MONETARY THEORY AS A BASIS FOR MONETARY POLICY
A Conference Sponsored by the International Economic Association
University of Trento
September 4-7, 1997

Panel:
"What have Monetary Economists done for Central Bankers"
Pedro Pou[1]

Introduction

I was told by professor Leijonhufvud that the question for the panel is "What monetary economists can do, have done and have failed to do for central bankers". This is indeed a wide and ambitious question for me, so I will concentrate my remarks on just six very instructive lessons that monetary economists have suggested for policy makers that are particularly relevant for Argentina.

Then, I want to analyze the opposite question and ask what policy makers have done for monetary economists. I will argue that policy makers in Argentina have done their best to give monetary economists extremely valuable observations, in particular on inflationary phenomena. Indeed, one could probably argue that Argentina is about as good a laboratory to test various theories of monetary economics as one could hope to find. So I will attempt to show some of the lessons that could be learned from Argentine data, concerning the impact of 'good' and 'bad' monetary policy on several variables.

The Main Lessons from Monetary Economists

Let me turn first to lessons that Monetary Economists have taught Central Bankers.

The first lesson that I think is absolutely central, and although so obvious when stated often appears to be forgotten, is one that has been stressed by the organizer of this conference, Axel Leijonhufvud. Namely, a Central Bank can either attempt to fix quantities or prices, but certainly cannot fix both. Hence monetary regimes can be thought of as how much they attempt to fix **M** (quantity of money) or **P** (the value of money). This implies that we have to set a nominal anchor; an inflation target or a devaluation target (controlling P or some subset of P) or set a monetary target (controlling M).

As Leijonhufvud has argued, the regime in place then has implications for the behavior of the private sector. He claims that we have lost a world (pre First World War) when governments successfully fixed the value of money and in which the prices of goods and services were then much more flexible.

[1] President, Central Bank of Argentina.

The second lesson is that in thinking of the supposed trade-off between inflation and output, we have to take into account the role of expectations. Here of course the work of Sargent, Lucas and Wallace was critical, and the Argentine experience of 50 years of high inflation and stagnant growth is a very telling illustration of those ideas.

A third lesson from monetary economists was suggested by Sargent[2] and concerns on how to stop a hyperinflation. He stressed that to stop inflationary expectations in their tracks, a distinct change in regime is required. In particular, given that inflationary expectations may be derived from the calculation of the seigniorage income required to balance the fiscal accounts, a distinct change in the perceived intertemporal solvency of the state is needed.

The fourth lesson I would include is that of the interaction between the monetary regime and the political economy of wider policy making. This is an idea, in common with many, that goes back at least to Hicks, Keynes and Friedman but also has been stressed more recently by Kenen[3]. In particular the idea is that a rule-based monetary policy regime might improve the quality of policy making elsewhere. Unlike a policy governed by discretion, a monetary rule focuses the political debate; one either has to be in favor or against a specific rule, it is more difficult to sit on the fence. However, to be against one rule normally implies that one must suggest an alternative or lose political credibility. In this way, rule-based monetary regimes sharpen the political debate and positions tend to have to be defined more precisely.

The fifth lesson has to do with fixed exchange rates and it is very relevant for understanding two recent crises in emerging countries, Mexico 1995 and Thailand 1997. As Mundell[4] has recently pointed out, "There is an important difference between fixed and pegged exchange rate. The fixed exchange rate system presupposes that the money supply is allowed to increase or decrease with balance of payment surpluses or deficits, while a pegged rate system allows monetary policy to finance deficits or to support an incompatible exchange rate. The pegged rate system deserves to be discredited as the worst of all systems." The pegged exchange rate system used by Mexico may help to explain the recent crisis of 1995 in that country. On the other hand, the misunderstanding of the difference between fixed and pegged could go a long way in explaining the contagious impact of the Mexican crisis on Argentina.

Last but not least, the sixth lesson is that the economic history of a country is always very important when formulating monetary policy, since it is built into attitudes and institutions that matter. It is clear that the deflationary background in which Keynes wrote the General Theory is totally different from the hyperinflationary one that was in the mind of an Argentine economist in 1989, and those backgrounds have had an impact on institutional settings. As John Hicks has said "Monetary theory is less abstract than most economic theory; it cannot avoid a relation to reality, which in other economic theory is sometimes missing. It belongs to monetary history in a way that economic theory does not always belong to economic history"[5].

What have Policy-Makers done for Monetary Economists?

[2] Sargent, T, "The ends of four big inflations", in Hall, R., ed., "Inflation: Causes and Effects", Chicago: The University of Chicago Press.

[3] Kenen, P, "Exchange rate and the monetary system: Selected essays of P. B. Kenen" - Economist of the twentieth century series - Aldershot, UK - 1994.

[4] Mundell, "Currency Boards, Fixed Exchange Rates and Monetary Discipline", Discussion Paper 207, World Bank, 1993.

[5] Hicks, John: Critical Essays in Monetary Theory; quoted from Axel Leijonhufvud: “Monetary policy and the business cycle under 'loose' convertibility. Greek Economic Review, Vol 12, Supplement.

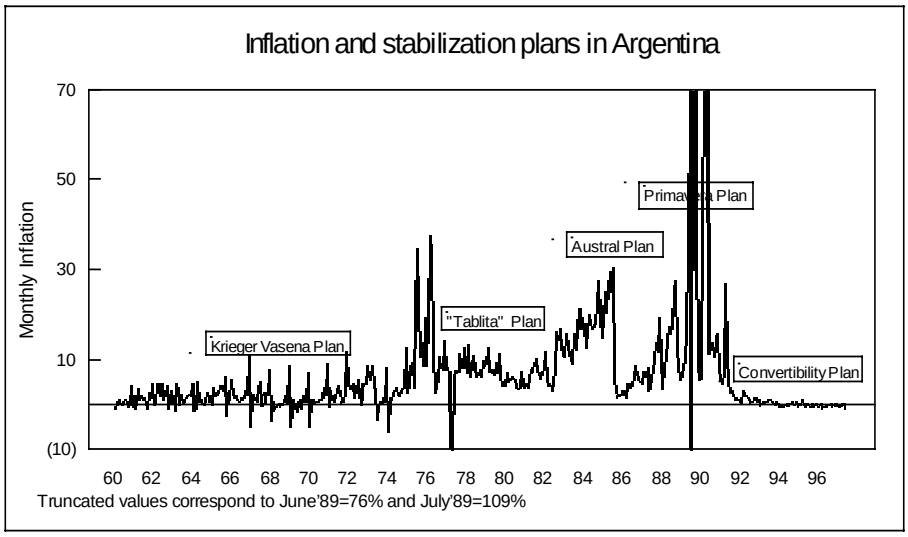
It seems to me that Argentineans have not learned these lessons out of the teaching of monetary economists, a healthy and good way indeed, but out of trying different monetary policies and learning from our own mistakes. More recently, we have also learned from some good policies. So, in what follows, I will attempt to show how we did learn those particular lessons, and why we believe them to be important for other policy makers involved in the design of monetary policy.

In particular, I will focus my comments on two points that are particularly relevant: from the past, I will analyze the costs of inflation, specially high inflation. From the present, I will discuss the benefits of a fixed exchange rate for a country like Argentina, in terms of (i) its impact on general macroeconomic policy and politics at large; and (ii) on the endogeneity of price flexibility, taking into consideration that the lack of price flexibility has been used as an argument against a fixed exchange rate system.

1. Argentina's Long Inflationary History

To give you an idea of Argentina's experience, the first Graph illustrates inflation in Argentina over the last 35 years or so. The Graph shows that the history is one of (i) variable inflation regimes with some periods of very high inflation and (ii) many failed stabilization attempts. As I will demonstrate shortly this experience has had significant costs indeed.

Graph 1



Those familiar with Argentina will appreciate that Graph 1 reflects a pattern. Inflation was generally followed by a poorly constructed stabilization plan, followed by the failure of the plan, followed by economic disorder and subsequently higher inflation. This cycle affected expectations and hence led to a very high persistence of inflation also causing more and more difficulties for the next stabilization effort.

This pattern continued until hyperinflation eventually emerged. The hyperinflation was stopped

by the introduction of the Convertibility Program. As Graph 1 demonstrates, Convertibility was extremely successful in bringing down inflation such that now Argentina enjoys one of the lowest levels of inflation in the Western World.

2. Impact of Inflation

What were the costs of this inflationary history? The first point I should make here is that it is clear that inflation was always considered a problem in Argentina. It was not that the country learned to live with it so well that it was considered unimportant. Far from it, the repeated stabilization attempts illustrate that there was always a feeling that something should be done!

The actual impact of inflation can be considered in a variety of different ways. Here I will just draw out two results. These are the impact of inflation on relative price variability and on growth.

I believe that one of the largest costs of inflation is its impact on one of the most important institutions that man has created: *the price system*, an institution whose importance can be compared to that of language. In a sense it is a form of language, of economic language that communicates efficiently the relative scarcities, and by so doing directs resources allocation. Mild inflation is like a minor language problem. High inflation destroys the language, and by so doing it has a severe impact on output[6].

We postulate that the impact of inflation on welfare is not a direct one, but it channels its effects through its impact on other variables. There are two that we can estimate[7]: the impact of inflation on price variability and on the functioning of the credit market. By introducing 'noise' into relative prices, inflation diminishes prices capacity to transmit correctly the relative scarcities in the economy. By reducing the size of the financial system, it alters the size and quality of the intermediation of savings[8].

2.a. Impact of Inflation on Price Variability

To analyze the impact of inflation on price variability, we constructed a series of relative price variability using the squared root of the standard definition, used first by Theil [9, 10].

$$rpvar = \left(\sum_{i=1}^{n} w_i (\pi_{i,t} - \pi_t)^2 \right)^{\frac{1}{2}} \qquad (1)$$

Graph 2 shows the monthly inflation rate and our relative price variability measure over time. As you can appreciate the behavior of relative price variability resembles that of inflation: high

[6] In an inflationary context, the market develops its own language to substitute for the missing one: indexation and/or dollarization. These are, however, imperfect substitutes of the 'official language' of price stability, and are not as efficient.

[7] See Leijonhufvud, "Monetary policy and the business cycle under 'loose' convertibility", Greek Economic Review, Vol 12, Supplement, for a list of the variables through which inflation impacts.

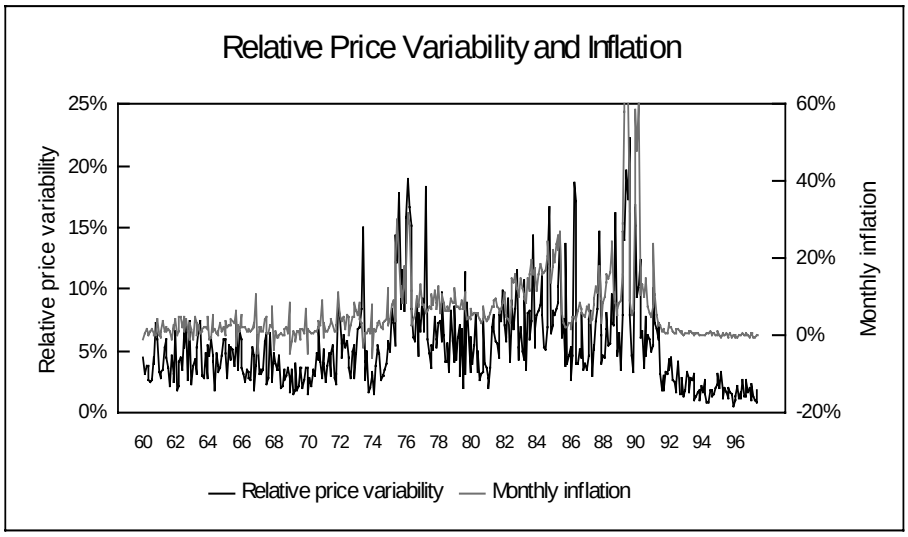
[8] De Gregorio and Guidotti, "Financial Development and Economic Growth" - IMF Working Paper, 1992.

[9] Theil, "Economic and Information Theory", Rand McNally, Chicago, 1967.

[10] In Appendix I, we developed this issue in further details.

inflation leads to high price variability.

Graph 2



To test this relationship we ran Causality test and ordinary least squared (OLS) regressions between these two variables using monthly data for the period 1.1960-6.1997 and some sub-periods related to the level of monthly inflation. In all the cases, the Causality tests show an anticipation from inflation to relative price variability; only for the Convertibility we found some feed-back between these variables. Considering this result we measured the impact of inflation on price variability using OLS regressions. As expected, significant effects between the variables were found[11], [12].

Also, to measure the impact of expected and unexpected inflation on relative price variability, we defined expected inflation (EI) as the predicted value of an AR model and unexpected (UI) as the residual, and both variables were included in the regression. We see that both expected and unexpected inflation have an impact on price variability[13]. The conclusion is that even a perfectly anticipated inflation has an impact on price variability. *Therefore, there seems to be no such a thing as harmless inflation.*

2.b. Impact of Inflation on the Financial System

[11] There is a theory in Latin America that inflation may be caused by income distribution fights supported by a passive monetary policy and therefore that it can be caused by price variability rather than being its cause. To understand this causality issue, we run the usual Granger causality tests. They indicate that over the period inflation caused relative price variability and not vice versa. Therefore, our results are in favor of the view that inflation is caused by some other phenomena than changes in relative prices rather than being caused by some type of price adjustment process as advanced in Latin America, in the context of the 'structuralist' view.

[12] These results are shown in Table I.2 and Table I.3, Appendix I.

[13] See Table I.4, Appendix I.

Inflation has two impacts on credit markets: on the one hand, it diminishes the monetization of the economy and consequently the real amount of banking credit; and on the other hand, due to the variability of relative prices it distorts price signals and diminishes the quality of financial intermediation and ultimately investment allocation.

The impact that we want to measure in this section is the quantitative impact of inflation on domestic credit.

First, we tested the causality relations between inflation, relative price and credit. We found feed-back links between credit and the other variables so we used a Vector Auto-Regression (VAR) model in order to determine the impact of inflation on credit. As expected, we found that credit has a negative response to inflation. An increase of 10% in monthly inflation reduces the monthly credit growth by more than 5% after one year[14].

2.c. Impact of Inflation on Welfare

A more difficult question is how to measure the impact of the deterioration of the price system and the reduction in the size of the financial system on the level of welfare? One way is to measure the impact of relative price variability and credit on output growth; another is to measure just the impact of inflation on output growth.

To do so, we conducted a series of analyses. In order to establish the link between inflation and GDP we ran Causality tests. We found that inflation affects relative prices and in turn those affect the GDP. Hence, we measured the impact of relative price variability and its cause: contemporary inflation, on GDP using OLS models and two-stage least squared regressions (TSLS). This was done for quarterly and annual data for the period 1960-1997[15]. The results show that inflation has a negative impact on GDP, directly in OLS regressions or through its impact on relative price variability when we used TSLS estimations[16].

On the other hand, we tested the hypothesis that the impact of inflation is through its impact on relative prices and credit to the private sector, and we confirmed this through appropriate statistic techniques. In this case, the Causality tests using quarterly data show feed-back between credit and GDP. So, again, we estimated VAR models. Following our results, if the economy suffers an inflation shock of about 10% annual, the annual GDP growth rate falls by about 1%. On the other hand, a positive shock of 10% on the credit growth rate increases the GDP growth rate by roughly 0.2%[17].

3. Currency Boards and the Endogeneity of Government Policy and Price Flexibility

The alternatives faced by Argentina in the middle of hyperinflation in 1990/1991 were not

[14] See Table I.8, I.9 and A in Appendix I.
[15] The GDP data for the period 1960-1970 is only available on an annual basis. We transformed it in a quarterly basis using the quarterly seasonally adjusted "Industrial Production Index" (Heymann, 1980) and its own seasonality calculated for the period 1970-1980. Hence, we worked with both quarterly and annual data.
[16] See Table I.7, Appendix I.
[17] See Table I.11 and Table B, Appendix I.

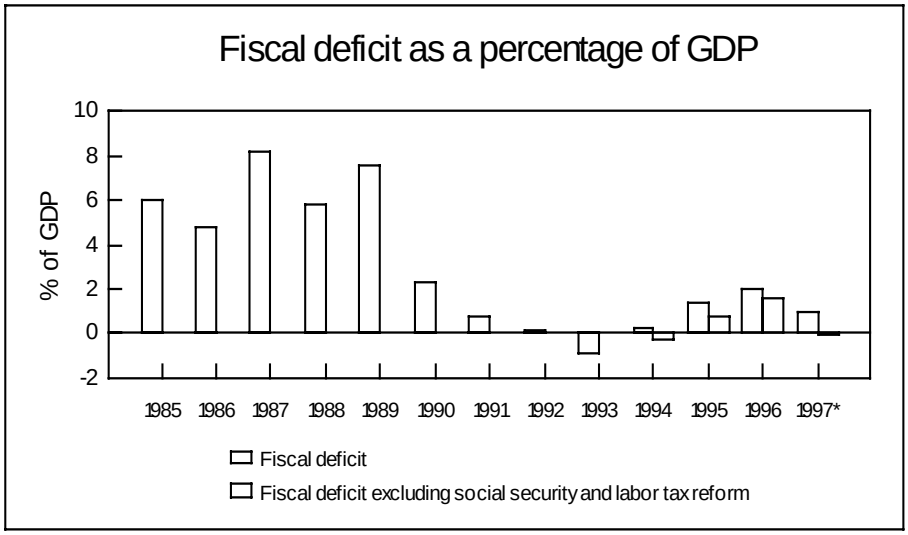
choosing between different monetary policies, with different targets (the conventional ones, such as a target on the money growth, inflation or exchange rate); there were really between dollarization and a rule that very much resembled it, given the commitment it requires: a currency board. At the end, a currency board was chosen.

Inflation was conquered by the introduction of Convertibility. This was a distinct change in the regime involving a fiscal reform, privatization, deregulation, opening of the trade and capital account, as well as fixing the exchange rate as part of a currency board system. This therefore follows Sargent's thesis extremely well[18]. By altering the perceived solvency of the state and providing a 'shock to confidence' Convertibility managed to shift expectations to stop the inflationary cycle.

The more significant change introduced by Convertibility was the improvement of the quality of economic policy. But there is more than a temporary change in expectations. The endogeneity of economic policy induced by a currency board derives from the fact that that regime does not allow any exchange rate flexibility. Therefore, society at large has to accept the budget constraint and economic policies have to be consistent with foreigners' willingness to finance the budget deficit. Also, it is necessary to make sure that there are no obstacles in introducing productivity changes to allow the local economy to maintain its level of competitiveness with respect to the economy to which the exchange rate has been fixed.

As an illustration of the change in fiscal solvency and the subsequent improvement in the quality of policies pursued, Graph 3 shows the fiscal deficit before and after the introduction of Convertibility in 1991. As depicted, the fiscal deficit fell significantly, with Argentina actually posting a fiscal surplus in 1993. The fiscal deficit then deteriorated somewhat, but to a large extent this was due to the reform of the pension system, so that the fiscal deficit was accompanied by an increase in savings of the private sector.

Graph 3



This change in the regime had deep consequences for Argentina. The results of the improvement in the quality of policies were reflected in an excellent macroeconomic performance. For the period 1991-1996, i.e, including Tequila crisis, GDP growth at almost 5%

[18] Op. cit.

per annum (4.8%), investment growing at 14% per annum, exports growing at 8% per annum and labor productivity growing by 4.6% per annum. In 1997, after the Tequila recession, output is growing at an annual rate of about 8% while inflation is below 0.3% per year.

However, apart from these changes in macroeconomic results, we have also found rather interesting results relating to price flexibility within the economy which I think may be of interest to this audience. In particular, we have analyzed the degree of price flexibility[19].

The assumption of price stickiness is at the heart of many discussions in the field of monetary and exchange rate policies. Anticipating the conclusion from the empirical analysis, the claim here is that price flexibility is an endogenous variable and depends on the credibility of the monetary regime. Price flexibility increases since (i) devaluation can not be used to transfer wealth from creditors to debtors; therefore, there is no incentive to accumulate losses and hope (and/or pressure) for a devaluation (a situation that has been present many times in Argentina's history); and (ii) as soon as one firm perceives that the demand for its product has diminished, the sooner it reacts by lowering its price the sooner the quantity demanded will increase. There is no incentive to wait for a general solution the firm`s problem through the exchange rate; problems have to be dealt with at the micro level and price flexibility is the best economic response.

The analytical tool that we used for understanding this problem is the distribution of relative price changes. We generated these distributions for a range of +/- 20% at intervals of 0.5% of relative price variability defined as:

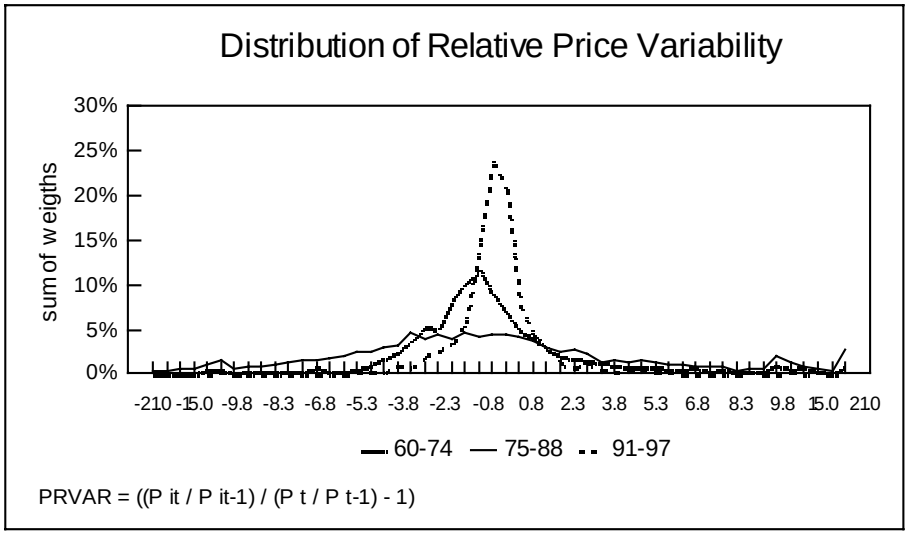
$$prvar_{i,t} = ((p_{i,t} / p_{i,(t-1)}) / (p_t / p_{(t-1)})) - 1 \qquad (2)$$

In Graph 4 we plotted these distributions for three different periods related to different inflation levels.

As you can see, the distributions accumulate 50% on each side by construction, but they are not necessarily symmetric. In other words, the total weight of negative relative price changes is equal to the positive one, but this does not happen for every individual price change.

Graph 4

[19] We developed this subject in detail in Appendix II and Appendix III.



The graph mentioned above also shows that the distribution for medium and high inflation regimes have higher variances than that for Convertibility. One might suggest that this indicates much greater price flexibility for the inflationary regime, but I suspect that it really indicates a greater level of noise.

To investigate this further, we defined a Relative Price Inversion index which measures the percentage of prices that invert in a specific time period, i.e. the sum of the accumulated deviation between an individual price and the CPI that tends to zero. Our results show that there is a significant link between the level of inflation and the percentage of relative prices that invert. We interpret this result as the evidence that inflation generates spurious price changes which are produced by misunderstanding the signals of the market.

We measured the noise that inflation generates through the comparison of the distributions of relative prices, computing specific moving averages of different lenghts. We found that the longer the period of the moving average we took, the more similar the distributions became and hence the more noise we removed[20].

Furthermore, we analyzed the price flexibility remaining once we took out the noise. We observe that the probability of falling relative prices is lower during non-inflation periods when it is necessary that the nominal price of a good falls to generate a negative change in its relative price. However, we notice that the effect of noise is much greater than the effect of price flexibility without the noise that inflation produces, showing the benefits of price stability[21].

I think that the general idea behind these results is clear. Medium and high inflationary regimes have a greater degree of noise (low persistence of relative price changes) whereas there seems to be high persistence of relative price changes in the Convertibility regime. This is a result consistent with the higher price variability in the inflationary regime than during Convertibility and with our finding that inflation has a negative impact on the efficiency of the price system.
However, low inflation does not mean the non-existence of price variability. But there is no single international standard of price flexibility with which to compare our findings for the Argentine case, so we decided to compare the behavior of Argentine prices with those of some

[20] See Table II.5, Appendix II.
[21] See Table II.7, Appendix II.

"stable" economies[22]. The results show that even in the Convertibility period, the Argentine economy has, at least, the same price flexibility as that of the other developed economies that have a record of price stability. This is true even when we analyze the prices of labor intensive service sectors as a proxy of the flexibility of wages. In particular, we demonstrated that Argentina has the same price and wage flexibility as the USA, an economy normally considered as highly flexible.

4. On Unemployment in Argentina

I have argued then that Convertibility was a very distinct change in regime for Argentina. Inflationary persistence was eradicated and prices have become much more flexible in nominal terms.

There is one observation, however, which sits at odds with this view, namely the high level of unemployment which although falling stands currently at some 16%. However, let me make one or two remarks about the labor market in Argentina.

First, in the period 1991-1994, we saw growing unemployment even though there was also strong growth in the economy. This was the result of growing employment not keeping pace with growing labor market participation. There were a number of reasons behind this, first labor market participation grew rapidly due to demographic changes and, in particular, to increased female participation.

Second, employment did not grow as fast as one might have expected in part due to the very significant restructuring of the economy. The privatization program for example led in some cases to very sharp falls in overemployed firms and hence rises in observable unemployment (substituting less visible under-employment).

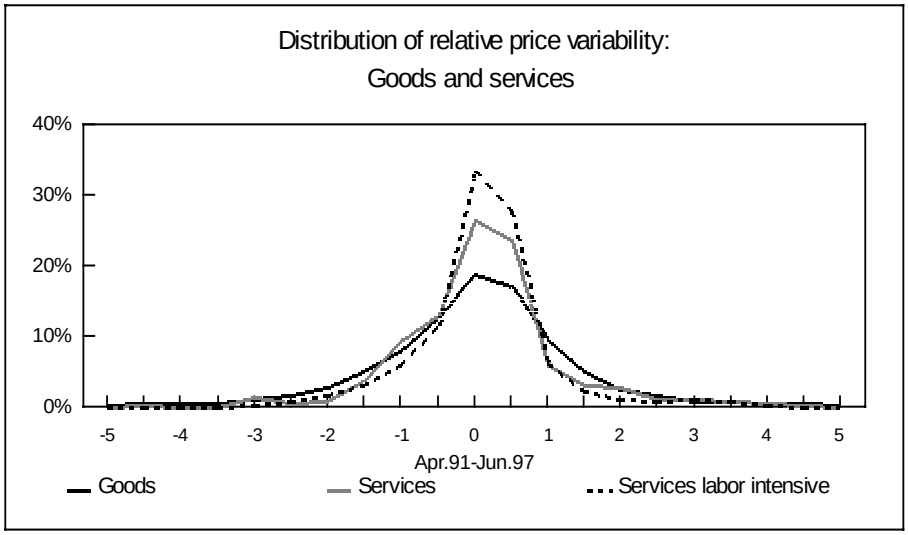
Finally, employment also did not grow as fast as might have been expected as labor was of high relative cost due to inflexible labor regulations and taxes on labor, and the lowering of the price of capital resulting from the opening of the capital account and reduction in interest rates. The growth therefore was capital intensive and not labor intensive.

By the end of 1994, unemployment had reached some 11% when the Tequila shock hit the country. In 1995 we saw a very sharp increase in unemployment to peak at 18,4% in May 1995[23] as the economy fell into recession. In the last year or so we have seen unemployment falling, but relatively slowly, so that it stands today at 16.1%.

Graph 5

[22] In Appendix III we studied the behavior of prices in United States, Canada, France, Germany and United Kingdom. We also compared the price flexibility of these economies with that of Argentina.

[23] It must be noted that it was precisely in may 1995 when the presidential elections were held, and president Menem was reelected. Indeed that seems to me an evidence of how the voter thought about the unemployment-inflation trade off. It may also tell some of the important impacts of a credible regime on the political environment or what we have as lesson Nº 4.



The usual response to this story is to state that, at least since 1995, the labor market has been clearing through quantities and not through prices due to downward inflexibility in wages. However let us reconsider our graphs on the distribution of price changes. In Graph 5 we broke down the price changes into goods, services and a subset of the service industry which we feel reflects the most labor intensive sectors for the Convertibility period. Our idea is that given greater labor intensity this will give us a better proxy for the wage flexibility.

In the Convertibility regime we do see downward flexibility in the price of services, even those that are labor intensive. However, this is clearly less than that in the goods sector or even in the non-labor intensive services. The χ^2 test shows that the distribution of labor intensive services is different from that of goods. The question is then how is the flexibility that is occurring and what might be preventing greater flexibility.

Table 1 shows data on wage rates and participation rates of the formal and informal labor market which I think is very informative on this point. The lesson I learn from this data is that the formal market lacks flexibility and hence the adjustment in price that did occur, occurred through the medium of firings in the formal market and new hires in the informal market, presumably at lower wages. This is a very imperfect way of getting labor market flexibility and not only has costs in terms of higher unemployment but also more generally; for example in terms of lower fiscal revenues, etc.

In any event, it is clear that there remains an unemployment problem in Argentina. Unemployment remains high and although it is falling it appears to be falling at a relatively slow rate given that the economy is growing very fast, at rates projected by the private sector of about 8%. I suspect that the fundamental restructuring that we have seen in the economy is also still playing an important role. In other words, mis-match problems are very severe indeed.

Table 1
Formal and informal sector wages

Year (*)		1992	1993	1994	1995	1996	1997
Nominal Wages (in $)	Formal Sector	629	736	770	783	754	784
	Informal Sector	470	556	525	483	479	471
Relative Shares (in $)	Formal Sector	76.1	74.8	76.4	73.6	69.6	68.1
	Informal Sector	23.9	25.2	23.6	26.4	30.4	31.9
(*) Observations correspond to October of each year							

On the other hand, the regulatory inflexibilities play an important part of this story. Companies that have gone through the costly process of firing workers during the recession are very reticent indeed to rehire. Labor laws that were passed in the inflationary regime, did provide sufficient real wage flexibility, since inflation allowed to decrease real wages by just not adjusting nominal ones. These laws are now a serious problem in an economy with price stability, and have to be changed to allow more flexibility. The society is conscious about the necessary changes that should be introduced in the legal framework so the political discussion about this issue is going on.

5. The Argentine Case: Conclusion

In summary, the 'rigidity' introduced by the fixed exchange rate system is compensated by additional flexibility elsewhere in the economy. In particular, there are two areas where this is very important: (i) economic policy in general and fiscal policy in particular; and (ii) price and wage flexibility. With respect to 'economic policy flexibility', it is important that fiscal policy accommodates the passive monetary policy and variations in the willingness of capital markets to finance private and fiscal deficits. But it is equally important to remove all obstacles that remain to allow the private sector to introduce more productive technologies (specially regulatory and tax distortions), so that labor productivity can grow at the same rate as in USA to whose currency the Argentine peso is pegged. This will then remove downward wage pressures. With respect to price and wage flexibility, it is necessary that all regulations in goods and services markets that prevent prices from adjusting to changes in demand and/or supply should be removed so that markets can be cleared by price movements rather than by quantity changes.

6. Fixed versus Floating Revisited

Finally, I wish to make a comment on the implications of our various results for the debate of fixed versus floating exchange rates. We have found that nominal price flexibility has grown considerably in Argentina due to the change in monetary regime, so that we may conclude that price flexibility is endogenous to the monetary regime in force. The point that I want to make here is that if this result is true then this changes the trade-off relating to the debate on fixed versus floating exchange rates quite fundamentally. In particular, the benefit of exchange rate flexibility may be severely reduced if in a fixed exchange rate world, prices become more flexible. I think this is precisely the idea of the organizer of this conference when he talked about the world that we have lost. Perhaps we can add an addendum that in one, admittedly rather unimportant corner of the world, perhaps we have regained some part of that heritage. Perhaps, also if EMU comes off, and is seen to be completely credible a bit more of that world

might be regained too.

Thank you very much for the opportunity to present these ideas in this forum.

Appendix I[24]

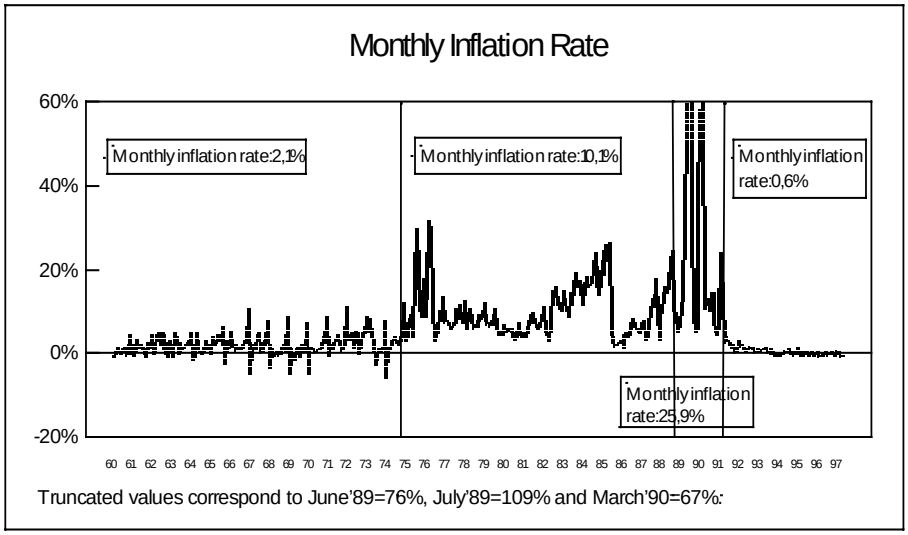
One of the most important costs of high inflation are its effects on relative price variability. From a theoretical point of view, fluctuations of relative price variability associated with inflation may have negative effects on the real side of the economy, since they deteriorate the informational role of prices leading to errors in the process of resource allocation.

Inflation also causes fluctuations in real output through the effect on relative prices. Following the hypothesis of Lucas[25] and Barro[26], monetary shocks erroneously perceived as relative price changes may lead to short run fluctuations in output.

Many empirical studies conducted during the 80's for different countries supported the hypothesis that high inflation is associated with high variability in relative prices. Other studies paid more attention to the effects that inflation and relative price variability may have on real output.

More recently Dabus[27] studied the relationship between inflation and relative price variability for the Argentine case in the period 1960-1990. In this study, we extended the period of analysis up to 1997 and also we examined the links between inflation, relative price variability, credit and output.

Graph I.1



In this Appendix we explore first the link between relative price variability and inflation. We

[24] I would like to thank Andrew Powell for his helpful comments and suggestions. Also, I am especially indebted to Alejandra Anastasi, Laura D'Amato and Elena Grubisic for elaborating this appendix.
[25] Lucas, R, "Some international evidence on output-inflation tradeoffs" - American Economic Review - 68 - 1973.
[26] Barro, R, "Rational expectations and the role of monetary policy" - Journal of Monetary Economics- January 1976.
[27] Dabus, C "Causalidad inflación-precios relativos: Algunas implicaciones del caso argentino" - Desarrollo Económico - Vol. 36 - Nº 142 - July-September 1996.

analyzed the relationship for the whole period and different sub-periods associated with low, medium and high monthly inflation rates (see Graph I.1)[28].

Second, as relative price variability is associated in the literature with inflationary shocks rather than with expected inflation, we studied the relationship between relative price variability and expected and unexpected inflation, following Blejer[29].

Third, we examined the links between inflation, relative price variability, credit and output.

a.1. Relative Price Variability and Inflation

We calculated here the squared root of the most broadly used measure of relative price variability, suggested by Theil[30], defined as follows:

$$rpvar = \left(\sum_{i=1}^{n} w_i (\pi_{i,t} - \pi_t)^2 \right)^{\frac{1}{2}} \qquad \text{(I.1)}$$

where:

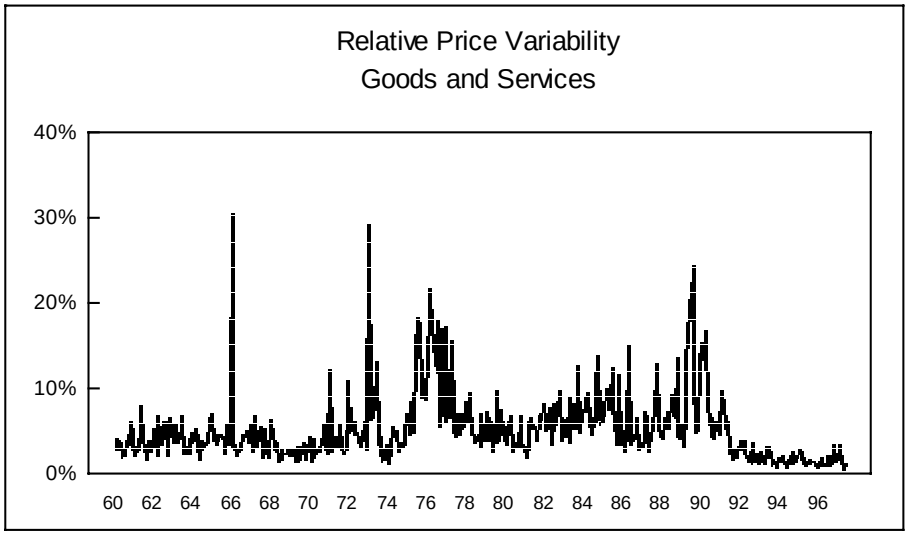
$\pi_{i,t} = \ln p_{i,t} - \ln p_{i,(t-1)}$

$\pi_t = \ln p_t - \ln p_{t-1}$

$p_{i,t}$ refers to the price of good *i* at moment *t,* and

p_t refers to the CPI at moment *t*

Graph I.2



Graph I.2 shows the behavior of the *rpvar* measure for all the prices collected by the CPI while

[28] We worked with the monthly data of the Consumer Price Index for the period January 1960 to June 1997.
[29] Blejer, M "On the real effects of inflation and relative-price variability. Some empirical evidence" - Review of economic statistics - Nov. 1980.
[30] Op.cit.

Graph I.3 only shows the behavior of the prices of goods. As it can be seen, the main differences correspond to the period 1960-1974. During the 60's and early 70's the CPI did not include changes in the prices of services as frequently as those of goods. When prices of services were adjusted, the measure of relative price variability over-compensated by the effect of the accumulated changes. Taking this into account, we calculated the *rpvar* measure using only the prices of goods and not of services.

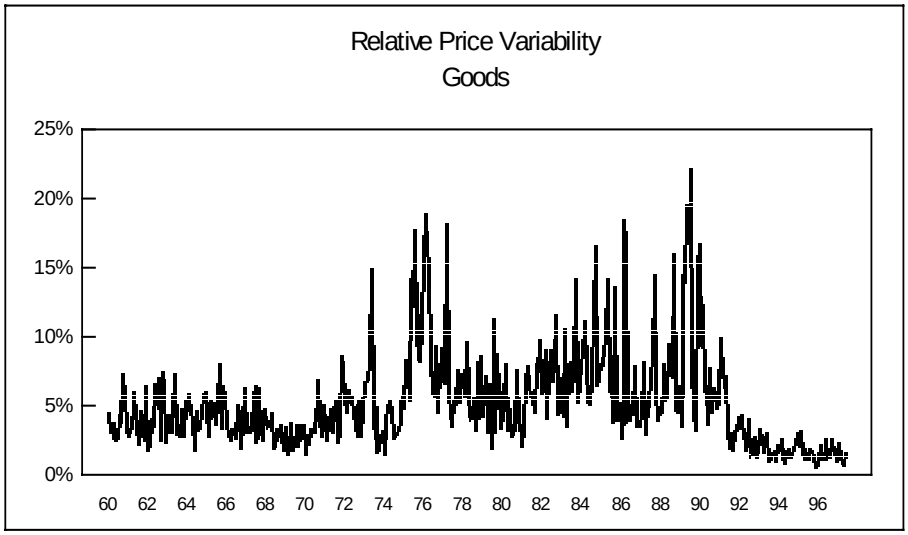
In Table I.1 we present the average monthly inflation rates and the relative price variability for different periods.

Table I.1
Average monthly inflation and relative price variability

Period	monthly inflation	rpvar
Whole Period		
1960.01 - 1997.06	6.3%	5.2%
Sub-Periods		
1960.01 - 1974.12	2.1%	4.1%
1975.01 - 1988.12	10.1%	7.2%
1989.01 - 1991.03	25.9%	9.4%
1991.04 - 1997.06	0.6%	2.2%

It is clear from Table I.1 that there is a strong positive relationship between the two variables. The higher the inflation rate the larger the relative price variability.

Graph I.3



a.1.1. The Monetarist vs. the Structuralist Hypothesis

According to the structuralist hypothesis, inflation is caused by changes in relative prices which are associated to the pushing of different groups for increasing the share in the national income. The money supply acts passively to accommodate to changes in prices. Inflation is a mechanism that facilitate the path towards the equilibrium prices when there are shifts in the sectional supplies or demands[31]. Conversely, the monetary approach stresses that movements in inflation anticipate changes in relative price variability.

Table I.2
Granger-Causality Test

Period	Ho = rpvar does not g-c inflation		Ho = inflation does not g-c rpvar	
	F-Statistic	Probability	F-Statistic	Probability
Whole Period				
1960.01 - 1997.06	1.93	0.08	15.45	0.000
Sub-Periods				
1960.01 - 1974.12	0.94	0.46	5.13	0.000
1975.01 - 1988.12	0.60	0.73	4.40	0.000
1989.01 - 1991.03	0.95	0.51	6.61	0.009
1991.04 - 1997.06	3.89	0.003	3.77	0.003

In Table I.2 the results of Granger-Causality tests (calculated on monthly data with 6 lags) are presented. In all the cases, the results show an anticipation from inflation to relative price variability. Only for the Convertibility period (1991.04-1997.06) was a feed-back relationship between both variables significant.

Since our evidence is in favor of the anticipation from inflation to relative price variability, we estimated regressions of relative price variability on the inflation rate which are shown in Table I.3. We observe that the mean of the relative price variability is about 4%. The relative price variability increased during the hyperinflation (the mean grew up to 6%) and decreased during the Convertibility period.

An increase of 10% in the monthly inflation rate, increased the monthly dispersion of relative prices by some 2%. However, in the Convertibility period an increase in the monthly inflation rate lead to an increase of the same magnitude in relative price variability, this is due to the feed-back that exists between these variables.

It is worthwhile noting that the period 1960-1988 is characterized by different mechanisms of price controls. These mechanisms provoked discrete changes in some prices affecting the measure of relative price variability in those months where the changes occurred. Also, these price movements implied a worse fit of the model. Starting 1989 when most of the price controls were removed, the fit of the model improved.

Table I.3
Regressions of relative price variability on inflation

Period	constant	inflation	adj-R^2

[31] See "Inflación y políticas de estabilización" in "Tres ensayos sobre inflación y políticas de estabilización" - CEPAL, Working paper Nº 18, Febraury 1986.

Whole Period			
1960.01 - 1997.06	0.04 (25.69)	0.23 (18.16)	0.42
Sub-Periods			
1960.01 - 1974.12	0.04 (23.84)	0.10 (2.09)	0.02
1975.01 - 1988.12	0.04 (9.35)	0.29 (7.25)	0.24
1989.01 - 1991.03	0.06 (5.65)	0.14 (5.31)	0.51
1991.04 - 1997.06	0.02 (14.05)	1.00 (10.57)	0.60

a.1.2. Relative Price Variability and Unexpected Inflation

As mentioned above, the monetary theory stresses that only unexpected monetary shocks can affect relative prices. In issue a.1.1. we concluded that inflation Granger caused relative price variability. In order to test to what extent the data support monetary hypothesis for Argentina, we analyzed the relationship between relative price variability and expected and unexpected inflation.

Table I.4
Regressions of relative price variability on expected and unexpected inflation

Period	constant	expected	unexpected	adj-R^2
Whole Period				
1960.01 - 1997.06	0.03 (21.82)	0.30 (19.63)	0.12 (6.05)	0.49
Sub-Periods				
1960.01 - 1974.12	0.04 (12.04)	0.27 (2.18)	0.07 (1.21)	0.02
1975.01 - 1988.12	0.04 (6.20)	0.35 (6.55)	0.21 (3.70)	0.25
1989.01 - 1991.03	0.03 (2.70)	0.24 (6.34)	0.09 (2.97)	0.64
1991.04 - 1997.06	0.01 (12.76)	1.11 (9.94)	0.75 (4.44)	0.61

The break-down between expected and unexpected inflation was calculated for the different periods using AR models. The unexpected inflation was calculated as the residuals of the regression of actual inflation on expected inflation.

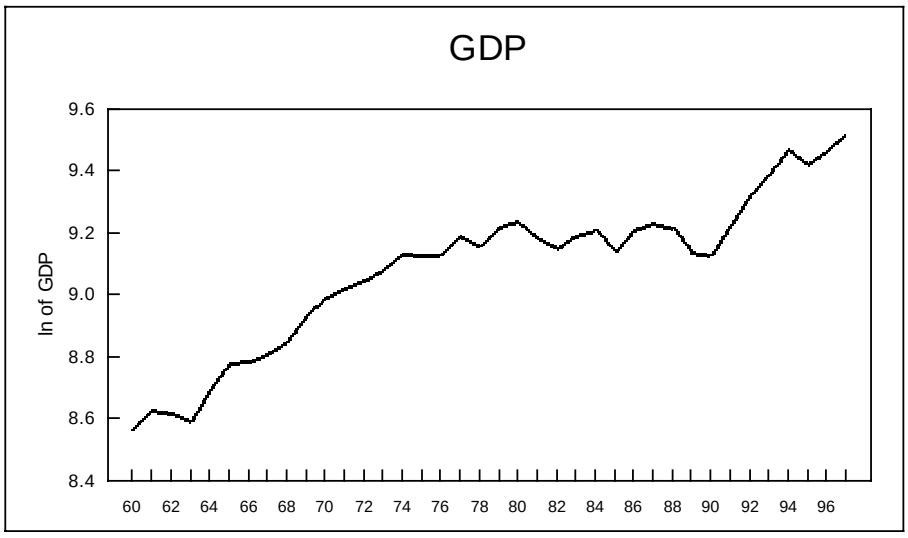
The relationship between relative price variability and expected and unexpected inflation is shown in Table I.4. In general, both expected and unexpected inflation are significant in explaining relative price variability. Therefore, there is not clear evidence that it is only unexpected inflation which causes increases in relative price variability. Moreover, expected inflation is more significant in explaining variability in relative prices. Hence, we decided for next issues to work with the inflation rate rather than its break-down.

b.1. Relative Price Variability, Inflation and Output

For the analysis of the effects of inflation and relative price variability on the real variables of the economy, we worked with the annual inflation rate, the annual average of the relative price variability measure and the logarithm of GDP for the period 1960-1997.

We first looked at the time series properties of the logarithm of GDP. A first inspection of Graph I.4 suggests that the series is not stationary. However, we tested the stationarity of the GDP using the Augmented Dickey-Fuller test. The results[32] confirmed the non-stationarity of the logarithm of the GDP and the stationarity of its first difference.

Graph I.4



We have established the relationship between inflation and relative price variability. Now, we want to verify the Lucas' proposition, i.e. that inflation causes fluctuations in real output through the relative price channel.

Table I.5
Granger-Causality Test

Period: 1960- 1997, annual data

	F-Statistic	Probability
Ho = Inflation does not g-c rpvar	2.00	0.17
Ho = rpvar does not g-c inflation	1.36	0.25

[32] The ADF test values are:
lngdp: - 0.88 (-2.95) *
d(lngdp): -4.88 (-2.95) *

*MacKinnon critical value for rejection of the hypothesis of a unit root at a 5% level of significance.

Ho = Inflation does not g-c GDP	0.49	0.49
Ho = GDP does not g-c inflation	0.58	0.45
Ho = rpvar does not g-c GDP	0.97	0.33
Ho = GDP does not g-c rpvar	0.07	0.80

We ran Granger-Causality tests between inflation, relative price variability and GDP on an annual basis. These tests show that the different variables do not Granger cause each other (see Table I.5). But when we analyzed the data on a quarterly basis[33], [34], we found that inflation Granger caused relative price variability and the latter Granger caused GDP (see Table I.6).

Table I.6
Granger-Causality Test

Period: 1960.I - 1997.II, quarterly data

	F-Statistic	**Probability**
Ho = Inflation does not g-c rpvar	5.69	0.000
Ho = rpvar does not g-c inflation	1.82	0.13
Ho = Inflation does not g-c GDP	0.99	0.42
Ho = GDP does not g-c inflation	0.91	0.46
Ho = rpvar does not g-c GDP	5.13	0.000
Ho = GDP does not g-c rpvar	0.50	0.73

Next we quantified the effect of inflation and relative price variability on GDP using both annual and quarterly data.

We estimated these effects with two different models on GDP: a two-stage least squared regression and an ordinary least squared model. The results (including significant variables) are shown in Table I.7.

Table I.7
Regressions of the first difference of the logarithm of GDP

Method	**Data frequency**	**C**	**Inflation**	**rpvar**	**dummy 75-90**	**seas. 1Q**	**seas. 2Q**	**adj-R^2 s.e.dep.var s.e.regress. D.W.**	**Instrument variable**

[33] The GDP data for the period 1960-1970 is only available on an annual basis. We transformed it to a quarterly basis using the quarterly seasonally adjusted "Industrial Production Index" (Heymann, 1980) and its own seasonality calculated for the period 1970-1980. We checked the transformed annual series against the quarterly GDP for the period 1970-1977 and we obtained an R^2 equal to 0.90.

[34] In this case, we worked with the annualized quarterly GDP, the annualized quarterly inflation rate and a 12-month average of rpvar.

TSLS	annual	0.10 (3.46)		-1.46 (-2.71)				0.14 0.049 0.045 1.88	Inflation
TSLS	quarterly	0.07 (3.35)		-1.09 (-3.06)		-0.06 (-6.78)	0.05 (6.31)	0.36 0.051 0.041 1.58	Inflation
OLS	annual	0.046 (5.01)	-0.002 (-1.90)		-0.036 (-2.40)			0.26 0.049 0.042 2.20	
OLS	quarterly	0.012 (2.77)	-0.0004 (-3.43)		-0.009 (-1.57)	-0.05 (-8.12)	0.05 (7.97)	0.59 0.051 0.033 2.26	
Note: t-value in parentheses.									

From the results of Table I.7 we can conclude that the OLS models have a higher level of fit, but the coefficients of all regressions lead to a similar relationship between inflation and GDP. The annual average rate of GDP growth is about 4.6%. However, this mean falls to 1.0% in the period 1975-1990 when, as it can be seen in Graph I.4, the GDP became flatter. Furthermore, an increase of 10% in the annual rate of inflation reduces in 0.02% the annual rate of GDP growth.

On the other hand, considering that the relationship between *rpvar* and inflation is 0.2%[35], an increase of 10% in the annual inflation rate produces an increase of 0.02% in relative price variability. Consequently, the annual rate of GDP growth is reduced by 0.03%.

b.2. Relative Price Variability, Inflation and Credit to Private Sector

The literature suggests that the degree of the development of the financial system affects the long-run growth of GDP. In order to test this assumption for Argentina, we chose credit to private sector in real terms as a proxy of the degree of financial development.

We ran Granger-Causality test between the price variables and the logarithm of credit to the private sector using monthly data (see Table I.8). Also, we tested the hypothesis of stationarity of credit[36].

Table I.8
Granger-Causality Test

Period: 1960.01 - 1997.06

	F-Statistic	**Probability**
Ho = Inflation does not g-c credit	20.17	0.000

[35] OLS regression:
Annual data: rpvar = 0.05 + 0.002 * inflation
(13.94) (4.27)

[36] The values of ADF test are: lncred: -1.06 (-2.87) *
d(lncred): -9.10 (-2.87) *
*MacKinnon critical value for rejection of the hypothesis of a unit root at a 5% level of significance.

Ho = Credit does not g-c inflation	22.84	0.000
Ho = rpvar does not g-c credit	6.13	0.000
Ho = Credit does not g-c rpvar	5.70	0.000

The Granger-Causality tests showed that there is a feed-back link between these variables. Hence, we used a VAR analysis and variance decomposition techniques to analyze the interactions between credit, inflation and relative price variability.

Table A shows that there are positive and negative significant effects of credit on inflation and of inflation on credit. In the first case the dominant effect is a positive link while in the second case it is negative. In addition, the effect of credit on relative price variability is less significant that the effect on inflation.

A summarized measure of the effects of shocks in credit and inflation is the impulse response function in VAR models. Since an autoregression has a moving average representation, a VAR model can be written as a Vector Moving Average (VMA). It is thus possible to trace out the time path of the various shocks on the variables contained in the VAR system. A compact expression of a VMA can be written as follows:

$$x_t = \mu + \sum_{i=0}^{\infty} \phi_i \varepsilon_{t-i}$$

This representation is an useful tool to examine the interactions between variables in a VAR model. The ϕ_i can be used to generate the effects of shocks in each variable on the time path of all variables in the system. They are called the impulse response functions. The cumulate sum after *n* periods of the effects of a shock in each variable yields the long run multiplier.

In our model, we found a negative long run (1 year) response of credit due to a shock in inflation (see Table I.9).

Table I.9
Long Run Response

Variable	Response of Credit
Inflation	-0.054
rpvar	0.005

After one year the credit growth rate would be reduced by 5% if there was a shock of one standard deviation to the innovation of the inflation rate $\left(\varepsilon_{i,t}\right)$[37].

b.3. Relative Price Variability, Inflation, Output and Credit to Private Sector

Using both annual and quarterly data we tested how credit and prices affect GDP. First we ran Granger-Causality test between inflation, price variability and the logarithm of GDP with the logarithm of credit. For the annual data we observed that the different variables do not Granger caused each other (see Table I.5 and Table I.10).

[37] The standard deviation of the inflation rate is about 9%.

Table I.10 **Granger-Causality Test**		
Period: 1960- 1997, annual data		
	F-Statistic	**Probability**
Ho = Inflation does not g-c credit	3.38	0.08
Ho = credit does not g-c Inflation	0.27	0.61
Ho = rpvar does not g-c credit	0.28	0.60
Ho = credit does not g-c rpvar	0.15	0.70
Ho = GDP does not g-c credit	6.41	0.02
Ho = credit does not g-c GDP	0.88	0.36

But when we analyzed quarterly data the test showed that there is only a feed-back link between the variables and the logarithm of credit (see Table I.6 and Table I.11).

Table I.11 **Granger-Causality Test**		
Period: 1960.I- 1997.II, quarterly data		
	F-Statistic	**Probability**
Ho = Inflation does not g-c credit	4.56	0.002
Ho = credit does not g-c Inflation	13.85	0.000
Ho = rpvar does not g-c credit	2.54	0.04
Ho = credit does not g-c rpvar	2.77	0.03
Ho = GDP does not g-c credit	5.17	0.001
Ho = credit does not g-c GDP	5.10	0.001

Hence, we again used VAR analysis and variance decomposition techniques to analyze the interaction between the variables (see Table B). The long run responses for a one year period are shown in Table I.12.

Table I.12 **Long Run Response**	
Variable	**Response of GDP**
Inflation	-0.009
rpvar	-0.003
Credit	0.002

As it can be seen from Table I.12, an increase in inflation rate or a decrease in the credit growth produce a negative impact on the GDP growth. An increase of 9% (one standard deviation) in the inflation rate reduces the GDP growth in 0.9%. On the other hand, a reduction of 10% in the credit growth reduces the GDP growth in 0.2%.

Then we also verified this result using annual data with a two-stage model using the inflation rate as the instrumental variable. As we found that credit is influenced by relative price

variability and both influence GDP, we isolated the effects of each one of the variables on GDP defining a new credit variable which did not have the effect of relative price variability (lncred1). We use this new variable in the two-stage model with the inflation rate as instrumental variable. Also, we estimated ordinary least squared model.

As it was expected, the result in Table I.13 show the same relations between the variables than the VAR model. However, the magnitude of the coefficients are different. Taking into account that the VAR model considers the feed-back between the variables, this result is more accurate.

Table I.13
Regressions of the first difference of the logarithm of GDP

Method	Data frequency	C	Inflation	rpvar	credit (*)	dummy 75-90	adj-R^2 s.e.dep.var s.e.regress. D.W.	Instrument variable
TSLS	annual	0.108 (3.75)		-1.556 (-2.98)	0.099 (2.06)		0.19 0.049 0.044 1.85	Inflation
OLS	annual	0.039 (4.19)	-0.002 (-1.92)		0.106 (2.59)	-0.028 (-1.93)	0.36 0.049 0.039 2.32	

(*) lncred1 instead of lncred in TSLS models.
Note: t-value in parentheses.

It is important to notice that when we compare the results of Table I.7 and Table I.13, we found that the addition of credit improved the fit of the regressions[38]. In both tables the coefficients obtained using annual data are similar.

Summing up our findings for the Argentine case we can conclude that:

a) the higher the inflation rate the higher the relative price variability;

b) inflation Granger caused relative price variability, and the latter Granger caused GDP so the higher the inflation the lower the GDP growth;

c) the higher the inflation rate the lower the credit growth;

d) the larger the development of the financial sector the higher the GDP growth.

An increase in inflation affects the growth of GDP in two ways: first, directly due to the negative link between both variables and second reducing the credit growth. Hence, the

[38] The F test that compare the OLS models in Table I.7 and Table I.13 is 7.24 (P-value: 1.0%) and the F test that compare the TSLS models in Table I.7 and Table I.13 is 3.24 (P-value: 8.0%).

Convertibility Plan fostered the growth of the economy by reducing the inflation from an anual rate of 2400% in 1989-1990 to 0.5% in 1997 and leading to an increase in credit of 399% between 1991 and 1997.

Table A
VAR model of credit, inflation and relative price variability

Standard error & t-statistics in parentheses
Period 1960-1997

	Dlncred	Inflation	rpvar
Dlncred(-1)	-0.353833	0.562569	0.013032
	(0.05739)	(0.05887)	(0.02716)
	(-6.16547)	(9.55673)	(0.47988)
Dlncred(-2)	0.118442	0.318886	-0.063375
	(0.06165)	(0.06324)	(0.02918)
	(1.92108)	(5.04245)	(-2.17219)
Dlncred(-3)	-0.141948	0.146907	-0.016894
	(0.06556)	(0.06724)	(0.03102)
	(-2.16531)	(2.18474)	(-0.54457)
Dlncred(-4)	0.006235	-0.083684	-0.016764
	(0.06569)	(0.06738)	(0.03108)
	(0.09492)	(-1.24205)	(-0.53931)
Dlncred(-5)	0.265878	-0.119627	-0.025872
	(0.06364)	(0.06528)	(0.03012)
	(4.17775)	(-1.83254)	(-0.85905)
Dlncred(-6)	0.121639	-0.075224	0.010264
	(0.06170)	(0.06328)	(0.02920)
	(1.97155)	(-1.18866)	(0.35156)
Inflation(-1)	-0.427675	0.831311	0.186865
	(0.05763)	(0.05911)	(0.02727)
	(-7.42168)	(14.0643)	(6.85258)
Inflation(-2)	0.109761	0.203813	-0.048119
	(0.06917)	(0.07095)	(0.03273)
	(1.58693)	(2.87282)	(-1.47016)
Inflation(-3)	-0.13635	-0.047154	-0.027845
	(0.07107)	(0.07290)	(0.03363)
	(-1.91855)	(-0.64685)	(-0.82793)
Inflation(-4)	0.034770	-0.160694	-0.045933
	(0.07026)	(0.07207)	(0.03325)
	(0.49488)	(-2.22977)	(-1.3815)
Inflation(-5)	0.223129	0.108493	0.036914
	(0.06911)	(0.07088)	(0.03270)
	(3.22877)	(1.53055)	(1.12879)
Inflation(-6)	-0.029305	0.000200	-0.010122
	(0.06023)	(0.06178)	(0.02850)
	(-0.48658)	(0.00324)	(-0.35515)
rpvar(-1)	-0.104601	0.315371	0.191321
	(0.10442)	(0.10711)	(0.04942)
	(-1.0017)	(2.94436)	(3.87171)
rpvar(-2)	0.137903	0.021588	-0.00691
	(0.10604)	(0.10876)	(0.05018)
	(1.30053)	(0.19849)	(-0.1377)
rpvar(-3)	-0.137878	-0.03136	0.050813
	(0.10602)	(0.10874)	(0.05017)
	(-1.30054)	(-0.28838)	(1.01283)
rpvar(-4)	0.258879	-0.232512	0.003241
	(0.10609)	(0.10882)	(0.05020)
	(2.44023)	(-2.13671)	(0.06456)
rpvar(-5)	0.112746	-0.157724	-0.02788
	(0.10647)	(0.10921)	(0.05039)

Table A **VAR model of credit, inflation and relative price variability**			
Standard error & t-statistics in parentheses Period 1960-1997			
	(1.05892)	(-1.44419)	(-0.55334)
rpvar(-6)	0.236453	0.061288	0.184001
	(0.10028)	(0.10286)	(0.04746)
	(2.35789)	(0.59583)	(3.87734)
C	0.000257	-0.008026	0.012903
	(0.00765)	(0.00784)	(0.00362)
	(0.03358)	(-1.02333)	(3.56583)
Dum6074	-0.013362	0.008333	0.010772
	(0.00759)	(0.00778)	(0.00359)
	(-1.76113)	(1.07082)	(3.00016)
Dum7591	-0.01056	0.017800	0.021395
	(0.00984)	(0.01009)	(0.00466)
	(-1.07308)	(1.76336)	(4.59418)
R-squared	0.316034	0.746247	0.569156
Adj. R-squared	0.283619	0.734221	0.548737
Sum sq. resids	1.066839	1.122449	0.238905
S.E. equation	0.050280	0.051574	0.023793
Log likelihood	706.8064	695.5515	1038.256
Akaike AIC	-5.934061	-5.883249	-7.430449
Schwartz SC	-5.740009	-5.689197	-7.236397
Mean dependent	0.003001	0.063309	0.053000
S.D. dependent	0.059405	0.100038	0.035419

Table B
Var model of GDP , credit , inflation and relative price variability
Standard errors & t-statistics in parentheses
Period 1960 - 1997

	DlnGDP	Dlncred	rpvar	Inflation
DlnGDP(-1)	-0.160892	-0.019706	0.003384	-6.789623
	(0.08675)	(0.24817)	(0.01660)	(49.3140)
	(-1.85471)	(-0.0794)	(0.20387)	(-0.13768)
DlnGDP(-2)	-0.170443	0.363889	-0.003815	-32.42704
	(0.07466)	(0.21359)	(0.01429)	(42.4425)
	(-2.28292)	(1.70365)	(-0.26702)	(-0.76402)
DlnGDP(-3)	-0.173353	0.177111	-0.011483	-87.78965
	(0.08494)	(0.24300)	(0.01625)	(48.2861)
	(-2.0409)	(0.72885)	(-0.70646)	(-1.81811)
DlnGDP(-4)	0.274690	-0.10069	0.006331	-2.094113
	(0.08925)	(0.25534)	(0.01708)	(50.7383)
	(3.07764)	(-0.39433)	(0.37067)	(-0.04127)
Dlncred(-1)	-0.051667	-0.328669	0.004685	178.2490
	(0.03714)	(0.10626)	(0.00711)	(21.1140)
	(-1.39109)	(-3.09315)	(0.65924)	(8.44221)
Dlncred(-2)	0.079005	0.300497	-0.015248	-23.98679
	(0.04850)	(0.13876)	(0.00928)	(27.5725)
	(1.62889)	(2.16559)	(-1.64289)	(-0.86995)
Dlncred(-3)	-0.026345	-0.067806	-0.008321	6.497459
	(0.04759)	(0.13614)	(0.00911)	(27.0522)
	(-0.55361)	(-0.49805)	(-0.91381)	(0.24018)
Dlncred(-4)	0.011368	0.350347	-0.007522	-23.95858
	(0.04633)	(0.13254)	(0.00887)	(26.3372)
	(0.24537)	(2.64327)	-0.84849	-0.90969
rpvar(-1)	-0.554594	-1.826731	1.210564	917.9304
	(0.57552)	(1.64651)	(0.11013)	(327.172)
	(-0.96363)	(-1.10946)	(10.9921)	(2.80565)
rpvar(-2)	1.104684	2.368497	-0.235946	-635.8914
	(0.82806)	(2.36899)	(0.15846)	(470.735)
	(1.33405)	(0.99979)	(-1.48904)	(-1.35085)
rpvar(-3)	-0.588403	2.829672	-0.237351	-697.0222
	(0.81913)	(2.34342)	(0.15675)	(465.654)
	(-0.71833)	(1.20750)	(-1.51425)	(-1.49687)
rpvar(-4)	0.434485	-1.918632	0.093712	301.6344
	(0.51247)	(1.46613)	(0.09807)	(291.329)
	(0.84782)	(-1.30864)	(0.95560)	(1.03537)
Inflation(-1)	-0.000143	-0.001163	3.56E-05	0.437726
	(0.00020)	(0.00058)	(3.9E-05)	(0.11448)
	(-0.70776)	(-2.01837)	(0.92425)	(3.82353)
Inflation(-2)	0.000243	0.001182	-0.0000516	0.018224
	(0.00019)	(0.00055)	(3.7E-05)	(0.10989)
	(1.25649)	(2.13785)	(-1.39604)	(0.16583)
Inflation(-3)	-0.000348	-0.002129	7.62E-05	0.484614
	(0.00020)	(0.00058)	(3.9E-05)	(0.11529)
	(-1.71766)	(-3.67034)	(1.96243)	(4.20352)
Inflation(-4)	3.11E-06	0.000652	-0.000046	-0.120261
	(0.00018)	(0.00053)	(3.5E-05)	(0.10447)
	(0.01694)	(1.24064)	(-1.30821)	(-1.15112)
C	-0.003043	-0.030814	0.006013	-0.307818

Table B **Var model of GDP , credit , inflation and relative price variability**				
Standard errors & t-statistics in parentheses				
Period 1960 - 1997				
	(0.00983)	(0.02814)	(0.00188)	(5.59081)
	(-0.30938)	(-1.09517)	(3.19505)	(-0.05506)
Dum7591	-0.023937	-0.050493	0.006514	7.879536
	(0.00852)	(0.02436)	(0.00163)	(4.84080)
	(-2.81104)	(-2.07264)	(3.99784)	(1.62774)
Dumseas1	-0.027085	-0.034936	0.000809	4.357162
	(0.01004)	(0.02872)	(0.00192)	(5.70763)
	(-2.69766)	(-1.21626)	(0.42124)	(0.76339)
Dumseas2	0.027276	-0.030586	0.000811	11.10315
	(0.00991)	(0.02835)	(0.00190)	(5.63288)
	(2.75276)	(-1.07897)	(0.42767)	(1.97113)
R-squared	0.707676	0.356645	0.953787	0.574146
Adj. R-squared	0.662150	0.256450	0.946590	0.507824
Sum sq. resids	0.113099	0.925672	0.004141	36549.58
S.E. equation	0.030447	0.087106	0.005826	17.30857
Log likelihood	305.1191	155.8587	539.9326	-595.5812
Akaike AIC	-6.853632	-4.751373	-10.16087	5.832288
Schwarz SC	-6.437319	-4.335059	-9.744551	6.248602
Mean dependent	0.005555	0.008022	0.053879	4.699352
S.D. dependent	0.052383	0.101017	0.025210	24.67182

Appendix II[39]

Inflation and Price Flexibility

The patterns of price adjustment and how these different patterns impact on macroeconomic policies is an issue of discussion. In this Appendix we analyzed the impact of inflation on the mechanisms of price setting in Argentina.

We tried to measure first the noise and flexibility that inflation causes on relative prices and then the benefits that price stability has.

This study was done using the Consumer Price Index (CPI) for the period January 1960-June 1997[40]. For the analysis of the price flexibility we worked not only with the prices of goods, like in Appendix I, but also with the prices of services.

Also, as in the previous Appendix, we analyzed the data for different sub-periods associated with low, medium and high monthly inflation rates (see Graph I.1, Appendix I).

a.1. Distribution of Relative Price Variability

We defined relative price variability as:

$$prvar_{i,t} = ((p_{i,t} / p_{i,(t-1)}) / (p_t / p_{(t-1)})) - 1 \qquad \text{(II.1)}$$

where $p_{i,t}$ is the price of good *i* at moment *t* and p is the CPI at moment *t*.

We generated distributions of relative price variability for a range of +/- 20% at intervals of 0.5%. Each relative price is incorporated in these distributions according to its weight in the CPI. By construction, the area under any of the distribution curves is equal to one. Also, we constructed the distributions for all the components of the CPI and the prices of goods and services separately[41].

Notice that our measure of relative price variability implies that the mean at every moment *t* is zero. The total weight of negative relative price changes is equal to the positive one, i.e. the distributions accumulate 50% on each side.

---

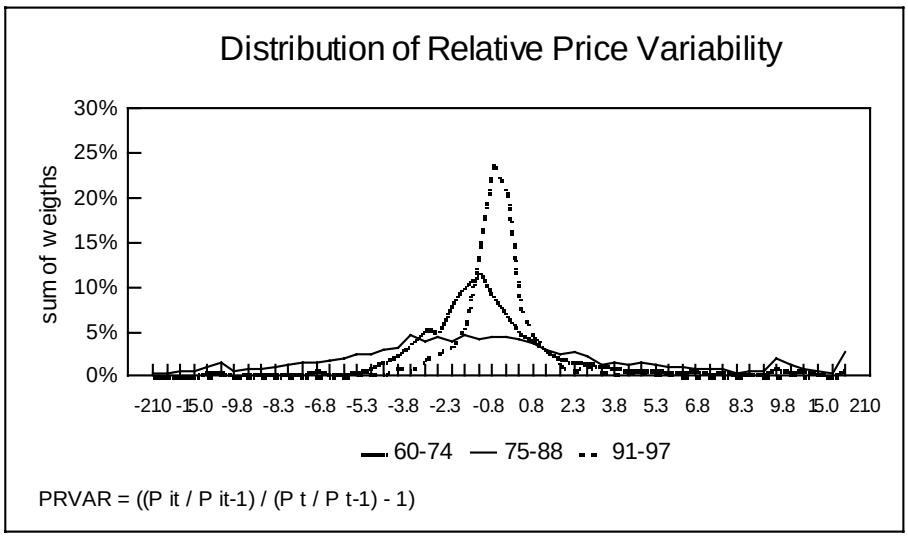
[39] I would like to thank Andrew Powell for his helpful comments and suggestions. Also, I am especially indebted to Alejandra Anastasi and Elena Grubisic for elaborating this appendix.

[40] We used the maximum level of CPI break-down data, i.e., 284 series for the period January 1960-April 1977, 332 series for the period May 1977-April 1989 and over 500 series for the period May 1989-June 1997. Each one of the mentioned periods has a different basket of goods and services. The change from one basket to other not only incorporates new goods (part of them related to new uses and technology) but also increases the percentage of incorporated services.
In order to homogenize the data we constructed 57 series, 41 series for good prices and 16 series for service prices.

[41] For the analysis of relative prices of goods and services separately we constructed a "Goods Price Index" and a "Services Price Index" to work with.

The distributions for the different periods are shown in Graph II.1. As it can be seen in the Graph, the probability of a change close to zero is higher in the Convertibility period (April 1991-June 1997) and lower in the high inflation period.

Graph II.1



Therefore, we can associate high inflation rates with high relative price variability as shown in Graph I.2 and Graph I.3 in Appendix I. We also broke down the Convertibility period into two sub-periods in order to analyze a period with almost zero inflation rate.

Table II.1						
Period	**1960/01 1974/12**	**1975/01 1988/12**	**1989/01 1991/03**	**1991/04 1997/06**	**1991/04 1993/12**	**1994/01 1997/06**
in percentage						
Monthly Average Inflation Rate	2.1	10.1	25.9	0.6	1.3	0.1
Goods and services prices						
Std.	4.4	6.7	9.3	2.4	3.0	1.8
Kurtosis	9.6	4.9	3.3	22.1	16.2	26.4
Goods prices						
Std.	4.4	7.1	9.1	2.5	3.2	1.8
Kurtosis	8.7	4.4	3.3	20.1	14.7	19.2
Services prices						
Std.	4.5	6.0	8.6	2.0	2.2	1.7
Kurtosis	12.9	6.8	3.7	22.2	14.4	34.7

We calculated the standard deviation and the kurtosis for these distributions. The statistics in Table II.1 show lower standard deviation and higher kurtosis for low inflation rate periods.

In addition, we can observe that, in general, relative prices of goods have more variability than that of services and thus larger standard deviations.

a.2. Noise versus Flexibility
a.2.1. Relative Price Inversion

In order to prove the existence of noise in relative prices, we calculated an index of "Relative Price Inversion" (RPI). The RPI index measures the percentage of prices that inverts in a 12- or 24-month period.

We considered that a price inverts when the sum up to 12 (or 24 months) of the accumulated deviation between individual price and CPI fall between +/- x% of the same length average inflation rate. The inversion can occur in any of the months considered in the 12- or 24-month period. We computed the RPI index for *x* equals to 1%, 5% and 10% (see Table II.2). Thus the RPI measure can be written as follows:

$$(1/nm)\sum_{i=1}^{n}\sum_{j=1}^{m} I_{i,j} \qquad \text{(II.2)}$$

where:

$$I_{i,j} = \begin{cases} 1 \; if \; \left|\sum_{t=0}^{T-1}\pi_{i,j-t}\right| < x\left|\sum_{t=0}^{T-1}\pi_{j-t} * (1/T)\right|; \; for\ at\ most\ T = 1,..,12 \\ 0 \; otherwise \end{cases}$$

n = number of prices
m = number of months
$\pi_{i,j}$ = prices change for good *i* in period *j*
π_{j} = inflation rate for period *j*

Table II.2 shows that there is a link between the level of the inflation rate and the RPI. No matter which range of inflation we consider, the relation between the percentage of inversion in the different sub-periods stay stable. We interpret this result as evidence that high inflation produces more spurious changes (or more noise) in relative prices that after several months are compensated.

Table II.2
Relative Price Inversion Index, in %

Range of inflation	Inversion up to 12 months			Inversion up to 24 months		
	1960-1974	1975-1988	1991-1997	1960-1974	1975-1988	1991-1997
	Goods and Services Prices					
+/- 1%	2.0	6.0	0.7	3.3	9.3	1.0
+/- 5%	8.9	24.3	3.6	14.2	34.0	5.0
+/- 10%	16.5	38.6	7.0	25.0	50.1	8.9
Goods Prices						
+/- 1%	2.6	5.7	0.9	4.1	9.2	1.1
+/- 5%	10.3	24.2	4.3	15.5	33.7	5.8
+/- 10%	18.6	38.3	8.0	26.4	50.3	10.4
Services Prices						
+/- 1%	1.6	6.6	1.6	2.5	9.0	2.1
+/- 5%	7.8	26.5	5.7	12.0	34.5	7.6
+/- 10%	13.7	41.4	9.4	21.2	51.5	12.8

The comparison of the RPI measure for goods and for services shows that the percentage of

price inversion of the latter is greater than the first. However, during the 1960-1974 period this relationship differs due to the way that prices of services were collected[42].

In general, prices of services are more rigid than prices of goods and in Argentina a large part of their adjustment was done to compensate past inflation.

a.2.2. Noise Measure

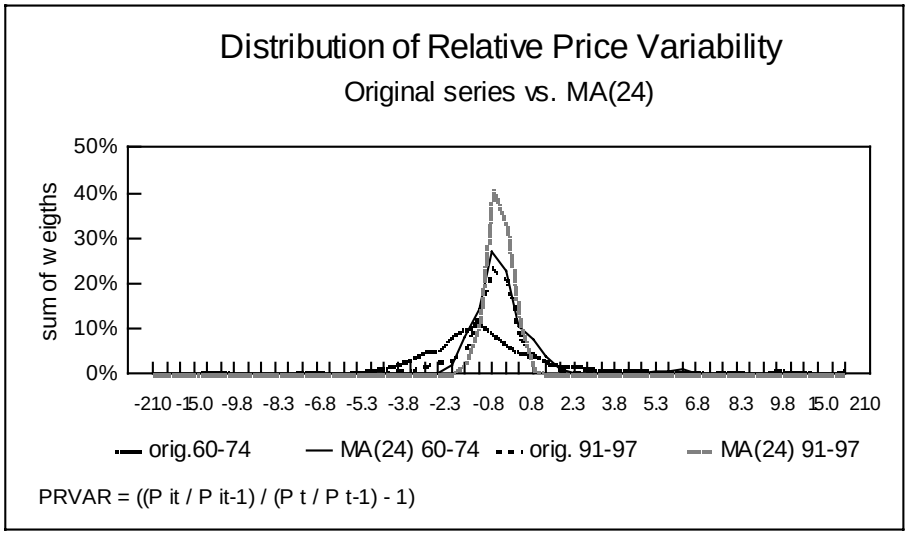
Keeping in mind the previous results, we constructed the distribution of relative price variability computing 12- and 24-month moving average of price changes, calculated as follows:

$$prvar_{t,n} = \left(\sum_{i=1}^{n} ((p_{i,t} / p_{i,(t-1)}) / (p_t / p_{(t-1)})) / n \right) - 1 \qquad \text{(II.3)}$$

for n = 12 or 24

Graph II.2 shows how relative price variability diminishes if we compare the original distribution against the 24-month moving average distribution.

Graph II.2



In Table II.3 and Table II.4 it can be seen the statistics corresponding to the moving average distributions.

Table II.3

[42] As we mentioned in Appendix I, during the 1960-1974 period the prices of services were not collected as frequently as prices of goods, remaining with same index for long periods.

Period	1960/01 1974/12	1975/01 1988/12	1989/01 1991/03	1991/04 1997/06	1991/04 1993/12	1994/01 1997/06
12-month moving average, in %						
Goods and Services Prices						
Std.	1.9	2.0	3.5	0.6	0.8	0.5
Kurtosis	34.6	12.6	11.1	6.1	3.2	14.2
Goods Prices						
Std.	1.2	1.9	2.6	0.6	0.9	0.5
Kurtosis	6.3	6.6	14.0	5.8	3.9	4.7
Services Prices						
Std.	2.6	2.2	3.9	0.6	0.7	0.5
Kurtosis	19.9	14.9	9.8	9.2	3.1	23.4

From Tables II.1, II.3 and II.4, we observe that the longer the moving average we took the more similar the distributions became. In particular, we notice that the standard deviation for the 24-month moving average considering all the prices included in the CPI are the same for the periods 1960-1974 and 1975-1988. In order to test statistically these results we use a χ^2 test for the distribution comparison.

Table II.4			
Period	**1960/01 1974/12**	**1975/01 1988/12**	**1991/04 1997/06**
24-month moving average, in %			
Goods and Services Prices			
Std.	1.3	1.3	0.5
Kurtosis	15.7	8.7	3.7
Goods Prices			
Std.	0.9	1.2	0.5
Kurtosis	5.3	5.2	4.0
Services Prices			
Std.	1.8	1.3	0.5
Kurtosis	8.8	9.5	4.5

a.2.3. Distribution Comparison: χ^2 Test

For the comparison of the distributions we used a χ^2 test of goodness of fit[43]. We compared the same order moving average distributions of relative price variability to the corresponding medium-inflation period (1960/01-1974/12) distributions.

The results are shown in Table II.5. Each value in this table corresponds to the χ^2 statistic obtained from the comparison of the distributions. For example, the statistic got from the comparison of the original series between the 1960-1974 and 1975-1988 periods is equal to 60.8. Considering a χ^2 with 13 degrees of freedom we rejected the hypothesis that the distributions of the prices are similar.
Observing the P-values we noticed that for the distributions including all prices only the 24-month moving average for the period 1975-1988 does not differ from the base-period

[43] This test evaluates the fit of observed frequencies to any arbitrary set of expected frequencies. In our case, the expected frequencies are those related to the period 1960-1974.

distribution.

If we analyze the relative prices of goods, there are not similarities. In the case of services prices, we can not reject the hypothesis of similarity for the 12- and 24-month moving average for the period 1975-1988.

When we broke down the Convertibility period into two sub-periods, the distribution of prices in the first one (1991/04-1993/12) is similar to the distribution of prices for the period 1960-1974 when we compare the original series but it does not happen when we compare the 12-month moving average. This is due to the fact that the inflation trend is positive in the 1960-1974 period and negative in the Convertibility period.

Table II.5
Comparison of Distribution of Relative Price Variability

Period of comparison	**60/01-74/12 vs. 75/01-88/12**	**60/01-74/12 vs. 89/01-91/03**	**60/01-74/12 vs. 91/04-97/06**	**60/01-74/12 vs. 91/04-93/12**	**60/01-74/12 vs. 94/01-97/06**
Goods and Services Relative Price					
Orig. series df: 13	60.8 (0.000)	134.9 (0.000)	75.9 (0.000)	23.6 (0.228)	144.3 (0.000)
MA (12) df: 8	20.4 (0.009)	109.1 (0.000)	36.1 (0.000)	26.6 (0.000)	76.9 (0.000)
MA (24) df: 6	7.9 (0.248)		29.0 (0.000)		
Goods Relative Prices					
Orig. series df: 14	66.0 (0.000)	100.8 (0.000)	42.9 (0.000)	17.6 (0.035)	85.0 (0.000)
MA (12) df: 8	22.7 (0.004)	48.8 (0.000)	35.5 (0.000)	20.5 (0.009)	72.3 (0.000)
MA (24) df: 6	14.0 (0.029)		30.8 (0.000)		
Services Relative Prices					
Orig. series df: 11	51.5 (0.000)	171.3 (0.000)	114.0 (0.000)	58.1 (0.000)	184.0 (0.000)
MA (12) df: 9	6.9 (0.644)	86.4 (0.000)	81.2 (0.000)	64.5 (0.000)	153.1 (0.000)
MA (24) df: 7	6.1 (0.530)		68.7 (0.000)		

Note: P-value in parentheses.

As expected, the distributions of the prices of goods and services tend to approximate the longer the moving average we took. We can interpret this result as the evidence that the longer the moving average the more noise we removed.

a.3. Measure of the Benefits of Price Stability

In order to measure the improvement that price stability has in the mechanisms of price setting,

we analyzed the noise and the flexibility of prices.

As mentioned above, we considered that the noise impact of inflation can be evaluated by the comparison of the original series versus the 12- or 24-month moving average distribution of relative prices.

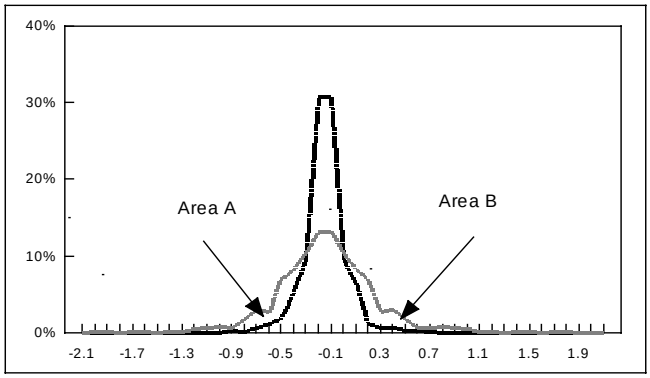
Table II.6
Noise and Flexibility of Prices

Period of comparison	**60/01-74/12 vs. 75/01-88/12**	**60/01-74/12 vs. 89/01-91/03**	**60/01-74/12 vs. 91/04-97/06**	**60/01-74/12 vs. 91/04-93/12**	**60/01-74/12 vs. 94/01-97/06**
12-month moving average					
Goods and Services Price					
Noise effect	39.2	69.4	13.6	17.1	15.9
Price flexibility effect	-7.8	-16.6	13.3	10.6	22.5
Goods Prices					
Noise effect	43.2	68.7	19.1	26.0	18.3
Price flexibility effect	-7.4	-10.7	12.5	9.1	19.2
Services Prices					
Noise effect	34.9	66.8	20.0	13.5	24.4
Price flexibility effect	-5.1	-14.9	23.7	8.7	32.7

The "noise effect" in Table II.6 and Table II.7 measures the difference for changing prices between two distributions in terms of the total change of prices. During the high-inflation period (1974-1988) our measure of noise is about 40% (39% when we considered the 12-month moving average and 46% when we used the 24-month moving average), i.e. 40% of total changing in relative prices corresponded to changes due to errors in the price setting.

However, it is worthwhile to notice that the values for the "noise effect" and "flexibility effect" are approximations of their real values since they are calculated on distribution curves instead of the real curves.

Also, a lower inflation rate is associated with lower standard deviation, in other words, less flexibility for price changing. In order to measure the change in this price flexibility, we compared the non-noisy distributions between two periods. The area in the tails between both curves is our measure of "relative price flexibility". According to this, a flatter curve (with higher standard deviation) will have more relative price flexibility or dispersion than a stepper curve. In other words, we are comparing distribution curves with areas equals to one, then the measure of flexibility can be calculated as the sum of the "area A" plus "area B" in a graph like the following:



Again, we selected the 1960-1974 period as our base-period, so the price flexibility effect shows the difference in price variability that this base-period has with the others. These results are shown in the "price flexibility effect" line in Table II.6 and Table II.7.

Considering the 24-month moving average distributions as the ones without noise, the 1975-1988 period has more changes in relative prices than the base-period. On the other hand, the Convertibility presents less relative price variability.

Table II.7
Noise and Flexibility of Prices

Period of comparison	**60/01-74/12 vs. 75/01-88/12**	**60/01-74/12 vs. 91/04-97/06**
24-month moving average		
Goods and Services Prices		
Noise effect	46.2	17.0
Price flexibility effect	-4.2	10.5
Goods Prices		
Noise effect	49.4	23.2
Price flexibility effect	-5.7	11.9
Services Prices		
Noise effect	42.0	21.5
Price flexibility effect	-5.1	20.2

It can also be appreciated that in the 1994-1997 period, when the inflation rate was almost zero, relative prices have less changes than the non-noisy prices of 1960-1974.

We have showed that inflation produces "unnecessary" changes in relative prices, so the RPI measure demonstrated that an important percentage of these changes inverts before 1 year. Price stability reduces significantly these changes; we demonstrated this through the RPI measure if we compare different periods and through the calculation of "noise effect" if we analyze different moving averages in the same period.

Also, the "price flexibility effect" shows that the probability of falling relative prices is lower

during non-inflation periods when it is necessary that the nominal price of a good falls to produce a negative change of its relative price.

Taking into account the flexibility effect, we can say that price stability could affect in a different way prices of goods and prices of services. Since services are characterized by a larger labor component than goods introducing a high degree of stickiness and, thus, a low degree of flexibility specially in non-inflation periods (see Table II.6 and Table II.7).

To analyze this particular effect we studied the price movements in the Convertibility period comparing the distributions of relative price of goods, services and a subset of services that are labor intensive. During the Convertibility, nominal wages have to fall to produce relative changes in the latter set of prices since they have a greater labor component. As expected, we found that the distribution of relative prices of labor intensive services is statistically different from that of goods, using a χ^2 test (see Table II.8).

Table II.8 **Comparison of Distributions of Relative Price Variability Convertibility Period**	
Goods vs. Services	12.0 (0.213)
Goods vs. Labor Intensive Services	30.5 (0.000)
Services vs. Labor Intensive Services	5.7 (0.458)
Note: P-value in parentheses	

In other words, the effects of price stability and macroeconomic policies do not affect in the same way the different sectors of the economy. We proved that prices of labor intensive services had less dispersion or variability, so do wages. The increase of the participation rate of the informal labor market is a way of introducing a greater degree of flexibility in the mechanisms of wage settings.

Summing up, the results of this Appendix show that in the case of Argentina the conquest of the inflation reduced both the noise in prices that led to errors in the process of resource allocation and also made necessary the fall in nominal prices in order to produce a change in relative prices.

As in the previous Appendix, we can conclude that price stabilization has nothing but benefits, avoiding the waste of resources and forcing markets to be more competitive.

Appendix III[44]

Comparison between the Behavior of Prices during the Convertibility Period and Other Stable Economies

In Appendix II we demonstrated that the Convertibility period has much less price flexibility that the other studied periods. However, this result does not mean that the Convertibility period does not have price flexibility. In this Appendix we analyzed to what extend Argentina has relative price changes.

There is not a standard measure to establish price flexibility. Thus, we compared the behavior of relative prices during Convertibility with their evolution in several developed countries that have similar levels of inflation as Argentina and that have different levels of wage flexibility (measured by the level of unemployment).

We chose five countries USA, Canada, UK, Germany and France and we compared the distribution of prices in Argentina vis a vis with these countries to gain an idea about the price flexibility in our economy.

a.1. USA

We chose USA economy due to the relatively smaller government intervention in price determination and its reputed wage flexibility that it could turn into a relatively high level of price flexibility[45]. Also because we pegged our currency to theirs so that the differences between inflation rates might be reflected in a different degree of productivity gain that call for a different degree of price flexibility between both economies.

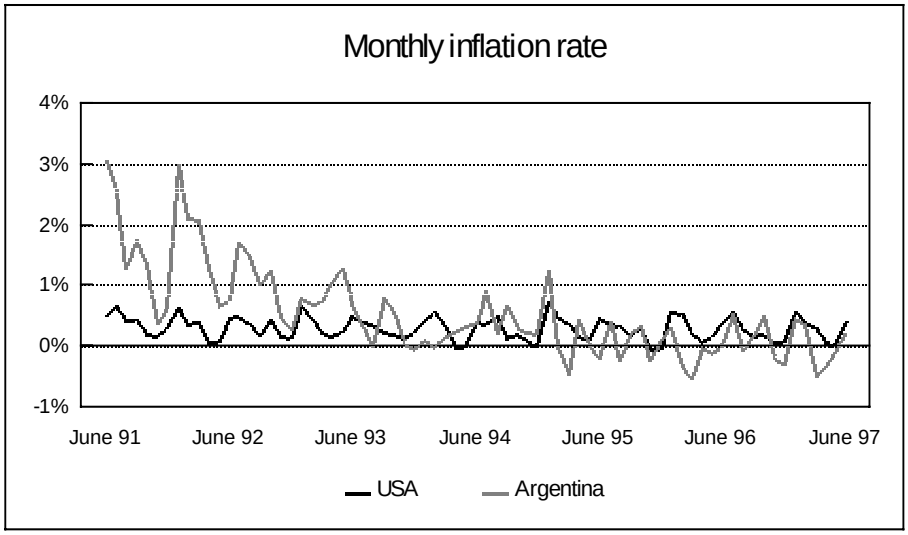
First, it has to be noticed that there are important differences between the two indexes. In particular, the CPI of USA is composed of 43% of goods and 57% of services while in the Argentine CPI goods represent 69% and services only 31%. Furthermore, the participation of 'food' is greater in Argentina and 'housing' in USA. Taking into account that the prices of services are more rigid, the different shares in the index may introduce differences in its behavior.

Also, there are significant differences between the two indexes when we analyze their evolution between 1991-1997. Monthly inflation in USA ranges between a rate of 0%-+0.7% while in Argentina this range widens up to -0.5%-+3.0%. In addition, inflation in Argentina presents a trend. The inflation rate has been falling since 1991 and currently there are many months with inflation below to zero (see Graph III.1).

Graph III.1

[44] I would like to thank Andrew Powell for his helpful comments and suggestions. Also, I am especially indebted to Alejandra Anastasi and Elena Grubisic for elaborating this appendix.

[45] We worked with 46 series at the level of intermediate components of the CPI for All Urban Consumers for the period June 1991-June 1997.



In order to capture the differences in the Argentine monthly inflation rate we compared price evolution in three periods (see Table III.1).

For the comparison of the relative price variability between the two economies, we first, and in a similar way as we did before, generated 12-month moving average distributions of relative price variability for a range of +/- 7% at intervals of 0.1%[46]. Each relative price is incorporated in these distributions according to its weight in the corresponding CPI. We constructed distributions for all the components of the CPI and for the prices of goods and services separately.

Table III.1
Average monthly inflation rate, in %

Period	USA	Argentina
June 91-June 97	0.2	0.5
June 93-June 97	0.2	0.2
June 95-June 97	0.2	0.0

We calculated the standard deviation and the kurtosis for these distributions. Table III.2 shows that in all the cases the Argentine economy has higher standard deviations (almost double than the American ones), meaning that this economy has larger relative price variability. However, this statistic falls as the period is shortened, meaning that the most important relative price adjustments were done in the first years of the Convertibility period.

There are remarkable similarities that are interesting to be noticed. In both economies relative prices of goods have more variability than those of services and thus larger standard deviations. In addition, the USA economy has a greater difference between the standard deviations of goods and those of services than the Argentine economy. In other words, prices of goods in USA present more seasonality than prices of services, something that does not happen in Argentina.

[46] We changed the width of the interval in order to improve the comparison between distributions in these low inflation periods.

Also, we could observe that the standard deviation falls considerably when we calculated the 12-month moving average. In Appendix II, we interpreted this result as the evidence that, in the case of Argentina, almost most of the noise was removed. But in the case of USA this result is due to the fact that, in this period, its economy had much less structural changes that the Argentine so seasonality becomes more evident (see Table C).

Table III.2
Statistics of CPI

	June 1991-June 1997		June 1993-June 1997		June 1995-June 1997	
	Original	**12-month MA**	**Original**	**12 month MA**	**Original**	**12 month MA**
in percentage						
United States						
Goods and services prices						
Std.	1.0	0.2	1.0	0.2	1.0	0.2
Kurtosis	16.8	7.8	17.9	8.6	17.1	11.0
Goods prices						
Std.	1.1	0.2	1.1	0.2	1.1	0.2
Kurtosis	12.3	6.6	13.8	6.9	13.2	6.5
Services prices						
Std.	0.8	0.1	0.8	0.1	0.8	0.1
Kurtosis	21.5	7.1	21.8	6.7	20.9	10.0
Argentina						
Goods and services prices						
Std.	2.0	0.6	1.7	0.5	1.5	0.5
Kurtosis	11.7	7.0	17.8	14.6	20.9	28.8
Goods prices						
Std.	2.1	0.6	1.7	0.5	1.5	0.4
Kurtosis	9.7	6.5	13.9	7.9	15.5	5.8
Services prices						
Std.	1.7	0.5	1.6	0.4	1.4	0.6
Kurtosis	14.2	13.4	19.4	33.8	25.1	35.8

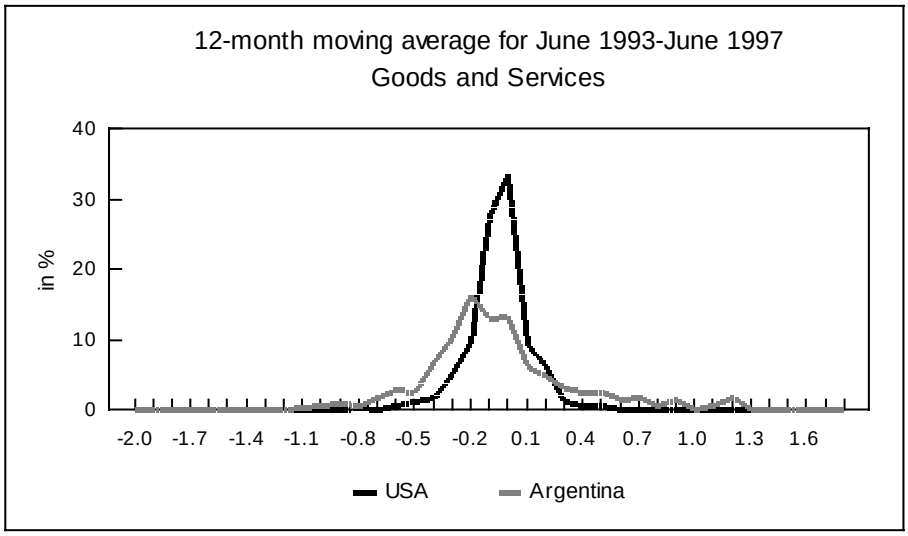
Table III.3
Comparison of Distribution of Relative Price Variability for USA

Series for comparison	**June 1991-June 1997**	**June 1993-June 1997**	**June 1995-June 1997**
Goods and Services Relative Price			
MA (12) df: 11	70.1 (0.000)	63.0 (0.000)	87.9 (0.000)
Goods Relative Prices			
MA (12) df: 11	110.5 (0.000)	100.0 (0.000)	112.4 (0.000)
Services Relative Prices			
MA (12) df: 10	124.2 (0.000)	114.5 (0.000)	275.4 (0.000)
Note: P-value in parentheses.			

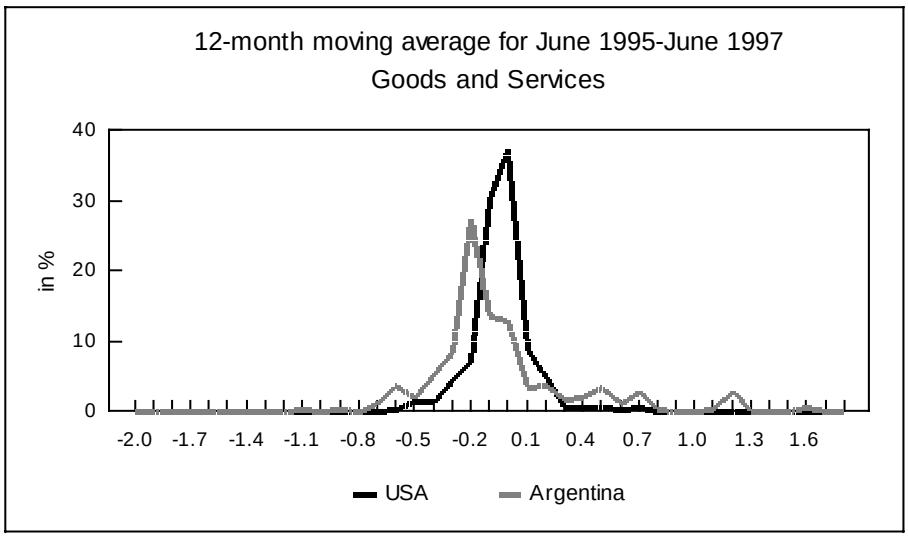
In spite of the result in Table III.2, we checked, using a χ^2 goodness of fit test, the similarity between the USA original distribution and its 12-month moving average one. We found that in all the cases there are significant differences between the distributions confirming the fact that

the seasonality and some eventual noise were removed in the 12-month moving average distribution (see Table III.3).

Graph III.2



Graph III.3



The following step was to analyze the behavior of the non-noisy relative price distributions (or the 12-month moving average distributions) between both economies in order to establish the differences in terms of price variability. Graph III.2 and Graph III.3 show the distributions for different periods. Even in the period June 1995-June 1997 (when Argentina had less inflation than USA) the distributions are statistically different using a χ^2 goodness of fit test, pointing out that changes of relative prices are different between both economies (see Table III.4). However, even when we rejected the hypothesis that the distributions of relative price variability are equal in both economies, the differences decrease in the case of goods.

Since the beginning of the Convertibility the Argentine economy had more relative price variability than the USA economy. As it can be seen in Graph III.2 and Graph III.3, the Argentine price distribution curve is flatter than the USA curve. In order to quantify the differences in price dispersion we compared the two non-noisy distributions as we did in Appendix II.

Table III.4
Comparison of Distribution of Relative Price Variability - June 1995-June 1997

	Argentine vs. United States 12-month Moving Average
Goods and Services Relative Price	
Chi df: 8	106.2 (0.000)
Goods Relative Prices	
Chi df: 8	56.2 (0.000)
Services Relative Prices	
Chi df: 6	396.6 (0.000)

Note: P-value in parentheses.

As mentioned in that Appendix, calculating over distribution curves results in approximate figures. However, our results show that the probability of having a change in a relative price of goods is greater in Argentina than in USA and this percentage increases in the case of the relative prices of services (see Table III.5).

Table III.5
Relative price flexibility - Argentina vs. USA, in %

	June 1991-June 1997	**June 1993-June 1997**	**June 1995-June 1997**
Goods and Services Relative Price	27.7	22.8	27.8
Goods Relative Prices	23.5	15.9	17.6
Services Relative Prices	33.0	30.3	49.9

a.1.1. Price Flexibility vs. Structural Change

However, our previous results need to be interpreted very carefully. The period used for the study corresponds to a very special time for the Argentine economy. The 1991 Convertibility Program included a wide set of reforms combining a stabilization plan with structural macroeconomic policy changes. Hence, the higher price flexibility of Argentine economy is related to the very important structural changes of its economy and the significant gains in productivity associated with this changes.

In Table C we present the break down of the CPI between its main components. In general, in both economies the largest positive relative price changes correspond to services and the largest

negative relative price changes to goods. However, the Argentine economy had greater relative price adjustments. In part this was due to the opening of the economy (specially for the price adjustment of the commodities) and in part this was due to the privatizations of the public enterprises that demand a deep adjustment on the prices of public services (specially those related to communications and public transportation).

In order to avoid the bias on the distributions when we included the prices of public services and to establish a relationship of wage flexibility between both economies, we analyzed the behavior of a subset of prices of labor intensive services[47]. We used both CPIs at their lowest level (basic classes) and we chose the series corresponding to the labor intensive services for the calculation of the distributions[48].

In all the cases, the distributions of the subset of labor intensive services had less relative price variability than the corresponding to all the services (compare statistics in Table III.2 and Table III.6). As it was expected, those prices of services with a large component of labor were more 'rigid' in both economies.

Table III.6
Statistics for Labor intensive services

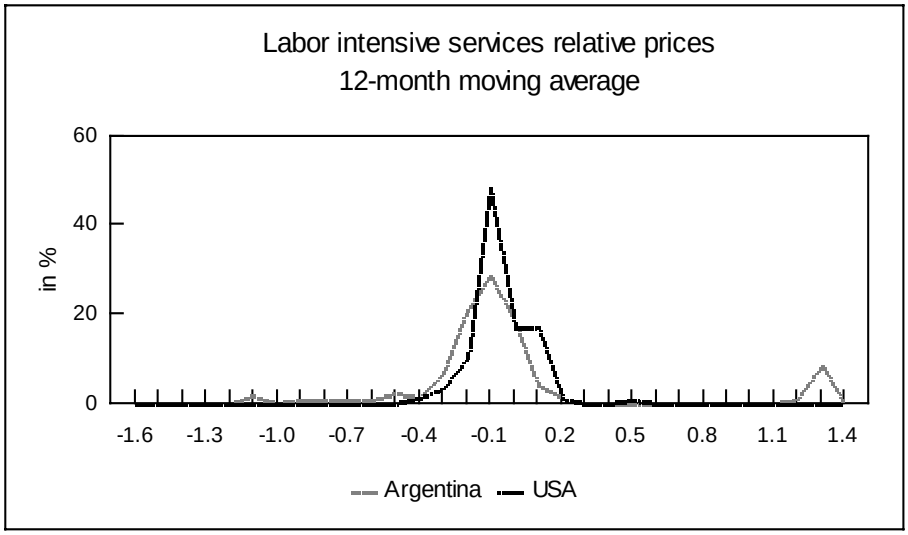
	June 1991-June 1997		June 1993-June 1997		June 1995-June 1997	
	Original	12-month MA	Original	12 month MA	Original	12 month MA
in percentage						
United States						
Std.	0.5	0.2	0.5	0.1	0.4	0.1
Kurtosis	27.1	3.5	19.5	3.7	15.3	5.8
Argentina						
Std.	1.3	0.5	1.1	0.5	0.9	0.5
Kurtosis	18.3	5.6	41.8	7.3	70.7	6.4

Although in Appendix II we found that for the period 1991-1997 the distribution of relative price of services were statistically similar to that of the subset of labor intensive services, when we broke down the period we found that for the June 1995-June 1997 period these distributions are different using the χ^2 test (in the mentioned period the value of the test is 41.5 with 6 degrees of freedom). Conversely, for the USA case in the three periods these distributions are different. As mentioned above, this result could be interpreted as the evidence that most of the structural changes of the Argentine economy were done in the first years of the Convertibility.

Since 1995 the behavior of services prices in Argentina tend to differentiate between those which are labor intensive and those which are not, as in USA.

Graph III.4

[47] In Appendix II we demonstrated that labor intensive services had a different distribution of relative price variability that the corresponding to the subset of goods in the period of the Convertibility.
[48] In the case of USA we chose 27 series that represent 19% of the CPI. For Argentina we chose 25 series with a weight in the general index of 20%.



When we compared the 12-month moving average distribution of the labor intensive services between both economies, we estimated that the Argentina had about 20% more flexibility in the prices of these subset of services than the USA economy (see Graph III.4 and Table III.7).

Table III.7
Relative price flexibility - Argentina vs. USA, in %

	June 1991-June 1997	June 1993-June 1997	June 1995-June 1997
Labor Intensive Services Relative Prices	19.2	16.5	20.8

a.2. Canada, France, Germany and United Kingdom

We also analyzed the evolution of prices in other G-7 countries in order to compare price variability in economies with different degrees of wage flexibility.

At a first glance the evolution of inflation in these countries is quite similar to that of USA (see Table III.8). However, there are significant differences in the composition of their CPIs. Although the items of the CPIs are almost the same, their break-down and weights are closely related to the uses in each country[49]. For example, the weight of 'health care' is 2% in the Canadian CPI, 10% in the French, 5% in the German and is included in 'personal goods and services' item in the British CPI.

[49] We worked with 51 series of the Canadian CPI, 53 series of the French CPI, 55 series of the German CPI (for former territory of the Federal Republic) and 55 series of the British CPI. In the all the cases, at the level of intermediate components for the period June 1991-June 1997.
These indexes are composed by:
Canada: 48% of goods and 52% of services.
France: 62% of goods and 38% of services.
Germany: 53% of goods and 47% of services.
United Kingdom: 64% of goods and 36% of services.

Table III.8 Average monthly inflation rate, in %				
Period	**Canada**	**France**	**Germany**	**UK**
June 91-June 97	0.1	0.2	0.2	0.3
June 93-June 97	0.2	0.2	0.2	0.2
June 95-June 97	0.1	0.1	0.1	0.2

It is important to notice that, in general, prices in these economies have larger relative changes than those in USA. It is also true for these countries that the largest positive relative price changes correspond to services and the largest negative relative price changes to goods (see Table D). In addition, in all the countries the accumulated price change for services almost doubled the change for goods in the period June 1991-June 1997[50].

We also calculated the statistics for the distributions of relative price variability for the original series and the 12-month moving average, which are shown in Table III.9.

The statistics in Table III.2 and Table III.9 show that, for the 12-month moving average distribution, all the developed economies have similar relative price dispersion not only for goods but also for services. It ranges between 0.1 to 0.3. However, they have different kurtosis. As Tables C and D show, Canada, France, Germany and UK have larger relative price changes than USA, for a small number of items, that are reflected in heavier distribution tails and, hence, in larger kurtosis.

Table III.9 Statistics of different CPIs						
	June 1991-June 1997		June 1993-June 1997		June 1995-June 1997	
	Original	12 month MA	Original	12 month MA	Original	12 month MA
	in percentage					
Canada **Goods and services prices**						
Std.	1.3	0.3	1.3	0.3	1.4	0.2
Kurtosis	22.3	20.6	22.2	25.6	22.2	6.6
Goods prices						

[50] The accumulated price changes are:

	Goods	Services
Canada	7.3%	12.6%
France	10.1%	13.9%
Germany	10.5%	22.7%
United States	12.6%	24.3%
United Kingdom	18.4%	24.2%
Argentina (95-97)	0.3%	1.0%

Std.	1.5	0.3	1.5	0.3	1.5	0.2
Kurtosis	14.8	22.9	14.6	27.8	14.4	6.6
Services prices						
Std.	1.1	0.3	1.2	0.3	1.4	0.3
Kurtosis	38.5	5.6	35.9	6.2	30.6	5.0
France						
Goods and services prices						
Std.	1.5	0.3	1.4	0.2	1.4	0.2
Kurtosis	22.0	21.9	22.4	24.5	21.2	21.5
Goods prices						
Std.	1.8	0.3	1.6	0.3	1.6	0.3
Kurtosis	16.3	18.2	16.7	21.4	17.0	17.2
Services prices						
Std.	0.8	0.2	0.8	0.1	1.0	0.1
Kurtosis	39.6	11.7	43.9	14.3	32.4	16.5
Germany						
Goods and services prices						
Std.	1.2	0.2	1.3	0.2	1.3	0.2
Kurtosis	30.5	15.6	30.8	10.1	29.1	7.7
Goods prices						
Std.	1.1	0.2	1.0	0.2	1.0	0.2
Kurtosis	33.6	19.3	36.7	15.4	32.7	6.3
Services prices						
Std.	1.4	0.2	1.5	0.2	1.6	0.2
Kurtosis	25.5	7.8	24.3	10.9	23.0	10.9
United Kingdom						
Goods and services prices						
Std.	1.3	0.3	1.3	0.3	1.4	0.3
Kurtosis	17.7	7.5	17.5	10.2	17.9	14.2
Goods prices						
Std.	1.4	0.3	1.5	0.3	1.6	0.3
Kurtosis	14.1	9.7	14.2	13.2	14.6	17.1
Services prices						
Std.	1.0	0.3	0.9	0.3	0.8	0.3
Kurtosis	32.2	4.7	25.1	4.5	27.2	4.0

Table III.10 shows the value of the χ^2 test of goodness of fit for the comparison of the Argentine relative price distributions with that of the G-7 economies. In all the cases, we rejected the hypothesis that relative prices in Argentina have the same behavior that in the other countries.

Table III.10
Comparison of Distribution of Relative Price Variability, MA(12)

Series for comparison	Versus Argentina		
	June 1991-June 1997	June 1993-June 1997	June 1995-June 1997
Canada			
Goods and Services Relative Price			
Chi df: 5	54.2 (0.000)	19.0 (0.002)	43.4 (0.000)
Goods Relative Prices			

Chi df: 5	36.8 (0.000)	11.4 (0.044)	34.1 (0.000)
Services Relative Prices			
Chi df: 4	21.1 (0.000)	5.0 (0.285)	5.3 (0.259)
France **Goods and Services Relative Price**			
Chi df: 5	119.7 (0.000)	85.9 (0.000)	80.1 (0.000)
Goods Relative Prices			
Chi df: 5	92.9 (0.000)	70.1 (0.000)	49.8 (0.000)
Services Relative Prices			
Chi df: 4	152.2 (0.000)	91.4 (0.000)	160.6 (0.000)
Germany **Goods and Services Relative Price**			
Chi df: 5	133.8 (0.000)	111.4 (0.000)	84.7 (0.000)
Goods Relative Prices			
Chi df: 5	172.0 (0.000)	164.3 (0.000)	103.1 (0.000)
Services Relative Prices			
Chi df: 4	94.7 (0.000)	62.4 (0.000)	130.8 (0.000)
United Kingdom **Goods and Services Relative Price**			
Chi df: 6	53.0 (0.000)	48.8 (0.000)	70.0 (0.000)
Goods Relative Prices			
Chi df: 6	30.5 (0.000)	29.5 (0.000)	31.3 (0.000)
Services Relative Prices			
Chi df: 5	13.7 (0.018)	13.0 (0.024)	40.2 (0.000)
Note: P-value in parentheses.			

Our measure of relative price flexibility that compute the tail area difference between two curves of price distribution pointed out that Argentina has more relative price variability than Canada, France, Germany and UK (see Table III.11).

We also measured the percentage of changes in the relative prices of goods and services ranged between +/- 0.2%. We found that while Argentina had 50% of relative price changes in this range for both goods and services, United Kingdom had about 60% for both goods and services, Canada had roughly 65% for both items, France 75% for goods and 90% for services, Germany 85% for goods and services and USA 75% for goods and 90% for services. These figures confirm our findings about larger Argentine price flexibility.
Taking into account our results, we can conclude that the Argentine economy had during 1995-1997 more relative price variability than the other countries of the sample.

Table III.11
Relative price flexibility, in %

Series for comparison	**Versus Argentina**		
	June 1991-June 1997	**June 1993-June 1997**	**June 1995-June 1997**
Canada			

Goods and Services	-25.3	-15.0	-26.2
Goods	-20.8	-11.9	-9.6
Services	-15.6	-9.0	-9.4
France			
Goods and Services	-27.3	-19.8	-24.4
Goods	-28.2	-22.5	-19.9
Services	-24.1	-18.7	-34.0
Germany			
Goods and Services	-27.4	-22.1	-23.9
Goods	-30.1	-27.6	-26.0
Services	-18.9	-17.1	-25.1
United Kingdom			
Goods and Services	-15.2	-8.6	-14.6
Goods	-18.8	-10.1	-15.8
Services	-6.4	-6.6	-19.1

As we did before and in order to study in more detail the behavior of the services prices we analyzed the price dispersion of a subset of services, in particular those labor intensive[51].

Table III.12
Statistics for Labor intensive services

	June 1991-June 1997		June 1993-June 1997		June 1995-June 1997	
	Original	**12-month MA**	**Original**	**12 month MA**	**Original**	**12 month MA**
in percentage						
Canada						
Std.	1.0	0.2	1.0	0.2	0.8	0.2
Kurtosis	43.3	7.4	45.4	8.2	54.3	7.9
France						
Std.	0.8	0.2	0.8	0.2	0.5	0.1
Kurtosis	64.9	4.6	58.5	4.3	121.3	5.1
Germany						
Std.	2.3	0.3	2.4	0.2	2.4	0.2
Kurtosis	11.0	5.9	10.6	7.3	11.0	7.3

As in the case of USA, the distributions of relative price for labor intensive services for Canada, France and Germany in the three periods are statistically different than that for all the services[52]. The statistics for these distributions are shown in Table III.12.

As expected, we found that even when we reduced the sample of services to those labor

[51] We chose 18 series at the lowest level of the Canadian CPI that represent 13%, 22 series (17%) for the French CPI and 24 series (22%) for the German CPI.

[52] The Chi^2 values are:

	Canada	France	Germany
June 91-June 97:	31.7 (0.000) - df: 5	15.8 (0.007) - df: 5	39.4 (0.000) - df: 7
June 93-June 97:	53.5 (0.000) - df: 4	22.7 (0.000) - df: 4	26.2 (0.000) - df: 6
June 95-June 97:	164.1(0.000) - df: 4	22.8 (0.000) - df: 4	20.1 (0.001) - df: 5

intensive, we found that relative prices in Argentina has more variability than that in the developed countries (see Table III.13).

Table III.13
Relative price flexibility - Labor intensive services

Comparison versus Argentina	June 1991-June 1997	June 1993-June 1997	June 1995-June 1997
	in percentage		
Canada	-21.8	-17.4	-11.8
France	-17.2	-12.0	-19.1
Germany	-9.0	-7.5	-9.0

b.1. Conclusions

In this Appendix, we found some similarities in the evolution of prices in the studied economies.

Firstly, prices of services in all the countries increase more than those of goods. The accumulated price change for services almost doubled the corresponding change for goods in all the countries.

Secondly, the behavior of relative prices of goods tend to be more similar than those of services across all the economies. As we are working with CPIs, the differences between the behavior of prices of goods in these open economies could be associated to the changes in some of the components of the consumer prices such as taxes and transportation costs. Also in the case of Argentina part of the differences are due to its larger changes in productivity.

Thirdly, we found that Argentina had price flexibility during the Convertibility period. Part of the price variation has to be associated to structural macroeconomic changes. However, since larger relative prices changes persisted during 1995-1997 (after most of these changes were done) we could argue that Argentina is an economy with a fixed exchange rate regime and, at least, the same degree of price flexibility that the main economies in the world. Moreover, if there is a difference in the degree of price flexibility this in a favor of Argentina.

Hence, the Argentine case is one that proved that it is possible to have a fixed exchange rate system and at the same time similar price flexibility than the main economies in the world, particularly USA, an economy recognized by its price flexibility.

Table C
Relative price total change: $(p_{i,t} / p_t)/(p_{i,t-i} / p_{t-i}) - 1$

United Sates				Argentina			
CPI Group	**91-97**	**93-97**	**95-97**	**CPI Group**	**91-97**	**93-97**	**95-97**
School books and supplies	12.4	8.8	6.1	Communications	66.1	69.1	69.9
Fuel oil and other fuel commodities	-6.9	-2.3	6.1	Motor fuel, motor oil, other prod	-1.5	19.7	19.6
Personal and educational services	21.4	11.5	5.2	Public transportation	29.5	42.1	14.5
Other renter's costs	10.7	6.9	4.4	Dairy products and eggs	14.7	11.6	10.5
Infants' and toddlers' apparel	-13.1	-6.5	4.0	First aid commodities	-2.0	15.3	6.3
Dairy products	-1.3	0.0	3.7	Vacation and tourism	18.5	16.7	6.1
Meats, poultry, fish and eggs	-5.2	-1.5	2.6	Tobacco	-26.5	-1.2	5.5
Sugar and sweets	-3.0	0.2	2.6	Fuels	12.8	9.7	5.0
Entertainment services	4.1	3.6	2.5	Bakery products	27.5	9.0	4.8
Personal care services	0.5	2.2	2.4	Appliances	-19.8	1.6	1.7
Household maintenance, repair serv	-2.0	-0.6	2.4	Pasta	23.5	3.5	1.5
Medical care services	15.0	6.1	1.6	Electricity	-9.8	-0.2	1.5
Other prepared foods	-0.2	1.3	1.4	Fruits	-13.7	-7.4	1.3
Tobacco and smoking products	0.9	-8.0	1.4	Educational services	18.4	6.1	0.5
Cereals and bakery products	3.8	2.4	1.2	Medicines- other medical supplies	10.9	18.8	0.3
Owners' equivalent tent	2.7	1.9	1.0	Professional medical services	25.7	5.3	0.2
Housekeeping services	1.2	0.8	0.9	Goods(other)	-18.4	-3.1	-0.1
Medical care commodities	3.8	-0.1	0.8	Automobile maintenance and repairs	-24.0	-2.2	-0.2
Other utilities and public services	-0.5	-0.6	0.7	Vegetables	5.1	-27.7	-0.2
Automobile maint. and repairs	1.7	0.5	0.7	Sugar, sweets, candy and cocoa	-18.4	-1.2	-0.3
Rent, residential	-1.3	-0.3	0.5	Cultural and entertainment services	24.1	5.6	-0.6
Alcoholic beverages	-3.5	-2.0	0.5	Fish and seafood	-7.0	1.0	-0.6
Food away from home	-3.7	-1.5	0.1	Medical equipment and supplies	-0.6	-3.5	-0.9
Housekeeping supplies	-6.0	-2.0	-0.3	Seasonings and other condiments	7.9	6.9	-0.9
Other private transportation services	4.1	4.0	-0.4	Other services	-11.5	-5.7	-1.4
Gas (piped) -electricity (energy serv)	-5.4	-5.9	-0.5	Housekeeping services	29.9	1.8	-1.6
Household insurance	1.3	1.6	-0.5	Magazines, periodical and books	-3.7	13.2	-1.7
Entertainment commodities	-4.8	-2.7	-0.9	Fresh meats	-14.6	-10.9	-2.1
Apparel services	-3.2	-2.8	-1.0	Men's underwear	-25.5	-6.4	-2.3
Household maint. and repair comm	-6.2	-3.2	-1.1	Other expenses (transportation)	0.3	2.3	-2.8
Fats and oils	-8.7	-2.0	-1.2	Fabric and apparel services	-18.4	-6.1	-2.8
Fruits and vegetables	-6.6	7.3	-1.5	Women's underwear	-25.1	-11.5	-2.9
Men's and boys' apparel	-11.7	-8.1	-2.2	Goods (not included before)	-29.0	-10.5	-3.2
Nonalcoholic beverages	0.4	6.0	-2.5	Boys' and girls' underwear	-24.5	-7.6	-3.2
New vehicles	-2.7	-1.7	-2.7	Automobile	-26.9	-6.8	-3.4
Public transportation	8.0	2.2	-2.7	Boys' and girls' footwear	-26.8	-8.2	-3.4
Footwear	-10.9	-9.4	-3.6	Cleaning products	-15.6	-8.4	-3.5
Toilet goods-personal care appl.	-7.5	-6.5	-3.9	Toys, video and audio products	-28.6	-8.6	-3.6
Women's and girls' apparel	-14.5	-12.4	-3.9	Table service	-27.2	-11.6	-3.7
House furnishing	-12.2	-8.2	-4.4	Food away from home	1.0	-6.1	-3.7
Other private transportation comm.	-14.1	-8.3	-4.8	House furnishing and supplies	-21.6	-8.9	-3.7
Motor fuel	-10.6	-4.4	-5.0	Lunchmeats	-15.6	-6.7	-3.9
Used cars	8.4	1.8	-8.8	Renters' costs	32.1	4.6	-3.9
Other apparel commodities	-5.6	-9.2	-9.3	Major household appliances	-46.0	-17.3	-4.1
				Oils and fats	14.9	8.1	-4.3
				Textile House furnishing	-33.1	-11.3	-4.3
				Rice and flour	-6.1	0.2	-4.4
				Processed food	-5.1	-9.3	-4.8
				Services (several)	21.3	-2.7	-5.6
				Nonalcoholic beverages	-1.1	-9.6	-6.1
				Coffee, tea and other infusions	4.6	21.6	-7.8
				Services (household appliances)	-7.8	-9.3	-7.9
				Footwear (men's , women's)	-36.0	-16.1	-8.2
				Men's apparel	-38.5	-20.7	-8.6
				Alcoholic beverages	-13.2	-16.2	-11.9
				Boys' and girls' apparel	-46.0	-27.7	-14.2
				Women's apparel	-52.6	-32.9	-15.3

Table D
Relative price total change: $(p_{i,t} / p_t)/(p_{i,t-i} / p_{t-i}) - 1$

Germany				France			
CPI Group	**91-97**	**93-97**	**95-97**	**CPI Group**	**91-97**	**93-97**	**95-97**
Other services	37.1	36.7	34.0	Tobacco	68.3	32.5	14.9
Medicines- other medical supplies	2.5	26.8	26.7	Fuel oil and other fuel	4.7	0.6	10.8
Coffee, tea , mate and other infusions	18.7	20.6	22.2	Water and heating	31.5	20.6	6.1
Services (several)	21.1	24.2	22.1	Gasoline	20.5	12.1	5.6
Housekeeping services	17.8	17.7	17.9	Gas	-8.1	-3.0	4.4
Nonalcoholic beverages	4.4	14.0	15.8	Other services	6.0	3.7	2.5
Services (household appliances)	14.6	13.8	13.8	Cultural and entertainment services	4.0	3.0	2.3
Automobile maint.- repairs serv	13.0	12.7	12.8	Household services	5.6	3.0	2.1
Vegetables	3.6	0.6	12.3	Sugar	1.4	2.0	2.0
Food away from home	11.3	11.3	10.9	Fish and other seafood	-7.7	-4.2	1.7
Vacation and tourism	14.7	21.0	10.8	Other car expenses	6.7	4.5	1.4
Cultural and entertainment services	10.6	10.4	10.2	Restaurants rants and hotels	3.1	1.2	1.4
Educational services	9.1	9.4	9.5	Cars parts	6.0	8.7	1.4
Communications	11.2	10.8	9.1	Non-alcoholic beverages	-2.8	-0.3	1.1
Renters' costs	8.8	8.7	8.4	Household maintenance products	-4.1	-2.6	0.9
Magazines, periodical and books	3.9	-1.7	7.5	Clothing services	4.4	2.9	0.9
Motor fuel, motor oil, other prod	6.2	6.9	7.3	Bakery and cereal products	-1.0	-1.2	0.8
Pasta	4.6	4.3	4.5	Meat	-4.8	-2.5	0.7
Lunchmeats	4.2	4.6	4.5	Coal	2.3	-0.8	0.6
Textile house furnishing	4.2	4.2	4.3	Kitchen utensils	1.1	-0.7	0.5
Medical equipment and supplies	3.3	3.5	3.5	Women's underwear	-4.1	-2.3	0.2
Oils and fats	2.9	3.9	2.8	Rent	4.6	1.1	-0.1
Fresh meats	2.7	2.6	2.7	Alcoholic beverages	-4.4	-4.9	-0.3
Goods(other)	-0.2	1.3	2.5	Public transportation	1.6	-1.2	-0.5
Footwear (men's , women's)	2.4	2.2	2.1	Fats and oils	-3.4	-1.6	-0.5
Fabric and apparel services	2.0	1.8	2.1	Books and other reading mat.	-0.7	-1.6	-0.7
Boys' and girls' footwear	1.6	1.6	1.6	Personal care goods and services	-0.2	-1.5	-0.7
Table service	1.4	1.3	1.3	Working clothing	-2.9	-2.7	-0.7
Fuels	0.2	0.9	1.2	Financial services	5.5	-1.1	-0.7
Public transportation	1.1	0.8	0.9	Furniture and household textiles	-3.3	-2.7	-0.9
Alcoholic beverages	0.6	0.5	0.8	Educational services	-1.8	0.6	-0.9
Boys' and girls' apparel	0.6	0.9	0.7	Men's underwear	-7.0	-4.7	-1.1
Men's underwear	0.1	0.4	0.6	Other food products	-5.8	-4.8	-1.2
Women's underwear	-0.9	-0.6	-0.5	Tablewear and other textiles	0.3	-1.8	-1.2
Sugar, sweets, candy and cocoa	-0.5	-0.4	-0.7	Children's underwear	-5.5	-5.4	-1.4
Automobile	-1.3	-1.1	-1.1	Health care services	-2.0	-0.9	-1.7
Men's apparel	-2.5	-2.4	-2.3	Vacation and tourism	1.1	-2.0	-1.7
Women's apparel	-2.6	-3.1	-2.9	Men's apparel	-6.8	-5.8	-1.7
Appliances	-3.4	-3.4	-3.5	Women's apparel	-5.5	-5.7	-2.1
Dairy products and eggs	-4.3	-4.5	-4.5	Health care appliances	-1.2	-2.8	-2.1
Processed food	-5.9	-5.7	-5.7	Dairy products and eggs	-8.6	-6.8	-2.4
Major household appliances	-5.9	-5.9	-6.0	Health care goods	-6.6	-5.1	-2.5
Fish and seafood	-9.0	-9.7	-7.5	Other personal goods	-8.5	-4.9	-2.8
Electricity	-7.8	-7.7	-8.0	Children's apparel	-12.6	-8.5	-3.6
Other expenses (transportation)	-18.0	-21.9	-9.9	Household equipment	-13.3	-9.7	-3.7
Tobacco	-10.7	-10.7	-10.7	Coffee, tea, cocoa	17.1	24.2	-3.8
Rice and flour	-12.4	-12.0	-11.8	Footwear	-7.7	-6.6	-4.1
Professional medical services	-11.6	-11.6	-11.8	Electricity	-8.5	-7.8	-4.6
Goods (not included before)	-12.1	-12.2	-12.3	Recreational equipment	-14.5	-10.3	-5.0
House furnishing and supplies	-13.1	-13.0	-12.7	Automobile	-11.2	-8.7	-5.0
Seasonings and other condiments	-10.6	-12.1	-13.2	Communication	-10.2	-7.2	-5.2
Bakery products	-19.0	-19.1	-17.9	Vegetables	-13.6	10.3	-6.1
Toys, video and audio products	-25.0	-24.4	-23.1	Fruit	-11.3	-3.2	-8.5
Fruits	-9.8	-15.3	-25.6				
First aid commodities	-10.7	-27.9	-27.9				

Table D
Relative price total change: $(p_{i,t} / p_t)/(p_{i,t-i} / p_{t-i}) - 1$

United Kingdom	Canada

CPI Group	91-97	93-97	95-97	CPI Group	91-97	93-97	95-97
Housing - Repairs-maint. charges	9.0	8.8	9.0	Inter-city transportation	23.7	26.3	14.0
Community charge and rates	6.8	11.7	8.5	Travel services	13.1	20.1	12.0
Tobacco	28.6	17.8	8.0	Education	43.5	23.4	11.4
Soft drinks	5.4	3.8	6.3	Fuel oil and other fuel	2.7	2.6	9.8
Personal services	22.1	11.1	5.6	Local and commuter transportation	20.1	7.3	8.7
Books and newspaper	8.6	3.2	5.4	Other automobile operat exp.	27.7	18.6	6.5
Petrol and oil	11.1	8.2	5.2	Communications	1.8	2.4	5.5
Maintenance of motor vehicles	10.0	3.3	4.7	Meat	-0.6	0.4	4.3
Housing-water and other charges	23.7	11.7	3.7	Reading mat. and other print matter	11.1	11.2	3.9
Chemists goods	8.0	5.6	3.1	Purchase and rental of vehicles	19.8	13.9	3.6
Entertainment and other recreations	1.2	10.6	3.0	Paper, plastic and foil supplies	5.1	8.5	3.6
Domestic services	6.3	4.6	2.7	Purchase of recreat. vehicle	9.3	7.2	3.2
Restaurant	8.7	5.1	2.3	Water	18.6	6.1	3.1
Pet Care	2.9	7.2	2.3	Other recreational services	13.6	7.3	2.9
Oils and fats	-5.5	-2.4	2.3	Bakery and other cereal products	3.3	4.4	2.5
Meats and fishes	-9.0	-4.3	2.2	Services - household furnishings	3.8	1.4	2.3
Sweets and chocolate	6.3	3.8	2.1	Condiments, spices and vinegars	-3.4	0.6	1.7
Bus and coach fares	5.3	2.0	2.0	Sugar and confectionery	4.3	10.4	1.5
Alcoholic drinks on sale	8.7	4.7	1.8	Health care services	3.9	-0.3	1.2
Rent	16.3	7.4	1.8	Dairy products and eggs	-2.2	0.5	1.2
Other clothing	1.3	1.9	1.7	Children's clothing	-3.0	-3.6	1.1
Butter	16.9	9.5	1.1	Piped gas	4.2	-2.5	0.9
Other travilcosts	-1.0	-3.3	0.8	Alcoholic beverages	1.2	-1.9	0.7
Fruit	-17.7	0.4	0.6	Child care and domestic services	10.3	2.3	0.6
Rail fares	11.0	4.3	0.6	Fruit, fruit preparations and nuts	-20.5	-4.1	0.1
Other foods	-5.2	-2.7	0.3	Food purchased from restaurants	0.1	-0.4	0.1
Do-it-yourself materials	-6.0	-2.5	0.2	Personal care services	2.8	-0.4	0.0
Furniture	-4.1	-0.7	0.2	Other food preparations	-3.8	-1.2	0.0
Oil and other fuels	-13.9	-4.7	-0.1	Clothing material, notions and serv	-0.6	-1.1	-0.4
Biscuits and cakes	-1.5	-1.9	-0.5	Pers. care supplies and equipment	-7.3	-6.2	-0.5
Postage	2.1	-1.5	-0.8	Rented accommodation	1.0	-1.2	-0.7
Purchase of motor vehicles	-3.8	-1.7	-0.8	Vehicle parts, maint and repairs	-8.1	-3.9	-0.9
Television licenses and rentals	-10.5	-4.9	-1.1	Other household goods and services	-6.5	-3.2	-1.0
Dairy products and eggs	1.5	-1.1	-1.4	Electricity	2.5	-4.3	-1.1
Coffee and tea	-3.4	4.1	-1.9	Gasoline	-4.5	0.4	-1.4
Household equipment	-7.4	-3.8	-2.1	Men's clothing	-7.7	-7.9	-1.6
Alcoholic drink off sale	-6.6	-5.5	-2.2	Fats and oils	1.3	7.3	-1.6
Fees and subscriptions	2.4	-3.6	-2.6	Footwear	-6.2	-3.1	-1.8
Coal and solid fuels	-0.6	0.5	-3.1	Women's clothing	-6.1	-5.0	-2.1
Personal articles	-10.5	-5.9	-3.3	Furniture and household textiles	-8.4	-5.7	-2.4
Cereals	-10.1	-8.3	-3.5	Household equipment	-8.5	-5.0	-2.8
Household consumable	-3.3	-3.5	-3.8	Health care goods	-4.2	-6.4	-3.2
Bread	-11.9	-10.9	-3.9	Household chemical products	-14.6	-9.2	-3.7
Sugar and preserves	-5.7	-5.5	-4.3	Fish and other sea food	0.1	-4.7	-4.5
Children' outerwear	-14.7	-5.9	-4.5	Owned accommodation	-9.3	-7.5	-4.9
Vehicle tax and insurance	16.5	-8.5	-4.8	Clothing accessories and jewelry	-12.0	-9.9	-5.0
Gas	-12.6	-1.4	-5.3	Home entert. equipment and serv.	-17.7	-10.6	-5.1
Women's outerwear	-20.4	-11.9	-5.9	Coffee and tea	18.1	34.2	-8.6
Entertained goods	-17.6	-12.6	-6.1	Recreational equip. and services	-17.8	-14.7	-8.8
Men's outerwear	-18.3	-10.8	-6.6	Non-alcoholic beverages	-19.6	-16.3	-10.7
Electricity	-13.5	-9.2	-8.8	Vegetables and vegetable prep.	-29.8	-19.8	-14.8
Footwear	-17.9	-13.2	-9.9				
Vegetables	-16.5	-0.1	-11.3				
Dwelling insurance and ground rent	-18.1	-15.4	-11.6				
Telephones, telemessages, etc.	-26.6	-22.2	-12.5				