments and fiscal accounts.

37. Greenspan (2005). See also Greenspan (2007).

Table 6. Real GDP Growth in Selected Regions and Countries, 1990-2005 (%)

| | <i>World</i> | <i>Developed countries</i> | <i>Emerging countries</i> | <i>Chile</i> | <i>United States</i> | <i>Brazil</i> |
|------|--------------|----------------------------|---------------------------|--------------|----------------------|---------------|
| 1990 | 3.2 | 3.1 | 3.4 | 3.6 | 1.9 | -4.2 |
| 1991 | 2.2 | 1.5 | 3.8 | 8.0 | -0.2 | 1.0 |
| 1992 | 2.2 | 2.2 | 2.3 | 12.3 | 3.4 | -0.5 |
| 1993 | 2.1 | 1.5 | 3.3 | 7.0 | 2.9 | 4.9 |
| 1994 | 3.4 | 3.4 | 3.4 | 5.7 | 4.1 | 5.9 |
| 1995 | 3.3 | 2.9 | 4.0 | 10.6 | 2.5 | 4.2 |
| 1996 | 3.8 | 3.0 | 5.1 | 7.4 | 3.7 | 2.2 |
| 1997 | 4.1 | 3.5 | 5.6 | 6.7 | 4.5 | 3.4 |
| 1998 | 2.6 | 2.6 | 2.5 | 3.2 | 4.4 | 0.0 |
| 1999 | 3.6 | 3.7 | 3.2 | -0.4 | 4.8 | 0.3 |
| 2000 | 4.8 | 4.2 | 5.8 | 4.5 | 4.1 | 4.3 |
| 2001 | 2.3 | 1.4 | 3.7 | 3.5 | 1.1 | 1.3 |
| 2002 | 2.9 | 1.7 | 4.7 | 2.2 | 1.8 | 2.7 |
| 2003 | 3.6 | 1.9 | 6.2 | 4.0 | 2.5 | 1.1 |
| 2004 | 4.9 | 3.2 | 7.5 | 6.0 | 3.6 | 5.7 |
| 2005 | 4.6 | 2.7 | 7.3 | 5.5 | 3.1 | 3.7 |

Source: International Monetary Fund.

In his memoirs³⁸ Greenspan states that a panorama of deflationary forces, strong activity, and asset price indicators indicating a vigorous economy, was a conundrum for monetary policy. Such a combination of events can be explained by supply shocks, mainly associated to the entry of China, India, and the former Soviet republics in the international economy, and reinforced by significant productivity gains in the information technology industry.

The idea of a worldwide disinflation phenomenon was raised by economists of the Bank for International Settlements³⁹ as well as by economists of the International Monetary Fund. However, this hypothesis has not played an important role in the economic

38. See Greenspan (2007).

39. Borio and Filardo (2007).

discussion of emerging economies like the Chilean one. In this case, as in many others, the most popular theories of the so called “conquest of the Chilean inflation”, stressed the role of changes introduced in the Central Bank’s institutional setting as well as in the monetary policy framework. Certainly we do not dismiss such aspects of the explanation of the recent evolution of the rate of inflation in Chile. However, a careful analysis of the numbers suggests the role of external factors in the Chilean disinflation process.

3. THE INSTITUTIONAL FRAMEWORK

One of the possible causes of the inflation movements observed in Chile is the evolution in the legal mandate guiding the Central Bank. From this perspective, it would be reasonable to relate the reduction in inflation to the institutional shift to central bank independence at the end of 1989.

In fact, the bank’s autonomy from political interference was ill-defined from the 1925 law that created it, and subsequently declined over time. In effect, the initial institutional design proposed an administration and ownership structure that sought to reduce the government’s influence on the Central Bank’s decisions. The law established a board of directors of 10 members, only three of whom were appointed by the country’s president. As for the other board members, two were appointed by the domestic banks, one by foreign banks, two by industry groups, one by worker organizations and one by private shareholders.⁴⁰ Regardless, the statutes of the nascent central bank did not define its objectives clearly or with precision, a flaw that would contribute to a sustained deterioration in the institutional commitment to a stable currency. As shown in Carrasco (2009), the same ambiguity on the guidelines for the operation of the Central Bank led to policies that were increasingly determined by fiscal needs.

One of the reasons behind the creation of the Central Bank in 1925 was to establish an institutional framework to organize the process of creating means of payments and for many, to reestablish the gold standard system. Moreover, there was already evidence of

40. As for the Bank’s capital, the law approved in 1925 creating the entity indicates that the state’s share would be 13%, domestic banks would contribute 32%, foreign banks were responsible for 9% and the share of private shareholders was 46%. Corbo and Hernández (2005).

significant inflation pressures, which contributed to shaping a climate of conflict and social instability.

As pointed out in Carrasco (2009), the creation of the Central Bank of Chile was a complex process, as it faced an unstable political environment and intense disagreement between those in favor of strict rules for liquidity supply and those who wanted a more flexible monetary policy, capable of adapting to changes in liquidity.⁴¹ It is interesting to note that the notion of establishing an independent central bank to shelter monetary policy from being subordinated to the needs of public finances already existed in the first proposed laws to create a central bank in the country. Thus, in Carrasco op. cit. the author points out that an important milestone within this debate was reached during “Currency Week,” organized in Santiago’s Municipal Theater by the School of Commerce at the Universidad Católica de Chile. Some important conclusions drawn at this forum were: ...“ c) The proposed creation of a central institution to address regularization of the money supply;⁴² d) This institution should be absolutely independent from fiscal and political interests; nor should the field of activities of private banks have any influence.”

Although there was substantial initial support to focus the Central Bank’s efforts on achieving stability of process and balance of payments, the consensus later shifted to interpret monetary and credit management as instruments for economic stimulus⁴³ rather than economic stability. In fact, since the 1930s monetary policy became so dissociated from maintaining stable prices that price stability was targeted directly by microeconomic interventions through price setting agencies, a severe distortion that would become increasingly prevalent.

The increasing deterioration in the anti-inflation commitment of monetary policy during the Great Depression was accompanied by

41. The former were known as the “*oreros*” because of their preference for strict adherence to the discipline of the gold standard. The latter were known as “*papeleros*” since their proposal was closer to what could be called adhesion to a fiduciary money system with flexibility in monetary policy to adjust instruments in order to achieve stability.

42. This was after a period in which the wars Chile had been involved in led to the creation of bank money that was not pegged to the gold standard, upon request from the Treasury, in consideration of circumstances qualified as “exceptional” but which curiously had become relatively frequent. In this period, the Chilean monetary debate, described by Carrasco op. cit. and Millar (1994), took place amidst the unpleasant memories of painful adjustments imposed by the gold standard and the inflation pressures of the paper-money system.

43. Regardless of the implication of the monetary policy of this mandate.

a systematic loss in the already weak Bank's autonomy, along with a more active role in regulatory tasks, particularly in the currency and credit markets.⁴⁴

As the Central Bank began to lay an active role as instrument for development, the presence within the Board of representatives of the different branches of production, only exacerbated the pressures for more expansionary monetary management.⁴⁵

This new understanding of the responsibilities of Central Bank as a development bank was expressed in the 1953 reform to its organic law, which states: "The aim of the Central Bank of Chile is to foster the orderly and progressive development of the national economy through a monetary and credit policy that, seeking to avoid inflationary and depressive trends, allows for the best use of the country's productive resources."⁴⁶

The shaping of a development goal for monetary policy was strongly influenced by the Great Depression and the popularization of the "real bills doctrine."⁴⁷ According to this doctrine, the macroeconomic impact of monetary policy did not depend on how much money was issued, but on the way in which it was done. Thus, money provided for "productive credit," has different effects than money generated to finance the fiscal deficit or speculative stock market operations.⁴⁸

In 1960, the authority of the central government over the Central Bank power was formally consolidated through the enactment of a new Organic Law for the institution. The law increased the number of government appointed representatives in the Central Bank board to four of a total of eleven members. In addition, a new provision established that the Governor and Vice governor of the Central Bank had to be ratified by a presidential decree. Somewhat unsurprisingly,

44. The Central Bank's obligation to control currency was established in 1960; prior to that, the International Exchange Commission (Comisión de Cambios Internacionales) held that responsibility.

45. It should be noted that in 1946 a law was passed to include members of Congress in the board of directors of the Central Bank, which evidently made it more difficult to focus the bank on the objectives of macroeconomic stability, as the high discount rate inherent in the political process dominated its decision-making.

46. Article 2 of Decree with Force of Law 106, of July 28, 1953. Cited in Carrasco (2009) op.cit.)

47. As pointed out by Lüders and Rosende (2007), the real bills doctrine had a significant influence on the focus of monetary policy implemented by the Central Bank of Chile almost until the end of the 1950s.

48. Carrasco, op. cit.; Millar op. cit.

designating the Minister of Finance as Central Bank Governor became the usual practice after these reforms, highlighting with no subtlety who was in charge.

In 1989, a new institutional framework, modeled essentially on the successful experience of Germany's Bundesbank,⁴⁹ granted the Central Bank autonomy from the central government. The new law defined stability in currency value and the operation of the system of payments as the CB's main goals. Over the years, this mandate came to be interpreted—by the Central Bank itself—as an inflation target range between 2% and 4%.

The decline of inflation in Chile since 1990 suggests that the new institutional framework has been successful.⁵⁰ Nevertheless, assuming a direct causality might appear as overly simplistic, as the evidence suggests a weak relationship between the legal and the effective degree of central bank independence⁵¹ in developing countries. In the specific case of Chile, the first 20 years of Central Bank independence have been characterized by a broad political agreement over the benefits of this framework, and of making inflation the CB's main concern. This agreement, however, has been certainly strengthened by the fact that, during the last 2 decades, there have been very few occasions in which the control of inflation has posed a significant cost in terms of output and unemployment. Throughout most of its independent era, the Central Bank has faced favorable macroeconomic conditions. Perhaps the biggest exception was the severe monetary adjustment carried out in 1999, when the Central Bank acted swiftly to put the brakes on the economy's excessive spending,⁵² in a context of difficult credit conditions in international markets as a consequence of the Asian financial crisis. This brief episode led to widespread criticism of monetary policy decisions, placing it in evident conflict with fiscal policy. Of course, more time, and probably more adverse shocks, will be needed to prove how solid is the anti-inflation commitment of the Chilean political

49. A review of the debate over the proposed law to establish the autonomy of the Central Bank can be found in *Cuadernos de Economía* 77 of 1989. Also see Fontaine (2000).

50. Regardless of the strong variability seen from one year to the next.

51. Of course, in this second case—when an effective autonomy of monetary policy in regard to the needs of public finances prevails—the inflation rate is lower. On this subject, see Cukierman, Neyapti, and Webb (1993).

52. The current account deficit in the balance of payments reached 6.2% of GDP in 1998.

system, and how much support will be given to CB independence if conditions turn sour. If anything, international experience has shown that such support is not guaranteed.⁵³

Finally, we highlight the significant complementary role played by the reforms to banking regulation introduced in 1987. The purpose of these reforms was to establish some early warnings indicators of solvency for the banking system, in order to minimize the magnitude and frequency of government and central bank interventions during episodes of financial stress. Also, private adjustment mechanisms were developed to address deficiencies in banking capital, while at the same time the Central Bank became the lender of last resort in the event of liquidity problems.⁵⁴

4. INFLATION AND FISCAL FINANCES

The “passive” nature of monetary policy with respect to fiscal needs can be described simply by using the government’s budget constraint, as shown in equation (1). This equation indicates that the government deficit ($G - T$) can be financed by printing money⁵⁵ (dM/P), domestic debt, (dB/P), and net foreign debt (dD/P); that is, by taking on foreign debt or using international reserves.

Equilibrium in the money market implies that: $dM/P = m(\pi + \eta_y^m g)$ where g is the growth rate of real GDP and η_y^m is the income elasticity of money demand. It is obvious that $m = f(\pi^e)$, where $f' < 0$, imposing a limit on the capacity of the Central Bank to raise revenue through inflation.

In regard to domestic debt, we can assume that there is demand for public debt of the government and/or the Central Bank, which is described by:

$$dB/P = b(\pi + \eta_y^b g).$$

This demand reflects institutional investors—essentially insurance companies and pension fund managers—and banks that seek to

53. On this topic, see Posen (1993).

54. On this subject, see Ramírez and Rosende (1992) and Reinstein and Rosende (2000).

55. For simplicity’s sake, we can assume that the multiplier of the monetary base is equal to one.

maintain a certain proportion of their portfolio in sovereign debt. This demand constitutes a kind of seigniorage associated with the issuance of non-monetary debt. In what follows, we assume for the sake of simplicity that $\eta_y^m = \eta_y^b = 1$.

For tax revenue (T), we assume that it is positively related to the level of real output, so that given an initial product we will associate it with a growth rate (g), and with the level of terms of trade (q). In the Chilean case the copper price is a key determinant of government's current incomes, either through specific taxes on mining activities as well as the profits of Codelco, a state owned copper producer enterprise.

In (2) we derive the inflation rate required to completely finance fiscal expenditure, given a certain level of fiscal deficit, net foreign debt, and domestic debt. Of course, the government could face its budget imbalance by taking more debt from the private sector. In that case, inflation would not rise in the short term, although interest rates would increase, generating larger inflation pressures in the medium term:

$$G - T(q, g) = dD / P + dM / P + dB / P, \tag{1}$$

$$\pi = \left[1 / m(\pi^e) \right] \left[(G - T(q, g)) - dD / P - g(m + b) \right]. \tag{2}$$

According to equation (2), adverse terms of trade shocks—shocks lower level of q —increased the fiscal deficit and the extent of use of international reserves; this lasted until devaluation became inevitable, thereby boosting inflation.⁵⁶

The same equation (2) described above reveals the aggregate relationship between inflation and accumulation of international reserves, making it clear that this accumulation can be financed with resources from the inflation tax.

Viewing the period of high inflation in the Chilean economy from the public finance perspective—at least for the period that would be our Great Inflation between 1953⁵⁷ and 1994⁵⁸—gives relevance to the view proposed by Cukierman, Edwards and Tabellini (1992), who

56. These habitual traits of Chilean economic cycles are described in Cortés (1984).

57. That year, inflation jumped to 53%, the highest ever figure for inflation in Chile until this point.

58. Since that year, inflation has been maintained below 10% annually.

see it as the result of a scenario of political conflict that prevented the establishment of more efficient taxes or adjustments in spending. This is an interesting interpretation of the Latin American political and economic reality in the 1960s, which was marked by increasing social effervescence and political conflict. This took place in a scenario of growing public spending, which did not affect the overall equilibrium as long as terms of trade were high, but which did have an impact on it later.

Equation (2) can also be written as:

$$\pi_t = \theta d_t + \lambda \pi_t^e, \quad (3)$$

where d_t is the rate of monetary expansion required to finance the fiscal deficit, given the use made of international reserves and debt. This is for a certain level of inflationary expectations. This expression can be written as:⁵⁹

$$\pi_t = \theta E_t \left(\sum_{i=0}^{\infty} \lambda^i d_{t+i} \right). \quad (4)$$

According to equation (4), an inflation process with a fiscal origin can only be controlled by making significant adjustments to the level of public expenditures and/or the tax system, as well as to the institutional framework that determines fiscal management.

While the influence of fiscal factors during a large part of Chile's inflation history is unquestionable, it is interesting to note (as discussed in Morandé and Noton, 2004) that regardless of the profound adjustments made in 1975 to the tax system, government spending levels, and the institutional framework for budgeting, inflation remained high—although far from a hyperinflation scenario—in the following years. One possible explanation for the persistence of inflation was the absence of a nominal anchor in a context in which the exchange and wages were indexed until the early 1990s.⁶⁰ Another possible source of inflation persistence is the presence of a quasi-fiscal deficit caused by the bailout of the

59. The term E_t indicates the expectation conditional on information available at t .

60. During the 1990s, the Central Bank made successive changes in exchange policy to give greater flexibility to the exchange rate and regain control over monetary policy and inflation. On this topic, see Vergara (1994) and Rosende (1998).

banking industry in the early 1980s. While it is true that the bailout was handled without major difficulties by the Central Bank, one can't ignore the fact that its presence could have been a source of macroeconomic destabilization if the economy had suffered an adverse shock that would have reduced the rate of growth of real output.

5. AN EXAMINATION OF THE DEBATE ABOUT INFLATION AND MONETARY POLICY

As indicated, the Great Depression led to an environment in which monetary strategies of the kind inherent in the gold standard were severely questioned. The rise of Keynesian thought, mixed with theories such as the real bills doctrine, provoked a significant decline in the priority given by the authorities to the goal of controlling inflation starting in the 1930s. From this perspective, monetary policy tools were to be essentially aimed at supporting government and private sector financing.

From the mid-1930s to the 1950s, public policies showed greater tolerance for inflation, with most of the attention on the role of institutions such as the Corfo,⁶¹ a state agency created to simulate development of productive activity along guidelines determined by the central government. This was part of a more general shift towards protectionism and a more active role for the State in the economy.

In this period, the “structuralist approach” to inflation became popular in Chile and other nations in the region, promoted strongly by the Economic Commission for Latin America and the Caribbean (ECLAC). In ECLAC's view, inflation was a symptom of weaknesses in the operation of the economy, causing bottlenecks that triggered an increase in overall price levels. From this perspective, inflation could only be contained by correcting those issues, which implied a more difficult and complex effort than merely managing the movements of aggregate demand.⁶² Thus, for example, in Sunkel (1958) four structural

61. Corporación de Fomento de la Producción.

62. As pointed out in Lüders (1970), some inflation theories—which we can place in the structuralism category—stressed the political causes of inflation, which in general were not well specified, but in terms of modern literature can be associated with institutional development models such as those posed by Acemoglu and others (2004) or the perspective proposed by Cukierman, Edwards and Tabellini (1992).

imbalances are identified as causes for money growth and inflation: i) stagnation in the availability of food; ii) inability to increase, through diversification, the purchasing power of exports; iii) an inadequate capital formation rate; and iv) deficiencies in the tax system.⁶³

Toward the late 1960s, there was an intense debate about the causes of inflation in Chile and in Latin America in general, which pitted as the structuralism vision against what was called the “monetary approach.” As is well known, the monetary theory viewed the high money growth rate, stimulated by fiscal deficits and expansive domestic credit policies, as the main cause of inflation. From this perspective, inflation control would be achieved essentially through the implementation of measures aimed at imposing discipline and austerity on public finance and through that, managing the monetary policy. This approach generally led to the adoption of some kind of exchange rate peg.

The academic debate on inflation was relatively limited in Chile until the mid-1960s, and focused the discussion on conceptual aspects rather than empirical evidence, thus leaving plenty of room for the influence of ideological perspectives. Among the first efforts to carry out rigorous studies on this process using the latest econometric instruments available at the time were those of Harberger (1963), Luders (1970) and Corbo (1974).

In parallel, starting in the late 1960s a series of papers provided empirical estimates of money demands. Of course, an important goal of this research was to identify inflation pressures, through the prism of the monetary theory of nominal income.⁶⁴ Important studies along these lines were those of Deaver (1960), Ossa (1964), Reichmann (1965), and Cortés and Tapia (1970), among others.

In the second half of the 1960s, the macroeconomic debate became more sophisticated, reflected in the adoption of more rigorous and formal models for inflation control. An important contribution was provided by the “costs of inflation” model developed by Cauas (1970), which gave the rationale for the stabilization plan used in the first part of the 1966/1970 Frei presidency. The model tried to identify the pressures faced by the economy’s most important prices aligning monetary and fiscal policy behind certain inflation objectives. This exercise combined a rigorous evaluation of the cost pressures with

63. Ossa (1964) explains the failure of some efforts to control inflation, which was due to the deepening of the imbalances mentioned.

64. Friedman (1971).

an estimate of money demand, with the aim of establishing a money growth rate that was compatible with the proposed inflation target. This model was successful in moderating the pace of inflation during the first part of Frei's government, although in the second part it was overwhelmed by intense fiscal spending pressures.

The tremendous monetary and fiscal pressure generated during the socialist government in the early 1970s left the Chilean economy at the threshold of hyperinflation, making it essential to immediately apply an effective stabilization program.

The military government that took power in mid-1973 displayed some doubts about the correct strategy to confront inflation. However, in 1975 a drastic monetary and fiscal adjustment was chosen, instead of a more heterodox program of gradual adjustment based on price controls.⁶⁵ This strategy was triggered by a complex balance-of-payments scenario, provoked by an almost 40% decline in terms of trade, in circumstances where the country's political-institutional reality hindered access to external financing.

Many articles and documents describe and discuss the strategy used to confront the serious inflation problem of the 1970s, however it is worth mentioning the letter sent by Milton Friedman to General Pinochet summarizing his recommendations for reaching this objective. That letter describes the classical monetarist recipe for attacking a high inflation scenario. Even though that approach was not fully adopted—mainly because the exchange rate assumed a critical role in the stabilization program—Friedman's view contributed to support the reduction of monetary growth and the adoption of a shock treatment for adjusting public finances as the key ingredients of the stabilization program, dismissing heterodox alternatives.⁶⁶

After a significant decline from inflation levels of three and almost four digits to levels around 40%, there was a perceived barrier to achieving further progress. This could reasonably be assumed to be related to some stickiness in inflation expectations, reflecting a credibility problem about the possibility of achieving greater progress in inflation control. In order to chip away at the skepticism of inflation expectations, and reduce the high degree of inertia in inflation that prevailed in price and wage movements, in June 1979 the government

65. On the internal controversies regarding how to address the problem of inflation, see Arancibia and Balart (2007) and Fontaine (1988).

66. This letter was published in Friedman and Friedman (1998).

decided to fix the nominal exchange rate.⁶⁷ This occurred in the context of a strong influence of the “monetary approach to the balance of payments.”⁶⁸ As previously stated, this strategy sought to establish a credible commitment to low inflation (in the medium term), which would help contain the inflationary dynamic incorporated into price and salary movements. In fact, the same empirical research on the Chilean inflationary dynamics reveals the importance of movements in the nominal exchange rate. Thus, it is understandable that this variable would play an important role in stabilization programs.

However, as mentioned before, the fixed exchange rate rule, as a central element for inflation control, suffered a severe blow as consequence of the strict stabilization program implemented in the United States in 1979. This stimulated a substantial increase in international interest rates, causing a sharp balance-of-payments and financial crisis in economies with significant excess expenditures, like the Chilean.

Although concern about the consequences of a high degree of price and salary indexation in the Chilean economy was one of the justifications for imposing a fixed exchange rate as a nominal anchor and using it to break down inflationary inertia, the financial and balance-of-payments crisis that followed the collapse of that regime made it necessary to overlook this concern, and led to the adoption of a “real exchange rate policy” to stimulate expansion of the tradable sector.

Abandonment of the fixed exchange rate rule and the adoption of an exchange rate indexation scheme to address balance-of-payment problems not only downgraded the importance of inflation in the government’s objective function,⁶⁹ but also led to the loss of the nominal anchor that guaranteed a certain medium-term stability for inflation.

It is important to note that until the end of the 1990s, the Central Bank had to reconcile the inflation objective with the restriction

67. This occurred after two devaluations of the peso, which moderated the pace of inflation, although it still remained at a relatively high level. On the other hand, different analysts put forward the hypothesis that the high level of real interest rates reflected the rebelliousness of expectations and inflationary inertia, which did not change substantially with the aforementioned devaluations.

68. Frenkel and Johnson (1976).

69. This was despite the fact that application of a rigorous adjustment program supervised by the International Monetary Fund involved the establishment of a related monetary program with a certain itinerary for inflation. This occurred in a context in which the priority objective was to put external accounts in order.

represented by an exchange rate band, which frequently led to a significant accumulation of international reserves. In mid-1999, the Central Bank adopted a floating exchange rate scheme, which together with the ban on providing loans to the central government included in the constitution of an independent Central Bank in 1989, created, for the first time in several decades, a scenario where monetary policy could be concentrated exclusively—or at least preferentially—on achieving a given inflation objective.

Inflation targeting is without a doubt a contribution to the design and evaluation of monetary policy. Nevertheless, it is difficult to assume that the decline in inflation in Chile starting in 1990 was solely a consequence of its adoption. That was insofar as the true commitment of the monetary authority to this result—and consequently the costs of not complying—were not clearly shown until the full adoption of the scheme, with the abandonment of the exchange rate band after the Asian Crisis in the late 1990s. In fact, it is here when the Central Bank decided to adopt a severely contractive monetary stance to contain a significant aggregate excess demand where a fiscal stimulus combined with aggressive adjustments in the minimum wage and public sector salaries had an important responsibility.

Starting with this episode, inflation continued to fall rapidly. This was at least partially the result of the above mentioned global environment of disinflation, which was supported domestically by the energy with which the Central Bank reacted in the face of signals of excess expenditures. The global financial crisis of 2007-2009 accentuated the deflationary pressures on Chile's economy, thus containing a resurgence that had pushed this variable to 7.8% in 2007, well past the Central Bank's target range for inflation.

In relation to the inflationary dynamics of the last decades, Morandé, García, and Johnson (1995) find that until the mid-1990s no changes were observed in the inflationary trend or dynamics, suggesting that the change in inflationary dynamics occurred later. In fact, they find that inflation appears as exogenous to the set of variables selected in a vector autoregressive exercise, which—in their opinion—would confirm how rooted this process was in policies and institutions sustained for a long period. Rojas, Rosende, and Vergara (1995) find a similar result.

Available empirical research provides a series of interesting clues for designing a general framework for studying inflation in Chile. On one hand, what it reveals is that the pace of inflation showed

significant fluctuations over time, with particularly sharp movements between 1970 and 1990. The studies of Rosende and Guier (1994) and Belaisch and Soto (1998) find evidence of inflation's anti-cyclical behavior, which seems to reinforce the importance of the public finance considerations described previously in the explanation of movements of this variable. The study by Restrepo and Soto (2006) confirms the finding of a negative contemporary correlation between activity cycles and inflation, which is especially clear in the case of underlying inflation. This was true for the period 1986-2005. While this result seems to contradict inflation theories based on a Phillips curve of the type shown in equation (5), Restrepo and Soto argue the contrary, finding a positive and significant correlation between activity cycles and inflation (measured by underlying inflation) three quarters later. They also find a negative correlation between the preceding inflation and cycles of activity and employment in period t .

$$\pi_t = \alpha \pi_t^e + \lambda(y - y^*)_{t-k} + \gamma \pi_{t-1}. \quad (5)$$

While a more detailed analysis of the inflation process is needed to draw more solid conclusions about the main features of the process—which we do in section 7—a review of macroeconomic data from Chile in the transition process toward low inflation suggests that a major role has been played by the behavior of the nominal exchange rate and changes in the global economy during that period, shown in tables 5 and 6. The hypothesis of a favorable external environment, which made it possible for movements of the nominal exchange rate to decisively contribute to controlling inflation, has been put forward by Calvo and Mendoza (1999).

An alternate view of the nature of the inflation control process in Chile—arriving at the levels of an industrialized economy—highlights the effect on expectations of the maintenance of economic guidelines after the political change in 1990, including the new autonomy of the Central Bank. This situation would have shaped a scenario of favorable expectations regarding growth and stability, making possible a credible disinflation process à-la-Lucas-Sargent, which prevented the appearance of any significant real costs.

To be fair, this line of argument does not contradict the one which emphasizes the “stroke of luck” caused by a favorable external scenario that was adverse for inflation. In fact, it would be sufficient that the belief in the strength of institutions and the anti-inflationary commitment were credible to the markets in order to attract capital

for investment in the country, which by pushing down the exchange rate helps to contain inflation. Moreover, it is important to recall that until 1989 a strong tension was maintained between the tendency to grow from investment and capital inflows with a real exchange rate policy. As this was inconsistent with inflation control—a priority objective of the newly autonomous Central Bank—it was to be expected that there would be strong downward pressure on the nominal exchange rate, which would confirm that it was technically under control, but sustained by the indexation mechanisms in place.

6. EMPIRICAL ANALYSIS

This section provides an analysis of the evolution of Chilean inflation dynamics since 1977, following some of the recent literature that has done similar exercises for the U.S. and G7 nations (among others, Cogley, Primiceri, and Sargent (2010), Stock and Watson (2007), Cecchetti and others (2007)). This exercise tries to evaluate the changes in the behavior of inflation in Chile and place them in an international context, and is an initial step towards a formal evaluation of the causes underlying these changes.

We start by providing some statistics of inflation in the sample period, and across subsamples chosen on the basis of the previous discussion. We then estimate a simple inflation equation, and check for structural changes using the methodology developed in Bai and Perron (1998, 2003). Finally, we follow the state-space methodology in Stock and Watson (2007) to decompose the inflation path into a time varying-trend and a transitory component, each of them with time-varying volatility.

6.1 Simple Descriptive Statistics on Inflation

Our analysis uses quarterly CPI data from 1977 to 2011. This allows us to have a long series (more than 120 observations), and is an interesting sample for various reasons. On one hand, starting in 1977 allows us to avoid the hyperinflation episodes of the early 1970s, and to focus our attention on a period characterized by overall sound macroeconomic policy, in which the fiscal imbalances that historically caused high inflation are largely absent (Morandé and Noton, 2004). The period is still very interesting because there is still significant variance in the policy framework across time, as

the country moved from the fixed peg of the late 70s and early 80s, to the relatively loose monetary policy with a clear exchange rate objective in the mid-1980s, to Central Bank independence and the gradual abandonment of the exchange rate band in the 1990s, to the adoption of full-fledged inflation targeting in early 2000.

Table 7 describes the mean and standard deviation of CPI inflation for the whole sample, and for three subsamples: pre and post Central Bank independence, and after the adoption of free float⁷⁰ for the exchange rate after the Asian crisis, which has been identified as a period of consolidation of the inflation targeting regime that was gradually adopted during the 1990s (see, for example, Corbo, Landerretche, and Schmidt-Hebbel, 2002, and Aguirre and Schmidt-Hebbel, 2007).

The behavior of inflation in Chile over the sample period is very similar to what has occurred in many other economies: inflation has become significantly lower and more stable. This has made inflation, according to Stock and Watson (2007), both simpler and harder to forecast. On one hand, the stability of inflation implies that naïve inflation models, such as a simple average over the last four quarters, have become increasingly better forecasting devices. On the other hand, more complicated multivariate models have a harder time providing better forecasts than their naïve counterparts (Atkeson and Ohanian, 2001), as short term variations in inflation appear to be increasingly associated to transitory, unpredictable shocks.

Table 7. Mean and Standard Deviation of Annualized Quarterly Inflation in Chile, 1977-2011

| | <i>Mean inflation (%)</i> | <i>Standard deviation (%)</i> |
|-------------|---------------------------|-------------------------------|
| Full sample | 11.90 | 10.56 |
| 1977-1990 | 21.32 | 9.70 |
| 1990-2011 | 6.34 | 6.32 |
| 1990-2000 | 11.10 | 6.63 |
| 2000-2011 | 2.94 | 3.00 |

Source: Calculated using seasonally-adjusted quarterly CPI data.

70. While the ER float has been largely clean, the Central Bank has intervened the exchange rate market in four limited periods during the last decade.

6.2 Looking for Structural Changes: Has the Inflation Process Changed in Time?

The descriptive statistics presented above suggest that the behavior of inflation in Chile has changed over time, particularly since the 1990s. Thus, our first strategy is to evaluate whether the data suggests the presence of significant changes in the statistical process governing inflation.

In order to do so, we estimate a simple AR(1) model of inflation, traditionally used in the literature, and use the methodology developed by Bai and Perron (1998, 2003)⁷¹ to test for the presence of multiple structural changes. The main advantage of the Bai and Perron tests is that the number and dates of the potential breaks are not set exogenously by the researcher, but are determined endogenously from the data using a sequential process. The method allows the identification of up to 5 structural breaks.

Results are presented in table 8. The procedure identifies two breaks, and dates them in the second quarter of 1982 and the second quarter of 1991. Both dates seem to make sense from an *ex ante* perspective, as the first break coincides with the June 1982 devaluation of the peso that put an end to the peg set in 1979 and the second break is associated to the start of the decline of Chilean inflation during the 1990s. This date is also consistent with the adoption of a disinflation strategy by the newly independent Central Bank and also to the start of the worldwide disinflation process. Somehow surprisingly, the procedure suggests that there were no breaks at other dates that would have appeared suggestive *ex ante*, such as the aftermath of the September 1998 aggressive monetary policy response against the peso devaluation or the adoption of “full-fledged” inflation targeting in 2000. Interestingly, the procedure suggests that there are no breaks when we allow for a linear time trend. This indicates that much of the action in Chilean inflation during the last 30 years has been its (relatively smooth) decline from values close to 30% to its current 3%. However, a model with a linear time trend is evidently not a particularly interesting description of the inflation process, especially when, as is the case of Chile’s, observing further permanent reductions in the inflation rate seems highly unlikely.

71. In fact, an AR(1) inflation model for the UK is exactly one of the applications discussed in Bai and Perron (2003).

Table 8. Inflation in Multiple Structural Change Test Results for Chile, 1977-2011

| <i>Inflation model</i> | <i>Number of Suggested Breaks</i> | <i>Suggested Break Dates</i> |
|---|-----------------------------------|------------------------------|
| $\pi_t = c + \beta\pi_{t-1}$ | 2 | 1982.Q2 1991.Q2 |
| $\pi_t = c + \beta\pi_{t-1} + \gamma t$ | 0 | - |

Source: Calculated with quarterly seasonally-adjusted inflation using the R algorithm that implements the methodology in Bai and Perron (1998, 2003).

Thus, the evidence suggests that, as expected, the statistical process governing inflation has changed in time. However, it is possible that a better representation is obtained not by assuming discrete, occasional changes, but a continuous process in which inflation dynamics are evolving at every moment across time, and in which the volatility of inflation is not constant, but behaves like a stochastic variable. This approach to the inflation process, which comes from the asset pricing literature, has received significant attention over recent years (Cogley and Sargent (2005), Sims and Zha (2006), Stock and Watson (2002, 2007)). We follow this approach in the next section.

6.3 An Unobserved Components Model With Stochastic Volatility for Inflation

Stock and Watson (2007) decompose inflation into the sum of a time varying trend τ_t , and a transitory component that behaves like a martingale difference innovation, ε_t . This is,

$$\pi_t = \tau_t + \eta_t, \quad (6)$$

$$\tau_t = \tau_{t-1} + \varepsilon_t, \quad (7)$$

$$\eta_t = \sigma_{\eta,t}^2 \xi_{\eta,t}, \quad (8)$$

$$\varepsilon_t = \sigma_{\varepsilon,t}^2 \xi_{\varepsilon,t}, \quad (9)$$

where $\xi_{\eta,t}$ and $\xi_{\varepsilon,t}$ are mutually independent i.i.d. $N(0,1)$ stochastic processes.

The trend component is stochastic, and behaves like a driftless random walk. This a state-space representation of the inflation process, with equation (6) being a measurement equation and equation (7) describing the state.

Inflation is thus represented as the sum of a random walk component (the trend or permanent component, which in a general equilibrium model should be anchored by monetary policy) and a random transitory disturbance. The relative importance of trend and transitory disturbances depend on the variances $\sigma_{\eta,t}^2$ and $\sigma_{\varepsilon,t}^2$, which are described by

$$\ln(\sigma_{\eta,t}^2) = \ln(\sigma_{\eta,t-1}^2) + v_{\eta,t}, \tag{10}$$

$$\ln(\sigma_{\varepsilon,t}^2) = \ln(\sigma_{\varepsilon,t-1}^2) + v_{\varepsilon,t}, \tag{11}$$

where $v_{\eta,t}$ and $v_{\varepsilon,t}$ are mutually and serially independent zero-mean variables.

There are two important implications of this representation. First, it assumes that inflation has a unit root, which comes from the trend component, and whose importance varies over time. While this may appear odd, many recent papers agree that a driftless random walk is a reasonable approximation to the behavior of trend inflation (among others, Cogley and Sargent (2005), Cogley, Primiceri, and Sargent (2010), Smets and Wouters (2003)). Notice that assuming a unit root in inflation does not imply that the central bank has no weapons to control inflation, as the unit root comes precisely from a trend component that in general equilibrium depends directly on monetary policy. This is, the empirical characteristics of the univariate process are not defined in a vacuum outside of policy influence, but are conditional on policy actions and all the variables that are relevant for inflation in a structural model. Secondly, if are constant, the UC-SV becomes a IMA(1,1) model, a representation that has been traditionally used in the literature. Thus, the UC-SV is locally a IMA (1,1) model, with a moving average coefficient that depend on the evolution of the relative variances.

Table 9 presents estimated autocovariances for the first differences of inflation over different subsamples. In a IMA (1,1) model, the first-autocorrelation should be negative and all other autocorrelations should be zero.

Table 9. First Difference Autocorrelations for the Change in Inflation in Chile, 1977-2011

| | <i>First lag</i> | <i>Second lag</i> | <i>Third lag</i> | <i>Fourth lag</i> |
|-------------|------------------|-------------------|------------------|-------------------|
| Full sample | -0.234 | -0.012 | 0.03 | -0.208 |
| 1977-1990 | -0.20 | 0.07 | -0.001 | -0.24 |
| 1990-2011 | -0.38 | -0.06 | 0.08 | -0.11 |

Source: Calculated using CPI inflation data. Bold numbers significant at 5% level.

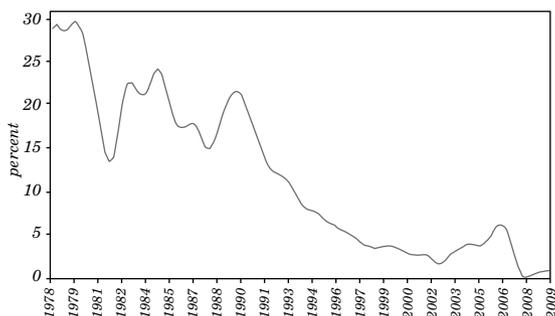
The first autocorrelation is always negative and significant, as suggested by the model. The fourth autocorrelation is also significant in part of the sample, probably reflecting some seasonal component that was not captured by the seasonal adjustment procedure. This exercise suggests that the UC-SV model is a reasonable approximation to the inflation process.

The UC-SV model is estimated using the algorithm in Stock and Watson (2007), based on 1000 Markov Chain Monte Carlo draws, using non-informative initial priors. As we have not checked how the estimates change if different priors are used, our results must be seen as preliminary in nature. Figure 1 presents the smoothed estimate for the stochastic inflation trend, τ_t .

The results are consistent with what we already know about Chile's inflation history. On average, trend inflation has decreased over time (and thus, a linear trend is not a bad approximation), but has suffered some significant fluctuations along the way. Our estimate falls abruptly after the adoption of a fixed exchange rate in 1979, to reverse course and recover strongly during the mid-1980s, approaching a peak at the end of the decade. The trend falls smoothly across the 1990s, much less rapidly than its decrease during the late 1970s-early 1980s. The 2008 inflation outburst is captured partially as change in trend inflation that is quickly reversed.

Table 10 compares our results with those in Cechetti and others (2007), who perform a similar exercise for the G7 economies for the period 1970-2006. As we already know, the decline in trend inflation over the last decades is hardly a unique feature of the Chilean experience. Across all countries, trend inflation falls across time, although only Italy comes somewhere close to the extent of the decline observed in Chile.

Figure 1. Estimated Stochastic Inflation Trend in Chile, 1977-2009



Source: Estimated by the authors using CPI data and the methodology described in Stock and Watson (2007).

Table 10. International Comparison of Estimated Inflation Trends, 1980-2006 (%)

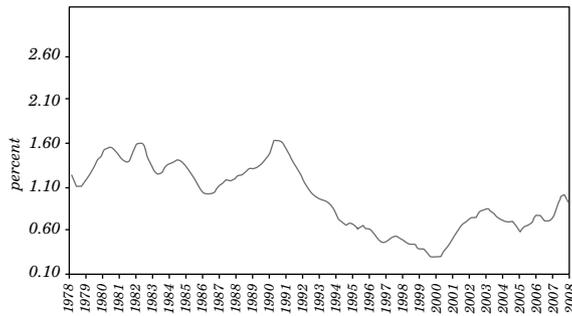
| | 1980-1989 | 1990-1999 | 2000-2006 |
|----------------|-------------|------------|------------|
| Canada | 5.3 | 1.9 | 2.4 |
| France | 6.7 | 1.5 | 1.6 |
| Germany | 3.0 | 1.9 | 0.7 |
| Italy | 10.8 | 4.1 | 2.4 |
| Japan | 2.4 | 0.2 | -1.3 |
| United Kingdom | 6.6 | 3.3 | 2.4 |
| United States | 4.4 | 2.1 | 2.3 |
| G7 Average | 5.6 | 2.1 | 1.5 |
| Chile | 19.5 | 9.9 | 2.9 |

Sources: Data for G7 countries taken from Cechetti and others (2007); data for Chile estimated by the authors using CPI data and the methodology described in Stock and Watson (2007).

Figures 2 and 3 present the median estimates for the variance of the trend and transitory components. Both series exhibit a similar behavior, being much lower after 1990, although the variance of the transitory component grows again during the last decade. The variance of the transitory component is always larger, and seems to

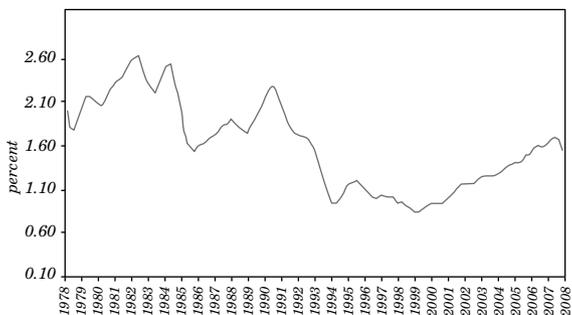
have become relatively more important in the last decade (table 11). This is qualitatively similar to the result found in Cechetti and others (2007) for the G7. Inflation has become more stable because both of its components have become more stable, and in relative terms transitory disturbances have become more important.

Figure 2. Median of Estimated Trend Volatility in Chile, 1977-2009



Source: Estimated by the authors with CPI data and the methodology described in Stock and Watson (2007).

Figure 3. Estimated Median of the Disturbance Volatility in Chile, 1977-2009



Source: Estimated by the authors using CPI data and the methodology described in Stock and Watson (2007).

Table 11. Estimated Trend and Disturbance Volatility in Chile, 1980-2008 (%)

| | <i>Average of median volatility</i> | | <i>Ratio of trend volatility to disturbance volatility</i> |
|-----------|-------------------------------------|--------------------|--|
| | <i>Trend</i> | <i>Disturbance</i> | |
| 1980-1989 | 1.25 | 2.05 | 0.61 |
| 1990-1999 | 0.84 | 1.35 | 0.62 |
| 2000-2008 | 0.65 | 1.26 | 0.51 |

Source: Estimated by the authors with CPI data and the methodology described in Stock and Watson (2007).

7. CONCLUSIONS

This paper has provided an overview on the behavior of inflation in Chile over the last decades, placing it in the context of the inflationary experience in other parts of the world. One of our main conclusions is that the behavior of inflation in Chile over the last 30 years has striking similarities to the experience of many industrialized (and developing) economies. In that sense, the discussion of the factors underlying the reduction of inflation in Chile can be complemented with the insights obtained from the theoretical and empirical analysis of what happened in other countries, and especially in the U.S. As suggested by that literature, the successful reduction of inflation, in a context of healthy GDP growth, probably reflects a combination of factors, ranging from better policies (both in terms of objectives and actual policy management) to a global supply shock that reduced inflation everywhere. Thus, the reduction of inflation in Chile was not solely luck or solely inspiration from the monetary authorities, but rather a (successful) combination of both.

The second part of the paper uses recent empirical methodologies to replicate some of the statistical results obtained for the U.S. and other developed countries. We present two main empirical exercises. The first one, using the structural break methodology developed by Bai and Perron, suggest that the inflation process has changed twice since 1977, both changes roughly coinciding with relevant changes in both the monetary policy framework and international conditions, although somehow surprisingly there is no evidence change after the adoption of “full-fledged” inflation targeting in 2000, when inflation stabilized around 3%, ending the disinflation

process started in 1990. The second exercise uses the UC-SV model developed by Stock and Watson (2007) to show that the reduction of the level and volatility of inflation can be decomposed into the reduction of its trend, and a reduction of the volatility of its trend and temporary components. Comparing our results for Chile with a similar exercise for the G7, we confirm the strong similarities between the timing and characteristics of the inflation process in Chile and the industrialized world.

This paper can be seen as the first part of a wider agenda that tries to understand the features of inflation in Chile, with an emphasis on placing them on an international context. In that sense, we have provided a detailed statistical description of inflation, and a conceptual discussion of the mechanisms underlying the inflationary process over the last two decades. Future research will try to empirically analyze those mechanisms, shedding some light on the competing hypotheses and their relative weight.

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