ESCOLA DE ECONOMIA E GESTÃO

CEEG CENTRO DE ESTUDOS EM ECONOMIA E GESTÃO

DOCUMENTOS DE TRABALHO

"The Timing of Inflation Stabilization Plans"

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CEEG - Documento de Trabalho 1 / 1999

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PAPER:
Title: **The Timing of Inflation Stabilization Plans**
JEL codes: E31, E63, F41

Abstract:

In some new political economic models, delays of stabilizations generally result from some sort of coordination problem caused by the mechanisms of making collective choices. Although several authors have tested the effects of political instability and fragmentation on seigniorage, deficits, or inflation, no direct tests of the influence of these factors on the timing of stabilizations have been undertaken. This is what I try to accomplish here with the use of a duration model. Empirical results identify the degree of fragmentation of the political system and the level of inflation as important determinants of the timing of inflation stabilizations.

A. INTRODUCTION

One intriguing fact that is common to many chronic inflation countries is that they have followed potentially unsustainable policies for extended periods of time. These policies include large budget deficits which lead to ever-growing debt to GDP ratios and hyperinflation. Although these policies are recognized as suboptimal from a social standpoint, the necessary (and welfare-improving) stabilizations are often delayed or not fully implemented. Many economists explain these suboptimal policies by accusing politicians of myopia or irrational behavior. Others argue that the countries lack the expertise necessary to carry out the reforms or that they simply did nothing, expecting things to get better by themselves or waiting for a big crisis that would force them to act.

Needless to say, these explanations are not very convincing. A new strand of political economic literature has developed formal models that try to explain the adoption of suboptimal policies by rational and forward looking agents that do the best they can in the game being played.[1] Most of them depart from the assumption of a social planner choosing policies according to a social welfare function, and assume, instead, that policy choices tend to be the result of negotiations between contending interest groups with conflicting interests. Then, deviations from optimality are explained by coordination problems caused by the mechanisms of making collective choices.

These models have several testable implications. Many of them focus on the influence of political factors on the timing of stabilizations: fragmentation or polarization of the political system; political instability; type of regime; political orientation of the government; and time in office. Others are related to economic factors: intensity of the crisis (level of inflation); or amount of foreign reserves available. Although several

authors have tested the effects of political instability and fragmentation on seigniorage, budget deficits, debt, or inflation [Cukierman, Edwards, and Tabellini (1992), Roubini and Sachs (1989), and others], no direct tests of the influence of these factors on the timing of stabilizations have been undertaken.

This is what I try to accomplish here. The influence of the above-mentioned political and economic variables on the probability of starting a stabilization program is evaluated with the help of a probit model. What increases that probability decreases the duration of high inflation before the start of a stabilization program. This duration is defined as the number of quarters since the onset of high inflation until the start of a stabilization. Then, the empirical results are compared with the testable implications of the theoretical models, so that we can discriminate among them. The second part of the empirical analysis, more similar to the tests performed by most authors, deals with the effects of political fragmentation and some economic variables on inflation across time and countries (using an OLS model).

The paper is organized as follows. Section *B* presents a description of the recent theories of delayed stabilization and reform. Testable implications of these theories are discussed in section *C*, and the empirical analysis is described in section *D*. Finally, the conclusions of this paper are presented in section *E*.

B. DELAYED STABILIZATION

1) Distributional conflict

Alesina and Drazen (1991) present a model in which delays of fiscal stabilization result from the failure of rival interest groups to agree on a deficit reduction program.

Until a consensus is reached the fiscal deficits are financed by external borrowing and highly distortionary taxation (inflation tax), which is costly. Although the replacement of distortionary taxation with an increase in less distortionary taxes is desirable, the two groups involved are not able to agree on how the burden of higher taxation is going to be distributed across them. Each group wishes to shift that burden onto the other group. This situation leads to a "war of attrition" in which agreement on a stabilization program is only reached when one of the groups concedes, that is, accepts paying a higher proportion of the taxes in order to eliminate the deficit.

It is assumed that the welfare costs of distortionary taxation and the political costs (of lobbying) differ across socioeconomic groups and that each group knows its own costs but not those of its opponent. Thus, the loser, who suffers the highest costs of maintaining the war, can not be identified from the outset, which gives each group a rational incentive to wait and see if the opponent concedes first. Concession happens when the marginal benefit of waiting equals the marginal benefit of conceding, that is, when the expected gains of waiting another period equal the expected costs of doing so.

Several factors may lead to delays: more unequal distribution of the costs of stabilization (lack of political cohesion or higher political fragmentation); lower costs of delaying stabilization (smaller economic costs of inflation or smaller political costs); greater dispersion of income across groups.

Drazen and Grilli (1993) extend the war of attrition model emphasizing the possible benefits of economic crises. Since higher costs of delay hasten stabilizations (by revealing the loser faster) an exogenous shock that aggravates the economic conditions

may be welfare improving if the welfare costs of the shock are more than compensated for by the benefits of earlier stabilization.

Laban and Sturzenegger (1994b) develop a model in which class conflicts (between the rich and the poor) and adjustment costs lead to delays of stabilizations in the context of the Latin American debt crisis. Stabilization means tax reform and expenditure cuts. At the beginning of each period both groups decide whether or not to start a stabilization program and how to distribute its costs. Until agreement is achieved, the government finances the interest payments on its debt and transfers to the poor with distortionary taxation (inflation tax). Since stabilization is costly the groups may prefer to postpone it when inflation is low. In Laban and Sturzenegger (1994a) there is also ex post payoff uncertainty and the two groups are assumed to be risk averse.

It is assumed that the rich make use of a financial adaptation technology which allows them to hide part of their income from the inflation tax (through capital flight), which is not available to the poor. As capital flight increases, the base for the distortionary taxes diminishes and inflation has to increase in order to generate enough receipts to finance the deficit, leading to higher welfare costs to the poor who can not evade the inflation tax. As the relative situation of the poor gets worse, they will eventually be willing to bear a disproportionate share of the adjustment costs (lower transfers to them) and an agreement to stabilize will be reached. Several factors may increase delays: higher costs of stabilization, lower costs of inflation, and lower costs of financial adaptation.

Mondino, Sturzenegger, and Tommasi (1996) extend this framework by incorporating the possibility of recurrent cycles of inflation and stabilization. They

consider two pressure groups which request transfers from the government and whose welfare increases with transfers and decreases with inflation. The government finances these transfers by printing money, which results in higher inflation. Financial adaptation is available to both groups, allowing them to avoid the inflation tax.

When inflation is low it may be worthwhile for the groups to request high transfers. Since this results in higher inflation, both groups will resort to financial adaptation which will increase inflation even more. Eventually, they will get to a high level of inflation for which asking for big transfers is no longer optimal. Instead, they will accept a stabilization that cuts subsidies, decreasing inflation and financial adaptation, and leading to a remonetization of the economy. Back to the initial state of low inflation, both groups will request higher transfers and the cycle just described will start again. Successive cycles result in high average inflation, high variability of the inflation rate over time, and stabilizations which are only temporarily successful (all commonly observed in Latin American countries).

2) Uncertainty

Fernandez and Rodrik (1991) illustrate how a reform that would benefit a majority of the population may be rejected by a majority of the electorate when the identity of many gainers can not be determined ex ante. They examine the specific case of a trade reform in a two-sector economy, where the removal of one tariff will increase wages in the export sector (X) and lower them in the import-competing sector (Y). Workers in *Y* can change to *X* incurring a cost. Some of them would be better off after the reform and their move to *X*, but each worker does not know whether he will gain or lose because the

cost of moving is not known ex ante. In this framework, individuals in *X* unconditionally support the reform and those in *Y* will only do so if their expected benefit from reform is positive. The approval of a reform is done through majority voting.

Even if a majority of the population (*X* workers plus those of *Y* that would win with reform) would be better off, the reform may be rejected if *Y* workers are a majority of the population and their expected benefit from reform is not positive. This result holds with risk neutrality and is reinforced if we assume risk aversion. In a two period game, there is a tendency towards the status quo. A reform rejected in the first period, even when a majority would benefit from it, is not adopted in the second period because no new information is revealed. But a reform adopted in the first period that ends up not being beneficial to a majority of the population will be reversed in the second period.

Orphanides (1996) examines delay and abandonment of a stabilization program as optimal decisions by a policymaker. He argues that it may be better to delay the program if more favorable initial conditions are expected: either the adjustment may become less painful, or political support may increase when the costs of inflation are fully recognized by the public. Furthermore, after a plan is initiated, the policymaker may decide to abandon it if the expected costs of concluding the program outweigh the expected benefits. In a framework of an exchange rate based stabilization, where inflation is reduced via the management of the exchange rate, the level of foreign reserves (subject to stochastic shocks) will be a decisive factor. If this level is too low, the stabilization will be delayed or abandoned.

The model explains those cases in which policymakers expect crises to be transitory and prefer to stabilize when things get better. But it does not explain delays

when the situation is only expected to get worse or why countries often fail to stabilize as soon as favorable shocks occur. It also assumes that decisions are made by a policymaker trying to maximize social utility or welfare, which in most cases (dictatorships excluded) is not the way decisions are actually made. In democracies, decisions tend to be the result of negotiations among contending parties or interest groups with conflicting interests.

3) Political Instability

Alesina and Tabellini (1989) present a model in which political instability and polarization lead to overaccumulation of external debt, capital flight, and low domestic investment. They consider two parties alternating in office, one representing the "workers" and the other the "capitalists", which attempt to redistribute income in favor of their constituencies. When the incumbent party faces a small probability of reelection there is an incentive to overaccumulate external debt, since it is able to allocate the proceeds of the debt towards its constituency but does not internalize the costs of servicing the debt, which will be faced by the next government. Higher debt leads also to higher expected future taxes inducing capital flight and reducing investment, especially when right-wing regimes are expected to collapse. Although not directly related to stabilizations, their model shows how inefficient outcomes, sometimes related to delays of stabilizations, can be generated by political instability and polarization.

Roubini and Sachs (1989) present evidence for OECD countries that higher fragmentation (lower degree of cohesion) of the political system leads to higher public debt. They find that high debt countries are usually parliamentary democracies with highly proportional electoral systems that enable a large number of parties to be

represented in Parliament and make one-party overall majorities difficult to obtain. This generally results in coalition or minority governments and a low average tenure of governments. As each member of a coalition holds veto power, and minority governments can easily be turned down, agreements are harder to obtain and stabilizations are delayed.

Cukierman, Edwards and Tabellini (1992) present a political model of tax reforms in which strategic considerations may induce the current government to leave an inefficient tax system to its successors (in the presence of political instability and polarization). In a framework along the lines of Alesina and Tabellini (1989), the lower the probability of the current government being reappointed and the greater is polarization, the more inefficient will be the tax system left for future governments. This will limit their availability of funds and, therefore, decrease spending on areas that are not favored by the incumbent policymaker. Thus, tax reform is delayed when the incumbent faces small probability of reelection and high polarization.

They also show that after controlling for a set of structural variables, countries with more unstable political systems tend to rely more on seigniorage.[2] Their proxy of political instability is the probability of government change, estimated in a probit model that has economic performance indicators (inflation and growth), political events (riots, coups, etc.), and structural variables (GDP per capita, democracy, etc.) as explanatory variables. When included in the seigniorage regressions along with the structural variables, this measure of political instability is always statistically significant.

Haggard and Kaufman (1992) argue that the security of governments and their independence from the short-term distributive political pressures has great effects on the

level and variability of inflation over the log-run. Political systems where military coups and changes in regime abound, and the tenure of governments is short, tend to have higher and more variable inflation than more stable regimes. They also found that fragmented party systems or systems where some major parties are excluded from the electoral game tend to lead to "bidding wars" among contending parties vying for support, reinforcing the cleavages among them and making agreement on stabilization policy more difficult.

They also argue that the capacity of different types of regimes to implement successful stabilization plans depends on the political dynamics that underlie inflationary pressures. In countries with a tradition of low or moderate inflation, stable democracies and authoritarian regimes tend to fare equally well, but when inflation is very high, authoritarian regimes have done a slightly better job. Democracies characterized by fragmented party systems have the worst record, as the political instability they generate tends to lead to higher inflation, and support for a stabilization program is difficult to obtain.

C. TESTABLE IMPLICATIONS

Although most of the theoretical models referred to in the previous section deal with stabilization as a reduction in the budget deficit or the ratio of public debt to GDP (fiscal stabilization), their conclusions are also applicable to inflation stabilization, which is the main focus of this paper. Furthermore, in most of the countries suffering from chronic inflation large budget deficits lead to ever-growing debt to GDP ratios and hyperinflation (through monetization), meaning that an inflation stabilization program

can only succeed if it is accompanied by fiscal stabilization. Thus, the models above have several testable implications that can be applied to inflation stabilization and that one could try to confirm or deny with empirical data. They are presented below in four categories.

1) Fragmentation of the political system

Roubini and Sachs (1989) showed that for industrial countries the degree of fragmentation of the political system is directly related to the public debt. This is due to the greater difficulty of parties to agree on the implementation of a stabilization in more fragmented party systems. Since this article deals mainly with inflation, one could test the related hypothesis that higher fragmentation leads to higher average inflation and delayed stabilization, as Haggard and Kaufman (1992) suggest.

Since contending interest groups tend to be represented by political parties, the multitude of parties represented in the parliaments of many fragmented party systems can be associated with a high degree of political polarization of these systems[3], which in the models of Alesina and Drazen (1991) and Cukierman, Edwards, and Tabellini (1992) would also lead to greater delays of stabilizations.

This hypothesis would also be consistent with Alesina and Tabellini (1989) and with Cukierman, Edwards, and Tabellini (1992) as higher fragmentation generally is translated into an abundance of coalition governments leading to higher political instability and shorter average tenure of governments. According to Alesina (1994), that happens because each coalition member has the power of veto over things it may not like,

which generates wars of attrition between coalition members, with stabilization being delayed until the conflict is resolved.

2) Inflation rate

Drazen and Grilli (1993) suggest that crises, or higher costs of delay, hasten stabilizations. Since the higher inflation is, the higher are the costs of delaying stabilization, one should observe faster starting stabilizations as inflation gets higher (assuming no efforts by the government to reduce the costs of inflation through indexation or other means). This second testable hypothesis is consistent with most of the models referred to above: in Laban and Sturzenegger (1994a and 1994b) higher inflation worsens the relative bargaining position of the poor forcing them to accept conditions they were not willing to accept before; in Mondino, Sturzenegger, and Tommasi (1996) high inflation makes the request of further subsidies non-optimal; and it increases the costs of delay in Alesina and Drazen (1991) and Orphanides (1996), leading also to earlier stabilization.

3) Level of foreign reserves

Orphanides (1996) considers the level of foreign reserves as the main variable influencing the decision of a policymaker to start or delay an exchange rate based stabilization program. Thus, the higher the amount of reserves available, the smaller the delay should be. This will be our third testable hypothesis.

4) Others

Although the main purpose of the present paper is to test the models of the previous section, it may be worthwhile to test some additional hypotheses: 4) stabilization comes faster in authoritarian regimes than in democracies; 5) rightist governments are more prone to stabilize than leftist ones; and, 6) governments tend to stabilize in the beginning of their terms. The fourth builds on the discussion about the relative advantages of both regimes [Haggard and Kaufman (1992) and Haggard and Webb (1993)]; the fifth is related to the partisan model of Hibbs (1987), that suggests that rightist parties care more about inflation that leftist parties; and the last with the opportunistic political business cycle of Nordhaus (1975), in which a government implements the toughest measures in the beginning of its term, when it still enjoys a large public support.[4]

D. EMPIRICAL EVIDENCE

The first part of the empirical analysis consists of using a duration model to test the above-mentioned hypotheses. Probit and proportional hazards specifications will be estimated for a panel of 10 countries and 27 inflation stabilization programs in order to determine which variables have a greater effect on the timing of stabilizations.

The second part of the empirical analysis, more similar to the tests performed by most authors, deals with the effects of fragmentation of the political system on inflation across time and countries. OLS regressions of the annual inflation rate on political fragmentation and some economic variables are estimated for a panel of 10 countries covering 40 years of observations (1957-1996) .

1) The Data

The list of stabilization plans analyzed in this article is shown in Table 1. They are the major programs generally referred to in the literature, which were able to reduce the inflation rate considerably for some time and represented a "strong" willingness of the incumbent government to reduce inflation, while some "minor" plans also implemented in these countries were just vague attempts to do so with almost no probability of success. The second column indicates the quarter in which the plans were implemented. The last column indicates the number of quarters of high inflation that preceded the start of a stabilization plan.[5] Those stabilizations that were implemented when inflation was not high according to my definition, have a duration of high inflation of zero quarters.

For each country, quarterly data was collected from the first quarter of 1957 (first quarter for which quarterly data is available) until the fourth quarter of 1996. A description of the variables used in this paper and their sources is presented in Table 2. Quarterly data is not always available for some of the countries studied, but annual data usually are. In order to make possible the inclusion of these data in the data set, straight-line interpolation was used to generate quarterly data.[6] The variables for which interpolation was used (mainly for the 1950s, 1960s) are: real GDP; government deficit or surplus as a percentage of the GDP; current account balance as a percentage of GDP; and the unemployment rate. Even after interpolating annual data for these variables, there are missing values for some of them, in particular the unemployment rate.

2) The timing of stabilizations

In order to determine which factors influence the timing of an inflation stabilization program, I use a binary probit model to estimate the effect of a set of political and economic variables on the probability of starting a stabilization program in a given quarter, when inflation is high. High inflation is defined as twice the average inflation rate of the last 10 years (and greater than 25%) or greater or equal to 100%, and only the quarters for which inflation is high and the quarter of implementation of a stabilization plan are included in the data-set.

An individual inflation spell contains all the consecutive quarters in which inflation was high according to my definition, until a stabilization plan started or inflation ceased to be high. For each quarter and each inflation spell the dependent variable (*STAB*) takes the value of one if a stabilization plan was implemented in that quarter, and zero if it was implemented after that quarter. If no stabilization is implemented, *STAB* takes the value of zero for all the observations in that inflation spell.

Three dummy variables based on *Frag*[7], the degree of fragmentation of the national government, were created: *Frag=1*, that takes the value of one when no political parties are allowed or there is an exclusive one-party system, and zero otherwise; *Frag=2*, that takes the value of one when there is a one-party majority government or a presidential government with the same party in control of the parliament, and zero otherwise; and *Frag>2* that takes the value of one for the most fragmented political systems, and zero otherwise.

Here I assume that the unobserved probability of starting a stabilization program in a given quarter depends only on the following explanatory variables:

Frag=1 and *Frag=2:* as explained above, they represent different degrees of political fragmentation. According to Alesina and Drazen (1992) and Roubini and Sachs (1989), a greater fragmentation of the government is expected to delay stabilization. Thus, when these two dummies are included in a regression (with *Frag>2* left out) their estimated coefficients are expected to be positive, and the one on *Frag=1* is expected to be greater than the one on *Frag=2*;

F.Ind[8]*:* fragmentation index of the distribution of seats in the lower house of the parliament. The proliferation of parties represented in parliament is expected to lead to delays of stabilization. A negative estimated coefficient is expected;

Orient: political orientation of the government (from 1 to 4). The higher this variable is the more to the left is the political orientation of the government. Thus it is expected to be negatively related to the probability of starting a stabilization;[9]

Type: dummy variable that takes the value of one for authoritarian regimes and zero for democracies. Expected to be positively related to the start of a stabilization given the greater autonomy that authoritarian governments enjoy;

QLCH: number of quarters since last change in government or election. According to the political business cycle literature (see Nordhaus, 1975) a government is expected to implement tough measures earlier in its term;

Inf: annual inflation rate. According to Drazen and Grilli (1992) and Laban and Sturzenegger (1994a,b) higher inflation is expected to hasten stabilizations;

TR/Imp: total foreign reserves as a percentage of imports. According to Orphanides (1996), higher reserves hasten stabilizations;

Other variables not so directly related to the models presented but that can influence the outcome of a stabilization were used as controls:

GDS/GDP: government deficit or surplus as a percentage of GDP. Expected to be positively related to the probability of starting a stabilization;

GDP: real GDP growth since same quarter of previous year. Expected to be positively related to the probability of starting a stabilization;

Country dummies: a dummy variable was created for each of the ten countries. Then, nine are included in the model to control for fixed effects.

Table 2 presents a more complete description of these variables and their sources. All economic variables were lagged because the start of a stabilization program could affect their contemporaneous values.

Results are reported on the first three columns of Table 3. Probit estimated coefficients and estimates of the derivative of the probability of starting a stabilization in a given quarter with respect to the independent variables are reported. The latter give the effects of one-unit changes in the regressors on that probability (expressed in percentage points), evaluated at the mean of the data. T-statistics for the null of no effect and the associated p-values are also reported.

In column 1, *Frag=1* and *Frag=2* are statistically significant and the estimated coefficients have the expected signs. Furthermore, the estimated coefficient of *Frag=1* is greater than that of *Frag*=2 as expected, supporting my first testable hypothesis that higher fragmentation decreases the probability of starting a stabilization, that is, leads to delays. The higher estimated coefficient and slope derivative of *Frag=1* seems to indicate that authoritarian regimes that did not allow political parties tend to stabilize faster.

In the second column I use my other measure of fragmentation, *F.Ind*. Its coefficient has the expected sign and is marginally significant (10% significance level), providing some evidence that the proliferation of parties in the parliament leads to delays of stabilizations. A one unit increase in the index decreases the probability of starting a stabilization by 2.3 percentage points. *Type*[10] has the wrong sign and is not statistically significant, which goes against the hypothesis that authoritarian regimes in general tend to stabilize faster. Thus, it seems that my fourth testable hypothesis that authoritarian regimes tend to stabilize faster than in democracies is not supported in general (for all authoritarian regimes) but, as mentioned above, authoritarian regimes that did not allow political parties do seem to stabilize faster[11], providing support for a restricted version of the hypothesis.

In the third column, *Frag=1* and *Frag=2* were included in a single model with *F.Ind*. For the two dummy variables, results are almost identical to those of column 1. The only difference is that coefficients and slope derivatives are larger than before. *F.Ind* is no longer statistically significant and has the wrong sign. Thus, when the two measures of fragmentation are used at the same time, the dummy variables based on *Frag* seem to work better that *F.Ind*.

Orient (orientation of the government) and *QLCH* (quarters since last change in government or election) also have the expected signs but are only marginally significant in the second estimation and not statistically significant in the others. Therefore, one finds little or no support here for the hypotheses that rightist governments tend to stabilize faster and that governments would tend to stabilize early in their terms.

The first lag of the annual inflation rate (*Inf(-1)*) is always highly significant and has a positive coefficient, supporting the hypothesis that stabilization comes faster as inflation gets higher. A one percentage point increase in the annual inflation rate increases the probability of starting a stabilization by .004 percentage points. Although it may seem a very small slope, one should note that inflation was over 10,000 on a few occasions and that its mean is 389.21 (means not reported here). *TR/Imp(-1)* has also a positive coefficient, as expected, but is never significant, providing no support for Orphanides' (1996) hypothesis that the decision on starting or postponing a stabilization depends upon the available level of reserves. Although the ratio of total reserves to imports may not be a perfect indicator of the amount of reserves available, it gives an idea of the capacity of one nation to keep financing its imports, and is one of the best proxies available that can be compared across countries of different sizes.

The control variables, *GDS/GDP(-1)* and *GDP(-1)*, have the expected signs and only the first lag of real GDP is usually significant. There was no evidence of country fixed effects: the country dummies were usually not statistically significant individually and one was never able to reject the null hypothesis that their coefficients were all equal to zero.

I also performed a considerable number of robustness tests not reported here: using quarterly inflation instead of annual inflation; using annual growth in money instead of annual inflation; adding current account balance as a percentage of GDP, growth in exports, growth in imports, change in total reserves, and the unemployment rate to the list of explanatory variables (either one at a time or all at the same time). None of these changed results significantly.

Sensitivity analysis was performed estimating the specifications of Table 3 for several alternative samples (results are not reported here). First, several alternative definitions of high annual inflation were used: over twice the average inflation rate of the last five years or greater than 100%; or, simply, above 50%, 75%, 100%, etc.. Second, Israel and Turkey were excluded from the sample, so that one could verify if conclusions hold when only Latin American countries are included. Then, Mexico and the Dominican Republic were excluded, so that only South American countries would remain. Third, all observations before 1970 were excluded. Since most of the problems with chronic inflation started or became more severe in the 1970s, leading to the implementation of stabilization programs in several countries, I check whether results are affected by dropping the earlier stabilizations from the sample. Fourth, the stabilizations for which duration of high inflation was zero were excluded, in order to keep only those starting after a period of high inflation. results were virtually the same. In all cases, results did not change considerably.

Probit with time dummies and Proportional Hazards

In the estimations described above I assumed that the probability of starting a stabilization plan in a given quarter did not change autonomously over time, meaning that any variation had to be due to changes in the explanatory variables. A simple way to allow that probability to change over time even when the independent variables are held constant, is to create a set of dummy variables accounting for the passage of time and include them in the probit model. Seven time dummies reflecting the duration of high

inflation before stabilization were created (each dummy reflects 4 quarters of high inflation) and six were included in the list of independent variables.

Results are shown in columns 4 and 5 of Table 3 (page 35), which should be compared with columns 1 and 2. *Frag=1* and *Frag=2* are now highly significant, *F.Ind* is more significant than before, and their slope derivatives are larger than before. *Inf(-1)* remains significant in both regressions, *Orient*, *Type*, *QLCH*, and *TR/Imp(-1)* are not significant, *GDP(-1)* is only marginally significant in column 5, and *GDS/GDP(-1)* is only marginally significant in the first estimation and significant at the 5% level in the second. The time dummies were always jointly significant (coefficients on the dummies are not reported). The introduction of year dummies in the regressions reinforced the support for the hypothesis that higher fragmentation reduces the probability of starting a stabilization, regardless of the measure used, and did not change considerably the support found for most of the other testable hypotheses.

I also performed the same estimations using the discrete-time version of the proportional hazards model developed by Prentice and Gloeckler (1978). Although in practice results tend to be almost the same as those of probit estimations and probit models are easier to estimate in most of the statistical software packages available, this model may be theoretically more correct because, unlike the probit, its estimated coefficients are the discrete-time equivalent of the underlying continuous-time model [see Jenkins (1995)]. Given that similarity of results, only one estimation is reported in the last column of Table 3, which should be compared with columns 1 and 4. *Frag=1*, *Frag=2*, and *Inf(-1)* remain statistically significant, and the slope derivatives of the first two are higher than for the probit models. None of the remaining explanatory variables is

statistically significant. In short, results are not very different from those of the probit model with or without time dummies, and the conclusions regarding the support for the testable hypotheses remain the same.

3) Political fragmentation and inflation

The probit and proportional hazards estimations described above show that the degree of fragmentation of the political system is one important determinant of the timing of inflation stabilizations. Results over a panel of 10 countries and 27 stabilization attempts clearly support the hypothesis that higher fragmentation leads to delays of stabilizations (decrease the probability of starting a stabilization plan at a given quarter).

In this section, I will test the hypothesis that higher fragmentation of the political system tends to lead to higher inflation. Again, I use two indicators of fragmentation: the dummy variables based on *Frag*, the degree of fragmentation of the government; and *F.Ind*, the Laakso and Taegepera (1979) measure of the effective number of parties in the lower house of parliament.

The data-set consists of annual data covering 40 years (1957-1996) for the ten countries considered in this paper.[12] I estimate OLS regressions of annual inflation (*Inf*) on an indicator of fragmentation (*Frag=1* and *Frag=2*, or *F.Ind*) and on the following economic variables: *Inf(-1)*, *GDS/GDP(-1)*, *GDP(-1)*, and *UR(-1)*. Estimated coefficients are expected to be positive for *F.Ind, GDP(-1),* and *UR(-1),* and negative for *Frag=1, Frag=2,* and *GDS/GDP(-1)*. Country dummies were also included in the regressions in order to control for fixed effects.[13]

Results are reported in the first three columns of Table 4. As *UR(-1)* was not statistically significant (column 1) and there are many missing values for unemployment in my sample, it was excluded from the following regressions. *F.Ind* is highly significant in the first two regressions and has the expected sign, supporting the hypothesis that fragmentation, here equivalent to a higher effective number of parties, tends to lead to higher inflation.[14] *Inf(-1)* and *GDS/GDP(-1)* are always significant and have the expected sign, expressing the influence of past inflation and budget balances on today's inflation rate. *GDP(-1)* is not statistically significant and has the wrong sign.

Frag=1 and *Frag=2* are not statistically significant and the second has the wrong sign (column 3). Thus, it seems that these dummy variables do not work as well as *F.Ind* in the OLS regressions, while in the probits all were statistically significant.[15] One could also estimate a model using *Frag* as an explanatory variable, as Roubini and Sachs (1989) do, instead of breaking it into dummies. The problem is that *Frag* has five categories of fragmentation that are not necessarily equidistant from one another, that is, the increase in fragmentation from *Frag*=1 to *Frag=2* is not necessarily the same than from *Frag=2* to *Frag=3*. Furthermore, *Frag=4* may not be equivalent to twice the fragmentation of when *Frag=2* or *Frag=5* five times that of *Frag=1.* In short, the scale in this index and, consequently, in the one used by Roubini and Sachs (1989) is not meaningful, and such a variable should not be included in an OLS estimation. Instead, dummy variables for the categories included in that index should be used.

In Augmented Dickey-Fuller tests not reported here the null hypothesis of unit root behavior of the annual inflation rate could not be rejected for Chile and Mexico, and it was rejected for Brazil and Israel only at the 10% significance level. Since

nonstationarity of the inflation rate in these countries could affect the efficiency of the estimators, I decided to reestimate the regression of column 2 with two restricted samples: first, excluding Chile and Mexico (see column 4); second, excluding Brazil and Israel as well (see column 5). Results did not change significantly, and one still finds support for the hypothesis that higher fragmentation tends to lead to higher inflation.[16]

I also performed several robustness tests not reported here: adding current account balance as a percentage of GDP, growth in exports, growth in imports, change in total reserves, and total reserves as a percentage of imports to the list of regressors (individually or all at the same time). None changed results significantly. Sensitivity analysis, not reported here, was performed by using different samples: Latin American countries only, and only observations since 1970. Again, results did not change significantly.

E. CONCLUSIONS

A new strand of political economic literature tries to explain the delay of stabilization programs by rational and forward looking agents that do the best they can in the game being played. In these models, delays generally result from some sort of coordination problem caused by the mechanisms of making collective choices. Although several authors have tested the effects of political instability and fragmentation on seigniorage, deficits, or inflation, no direct tests of the influence of those political factors on the timing of stabilizations have been undertaken. That is accomplished here using a duration model.

Empirical results show that some political variables are important determinants of the timing of stabilizations. Probit and proportional hazards estimations over a panel of 10 countries and 27 stabilization attempts clearly support the hypothesis that higher fragmentation of the political system generally leads to delays of stabilizations. OLS estimations covering 40 years of observations for the same 10 countries show that fragmentation is directly related to inflation. Since higher fragmentation of the political system tends to lead to higher polarization and political instability, these results are consistent with the "war of attrition" model of Alesina and Drazen (1991) and with the findings of Cukierman, Edwards, and Tabellini (1992) regarding the effect of political instability on inflation.

Higher inflation seems to hasten stabilizations, as suggested by the "benefits of crises" model of Drazen and Grilli (1993) and those of Laban and Sturzenegger (1994a,b), and Mondino, Sturzenegger, and Tommasi (1996). There is also some support for the hypothesis that authoritarian regimes hasten stabilizations, but evidence is found only for those cases in which political parties are not allowed. Little or no evidence was found of opportunistic business cycles or partisan effects. Finally, empirical results do not support the model of Orphanides (1996) that bases the decision of starting or delaying a stabilization program on the available amount of foreign reserves.

In short, it seems that the structure of the political system may help explain why suboptimal (inflationary) policies are kept for long periods of time and the necessary corrective actions are not taken. Countries whose electoral systems are highly proportional tend to have a higher number of parties represented in parliament, generally leading to higher political polarization and instability. Then, conflicts of interests between

political parties make the approval of new legislation harder and stabilization programs are often delayed until a serious crisis sets in.

[1] For surveys on this literature, see: Alesina (1994), Drazen (1996), Rodrik (1993), and Rodrik (1996).

[2] Similar evidence regarding the effects of political instability on inflation and budget deficits is found by Edwards and Tabellini (1991), and Roubini (1991).

[3] Mainwaring and Scully (1995, p. 28-33) argue that the most polarized political systems in Latin America are also the most fragmented. As the lack of political surveys in most of these countries does not allow us to find data on polarization, the best proxy that can be found is the number of parties represented in parliament (weighted by their relative size).

[4] On political business cycle and partisan theories, see: Alesina (1994).

[5] High inflation was defined as an annual inflation rate greater or equal to 100% or greater than twice the average inflation rate of the last 10 years (and higher than 25%). Then, the duration of high inflation is given by the number of consecutive quarters of high inflation until a stabilization program is implemented. Later on, in the sensitivity analysis, alternative definitions of high inflation will be used.

[6] The IFS CD-ROM does not have quarterly data for all the variables and all the countries considered for the entire time period used here. For some countries only annual data is found on some variables or and, sometimes, there is no data at all for earlier decades (1950s, 1960s, and in some cases, even for the 1970s). Interpolation was also performed assuming the series were AR1 (auto-regressive or order 1) or RW1 (random walk of order 1). Results using any of these two alternatives were virtually equal to those obtained when straight-line interpolation was used.

[7] Values 2 to 5 of *Frag* correspond to the 4 degrees of fragmentation used by Roubini and Sachs (1989). Since they were dealing with OECD democracies, there were no dictatorships in their sample. The same can not be said about many countries in my sample. To account for this possibility, one more degree of fragmentation was considered ("1- No parties allowed or exclusive one-party systems"). Since there were no stabilizations being implemented when *Frag* was equal to 4 or 5, it was not possible to create dummy variables for these cases and include them in the set of regressors, because they would totally predict the value of the dependent variable (*STAB=0*). Thus, only three dumies were created (*Frag=1*; *Frag=2*; and *Frag>2*), and the first two were included in the set of explanatory variables.

[8] *F.Ind* is the Laakso and Taegepera (1979) measure of the effective number of parties in Parliament with parties being weighted according to their size (it is equal to zero when no parties are allowed). The greater the index, the greater is the effective number of parties and fragmentation. According to Maiwaring and Scully (1995, pp. 31) polarization or the "ideological distance tends to widen as the effective number of parties increases." Thus, *F.Ind* can also be used as a proxy for polarization of the party system.

[9] According to the partisan business cycle of Hibbs (1977), leftist governments are more prone to inflation than rightist governments. The classification used for this variable follows Haggard and Kaufman (1992).

[10] This variable was not included in the estimation of column 1 because when *Frag=1* takes the value of one *Type* is also equal to one, resulting in high correlation of these variables (66.8%) which could lead to problems of multicolinearity (the correlation matrix is not shown here).

[11] One direct way of testing whether "strong" dictators tend to stabilize faster than "weak" dictators or not would be to create a dummy variable representing the latter and include it in the estimation of column one, so that its coefficient could be compared to that of *Frag=1.* Unfortunatelly that is not possible because in my sample there is not a single case in which a "weak" dictator implements an inflation stabilization program, meaning that a dummy variable representing "weak" dictators would totally predict the value of the dependent variable (*STAB=0*).

[12] Here I use annual data instead of quarterly to avoid possible problems of using data generated by interpolation for the three economic variables on the earlier decades. In the probit that was not an important problem because there were few observations of earlier decades in the sample: there were not many quarters for which inflation was high according to my definition, and there were only five stabilizations before 1970.

[13] The first lags of *GDS/GDP, GDP,* and *UR* are used instead of their contemporaneous values because inflation today may be better explained by last year's deficit, GDP growth, and unemployment rate than by the current ones. The optimal number of lags of the dependent and independent variables was determined with the help of the Schwartz Bayesian Information Criterion (SBIC). In individual country estimations of this specification Durbin h alternative tests reveal no evidence of autocorrelation.

[14] In country regressions not reported here 8 countries have a positive coefficient but, due to the low number of observations, a maximum of 40 per country, most of the estimated coefficients were not statistically significant (only 3 in 10).

[15]Besides grouping the categories in *Frag* into three dummies as done in column 3, I also grouped them into five dummies (one per category). When the first four are included in a regression like that of column 3 none of the dummy variables is statistically significant (results not reported here).

[16]In order to correct for problems of nonstationarity of the dependent variable in Chile, Mexico, Brazil, and Israel I first-differenced the regression of column 2 and estimated it for a sample containing only those countries. *F.Ind* was not statistically significant (results not reported here). That may be due to the fact that there are few observations in that restricted sample, or that the relationship between fragmentation and inflation is weaker for these countries than for the others.

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Table 1: Stabilization Programs

Country	Program dates / names	Duration of "high" inflation until stabilization (quarters)
Argentina	1959.3	4
	1967.2	0
	1973.3	6
	1978.4 (Tablita)	15
	1985.1(Austral)	14
	1990.1 (Bonex)	11
	1991.2 (Convertibility)	1
Bolivia	1985.4	14
Brazil	1964:2	4
	1986:1 (Cruzado)	22
	1990.2 (Collor)	13
	1994.3 (Real)	14
Chile	1975.2	11
	1978.1 (Tablita)	0
Dominican Republic	1985.2	4
	1991.2	13
Israel	1985.3 (Shekel)	27
Mexico	1976.4	0
	1988.1	5
Peru	1981.3	22
	1985.4	10
	1990.3	11
Turkey	1980.1	12
Uruguay	1960.4	7
	1968.2	11
	1978.4 (Tablita)	0
	1991.3	5

Sources: Bruno, et al. (1988), Bruno, et al. (1991), Calvo and Végh (1994), Kiguel and Leviatan (1992), Pastor (1992), Hoffmaister and Végh (1996), and Végh (1992).

Table 2: Variables Used and Respective Sources

List of Variables Used:	Sources:
Frag - Degree of fragmentation of the national government: 1 no parties allowed or exclusive one-party systems; 2 one-party majority parliamentary government; or presidential government, with the same party in control of the parliament (with an overall majority); 3 two-party coalition parliamentary government; or presidential government with different parties in control of the parliament; 4 coalition parliamentary government with 3 or more coalition partners; 5 minority parliamentary government.	<u>For all the political variables:</u> Arthur Banks, ed., *Political Handbook of the World*, several issues Gorvin (1989) Haggard and Kaufman (1992) Dornbusch and Edwards (1991)
F.Ind - Fragmentation Index of the distribution of seats in the lower house of the parliament: $F.Ind = \frac{1}{\sum p_i^2}$ p_i = percentage of seats of party *i*.	McDonald and Ruhl (1989): Mainwaring and Scully (1995):
Orient - Political orientation of the government: 1 conservative, antilabor, antileft government; 2 center-right government or coalition of center-right and center-left parties; 3 center-left government; 4 socialist or populist government.	*World Europa Yearbook*, Europa, several issues
Type - Type of political system: 1 = m military dictatorship or authoritarian government backed by the military; 0 = d democracy.	
QLCH - Quarters since last change in government or election	
Inf - Inflation Rate (growth in the CPI)	*IFS* - IMF
TR/Imp - Total Reserves as a Percentage of Imports	*IFS* - IMF
GDS/GDP - Government Deficit or Surplus as a Percentage of GDP	*IFS* - IMF
GDP - Growth of Real GDP since same quarter of previous year	*IFS* - IMF, IBGE, INEGI
CA/GDP - Current Account Balance as a Percentage of GDP	*IFS* - IMF
Money - Growth of Money since same quarter of previous year	*IFS* - IMF
Exp - Growth of Exports since same quarter of previous year	*IFS* - IMF
Imp - Growth of Imports since same quarter of previous year	*IFS* - IMF
UR - Unemployment Rate	*YNAS* - UN, IBGE, INEGI

Notes: *IFS* - IMF = *International Financial Statistics* - International Monetary Fund
IBGE = Instituto Brazileiro de Geografia e Estatistica (Brazil)
INEGI = Instituto Nacional de Estatistica Geografia e Industria (Mexico)
YNAS - UN = *Yearbook of National Account Statistics* - United Nations

Table 3: Probability of Starting a Stabilization Program

	1	2	3	4	5	6
Frag = 1	.770395 (2.24)** [10.2]		1.06589 (2.04)** [14.2]	1.25084 (3.01)*** [14.9]		2.11016 (3.23)*** [18.4]
Frag = 2	.657210 (2.46)** [8.76]		.783615 (2.47)** [10.4]	1.08622 (3.17)*** [8.76]		1.71790 (2.42)** [15.0]
F.Ind		-.167725 (-1.77)* [-2.30]	.080839 (.76) [1.07]		-.217333 (-2.05)** [-2.80]	
Orient	-.103821 (-.75) [-1.38]	-.241049 (-1.67)* [-3.30]	-.088329 (-.64) [-1.17]	-.009741 (-.06) [-.116]	-.186309 (-1.24) [-2.40]	-.003327 (-.008) [-.029]
Type		-.477930 (-1.26) [-6.55]			-.458327 (-1.18) [-5.91]	
QLCH	-.032520 (-1.46) [-.433]	-.041645 (-1.94)* [-.571]	-.029257 (-1.29) [-.389]	-.017580 (-.73) [-.210]	-.035323 (-1.55) [-.455]	-.037091 (-.62) [-.324]
Inf (-1)	.0003495 (3.23)*** [.004]	.000368 (3.31)*** [.005]	.000315 (2.68)*** [.004]	.0003048 (2.29)** [.003]	.0003508 (2.66)*** [.004]	.000552 (2.49)** [.004]
TR/Imp (-1)	.022942 (.23) [.306]	.040786 (.40) [.559]	.008471 (.08) [.112]	-.081004 (-.68) [-.967]	-.007543 (-.06) [-.097]	-.292980 (-1.01) [-2.56]
GDS/GDP (-1)	.037623 (1.41) [.501]	.041413 (1.63) [.568]	.036189 (1.36) [.482]	.057008 (1.86)* [.681]	.060660 (2.11)** [.782]	.112706 (1.47) [.984]
GDP (-1)	.049490 (1.93)** [.660]	.052013 (2.07)** [.713]	.046771 (1.79)* [.623]	.045363 (1.47) [.541]	.053113 (1.83)* [.684]	.062866 (1.08) [.549]
Log of Likelihood	-76.05	-78.36	-75.76	-68.12	-73.23	-67.83
McFadden R^2	.1696	.1444	.1728	.2046	.2005	.3134
Number of Observ.	309	309	309	309	309	309

Sources: see Table 2.

Notes: - t-statistics are in parentheses and Probit slope derivatives are in brackets;
- significance level at which the null hypothesis is rejected: ***, 1%; **, 5%, and *, 10%;
- columns 1 to 3: probit model estimated with a constant, by Maximum Likelihood (ML);
- columns 4 and 5: probit model estimated with a constant and 6 time dummies, by ML;
- column 6: proportional hazards model estimated with a constant and 6 time dummies, by ML.

Table 4: Political Fragmentation and Inflation

	Entire Sample of 10 Countries			Restricted Samples	
	1	**2**	**3**	**4**	**5**
F.Ind	105.021 (2.59)***	84.3630 (3.00)***		115.390 (3.28)***	99.1363 (2.23)**
Frag = 1			-87.0216 (-.74)		
Frag = 2			108.042 (1.04)		
Inf (-1)	.126040 (1.86)*	.174480 (3.33)***	.202930 (3.92)***	.153130 (2.63)***	.1305737 (2.04)**
GDS/GDP (-1)	-70.6943 (-4.92)***	-62.2120 (-5.95)***	-65.0663 (-6.13)***	-73.2357 (-5.86)***	-142.852 (-7.10)***
GDP (-1)	-1.58429 (-.12)	-4.00200 (-.50)	-6.09153 (-.75)	-3.42316 (-.35)	6.12384 (.51)
UR (-1)	29.6901 (1.38)				
Adjusted R^2	.1898	.1869	.1696	.2038	.2556
Number of Observat.	220	350	350	285	213
Schwartz B. Inf. Crit.	13.89	13.36	13.40	13.54	13.70

Sources: See Table 2.

Notes: - all the above models were estimated by OLS with a constant and nine country dummies (to control for fixed effects);
- the dependent variable is the annual inflation rate (*Inf*);
- in column 4 Chile and Mexico were excluded from the sample;
- in column 5 Chile, Mexico, Brazil, and Israel were excluded from the sample;
- t-statistics are in parentheses;
- the number of stars reveals the significance level at which the relevant null hypothesis is rejected: *** for 1%, ** for 5%, and * for 10%.