Imbalances, Adjustment, and Reactions: Institutions and Banking Crisis Incidence

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Abstract

A political economy approach to Banking Crisis incidence is developed by applying Veto Player Theory to the crisis literature, developing hypotheses of the effect of institutional constraints on Banking Crisis probability. These hypotheses are tested using econometric mediation to estimate the full effect of higher levels of Veto Players on crisis probability; finding these higher constraints lead to a reduction in crisis probability through reducing economic imbalances, impede adjustment given a shock or imbalance, and reinforce stable economic conditions. Higher levels of Veto Players directly lead to an increase in crisis probability in the presence of an external shock, an increase in crisis probability when levels of constraint are high, and a reduction in crisis probability when constraints are low. A final major result is increases in the VIX are only shown to impact crisis probability in the presence of higher levels of Veto Players.

1 Introduction

Banking Crises occur when a combination of shocks and financial or economic imbalances push a financial sector beyond a threshold of stress where investors lose confidence in the banking sector, leading to bank-run style behavior and systemic insolvency or illiquidity. This can be tied to a number of economic factors, spanning from inappropriately priced assets correcting to fundamental values, liquidity shocks due to realization of non-performing loans, market psychology, or economic factors such as inflation and growth - to name but a few. One area discussed in previous literature is the role of political factors in this phenomenon. A subset of this not yet addressed is the role of political institutional constraints in driving Banking Crisis probability.

Veto Player Theory offers widely used approaches and measures to analyze the effects of political constraints. Prior literature has analyzed the role of constraints on generating economic imbalances, or reinforcing existing conditions. Other work has approached the role constraints play in responses to other forms of financial crises while controlling for economic fundamentals. Some work with constraints and Banking Crises has been done through analyzing their impact on regulatory quality, though with mixed results. Political constraints and the probability of Banking Crises both working through economic fundamentals, and conditional upon shocks and economic imbalances, is a topic thus far untouched.

Structuring an analysis combining these factors requires the use of econometric multiple mediation - a technique uncommon in the International Finance and Political Economy literatures. This estimates effect of Veto Players on economic fundamentals in a first step, then estimates the effect of these fundamentals on crisis probability in a regression controlling for Veto Players. The effects of Veto Players on crisis probability working through these fundamentals is then calculated and added to the direct effect estimated while controlling for these fundamentals.

This paper contributes to the literature by estimating Veto Player's effects on the probability of Banking Crises by synthesizing multiple approaches; How these constraints reduce crisis probability by reducing economic or financial imbalances, impeding policy adjustment to shocks or economic fundamentals, and provoking market reactions based on the aforementioned. The findings indicate higher levels of Veto Players reduce economic imbalances - reducing crisis probability. By imped-

ing adjustment, higher levels of constraint reduce crisis probability when fundamentals are strong, and increase crisis probability when fundamentals are weak. Observing these effects on economic imbalances and policy adjustment, markets react with "bank - run" style behavior at lower levels of stress when Veto Player levels are at either extreme, and when the VIX is higher. Further, the VIX is shown to only have a significant effect on crisis probability when levels of Veto Players are relatively high.

After section two provides background on Veto Player Theory and the current state of the political economy of Banking Crises literature, section three combines these two fields to provide theory and testable hypotheses in regards to the full effects of constraints on crisis probability. Section four outlines the econometric strategy, discussing the formulation of the econometric mediation to be tested, and the estimators to be used in each of the stages. Section five conducts the empirical analysis, testing the effect of political constraints on three economic fundamentals found to be important factors in crisis incidence (inflation, credit growth, and foreign exchange reserve coverage), the effect of political constraints on the inertia in them, and the effect of constraints on crisis probability after controlling for these fundamentals. These individual results are then combined into a full mediated effect of constraints on crisis probability in section six, which is then discussed and interpreted in section seven to conclude the paper.

2 Literature Review

2.1 Banking Crises Overview

A Banking Crisis generally occurs either when A: some factor causes a large scale loss of confidence in the system, leading to a bank run, or B: Systemically banks make a large quantity of bad investments that are realized at the same time, potentially related to a speculative bubble and market (over)correction (Diamond and Rajan 2005). Either of these mechanisms can cause illiquidity or insolvency, leading to an asset market deflation that has substantial negative effects on credit issuance and domestic balance sheets. Both of these can slow economic activity, plunging the economy as whole into a recession. This tends to be related to some combination of an economic or financial imbalance being realized, and an exogenous shock occurring, that pushes financial sector stress beyond a threshold where markets react with bank-run style panic.

Imbalances may refer to financial factors such as systemically mis-valued assets and/or credit bubbles, or economic factors such as inflation, weak growth, external vulnerability (current account deficits/exchange rate overvaluation, poor foreign exchange reserve coverage), and/or debt/deficits. Shocks refer refer to unexpected shifts in income, risk, asset values, or financing costs which put stress on a country's banking sector. Examples of this could be increases in the VIX, increases in the domestic real interest rate, or losses of income due to economic slowdowns. For a detailed yet broad discussion of Banking Crises see Kauko (2014). The subset of the Banking Crisis literature of concern for this analysis focuses on political economy factors.

In the lead up to the crisis government policy may have an important impact on the creation of bubbles or vulnerability that eventually creates a Banking Crisis (Broz 2013). Policy that creates incentives to make bad loans, even if politically expedient at the time, may make crises more likely. Policy resulting from lobbying by banks in order to reduce protections lowering returns, but ensuring a greater stability to the system, may have a positive relationship with the likelihood of a crisis as

well. Factors such as interest rate shifts or policy shifting asset or collateral values may also quickly alter the breakdown of asset vs liability values, or the costs of servicing liabilities, causing insolvency or illiquidity.

Broz outlines one potential way this mechanism may exist by showing how in the "boom" leading up to Banking Crises, due to reduced perceptions of risk, policy tilts towards looser regulations, expansionary tax/fiscal policy, and other factors expanding the boom and increasing the crisis size if one does occur (e.g. U.S. and the U.K. in the lead up to 2008)(2013). After a crisis voters tend to respond by electing left-leaning governments as risk and risk aversion increase (the U.S. again is a prime example). Considering these policy interactions with Banking Crises, it is likely that institutional variables have explanatory power magnifying or mitigating the build up to Banking Crises through policy factors.

There has been some analysis of the effect of levels of Veto Players on crisis probability by working through regulatory quality. Higher levels of these constraints have also been shown to impact delays in regulatory changes, allowing risky financial sector behavior to proceed for a longer time period than in more constrained systems (Garriga 2016). Another analysis in this area shows higher levels of Veto Players reduce crisis probability in systems with less autonomous financial regulatory structures, while increasing crisis probability in the presence of lower levels of financial regulatory autonomy (Jordana and Rosas 2014). Veto Players have also been used as a proxy for interest group pressure in altering regulatory quality, though this analysis was unable to find a statistically significant effect using an alternative Veto Player measure (Amri and Kocher 2011).

2.2 Veto Player Theory

Veto Player Theory analyzes the effect of institutional constraints on a variety of outcomes. A Veto Player is a person or body in government with the power to halt legislation (Tsebelis 2002). Though the method of measuring Veto Players has moved from attempting to count numbers of Veto Players to broader measurements of institutional constraint indicated by a decimal between zero and one, the premise has not: with high level of Veto Players governments become more rigid (or stable) and legislation is more difficult to pass. With fewer governments are better able to quickly change policy.

A robust literature exists outlining the potential relationship between Veto Players and a number of variables, spanning the range of the internal institutional functioning of the government and direct policy outcomes such as budget deficits to pure economic outcomes such as inflation, exchange rate overvaluation, and economic growth. For a more detailed discussion of Veto Player Theory and its applications see either Ganghoff or Hallerberg (2003)(2010). The literature identifies four primary models or approaches analyzing how levels of Veto Players may drive government functioning and policy outcomes.

2.2.1 Inertia Model

Tsebelius's initial outline focused on how a greater number of Veto Players requires a greater number of actors to agree to the policy change (1995). Requiring a broad consensus for any policy change, and creating a structure of government with greater opportunities for one individual person or body to be lobbied to prevent any piece of legislation, will tend to enforce the status quo (Tsebelis 2002). Under this Veto Player theory, though Veto Players may not have a significant effect on the levels of

inflation, taxes, or other economic fundamentals, they will serve to"lock in" whatever policy is in place initially, which is considered to be exogenous. An important factor to consider in this Veto Player Theory is that higher levels of the variable may not impact average levels, but may substantially impact the variance observed in fundamentals, which may be relevant depending on what type of phenomena is being looked at. For factors such as inflation a high variance may itself be considered a poor economic fundamental.

2.2.2 Collective Action Approach

Under this framework a higher number of Veto Players will alter the form policy takes (Treisman 2000). A higher number of Veto Players will force log-rolling between many actors to get legislation passed. As each Veto Player should reasonably be expected to have some targeted constituency, this veto power should force legislation to have provisions favoring these constituencies the Veto Players are affiliated with. As number of Veto Players become higher, more targeted benefits must be given in order for the higher number of Veto Players to collectively pass policy. In aggregate, higher levels of Veto Players generate an expansionary bias, pushing policy away from public good provision towards allocating resources for private favors, increasing rent-seeking and budget deficits along with aggregate demand.

2.2.3 Commitment Approach

Veto Players may also drive economic fundamentals in the opposite direction of the Collective Action Approach. Political actors may find it difficult to credibly commit to policy that may have long-term benefits, but be political costly in the short-term (Mosher 1999). Constraints upon later policy change provide this credible commitment to long-sighted policy. An example of this would be inflation, where without institutional constraints preventing policymakers from engaging in expansionary policy to provide short-term benefits at the cost of losing the long term positive effects of stable prices, we expect to see excessively expansionary policy. Since unexpected inflation has a positive real effect in the short term, the only way policymakers create a credible commitment to maintaining stable prices is by creating an institutional restriction on future actions. Comparable examples could be used with economic fundamentals such as fiscal deficits or exchange rate overvaluation.

2.2.4 Curvilinear Model

The Cuvilinear (or "U-shaped") Model posits a more complex relationship between Veto Players and policy. Countries with high levels of Veto Players will display resoluteness in policy, while countries with low levels will be able to decisively shift policy (Cox and McCubbins 2007). There potentially exists some optimal point at which there are enough Veto Players in order to generate the policy stability allowing investors to develop stable expectations, but once this threshold is crossed further Veto Players make it more difficult to respond to shocks and imbalances effectively, reducing confidence in the government (MacIntyre 2001). This would push the relationship between Veto Players and the effectiveness of response to potentially impending crisis conditions into an upside down U-Shape. This may be a tricky contention to test, as the optimal level of Veto Players ought to shift towards decisiveness (less) in conditions of global volatility to respond to changing conditions, and towards resoluteness (more) otherwise to generate stable expectations.

3 Theory: Institutional Constraints Applied to Banking Crises

Given that Veto Players have been shown to impact economic fundamentals and market behavior, it is necessary to account for both mechanisms. The indirect effects of Veto Players addresses how higher levels of these constraints impact economic imbalances (in this analysis inflation, credit growth, and foreign reserve coverage), and policy responses to these imbalances or shocks. The direct effect of Veto Players addresses how higher levels of constraints alter crisis probability after controlling for the effect of these constraints on imbalances and adjustment. Direct effects are the role of Veto Players in driving market reactions to imbalances or the expectation of adjustment, while the indirect effects are the role of Veto Players in driving the adjustment or imbalances themselves.

Indirect effects of Veto Players will alter the imbalances and levels of stress created by shocks in a country. Direct effects will alter the threshold of this stress at which "bank-run" style critical behavior occurs. Each of the four primary Veto Player models offers different hypotheses with respect to the magnitude and direction of this combination of effects, to be outlined below. The evaluation of this relationship requires the use of econometric mediation to independently estimate the imbalance, adjustment, and reaction effects, then combine these outputs into a full effect.

3.1 Indirect Effects: Imbalances and Adjustment

The two components of the indirect effect of Veto Players on crisis probability are imbalances and adjustment. Given the link between economic imbalances and crises, and Veto Players and economics imbalances, it is necessary to analyze the effect of a given imbalance on crisis probability, and the effect of Veto Players on that economic imbalance. Given the link between economic adjustment/inertia (or the lack thereof) to imbalances or shocks, and the link between Veto Players and economic inertia, it is necessary to analyze the effect of Veto Players on inertia in an economic fundamental shown to impact crisis probability. This will be discussed for three factors considered economic fundamentals: Inflation, Credit Growth, and Foreign Exchange Reserve adequacy.

With Banking Crises often a result of a long buildup of fundamental imbalances followed by a shock to asset values or liquidity that exposes vulnerability, the role of Veto Players in building (or preventing) these imbalances may be extremely important. Inflation associated with excessive aggregate demand due to economic policy may be magnified with higher levels of Veto Players under the Collective Action Approach, increasing crisis probability. Alternatively, inflation may be reduced with higher levels of Veto Players due to the restrained aggregate demand under the Commitment Approach. Under the Inertia Model, a higher level of inflation may be more difficult to correct with higher Veto Players, or at a lower level more stable.

Foreign Exchange Reserve adequacy (specified as the logged M2 to Foreign Exchange Reserve ratio) is another economic fundamental increasing crisis probability as values increase. An expansionary bias from higher levels of Veto Players under the Collective Action Approach would be expected to increase this value (weakening reserve coverage), increasing crisis probability. A credible commitment to effective, stable policy avoiding this expansionary bias with more Veto Players under the Commitment Approach would be expected to reduce this

value. Higher values of Veto Players may also increase inertia in this reserve coverage, facilitating stability when imbalances are minimal, and preventing adjustment when conditions generate crisis probability.

Credit or asset value growth associated with excessive aggregate demand perpetuating themselves in Financial Cycles may be accelerated by the expansionary bias generated in the Collective Action Approach, increasing crisis probability, or reduced by the restrained policy expected under the Commitment Approach (Borio 2014). Further, if Credit Growth is excessive, it may be more difficult to engage in a retrenchment with higher levels of Veto Players (Inertia Model). Conversely, when Credit Growth is appropriate higher levels of Veto Players may maintain this stable condition.

The effect of Veto Players on each of these three economic fundamentals known to increase crisis probability will be estimated[1] in the Imbalance section. Next, the effect of these fundamentals on crisis probability will be estimated[2] in the Reactions section, and these two stages will be combined to find the effect of Veto Players on crisis probability working through these economic fundamentals[3]. An estimation will also be done to ascertain the effect of Veto Players on inertia in these economic fundamentals in the Adjustment section. The results of these steps will comprise the indirect effect.

3.2 Direct Effects: Reactions

Market Reactions to a given set of economic conditions comprise the direct effects component of Veto Players on crisis probability. After controlling for economic fundamentals any effect found of Veto Players on crisis probability must indicate a relationship above and beyond the effect on fundamentals themselves (or inertia in them) outlined in the previous section. Levels of Veto Players will alter market perceptions of crisis risk associated with a given set of conditions, raising (or lowering) the threshold of financial sector stress at which markets react in a way generating systemic critical behavior.

The first mechanism through which this effect works is the expectation of future fundamentals. Under the Collective Action Approach, markets will associate a higher level of Veto Players with a relatively worse state of future fundamentals, lowering the threshold of stress and economic imbalances at which crises occur. Under the Commitment Approach, markets will associate a higher level of Veto Players with a relatively stronger state of future fundamentals, raising the threshold of stress at which critical events will occur. For this effect to be supported, the sign on the linear term must be the same as that in the Imbalance section.

The second and third mechanism combine to create behavior expected under the "U-Shaped" Model. For the former of these, when these constraints are relatively low markets are unable to form stable expectations, and volatile policy may generate quickly shifting asset values or debt service costs. Both of these are likely to make markets more flighty, leading to "bank-run" type behavior at relatively lower levels of economic fundamentals or external stress. Higher levels of Veto Players, from an initially low starting point, are likely to offer increased stability that reduces crisis probability.

For the latter of these, when Veto Players are relatively low, markets will have little faith in the ability to protect the financial section in a timely fashion from any stress. Without this confidence (comparable to the effect of implicit deposit insurance) markets are more likely to believe any given level of

[1] Path A in Mediation
[2] Path B in mediation
[3] The product of Paths A and B

stress may cause a failure of financial markets, leading to "bank-run" style behavior at a lower threshold of stress. Therefore when Veto Players are higher from an initially high starting point, they are likely to reduce flexibility and increase crisis probability. These two factors taken viewed in tandem generate the implications of the "U-Shaped" Model, where higher Veto Players from a low initial value reduce crisis probability, and higher Veto Players from a high initial value increase crisis probability.

The final mechanism of the direct effect of Veto Players on crisis probability will be conditional upon the VIX, and may be considered a modifier of the second and third mechanisms. When the VIX is rising (indicating higher levels of risk and stress in the international system) the optimal level of Veto Players will likely be relatively low (to facilitate adjustment to this stress). When the VIX is falling, the optimal level of Veto Players will likely be higher, as the likelihood of needing adjustment is far lower. A higher level of Veto Players will have the effect of reducing crisis probability when the VIX is falling, but increasing crisis probability when the VIX is rising. These mechanisms[4] will be tested in the Reactions estimation then combined with the indirect effects output in the Mediation Results section.

3.3 Hypotheses

3.3.1 Crises and the Inertia Model

Hypothesis 1 *The Veto Player interaction term in the Adjustment section will be statistically significant and positive*

Hypothesis 2 *The Veto Player interaction term(s) in the Reaction section will be statistically significant and positive*

[4]Path C' in Mediation

3.3.2 Crises and the Collective Action Approach

Hypothesis 1 *The Veto Player variable in the Imbalance section will be statistically significant with a positive sign*

Hypothesis 2 *The linear Veto Player term in the Reactions section will be statistically significant with a positive sign*

3.3.3 Crises and the Commitment Approach

Hypothesis 1 *The Veto Player variable in the Imbalance section will be statistically significant with a negative sign*

Hypothesis 2 *The linear Veto Player term in the Reactions section will be statistically significant with a negative sign*

3.3.4 Crises and the Curvilinear Model

Hypothesis 1 *The linear Veto Player term in the Reactions section will be statistically significance with a negative coefficient*

Hypothesis 2 *The quadratic Veto Player term in the Reactions section will be statistically significance with a positive coefficient*

Hypothesis 3 *The marginal effects of the previous terms will be statistically significant for a not-trivial portion of the sample space*

4 Econometric Strategy

4.1 Econometric Mediation

The research design will take a form known as econometric mediation, with a separate estimation of the direct and indirect effects of some factor (in this case Veto Players) on an outcome by both working through some other factor (known as a mediator), and independent of it's effect on that other factor[5]. As the effect will be working through multiple factors, this is known as multiple mediation analysis. A visual example of this relationship, and the paths to be estimated, can be found in Figure 1. (though with three mediators, and therefore a and b paths, rather than one). The full effect coefficients (and delta method standard errors) of the political constraint variable on crisis probability will be estimated using the product of coefficients approach as outlined by Preacher and Hayes (2008).

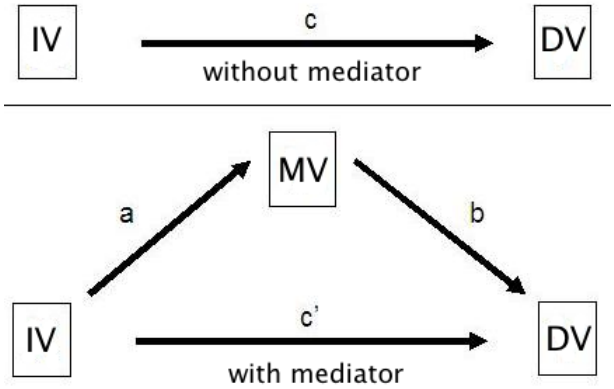

Figure 1: Statistical Mediation

The Imbalance regressions will estimate the "a" paths in the mediation analysis. The Reactions regressions will estimate the "b" and "c' " paths in the mediation analysis. After these estimations take place, the coefficients on the "a" and "b" paths for a given coefficient will be multiplied to get the full effect of political constraints on crisis probability through it's effect on the given fundamental. This will be done for Inflation, the M2 to Foreign Exchange Reserve Ratio, and Credit Growth (the three imbalance variables found to have a statistically significant effect on crisis probability in the Reactions regressions). This will be referred to as the "Indirect Effect" of political constraints through a given fundamental. These terms will be summed for the full indirect of political constraints on crisis probability. The final path ("c' ") will be the effect of political constraints on crisis probability after controlling for it's effect working through fundamentals. This will be referred to as the "Direct Effect" of political constraints on crisis probability.

Due to the use of quadratic and interaction terms in the "c' " path, the indirect effect will be added to the margins output of the Reactions regressions for political constraints for a variety of levels of political constraint and the change in the vix (the term constraints are interacted with), rather than the coefficients themselves. This will give the full effect (path "c" in the figure) for the analysis.

4.2 Models/Estimators

The estimations for the three economic fundamentals that are being tested in the imbalance section use either a two-step Arellano-Bover/Blundell-Bond (also known as a system GMM) Fixed Effects estimator for the Inflation regressions, or a two-step Arellano-Bond Fixed Effects estimator (also known as a differenced GMM estimator[6]) for the M2 to Foreign Exchange Reserve Ratio and Credit Growth regressions. The Arellano-Bover/Blundell-Bond estimator uses lagged levels of the depen-

[5]For a detailed analysis of multiple mediation, see Preacher and Hayes (2008)

[6]As these variables are a level, rather than a rate of change as it is specified in the other estimations, a "noleveleq" option is used, running the xtabond2 package as a differenced GMM

dent and independent variables to instrument differences, and lagged differences to estimate levels[7], after which a weighting matrix based on the error terms of the two estimations is used to generate coefficients (Roodman 2009). This avoids Nickell bias by instrumenting the lagged dependent variable, eliminating the correlation it would otherwise have with the error term. For a full explanation of the estimators see Roodman (2009). In the Imbalance section, these estimators are used with the lagged dependent variable with just the variable of interest, then estimated with controls.

The basic Fixed Effects Econometric Model using a lagged dependent variable for the Imbalance section is:

$$y_{it} = \beta_0 + \phi_1 y_{it-1} + \beta v_{it} + c_i + \epsilon_{it} \tag{1}$$

Where y_{it-1} is a lagged observation of the dependent variable, v_{it} is the political constraints variable, c_i is a fixed effects term, and ϵ_{it} is an idiosyncratic error term[8]. Fixed effects estimators often take the difference of the variables to eliminate the country fixed effects from the model, however when using a lagged dependent variable this leads to correlation in the error term and the lagged dependent variable, causing a bias in the coefficients of the explanatory variables. To account for this Nickell bias the y_{it-1} term is instrumented using a GMM approach. Other instruments can be included as standard, rather than GMM, instruments as well.

This process changes little with the addition of explanatory variables, and any added endogenous variables are instrumented in a way similar to the instrumentation of the lagged dependent variable. The Fixed Effects model with controls is:

$$\begin{aligned} y_{it} = \beta_0 + \phi_1 y_{it-1} + \beta_1 v_{it} + \beta_2 x_{1it-1} \\ \cdots + \beta_k x_{kit-1} + c_i + \epsilon_{it} \end{aligned} \tag{2}$$

In the Adjustment section, the variable of interest (polcon) is then interacted with the lagged dependent variable to ascertain it's effect on the inertia of previous observations of the dependent variable.

In this section the regressions will be specified as:

$$y_{it} = \beta_0 + \beta_1 y_{it-1} + \beta_2 y_{it-1} v_{it} + \beta_3 v_{it} + c_i + \epsilon_{it} \tag{3}$$

The marginal effect of the previous term's observation of the dependent variable, y_{t-1} on y_t will be:

$$\Delta y_{it} = (\beta_1 + \beta_2 v_{it}) \Delta y_{t-1} \tag{4}$$

The value of the β_1 indicates the inertia in the dependent variable, with values closer to one indicating a greater inertia. The value of β_2 indicates inertia in the dependent variable conditional upon the observed value of v. The null and alternative hypotheses will be:

$$H_0 : \beta_2 = 0 \tag{5}$$

$$H_1 : \beta_2 > 0 \tag{6}$$

A value of $\beta_2 > 0$ that is statistically significant indicates the marginal effect of y_{it-1} on y_{it} is higher in the presence of higher levels of Veto Players, as $(\beta_1 + \beta_2 v_t)$ will necessarily be larger than β_1 for all non-zero values of v, given that all values of v are greater than or equal to zero. This positive coefficient is interpreted as greater inertia in the dependent variable when institutional constraints are higher. For estimations in which we reject the null in favor of the alternative hypothesis we have evidence the effect of the previous observation of the dependent variable on the current observation is increased by greater institutional constraints. These outputs will be assessed qualitatively in the implications section, but not included in the full Mediated Results section.

[7] This step is absent in the Arellano-Bond estimator

[8] There will be no β_0 term in the M2 to Reserve Ratio and Credit Growth estimations, due to the use of a differenced vs system GMM

In order to combine the results in the Indirect Effects section with the Direct Effects section through econometric mediation, it is necessary to use a linear probability model in the Direct Effects estimation. Using econometric mediation with a linear estimator in one stage and a non-linear estimator in another stage generates estimates that are inconsistent, producing a bias in the estimated mediated values based on the magnitude and direction of the correlation between the error terms of each stage's regression (Hayes and Preacher 2008)(Hicks and Tingley 2011). As such, the Random Effects GLS estimator is used to estimate a linear probability model in the Direct Effects estimation, selected after the results of a Hausman test indicated fixed effects were unnecessary.

Lags are used for variables considered economic fundamentals to avoid endogeneity and account for the fundamentals that build into a crisis. In the Reactions section the general form of the regressions using the random effects panel model will be:

$$\begin{aligned} p_{it} = \beta_0 + \alpha_1 v_{it} + \beta_1 x_{1it-1} \\ + \ldots \beta_k x_{kit-1} + \epsilon_{it} \end{aligned} \tag{7}$$

Where v is the political constraints variable (polcon) with α_1 as the coefficient. The effect of political constraints on economic fundamentals being controlled for will not be captured in α_1. The estimation of the coefficient α_1 is done holding constant all other variables in the specification, meaning any effect of political constraints on crisis probability through these control variables will be captured in their respective coefficients in these regressions. The interpretation of this then is that α_1 is capturing the effect of Veto Players on crisis probability related to reactions to fundamentals, independent of (or above and beyond) it's effect on the fundamental itself. The variable p_{it} is the probability of a crisis in a given country year, and β_k is the coefficient on a given variable k, for all control variables in the specification from x_1 through x_k. For simplicity terms of the control variables that are tested as differences will not be addressed in this outline, as using a differenced term in a control is merely a transformation of a variable, rather than a change in the format of the specification. To capture the Indirect Effects on the sections above in this interpretation, the full effect of a change in the Veto Players variable will not be α_1 alone, but after accounting for mediation will be:

$$\Delta p_t = (\alpha_1 + \sum_{k=1}^{n} \beta_k \beta_{kf}) \Delta v_t \tag{8}$$

Where β_k is the coefficient for control variable k in these estimations, and β_{kf} is the coefficient for control variable k in the previous section's estimations of the effect of Veto Players on that given fundamental. The value n represents the sample of variables controlled for in the estimation for which the effects of Veto Players on their values were estimated in the previous imbalance section. The sum of these two coefficients multiplied for each variable having had the effect of Veto Players on fundamentals estimated for it plus the estimated value α_1 will make up the total effect of Veto Players on crisis probability, with the former making up the indirect effect through imbalances and the latter the direct effect through reactions. These full results will be reported in the Mediation Results section.

An interaction term with the difference in the VIX is added to estimate the effect of constraints on crisis probability conditional upon a shock, and vice versa. A squared term of the Veto Player variable is also added to the specification, estimating if the marginal effect of Veto Players changes at different levels of the variable. This will be used to test for support of the "U-Shaped" Model; that observations at either extreme regarding levels of constraints generate poor economic outcomes, while intermediate values generate strong economic out-

comes.

A model combining these estimations of multiple mechanisms through which Veto Players will impact crisis probability through reactions takes the form:

$$p_{it} = \beta_0 + \alpha_1 v_{it} + \alpha_2 v_{it} x_{1it} + \alpha_3 {v_{it}}^2 + \beta_1 x_{1it-1} + \ldots \beta_k x_{kit-1} + \epsilon_{it} \quad (9)$$

For the interpretation, the full effect of a change in the Veto Player variable will again not be α_1 alone, but will be:

$$\Delta p_t = (\alpha_1 + \alpha_2 x_{1it} + 2\alpha_3 v_{it} + \sum_{k=1}^{n} \beta_k \beta_{kf}) \Delta v_t \quad (10)$$

If α_2 is statistically different than zero, then levels of Veto Players have a different effect on crisis probability at different levels of the change in the VIX. A statistically significant value for α_2 is therefore evidence supporting political constraints have a different effect on crisis probability conditional upon the presence of a shock.

If α_3 is statistically different than zero, then levels of Veto Players have a changing marginal effect on crisis probability at different levels of Veto Players again independent of the effect of Veto Players on economic fundamentals. A statistically significant value for α_3 is evidence there is a significant difference in the effect of Veto Players on crisis probability for observations where the Veto Players value is relatively extreme vs intermediate (assuming the quadratic and linear term have different signs as expected). The value of this term is the full marginal effect (including the mediated effect) of a one unit higher level of Veto Players at the given value of the VIX and Veto Players.

A population averaged panel logit model will be estimated in the Reactions section as well as a robustness check.

5 Empirical Analysis

5.1 Estimation: Imbalances

The control variables in the specification testing for (logged) inflation were generated based on previous studies testing the determinants of inflation[9]. After the initial estimations of purely the variable of interest (polcon - the Veto Player variable) and a lagged dependent variable[10] to control for inertia in the dependent variable, the sets of controls[11] are added. A full data description can be found in Appendix A

Any elements of the effect of Veto Players on the dependent variable may be in fact operating through the other dependent variables being controlled for (as this effect - working through policy as it does - will necessarily be very indirect), which must be considered when interpreting regression results. Therefore the estimates before controls are added are of particular interest. The regression[12] including the variable by itself indicates a one standard deviation increase in Veto Players is associated with approximately a .11, or 11%, reduction in inflation. When controls are added the variable loses statistical significance, indicating the effect of Veto Players on inflation may operate through the variables being controlled for. This gives some support for the Commitment Approach on the effect of Veto Players on inflation, with higher levels of constraints associated with lower levels of inflation. As this represents one of the "a" paths in statisti-

[9] Cottarelli (1998).

[10] Instrumentation described and discussed in Appendix D.

[11] Instrumentation is unchanged

[12] Postestimation results for all regressions are discussed in Appendix C

Table 1: Imbalances

VARIABLES	lnI	FX Ratio	CG	lnI C.	FX Ratio C.	CG C.
polcon	-0.319**	-0.938***	-0.644**	-0.324	-0.708*	0.838
	(0.142)	(0.319)	(0.273)	(0.227)	(0.405)	(0.789)
L.lnI	0.812***			0.778***		
	(0.0683)			(0.0616)		
L.lnM2Res		0.596***			0.450***	
		(0.165)			(0.154)	
LD.lnCtoGDP			0.119***			0.0671
			(0.0407)			(0.122)

Robust Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

cal mediation, in the later chapters the coefficient of the specifications without controls will be used to estimate the indirect effect of the level of institutional constraints on crisis probability.

For the (also logged) M2 to Foreign Exchange Reserve Ratio, control variables have been generated again from prior estimations[13]. In the first specification the political constraints is tested only with only the lagged dependent variable (for the former) initially, then the controls are added.

The regression including the variable by itself indicates a one standard deviation increase in Veto Players is associated with approximately a .31, or 31%, reduction in the change in the M2 to Foreign Exchange Reserve Ratio from the previous change. When controls are added the variable passes a lower threshold of statistical significance with a lower coefficient, indicating the effect of Veto Players on the M2 to Foreign Exchange Reserve Ratio may operate through the variables being controlled for. This gives support for the Commitment Approach, with higher levels of constraints associated with more reserve coverage. As with the inflation regression, in the later chapters the coefficient of the specifications without controls will be used to estimate the indirect effect of the level of institutional constraints on crisis probability.

For the differenced (again logged) Credit as a portion of GDP estimation, control variables have been generated again from prior estimations[14]. In the first specification the Veto Player is tested only with only the lagged dependent variable, then the controls are added.

The regression including the variable by itself indicates a one standard deviation increase in Veto Players is associated with approximately a .21, or 21%, reduction in the change in the differenced Credit to the private sector from the previous year's change. When controls are added the variable no longer meets the threshold of statistical significance and the coefficient changes signs, indicating this result should be interpreted tentatively. This gives some support for the Commitment Approach on the effect of Veto Players on credit growth, with higher levels of constraints associated with lower levels of Credit Growth. As this represents one of the "a" paths in statistical mediation, in the later chapters the coefficient of the specifications without controls will again be used to estimate the indirect effect of the level of institutional constraints on crisis probability.

[13] Control Variables based Lane (2001).

[14] Cottarelli 2005.

5.2 Estimation: Adjustment

Instrumentation will be the same for each variable as in the previous section[15]. For all specifications, the political constraint variable indicates the expected negative sign from the previous chapter, while the interaction term displays the expected positive coefficient associated with a higher level of inertia in the dependent variable in the presences of higher levels of Veto Players.

Compared to the estimation in the imbalance section with no controls, the coefficients of the lagged dependent variables are small, having fallen from above .8 to about .3 for the Inflation regression, .12 to statistically zero in the Credit Growth regression, and .6 to again statistically zero in the M2 to Foreign Exchange Reserve Ratio regression. The interaction term, however, is significant, and indicates the correct sign in all. With a positive coefficient on this term, we see the effect of the previous term's observation of the dependent variable on the current term is magnified by the presence of institutional constraints. In other words, with higher political constraints, the variable in question has more inertia - it's value is more dependent upon the previous period's value[16].

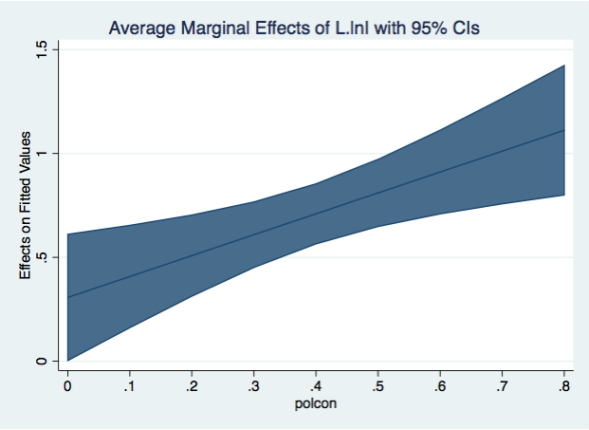

Figure 2: Inflation

Analyzing the marginal effects graph for the Inflation variable (Figure 2.) shows a higher marginal effect of the previous period's observation of the dependent variable on the current period's observation of the dependent variable when political constraints are higher. The scale goes from the minimum observed value of the political constraints variable, to approximately the 95 percentile. With the higher level of constraints demonstrating larger marginal effects of a change in the previous observation, the inertia approach's hypothesis is supported. Though the marginal effects are larger than one for extreme values of political constraints, the large negative coefficient on political constraints will prevent the expected values from diverging once this is taken into account.

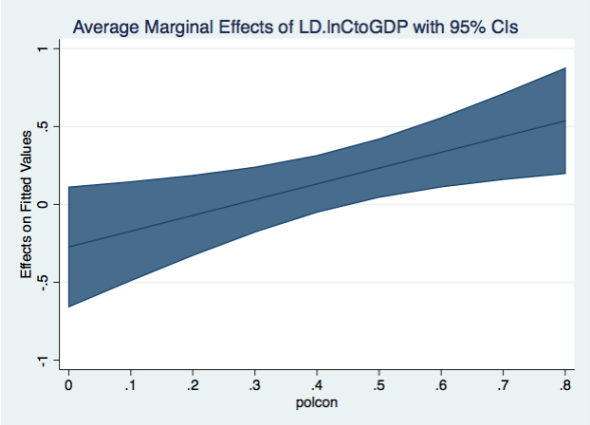

Figure 3: Credit Growth

Analyzing the marginal effects graph for the Credit Growth variable (Figure 3.) also shows a higher marginal effect of the previous period's observation of the dependent variable on the current period's observation of the dependent variable when political constraints are higher. However, the effect is only statistically different from zero when political constraints approach .5, indicating there is only inertia in the change in Credit Growth when political constraints are relatively high. This also supports the inertia approach's hypothesis, showing the previous level of Credit Growth is only a determinant of current Credit Growth in the presence of institutional constraints reinforcing this growth.

[15] A detailed discussion can be found in Appendix D
[16] See Appendix C for a discussion of postestimation tests

Table 2: Inertia

VARIABLES	Credit Growth	Inflation	M2Res
cLD.lnCtoGDP*c.polcon	1.012**		
	(0.399)		
cL.lnI*c.polcon		1.006***	
		(0.347)	
cL.lnM2Res*c.polcon			2.101*
			(1.177)
LD.lnCtoGDP	-0.273		
	(0.196)		
L.lnI		0.307**	
		(0.155)	
L.lnM2Res			0.0556
			(0.360)
polcon	-0.228	-2.580***	-3.557*
	(0.332)	(0.800)	(1.899)

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

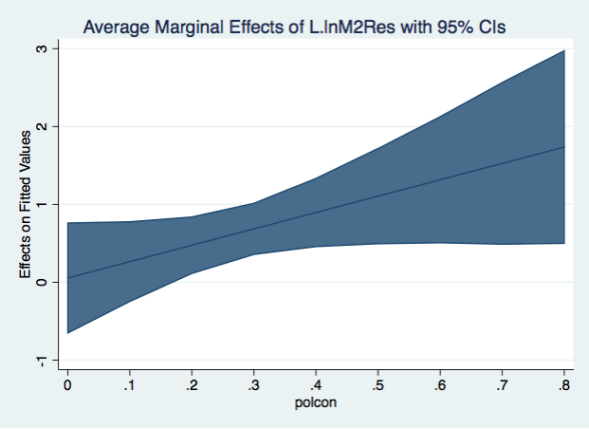

Figure 4: M2 to Foreign Exchange Reserve Ratio

The marginal effects graph for the M2 to Foreign Exchange Reserves Ratio (Figure 4.) is similar to the Inflation marginal effects graph. The previous change in the the ratio from the previous year only has a marginal effect on the present change from the previous year in the presence of institutional constraints. This effect does not show statistical significance until the constraints variable is approximately .2, through the effect is greater than 1 at approximately .5 indicating results should be interpreted with caution. However, much as with the Inflation marginal effects, the large negative coefficient on political constraints will prevent the expected values from diverging once this is taken into account. Thus supports the hypothesis of the inertia approach for the variable indicating reserve coverage.

There is support for the idea that institutional constraints impact inertia in inflation. When constraints are higher, the current inflation rate will be more dependent upon the previous observation. When constraints are low, there is a far weaker relationship between the current and previous changes. In addition to this measured initial effect of political constraints on inertia, markets (observing this) are likely to react differently to inflation (or the lack thereof) in relatively constrained vs unconstrained countries (though this is not tested in these specifications).

Given this result, there is support for the idea

that institutional constraints have an effect on the inertia in economic fundamentals included in the mediation analysis. When constraints are higher, the current observation of the variables will be more dependent upon the previous observations (or the previous observations in the change of them). When constraints are low, there is little relationship between the current and previous levels or changes. In addition to this measured initial effect of political constraints on inertia, markets (observing this) will likely react differently to reserve weakness (or strength) in relatively constrained vs unconstrained countries.

5.3 Estimation: Reactions

The control model was put together based on variables common in the banking crisis literature[17] after which the variable of interest was added. A logitit[18] is estimation is included as a robustness check. Reporting of variables[19] not used in interaction terms or mediation are eschewed for space concerns, though can be found in Appendix B. A full data description can be found in Appendix A.

The ratio of the money supply to foreign exchange reserves shows up as significant and positive, indicating a smaller buffer for external imbalances may lead to increased risk evaluations that generate bank runs or shocks to asset values leading to Banking Crises. A similar mechanism may be in play with the change in the VIX (the variable included as a measure for international shocks), with higher values indicating increased risk, lowering asset values through a reduction in the risk adjusted return given a nominal rate of return and leading to insolvency or illiquidity as debt service costs rise with the increased risk. The credit growth variable shows up as statistically significant and positive, supporting previous findings that excessive earlier credit growth increases crisis probability. Inflation is statistically significant and positive, with higher inflation potentially leading to monetary contractions that generate crises, or weakening confidence in the economy as a whole.

When the Veto Players variable ("polcon") is added, the controls remain fundamentally unchanged, and the term doesn't display statistical significance. After a quadratic term is added, however, a U-Shaped relationship between political constraints and crisis probability is seen, with the probability falling initially from a beginning point of low constraints, then rising when a threshold of constraints is crossed due a negative linear coefficient and positive quadratic coefficient (both of which are statistically significant)[20].

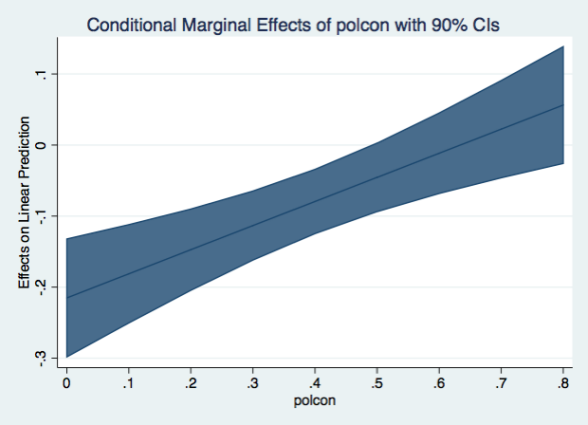

Figure 5: Marginal Effect Political Constraints (D.VIX = -6) (Full Model)

However, in order to assess the significance of a variable included in three terms in these regressions, evaluating conditional marginal effects is necessary. The marginal effect of a change in political constraints on crisis probability is shown in Figure 5 (for the linear probability model), and Figure 6 (for

[17] Based on Demirg-Kunt and Detragiache with additional explanatory variables added, then AIC/BIC tests performed after to remove unnecessary regressors (1997)

[18] Population averaged panel logit

[19] Including three variables critical based on theory, but proving problematic due to poor coverage limiting sample size - tested individually in specifications 4-6

[20] Null results using interaction terms to test for the reactions element of the adjustment effect are not reported.

Table 3: Reactions: Banking Crises

VARIABLES	Linear	Full	Logit	Int. Rate	Fin Reform	EFI
polcon	-0.00526	-0.146***	-4.079***	-0.105*	-0.146**	-0.175***
	(0.0141)	(0.0422)	(1.513)	(0.0569)	(0.0601)	(0.0504)
polcon*polcon		0.170***	4.404**	0.113*	0.180**	0.192***
		(0.0526)	(1.874)	(0.0665)	(0.0709)	(0.0598)
polcon*D.vix		0.0116***	0.224***	0.00879**	-0.000199	0.0131***
		(0.00387)	(0.0805)	(0.00400)	(0.00719)	(0.00465)
L.lnM2Res	0.0117***	0.00970**	0.201*	0.00757*	0.00530	0.00997*
	(0.00395)	(0.00404)	(0.114)	(0.00455)	(0.00477)	(0.00526)
LD.lnCtoGDP	0.0389***	0.0403***	1.319***	0.0340**	0.0449**	0.0528***
	(0.0137)	(0.0134)	(0.394)	(0.0158)	(0.0195)	(0.0178)
L.lnI	0.0103***	0.0106***	0.313***	0.0129***	0.00758*	0.00935***
	(0.00322)	(0.00303)	(0.0756)	(0.00416)	(0.00418)	(0.00355)
D.vix	0.00314***	-0.00175	-0.0167	-0.00103	0.00393	-0.00207
	(0.000995)	(0.00143)	(0.0471)	(0.00144)	(0.00377)	(0.00185)
Constant	-0.0593*	-0.0380	-5.957***	-0.0628	0.0193	0.00527
	(0.0316)	(0.0330)	(1.164)	(0.0410)	(0.0503)	(0.0443)
Observations	1,856	1,856	1,856	1,195	1,070	1,504
Countries	125	125	125	110	76	107

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

the panel logit model) when the VIX falls by 6, approximately at the 10th percentile of observations. The indirect effects have not yet been accounted for in these marginal effects.

In the linear probability model, the marginal effect is statistically significant and negative until the political constraints variable is at approximately .5, at which point there is no statistically significant marginal effect. In times of reduced international risk and volatility (i.e. little in the way of international shocks are generating stress in a country's banking sector), higher levels of constraints help to insulate countries with low levels of constraints from domestic volatility that may drive Banking Crises, independent of the effect these lower levels of constraints are shown in previous sections have in reducing the imbalances in economic fundamentals that generate stress in a country's financial system.

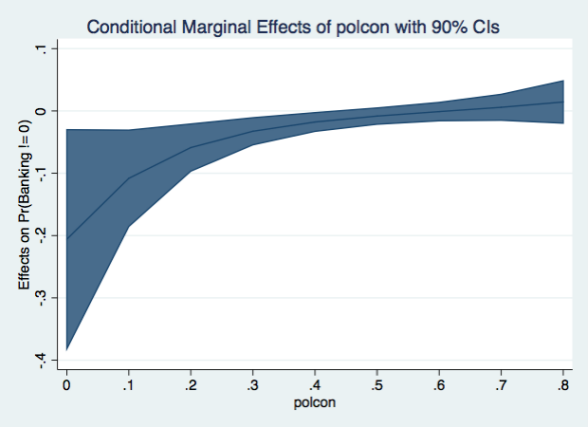

Figure 6: Marginal Effect Political Constraints (D.VIX = -6) (Logit)

When constraints are already high, a further increase in constraints will do little in the way of preventing further domestic volatility and risk. Graphed on a scale showing crisis probability based

on levels on constraints (instead of the marginal effect), this would create a "U-shaped" figure - supporting the "U-shaped" hypothesis. The same relationship is shown in the logit specification. However, the marginal effect loses statistical significance at a slightly lower level of institutional constraints.

When the VIX is increasing by 6 (approximately the 90th percentile of observations), the relationship exhibits a similar trend, with rather different levels. Increases in political constraints when constraints are low are not shown to have a statistically significant marginal effect, but when constraints rise above approximately .4, higher constraints are associated with a positive and statistically significant marginal effect on crisis probability in the linear probability model (Figure 7.). In times of relatively high global risk and volatility (i.e. there is much in the way of international shocks generating stress in a country's banking sector), more constrained countries are less able (and generate less confidence from markets) in their ability to respond to changing conditions and stress upon the banking system, and become more exposed to crisis incidence as constraints rise further.

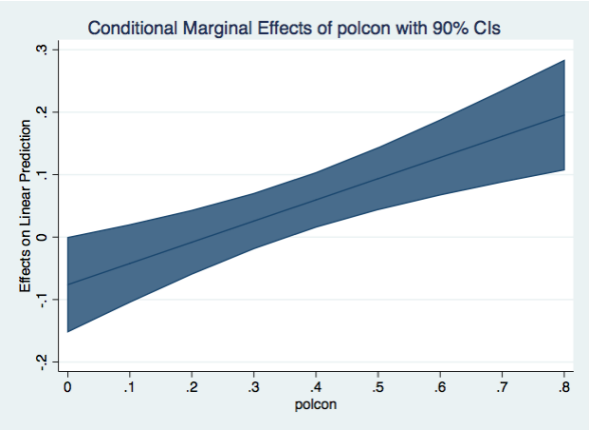

Figure 7: Marginal Effect Political Constraints (D.VIX = 6) (Full Model)

This relationship is again robust to the estimation with the logit model (Figure 8.). However, in the logit model higher levels of constraints aren't shown to increase crisis probability until constraints are higher than approximately .5. These findings again support the "U-Shaped" hypothesis, with higher constraints tending to increases crisis probability (given the increase in the VIX) only when constraints are already high and potentially impeding stress response.

Perhaps more interesting, in both the linear probability (Figure 9.) and the logit model (Figure 10.), the linear term of the change in the vix loses significance, indicating an increase in the vix only has a measurable effect on crisis probability when institutional constraints are in place slowing policy response to the shock. This may be a perhaps more interesting response, that the effect of global risk and volatility on crisis probability in a country is heavily conditional upon it's political system.

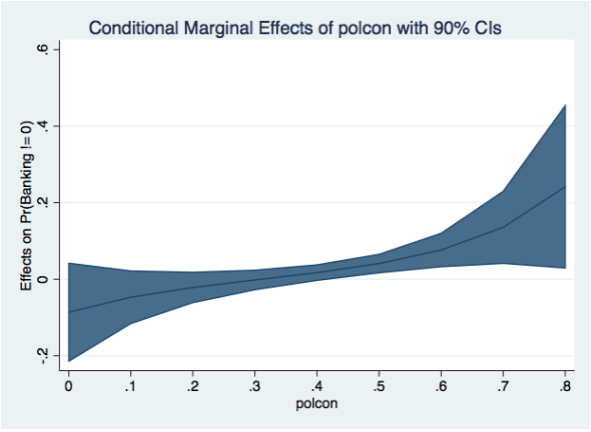

Figure 8: Marginal Effect Political Constraints (D.VIX = 6) (Logit)

As seen in Figure 9. and Figure 10., when constraints are low the marginal effect of an increase in the vix on crisis probability is not statistically different from zero. When constraints rise above (approximately) the mean, the marginal effect becomes statistically significant, and rises as constraints rise further. This finding is again supported in both the linear probability and the logit model.

The results of the Reactions section support the "U-Shaped" hypothesis - that the marginal effect

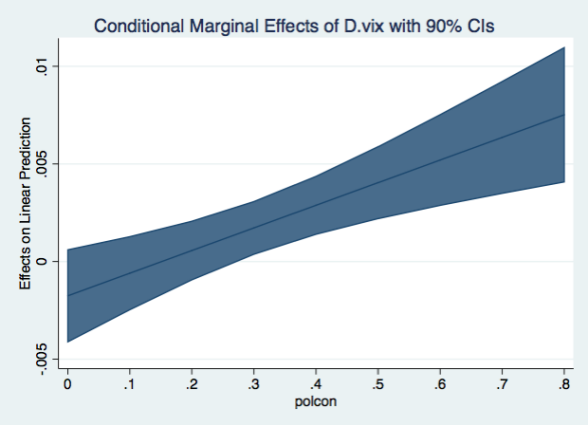

Figure 9: Marginal Effect D.VIX (Full Model)

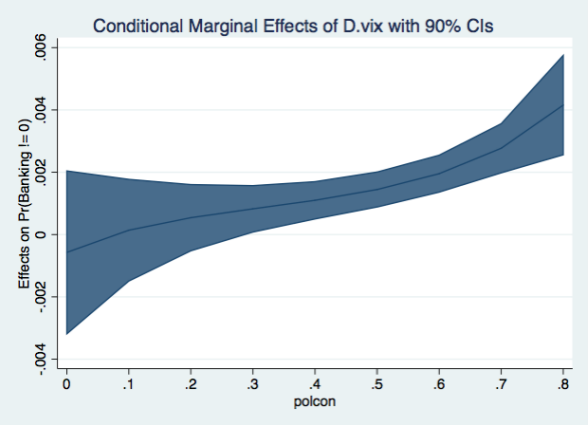

Figure 10: Marginal Effect D.VIX (Logit)

of increases in constraints tends to be negative in the presence of low levels of constraints, and positive in the presence of high levels of constraints. By preventing potential adjustment and enforcing policy rigidity, excessively high levels of constraints reduce faith the financial system and increase crisis probability. By generating policy volatility and reducing the formation of stable expectations, excessively low levels of constraint also increase crisis probability. When international shocks are present, the scale tilts to markets preferring relatively low levels of constraint to create confidence in the ability to respond to changing condition.

When international shocks are not present, the scale tilts to markets preferring relatively higher levels of constraint to facilitate the formation of stable expectations. In reacting to international shocks, markets tend to consider the increased volatility as a factor increasing crisis probability only when the political system is constrained from being able to respond to a stressed financial sector.

Table 4: Full Marginal Effects at D.VIX = -6

Polcon	Direct	Full	$\Delta 1SD$
0	-0.2150***	-0.2533***	-8.28***
	(0.0505)	(.0510)	
.25	-0.1300***	-0.1683***	-5.50***
	(0.0318)	(.0337)	
.5	-0.0455	-.08384***	-2.74***
	(0.0293)	(.0325)	
.75	0.0393	.001	.03
	(0.0457)	(.0486)	

Delta Method Standard Errors

*** p<0.01, ** p<0.05, * p<0.1

6 Mediation Results

Once the indirect effects from the econometric mediation are calculated[21] and taken into account, the picture becomes more interesting. After calculating the indirect effects by multiplying the "a" path coefficients by their respective 'b" path coefficients, then summing the three terms, the effect of a one unit change in constraints on crisis probability purely through the indirect Imbalance effects is approximately .04, or 4 percentage points. Compared to the unconditional crisis probability of about 3 percentage points, these changes are far from economically insignificant, as this one standard deviation (approximately .3) higher level of Veto Players reduces crisis probability by almost 40 percent from it's unconditional value.

[21] discussed and shown in Appendix E

To display the full mediated marginal effects of constrains on crisis probability, marginal effects tables were generated. The first of these, Table 4., shows the mediated marginal effects at a fall in the VIX of 6. The second of these, Table 5., shows the mediated marginal effects with no change in the VIX. The last of these, Table 6. shows the mediated marginal effects at an increase in the VIX of 6. The column labeled "Direct" for each indicates the direct marginal effects purely from the Reactions regressions estimated in the section above. The column labeled "Full" for each table adds the direct marginal effect and the indirect marginal effect[22]. The column labeled "$\Delta 1SD$" shows the full effect (path "c")on crisis probability (expressed in percentage points) of a one standard deviation increase in constraints.

Table 5: Full Marginal Effects at D.VIX = 0

Polcon	(1) Direct	(2) Full	(3) $\Delta 1SD$
0	-0.146***	-0.1843***	-6.03***
	(0.0422)	(0.0430)	
.25	-0.0608***	-0.0991***	-3.24***
	(0.0193)	(0.0226)	
.5	0.0240	-0.0143	-.47
	(0.0185)	(0.0236)	
.75	0.109***	0.0707	2.31
	(0.0411)	(0.0444)	

Delta Method Standard Errors

*** p<0.01, ** p<0.05, * p<0.1

When the VIX is falling, an indication of lower levels of international risk and volatility stressing a financial sector, the full effect of a increase in Veto Players tends to be negative and reasonably large. When the value is at the minimum, a one standard deviation increase in constraints reduces probability by almost a full 10 percentage points. While this value falls as the level rises, at no point does the full effect exhibit a statistically significant and positive marginal effect.

When the VIX is neither increasing nor decreasing, we can see a nice illustration of the "U-Shaped" effect. Though the Direct Effects exhibit statistical significance at either extreme, once the Indirect Effects are added it's only at low levels of constraint that a statistically significant marginal effect exists - the indirect effects reduce the direct effect enough at high levels of constraints to make the full effect lose statistical significance, though the marginal effect is close enough to statistical significance a slight increase in the VIX or a slightly higher level of constraints would push the full effect to statistical significance.

When the VIX is increasing by 6, the marginal effects of a one standard deviation increase in constraints is statistically signifiant and negative when constraints are very low, and statistically significant and positive when constraints are high. Both the marginal effect at zero, and the marginal effect at the reported maximum, are larger in absolute value terms than the unconditional crisis probability.

The mediated results don't display outputs fundamentally different than what can be inferred by analyzing the different steps of the mediated analysis, but utilizing the marginal effects of the Reactions output with the full Indirect Effect allows to develop point estimates of a full effect after accounting for mediation, as well as the standard error and statistical significance of this effect. It can be clearly seen that the marginal effect of political constraints is different after accounting for mediation than it is before, and that the marginal effects of constraints are heavily dependent both on the level of constraints and the shocks/volatility present in the system.

[22]The Standard Error of this term is calculated using the Delta Method, discussed in Appendix E

Table 6: Full Marginal Effects at D.VIX = 6

Polcon	(1) Direct	(2) Full	(3) $\Delta 1SD$
0	-0.0761*	-0.1144**	-3.74**
	(0.0458)	(0.0467)	
.25	0.00872	-0.0296	-.96
	(0.0285)	(0.0311)	
.5	0.0935***	0.0552	1.81
	(0.0300)	(0.0337)	
.75	0.178***	0.1340***	4.38***
	(0.0487)	(0.0517)	

Delta Method Standard Errors

*** p<0.01, ** p<0.05, * p<0.1

Inertia in Inflation, Credit Growth, and the M2 to Foreign Exchange Reserve Ratio can be analyzed by combining the direct effect estimations with the analysis from Section 5.2. Higher levels of all three have a positive effect on crisis probability, and higher levels of constraints have been shown to significantly increase the inertia in each variable. With a higher level of institutional constraints values of these variables from period to period are less likely to change. If a country is exhibiting weakness in these fundamentals, the higher constraints will increase crisis probability. If a country is in a strong position with respect to the fundamentals, the higher level of constraints will reduce crisis probability again by reducing the change in these variables from year to year.

Unlike as in the imbalances section, the estimated values with regard to the inertia of these variables are difficult to interpret in the context of these crisis probability estimations, although the economic significance of increased inertia in these crisis determinants is clear conceptually.

7 Implications/Conclusions

7.1 Indirect Effects of Veto Players

By constraining attempts of policymakers to engage in expansionary policy, higher levels of Veto Players reduce crisis probability through the indirect Imbalance mechanism. In line with the Commitment Approach, higher levels of constraint create a credible commitment to long-sighted policy, reducing the growth of imbalances such as inflation, excessive credit growth, and poor foreign exchange reserve coverage. Cumulatively a one standard deviation increase in constraints is associated with a reduction in crisis probability of approximately 1.3 percentage points through the Imbalance mechanism, a not insignificant amount relative to the unconditional crisis probability of approximately 3 percent.

By increasing the marginal effect of the previous observation of inflation, credit growth, or change in the foreign exchange reserve coverage on the present observation, higher levels of institutional constraint increase inertia in these key fundamental factors through the Adjustment mechanism. Marginal effects on crisis probability are difficult to interpret quantitatively, but this finding is broadly in line with the Inertia Model. Inertia in key fundamentals can be a double-edged sword with respect to crisis probability. When fundamentals are strong and shocks are small, inertia can minimize the generation of imbalances that may lead to crises. When fundamentals are weak and/or shocks are large, inertia can prevent critical policy adjustment to these shocks or imbalances that push countries beyond the threshold of stress at which crises occur.

7.2 Conditional Effects of Veto Players

Through the Reactions mechanism, when levels of Veto Players are low a higher level of these constraints reduces crisis probability, but when Veto Players are high a further higher level will increase crisis probability. A large portion of Banking Crises are result of some large shift in asset/collateral values generating solvency issues, or bank run type shocks generating liquidity issues. On the former extreme (low constraints) quickly shifting policy may cause political shocks to asset values, creating a higher probability of a crisis when Veto Players are low through the effects of policy volatility on banks' balance sheets.

On the latter extreme, countries with extremely rigid political systems may find it difficult to generate confidence in markets that they will overcome the collective action problem inherent in passing policy to insulate/protect a stressed banking sector - leading to a lower threshold of stress for bank runs to occur, and therefore increasing crisis probability. Together, these two factors generate a "U-shaped" (or Curvilinear) relationship between Veto Players and Banking Crisis probability - in line with this Veto Player model. The changes in crisis probability are highly conditional, but without the presence of an international shock the effect of a one standard deviation increase in constraints ranges from a reduction of six percentage points (when constraints are low) to an increase of over two percentage points (when constraints are high).

The effects of Veto Players are also conditional upon shocks (changes in the VIX). Higher levels of Veto Players reduce crisis probability in the presence of stabilizing conditions (a falling VIX) by reducing domestic policy volatility and the expectation thereof. Higher levels of Veto Players increases crisis probability in the presence of shocks (a rising VIX) by reducing the ability of policymakers to respond to shocks, lowering market confidence in banking sector stability for any given shock.

7.3 Conditional Effects of the VIX

The effect of shocks (changes in the VIX) on crisis probability is also conditional upon levels of Veto Players. Increased risk/expected volatility, and the effect this is likely to have on the stress in a banking sector, is only important when a country's political system is more constrained and unable to respond to the shift in risk's effect on the banking sector's balance sheet or liquidity. It's likely this effect operates through reactions - as a country's banking sector comes under stress from this shift in risk, international markets only expect it to be problematic if the country is more constrained, and therefore only engage in substantial withdrawals (creating liquidity stress) if the political sector is unable to generate confidence it will protect the banking sector. This supports a reactions oriented approach to the "flexibility vs rigidity" framework associated with the "U-Shaped" Model, with markets only increasing stress upon a banking sector given an exogenous shock if these institutional constraints are expected to impede policy responses.

7.4 Conclusion

Institutional structures are an important element of Banking Crises. In a crisis style generated by imbalances, shocks, and market reactions to them pushing stress beyond a threshold where crises occur, political factors are an important (and often underrated) element of crisis incidence. By reducing economic and financial imbalances, higher levels of Veto Players reduce crisis probability. By impeding policy adjustment to shocks or (good or bad) economic fundamentals, higher levels of Veto

Players impact crisis probability in a manner conditional upon the state of fundamentals or imbalances. By provoking different market reactions to the aforementioned, higher levels of Veto Players impact the level of stress associated with a given shock or imbalance, and whether this crosses the threshold of stress at which crises occur. As political behavior is guided by the structure politics and policy operate within, the variable measuring how constrained this system is should be expected (and is found) to be an important element in crisis incidence.

Appendices

A Data Description/Sources

Panels nominally run from 1970 to 2012, and include all countries in the IMF's systemic crisis database - though they are unbalanced due to missing observations. Some variables' observations begin after 1970 (e.g. the vix), meaning regressions including these variables don't contain observations for the whole time period. Summary statistics for the observations used in each specification are reported in the relevant table.

The crisis variable is from the IMF's systemic crisis database, coded by Laevan and Valencia as a 1 if two conditions are met: Significant signs of distress in the banking system (as indicated by significant bank runs, losses in the banking system, and/or bank liquidations), and significant policy intervention measures in response to significant losses in the banking system. The data used in the full specification of probability model regressions contains 59 crisis instances. The variable of interest (Veto Players) is political constraints (POLCON - V) from Heinzs (2006). It is coded based on data available on January 1st of the given year, with higher values corresponding with more institutional or partisan constraints (after adjusting for similarity of policy preference) - hence the choice to not include it as a lagged term.

The first control variable tested through the mediation analysis is the (logged) M2 to Foreign Exchange Reserve ratio, labeled lnM2Res, from the World Bank's World Development Indicators. Next is the difference in the logged Credit to the Private Sector as a percentage of GDP (labeled d.lnCtoGDP), again from the World Bank's world development indicators, in order to account for the effect of credit growth relative to previous levels. The final variable tested through mediation analysis is logged inflation (lnI - also from the World Bank), which is important to control for as a strong sign of weak economic fundamentals. All are tested as lagged variables to avoid endogeneity and account for their role as economic imbalances building crisis vulnerability.

The primary measure accounting for shocks is the VIX, a measure of international financial market risk and volatility. The VIX is included as a differenced term (labeled d.vix) instead of as a regular term since the operative mechanism is likely to be the increased risk's negative effect on asset values (and therefore balance sheets), rather than the higher risk's effect on the likelihood of speculative attacks as in Currency Crises. As changes in the vix are a proxy for a global shock, this is the measurement indicating the effect of international shocks on generating stress in the banking sector.

Control variables representing economic fundamentals are next on the list. Logged Real GDP Per Capita (lnRGDPPC) is generated from the Penn World Tables, to account for the effect of levels of development on crisis probability. A measure of exchange rate overvaluation from Rodrik (labeled

Table 7: Summary Statistics: Crisis Regressions

VARIABLES	(1) N	(2) mean	(3) sd	(4) p10	(5) p90
banking	1,856	.0315	.1755	0	0
polcon	1,856	0.421	0.297	0	0.769
d.vix	1,856	0.750	5.099	-5.310	5.920
l.Growth3RA	1,856	2.368	4.954	-2.091	6.984
l.lnM2res	1,856	1.309	0.948	0.259	2.376
l.d.lnCtoGDP	1,856	0.0219	0.238	-0.169	0.233
l.lnI	1,856	1.875	1.385	0.371	3.439
l.lnRGDPPC	1,856	8.544	1.086	7.073	10.12
l.lnreer_ov	1,856	-0.186	0.732	-0.727	0.413
l.finreform_n	1,070	0.664	0.214	0.381	0.952
l.efi	1,504	6.161	1.082	4.700	7.500
l.d.lnRIntRate	1,195	-0.0599	0.752	-0.803	0.708
Countries	125	125	125	125	125

Table 8: Summary Statistics: Imbalances and Adjustment

VARIABLES	(1) N	(2) mean	(3) sd	(4) p10	(5) p90
polcon	5,551	0.360	0.328	0	0.769
Int. Rate	3,501	6.334	20.05	-4.530	18.08
M2Growth	4,554	41.72	317.1	3.091	45.74
Trade/GDP	5,109	76.07	51.03	30.27	129.7
Manu VA/GDP	4,055	15.44	7.226	6.334	24.69
Deficit/M2	4,491	12.12	156.3	-9.691	23.66
finreform_n	2,547	0.499	0.298	0.0952	0.905
vix	3,259	20.44	5.910	12.81	27.29
lnI	4,683	2.029	1.320	0.586	3.437
Growth	4,620	1.905	7.330	-5.074	7.881
lnRGDPPC	4,772	8.530	1.132	7.047	10.09
lnM2Res	4,453	1.434	1.061	0.294	2.742
HFix	4,643	0.382	0.486	0	1
REER	4,724	-0.758	0.730	-1.481	0.0557
d.lnCtoGDP	4,747	0.0245	0.249	-0.138	0.203
Countries	125	125	125	125	125

"lnreer_ov") is generated by estimating the deviation from purchasing power parity after accounting for Balassa-Samuelson of a country's real effective exchange rate, also constructed using data from the Penn World Tables (2009). Lastly, this same data source is used to generate a three year rolling average of Real GDP Per Capita Growth (Growth3RA) as a final control. All are lagged.

Three further controls with coverage too sparse to keep in the full regression (but theoretically important enough for it to be necessary to include them) were tested individually in specifications 4 through 6. The first is a lag of the logged interest rate from the World Bank. The second is a measure of financial liberalization from the IMF (finreorm_n) (Abiad 2008). Lastly, is a measure of economic freedom from the Fraser institute, coded "efi".

For the Imbalance and Adjustment sections, summary statistics are listed in Table 8. Polcon, the VIX, logged real GDP Per Capita, the financial liberalization variable, the real effective exchange rate, the log of inflation, credit growth, and the M2 to Foreign Exchange Reserve Ratio are all under the same label and are the same variable - only with more observations now that this table is the full dataset rather than just what was used in the Banking Crisis regressions (some may be included as a level rather than a difference). Due to missing observations for certain variables, panels will be unbalanced.

New variables included are the real interest rate (Int. Rate - this time in standard units, not logged), again from the World Bank. M2 Growth (M2Growth), also from the World Bank, is measured as a the percent change in the M2 from the previous year. A variable measuring openness, Trade as a percentage of GDP (Trade/GDP) is also from the World Bank and is tallied as imports plus exports divided by GDP. The next variable is manufacturing value added (Manu VA/GDP), also from the World Bank and tallied as a percentage of GDP.

To measure inflationary pressure due to deficits, a measure of fiscal deficits as a portion of the M2 (Deficit/M2) is included from the World Bank as well. A second growth term was also generated from the Penn World Tables, this time measuring real GDP per Capita growth in a given year (Growth). Lastly, a term from Reinhart and Rogoff's exchange rate regime dataset was generated to create a dummy variable equalling a one if a country has a Fixed Exchange Rate (HFix).

B Full Output Tables

Tables included throughout Appendices.

C Postestimation

C.1 Imbalances

For the Inflation estimations, the Hansen Test indicates a p-value .17, meeting the threshold of instrument validity. Arellano-Bond test autocorrelation indicates 1st order autocorrelation in the first differences, but not second order, as expected.

Regarding the Difference-in-Hansen testes of instrument exogeneity of instrument subsets, the GMM instruments for levels indicate a p-value of .58, suggesting validity. The GMM instruments for differences of the lagged dependent variable and political constraints of lags 2 through 6 have a p-value of .42, again suggesting exogeneity. Growth and Growth in the M2 are also specified as GMM instruments with lags 2 through 4, showing a p-value of .55. The final GMM instrument is the 2nd lag

Table 9: Product of Coefficients Results

VARIABLES	Path A	Path B	Sobel Output
Inflation	-.319**	.0103***	-.00329*
	(.142)	(.00322)	(.00179)
M2 Ratio	-.938***	.0097**	-.0091*
	(.319)	(.00404)	(.00489)
Credit Growth	-.644**	.0403***	-.02595*
	(.273)	(.0134)	(.014)
Pooled Effect	-	-	-.03834**
	-	-	(.01528)

of the real interest rate, with a p-value of .77. The standard instrumental variables are logged real gdp per capita, deficit as a portion of the M2, and Manufacturing value added. These show a p-value of .46.

For the Credit Growth estimations, the Hansen Test indicates a p-value .6, meeting the threshold of instrument validity. Arellano-Bond test autocorrelation indicates 1st order autocorrelation in the first differences, but not second order, as expected.

Regarding the Difference-in-Hansen testes of instrument exogeneity of instrument subsets, the GMM instruments for difference in the lagged dependent variable indicate a p-value of .88, suggesting validity (as the null is exogeneity). The GMM instruments for differences of political constraints of lags 1 through 5 have a p-value of .22, again suggesting exogeneity. M2 Growth is specified as a standard IV, and indicates a p-value of .64. Manufacturing value added is also specified as a standard IV, with a p-value of .34. Logged Real GDP Per Capita is a standard IV with a p-value of .47. The VIX is the final standard IV, with a p-value of .67.

For the M2 to Foreign Exchange Reserve estimations, the Hansen Test indicates a p-value .37, meeting the threshold of instrument validity. Arellano-Bond test autocorrelation indicates 1st order autocorrelation in the first differences, but not second order, as expected.

Regarding the Difference-in-Hansen testes of instrument exogeneity of instrument subsets, the GMM instruments of the lagged dependent variable lags 1 through 6 indicate a p-value of .5, (narrowly) suggesting validity. The GMM instruments of political constraints of lags 1 through 6 have a p-value of .38, again suggesting exogeneity. Lagged Growth in the M2 is specified as a GMM instrument, showing a p-value of .72. Change in the Real Interest Rate is specified as a standard instrument, showing a p-value of .07.

C.2 Adjustment

For the Inflation estimations, the Hansen Test indicates a p-value .08, meeting the threshold of instrument validity. However, the null is validity, indicating a p-value of .08 would indicate a value that extreme would only occur if instruments were truly exogenous 8% of the time, suggesting results should be interpreted cautiously. Arellano-Bond test autocorrelation indicates 1st order autocorrelation in the first differences, but not second order, as expected.

Table 10: Correlation Matrix

	polcon	lnC/GDP	lnI	lnM2Res
polcon	1.000			
lnC/GDP	0.0178	1.000		
lnI	-0.1443	-0.1402	1.000	
lnM2Res	0.0481	-0.0534	-0.0063	1.000

Regarding the Difference-in-Hansen testes of instrument exogeneity of instrument subsets, the GMM instruments for levels indicate a p-value of .63, suggesting validity. The GMM instruments for differences of the lagged dependent variable and political constraints of lags 1 through 5 have a p-value of .2, again suggesting exogeneity. Growth and Growth in the M2 are also specified as GMM instruments with lags 2 through 4, showing a p-value of .17. The final GMM instrument is the 2nd lag of the real interest rate, with a p-value of .25. The standard instrumental variables are logged real gdp per capita, deficit as a portion of the M2, and Manufacturing value added. These show a p-value of .88.

For the Credit Growth estimations, the Hansen Test indicates a p-value .57, meeting the threshold of instrument validity. Arellano-Bond test autocorrelation indicates 1st order autocorrelation in the first differences, but not second order, as expected.

Regarding the Difference-in-Hansen testes of instrument exogeneity of instrument subsets, the GMM instruments of the lagged dependent variable lags 1 through 6 indicate a p-value of .77, suggesting validity. The GMM instruments of political constraints of lags 1 through 5 have a p-value of .26, again suggesting exogeneity. Growth in the M2 is specified as a standard instrument, showing a p-value of .92. Manufacturing value added is specified as a standard instrument, showing a p-value of .43. The last standard instrumental variables are logged real gdp per capita, and the VIX, showing (respectively) p-values of .59 and .37.

For the M2 to Foreign Exchange Reserve estimations, the Hansen Test indicates a p-value .37, meeting the threshold of instrument validity. Arellano-Bond test autocorrelation indicates 1st order autocorrelation in the first differences, but not second order, as expected.

Regarding the Difference-in-Hansen testes of instrument exogeneity of instrument subsets, the GMM instruments of the lagged dependent variable lags 1 through 6 indicate a p-value of .16, suggesting validity. The GMM instruments of political constraints of lags 1 through 6 have a p-value of .76, again suggesting exogeneity. Lagged Growth

in the M2 is specified as a GMM instrument, showing a p-value of .54. Change in the Real Interest Rate is specified as a standard instrument, showing a p-value of .04.

D Instrumentation

Instrumentation is the same for the Imbalance and Adjustment regressions.

Inflation - Lags 2-6 of logged inflation and political constraints are specified as collapsed GMM instruments. Lags 2-4 of Growth and Growth in the M2 are specified as collapsed GMM instruments. Lags 2-3 of the real interest rate is also specified as instrument. The change in the ratio of claims on the central government to the M2, manufacturing value added, and logged Real GDP Per Capita are specified as standard instrumental variables. First lags did not pass tests of exogeneity. Total instrument count is 22, with a standard regression testing instrument strength showing an R squared of .19, with all but 4 of the 22 instruments individually statistically significant.

Credit Growth -The dependent variable is specified with lags 1 - 6, and political constraints with lags 1-5 GMM instruments with the instrument matrix collapsed. Growth, Manufacturing Value Added, and the logged Real GDP Per Capita are specified as standard instruments. Total instrument count is 13. Instruments are weaker than in the inflation regression, instrument strength is weak for the political constraints variables on the dependent variable, though the standard IVs all display statistical significance. The R squared is relatively low at .05.

lnM2Res -The dependent variable and political constraints are specified as GMM instruments for lags 1 - 6 with the instrument matrix collapsed, M2 Growth is specified as a GMM instrument in the first lag also with the instrument matrix collapsed. The differenced Real Interest Rate is specified as a standard instrument. Total instrument count is 11. Lagged levels appear to be strong instruments, while political constraints appear to be weak instruments for the lagged dependent variable. The total R squared is stronger then the credit growth regressions, but weaker than the inflation regressions at .06

E Mediated Standard Errors

Initially the direct effects regression was run to ascertain which independent variables had a statistically significant effect on crisis probability. Once this was done, statistically significant variables with a potential relation to policy (i.e. not the VIX, which is a measure of global volatility/risk) were run in the imbalance regressions to ascertain the effect of constraints upon the variable in question. After this step, each dependent variable included in the imbalance regressions underwent a Sobel test to test for a statistically significant individual mediated effect. An alpha of .1 was used as the critical threshold, as Monte Carlo experiments have shown sobel tests to be overly conservative (Mackinnon, Warsi, and Dwyer 1995).

After surpassing this threshold, the combined coefficients of the individual mediated effects were summed, and the delta method was used to generate the standard errors for the full mediated effects. To avoid bias related to covariance between the estimated coefficients of the imbalance step from the multiple mediation analysis, the other mediators were not included as a free parameter in each regression, minimizing potential bias due to a correlation in the residuals. However, in this variance calculation the covariance between the estimation of the polcon coefficient in the individual

imbalance estimations was constrained to zero, a decision not uncommon according to Preacher and Hayes (2008). Though bootstrapped standard errors have been shown to be more accurate, generating bootstrapped standard errors for the mediated terms proved difficult given the use of the user written XTABOND2 package for the first step of the estimation. However, as the delta method tends to over, rather than under, estimate standard errors, this creates a bias towards lower, rather than higher, levels of statistical significance to be reported, a far smaller problem than the alternative (Mackinnon, Warsi, and Dwyer 1995).

Once this term indicating the full mediated effect and it's standard error had been generated, marginal effects from the direct effect regressions were calculated. Summing the marginal effects and the full mediated effect, rather than the coefficient and the full mediated effect, is necessary due to the inclusion of the quadratic and interaction term. Marginal effects were generated for a variety of values for the VIX and the level of constraints. Each individual full marginal effect was then calculated by summing the direct marginal effect and the full mediated effect, and generating a delta method standard error for the full marginal effect by adding the weighted variances, including the weighted covariances as outlined in the Delta Method, then taking the square root of the full variance for the overall standard error of the marginal effect at each set of values.

For the derivation of covariances between mediators in different steps see Tofighi (2009). A formula involving weighted covariances between steps is in the process of being derived and implemented, but this correction (as well as a correction for a potential bias) is not included at this time.

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Table 11: Imbalances

VARIABLES	(1) lnI	(2) FX Ratio	(3) CG	(4) lnI C.	(5) M2Res C.	(6) CG C.
polcon	-0.319**	-0.938***	-0.644**	-0.324	-0.708*	0.838
	(0.142)	(0.319)	(0.273)	(0.227)	(0.405)	(0.789)
L.lnI	0.812***			0.778***		
	(0.0683)			(0.0616)		
L.lnM2Res		0.596***			0.450***	
		(0.165)			(0.154)	
LD.lnCtoGDP			0.119***			0.0671
			(0.0407)			(0.122)
claimstomoney				0.000453		
				(0.000516)		
HFix				-0.778**		
				(0.353)		
lnreer				-0.235*		
				(0.123)		
TradeofGDP					-0.00475	
					(0.00639)	
Growth					-0.0358*	
					(0.0190)	
finreform_n						0.984**
						(0.435)
D.vix						0.0288
						(0.0202)
M2Growth						0.00115
						(0.00162)
Constant	0.477**			0.556***		
	(0.186)			(0.212)		
Observations	2,467	2,775	1,690	2,236	2,279	876
Countries	118	124	120	116	120	72

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 12: Inertia

VARIABLES	(1) Credit Growth	(2) Inflation	(3) M2Res
cLD.lnCtoGDP*c.polcon	1.012**		
	(0.399)		
cL.lnI*c.polcon		1.006***	
		(0.347)	
cL.lnM2Res*c.polcon			2.101*
			(1.177)
LD.lnCtoGDP	-0.273		
	(0.196)		
L.lnI		0.307**	
		(0.155)	
L.lnM2Res			0.0556
			(0.360)
polcon	-0.228	-2.580***	-3.557*
	(0.332)	(0.800)	(1.899)
Constant		1.691***	
		(0.382)	
Observations	1,688	2,467	2,775
Number of Country	120	118	124

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 13: Reactions: Banking Crises

VARIABLES	(1) Linear	(2) Full	(3) Logit	(4) Int. Rate	(5) Fin Reform	(6) EFI
polcon	-0.00526	-0.146***	-4.079***	-0.105*	-0.146**	-0.175***
	(0.0141)	(0.0422)	(1.513)	(0.0569)	(0.0601)	(0.0504)
polcon*polcon		0.170***	4.404**	0.113*	0.180**	0.192***
		(0.0526)	(1.874)	(0.0665)	(0.0709)	(0.0598)
polcon*D.vix		0.0116***	0.224***	0.00879**	-0.000199	0.0131***
		(0.00387)	(0.0805)	(0.00400)	(0.00719)	(0.00465)
L.lnM2Res	0.0117***	0.00970**	0.201*	0.00757*	0.00530	0.00997*
	(0.00395)	(0.00404)	(0.114)	(0.00455)	(0.00477)	(0.00526)
LD.lnCtoGDP	0.0389***	0.0403***	1.319***	0.0340**	0.0449**	0.0528***
	(0.0137)	(0.0134)	(0.394)	(0.0158)	(0.0195)	(0.0178)
L.lnI	0.0103***	0.0106***	0.313***	0.0129***	0.00758*	0.00935***
	(0.00322)	(0.00303)	(0.0756)	(0.00416)	(0.00418)	(0.00355)
L.lnRGDPPC	0.00689*	0.00617*	0.221*	0.00891*	0.00834	0.0124**
	(0.00361)	(0.00370)	(0.131)	(0.00459)	(0.00622)	(0.00536)
L.lnreer_ov	0.00628	0.00578	0.149	0.00384	0.00946**	0.00686
	(0.00387)	(0.00422)	(0.126)	(0.00717)	(0.00439)	(0.00739)
D.vix	0.00314***	-0.00175	-0.0167	-0.00103	0.00393	-0.00207
	(0.000995)	(0.00143)	(0.0471)	(0.00144)	(0.00377)	(0.00185)
L.Growth3RA	-0.000884	-0.000840	-0.0315	-0.00104	-0.000494	-0.00111
	(0.000573)	(0.000585)	(0.0258)	(0.000720)	(0.00154)	(0.00105)
LD.lnRIntRate				0.00994*		
				(0.00555)		
L.finreform_n					-0.0943***	
					(0.0274)	
L.efi						-0.0138**
						(0.00572)
Constant	-0.0593*	-0.0380	-5.957***	-0.0628	0.0193	0.00527
	(0.0316)	(0.0330)	(1.164)	(0.0410)	(0.0503)	(0.0443)
Observations	1,856	1,856	1,856	1,195	1,070	1,504
Number of Country	125	125	125	110	76	107

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1