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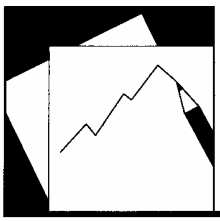

# IMF Working Paper

# Does Financial Globalization Induce Better Macroeconomic Policies?

*Irina Tytell and Shang-Jin Wei*

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# Does Financial Globalization Induce Better Macroeconomic Policies?

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## Abstract



Monetary and fiscal policies around the world are in better shape today than two decades ago. This paper studies whether financial globalization has helped induce governments to pursue better macroeconomic policies (the "discipline effect"). The empirical tests have two innovations. First, we recognize potential endogeneity of the observed capital flows in a given country and employ an instrumental variable approach that relies on the autonomous (global) component of the capital flows. Second, we recognize inherent discreteness in defining good versus bad macroeconomic policies and use a transition matrix technique to determine whether capital flows are effective in inducing substantial qualitative policy shifts. Our results suggest that, in spite of the plausibility of the "discipline effect" in theory, it is not easy to find strong and robust causal evidence. There is some evidence that financial globalization may have induced countries to pursue low-inflation monetary policies. However, there is no evidence that it has encouraged low budget deficits.

JEL Classification Numbers: F3

Keywords: Discipline effect, capital flows, mood swings, inflation, and deficit

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## I. INTRODUCTION

Macroeconomic policies around the world are better today than two decades ago. For example, the average government fiscal deficit as a share of GDP was 6 percent among developing countries in the first half of the 1980s. It has steadily declined to around 2 percent in the second half of the 1990s. A similar decline in deficits can be observed among developed countries as well. The evolution of monetary policies as measured by inflation rates is less than monotonic over time for developing countries. Even so, the average annual inflation rate among developing countries was 41 percent in the early 1980s and came down to 13 percent towards the end of 1990s. The average annual inflation rate for developed countries declined more noticeably from 12 percent in the early 1980s to 2 percent in late 1990s.[2] In short, for most countries, both inflation rates and fiscal deficits are under better control today than in the past.

Over the last two decades, there has also been a surge in capital flows among developing countries and, more notably, from industrial to developing countries. As journalist Thomas Friedman did in his book, *The Lexus and The Olive Tree: Understanding Globalization*, it is natural to wonder if the process of financial globalization has contributed in a significant way to the improvement of macroeconomic policies around the world. The objective of this paper is to study this question carefully.

It seems logical to expect financial globalization to exert a disciplinary effect on the conduct of national macroeconomic policies: if international capital flows become more important for national economic development, and if they respond negatively to bad monetary and fiscal policies, governments may be induced to conduct better macroeconomic policies. This is a point apparently agreed upon by Stanley Fischer (1998), Maurice Obstfeld (1998), and Joseph Stiglitz (2000), although, to our knowledge, this point has not been formalized.

As is sometimes the case, what is logically possible and what is true in reality are not necessarily the same thing. For example, financial globalization has the potential to raise economic growth rates and lower consumption volatility in theory, but has not quite delivered on these dimensions empirically (see Prasad, Rogoff, Wei, and Kose, 2003, for a review of the recent literature and the papers cited therein). Similarly, the belief in the disciplinary effect of financial globalization on national macroeconomic policies is not always unqualified or unchallenged. For example, Fischer (1998) stated, "normally, when the market's judgment is right, this discipline is valuable, rewarding good policies and penalizing bad. … However, markets are not always right."

Other economists dismiss the validity of the "disciplinary effect" more strongly. For example, Dani Rodrik (2001) made the following claim:

> Perhaps the most disingenuous argument in favor of liberalizing international capital flows is that the threat of massive and sudden capital movements serves to discipline policy makers in developing nations who might otherwise manage their economies

[2] The details of these calculations are explained later in the text (Section IV) and summarized in Table 2.

irresponsibly. In other words, governments might be less inclined to squander their societies' resources if such actions were to spook foreign lenders. In practice, however, the discipline argument falls apart. Behavior in international capital markets is dominated by mood swings unrelated to fundamentals.

It is useful to conceptually distinguish two types of forces driving cross-border capital flows. The first type has to do with recipient countries' policies. For example, relaxation of capital controls and privatization of previously state-owned assets by the governments of capital-importing countries may lead to an increase in capital inflows to these countries. The second type of driving force has to do with factors in the source countries of international flows (e.g., interest rate movements or business cycle conditions of the major source countries), improvement in the technology of transmitting capital across national borders, or improvement in the general investment climate in *other* countries. The key feature of the second type of driving force is that it is exogenous to the recipient countries' policies. For this reason, we may label the component of cross-border capital flows due to the second type of driving force (i.e., exogenous to a given recipient country) as an autonomous change in financial globalization.

In this paper, we choose to focus on the effect of a change in the autonomous component of cross-border capital flows on a country's incentive to pursue better macroeconomic policies. In other words, even if a country holds its policies on capital controls constant, would the fact that there is a much higher potential for cross-border capital flows today (compared with twenty years ago) induce governments to pursue better policies?

Of course, the effects of both types of driving force on national macroeconomic policies are of interest. We choose to focus on the autonomous part of financial globalization for three reasons. First, this question is closer to what Thomas Friedman and many other observers have in mind: whether a change in the global environment has an impact on a government's macroeconomic policies, as opposed to whether a change in one government policy (i.e., removal of capital controls) has an impact on other government policies. Second, because the autonomous component of financial globalization is exogenous to national policies, we are better able to make inferences on the direction of causality. Third, there has already been a set of excellent papers that studies the effect of removing capital controls on capital flows and macroeconomic policies.[3] In comparison, the literature on the effect of the autonomous component of financial globalization is a near-virgin territory.

[3] There is literature that examines how policies on capital account openness can either signal good policies or commit a government to good policies. Bartolini and Drazen (1997) provide an alternative explanation for the potential association between capital account liberalization and improvements in policies. They argue that governments may use capital account liberalization to signal their commitment to a broader set of reforms and thus to help attract foreign investors. Gourinchas and Jeanne (2002) provided a model that suggested that capital account liberalization could induce the government to pursue nonexpropriate policies. With an interesting, albeit somewhat less related model, Mukand (2002) studies how improvement in information technology may affect government policies.

The main contribution of this paper is on the empirical side. The only paper that we are aware of is one by Woochan Kim (2001) where he reported evidence that capital account liberalization is associated with a lower fiscal deficit. His work is a good start, but still incomplete in a number of dimensions. First, he looked only at fiscal but not monetary policies. Second, he employed de jure rather than de facto measures of financial openness, but laws and regulations may not always be well enforced, especially in developing countries. Third, he did not take into account the inherent uncertainty in assigning value judgments about macroeconomic policies. (these will be explained more clearly below.)

In the empirical part of this paper, we undertake a systematic examination of the relationship between international capital flows and domestic macroeconomic policies. Given the scarcity of the relevant literature, this paper represents one of the first tests of the "discipline effect." In addition, there are two main innovations in the paper. First, we recognize potential endogeneity of the observed capital flows in a given country with respect to macroeconomic policies in that country, and make an attempt to correct that by an instrumental variable approach. We propose using a weighted average of capital flows to neighboring countries (with the weights inversely related to distances from the country in question) as an instrument for capital flows. The basic idea behind this instrumental variable is that the fluctuation of capital outflows from a given source country may be common to all recipient countries. However, because of geography, history, and other factors, recipient countries in different parts of the world may have different levels of relative dependence on different source countries. For example, Latin American countries may depend relatively more on capital inflows from the United States. Japanese capital may go into Asian countries disproportionately more than to other regions. German capital flows to developing countries may primarily go to Central and Eastern Europe. This instrumental variable, which measures the common component of capital flows to countries in the same region, is designed to capture the autonomous component of capital flows discussed above. Besides alleviating the potential endogeneity bias, this instrument should also help to reduce the measurement error bias that is likely to be present in the data on international capital flows due to valuation problems. (More details will be explained later.)

Second, we recognize the inherent discreteness in defining good versus bad macroeconomic policies. In other words, we allow for the possibility that low inflation rates (or budget deficits) are better than very high inflation rates (or deficits), but do not impose the condition that one low inflation rate (deficit) is necessarily better than another low inflation rate (deficit). It is well established in the literature that inflation has substantial adverse effects on an economy only beyond a certain threshold level (see, for example, Bruno and Easterly, 1995, Khan and Senhadji, 2000, and Fischer, Sahay, and, Végh, 2002). Similarly, budget deficits are problematic only if they are sufficiently large, so as to threaten overall macroeconomic stability (recall, for example, the deficit threshold set in the Maastricht criteria). For this reason, we go beyond the linear model and make an attempt to see whether the potential disciplining effect of financial openness is sufficient to induce policy shifts that reduce inflation and the budget deficit beyond their threshold levels. An additional justification for this approach is that it is better suited for analyzing the discipline effect on the underlying macroeconomic policy stance, since small fluctuations in budget deficits or inflation rates do not necessarily reflect any changes in government attitudes towards maintaining fiscal prudence and price stability.

The rest of the paper is organized as follows: Section II presents a simple model. Section III describes the data. Section IV shows our analyses and findings, both from the linear and the transition matrix specifications. Finally, Section V concludes.

## II. THE MODEL

Even though the paper is primarily empirical, this section provides a simple model that formalizes a possible logic behind the "discipline effect" hypothesis. At the same time, it suggests some factors that may weaken the discipline effect from financial globalization.

### A. Economic Environment

Consider a small open economy with one domestic firm, and $n$ foreign firms. Each uses one input, capital, to produce a homogenous good. The production functions for all firms are identical and given by the following form:

$$Y_d = AK_d^{\beta} \tag{1}$$

and

$$Y_f = AK_f^{\beta} \tag{2}$$

For simplicity, we assume that domestic capital stock is fixed (i.e., unresponsive to domestic policies). Let $K_d^{\beta} \equiv X$, which is fixed.

The productivity parameter, $A$, can take only two values, depending on government policy, which also takes only two values:

$$\begin{aligned} A &= 1 \quad \text{if government policy is good, and} \\ &= 0 \quad \text{if government policy is bad.} \end{aligned} \tag{3}$$

The number of foreign firms in the economy, $n$ is taken as an index of financial globalization, with $n \in [0, N]$.

Government moves first, choosing q, the probability of pursuing a good policy (while taking into account the possible reaction from the foreign investors). Foreign investors move second (but simultaneously among themselves) by choosing an important level of investment, $K_f$, in the country, while taking government's policy rule, $q$, as given.

The central question that the model addresses is whether, $q$, the probability of good policy, would increase as financial globalization deepens (i.e., as $n$ increases). We will then examine what factors may influence the responsiveness of q to a change in n.

We solve the problem by backward induction, starting with foreign investor's optimization problem first.

### B. Foreign Investor's Optimization Problem

A representative foreign investor solves the following problem:

$$\begin{aligned} \max E(U) &= E(Y_f) - r K_f \\ &= q K_f^{\beta} - r K_f, \end{aligned} \tag{4}$$

where E(.) is expectation operator, and r is the marginal opportunity cost of investing in the host country (or the worldwide interest rate).

The first order condition yields

$$K_f^{1-\beta} = (\beta q)/r. \tag{5}$$

Of course, by construction, the problem is concave so that the second order condition for the maximization problem is satisfied.

To simplify the subsequent discussion, we pick a particular value $\beta = ½$.[4] Hence,

$$K_f^{1/2} = q/(2r). \tag{5'}$$

Note that all foreign investors solve their optimization problems simultaneously. By construction, there is no strategic substitution or complementarity among them.

### C. Host Government's Problem

The host government chooses the probability of pursuing good policy, q, in order to maximize an objective function that increases with total output but decreases with the disutility associated with pursuing the good policy

$$\max E(W) = E\{ Y_d + n \ Y_f \} - ½ b q^2. \tag{6}$$

Making use of the solution to the foreign investor's problem, the government objective function can be rewritten as

$$E(W) = q [X + (nq)/(2r) ] - ½ b q^2. \tag{6'}$$

We will assume that b is sufficiently large, in particular, $b > N/r$. If $b$ were very small, the objective function would have been convex, in which case, the government would always want to pursue the good policy, or $q$ =1. This would not be very interesting. If $b$ is assumed to be sufficiently large, then the government's optimization problem has an interior solution derived from the first order condition:

[4] The solution to the model in the general case of unrestricted β is provided in Appendix I.

$$q = \frac{xr}{br - n}. \tag{7}$$

Note that since $q$ is limited between 0 and 1, the constraint on b is, in fact, $b \geq X + N/r$.

From the optimal policy rule, one can easily work out the policy response to an increase in financial globalization.

$$\frac{dq}{dn} = \frac{xr}{(br - n)^2} > 0 \tag{8}$$

In other words, as n or financial globalization increases, government responds by raising the probability of pursuing the good policy. The comparative statics in equation (8) is what underlines the "discipline hypothesis."

### D. Mood Swings in International Capital Flows

We now introduce possible mood swings in international capital flow into the model. We do so by letting the opportunity cost of capital, r, be subject to a random shock:

$$r = m\, r^*, \tag{9}$$

where m is a random variable whose property will be explained below, and r* is the world interest rate.

We assume that the host government does not observe m when it decides on the policy rule, q, (though it understands the distribution of m), but foreign investors observe m perfectly when solving their respective optimization problems.

The representative foreign investor's investment rule is simply a modification of the one given in equation (5'), which is now

$$K_f^{1/2} = q/(2mr^*). \tag{10}$$

For convenience, we assume that m follows a binary distribution in such a way that

$$\begin{aligned} K_f^{1/2} &= 0 \quad \text{with probability s} \\ &= q/(2r^*) \text{ with probability 1-s.} \end{aligned} \tag{11}$$

This amounts to assuming that $m$=-∞ with probability $s$, and $m$=1 with probability 1-$s$. $s$ can be interpreted as the probability of "sudden stops[5]." The economics behind this assumption is that for a positive probability $s$, international capital flows can leave the host country for reasons entirely unrelated to the country's economic or policy fundamentals (represented here in the model by $q$). It is in this sense that the shock to capital flow, $m$, is termed as the investor'*s*" mood swings."

We now turn to the host government's policy choice in face of possible sudden stops in international capital flows. The objective function, modified from equation (6'), now becomes

$$\max E(W) = q \{X + [n(1-s)q]/(2r^*) \} - \tfrac{1}{2} b q^2 \qquad (12)$$

The optimal policy rule is given by

$$q = \frac{xr^*}{br^* - n(1-s)} \qquad (13)$$

It is easy to verify that there continues to be a "discipline effect" from more financial globalization to better economic policies:

$$\frac{dq}{dn} = \frac{(1-s)xr^*}{[br^* - n(1-s)]^2} \geq 0 \quad \text{for } 0 \leq s \leq 1 \text{ where the equality holds when } s = 1. \qquad (14)$$

[Note that we continue to maintain the assumption that $b \geq X + N/r$.]

The interesting question is what the possibility of a sudden stop in capital flows does to the discipline argument. This can be checked by taking the derivative of dq/dn with respect to s:

$$\frac{d^2q}{(dn)(ds)} = -\frac{xr^*\left[br^* + n(1-s)\right]}{[br^* - n(1-s)]^3} < 0 \qquad (15)$$

The expression in equation (15) implies that as the probability of a sudden stop in capital flows increases, the host government's policy responsiveness to financial globalization declines. In other words, *mood swings in international capital flows weaken the discipline effect on the host government.*

We might also note that different government policies may be associated with different levels of disutility of moving from bad to good policies. For example, it may be politically more painful for the host government to reduce government deficit than to reduce

[5] The term "sudden stop" is used in Calvo and Reinhart (2002) and Calvo and Mendoza (2000). Also in Calvo's 2003 paper in IMFSP (Special ARC issue. Vol. 50/2003).

inflation rate.[6] This can be represented by a higher value of *b* for a better fiscal policy than for a better monetary policy. So it may be of interest to check whether the strength of the discipline effect also depends on the nature of the policy, represented here by *b*.

$$\frac{d^2q}{(dn)(db)} = -\frac{2x\left(r^*\right)^2(1-s)}{[br^*-n(1-s)]^3} < 0 \tag{16}$$

The expression in equation (16) suggests that as the disutility of policy effort, b, increases, the government's policy responsiveness to financial globalization also declines. In other words, *the disciplinary effect of capital flows might be weaker on government fiscal deficit than on inflation.*

To summarize, the model illustrates the logic behind the discipline effect. At the same time, it suggests that if international capital movement is subject to mood swings, then the discipline effect is weakened. In addition, government policies that are politically more costly to improve (e.g., reducing fiscal deficits) may also be less affected by the disciplinary effect of financial globalization.

## III. THE DATA

In this section we explain the definitions and the sources of the main variables used in the subsequent statistical work. We will link macroeconomic policies to measures of countries' degree of financial integration and other control variables. Our choice of control variables for the monetary and fiscal policy stances is guided by the relevant theories as will be explained below.

### A. Macroeconomic Policy Stance

We use annual data for 62 countries—22 industrial and 40 developing—over the period from 1975 to 1999 (the sample countries are listed in Table 1). Our sample includes most of the countries for which the data on foreign assets and liabilities were compiled by Lane and Milesi-Ferretti (2001)7. In order to smooth out short-term fluctuations and to dampen serial correlation in variables, we average our data over five-year nonoverlapping subperiods: 1975–79, 1980–84, 1985–89, 1990–94, and 1995–99.

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[6] The political business cycle literature reports a robust positive association between fiscal deficit and reelection probability (see Drazen (2001) for a survey), whereas the association between inflation and reelection probability is weaker or even negative.

[7] We excluded the following countries from the original Lane and Milesi-Ferretti dataset: Kuwait, Oman, and Saudi Arabia (as major oil producers), Taiwan Province of China (for lack of macroeconomic data), and Singapore (as an outlier with respect to the amount of capital flows).

Table 1. Sample Countries

| *Industrial Countries* | *Developing Countries* |
|---|---|
| **1. Australia (AUS)** | 1. Algeria (DZA) |
| **2. Austria (AUT)** | 2. Argentina (ARG) |
| **3. Belgium (BLX)** | 3. Bolivia (BOL) |
| **4. Canada (CAN)** | 4. Botswana (BWA) |
| **5. Denmark (DNK)** | 5. Brazil (BRA) |
| **6. Finland (FIN)** | 6. Chile (CHL) |
| **7. France (FRA)** | 7. China (CHN) |
| **8. Germany (DEU)** | 8. Colombia (COL) |
| **9. Greece (GRC)** | 9. Costa Rica (CRI) |
| **10. Iceland (ISL)** | 10. Côte D'Ivoire (CIV) |
| **11. Ireland (IRL)** | 11. Dominican Republic (DÔM) |
| **12. Italy (ITA)** | 12. Ecuador (ECU) |
| **13. Japan (JPN)** | 13. Egypt (EGY) |
| **14. Netherlands (NLD)** | 14. El Salvador (SLV) |
| **15. New Zealand (NZL)** | 15. Guatemala (GTM) |
| **16. Norway (NOR)** | 16. India (IND) |
| **17. Portugal (PRT)** | 17. Indonesia (IDN) |
| **18. Spain (ESP)** | 18. Israel (ISR) |
| **19. Sweden (SWE)** | 19. Jamaica (JAM) |
| **20. Switzerland (CHE)** | 20. Jordan (JOR) |
| **21. United Kingdom (GBR)** | 21. Korea, Republic of (KOR) |
| **22. United States (USA)** | 22. Malaysia (MYS) |
| | 23. Mauritius (MUS) |
| | 24. Mexico (MEX) |
| | 25. Morocco (MAR) |
| | 26. Pakistan (PAK) |
| | 27. Panama (PAN) |
| | 28. Paraguay (PRY) |
| | 29. Peru (PER) |
| | 30. Philippines (PHL) |
| | 31. South Africa (ZAF) |
| | 32. Sri Lanka (LKA) |
| | 33. Syria (SYR) |
| | 34. Thailand (THA) |
| | 35. Trinidad and Tobago (TTO) |
| | 36. Tunisia (TUN) |
| | 37. Turkey (TUR) |
| | 38. Uruguay (URY) |
| | 39. Venezuela (VEN) |
| | 40. Zimbabwe (ZWE) |

We judge the potential disciplining effects of capital account openness on national monetary and fiscal policies by the outcomes of these policies across countries in our sample. In other words, we define the overall stance of macroeconomic policies in terms of actual inflation and the budget deficit. We measure inflation as an annual percentage change in consumer prices and the fiscal deficit as the ratio of central government budget deficit to GDP, both as reported in the IMF's *International Financial Statistics*.[8]

### B. International Financial Integration

We measure capital account openness by total actual foreign assets and liabilities as a share of GDP, as derived by Lane and Milesi-Ferretti (2001). While most studies of capital account liberalization use the so-called de jure measures based on legal restrictions on capital account transactions (Eichengreen, 2001), these measures may not adequately reflect actual or de facto exposure of countries to international capital markets. Indeed, Edison, Klein, Ricci, and Sløk (2002) argue that capital controls lose their effectiveness over time and tend to be circumvented, especially in developing countries, which, as a result, have experienced much larger capital flows than would have been consistent with their officially imposed capital account restrictions. With this in mind, we focus on actual de facto stocks of foreign assets and liabilities. However, as a robustness check, we also look at the binary de jure measure of capital account restrictions, as reported in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*.

The dataset compiled by Lane and Milesi-Ferretti (2001) provides estimates of foreign assets and liabilities and their subcomponents based on balance of payments data. This dataset extends the data on international investment positions (IIP), which have been published by the IMF for most industrial and some developing countries typically starting in the late 1970s or early 1980s. In particular, the dataset provides estimates of the stocks of foreign direct investment and portfolio equity based on the cumulative flow data, adjusted to reflect changes in exchange rates and market prices. We construct our measure of financial openness using these adjusted series and the debt stock measures as reported in the IIP, whenever the latter are available. We realize that this may introduce certain distortions in our measure of financial openness due to the limited coverage of the debt stock data. Therefore, we also check robustness of our results using only the adjusted data on foreign direct and portfolio investment and excluding the debt stocks.

### C. Control Variables

We use a number of control variables, emphasized in the literature on determinants of inflation and the fiscal deficit. Specifically, we use measures of exchange rate flexibility and central bank independence as determinants of inflation (see Reinhart and Rogoff, 2002; Ghosh, Gulde, and, Wolf, 2003). We use measures of government fragility and polarization as determinants of the fiscal deficit (Alesina and Tabellini, 1990, Alesina and Drazen, 1991).

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[8] The fiscal deficit data were supplemented by the corresponding data from the IMF's *World Economic Outlook* in several cases, namely, Algeria, Jamaica, Japan, Paraguay, and Trinidad and Tobago.

Since a fixed exchange rate serves as a nominal anchor for monetary policy, countries with more flexible exchange rates should have higher inflation rates than those with more fixed regimes. We use the index of exchange rate flexibility compiled by Reinhart and Rogoff (2002). This classification of exchange rate regimes is based on market-determined, rather than official exchange rates, and thus reflects de facto exchange rate arrangements better than most existing categorizations.

It is well established in the literature on monetary policy that central bank independence reduces inflationary bias under a discretionary monetary regime by alleviating the time inconsistency problem. We control for de facto central bank independence using the turnover rate of central bank governors from Ghosh, Gulde, and, Wolf (2003). The argument for using this proxy is that a high turnover of central bank governors reflects low independence from the government and hence should be associated with higher inflation rates.

Alesina and Tabellini (1990) argue that a current government may intentionally overspend and accumulate debt in order to limit spending choices of the rival party that may take over the office in the next period. This reasoning implies that frequent government changes should be associated with higher fiscal deficits. To control for this, we include the number of government changes per year constructed from the data in the Cross-National Time Series Data Archive (Banks, 1979 updated). This indicator combines the number of executive changes, cabinet changes, and coups d'etat per year.

Alesina and Drazen (1991) propose an explanation for delayed fiscal adjustments based on distributional conflict within a coalition government. The argument is that if the burden of stabilization is unequally distributed among the coalition members, it makes sense for each party to resist the adjustment hoping that other parties would concede first. This theory predicts that countries with polarized coalition governments should run higher fiscal deficits. To take this into account, we control for the number of coalition governments per year available in the Cross-National Time Series Data Archive (Banks, 1979 updated). Finally, we control for trade openness as the total volume of trade relative to GDP from the IMF's *International Financial Statistics*. Countries that are more open to trade are typically more competitive, which should dampen inflationary pressures. In addition, the benefits of a monetary expansion tend to be smaller in more open economies, given the relatively smaller size of the domestic sector and the potential feedback effects of exchange rate depreciation into domestic prices (Rogoff, 1985 and Romer, 1993). Trade also tends to create winners and losers, thus prompting governments to spend more on compensation of the disadvantaged segments of the economy (Rodrik, 1998). In addition, countries that are more open to trade may also be more open to foreign capital, so including a measure of trade openness helps us to isolate policy effects due specifically to financial globalization.

## IV. ANALYSES

We start with a straightforward linear specification that simply treats lower inflation (or deficit) as better than higher inflation (or deficit) without recognizing possible discreteness in the quality of macroeconomic policies. We then move on to a Markov transition matrix specification that does recognize the discreteness in the quality of macro

policies. In addition to a measure of financial globalization, we have a number of control variables, grounded in theories that are allowed to affect inflation rates or fiscal deficits.

## A. Linear Specifications

To gain some basic intuition and visual impression, we start with some summary statistics and look at the relationship between financial integration and macroeconomic policies using scatter plots. Then we proceed to estimate a liner system of inflation, fiscal deficit, and financial openness, controlling for a number of other determinants of macroeconomic policies. Finally, we report some robustness checks of our findings.

### Summary information and visual inspection

Table 2 shows summary statistics for the main variables of interest. Average gross foreign assets and liabilities show a dramatic increase over the sample period for both developing and industrial countries. The increase is especially spectacular for industrial economies, where the stock of foreign capital reached the average level of 165 percent of GDP by the end of the period, which is four times the average level across developing countries. This capital consists predominantly of foreign liabilities (over 50 percent of the total stock across industrial countries and over 90 percent across developing countries, on average), even though the share of foreign assets rose throughout the sample period.

The inflation rates were lower in the late 1990s than in the late 1970s for both developing and developed countries. The exact dynamics was somewhat different between the two country groups: inflation was on the rise across developing countries in the 1970s and 1980s before declining during the 1990s, while in industrial countries it was much lower to begin with and it steadily declined throughout the sample period.

The average budget deficit exhibits a clear decline in both sets of countries, from about 5 percent of GDP, on average, in the late 1970s to about 2 percent of GDP in the late 1990s. Interestingly, the average deficit was very similar in industrial and developing countries and in fact lower in developing countries since the mid-1980s (although the dispersion was generally higher across developing countries).

To see if financial globalization and macroeconomic policies are at all related to each other, it is useful to start with some simple, bivariate scatter plots. Figure 1 presents a set of six scatter plots of inflation rate (in logarithmic form) against a measure of financial globalization for each five-year period as well as for the whole sample. There is apparently a negative relationship between inflation and financial globalization in the whole sample as well as in each of the subperiods.

Table 2: Summary Statistics

| *Period* | *1975:1979* | *1980:1984* | *1985:1989* | *1990:1994* | *1995:1999* |
|---|---|---|---|---|---|
| | **Inflation (% p.a.)** | | | | |
| **Mean** | | | | | |
| Developing Countries | 24.80 | 40.87 | 135.52 | 111.87 | 12.79 |
| Industrial Countries | 12.25 | 12.40 | 6.25 | 4.38 | 2.00 |
| **Median** | | | | | |
| Developing Countries | 11.84 | 14.39 | 15.24 | 13.83 | 7.99 |
| Industrial Countries | 10.01 | 9.66 | 4.63 | 3.27 | 1.95 |
| **Standard Deviation** | | | | | |
| Developing Countries | 42.57 | 72.86 | 421.40 | 363.09 | 15.06 |
| Industrial Countries | 7.90 | 10.73 | 5.58 | 3.14 | 1.15 |
| | **Budget deficit (Percent GDP)** | | | | |
| **Mean** | | | | | |
| Developing Countries | 4.98 | 5.87 | 3.97 | 1.63 | 2.25 |
| Industrial Countries | 4.92 | 5.32 | 4.00 | 4.36 | 2.30 |
| **Median** | | | | | |
| Developing Countries | 4.23 | 4.60 | 3.17 | 1.46 | 1.57 |
| Industrial Countries | 3.80 | 5.05 | 3.30 | 3.90 | 1.88 |
| **Standard Deviation** | | | | | |
| Developing Countries | 6.15 | 5.75 | 5.56 | 3.51 | 2.68 |
| Industrial Countries | 3.39 | 3.79 | 4.40 | 3.37 | 2.67 |
| | **Exposure to Financial Globalization: Gross foreign assets and liabilities (Percent GDP)** | | | | |
| **Mean** | | | | | |
| Developing Countries | 10.55 | 16.78 | 26.72 | 26.22 | 41.02 |
| Industrial Countries | 19.82 | 49.91 | 102.70 | 137.18 | 164.71 |
| **Median** | | | | | |
| Developing Countries | 6.36 | 9.92 | 12.73 | 16.87 | 28.27 |
| Industrial Countries | 9.28 | 33.76 | 67.07 | 106.71 | 136.27 |
| **Standard Deviation** | | | | | |
| Developing Countries | 14.97 | 16.57 | 29.05 | 29.35 | 35.92 |
| Industrial Countries | 21.70 | 50.06 | 104.18 | 111.10 | 118.90 |

Figure 1. Log Inflation and Financial Globalization, by Time Period

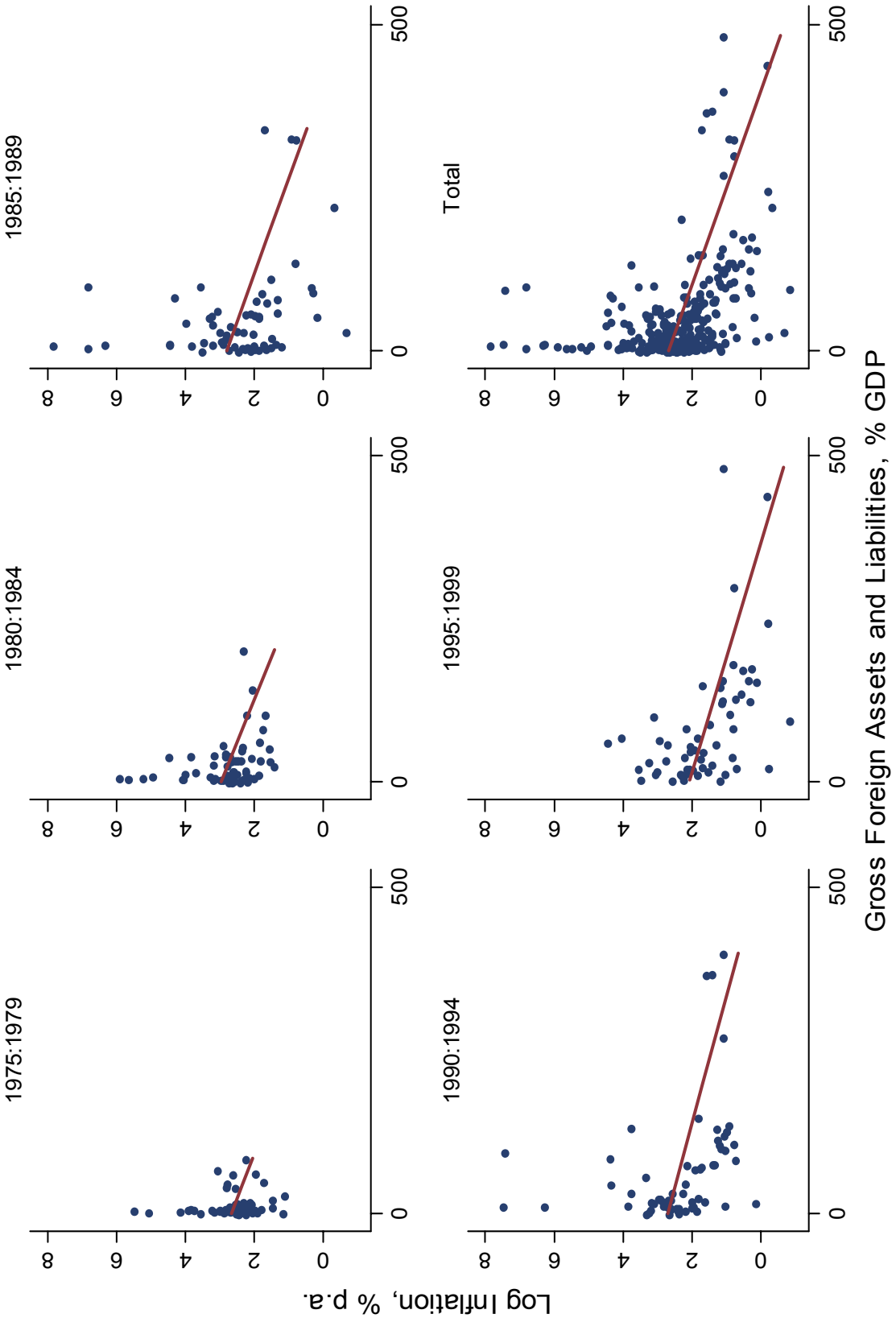

Figure 2 presents a similar set of scatter plots of fiscal deficit against financial globalization. The relationship between these variables is markedly weaker than between inflation and financial globalization.

Of course, these scatter plots reflect only bivariate correlations. They do not reveal what the true relationships are, conditional on other variables that would affect macroeconomic policies. Furthermore, they do not provide a clue on the direction of causality. For these issues, we turn to more formal statistical analyses.

**Regression analysis**

Simple correlations between the variables of interest (see Table 3) confirm that the negative link with capital account openness is stronger for inflation than for the budget deficit. For a more rigorous assessment of the linear effect of financial openness on macroeconomic policies, we estimate a system of simultaneous equations for inflation and the budget deficit by adopting the following specification:

$$\begin{aligned} \textit{Log Inflation}_{it} = {} & \beta_i + \beta_t + \beta_1\, \textit{Budget Deficit}_{it} + \beta_2\, \textit{Financial Openness}_{it} + \\ & \beta_3\, \textit{Exchange Rate Flexibility}_{it} + \beta_4\, \textit{Central Bank Governors}_{it} + \beta_5 \\ & \textit{Trade Openness}_{it} + \beta_6\, \textit{Industrial Countries}_{i} + u_{it}, \end{aligned}$$

$$\begin{aligned} \textit{Budget Deficit}_{it} = {} & \alpha_i + \alpha_t + \alpha_1\, \textit{Log Inflation}_{it} + \alpha_2\, \textit{Financial Openness}_{it} + \\ & \alpha_3\, \textit{Government Changes}_{it} + \alpha_4\, \textit{Government Coalitions}_{it} + \\ & \alpha_5\, \textit{Trade Openness}_{it} + \alpha_6\, \textit{Industrial Countries}_{i} + \varepsilon_{it}, \end{aligned}$$

where $i$ stands for countries and $t$ stands for five-year periods. $\alpha_i$ and $\beta_i$ denote regional dummies, while $\alpha_t$ and $\beta_t$ are period dummies. Averaging over nonoverlapping five-year subperiods dampens any serial correlation there may be. We choose log inflation as the dependent variable in the first equation due to the presence of a number of high inflation observations in our sample (but no deflation observations). We realize that while this improves the statistical properties of our estimation, the coefficients in the inflation equation become somewhat more difficult to interpret. For this reason, we provide a check on our results in the following subsection using the method of Least Absolute Deviations (LAD), which is less severely affected by outlying observations than Ordinary Least Squares.

We estimate the baseline specification of our system using Three-Stage Least Squares (3SLS). In the first stage, this approach produces predicted values for the endogenous variables from their regressions on all exogenous variables in the system. In the second stage, 2SLS residuals from each equation are used to obtain consistent estimates of the error covariance matrix. The third stage is a Generalized Least Squares (GLS) estimation using the instruments for the endogenous variables obtained in the first stage and the error covariance matrix obtained in the second stage. The 3SLS approach produces more efficient estimates than single-equation 2SLS, since it utilizes the information about cross-equation correlations of the disturbance terms.

Table 3. Correlation Matrix

| | Log Inflation | Budget Deficit | Financial Openness | Exchange Rate Flexibility | Central Bank Governors | Number of Government Changes | Number of Coalition Governments | Trade Openness |
|---|---|---|---|---|---|---|---|---|
| **Log Inflation** | 1.00 | | | | | | | |
| **Budget Deficit** | 0.21 | 1.00 | | | | | | |
| **Financial Openness** | -0.39 | -0.11 | 1.00 | | | | | |
| **Exchange Rate Flexibility** | 0.39 | -0.01 | -0.08 | 1.00 | | | | |
| **Central Bank Governors** | 0.48 | 0.08 | -0.18 | 0.13 | 1.00 | | | |
| **Number of Government Changes** | 0.15 | 0.22 | -0.12 | -0.00 | 0.27 | 1.00 | | |
| **Number of Coalition Governments** | -0.14 | 0.09 | 0.14 | -0.07 | -0.06 | 0.15 | 1.00 | |
| **Trade Openness** | -0.31 | -0.10 | 0.20 | -0.38 | -0.25 | -0.19 | 0.21 | 1.00 |

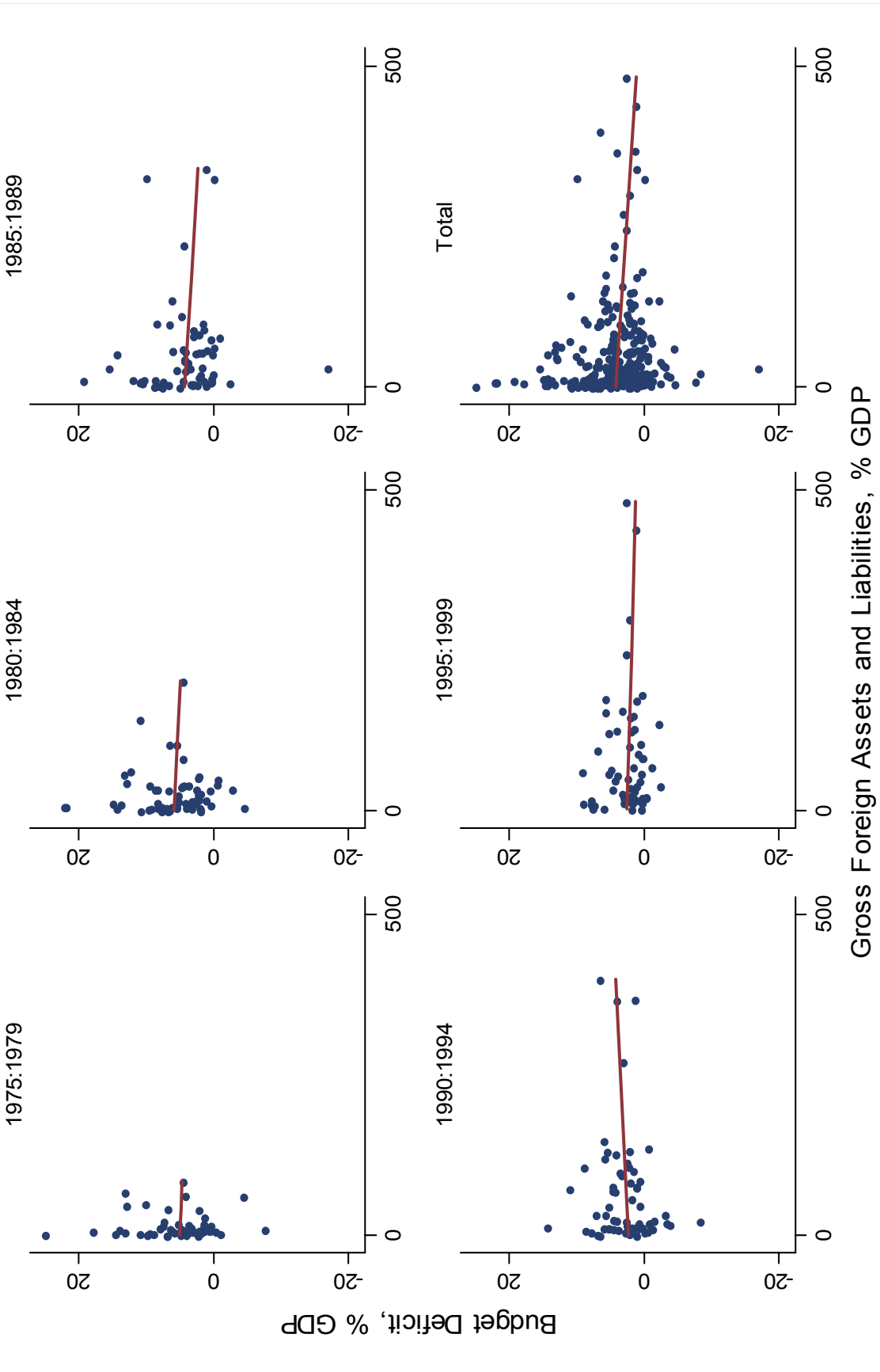


Figure 2. Budget Deficit and Financial Globalization, by Time Period

These results are reported in the first two columns of Table 4. We find that capital account openness has a small but significant and negative effect on inflation, but no effect on the budget deficit. This is consistent with our preliminary assessment based on Figures 1–2, which suggested that the association between capital flows and the budget deficit was weak, while that between capital flows and inflation was substantially stronger.

However, this simple approach may produce biased estimates of the capital flows' effect for several reasons. First, the causality may run not from capital flows to macro policies, but from macro policies to capital flows. In other words, it may not be the exposure to foreign capital that disciplines national monetary and fiscal policies, but rather foreign investors may be channeling their funds to countries where inflation and the fiscal deficit are already low. Second, the capital flows variable may be measured with errors including errors in assigning proper valuations of foreign assets and liabilities (see Lane and Milesi-Ferretti, 2001, for a discussion). The measurement errors could induce an attenuation bias that would push the estimated coefficient on capital account openness toward zero.

We attempt to obtain more consistent estimates of the effect of capital account openness on macro policies in the second version of our system approach. In this version we allow the capital flows variable to be endogenous and add a third equation to our original system, which explains financial openness. On the right hand side of this equation we include a weighted average of gross foreign assets and liabilities relative to GDP in other countries on the same continent, with the weights inversely related to the distances from a given country.

It may be useful to explain in some more details the idea behind this instrumental variable approach. The basic assumption is that the fluctuation of capital outflows from a given source country may be common to all recipient countries. However, due to geography, history and other factors, recipient countries in different parts of the world may have different levels of relative dependence on different source countries. For example, Latin American countries may depend relatively more on capital inflows from the United States. Japanese capital may go into Asian countries disproportionately more than to other regions. German capital flows to developing countries may primarily go to Central and Eastern Europe. Our proposed instrumental variable, by measuring the common component of capital flows to countries in the same region, is designed to capture the autonomous component of capital flows (similar to an increase in n, the number of potential foreign firms that could invest in the country, in the theoretical model in Section II). Empirically, this variable is indeed strongly correlated with capital flows in a given country (the overall correlation is 0.57 and it increases over the sample period), but it is much less likely to be the result of domestic macroeconomic policies of the country in question. Also, averaging across capital flows into the neighboring countries should reduce the measurement error associated with the capital flows variable and therefore help to correct the possible attenuation bias.

Table 4. Linear System Specification for Log Inflation and the Budget Deficit: 3SLS Estimation

| | *Financial Openness Exogenous* | | *Financial Openness Endogenous* | | |
|---|---|---|---|---|---|
| | **Log Inflation** | **Budget Deficit** | **Log Inflation** | **Budget Deficit** | **Financial Openness** |
| **Log Inflation (Percent p.a.)** | | 0.08<br>(0.64) | | 0.11<br>(0.81) | -1.43<br>(9.01) |
| **Budget Deficit (Percent GDP)** | 0.05<br>(0.06) | | 0.02<br>(0.07) | | -3.03<br>(3.68) |
| **Financial Openness (Percent GDP)** | -0.002***<br>(0.001) | 0.001<br>(0.005) | -0.01**<br>(0.01) | 0.05<br>(0.04) | |
| **Exchange Rate Flexibility (1~15)** | 0.12***<br>(0.02) | | 0.12***<br>(0.02) | | |
| **Central Bank Governor Turnover (0~1.4)** | 0.86***<br>(0.26) | | 0.79***<br>(0.30) | | |
| **Number of Government Changes (0~3.4)** | | 1.41***<br>(0.45) | | 1.72***<br>(0.56) | |
| **Number of Coalition Governments (0~1)** | | 0.62<br>(0.63) | | 0.26<br>(0.73) | |
| **Trade Openness (Percent GDP)** | -0.004**<br>(0.002) | -0.01<br>(0.01) | -0.0002<br>(0.003) | -0.02<br>(0.02) | 0.34**<br>(0.15) |
| **Industrial Countries (dummy)** | -1.03***<br>(0.28) | -1.63<br>(1.43) | -0.39<br>(0.55) | -4.41*<br>(2.55) | 52.29***<br>(20.02) |
| **Financial Openness in Neighboring Countries** † | | | | | 0.48**<br>(0.20) |
| **Region dummies** | yes | yes | yes | yes | yes |
| **Period dummies** | yes | yes | yes | yes | yes |
| **N** | 272 | 272 | 267 | 267 | 267 |
| **"R2"** | 0.90 | 0.53 | 0.83 | 0.35 | 0.58 |
| **First Stage F-test for Financial Openness** | | | 5.69<br>[0.02] | 5.69<br>[0.02] | |
| **First Stage F-test** | 5.00<br>[0.01] | 29.38<br>[0.00] | 4.67<br>[0.01] | 27.21<br>[0.00] | |
| **Over identification test (Sargan Chi2)** | 0.59<br>[0.44] | 0.81<br>[0.37] | 0.57<br>[0.45] | 3.01<br>[0.08] | 0.25<br>[0.88] |

† Weighted averages of gross foreign assets and liabilities as a share of GDP in other countries on the same continent, with weights inversely related to distances from a given country.
Region dummies: Asia and Pacific, Middle East and North Africa, Sub-Saharan Africa, Latin America, North America, and Europe.
Period dummies: 1975~1979, 1980~1984, 1985~1989, 1990~1994, and 1995~1999.
*, **, and *** denote statistical significance at 10 percent, 5 percent, and 1 percent, respectively.
Standard errors in parentheses. P-values in brackets. All variables are 5-year averages.

Our estimation results are presented in the last three columns of Table 4. We again find that an autonomous increase in financial globalization has a small but significantly negative effect on inflation, but no effect on the budget deficit. The coefficient on financial globalization in the inflation equation is somewhat larger than in the uninstrumented regression in the first column of Table 4. This suggests that the attenuation bias resulting from measurement error in the capital flows variable is probably more important than the endogeneity bias. In fact, we do not find any evidence of reverse causation in the equation of financial openness: both inflation and the budget deficit come out insignificant.

It may be worth noting that the coefficients on all of our control variables have expected signs and most of them are statistically significant. For example, an increase in central bank independence—measured by a reduction in the turnover rate of central bank governors—is estimated to be associated with a reduction in inflation rates (as predicted by Kydland and Prescott (1977), Barro and Gordon (1983), Rogoff (1985), and a large literature that followed). An increase in trade openness is also associated with a lower inflation rate (as predicted by Romer, 1993). Frequent changes in governments are associated with an increase in fiscal deficit (as predicted by Alesina and Tabellini, 1990). These results are broadly consistent with the prior literature on inflation and fiscal deficits.

**Robustness checks**

We check robustness of our findings using an alternative estimation technique and two alternative measures of financial openness (see Table 5). First, in order to circumvent the need for a semi log specification of the inflation equation, we employ the Least Absolute Deviations (LAD) approach, which is less sensitive to outliers than the OLS. We exclude only 13 very high inflation observations, with average annual inflation exceeding 100 percent (the threshold suggested by Fischer, Sahay, and Végh, 2002).[9] The results are consistent with our baseline findings: the coefficient on financial openness is negative and statistically significant in the inflation equation and insignificant in the deficit equation.

Second, excluding debt stocks from our measure of financial openness produces very similar results. In fact, the association between financial openness thus defined and inflation becomes somewhat stronger.[10] This finding is perhaps not surprising, given that foreign

[9] Including these very high inflation outliers weakens statistical significance of the coefficient on financial openness in the inflation equation to 14 percent. This suggests that the discipline effect may have less potency in severe crisis situations or that large exchange rate depreciations that tend to accompany such crisis situations reduce the dollar value of domestic GDP by so much that it overshadows any concurrent capital outflows.

[10] Indeed, using only debt stocks in a reduced sample of countries (for which these data are available) in place of the financial openness variable makes the effect on inflation statistically insignificant. Including only those countries covered by the IMF's IIP (international investment positions dataset) reduces our sample by more than a half and weakens statistical significance of the coefficient on financial openness in the inflation equation to 17 percent.

Table 5. Robustness Checks: LAD Estimation and Alternative Measures of Financial Openness

| | *LAD estimation 1/* | | *Restricted Financial Openness (Percent GDP) 2/* | | *De Jure Financial Openness (0 ~ 1) 3/* | |
|---|---|---|---|---|---|---|
| | **Inflation** | **Budget Deficit** | **Log Inflation** | **Budget Deficit** | **Log Inflation** | **Budget Deficit** |
| **[Log] Inflation (Percent p.a.)** | | 0.01<br>(0.02) | | 0.09<br>(0.64) | | -0.03<br>(0.68) |
| **Budget Deficit (Percent GDP)** | 0.18*<br>(0.11) | | 0.03<br>(0.06) | | 0.06<br>(0.06) | |
| **Financial Openness [Percent GDP / 0 ~ 1]** | -0.01**<br>(0.01) | -0.003<br>(0.004) | -0.007***<br>(0.003) | 0.006<br>(0.01) | -0.70***<br>(0.14) | -0.76<br>(0.92) |
| **Exchange Rate Flexibility** | 0.86***<br>(0.16) | | 0.12***<br>(0.02) | | 0.12***<br>(0.02) | |
| **Central Bank Governor Turnover** | 4.32**<br>(2.25) | | 0.89***<br>(0.26) | | 0.71***<br>(0.25) | |
| **Number of Government Changes** | | 1.52***<br>(0.38) | | 1.42***<br>(0.46) | | 1.35***<br>(0.45) |
| **Number of Coalition Governments** | | -0.41<br>(0.54) | | 0.69<br>(0.64) | | 0.73<br>(0.64) |
| **Trade Openness (Percent GDP)** | -0.02<br>(0.01) | -0.01<br>(0.01) | -0.003*<br>(0.002) | -0.01<br>(0.01) | -0.003*<br>(0.002) | -0.01<br>(0.01) |
| **Industrial Countries (dummy)** | -6.22***<br>(2.30) | -1.63<br>(1.12) | -1.03***<br>(0.28) | -1.70<br>(1.44) | -0.88***<br>(0.26) | -1.32<br>(1.41) |
| **Region dummies** | yes | yes | yes | yes | yes | yes |
| **Period dummies** | yes | yes | yes | yes | yes | yes |
| **N** | 261 | 282 | 272 | 272 | 273 | 273 |
| **"R2"** | 0.26 | 0.13 | 0.90 | 0.53 | 0.91 | 0.53 |
| **First Stage F-test** | | | 5.00<br>[0.01] | 29.23<br>[0.00] | 4.95<br>[0.01] | 28.78<br>[0.00] |
| **Over identification test (Sargan Chi2)** | | | 0.58<br>[0.45] | 0.77<br>[0.38] | 0.002<br>[0.96] | 0.64<br>[0.42] |

1/ Least Absolute Deviations excluding 13 observations with inflation exceeding 100 percent p.a.
2/ Gross foreign direct and portfolio investment, as reported by Lane and Milesi-Ferretti (2001).
3/ As reported in IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*.
Region dummies: Asia and Pacific, Middle East and North Africa, Sub-Saharan Africa, Latin America, North America, and Europe.
Period dummies: 1975~1979, 1980~1984, 1985~1989, 1990~1994, and 1995~1999.
*, **, and *** denote statistical significance at 10 percent, 5 percent, and 1 percent, respectively.
Standard errors in parentheses. P-values in brackets. All variables are 5-year averages.

direct investments (and maybe portfolio equity investments) are less subject to mood swings, than foreign loans. In this sense, this result is in line with our theoretical model (see Section II).

Third, using a de jure measure of financial openness (as reported in the IMF's *Annual Report of Exchange Arrangements and Exchange Restrictions*) also produces similar results, with a significant negative effect on inflation and an insignificant effect on the deficit.

In sum, we find that financial openness has a small statistically significant effect on inflation but no effect on the budget deficit. Instrumenting financial openness by a weighted average measure of financial openness across neighboring countries reinforces these results and produces a larger negative effect on inflation. We interpret the increase in the coefficient on financial openness after instrumenting as reflecting a smaller attenuation bias due to measurement errors in international capital flows. Our findings are robust to an alternative estimation approach and to two alternative measures of financial openness.

## B. Transition Matrix Specification

While the linear specification is a useful starting point, it may not be the most effective one for analyzing determinants of overall soundness of macroeconomic policies. It is well established in the literature that inflation has substantial adverse effects on the economy only beyond a certain threshold level (see, for example, Bruno and Easterly (1995), Khan and Senhadji (2000), and Fischer, Sahay, and Végh (2002)). Similarly, budget deficits are problematic only if they are sufficiently large, so as to threaten overall macroeconomic stability (the Maastricht criteria set thresholds on deficit and debt.

Furthermore, since small fluctuations in budget deficits or inflation rates do not necessarily reflect any changes in government attitudes towards maintaining fiscal prudence and price stability, a threshold-based approach is better suited for analyzing the discipline effect of financial globalization on the underlying macroeconomic policy stance. Since there are threshold effects in the impact of macroeconomic variables on welfare, there is inherent discreteness in defining good versus bad macroeconomic policies. With this in mind, we now go beyond the linear model and focus our attention on an alternative methodology based on Markov chains, which allows us to incorporate threshold effects in inflation and the fiscal deficit and to determine whether the potential discipline effect is effective to induce policy shifts from the "bad" territory to the "good" one.

### Analytical Background

The transition matrix approach provides a natural framework for an analysis of the dynamics across discrete states and allows one to assess the distribution across these states that would prevail in the long run, if the underlying model remains unchanged.[11]

[11] This approach has been traditionally used in studies of economic growth and convergence (originally by Quah, 1993, and, more recently, by Kremer, Onatski, and Stock, 2001).

It allows one to capture performance of countries relative to each other by studying how the whole distribution evolves over time. The transition matrix approach can also be extended to analyze factors that affect probabilities of regime shifts across countries and over time.[12] We use this method to study the evolution of macroeconomic policies and to analyze the role of international financial integration in triggering shifts of policy stance.

The simplest empirical model underlying the transition matrix approach is a first-order stochastic difference equation describing the evolution of a sequence of discrete distributions: $\pi_{t+1} = \pi_t P$. The approach is based on the theory of first-order Markov chains, that is, discrete stochastic processes with the property that given the current realization, future realizations are independent of the past. Under certain reasonably unrestrictive regularity conditions, the sequence of transition matrices converges to a limiting matrix and there exists a unique long run, or ergodic, distribution $\pi_e$ for all initial probability distributions over a given state space.

Transition probabilities can be allowed to vary across time and countries by means of a nonlinear reparameterization in terms of a set of explanatory variables. In particular, a convenient re-parameterization involves using logit functions under the appropriate constraints on transition probabilities (see Masson and Ruge-Murcia, 2002). The constraints are: a) transition probabilities are bounded between zero and one and b) each row of the transition matrix sums to one. A model of this type can be estimated by maximum likelihood to obtain (asymptotically) efficient and consistent estimates of the coefficients on explanatory variables.

The reparameterization just described can be expressed as follows:

$$p_{ii}(X_t) = 1/(1+\sum_{k\neq i}\exp(\beta'_{ik}\, X_t)),$$

$$p_{ij}(X_t) = \exp(\beta'_{ij}\, X_t)/(1+\sum_{k\neq i}\exp(\beta'_{ik}\, X_t))\ \textit{for}\ i \neq j,$$

where $p_{ij}(X_t)$ denotes transition probabilities and $\beta_{ik}$ is a vector of coefficients on the set of explanatory variables $X_t$. We can now construct the likelihood function for every country as the probability of observing a given sequence of states. Since transition probabilities in a first-order Markov chain are independent of past history, the likelihood function for country $k$ is as follows:

$$L(k) = \pi_{0k}\prod_i\prod_j (p_{ijk}(X_t))^{Nijk},$$

where *Nijk* is the number of times a transition from state $i$ to state $j$ in country $k$ occurs. The log likelihood function for the full sample is obtained by taking logs of the likelihood functions for each country and summing up over all the countries:

$$Log\ L = \sum_k \ln(\pi_{0k}) + \sum_k\sum_i\sum_j Nijk\ln(p_{ijk}(X_t)).$$

[12] This approach was recently employed in studies of "hollowing out" in exchange rate regimes (see Masson, 2001 and Masson and Ruge-Murcia, 2002).

This log likelihood function can be maximized numerically to obtain estimates of the coefficients on the explanatory variables.

We estimate the effects of financial globalization on monetary and fiscal policies, both jointly and separately. As it turns out, relatively little information is lost if the two effects are estimated separately. For expositional convenience, we report the results on inflation first, and follow with those on budget deficits. We describe the results when inflation and budget deficits are estimated jointly at the end as a robustness check.

**Analysis of inflation**

We start with a discussion of the effect of financial globalization on monetary policies, represented by levels of inflation. In order to separate cases of low, moderate, and high inflations, we impose two thresholds on inflation rates. We set the lower threshold at 10 percent per year, which is approximately equal to the median inflation rate across our sample. The 10 percent threshold is broadly consistent with the result in Khan and Senhadji (2000) that inflation above the range of 7–11 percent a year hurts growth in developing countries. Following Bruno and Easterly (1995), we set the upper threshold at 40 percent per year. This allows us to analyze separately any possible discipline effect of financial openness in high-inflation countries. These thresholds divide our sample into three groups according to their monetary policy states: Low (inflation less than 10 percent per year), Moderate (inflation between 10 percent and 40 percent per year), and High (inflation over 40 percent per year).

Table 6a shows transition probabilities among these states over five-year subperiods, calculated as the number of transitions between a pair of states relative to the number of countries in the initial state, over the whole sample. In other words, cell $(i, j)$ in the transition matrix shows transitions from state $i$ to state $j$ relative to the number of countries initially in state $i$. We see that the low inflation state is the most persistent, so that 84 percent of countries that start in that state in one five-year period remain there over the following five-year period. We also see that switches between very low and very high inflation states are infrequent: the probabilities of transitions between the low and high inflation states are not significantly different from zero.

The last row of the matrix contains the ergodic distribution, or the distribution that would prevail in the long run provided that transition dynamics remain unchanged. We see that 70 percent of countries converge over time to the low inflation state, while only 4 percent converge to the high inflation state. Compared with the actual sample proportions shown in the preceding row, the gradual move toward lower inflation is evident in our sample. Table 6b presents some examples of countries in various categories of transition across inflation states.

Our next step is to determine whether international financial integration that took place over the same period exerted any influence on the observed move toward low inflation across countries. We accomplish this by conditioning the transition probabilities on financial openness and a set of control variables. In order to increase the efficiency of our estimates, we impose zero restrictions on those transition probabilities that turned out statistically insignificant (see Table 6a). As in the linear case, we run two alternative versions of this

Table 6a. Transition and Long Run Probabilities Across Inflation States

| *Policy State* | *L ( < 10 percent )* | *M ( 10–40 percent )* | *H ( > 40 percent )* |
|---|---|---|---|
| **L ( < 10 percent )** | **0.84** | **0.16** | 0.00 |
| **M ( 10- 40 percent)** | **0.42** | **0.52** | **0.06** |
| **H ( > 40 percent)** | 0.06 | **0.28** | **0.66** |
| **Sample average** | 0.52 | 0.37 | 0.11 |
| **Long Run (ergodic)** | 0.70 | 0.26 | 0.04 |

Note: Transitions are over 5-year periods (1975~79, 1980~84, 1985~89, 1990~94, 1995~99). Bold indicates statistical significance at 5 percent level.

Table 6b. Examples of Actual Country Transitions Across Inflation States

New Policy State →

Old Policy State ↓

| *Policy State* | *L (< 10 percent)* | *M (10–40 percent)* | *H (> 40 percent)* |
|---|---|---|---|
| **L (< 10 percent)** | Australia Austria Belgium Canada Germany Denmark Finland France Italy Japan Jordan Korea Malaysia Mauritius Morocco Netherlands Norway Panama Spain Sweden Switzerland Thailand Tunisia UK USA | India Indonesia Sri Lanka Sweden Venezuela | |
| **M (10-40 percent)** | Bolivia Botswana Chile Egypt El Salvador Greece Guatemala India Indonesia Ireland Israel Italy Korea Mauritius Norway Pakistan Philippines South Africa Spain Sri Lanka | Chile Colombia Costa Rica Dominican Rep. Egypt El Salvador Greece Italy Jamaica New Zealand Paraguay Portugal South Africa Syria Zimbabwe | Bolivia Mexico |
| **H (> 40 percent)** | | Chile Ecuador Israel | Argentina Brazil Israel Peru Turkey Uruguay |

estimation: first, with exogenous financial openness and, second, with financial openness instrumented by the weighted average of the external financial stocks among neighboring countries. The first version is estimated by maximum likelihood as explained above, while the second version involves a two-stage instrumental variables procedure. At the first stage, we obtain predicted values for the financial openness variable from a least-squares regression of financial openness on the full set of instruments. At the second stage, we use these predicted values in place of the original financial openness variable and estimate the transition matrix using maximum likelihood.[13]

Table 7 presents our findings.[14] The rows of this table show the estimated coefficients on the explanatory variables, with the columns corresponding to different transition probabilities. In the first (uninstrumented) version of the estimation, we find that financial openness has a negative and statistically significant effect on the probability of transitions from low to moderate inflation. In other words, countries that are more exposed to financial globalization are less likely to move from low to medium inflationary states. This is consistent with the disciplinary hypothesis. However, financial openness does not have statistically significant effects on other transition probabilities.

The statistical significance of financial openness improves after instrumenting the financial openness variable (reported in the lower panel of Table 7). Thus, in the second (instrumented) version of the estimation we find, in addition, that financial openness has a positive and statistically significant effect on the probabilities of transitions from high inflation to moderate and from moderate to low. We interpret this as supporting the attenuation bias story: in the absence of instrumenting, measurement error in the capital flows variable pushes the corresponding coefficients toward zero, while with instrumenting the absolute values of the affected coefficients tend to increase by more than their standard errors.[15] This attenuation bias is strong enough that it seems to outweigh any potential endogeneity bias that would have pushed the coefficients in the opposite direction. The coefficients on the control variables have expected signs and offer support to the view that exchange rate anchors matter in stabilizations and that central bank independence plays a role in low and moderate inflation countries.

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[13] Note that we report the standard errors from the second stage, hence they do not account for the fact that predicted values for financial openness are used in place of the original variable.

[14] Since this approach allows us to capture sample heterogeneity by running the estimations separately for each country group defined by a different policy state, we omit time and country controls.

[15] Note also that since measurement error in one variable can bias the coefficients on the other variables, the coefficients on the control variables may change as a result of instrumenting the capital flows variable.

Table 7: Maximum Likelihood Estimation of Variable Transition Probabilities for Inflation

| *Policy Transitions* | *L → M* | *M → L* | *M → H* | *H → M* |
|---|---|---|---|---|
| **Financial Openness Exogenous** | | | | |
| **Financial Openness (Percent GDP)** | -0.10** | 0.01 | 0.02 | -0.01 |
| | (0.05) | (0.01) | (0.02) | (0.01) |
| **Budget Deficit** | 0.01 | -0.05 | -0.07 | -0.13 |
| **(Percent GDP)** | (0.09) | (0.04) | (0.13) | (0.10) |
| **Exchange Rate Flexibility** | 0.06 | -0.12 | 0.27 | -0.34 |
| | (0.14) | (0.09) | (0.23) | (0.31) |
| **Central Bank Governor Turnover** | 4.14** | -2.05* | 1.75 | 1.09 |
| | (2.12) | (1.11) | (1.98) | (1.76) |
| **Trade Openness** | -0.002 | 0.002 | 0.0005 | 0.03 |
| **(Percent GDP)** | (0.01) | (0.01) | (0.02) | (0.03) |
| **Financial Openness Instrumented 1/** | | | | |
| **Financial Openness (Percent GDP)** | -0.05** | 0.03** | -0.04 | 0.21** |
| | (0.02) | (0.01) | (0.06) | (0.10) |
| **Budget Deficit** | 0.17 | -0.05 | -0.16 | 0.17 |
| **(Percent GDP)** | (0.11) | (0.05) | (0.16) | (0.17) |
| **Exchange Rate Flexibility** | 0.02 | -0.19** | 0.40 | -1.04* |
| | (0.14) | (0.09) | (0.29) | (0.54) |
| **Central Bank Governor Turnover** | 3.60** | -1.94* | 1.50 | 4.11 |
| | (2.34) | (1.17) | (1.89) | (2.53) |
| **Trade Openness** | -0.01 | -0.003 | 0.03 | -0.03 |
| **(Percent GDP)** | (0.02) | (0.01) | (0.04) | (0.05) |

1/ Instrument: weighted averages of gross foreign assets and liabilities as a share of GDP of other countries on the same continent, with weights inversely related to distances from a given country.
All variables are 5-year averages (1975~79, 1980~84, 1985~89, 1990~94, 1995~99).
*, **, and *** denote statistical significance at 10 percent, 5 percent, and 1 percent, respectively.
Standard errors in parentheses. Coefficients on the constant not reported.

Overall, there is some support for the view that exposure to financial openness provides some disciplinary effect on monetary policies: With a higher level of financial openness, countries with low inflation levels are less likely to increase them; countries with medium or high inflation levels are more likely to lower them.

**Analysis of deficits**

We now turn to an analysis of the effect of financial globalization on a government's budget deficit. Consistent with our analysis of inflation, we impose two thresholds on deficit levels that separate cases of low, moderate, and high deficits. We set the lower threshold at 3 percent of GDP, which is approximately equal to the median deficit across our sample and which also coincides with the Maastricht criterion. We set the upper threshold at 8 percent of GDP. This upper threshold defines a similar proportion of "extreme" or high-deficit countries, as the 40 percent inflation threshold.

These two thresholds divide our sample into three policy states: Low Deficits (less than 3 percent of GDP), Moderate Deficits (between 3 percent and 8 percent of GDP), and High Deficits (over 8 percent of GDP). Table 8a shows transition probabilities among these states and the long run (ergodic) distribution.

As in the case of inflation, the low deficit state is the most persistent, with 83 percent of countries that happen to be in that state remaining there over the following five-year period. Unlike in the case of inflation, however, dramatic switches between very low and high deficits do take place: the probability of transitions from the high deficit state to the low deficit state is statistically significant. The ergodic distribution shows that 65 percent of countries converge over time to the low deficit state, while only 7 percent converge to the high deficit state. As with inflation, the gradual move toward lower deficits is evident in the sample. For concreteness, Table 8b gives some examples of countries that have made various transitions.

In Table 9, we report the results from an extended transition matrix analysis in which the transition probabilities are conditioned on financial openness and other control variables suggested by the literature. In contrast to inflation, we do not find any evidence of the influence of international financial integration on the observed tendency of diminishing deficits. We do not find any statistically significant effects of financial openness on the probabilities of shifts in fiscal policy with or without instrumenting (reported in the upper and lower panels of Table 9, respectively). There are only two statistically significant coefficients in this table, both on the number of government changes, which suggest that government fragility hinders stabilizations from high deficit levels.

Overall, there is no support for the view that financial openness exerts a disciplinary effect on government budget deficits.

Table 8a. Transition and Long Run Probabilities Across Budget Deficit States

| *Policy State* | *L ( < 3 percent )* | *M ( 3–8 percent )* | *H ( > 8 percent )* |
|---|---|---|---|
| **L ( < 3 percent )** | **.83** | **.16** | .01 |
| **M ( 3-8 percent )** | **.38** | **.52** | **.06** |
| **H ( > 8 percent )** | **.12** | **.40** | **.48** |
| **Sample average** | .49 | .37 | .14 |
| **Long Run (ergodic)** | .65 | .28 | .07 |

Transitions are over 5-year periods (1975~79, 1980~84, 1985~89, 1990~94, 1995~99).
Bold indicates statistical significance at 5 percent level.

Table 8b. Examples of Actual Country Transitions Across Budget Deficit States

| *Policy State* | *L ( < 3 percent )* | *M ( 3-8 percent )* | *H ( > 8 percent )* |
|---|---|---|---|
| **L ( < 3 percent )** | Algeria Australia Botswana Chile Colombia Germany Denmark Dominican Rep. Ecuador El Salvador Guatemala Indonesia Korea Mauritius Paraguay Philippines Switzerland Thailand Uruguay Venezuela | Colombia El Salvador Japan Norway Philippines Spain Uruguay | |
| **M ( 3- 8 percent )** | Canada El Salvador Iceland Indonesia Malaysia Netherlands Norway Philippines Thailand Tunisia UK Uruguay USA | Austria Canada India Netherlands Pakistan Tunisia Turkey South Africa Spain USA Zimbabwe | Greece Mexico Sweden Turkey |
| **H ( > 8 percent )** | Mexico Sweden | Bolivia Brazil India Italy Malaysia Pakistan Portugal | Egypt Greece Ireland Italy Portugal Sri Lanka |

Table 9: Maximum Likelihood Estimation of Variable Transition Probabilities for Budget Deficit

| *Policy Transitions* | *L → M* | *M → L* | *M → H* | *H → M* | *H → L* |
|---|---|---|---|---|---|
| **Financial Openness Exogenous** | | | | | |
| **Financial Openness (Percent GDP)** | 0.003<br>(0.004) | 0.004<br>(0.005) | -0.02<br>(0.02) | 0.01<br>(0.01) | 0.01<br>(0.01) |
| **Inflation (Percent p.a.)** | -0.002<br>(0.005) | 0.0004<br>(0.001) | -0.001<br>(0.003) | 0.01<br>(0.01) | 0.005<br>(0.01) |
| **Number of Government Changes** | 0.57<br>(0.57) | -0.17<br>(0.50) | 0.05<br>(0.63) | -1.99**<br>(0.97) | -4.10**<br>(2.13) |
| **Number of Coalition Governments** | -0.27<br>(0.61) | 0.46<br>(0.54) | 0.73<br>(0.81) | 0.70<br>(0.99) | 1.01<br>(1.36) |
| **Trade Openness (Percent GDP)** | -0.003<br>(0.01) | 0.01<br>(0.01) | 0.002<br>(0.01) | -0.01<br>(0.01) | -0.01<br>(0.02) |
| **Financial Openness Instrumented**[†] | | | | | |
| **Financial Openness (Percent GDP)** | 0.01<br>(0.01) | 0.005<br>(0.007) | -0.04<br>(0.03) | 0.01<br>(0.01) | 0.02<br>(0.01) |
| **Inflation (Percent p.a.)** | -0.002<br>(0.005) | 0.0005<br>(0.001) | -0.001<br>(0.003) | 0.01<br>(0.01) | 0.006<br>(0.01) |
| **Number of Government Changes** | 0.58<br>(0.58) | -0.16<br>(0.52) | -0.12<br>(0.67) | -2.20**<br>(1.05) | -4.61**<br>(2.28) |
| **Number of Coalition Governments** | -0.71<br>(0.72) | 0.44<br>(0.55) | 0.87<br>(0.81) | 0.91<br>(0.95) | 0.94<br>(1.37) |
| **Trade Openness (Percent GDP)** | -0.005<br>(0.01) | 0.01<br>(0.01) | 0.01<br>(0.02) | -0.01<br>(0.01) | -0.02<br>(0.02) |

1/ Instrument: weighted averages of gross foreign assets and liabilities as a share of GDP of other countries on the same continent, with weights inversely related to distances from a given country.
All variables are 5-year averages (1975~79, 1980~84, 1985~89, 1990~94, 1995~99).
*, **, and *** denote statistical significance at 10 percent, 5 percent, and 1 percent, respectively.
Standard errors in parentheses. Coefficients on the constant not reported.

**Robustness checks**

We checked robustness of our findings in several ways. First, we ran our estimations with different threshold levels and found that such perturbations did not alter our main findings.[16]

Second, we combined inflation and deficit states in a single transition matrix framework (i.e., classifying policies into the low inflation and low deficit state, the high inflation and high deficit state, and other intermediate states) and obtained qualitatively similar results. Specifically, we estimated a system of equations for the combined transition probabilities and found that we could not reject the hypothesis of equal coefficients between the equations describing transitions from low to high inflation (or reverse) in low deficit countries and in high deficit countries. Similarly, we could not reject the null hypothesis of equal transition probabilities between the equations describing transitions from low to high deficits (or reverse) in low inflation countries and in high inflation countries. In other words, we found that analyzing monetary policy transitions and fiscal policy transitions independently from one another does not lead to a significant loss of information.

Third, we reestimated our equations for inflation and budget deficits using a more conventional probit approach and obtained very similar results. We did this in two steps. In Step One, we defined high inflations and high deficits as zero/one variables and ran them on our set of control factors. We found that financial openness lowered the probability of moderate/high (over 10 percent per year) and high (over 40 percent per year) inflations, but that it did not have any effect on the probability of high deficits at the ten percent significance levels. In Step Two, we constructed a set of binary variables describing transitions up or down across inflation and deficit states. In other words, we set these variables to equal one if there occurred a transition to a higher state (i.e., from Low to Moderate/High or from Moderate to High) and zero otherwise, and likewise for transitions to lower states. We ran these variables on our set of controls and found that financial openness lowered the probability of moving to higher inflation states but had no effect on the dynamics of fiscal deficits. These results are in line with our findings based on the transition matrix specification, and hence are not reported here to save space. The transition matrix approach is considerably more informative than probit estimations, since it allows us to analyze specific policy transitions in different country groups, and also to calculate the associated ergodic distributions.

[16] Specifically, we varied the policy thresholds around their baseline levels: for inflation, we varied the first threshold from 5 percent to 15 percent and the second one from 30 percent to 50 percent; for fiscal deficit, we varied the first threshold from 2 percent to 4 percent and the second one from 7 percent to 9 percent. In all these alternative cases our estimation results were very close to the baseline reported in Tables 7 and 9.

In sum, our results from the transition matrix specification are in line with our results from the linear case: international capital flows may have exerted some disciplining effect on inflation, but none detectable on the budget deficit.

## V. CONCLUSIONS

This paper studies whether the process of financial globalization has helped to induce governments to pursue better macroeconomic policies (the "discipline effect"). We present a simple theoretical model that formalizes the logic behind this effect. Within the same model, we demonstrate how mood swings in international capital flows and the nature of policies may influence the strength of the discipline effect from financial globalization.

The main part of the paper then provides several tests of the hypothesis. The empirical part has two main innovations. First, we recognize potential endogeneity of the observed capital flows in a given country with respect to the nature of macroeconomic policies in that country. To correct for this potential endogeneity, we use a distance-weighted average of capital flows across neighboring countries as an instrument for capital flows in a given country.

Second, we recognize the inherent discreteness in defining good versus bad macroeconomic policies. That is, we allow for the possibility that low inflation rates (or deficits) are better than high inflation rates (or deficits), but do not impose the condition that one low inflation rate (or deficit) is necessarily better than another low inflation rate (or deficit). We do so by employing a nonlinear framework based on Markov chains with variable transition probabilities.

Our results suggest that, in spite of the plausibility of the "discipline effect" in theory, it is not easy to find strong and robust causal evidence. There is some modest evidence that financial globalization may have induced countries to pursue low-inflation monetary policies. However, there is no evidence that it has encouraged low budget deficits.

**Solution of the Model for the General Case with Unrestricted β**

In the general case, the objective function of the host government takes the following form:

$$EW = q\left[X + n\left(\frac{\beta q}{r}\right)^{\frac{\beta}{1-\beta}}\right] - b\,q^{\frac{1}{1-\beta}} \tag{17}$$

Assuming that b is sufficiently large, so that $b > N\left(\beta/r\right)^{\frac{\beta}{1-\beta}}$, the government's maximization problem has an interior solution:

$$q = \left[\frac{X\,(1-\beta)}{b - n\left(\beta/r\right)^{\frac{\beta}{1-\beta}}}\right]^{\frac{1-\beta}{\beta}} \tag{18}$$

Since q is limited between 0 and 1, the constraint on b becomes: $b \geq (1-\beta)X + N\left(\beta/r\right)^{\frac{\beta}{1-\beta}}$.

The policy response to an increase in n, or financial globalization, is now given by:

$$\frac{dq}{dn} = \frac{1}{\beta X}\left(\frac{\beta}{r}\right)^{\frac{\beta}{1-\beta}}\left[\frac{X\,(1-\beta)}{b - n\left(\beta/r\right)^{\frac{\beta}{1-\beta}}}\right]^{\frac{1}{\beta}} > 0 \tag{19}$$

In other words, as financial globalization increases, the government responds by raising the probability of pursuing the good policy.

Introducing investors' mood swings into the model modifies the optimal policy rule as follows:

$$q = \left[\frac{X\,(1-\beta)}{b - n(1-s)\left(\beta/r*\right)^{\frac{\beta}{1-\beta}}}\right]^{\frac{1-\beta}{\beta}} \tag{20}$$

The effect of an increase in s, or the probability of sudden stops in capital flows, on the government's responsiveness to financial globalization is given by:

$$\frac{d^2q}{(dn)(ds)} = -\frac{1}{\beta^2 X}\left(\frac{\beta}{r^*}\right)^{\frac{\beta}{1-\beta}}\left[\frac{X(1-\beta)}{b-n(1-s)\left(\beta/r^*\right)^{\frac{\beta}{1-\beta}}}\right]^{\frac{1}{\beta}}\left[\frac{b+ns\left(\beta/r^*\right)^{\frac{\beta}{1-\beta}}}{b-n(1-s)\left(\beta/r^*\right)^{\frac{\beta}{1-\beta}}}\right] < 0 \qquad (21)$$

In other words, mood swings in international capital flows weaken the discipline effect.

The effect of an increase in b, or the disutility of policy effort, on the government's responsiveness to financial globalization is given by:

$$\frac{d^2q}{(dn)(db)} = -\frac{1}{\beta^2 X}\left(\frac{\beta}{r^*}\right)^{\frac{\beta}{1-\beta}}\left[\frac{X(1-\beta)}{b-n(1-s)\left(\beta/r^*\right)^{\frac{\beta}{1-\beta}}}\right]^{\frac{1}{\beta}}\left[\frac{1-s}{b-n(1-s)\left(\beta/r^*\right)^{\frac{\beta}{1-\beta}}}\right] < 0 \qquad (22)$$

In other words, political and other costs of policy effort weaken the discipline effect.

**List of Variables with Descriptions and Data Sources**

| *Variables* | *Descriptions* | *Data Sources* |
|---|---|---|
| Inflation | Change in consumer prices, percent per annum. | IMF, *International Financial Statistics* |
| Budget Deficit | Central government deficit, percent of GDP. | IMF, *International Financial Statistics* and *World Economic Outlook* |
| Financial Openness | Total gross actual foreign assets and liabilities, percent of GDP. | Lane and Milesi-Ferretti (2001) |
| Restricted Financial Openness | Total gross actual foreign direct and portfolio investment, percent of GDP. | Lane and Milesi-Ferretti (2001) |
| De Jure Financial Openness | 1 if capital account transactions unrestricted, 0 otherwise. | IMF, *Annual Report on Exchange Arrangements and Exchange Restrictions* |
| Distance | Great circle distance | Andrew Rose's website at *http://faculty.haas.berkeley.edu/arose/RecRes.htm#Software* |
| Exchange Rate Flexibility | Index of de facto exchange rate flexibility. | Reinhart and Rogoff (2002) |
| Central Bank Governor Turnover | Turnover rate of central bank governors. | Ghosh, Gulde, and Wolf (2003) |
| Number of Government Changes | Number of government changes per year, including executive changes, cabinet changes, and coups d'etat. | Cross-National Time Series Data Archive (Banks, 1979 updated) |
| Number of Coalition Governments | Number of coalition governments per year. | Cross-National Time Series Data Archive (Banks, 1979 updated) |
| Trade Openness | Total volume of trade (exports and imports), percent of GDP. | IMF, *International Financial Statistics* |

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