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7 July 2011

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Abstract

Why do sudden and massive social, economic, and political changes occur when and where they do? Are there institutional preconditions that encourage such changes when present and discourage such changes when absent? I employ a general model which suggests that cascades which induce massive equilibrium changes are more likely to occur in regimes with centralized coercive power, defined as the ability to impose more than one type of sanction (economic, legal, political, social, or religious). Centralized authorities are better able to suppress subversive actions when external shocks are small, as citizens have little incentive to incur numerous types of sanctions. However, citizens are also more likely to lie about their internal preferences in such regimes (e.g., falsely declare loyalty to an oppressive government), entailing that large shocks are more likely to trigger a cascade when authority is centralized. The model is applied to the severity of protests that followed austerity measures taken in developing nations since the 1970s.

*I am extremely grateful to Andy Gill, Avner Greif, Kristin Kleinjans, Timur Kuran, Michael Makowsky, and Jonathan Meer for their extremely helpful insights. Comments received at seminars at Duke's "Islam and Economic Development" Conference, Cal State Fullerton, and the UC Berkeley Political Science Seminar were also quite useful. All errors are mine.

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1 Introduction

Economists, political scientists, and sociologists are well aware that small events may act as a spark which leads to a significant change in equilibrium outcomes. Granovetter (1978) was amongst the first to argue that cascades can arise when individuals' preferences are interconnected - if enough people take some action it encourages others to do the same, which encourages more to do the same, and so on until a vastly different equilibrium results. In some cases, small events encourage some individuals to publicly reveal their previously suppressed, privately held preferences, which leads to information revelation or changes in status, in turn resulting in starkly different equilibria (Granovetter 1978; Oliver, Marwell, and Teixeira 1985; Kuran 1989, 1991, 1995a, 1995b, 1998; Macy 1991; Bernheim 1994; Yin 1998; Kuran and Sunstein 1999; Kuran and Sandholm 2008). In other instances, such events act as a signal in the decision process, leading to social learning phenomena such as herd behavior and informational cascades that encourage individuals to ignore their private information and follow the actions of others (Banerjee 1992, 1993; Bikhchandani, Hirshleifer, and Welch 1992, 1998; Lohmann 1994; Callander 2007; Watts and Dodds 2007; Siegel 2009; Ellis and Fender 2011).[1]

The theoretical and experimental literature in economics focuses primarily on how the interactions amongst agents precipitates cascades, but provides little macroeconomic or institutional conditions under which such behavior is more likely to arise (Anderson and Holt 1997; Banerjee 1992, 1993; Bikhchandani, Hirshleifer, and Welch 1992, 1998; Çelen and Kariv 2004; Kübler and Weizsäcker 2004, 2005; Goeree et al. 2007; Alevy et al. 2007).[2] The works which do study the institutional conditions under which such behaviors emerge focus primarily on the role that social or political sanctions play in suppressing private opposition to a regime (Kuran 1989, 1995a; Lohmann 1994; Rasler 1996; Slater 2009). A common theme of these works is that cascades are more likely to occur in autocratic regimes, since they have greater means of restricting expression than democracies.

Yet, by merely focusing on the political structures in which such phenomena arise, it is possible to overlook the general microeconomic settings under which these behaviors are facilitated. This paper aims to

[1] Oliver (1993) provides an overview of the sociological advances made in this literature in the 1980s and early 1990s. Sushil Bikhchandani, David Hirshleifer, and Ivo Welch have organized a website, http://www.info-cascades.info/, which provides a literature review and links, as of 2004, to articles on information cascades.

[2] Ellis and Fender (2011) consider the role that information cascades play in revolutionary regime transition, but they model the two phenomena separately instead of intergrating the two.

shed light on these settings, formulating a general model which applies to all types of sanctioning authority (economic, legal, political, social, or religious). It extends on the works cited above, suggesting that cascades which induce massive economic, social, or political changes may be one consequence of an institutional arrangement in which one type of authority has multi-lateral coercive power - that is, the ability to affect sanctions over numerous dimensions. I formulate a model with three types of agents: a group of citizens and two different institutional authorities. The latter players can be thought of as religious authorities, political figures, social icons, or legal authorities. One of the authorities is a "central" authority, with the degree of centralization being the level of the cost imposed on the other authority for transgressing the central authority's dictates.[3]

Previous works have focused on "central authorities" primarily in a political context, as the most obvious examples come from the political world. For example, political, economic, and religious power in Iran is "centralized" in the religious establishment. It is costly for political or economic leaders to openly violate the dictates of religious authorities, which implicitly gives the religious authorities power over numerous types of sanctions. The same could be said about the leaders of the Communist Party in China or for the autocratic Arab dictators (e.g., Mubarak, Kadafi) who faced major protests (for reasons highlighted in this model) in the "Arab Spring" of 2011. Yet, the same also could be said for the medieval Church, which controlled numerous aspects of one's life, especially for members of the Church, before facing major protests during the Reformation.

The model analyzes the interactions between citizens and the authorities under the situation where the preferences of the latter are not aligned with those of the former. Citizens derive intrinsic utility from their own actions and have sanctions imposed on them for diverging from the actions of the two institutional authorities. These actions could represent any number of phenomena in which the desires of some citizens diverge from those of institutional authorities, such as speaking or writing freely, having more than one child, or practicing minority religions. Citizens' utility is also *interdependent* with other citizens (Granovetter 1978;

[3]Throughout this paper, I use the term "centralized" to indicate the degree to which coercive power over sanctions affecting different aspects of one's life (e.g., political, religious, social) is concentrated in one authority. This is similar to the structure recently proposed by Slater (2009), who looks at the role that the separation between political elites and communal/religious elites plays in revolution mobilization. This is a broader definition than ones normally used in the political science and political economy literature, which frequently focus on federalism, administrative centralization, fiscal centralization, or democratic centralization (for example, see Rondinelli [1981] or Manor [1999]). Any of these forms of centralization fit into the model espoused in this paper, although my focus is the costs imposed by authorities, not the institutional structures themselves.

Oliver, Marwell, and Teixeira 1985; Oliver and Marwell 1988; Marwell, Oliver, and Prahl 1988; Macy 1991; Kuran 1995; Kim and Bearman 1997; Yin 1998; Callander 2007; Siegel 2009; Ellis and Fender 2011).[4] That is, they derive disutility when their actions differ from endogenously determined social norms, which may arise from the importance individuals place on social identity (Akerlof and Kranton 2000, 2005), social custom and reputation (Akerlof 1980; Romer 1984; Kuran 1989, 1998; Naylor 1990; Gould 1993; Kuran and Sunstein 1999), or status and conformity (Fershtman and Weiss 1993; Bernheim 1994; Fershtman, Murphy, and Weiss 1996; Akerlof 1997; Kuran and Sandholm 2008).

This setup entails that highly-centralized authorities - those with coercive power over more than one type of sanction - are *more insulated* from pressures for change when exogenous shocks are small. There is less incentive for citizens to violate the dictates of highly-centralized authorities, as they incur more than one type of sanction from doing so. In turn, equilibrium actions remain stable as long as shocks are sufficiently small.

However, this logic also entails that citizens are more likely to choose actions further away from their intrinsic optimum when authority is centralized. Hence, massive changes in equilibrium actions are more likely to result in centralized regimes when a sufficiently large shock occurs. When a small portion of society transgresses the law (or norm, or custom, etc.), a cascade can arise when the actions of these citizens encourages more citizens to transgress the law, which encourages even more to evade the law, and so on. This is not the case when authority is less centralized, as authorities are more likely to accommodate the actions of the citizenry, and preferences are therefore less likely to be falsified and cascades are less likely to emerge.

In other words, this is a tipping point model. When shocks are small, centralized authorities are more insulated from change. However, when shocks are larger than the tipping point, equilibrium changes are larger in economies with highly-centralized authorities.[5] One implication of this hypothesis is that institutional authorities with centralized, multi-lateral coercive power may *seem* insulated from upheaval when in fact they are quite vulnerable. Because of this underlying vulnerability, authorities in such societies often do anything to suppress large shocks from occurring, such as suppressing and controlling media and harshly combating dissent. This can explain, for example, the extreme measures taken to suppress the internet in

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[4]This differs from the standard economic framework put forth by Olson (1971) and Tullock (1971), where individuals maximize their own utility independent of others. This property permits Olson and Tullock to suggest that collective action is difficult to sustain in large groups, but this observation is contradicted numerous times in the historical record.

[5]Yin (1998) makes a similar point relating shock level to protest scale, but is more concerned with threshold distribution than the interaction between protesters and authorities.

Iran and China. Such tactics work well to suppress small shocks. However, this also works to further push the actions of the citizenry away from their intrinsic preferences, which may cause a larger cascade and thus unintentionally sow the seeds of the authority's demise. Although this paper is not meant to be predictive,[6] it has significant implications for the fate of future of contemporary centralized regimes (e.g., Libya, Syria, Zimbabwe, Burma, North Korea) following systemic shocks such as major changes in the price of oil or grain or a natural disaster.[7]

This paper relates to the large economic, sociological, and political science literature in revolutions.[8] The present paper is not meant to accept or deny the validity of any of these arguments, but instead offers a complementary hypothesis. I do not account for the organizations or leadership that are often instrumental to revolutionary activity, but instead provide a mapping from broad institutional structure to massive social, political, and economic change.

Historical examples of massive and unexpected changes occurring in centralized regimes include the fall of the Egyptian and Tunisian governments in 2011, the Iranian Revolution of 1979, the Bolshevik Revolution of 1917, the Taiping Rebellion in China (1850-1864), the fall of Iron Curtain governments, the Protestant Reformation, and many others.[9] In this paper, I employ the insights of the model to analyze the numerous austerity protests which occurred in the developing world since the 1970s. An econometric analysis of these protests from 1976-1992 suggests that protests were more severe under decentralized authorities if they followed small shocks (proxied by indices of IMF involvement), but were more severe under centralized

[6]The model could certainly be employed in a predictive manner similar to Bueno de Mesquita (2009). This would require calibration of the model's parameters and is outside the scope of this paper.

[7]It may also be true that the type of policies taken by centralized governments exacerbate shocks to a greater extent than non-centralized governments (for a recent example, see Meng, Qian, and Yared [2010]; for more on centralization and distribution of public goods, see Lockwood [2002], Besley and Coate [2003], and Faguet [2004]). Where this is the case, the implications of the model for centralized governments are even greater.

[8]The mechanism underlying revolutionary activity in the present paper is closest to Kuran (1989, 1995a, 1995b), who analyzes the implications of public revelations of private preferences. For overviews of the social analysis of revolutions, see Tanter and Midlarsky (1967), Shugart (1989), and Goldstone (1994, 2001).

[9]For more on the broad effects of the centralization of coercive power throughout world history, see Greif (2005). Iyigun (2009) argues that there is a positive connection between monotheism and the length and bredth of dynastic power, as monotheistic religions have general been complementary to centralized government (due to high fixed costs of starting a monotheistic religion). This argument is quite consistent with the one made in the present paper.

authorities if they followed large shocks.

2 The Model

2.1 Setup

Consider a two-period game with perfect information. There are $M + 2$ players (where M is large): M heterogeneous citizens and two institutional (social, political, economic, legal, or religious) authorities, a central authority (C) and a non-central authority (N).[10] The institutional authorities choose from a continuous set of actions which the citizens can publicly accept or reject. The model analyzes situations in which the preferences of some citizens differ exogenously from those of the authorities, so actions could represent varying levels of freedom of speech, press, or religion, publicly expressed dissatisfaction with the government or religious authorities, or public opinion on social issues. The progression of events in each period is as follows:

1. Citizens choose whether to publicly accept or reject C's action from the previous period. An equilibrium is reached before progressing to step 2.
2. The non-central authority chooses an action.
3. The central authority chooses an action.

In the first period, players reach a steady-state equilibrium. In other words, this is a simplification of an infinitely-repeated game where only the steady states are analyzed. A shock, described in detail below, occurs between periods one and two.

Each citizen j derives utility from choosing actions, $a_{j,t} \in \{0, 1\}$ (where the subscript t denotes the period), where the citizen publicly accepts C's dictates if $a_{j,t} = 0$ and rejects them if $a_{j,t} = 1$. Citizens derive greater utility from rejecting C's dictates when their own intrinsic "bliss point", b_j, is further away from zero. Each citizen is randomly assigned a bliss point from a normal distribution with mean μ and variance σ^2.[11]

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[10] The inclusion of only two authorities allows for tractability. The intuition underlying the main results of the model holds in more realistic situations including numerous types of authorities.

[11] The assumption that bliss points are normally distributed plays a crucial role in the analysis. Normality is not a necessary feature, however. Any type of distribution with two inflection points with provide similar results.

The citizens' utilities are interdependent; that is, they derive more utility by choosing actions when other choose the same actions.[12] If the citizens choose to publicly reject the authorities' dictates, they incur costs which are a function of the actions of the institutional authorities, $a_t^C \in \mathbb{R}^+$ and $a_t^N \in \mathbb{R}^+$. These costs are increasing in the size of the violation (as in Romer [1984], Iannaccone [1988], Bernheim [1994], Kuran [1987, 1995a], Akerlof [1997], Kuran and Sandholm [2008], Rubin [2011]) and represent the costs (or punishments) associated with publicly breaking a religious dictate, breaking a law, violating a political norm, and the like, depending on the type of authority in question.

Citizen j's preferences are described in each period by the following utility function:

$$
\begin{aligned}
U_{j,t} \quad = \quad & I\{a_{j,t}=0\}\left[-m_1\left(a_{j,t}-b_j\right)+m_2\frac{1}{M-1}\sum_{i\neq j} I\{a_{i,t}=0\}\right]+ \\
& I\{a_{j,t}=1\}\left[\begin{array}{c} -m_1\left(a_{j,t}-b_j\right)+m_2\frac{1}{M-1}\sum_{i\neq j} I\{a_{i,t}=1\} \\ -m_3\left(a_{j,t}-a_{t-1}^N\right)-m_4\left(a_{j,t}-a_{t-1}^C\right) \end{array}\right]
\end{aligned}
$$

$$
\begin{aligned}
= & \; I\{a_{j,t}=0\}\left[-m_1 b_j+m_2\frac{1}{M-1}\sum_{i\neq j} I\{a_{i,t}=0\}\right]+ \\
& I\{a_{j,t}=1\}\left[\begin{array}{c} -m_1\left(1-b_j\right)+m_2\frac{1}{M-1}\sum_{i\neq j} I\{a_{i,t}=1\} \\ -m_3\left(1-a_{t-1}^N\right)-m_4\left(1-a_{t-1}^C\right) \end{array}\right],
\end{aligned} \tag{1}
$$

where m_1, m_2, m_3, and m_4 are weighting parameters greater than zero and $I\{\cdot\}$ is an indicator function.

The non-central authority, N, derives utility from choosing actions close to its bliss point, $b^N \in \mathbb{R}^+$. It also faces a cost from choosing actions which differ from the central authority, C. Its preferences can be described as follows:

$$
U_t^N = -n_1\left(b^N-a_t^N\right)^2-\gamma\left(a_t^N-a_{t-1}^C\right)^2, \tag{2}
$$

where n_1 is a weighting parameter greater than zero. $\gamma \geq 0$ is the primary exogenous parameter of concern in the model. It denotes the degree to which the non-central authority incurs a cost from diverging from the

[12] This "social cost" captures the influence of social norms which may arise from the importance individuals place on social identity, social custom, reputation, status, or conformity. This specification assumes that individuals derive utility from conforming. Gintis (2003) suggests that "pro-social" behavior may be biologically determined, as humans improved their biological "fitness" by internalizing cultural norms. Also see Greif (2009) and Greif and Tadelis (2010).

action of the central authority.[13] Although there are certainly endogenous elements to γ in reality - for example, the degree to which one authority incurs costs from diverging from the other could be a function of the degree to which the citizens abide by its dictates - endogenizing this key variable unnecessarily complicates the model. This paper concentrates on massive equilibrium changes over a short period and how such changes arise rapidly. Broader institutional changes which endogenously effect the level of centralization follow in the long run due to the interactions described in the model, but should not be affected in the short run by the rapid, massive change which is at the heart of this model.[14]

The centralization parameter enters N's utility as a scalar which affects the cost N incurs for choosing an action different from C. At $\gamma = 0$, there is no such cost, at $\gamma \to \infty$, there is an infinite cost (if $a_t^N \neq a_t^C$), and at $\gamma \in (0, \infty)$, there is a positive cost that is increasing in γ. While it is possible (in reality, but not in the model) that C may also face costs from not conforming to N, the assumption of unidirectional centralization of coercive power allows for tractability.[15] It follows from this setup that at $\gamma \to \infty$, the two authorities are ostensibly the same actor: power over numerous dimensions is centralized in one authority (C). At large γ, C has significant but not unlimited power over varying types of sanctions.

The central authority, C, derives utility from choosing actions close to its bliss point, $b^C \in \mathbb{R}^+$. It also wishes to minimize the average number of citizens who reject its dictates in the *next* period. Unlike the citizens or non-central authority, C is forward-looking. This specification is chosen to highlight the possibility that central authorities take into account the fact that their unpopular dictates can cause destabilization which they would prefer to avoid. C's preferences can be described as follows:

$$U_t^C = -c_1 \left(a_t^C - b^C\right)^2 - \frac{1}{M} \sum I\left\{a_{i,t+1} = 1\right\}, \tag{3}$$

where c_1 is a weighting parameter greater than zero.

Finally, a shock occurs between periods 1 and 2. The shock is formally defined as:[16]

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[13]For more on the centralization of coercive power, see Greif (2005) and Karaman (2009).

[14]Moreover, Rubin (2011) shows in a similar model that under a basic set of circumstances, endogenizing the degree of centralization merely exacerbates the effects seen under an exogenous parameterization, as the feedback between players is more enhanced.

[15]In fact, the model can be interpreted as one of *relative* centralization, where γ is the cost incurred by N for not following C's actions relative to the reverse situation (where C incurs costs). All that is needed for the results to hold is for N to have a greater cost than C.

[16]This definition of shock is overly strict in order to allow for a more straight-forward analysis. For example, similar qualitative results emerge if the shock affects citizens differently.

Definition 1 *A **shock** occurs between periods 1 and 2, where a portion $\alpha \in (0, 1)$ of the citizenry has their bliss points multiplied by $\beta > 1$.*

C expects a shock of size $\beta \in \mathbb{R}$ affecting α portion of the citizenry to happen in the next period with probability $\rho_{\alpha\beta}$, for all values of α and β. I assume without loss of generality that the relationship between the bliss points is such that $0 \leq b^C < b^N < \mu$. This entails that the shock encourages some of the citizens to transgress the authorities' actions (instead of the less interesting case in which shocks encourage citizens to choose actions closer to those of the authorities).

2.2 *Solving the Model*

2.2.1 Steady-state in Period 1

I assume steady-state conditions in period 1. That is, time subscripts do not matter; actions in period $t - 1$ are the same as actions in periods t and $t + 1$. This specification is chosen to highlight the effect that a shock has on an economy already in a steady-state (rather than one that is changing anyway). I denote equilibrium actions with a superscript * and employ the Nash equilibrium concept. I drop the time subscripts in this section.

I first solve for the optimal actions of N and the citizenry given the action of C. Solving for N is straight-forward; the first-order condition provides the result:

$$a^{N*} = \frac{n_1 b^N + \gamma a^{C*}}{n_1 + \gamma}. \tag{4}$$

A little algebra indicates that citizen j chooses to publicly accept C's dictates ($a_j = 0$) when:

$$b_j \leq \frac{1}{2m_1} \left[m_1 - m_2 \left(1 - \frac{2}{M-1} \sum_{i \neq j} I \{a_i = 0\} \right) + m_3 \left(1 - a^{N*}\right) + m_4 \left(1 - a^{C*}\right) \right] \tag{5}$$

As noted above, the citizens reach an equilibrium in the first stage of each period before N and C act. In equilibrium, some citizen has the largest bliss point, denoted b^*, of all of the citizens choosing $a_j = 0$. If an interior solution exists and there are enough citizens so that the law of large numbers is realized, then (denoting $F(\cdot)$ as the normal cdf with mean μ and standard deviation σ^2):

$$b^* = \frac{m_2}{m_1} F(b^*) + \frac{1}{2m_1} \left[m_1 - m_2 + m_3 \left(1 - a^{N*}\right) + m_4 \left(1 - a^{C*}\right) \right] \tag{6}$$

Plugging in (4) to (6) entails that b^* is implicitly defined by:

$$b^* = \frac{m_2}{m_1} F(b^*) + \frac{1}{2m_1} \left[m_1 - m_2 + m_3 \frac{n_1 \left(1 - b^N\right)}{n_1 + \gamma} + \left(m_3 \frac{\gamma}{n_1 + \gamma} + m_4 \right) \left(1 - a^{C*}\right) \right] \tag{7}$$

Since the distribution of bliss points is normally distributed, it is possible for there to be more than one solution to (7). This can be seen in Figure 1, which (in a manner similar to Granovetter [1978] and Kuran [1995]) maps b on the horizontal axis and the right-hand side of (7) on the vertical axis, at b rather than b^*. A solution to (7) exists where the curve crosses the 45-degree line. These solutions are the maximum bliss point which chooses $a_j = 0$ in equilibrium.

[INSERT FIGURE 1 HERE]

Figure 1 shows that 3 equilibria can exist: E1, E2, and E3. E3 is a "good" equilibrium from the central authority's perspective, since more citizens choose $a_j = 0$, while E1 is a "bad" equilibrium. Moreover, E1 and E3 are stable (or, in game theoretic terms, trembling hand perfect), while E2 is not. To see this, note that any point at which the curve is above the 45-degree line, such as bliss point Y in Figure 2, is one in which LHS<RHS of (7). Inequality (5) indicates that for citizens with bliss point between Y and b_3, the optimal action is $a_j = 0$. Hence, the citizen with bliss point Y cannot have the largest bliss point of all citizens choosing $a_j = 0$ in equilibrium; if it chooses $a_j = 0$, citizens with bliss points between Y and b_3 also have incentive to choose $a_j = 0$. This means that at equilibrium E3, if a small amount of citizens deviate and choose $a_j = 1$ (say citizens with bliss points between Y and b_3), the equilibrium will converge back to E3. Conversely, this means that at equilibrium E2, if even *one* citizen deviate and chooses $a_j = 0$, the equilibrium will move to E3.

At any point in which the curve is below the 45-degree line, such as bliss point X in Figure 2, LHS>RHS of (7). Inequality (5) indicates that at any bliss point between b_1 and X, the optimal action is $a_j = 1$. A similar logic to that espoused above indicates that if some citizens deviate from E1 to choose $a_j = 0$ (say citizens with bliss points between b_1 and X), the equilibrium will converge back to E1. Conversely, this means that at equilibrium E2, if even *one* citizen deviates and chooses $a_j = 1$, the equilibrium will move to E1.

[INSERT FIGURE 2 HERE]

This logic entails that equilibria E1 and E3 are stable - if a small group of citizens deviate, they old equilibrium will quickly re-emerge. On the other hand, it only takes one citizen deviating from E2 for a new equilibrium to emerge. But just how stable are these equilibria, and under what conditions will a cascade emerge? It can be seen in Figure 2 that, at equilibrium E3, if all of the citizens (plus one) with bliss points between b_2 and b_3 change their actions from public acceptance ($a_j = 0$) to public rejection ($a_j = 1$) of the central authority, E1 will emerge as the equilibrium outcome. All of the citizens with bliss points between b_1 and b_2 join the cascade to the new equilibrium. In other words, b_2 is the *threshold* bliss point - if citizens below bliss point b_2 choose $a_j = 1$, E1 will emerge, while E3 will emerge if citizens above b_2 choose $a_j = 0$.

For the remainder of the analysis, assume that the period 1 equilibrium is the one with the least public dissent (E3), if E3 exists. After all, the interesting case is one in which a shock encourages an acquiescing citizenry to publicly dissent. It follows from the above logic that a cascade of public dissent will happen over a larger set of shocks if b_2 and b_3 are close to each other. In other words, when the threshold citizen (the one with bliss point b_2) has a similar bliss point to the citizen with the highest bliss point who publicly accepts, a small number of citizens need to change actions in order for the cascade threshold to be passed. The shape and position of the curve thus determine how likely it is that a cascade will arise. This shape and position of the curve, in turn, are determined by the parameter values (especially the centralization parameter, γ) and the decision of the central authority.

2.2.2 Cascades and Centralization

Note from (7) that changes in the centralization parameter (γ) or the central authority's action (a^{C*}) merely shift the curve in Figures 1 and 2. For the moment, assume that the central authority chooses $a^{C*} = 0$, thus maximizing the probability of a "good" equilibrium emerging. The curve shifts up monotonically as γ increases. It is instructive to analyze the curve at the endpoints of γ (0 and ∞). We can re-write (7) at $\gamma = 0$ and $a^{C*} = 0$ as:

$$b^* = \frac{m_2}{m_1} F(b^*) + \frac{1}{2m_1} \left(m_1 - m_2 + m_3 \left(1 - b^N\right) + m_4\right) \tag{8}$$

and we can re-write (7) at $\gamma \to \infty$ and $a^{C*} = 0$ as:

$$b^* = \frac{m_2}{m_1} F(b^*) + \frac{1}{2m_1} (m_1 - m_2 + m_3 + m_4) \tag{9}$$

I assume that an interior solution exists.[17] Since the curve is merely a shifted cdf of a normal distribution,

[17]In other words, $b_{\min} < \frac{1}{2m_1} \left(m_1 - m_2 + m_3 \left(1 - b^N\right) + m_4\right)$ and $b_{\max} > \frac{1}{2m_1} (m_1 + m_2 + m_3 + m_4)$, where $b_{\min}$ and

the inflection point is μ, the mean bliss point. This can be seen in Figure 3.

[INSERT FIGURE 3 HERE]

The second feature of concern is how steep the curve is around the mean. A steep curve is one with a small standard deviation; this means that most of the realizations of the distribution are found near the mean. This also means that the bottom of the curve is more likely to jut out and cross the 45-degree line. A flatter curve is one with a larger standard deviation; it is flatter because there are more realizations at the tails. Figure 4 displays this graphically. It shows two curves with all of the same parameters (including μ) but different values of σ. It indicates that smaller values of σ entail steeper curves. It is straight-forward to see that the slope of the curve at the inflection point approaches infinity as $\sigma \to 0$.

[INSERT FIGURE 4 HERE]

I start the analysis by characterizing two trivial equilibria. First, when the bliss points of the citizens are sufficiently close to the action of C (that is, when μ is sufficiently small), few citizens publicly reject C (choose $a_j = 1$), and the economy is always in a "good" equilibrium from the perspective of C. In this case, a cascade cannot emerge because even when a shock convinces some citizens to publicly reject C, there is not broad enough support amongst the citizens for a mass rejection of C. In terms of the model, the curve will only cross the 45-degree line once, at the "good" equilibrium, regardless of the value of the centralization parameter γ. This is seen in Figure 5.

[INSERT FIGURE 5 HERE]

Second, if the citizens have bliss points that are sufficiently different from the action of C (μ is sufficiently large), most citizens will publicly reject C regardless of the other parameters, and the economy is always in a "bad" equilibrium from the perspective of C. In this case, it is trivial to note that a cascade of public dissent cannot emerge; most citizens dissent *prior* to the shock occurring. In terms of the model, the curve only crosses the 45-degree line once, at the "bad" equilibrium, regardless of the value of the centralization parameter γ. This is seen in Figure 6.

[INSERT FIGURE 6 HERE]

$b_{\max}$ are the minimum and maximum realizations of b, respectively.

This above logic is formalized in Proposition 1. The proofs for all propositions are found in Appendix D.

Proposition 1 *If $\mu \leq \frac{1}{2m_1}\left[m_1 - m_2 + m_3\left(1-b^N\right) + m_4\right]$, then cascades never occur and the economy is at the "good" equilibrium. If $\mu > \frac{1}{2m_1}\left[m_1 + m_2 + m_3 + m_4\right]$, then cascades never occur and the economy is at the "bad" equilibrium.*

These two parts of the equilibrium space are the least interesting ones, as cascades do not emerge in either. Before moving on, however, note that both cases are less likely to arise when citizens place significant weight on acting like others (m_2). This is not a surprising result; after all, cascades are unlikely to arise when people care little about what others are doing. When preferences are not interdependent (or are weakly interdependent), the mechanism underlying cascades is absent.

For the rest of the paper, consider the more interesting case where the mean bliss point of the citizens is in between the two cases highlighted in Proposition 1. At the lower end of this range, the mean bliss point of the citizens is relatively close to the action of the central authority. Hence, in some cases too many citizens "agree" with the central authority for a cascade of dissent to emerge, and the equilibrium is a good one from the perspective of C. When cascades do emerge, they are less likely to do so in highly centralized economies (high γ). This is because the combination of much of the citizenry "agreeing" with C combined with additional sanctions (from N) for publicly rejecting C reduce the incentive for the threshold citizens to join in voicing their opinion (and choosing $a_j = 1$). Meanwhile, the reduced sanctions in decentralized economies (low γ) encourage the threshold citizens to join others and a cascade arises. This logic is summarized in Proposition 2.[18]

Proposition 2 *If $\mu \in \frac{1}{2m_1}\left(m_1 - m_2 + m_3\left(1-b^N\right) + m_4, m_1 + m_3\left(1-b^N\right) + m_4\right]$, then $\exists\, \sigma^*$ and σ^{**}, where $\sigma^* < \sigma^{**}$, such that:*

i) No cascade ever emerges and the economy is in a "good" equilibrium if $\sigma \geq \sigma^{**}$

ii) Cascades can only emerge at $\gamma \leq \gamma^*$ (for some value γ^*) and all economies with $\gamma > \gamma^*$ are in a "good" equilibrium if $\sigma \in [\sigma^*, \sigma^{**})$

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[18] I assume in this Proposition that $m_2 > m_3 b^N$. This simply entails that the citizens place a sufficiently large weight on social pressures. This assumption is only necessary for a small part of the equilibrium to hold (at small μ). Since I do not focus on this part of the equilibrium solution in the analysis, I do not spend time discussing this assumption. The equilibrium is straight-forward to characterize, though it is a bit more complicated, if $m_2 \leq m_3 b^N$.

iii) Cascades can emerge for all γ if $\sigma < \sigma^*$

Part i) of Proposition 2 is represented in Figure 5, ii) is represented in Figure 7, and iii) is represented in Figure 8. The type of equilibrium that emerges is dependent on the mean and standard deviation of the citizens' bliss points. When the citizens' bliss points are close to the actions of C (μ is small, as it is in this case), cascades are unlikely to occur under highly centralized rule. Citizens are relatively happy, since they choose actions close to their bliss points, and publicly rejecting C is costly. Cascades are more likely to occur, however, as σ decreases. This is because citizens are clustered together more closely (at the mean) when σ is small, and so a shock which encourages some near the mean to publicly reject C ($a_j = 1$) is more easily transmitted to other like-minded citizens.

[INSERT FIGURES 7 AND 8 HERE]

The much more interesting case is when most citizens "disagree" with C (μ is large).[19] This is often true in autocratic regimes, where the interests of the autocrat and the citizens are not always aligned. Indeed, it is in these situations where revolutions occur; when a cascade occurs in a regime where the citizens disagree with the central authority, the change in expressed preferences is much greater than in a regime where most citizens agree with the central authority.

In this case, centralized authorities are better able to suppress dissent and are more insulated from small shocks. Decentralized authorities are less able to suppress dissent, because they are less able to impose multiple sanctions. Yet, because centralized authorities are able to impose multiple sanctions on dissent, citizens are less likely to publicly reject C despite disagreeing with its dictate. This enables a situation where citizens "falsify their preferences" to a greater degree in centralized regimes. That is, citizens under centralized rule are more likely to disagree with C but not publicly reject C. Kuran (1995a, p. 3) defines preference falsification as "the act of misrepresenting one's genuine wants under perceived social pressures." When citizens falsify their preferences, they choose actions which differ from their bliss point for two reasons. First, perceived social pressures encourage them to choose actions similar to those chosen by others. Secondly, this outcome is exacerbated when institutional sanctions are severe (m_3 and m_4 are large) and the actions of the authorities diverge from the bliss point of the citizenry.

[19] The case when $\mu \in \frac{1}{2m_1}\left(m_1 + m_3\left(1 - b^N\right) + m_4, m_1 + m_3 + m_4\right]$ is omitted for brevity. The full characterization of this equilibrium is available in the Appendix.

The major upshot of increased preference falsification is that cascades are more likely to occur after a large shock in centralized regimes than they are in decentralized regimes. After a large shock, a cascade is more likely to occur where citizens are falsifying their preferences; once some citizens act closer to their internal preferences by publicly rejecting C (choosing $a_j = 1$), others will find it more attractive to publicly reject C, *especially* since they disagreed with C in the first place. This is less likely to happen in decentralized regimes, where citizens are more likely to publicly reject C prior to the shock. This logic is summarized in Proposition 3.

Proposition 3 *If* $\mu \in \frac{1}{2m_1}(m_1 + m_3 + m_4, m_1 + m_2 + m_3 + m_4]$, *then* $\exists\, \sigma^{\Diamond}$ *and* $\sigma^{\Diamond\Diamond}$, *where* $\sigma^{\Diamond} < \sigma^{\Diamond\Diamond}$ *such that:*

i) No cascade ever emerges and the economy is in a "bad" equilibrium if $\sigma \geq \sigma^{\Diamond\Diamond}$

ii) Cascades can only emerge at $\gamma \geq \gamma^{**}$ *(for some value* γ^{**}*) and all economies with* $\gamma < \gamma^{**}$ *are in a "bad" equilibrium if* $\sigma \in \left[\sigma^{\Diamond}, \sigma^{\Diamond\Diamond}\right)$.

iii) Cascades can emerge for all γ *if* $\sigma < \sigma^{\Diamond}$.

In cases ii) and iii), as γ *increases,* C *is more insulated from small shocks but is more susceptible to large equilibrium changes (relative to the pre-shock state) after large shocks.*

Part i) of Proposition 3 is represented in Figure 6, part ii) is represented in Figure 9, and part iii) is represented in Figure 8. As in Proposition 2, the type of equilibrium that emerges is dependent on the mean and standard deviation of the citizens' bliss points. When the citizens' bliss points are far away from the actions of C (μ is large, as it is in this case), cascades are more likely to occur under highly centralized rule following large shocks. Although highly centralized authorities are more insulated from small shocks, citizens are relatively unhappy. This means that when a shock is large enough that some citizens publicly reject C, the cost to publicly rejecting C decreases, encouraging more citizens to publicly reject C, and so on. Relative to the pre-shock state - which may often seem tranquil - centralized regimes are subject to massive changes in public opinion despite having the appearance of public acceptance.

[INSERT FIGURE 9 HERE]

Finally, consider the action of the central authority. The analysis thus far has assumed that C chooses the most oppressive action ($a^C = 0$) to maximize the probability of a "good" equilibrium emerging. (7) indicates that less oppressive actions (increases in a^C) shift the curve downward, making cascades towards bad equilibria more likely to occur. Yet, (3) indicates that $a^C = 0$ may not be C's optimal action. C may be willing to forgo some probability of a cascade emerging (especially if the cascade is not that large) in order to choose an action closer to its bliss point b^C. Yet, as long as C's bliss point (b^C) and the weight that C places on its bliss point (c_1) are not sufficiently large, the intuition and the results of the propositions do not change. C may be willing to forgo some probability of a cascade in order to choose an action closer to its bliss point, but centralized authorities are still more subject to cascades following large shocks than decentralized authorities when the citizens "disagree" with C (μ is large).

2.3 Discussion

The intuition formalized in Proposition 3 offers two explanations for why *seemingly* tranquil, centralized societies can quickly undergo massive changes, especially when the centralized authority promotes policies that are detrimental to most citizens (that is, μ differs substantially from a^C). One explanation, which is also offered by Granovetter (1978) and Kuran (1989, 1995a, 1995b), is that preference falsification can encourage latent movements in social norms to emerge after a shock. That is, an economic, political, or social shock may move equilibrium actions by enough to encourage most citizens, even those who are not directly affected by the shock, to choose drastically different actions.

The other explanation, which is novel to this paper, sheds light on the role that institutional structures play in determining the effects of shocks. It suggests that a high degree of centralization of coercive power discourages marginal changes to equilibrium actions after small shocks. Citizens have less incentive to publicly dissent, as they incur two institutional costs from doing so. The same citizens may be more encouraged to publicly dissent in less centralized societies, however, as they face less cost from doing so and the authorities (especially the non-central authority) react by changing their actions to a greater extent. On the other hand, when larger shocks materialize, cascades towards vastly different equilibria are more likely to result in highly centralized economies. This occurs because citizens falsify their preferences to a greater extent in such economies, and thus large shocks encourage some citizens to change their actions, in turn making it more likely that the institutional laws will be much different in the post-shock equilibrium.

Kuran (1995a, 1995b) and Yin (1998) do suggest that unanticipated regime change is more likely to occur in politically repressive countries. Their hypotheses coincide with the one made in the present paper, though it is not clear that their hypotheses hold when other types of freedoms (religious, economic, legal) exist in politically repressive regimes. The essential difference between the present hypothesis and Kuran's and Yin's is that I stress the interdependence of institutions that are able to impose different types of sanctions. This leads to a similar conclusion as Kuran and Yin, as such institutional structures are often found in politically repressive regimes.

The model also sheds light on the connection between institutional centralization and revolutions. Numerous definitions for revolution exist in scholarly works.[20] For example, Goldstone (2001) defines revolution as "an effort to transform the political institutions and the justifications for political authority in a society, accompanied by formal or informal mass mobilization and non-institutionalized actions that undermine existing authorities." Kuran (1989, 1995a) broadly defines a revolution as a discontinuous change in public opinion or social order and Davies (1962) defines revolutions as "violent civil disturbances that cause the displacement of one ruling group by another that has a broader popular basis for support."

The model suggests that revolutions may occur in centralized regimes after a shock *only* when the shock is sufficiently large; on the other hand, smaller shocks are more easily repressed in centralized regimes. "Shock" is a somewhat ambiguous term, but the literature on revolutions provides numerous types of shocks that could precipitate revolutions, such as sharp reversals in economic fortunes (Davies 1962; Tanter and Midlarsky 1967), rapid economic growth (Olson 1963), defeat in war, or sustained population growth (Goldstone 2001).

Moreover, consider the implications of the model for centralized regimes. Holding the degree of centralization (γ) constant, which parameters affect the likelihood of revolution in such regimes? Proposition 3 suggests that shocks are more likely to lead to massive changes in centralized economies when the shock is sufficiently large in scope. Thus, a straight-forward way for centralized authorities to prevent revolutions is to decrease the number of citizens directly affected by a shock, which in turn decreases the probability of a cascade emerging. This often takes the form of the authority attempting to do everything possible to ensure that if a shock occurs, it is spread to as small of a portion of the population as possible. This provides a reason why centralized, authoritarian governments often impose restrictions on domestic and international media, the Internet, and social networking. Public dissatisfaction expressed in protests or other types of grievances is more likely to result in a cascade of public dissent the more that people know that others are willing to act in a way that coincides with their own intrinsic beliefs. Hence, media suppression is more likely to exist in economies where coercive power is centralized, since anti-government shifts of public opinion are more likely to form as a result of a systemic shock in such economies.

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[20] There is a large literature merely attempting to define the term revolution. I have no desire to enter this debate, summarized nicely by Goldstone (2001), and instead note that revolutions are an extreme form of massive equilibrium change.

In sum, the following testable predictions arise from this framework:

- When the preferences of central authorities are not aligned with those of the citizens:
  - Centralized authorities are more insulated from small shocks; that is, little public dissent is likely to occur following small shocks in centralized regimes
  - Centralized authorities are more susceptible to large changes in public dissent after large shocks; that is, cascades of dissent are more likely to arise following larger shocks in centralized regimes
- When the preferences of central authorities are close to being aligned with those of the citizens:
  - Centralized authorities are more insulated from small and large shocks; that is, cascades of public dissent are less likely to occur under centralized rule

3 Austerity Riots and Centralization

A primary implication of the model is that countries with centralized authorities are more insulated from change when economic shocks are small but are more susceptible to sudden, massive changes when economic shocks are large. In this section, I test the hypothesis by analyzing the severity of austerity protests in the developing world between 1976 and 1992. Such protests were common in the developing world beginning in the mid-1970s in reaction to measures employed - almost always as a condition of IMF aid - to combat inflation and government debt. I test the relationship between a series of "IMF pressure" variables and severity of protests over differing degrees of institutional centralization to shed light on the relationships espoused in the model. Although the data cannot speak to the microeconomic mechanisms highlighted in the model (namely, those related to internal and expressed preferences and cascades), it can shed light on the connections between macroeconomic events, institutional structures, and changes in publicly expressed opinions. This analysis underscores the determinants of protest severity (a macro concept) *as well as* sudden equilibrium changes (a micro concept), since the latter is realized in the former.

Modern austerity protests began in the mid-1970s, with the first one occurring in Peru in 1976. The protests were sparked by austerity measures which were almost always imposed by the IMF as a condition of assistance. The stated aims of these measures were freeing up markets and cutting government spending in order to reduce government debt and curb massive inflation. These market-based measures, known by some as “shock treatment”, included currency devaluation, broad reduction of spending on the public sector, privatization of state-owned corporations, cuts in public subsidies for food and basic necessities, wage restraints, higher interest rates, and elimination of protectionism (Walton and Seddon 1994).[21]

These policies sparked protests in many places where they were imposed. Such protests were defined by Walton and Seddon (1994) as "large scale collective actions including political demonstrations, general strikes, and riots, which are animated by grievances over state policies of economic liberalization implemented in response to the debt crisis and market reforms urged by international agencies." The international agency most associated with these protests is the IMF, and hence Joseph Stiglitz called them "IMF riots".

The distributional implications of these policies are clear – most policies negatively affected the urban poor, at least in the short run (Walton and Ragin 1990; Walton and Seddon 1994). The protests were primarily urban in nature, often following a rise in a price for a specific good or an elimination of a subsidy. In some cases, the protests were relegated to one city and remained non-violent, such as organized strikes planned in Ecuador and Bolivia (Walton and Ragin 1990). On the other extreme, protests turned into deadly riots which spread throughout the country, as was the case of the Venezuelan protest of 1989, where a week of rioting spread from Caracas to 16 other cities.

What determines the differences in severity of these protests? This topic has received some attention from sociologists and political scientists, who have proposed a wide range of explanations. Walton and Seddon (1994) and Walton and Ragin (1990) provide evidence that over-urbanization plays a key role in both the presence and severity of the riots. They suggest that the linkage between the two lies in the development of organizational infrastructure capable of mobilizing political action. Walton and Ragin (1990) also suggest that IMF pressure significantly affects protest severity but inflation and debt do not.[22]

In this section, I analyze how changes in IMF involvement affected the likelihood of severe protest in a country. When IMF pressure is present, pressures to liberalize markets generally ensue - and protests may follow. Proposition 3 of the model suggests that, since austerity measures are actions the differ substantially from the bliss point of most citizens (μ is much different that a^C), when IMF pressure (the "shock" in the model) is small, centralized economies will better be able to suppress protests. However, significant IMF pressure is more likely to precipitate massive changes in centralized economies. In other words, the following prediction arises from the model:

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[21] For a scathing review of these policies in the developing world over the last half-century, see Klein (2007).

[22] On the other hand, Auvinen (1997) finds that poor economic performance (indicated by high inflation and large debt service) is associated with political demonstrations, riots, and strikes.

Prediction 1: When there is a small amount of IMF pressure, austerity protests will on average be less severe in countries with more centralized institutions, all else being equal. However, when there is a large amount of IMF pressure, austerity protests will on average be more severe in countries with more centralized institutions.

3.1 Data

Data were gathered on austerity protests covering the same years as Walton and Seddon (1994): 1976-1992. The former date denotes the onset of the first modern austerity protest while the latter represents the time in which Walton and Seddon went to press.

As noted by Walton and Ragin (1990), obtaining a complete list of debtor countries that experienced international pressure to implement austerity measures can only be done indirectly, as the exact terms negotiated between the IMF and debtor countries is kept secret. To this end, I employ three measures identified by Walton and Ragin as indicative of IMF pressure: 1) the country employed the "extended fund facility" (EFF), generally reserved for countries suffering a significant imbalance of payments relating to structural maladjustments in production and trade (IMF [various]), in a given year between 1976 and 1992;[23] 2) the country's ratio of IMF funds used to its IMF quota exceeded 125% in a given year between 1976 and 1992; 3) the country rescheduled or renegotiated its debt in a given year between 1976 and 1992.[24] 70 countries satisfied one of these three criteria between 1976 and 1992.[25] I form a panel that is restricted to years in which one of these criteria were satisfied in the country in question within one year (either before or after).

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[23]The IMF defines the extended fund facility as "an IMF lending facility established in 1974 to assist member countries in overcoming balance of payments problems that stem largely from structural problems and require a longer period of adjustment than is possible under a Stand-By Arrangement. A member requesting an Extended Arrangement outlines its objectives and policies for the whole period of the arrangement (typically three years) and presents a detailed statement each year of the policies and measures it plans to pursue over the next 12 months." (IMF)

[24]Walton and Ragin split the last category into two: debt rescheduling and debt renegotiation. My reading of the data suggests that the line between these two is often blurred, so I have lumped them together. Data for EFF and IMF quota comes from various IMF Annual Reports; data for IMF funds used comes from the World Development Indicators database; data for debt rescheduling and restructuring comes from clubdeparis.org, Kuhn and Guzmàn (1990), and Dillon et al. (1985).

[25]Some countries were omitted from the dataset due to lack of IMF or control data. These include:Angola, Barbados, Burma, Dominica, Equatorial Guinea, Grenada, Liberia, Somalia, Uganda, Western Samoa, Yemen, and Yugoslavia. Iran and South Korea did not satisfy any of these conditions but are included in the data since there was an austerity protest in each country.

A list of these countries and the years employed in the data is available in Table A1.

40 countries in the data experienced austerity protests between 1976 and 1992. A Lexis-Nexis search of news reports of the 70 countries listed in Table A1 (as well as any listed in Walton and Seddon [1994] that were not in Table A1) from 1976-1992 produced 116 separate instances of austerity protest. Protests and riots were *only* documented if they resulted from austerity measures or IMF pressure - other types of anti-government protests or strikes are not included in the data. Planned general strikes and small, non-violent, sector-specific strikes are also not included in the data (even if they resulted from austerity measures).[26]

I subjectively coded each of these protests by severity using the following criterion, which are discussed further in Appendix B. This appendix also gives a brief description of each protest. An instance was scored 1 if it were a small (relative to population), confined (to one or two cities) protest. General strikes are not included in the data employed in the regressions analyzed in this section, but I include 86 instances of general strikes (or small, localized protests) as protests of level 1 in a robustness check in the Appendix C. General strikes are not included because the model is intended to analyze changes in individual behavior (on a collective scale) resulting from shocks, not organized, institutionally-driven protests. An instance was scored 2 if it were either prolonged but confined or widespread but not prolonged and 3 if the protest were prolonged and contained widespread riots. Only protests with both of these characteristics were coded level 3. An example of a protest coded 3 occurred in Algeria in October 1988, when 159 protesters were killed in a few major Algerian cities over the span of week and thousands were injured and arrested. The government's response to the protests, including those which lead to deaths, were *not* taken to account when creating the severity measures. Where government action occurred, the index takes into account the reported events that the government was responding to, not the government response itself. The reason for this is that it is possible that centralized governments are more likely to respond with violence. Hence, including the government's response would bias the severity index in favor of the proposed hypothesis.

While coding these protests is an admittedly subjective process, a reading of the articles reporting on the protests generally showed that most protests/riots easily fit into one of these three categories. The differences between protests coded 1 and other protests are especially stark. The difference between protests coded 2 and 3 are less obvious and thus more subjective, but this is not an issue in the analysis, since protests of these two severity levels are always lumped together. I also create an alternative index, found in Appendix B, for

[26] All results are robust to inclusion of general strikes and industry-specific protests as severity 1 protests. These results are available in Appendix C.

protests in which the severity level was not obvious. Tables 1 and 2 show the summary statistics of these protests broken down by year and continent.

[TABLES 1 and 2 HERE]

The intuition outlined in the model indicates that a good proxy for institutional centralization is one that accounts for one authority's ability to affect numerous types of sanctions. One such variable is spelled out in the Polity IV data set (Marshall and Jaggers 2008): constraint on the executive. This variable is defined as:

> The extent of institutionalized constraints on the decision-making powers of chief executives, whether individuals or collectivities. Such limitations may be imposed by any "accountability groups." In Western democracies these are usually legislatures. Other kinds of accountability groups are the ruling party in a one-party state; councils of nobles or powerful advisors in monarchies; the military in coup-prone polities; and in many states a strong, independent judiciary.

This variable ranges from 1 to 7, with 1 equaling “Unlimited Authority” (no regular limitations on the executive's actions) and 7 equaling “Executive Parity or Subordination” (accountability groups have effective authority equal to or greater than the executive in most areas of activity). This variable provides an ideal proxy for the degree of institutional centralization, as spelled out in the model, because it measures the degree to which political authorities can extend multifarious sanctions.

A weaker proxy of centralization is the Freedom House (2009) "degree of political freedom" variable. This variable ranges from 1 to 7, with 1 equaling "most free" and 7 equaling "least free". This is hardly an ideal measure of centralization, as defined in the model, since it does not directly underscore the ability of the central authority to impose numerous sanctions. However, centralized authorities generally also have the ability to restrict political freedoms. Nowhere do I claim that centralization *has* to be the driving force behind political freedom; I merely suggest that this is one way in which centralization manifests itself. For these reasons, regressions using this variable should be regarded as robustness checks relative to the results employing constraint on the executive data.

Other controls are employed to account for phenomena which political scientists, economists, and sociologists consider as salient factors associated with protest activity. These include the urbanization rate, per capita GDP, population, and a measure of religious fractionalization.[27] The religious fractionalization index

[27] Data on urbanization, GDP, and population comes from World Bank (various). The measure of religious fractionalization is derived from data found in Barrett, Kurian, and Johnson (2001).

is constructed like a Herfindahl index, equaling the sum of the proportion of each religion in the country squared. The summary statistics of all controls are reported in Table 3.

[TABLE 3 HERE]

3.2 Analysis

3.2.1 Testing for the Presence of Protest

The data provide a chance to test the model's primary prediction: countries with centralized political authorities should have smaller changes (relative to countries with decentralized authority) in expressed public opinion (as seen in protests) when shocks are small, but larger changes when shocks are large. Yet, before we can test how shocks (proxied with IMF variables) affect the severity of protests, we must establish *whether* the proxies are predictors of protest. In particular, the model suggests testing the following equation, where Protest_{it} is a dummy equaling 1 if there is a protest in a given year and country, i is the country, t is the year, X is the set of control variables, and "CP" denotes the "centralization proxy", where both the "constraint on the executive" and "political freedom" variables are transformed so that higher values indicate greater centralization.[28]

$$\text{Protest}_{it} = \delta_0 + \delta_1 \text{Shock}_{it} + \delta_2 \text{CP}_{it} + \delta X_{it} + \varepsilon_{it} \tag{10}$$

There are 3 different IMF variables that proxy for a shock: use of IMF funds (divided by IMF quota), use of EFF funds (divided by IMF quota), and the number of restructurings and reschedulings. The first two variables are deflated by the country's IMF quota, which is based on its standing in the world's economy. Walton and Ragin (1990) note that all three of these variables are good predictors of austerity protests, with the the number of restructurings being the strongest predictor.[29] I also create variables for the greatest single-

[28] The controls employed in these regressions are consistent with those pointed out by Auvinen (1997) as ones that traditionally have received attention in the political science, economics, and sociology literature related to political conflict. They include urbanization rate, real per capita GDP, population, religious fractionalization, and the number of previous protests. Inflation and government debt are not included as controls because they frequently *lead to* IMF involvement.

[29] Walton and Ragin formulate an "IMF pressure index" which is the summation of the z-scores of all 4 IMF indicators. I do not do this for two reasons: 1) I find, like Walton and Ragin, that the number of restructurings and reschedulings is by far the best predictor; 2) the sum of the z-scores is dominated by the restructuring variable, which is not normally distributed, and hence converting it to a z-score is erroneous. I have analyzed the regressions reported in this paper using Walton and Ragin's z-score variable and the results are similar - though not as strong - as the ones reported here. These results are available upon request.

year level of the three IMF proxies over the previous two years. These latter variables may be more suitable, since the chain of events from IMF pressure to implementation of austerity programs to protests can take months to matriculate and are thus often realized over multiple years.

Equation (10) does not provide a test of the model's hypothesis; instead, it provides a test of how well the IMF variables proxy for a "shock" *in the context* of the model. The model indicates that the coefficient on the IMF "shock" variable, δ_1, should be positive (and statistically significant). If it is not, then the variable in question is not a predictor of protests in general and thus should shed little light on how institutional centralization affects the *severity* of protests.

A probit model is used to test equation (10). The probit coefficients are reported in Tables 4 and 5. All regressions include continent dummies, and standard errors are clustered by continent.[30]

[TABLES 4 and 5 HERE]

The results in Tables 4 and 5 indicate that the "use of IMF funds" and "EFF" variables are not good predictors of protests, but the "restructuring/rescheduling" variable is a good predictor. The coefficients on the IMF Pressure Index are insignificant in all of the regressions where "use of IMF funds" and "EFF" variables are employed as the shock proxy and all other controls are included. However, the number of restructurings or reschedulings appears to be a strong predictor of protests (the coefficient is always positive and significant), a result also found in Walton and Ragin (1990). Indeed, the terms of IMF "conditionality" (policy prescriptions that are agreed to by all parties) are generally agreed to *in return for* the renegotiation or rescheduling of debt repayment (Walton and Ragin 1990), so it is not surprising that this variable is the "strongest" predictor of protests. Hence, for the remainder of the analysis I will only employ reschedulings - not use of IMF funds or EFF - as a proxy for an IMF "shock".

3.2.2 Relating "Centralization" and Protest Severity

Since the rescheduling variable is a good predictor of protests, we can re-write Prediction 1 as the following:

Prediction 1A: All else being equal, a change to a more centralized economy should have a positive (negative) effect on the probability of a more severe protest occurring when the restructuring variable is large (small)

[30] Including country dummies would be ideal, but there is too little variation within countries over time for this to be a feasible approach, as all results are dependent on a small number of observations. Using non-clustered standard errors gives largely similar results, which are available upon request.

As in the model, Prediction 1A suggests that there is a non-linear relationship between centralization and the severity of protests. This relationship can be estimated with the regression model in equation (11). The dependent variable, Protest Severity$_{it}$, equals one if the most severe protest in a given year and country equals 2 or 3 and equals zero otherwise. Unfortunately, there are too few observations of protests of severity 3 to test the model using a dependent variable which equals one only if the protest is of severity 3.[31] This should not detract from the results, however, as the most significant differences in protest severity are between those coded 1, which are generally confined and short, and 2 and 3, which are more widespread and long in duration. As before, "CP" denotes the centralization proxy (either the constraint on the executive or political rights variable), while the shock variable is the number of reschedulings (over one or two years).[32]

$$\text{Protest Severity}_{it} = \eta_0 + \eta_1 \text{Shock}_{it} + \eta_2 \text{CP}_{it} + \eta_3 \text{Shock}_{it} * \text{CP}_{it} + \eta X_{it} + \varepsilon_{it} \tag{11}$$

Prediction 1A implies that η_2 should be negative and η_3 should be positive. In other words, protest severity should be decreasing in centralization when shocks are small (and the interaction term is small), while protest severity should be increasing in centralization when shocks are large (and the interaction term is large). According to the model, centralized governments should be better able to suppress small shocks, but are subject to massive changes when there are large, systemic shocks. These predictions are mostly confirmed in Table 6, which reports the probit coefficients of an estimation of equation (11).

[TABLE 6 HERE]

The coefficient on the centralization proxies (η_2) is negative in columns (2)-(4), though it is never significant, while the coefficient on the interaction term is positive in all regressions and is significant in columns (2)-(4). A much more instructive look, however, is provided by Tables 7 and 8, which map the probability of

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[31] Nevertheless, the results are broadly robust (in terms of statistical significance) to an ordered probit specification.

[32] There is the possibility that the regressions specified above suffer from an endogeneity problem. That is, it is possible that more centralized regimes are more (or less) able to access IMF funds and impose austerity. If this is true, the "shock" variable (rescheduling) is a function of the centralization proxy, and the regression model is misspecified. However, the correlations between the shock variables and the centralization proxies are almost 0. Amongst the observations used in the regressions, $\sigma_{RESC,CE} = -0.0186$, $\sigma_{RESC,PR} = -0.0741$, where $RESC$ is the rescheduling variable, CE is the "Constraint on the Executive" variable, and PR is the "Political Rights" variable. Moreover, regressions with the rescheduling variables as the dependent variables and the centralization proxies and other controls on the right-hand side provides highly insignificant results on the centralization proxy coefficients. These results are available upon request.

a severe protest occurring over varying amounts of reschedulings and values of the centralization parameter. Again, the constraint on the executive has been transformed so that a value of 7 is the most centralized (least constraint) and the value of 1 is the least centralized (most constraint). These probabilities were derived using the coefficients in Table 6, taken at the average of the control variables.[33]

[TABLE 7 and 8 HERE]

A number of patterns emerge from these tables. First, in the lower panel of Table 7 and in both panels of Table 8, severe protests are less likely to occur as centralization increases when there are zero reschedulings. Although the last column suggests that this trend is not statistically significant, this is in line with what the model predicts: centralized regimes are more able to suppress dissent when shocks are weak or non-existent. These comparative statics reverse, however, when reschedulings occur. In all four panels of Tables 7 and 8, the probability of severe protest is increasing in centralization when a rescheduling occurs, with the trend being stronger when multiple reschedulings occur. This trend is statistically significant in 5 of the 8 specifications. This result is consistent with the model: although centralized regimes are good at suppressing small shocks, they are susceptible to massive changes when larger shocks occur. Indeed, the probability of a severe protest occurring in the most centralized regimes is more than double that of the least centralized regimes in 5 of the 8 specifications where at least one rescheduling occurs.

In sum, this empirical exercise is meant merely to support the theoretical contribution of the model. Although the analysis does not speak to the micro mechanisms suggested in the model, it does confirm its testable predictions. Most importantly, it provides evidence that centralized authorities are able to suppress changes in publicly-expressed opinion when shocks are small, but are susceptible to massive changes in publicly-expressed opinion when shocks are large.

4 Conclusion

This paper analyzes the institutional roots of massive social, economic, and political changes. It employs a simple economic model which suggests that authorities in centralized economies are relatively insulated from small shocks but may be susceptible to cascades resulting in massive changes if shocks are larger. On the micro level, this result arises because citizens living under centralized authority are more likely to choose

[33] The Africa dummy is set equal to 1 and all other continent dummies set equal to 0. The results are robust to setting other continent dummies equal to 1.

actions that differ from their intrinsic optima, as they face numerous costs from choosing such actions. This entails that small shocks are unlikely to upset the equilibrium outcome under centralized rule, as individuals are unwilling to incur the numerous, sometimes heavy sanctions associated with transgressing the centralized authority's dictates. However, a large shock may encourage some citizens to incur these costs, which can trigger a cascade that results in a massive change in actions of all players, including the institutional authorities.

This hypothesis is tested using data from austerity protests in 1976-1992. I employ various measures of IMF involvement to proxy for a "shock", as such involvement often directly led to austerity measures that contributed to the existence and severity of the protests. A regression analysis supports the model's hypothesis, suggesting that increasing the number of debt restructurings or renegotiations undertaken by a country leads to more severe protests in economies with centralized political authorities. Meanwhile, such protests are less likely to occur in economies with centralized political authorities when there are zero restructurings.

The model applies to numerous historical and contemporary phenomena. The most recent example is the Arab Spring of 2011, where citizens who had quietly lived under oppressive, centralized regimes for decades revolted in massive numbers in Egypt, Tunisia, Libya, Syria, and Bahrain. Another example is the fall of communism in the Soviet Union, which was due in part to the multi-faceted sanctions imposed by the Communist Party - consistent with the logic spelled out in this model. Similarly, the centralization of authority in Tsarist Russia may have led to the incredible scale of the Bolshevik Revolution (while also explaining the central government's ability to suppress numerous smaller outbreaks in the nineteenth century). The interdependence between the Chinese bureaucracy and Qing rulers may help explain the scale of the Taiping Rebellion (1850-1864), which followed after massive deflation systemically affected much of the Chinese countryside. The model also has implications for the future of centralized regimes such as those in Iran, China, Burma, North Korea, and Zimbabwe.[34]

This paper is *not* meant to suggest that a general framework exists for predicting revolutions or massive social change.[35] The amount of variables necessary for a revolution to occur likely renders this an impossible task. This paper, does, however, suggest that one ubiquitous set of conditions - those associated with the

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[34] Of course, the model also has implications for decentralized regimes, especially ones espousing separation between church and state. Such regimes are less likely to be subject to revolutions, as decentralized authorities have more incentive to respond to the citizenry.

[35] Nor is this paper meant to lay out any specific prediction concerning the future of centralized economies, à la Bruce Bueno de Mesquita. Instead, it provides a general framework which links centralized institutions to revolutionary activity.

centralization of coercive power - are conducive to massive changes in equilibrium outcomes.

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Tables

Table 1: Protests and Severity by Year

Year	Protests Indexed 1	Protests Indexed 2	Protests Indexed 3	Number of Protests
1976	0	1	0	1
1977	0	2	1	3
1978	1	2	0	3
1979	0	1	0	1
1980	0	1	1	2
1981	1	0	1	2
1982	0	3	0	3
1983	7	5	0	12
1984	7	3	2	12
1985	6	5	0	11
1986	7	5	0	12
1987	5	2	0	7
1988	2	2	1	5
1989	8	1	3	12
1990	4	6	2	12
1991	6	2	2	10
1992	7	1	0	8
Total	**61**	**42**	**13**	**116**

Table 2: Protests and Severity by Continent

Region	Protests Indexed 1	Protests Indexed 2	Protests Indexed 3	Total Protests
Africa	9	9	3	21
Asia	10	0	1	11
Central America	16	8	1	25
Europe	7	0	2	9
Middle East	2	2	5	9
South America	17	23	1	41
Total	**61**	**42**	**13**	**116**

Table 3: Summary Statistics, IMF and Centralization Variables

	Observations	Mean	Variance
	Including All Years Used in Regressions		
IMF and Centralization Variables			
Use of Funds/Quota (if > 1.25)	807	0.58	1.076
Use of Funds/Quota (if > 1.25) (over 2 years)	807	1.49	1.679
Extended Fund Facility/Quota	807	0.51	1.614
Extended Fund Facility/Quota (over 2 years)	807	0.64	1.982
# of reschedulings/restructurings	807	0.37	0.289
# of reschedulings/restructurings (over 2 years)	807	0.56	0.361
Constraint on Executive (1-7)	807	3.40	4.761
Political Rights (1-7)	807	4.45	3.608
Economic and Demographic Controls			
Urbanization Rate	807	0.40	0.039
Log Real GDP ($ per capita, 1987 USD)	803	2.80	0.201
Log Population	807	7.01	0.376
Religious Fractionalization	807	0.71	0.047

**Years used in regressions are ones within one year of one of the IMF variables being positive

Table 4: Protest Presence (Probit Coefficients)

	Dependent Variable: Protest Presence (0/1)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Use of Funds/Quota (if > 1.25)	-0.000	0.018	0.021						
	(0.089)	(0.092)	(0.091)						
Extended Fund Facility/Quota				0.075***	0.037	0.033			
				(0.027)	(0.036)	(0.037)			
# of reschedulings/restructurings							0.389***	0.304***	0.303***
							(0.099)	(0.108)	(0.110)
Constraint on Executive		-0.020			-0.020			-0.022	
		(0.023)			(0.023)			(0.024)	
Political Rights			-0.041**			-0.037			-0.041
			(0.018)			(0.024)			(0.025)
Urbanization Rate		0.913	0.877		0.870	0.838		0.698	0.656
		(1.153)	(1.134)		(1.154)	(1.138)		(1.025)	(1.000)
Log of Real GDP		-0.188	-0.193		-0.180	-0.184		-0.180	-0.183
		(0.128)	(0.141)		(0.122)	(0.137)		(0.111)	(0.126)
Religious Fractionalization		0.656	0.630		0.648	0.622		0.600	0.568
		(0.640)	(0.644)		(0.670)	(0.672)		(0.645)	(0.654)
Log of Population		0.195**	0.193**		0.190**	0.188**		0.188**	0.185**
		(0.087)	(0.085)		(0.084)	(0.082)		(0.086)	(0.084)
Number of Previous Protests		0.038**	0.039**		0.039**	0.040**		0.044**	0.046***
		(0.018)	(0.017)		(0.018)	(0.016)		(0.018)	(0.017)
Continent Dummies	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	805	801	801	807	803	803	807	803	803
pseudo R-squared	0.000	0.108	0.109	0.006	0.109	0.110	0.026	0.122	0.123

Standard errors, clustered by region, in brackets; *** p<0.01, ** p<0.05, * p<0.1; A constant term included in each regression

Table 5: Protest Presence, IMF variables over 2 years (Probit Coefficients)

	Dependent Variable: Protest Presence (0/1)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Use of Funds/Quota (if > 1.25)	0.004	0.016	0.019						
(over 2 years)	(0.090)	(0.098)	(0.097)						
Extended Fund Facility/Quota				0.081***	0.046	0.041			
(over 2 years)				(0.026)	(0.033)	(0.033)			
# of reschedulings/restructurings							0.422***	0.315***	0.316***
(over 2 years)							(0.064)	(0.074)	(0.075)
Constraint on Executive		-0.024			-0.025			-0.027	
		(0.025)			(0.026)			(0.027)	
Political Rights			-0.044**			-0.040			-0.047*
			(0.020)			(0.026)			(0.027)
Urbanization Rate		0.976	0.927		0.926	0.884		0.598	0.542
		(1.103)	(1.088)		(1.096)	(1.084)		(1.046)	(1.022)
Log of Real GDP		-0.197	-0.199		-0.191	-0.192		-0.179*	-0.179
		(0.131)	(0.143)		(0.125)	(0.139)		(0.104)	(0.117)
Religious Fractionalization		0.636	0.602		0.620	0.586		0.615	0.575
		(0.624)	(0.625)		(0.651)	(0.649)		(0.600)	(0.607)
Log of Population		0.194**	0.191**		0.186**	0.184**		0.192**	0.189**
		(0.084)	(0.082)		(0.080)	(0.079)		(0.083)	(0.081)
Number of Previous Protests		0.038**	0.041***		0.038**	0.041***		0.042**	0.045***
		(0.016)	(0.015)		(0.017)	(0.015)		(0.017)	(0.016)
Continent Dummies	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	788	784	784	788	784	784	788	784	784
pseudo R-squared	0.000	0.106	0.107	0.008	0.108	0.109	0.035	0.122	0.123

Standard errors, clustered by region, in brackets; *** p<0.01, ** p<0.05, * p<0.1; A constant term included in each regression

Table 6: Presence of Severe Protest (Probit Coefficients)

	Dependent Variable: Dummy = 1 if Protest 2 or 3			
	(1)	(2)	(3)	(4)
# of reschedulings	0.099	0.007		
	(0.148)	(0.115)		
Constraint on Executive	0.032		-0.033	
	(0.035)		(0.041)	
# of reschedulings*Constraint on Executive	0.024			
	(0.050)			
Political Rights		-0.023		-0.056
		(0.053)		(0.052)
# of reschedulings*Political Rights		0.048*		
		(0.027)		
# of reschedulings (over 2 years)			-0.246	-0.093
			(0.152)	(0.076)
# of reschedulings (over 2 years)*Constraint on Executive			0.085**	
			(0.035)	
# of reschedulings (over 2 years)*Political Rights				0.061**
				(0.024)
Urbanization Rate	0.959	1.013	1.032	1.065
	(0.649)	(0.778)	(0.809)	(0.857)
Log of Real GDP	-0.294*	-0.323*	-0.312*	-0.341*
	(0.150)	(0.168)	(0.167)	(0.179)
Religious Fractionalization	0.740	0.754	0.760	0.741
	(0.587)	(0.581)	(0.543)	(0.523)
Log of Population	0.183	0.195	0.191	0.198
	(0.138)	(0.130)	(0.134)	(0.127)
Number of Previous Protests	0.029	0.017	0.017	0.014
	(0.032)	(0.032)	(0.036)	(0.032)
Continent Dummies	Yes	Yes	Yes	Yes
Observations	705	705	690	690
pseudo R-squared	0.124	0.122	0.123	0.118

Standard errors, clustered by region, in brackets; *** p<0.01, ** p<0.05, * p<0.1; A constant term included in each regression

Table 7: Probability of Large Protest, varying shock and centralization levels

	Pr(Protest = 2 or 3)							
	Constr on Exec = 1	Constr on Exec = 2	Constr on Exec = 3	Constr on Exec = 4	Constr on Exec = 5	Constr on Exec = 6	Constr on Exec = 7	p-value: H_o: Column 1 = Column 7
# of reschedulings = 0	0.023***	0.024***	0.026***	0.028***	0.030***	0.033***	0.035***	0.409
	[0.004]	[0.003]	[0.003]	[0.004]	[0.006]	[0.009]	[0.012]	
# of reschedulings = 1	0.030***	0.034***	0.039***	0.043***	0.049***	0.055***	0.061***	0.004
	[0.005]	[0.005]	[0.005]	[0.006]	[0.007]	[0.008]	[0.010]	
# of reschedulings = 2	0.040***	0.047***	0.055***	0.065***	0.076***	0.088**	0.101*	0.317
	[0.015]	[0.013]	[0.014]	[0.019]	[0.028]	[0.040]	[0.055]	
# of reschedulings = 0	0.040***	0.037***	0.035***	0.032***	0.030***	0.028***	0.026***	0.438
(over 2 years)	[0.012]	[0.008]	[0.005]	[0.003]	[0.003]	[0.005]	[0.007]	
# of reschedulings = 1	0.028***	0.032***	0.035***	0.040***	0.044***	0.049***	0.055***	0.000
(over 2 years)	[0.003]	[0.002]	[0.002]	[0.003]	[0.003]	[0.004]	[0.004]	
# of reschedulings = 2	0.019***	0.026***	0.036***	0.048***	0.064***	0.083***	0.106***	0.000
(over 2 years)	[0.005]	[0.006]	[0.006]	[0.008]	[0.011]	[0.016]	[0.023]	

Standard errors, clustered by region, in brackets; *** p<0.01, ** p<0.05, * p<0.1
Estimates in the top 3 rows derived from Column 1 of Table 6 and estimates in the bottom 3 rows derived from Column 3 of Table 6

Table 8: Probability of Large Protest, varying shock and centralization levels

	Pr(Protest = 2 or 3)							
	Political Rights = 1	Political Rights = 2	Political Rights = 3	Political Rights = 4	Political Rights = 5	Political Rights = 6	Political Rights = 7	p-value: H_o: Column 1 = Column 7
# of reschedulings = 0	0.037**	0.035***	0.034***	0.032***	0.030***	0.029***	0.027***	0.679
	[0.017]	[0.012]	[0.009]	[0.006]	[0.005]	[0.007]	[0.009]	
# of reschedulings = 1	0.042***	0.044***	0.047***	0.049***	0.052***	0.055***	0.058***	0.367
	[0.015]	[0.013]	[0.011]	[0.009]	[0.008]	[0.007]	[0.008]	
# of reschedulings = 2	0.047**	0.055***	0.064***	0.073***	0.084***	0.096***	0.109***	0.025
	[0.019]	[0.021]	[0.023]	[0.026]	[0.030]	[0.034]	[0.040]	
# of reschedulings = 0	0.048**	0.042***	0.038***	0.033***	0.029***	0.026***	0.023***	0.327
(over 2 years)	[0.020]	[0.013]	[0.008]	[0.005]	[0.004]	[0.006]	[0.008]	
# of reschedulings = 1	0.045***	0.045***	0.046***	0.046***	0.046***	0.047***	0.047***	0.887
(over 2 years)	[0.015]	[0.012]	[0.009]	[0.006]	[0.004]	[0.004]	[0.006]	
# of reschedulings = 2	0.042***	0.048***	0.055***	0.062***	0.071***	0.080***	0.090***	0.021
(over 2 years)	[0.012]	[0.012]	[0.012]	[0.012]	[0.014]	[0.016]	[0.020]	

Standard errors, clustered by region, in brackets; *** p<0.01, ** p<0.05, * p<0.1
Estimates in the top 3 rows derived from Column 2 of Table 6 and estimates in the bottom 3 rows derived from Column 4 of Table 6

Figures

Figure 1: Three Equilibria

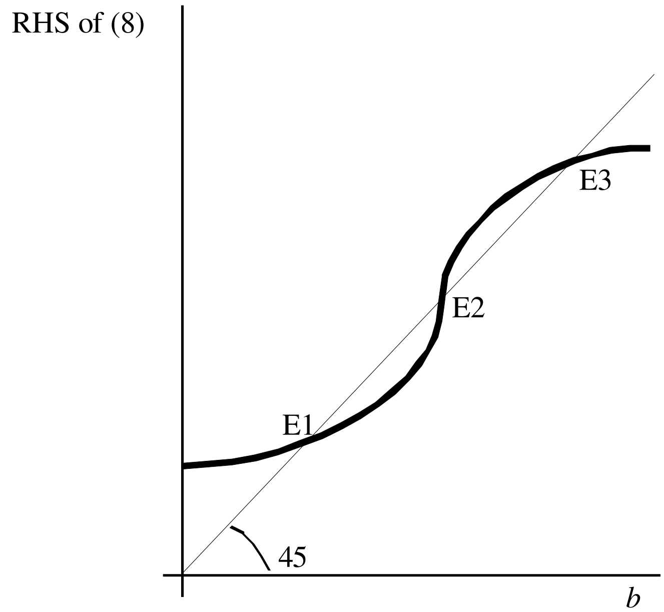


Figure 2: Stability of Equilibria

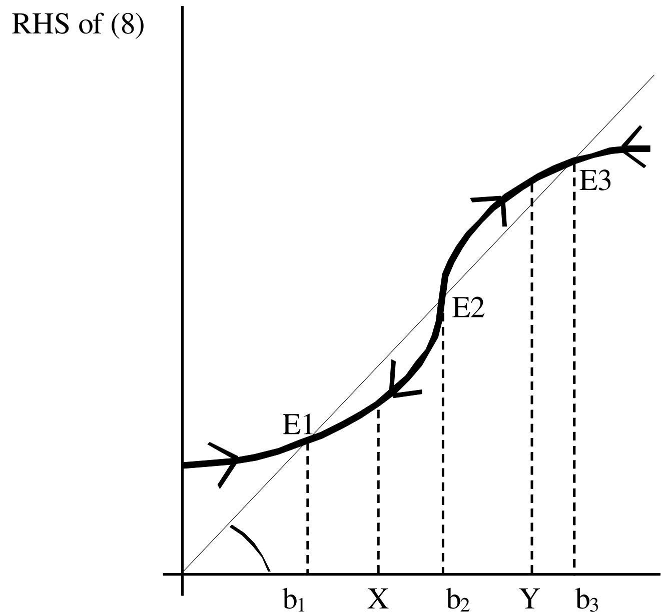


Figure 3: μ at the inflection point

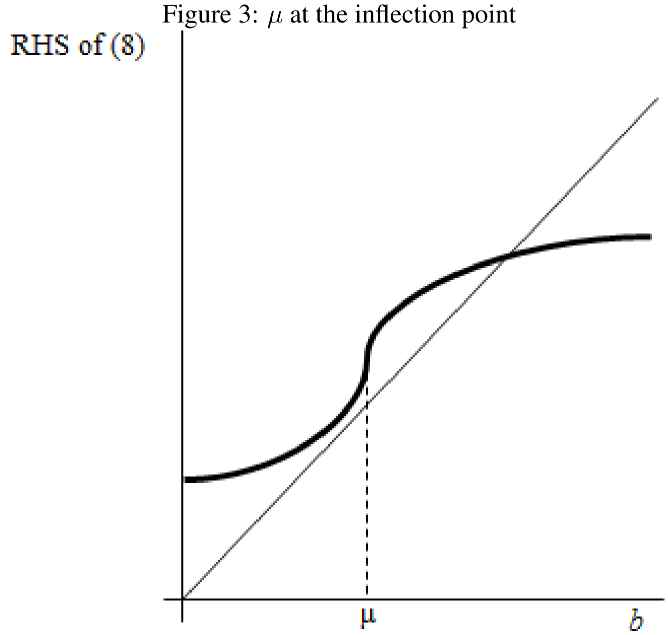


Figure 4: Curves with different σ

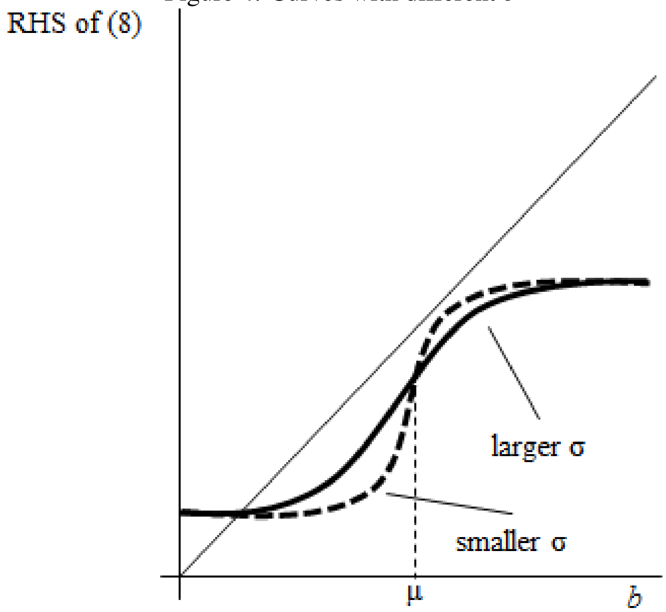


Figure 5: Always in the "good" equilibrium

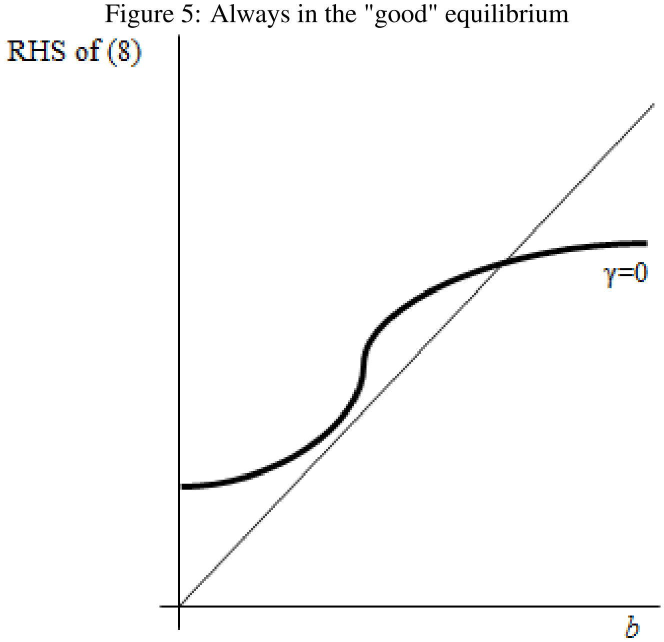


Figure 6: Always in the "bad" equilibrium

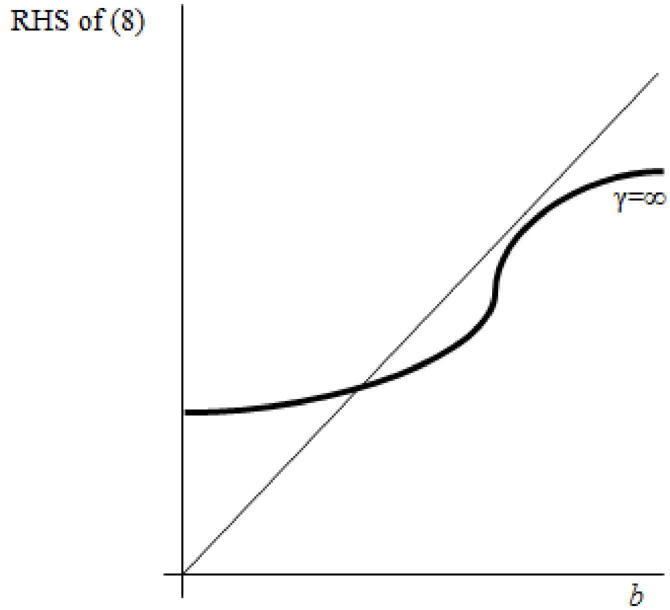


Figure 7: Cascades at low γ

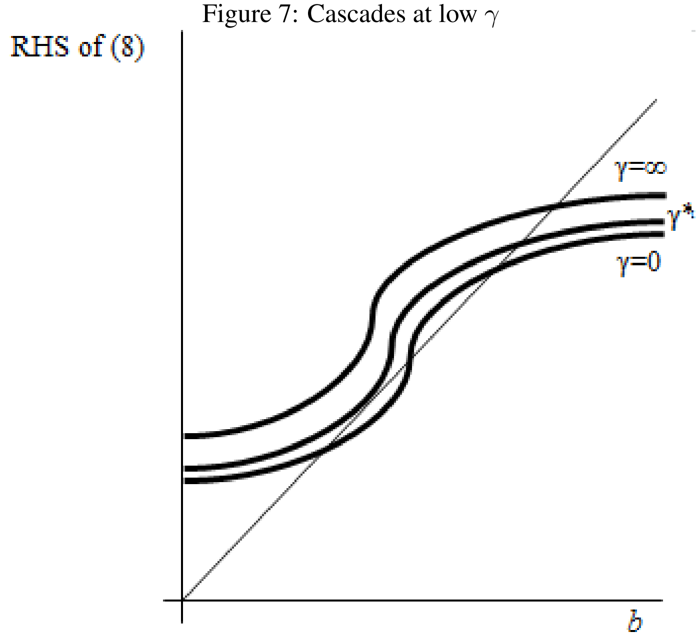


Figure 8: Cascades at all γ

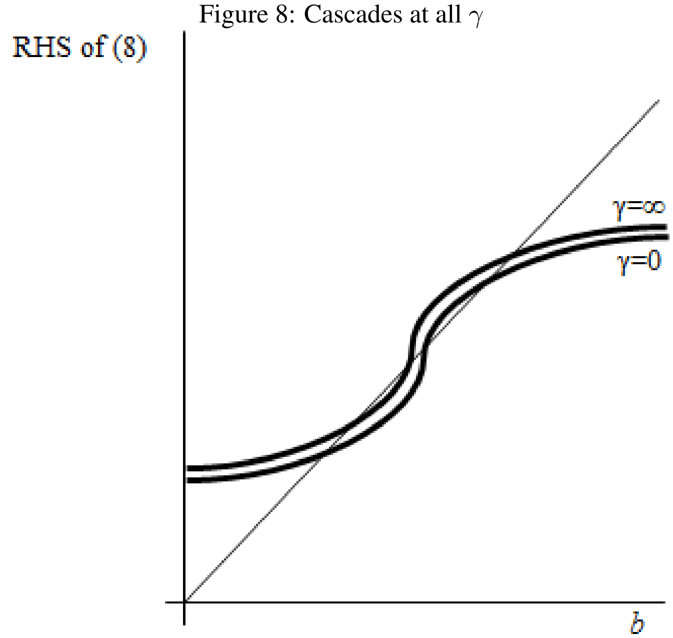
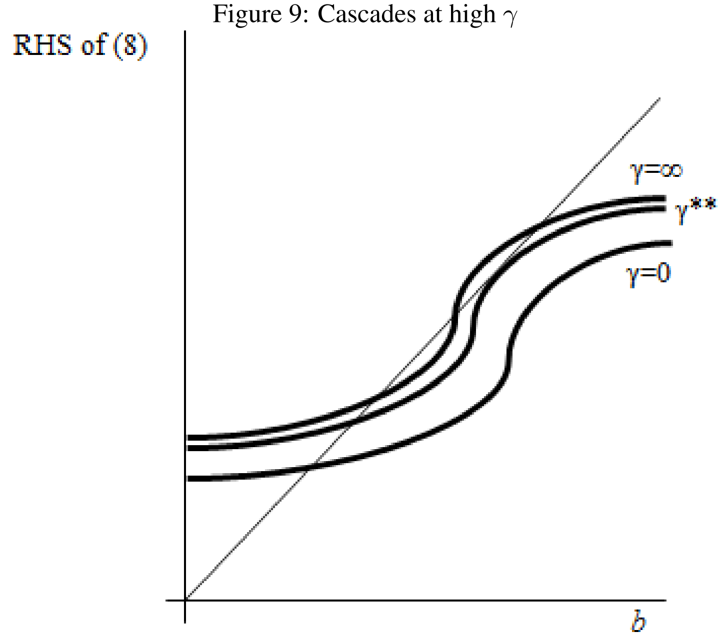


Figure 9: Cascades at high γ



A Other Tables

Table A1: IMF Pressure by Country and Year

X = IMF Pressure within one year

	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	Total
Algeria																X	X	2
Argentina						X	X	X	X	X	X	X	X	X	X	X	X	12
Bangladesh	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
Benin													X	X	X	X	X	5
Bolivia				X	X	X	X	X	X	X	X	X	X	X	X	X	X	14
Brazil							X	X	X	X	X	X	X	X	X	X	X	11
Bulgaria															X	X	X	3
Burkina Faso															X	X	X	3
Cameroon		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	16
Central African Republic					X	X	X	X	X	X	X	X	X	X	X	X		12
Chad													X	X	X			3
Chile	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
Congo (Dem. Rep.)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		16
Congo (Rep.)		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		15
Costa Rica					X	X	X	X	X	X	X	X	X	X	X	X	X	13
Côte d'Ivoire					X	X	X	X	X	X	X	X	X	X	X	X	X	13
Dominican Republic			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	15
Ecuador						X	X	X	X	X	X	X	X	X	X	X	X	12
Egypt	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
El Salvador						X	X	X	X	X	X	X	X	X	X	X		11
Ethiopia			X	X	X	X	X	X	X	X								8
Gabon		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	16
Gambia, The		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	16
Ghana							X	X	X	X	X	X	X	X	X	X	X	11
Guatemala						X	X	X	X	X								5
Guinea										X	X	X	X	X	X	X	X	8
Guinea-Bissau											X	X	X	X	X			5
Guyana		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	16
Haiti		X	X	X	X	X	X	X	X	X	X	X	X					12
Honduras			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	15
Hungary															X	X	X	3
India					X	X	X	X	X	X	X	X	X	X	X	X	X	13
Iran																		0
Jamaica	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
Jordan													X	X	X	X	X	5

Table A1 (continued)

X = IMF Pressure within one year

	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	Total
Kenya	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
Korea (South)																		0
Madagascar				X	X	X	X	X	X	X	X	X	X	X	X	X	X	14
Malawi			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	15
Mali						X	X	X	X	X	X	X	X	X	X	X	X	12
Mauritania	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		16
Mauritius			X	X	X	X	X	X	X	X	X	X	X	X				12
Mexico	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
Morocco		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	16
Mozambique								X	X	X	X	X	X	X	X	X	X	10
Nepal				X	X	X												3
Nicaragua			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	15
Niger							X	X	X	X	X	X	X	X	X	X	X	11
Nigeria							X	X	X	X	X	X	X	X	X	X	X	11
Pakistan	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
Panama						X	X	X	X	X	X	X	X	X	X	X	X	12
Papua New Guinea					X	X	X	X	X									5
Peru	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
Philippines	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
Poland					X	X	X	X	X	X	X	X	X	X	X	X	X	13
Romania	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
Senegal		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	16
Sierra Leone	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
Sri Lanka	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
Sudan	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
Tanzania	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
Thailand		X	X	X	X	X	X	X	X	X	X	X	X	X				13
Togo			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	15
Trinidad and Tobago													X	X	X	X		4
Tunisia											X	X	X	X	X	X	X	7
Turkey	X	X	X	X	X	X	X	X	X	X	X	X	X					13
Uruguay	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
Venezuela						X	X	X	X	X	X	X	X	X	X	X	X	12
Zambia	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	17
Zimbabwe							X	X	X	X	X	X	X	X	X	X	X	11
	19	**28**	**35**	**38**	**44**	**51**	**55**	**56**	**56**	**56**	**56**	**56**	**60**	**58**	**59**	**58**	**52**	**837**

Table A2: Protests And Severity by Country

Country	Protests Indexed 1	Protests Indexed 2	Protests Indexed 3	**Total Protests**
Algeria	0	1	1	**2**
Argentina	0	1	0	**1**
Bangladesh	1	0	0	**1**
Bolivia	5	2	0	**7**
Brazil	3	5	0	**8**
Bulgaria	1	0	0	**1**
Chile	1	3	0	**4**
Congo (Dem. Rep.)	1	0	1	**2**
Côte d'Ivoire	0	0	1	**1**
Dominican Republic	4	2	1	**7**
Ecuador	3	1	0	**4**
Egypt	0	0	1	**1**
El Salvador	2	0	0	**2**
Gabon	1	0	0	**1**
Ghana	1	0	0	**1**
Guatemala	0	1	0	**1**
Haiti	0	1	0	**1**
Honduras	1	0	0	**1**
India	6	0	0	**6**
Iran	1	0	0	**1**
Jamaica	2	2	0	**4**
Jordan	0	0	1	**1**
Mexico	4	0	0	**4**
Morocco	0	1	2	**3**
Mozambique	1	0	0	**1**
Nicaragua	1	0	0	**1**
Niger	0	1	0	**1**
Nigeria	0	3	0	**3**
Panama	2	2	0	**4**
Peru	3	9	0	**12**
Philippines	3	0	0	**3**
Poland	3	0	0	**3**
Romania	3	0	2	**5**
Senegal	1	0	0	**1**
Sierra Leone	0	1	0	**1**
South Korea	0	0	1	**1**
Sudan	2	3	0	**5**
Tunisia	1	0	0	**1**
Venezuela	2	2	1	**5**
Zambia	2	1	1	**4**
Total	**61**	**42**	**13**	**116**

B Protest Data Description

This section describes how the protest data was collected and classified. I first identified all countries that either satisfied at least one of the three "IMF pressure" variables noted in the text or were identified by Walton and Seddon (1994) as having protests in this period. For all of these countries, I searched all articles in Lexis-Nexis Academic that arose from the following search string: (IMF OR austerity) AND (riot OR protest) AND [country]. This method produced 116 instances of protest (and 86 additional general strikes), as opposed to 146 instances found by Walton and Seddon. The difference is likely a result of coding of non-severe protests, as I did not count events such as general strikes (unless they led to alternative forms of rioting) or small, sector-specific strikes. However, there do not appear to be any inconsistencies in the counting of severe protests.

As noted in Section 3.1, protests and riots were *only* documented if they resulted from austerity measures or IMF pressure. In the case of protests, a specific aim of those protesting had to be some sort of austerity measure, such as higher prices, reduced wages, or slashing of government jobs. If riots broke out, they are only counted in the data set if they were a result of some austerity measure. Thus, a government coup would not be part of the universe of observations, but the rioting on the streets that preceded a coup would be counted *if* the rioting resulted from austerity measures..

As noted, I subjectively coded each of these protests by their severity, using the following criterion. An instance was scored 1 if it was a small and confined (to one or two cities) protest. These protests do not result in significant violence, and the death count is usually (but not always) zero. A protest could be scored 1 even if the government employs violence on the rioters. In this case, the metric employed is to gather all information (available in news reports) on the riot *prior to* government intervention. Again, the reason that this standard is used is that centralized governments are more likely to employ violence, and thus including the government response in the classification could bias the results in favor of the hypothesis. This is avoided wherever possible.

An instance was scored 2 if it were either prolonged but confined or widespread but not prolonged. Generally, minimal deaths result in protests scored 2, but I do not rely on deaths as an indicator, since they are often correlated with the degree of government response. Finally, instances are scored 3 if they were prolonged and contained widespread riots. Instances scored 3 generally, but not always resulted in numerous deaths.

The severity of some protests was not obvious. For these protests, I created an "alternate index", listed below. The index takes a value only when a protest can reasonably be considered of a different severity than is given in the severity index. All protests are listed below with a brief description and severity level.

Africa

Country	Month	Year	Description	Severity Index	Alternate Index?
Congo (Dem. Rep.)	February	1989	Student protests after gas price increase; 1000 involved in fights with police	1	--
	September	1991	30 dead; precipitated regime change	3	2
Côte d'Ivoire	February	1990	Protests against wage cuts; lasted two months until austerity dropped; relatively non-violent	3	2
Gabon	December	1989	Series of strikes against austerity; national conference called	1	--
Ghana	November	1978	80 strikes after austerity measures	1	--
Mozambique	January	1990	Waves of strikes and protests over austerity	1	--
Niger	February	1990	10 students killed, 50 wounded in protest against austerity	2	--
Nigeria	April	1988	6 students killed in riot over increased gas prices	2	1
	May	1989	Two weeksof rioting against austerity, 30 killed	2	--
	May	1992	23-100 dead in riots in many cities	2	--
Senegal	March	1988	Urban riots over austerity measures	1	--
Sierra Leone	July	1980	4 days of riots after gas price hike; 2 dead	2	1
Sudan	March	1981	Protests in northern towns over inflation, shortages	1	--
	January	1982	4 days of student protests over austerity; thousands involved, 28 deaths	2	--
	March	1985	3 days of rioting following food price hikes; 5 deaths, 2000 arrested	2	--
	October	1987	Student protests over food and fuel price hikes, 10,000 involved, one death	2	1
	December	1987	Widespread demonstrations after price hikes	1	--
Zambia	December	1986	15 dead, 1000 arrested in widespread riot over hike in price of cornmeal; price hike rescinded	2	--
	January	1989	61 arrested after change in food subsidies	1	--
	July	1989	Youth food riots after food price hike	1	--
	June	1990	30 dead, hundreds injured in weekend riot	3	2

Asia

Country	Month	Year	Description	Severity Index	Alternate Index?
Bangladesh	June	1986	Thousands protest in Dhaka over rising cost of living	1	--
India	February	1986	Thousands protest price hikes	1	--
	September	1991	Thousands march in New Delhi to protest austerity	1	--
	November	1991	Millions strike against economic policies	1	--
	June	1992	Millions strike against economic policies	1	--
	September	1992	Protests in New Delhi after oil price hike	1	--
	November	1992	1,200 arrested, 50 injured in protest over rising prices	1	--
Philippines	November	1984	8,000 protest against IMF in Manila	1	--
	July	1991	Violent transport driver strike of economic policies	1	--
	January	1992	Protest against rise in electricity prices	1	--
South Korea	May	1980	Series of strikes and protests over austerity; 300 dead	3	2

Central America/Caribbean

Country	Month	Year	Description	Severity Index	Alternate Index?
Dominican Republic	April	1984	Protests over entire month throughout D.R. against austerity; 120 dead, 6,000 arrested	3	--
	July	1984	25,000 protest resumption of IMF talks	1	--
	August	1984	Students protest price hikes; 1 dead	1	--
	November	1984	Hundreds protest milk price hikes	1	--
	January	1985	Waves of protests after price hikes; hundreds arrested	1	--
	March	1988	Two weeks of protests over economic policies; 4 dead	2	1
	August	1990	2 day strike over price increases; 8 dead; 1000 arrested	2	--
El Salvador	January	1986	8,000 protest over austerity measures	1	--
	February	1986	50,000 protest over austerity measures	1	--
Guatemala	September	1985	Protests over bus fare increase; 1 dead, 466 arrested	2	1
Haiti	June	1984	Violence in 5 towns over 3 months over austerity; 3 dead	2	1
Honduras	May	1984	20,000 protest against austerity in Tegucigalpa	1	--
Jamaica	January	1979	3 days of rioting over gas price increase; 7 dead	2	--
	January	1985	Nationwide riots over gas price increase; 10 dead	2	--
	April	1985	Protests in several towns over austerity	1	--
	March	1986	Student, opposition protests over austerity	1	--
Mexico	February	1983	Thousands protest in Mexico City against austerity	1	--
	June	1983	Thousands of students protest against austerity	1	--
	October	1983	Thousands protest in Acapulco against austerity	1	--
	October	1985	7,000-10,000 marched against austerity	1	--
Nicaragua	October	1990	Protests throughout Managua over austerity	1	--
Panama	November	1984	150,000 marched in protest over austerity	2	1
	July	1985	Violent 2-day general strike over austerity	1	--
	March	1986	Week-long strike, riot against austerity; one death	2	1
	June	1991	Students, teachers riot over austerity in Panama City	1	--

Europe

Country	Month	Year	Description	Severity Index	Alternate Index?
Bulgaria	November	1990	20,000 protest austerity plan	1	--
Poland	January	1990	Street protests in Warsaw over austerity	1	--
	April	1992	30,000 protest plans for austerity measures	1	--
	May	1992	80 protests throughout country over IMF plans	1	--
Romania	November	1987	Thousands of workers riot over wage cuts	1	--
	December	1987	Student and worker protests throughout country	1	--
	December	1989	Hundreds dead in widespread riots	3	--
	April	1991	15,000 demonstrate in Bucharest	1	--
	September	1991	Miners, protesters battle police for 3 days; 3 dead	3	2

Middle East/North Africa

Country	Month	Year	Description	Severity Index	Alternate Index?
Algeria	November	1986	3 days of student rioting in Constantine; 4 deaths; 186 jailed	2	1
	October	1988	Followed increase in food prices; over a week of riots; 159 dead, 154 wounded; riots across country	3	--
Egypt	January	1977	Riots throughout country over food price increase; 79 dead	3	--
Iran	August	1991	Sporadic protests over bus fare increases	1	--
Jordan	April	1989	Riots for a week throughout country over austerity; 8 dead	3	2
Morocco	July	1981	General strike after price increases; 66 killed	3	2
	January	1984	Riots in half dozen cities after food price hikes; 240 killed over four days	3	2
	December	1990	33 killed, 210 arrested in two days of riots over economic hardships worsened by austerity	2	--
Tunisia	January	1984	Riots in main towns after bread price doubled	1	--

South America

Country	Month	Year	Description	Severity Index	Alternate Index?
Argentina	March	1982	6 wounded, 400 arrested in austerity protest	2	1
Bolivia	March	1983	Strike by public workers against austerity; 2 dead	1	--
	September	1985	Month-long strike; state of siege declared; thousands arrested	2	--
	January	1986	Waves of protests against austerity measures	1	--
	August	1986	Widespread protests; state of siege declared	2	1
	April	1987	10,000 demonstrate against austerity	1	--
	November	1987	10,000 demonstrate against austerity	1	--
	November	1989	Teachers strike, 700 arrested, state of siege declared	1	--
Brazil	May	1983	Riots in Sao Paulo and Rio de Janeiro over austerity	2	1
	July	1983	Workers around the country strike against austerity	2	1
	September	1983	Poor riots in Rio de Janeiro; austerity behind price rise	1	--
	October	1985	Thousands protest non-repayment of government debt	1	--
	November	1986	Thousands riot in Brasilia against austerity; looting and vandalizing	2	1
	July	1987	Violent demonstrations in Rio de Janeiro after increase in bus fares; 100 buses set on fire; military called in	2	1
	March	1989	Nationwide protest over wage freeze	1	--
	March	1990	Miners rampage in Peixoto; 2 dead, many injured; protest over austerity measures	2	--
Chile	June	1983	Labor protests and riots; 4 dead, hundreds arrested	2	1
	August	1983	Riot police clash with protesters; 200 arrested	1	--
	October	1983	3 days of protests; 40,000 in Santiago; more protests elsewhere over austerity; 6 dead	2	--
	July	1985	Riot police break up anti-austerity protest in Santiago; 70 arrested, 3 bombs dismantled	2	1
Ecuador	October	1982	3 days of demonstrations against austerity; state of emergency called	2	1
	January	1985	Street protests, bus driver strike over raise in fuel prices	1	--
	January	1986	Protests over prices in front of U.S. Embassy	1	--
	September	1992	Protests in 3 cities over austerity; 3 explosions	1	--
Peru	July	1976	Demonstrations against tax and price increases; civil rights suspended	2	1
	June	1977	Students demonstrate against price rise in 5 cities	2	1
	July	1977	Students, workers protest price hikes; 2 dead; 12 cities	2	--
	May	1978	Food price riots due to austerity; 12 dead	2	--
	May	1978	Youths revolt throughout Peru; 3 dead	2	--
	March	1983	24-hour strike against austerity; minimal violence	1	--
	September	1983	24-hour strike against austerity; 2 dead; 100 arrested	2	1
	March	1984	Workers and students strike in 6 towns; 1 dead	2	1
	November	1984	Student protest over austertiy in Lima; 250 arrested	1	--
	September	1988	Riots against austerity; looting and windows smashed	1	--
	August	1990	Week-long riots over food price hikes; 3 dead	2	--
	July	1991	All-out strike national strike; 2 dead	2	1

C Robustness Checks

In this section, I show that the results presented in the body of the paper are robust to numerous specifications.

First, it is possible that the exclusion of general strikes and localized protests from the data skews the results. I did not include these data in the regressions analyzed in the body because they represent organized, institutional responses to austerity, whereas the model analyzes unorganized, non-coordinated microeconomic behavior. In order to make sure that the omission of general strikes and small, localized protests is not providing misleading results, I re-analyze regression equations (10) and (11) using protest data which includes the 86 instances of general strike and small, localized protests coded as protest severity 1. These results are reported in Tables A3-A5.

Comparing Tables A3-A5 to Tables 4-6 indicates that there are almost no salient differences in the results when general strikes are added. The EFF variable appears to be a good predictor of protests in Table A3 (unlike in Table 4), but this effect goes away if the variable is considered over two years. Meanwhile, the rescheduling variable remains a good predictor of protests. The results related to protest severity (Table A5) look nearly identical to those reported in the body (Table 6).

Next, the data employed in the body of the paper include any year within a year of some IMF pressure being applied. However, it is possible that the correct universe of observations to employ are only years in which protests occurred; after all, the model suggests that an absence of protests may occur for very different reasons in centralized and decentralized countries. Moreover, it is possible that there is something inherently different about protest and non-protest years. The main reason that all data points were used in the body is that employing just protest years could cause a censoring bias, as it is possible that some of the years with zero protests are censored. If international news reports did not pick up on an austerity protest, then it is not included in the data. It is conceivable that centralized authorities are better able to suppress the *reporting* of small protests, and thus it may appear that there are less small protests in centralized countries than there are in actuality. Indeed, the estimations reported in the body over-correct for censoring issues, since they can be interpreted as assuming that a small protest (severity 1) occurred in *every* year that there was IMF pressure in a centralized country (since protests of severity 1 are lumped with non-protest years).

Yet, it is still worth estimating equation (11) restricting the universe of observations to protest years. In this case, the dependent variable equals 1 if a protest of severity 2 or 3 occurred and equals 0 if a protest of severity 1 occurred. The results are reported in Table A6. The results are very similar when the number of restructurings over 2 years is considered, but not when the number of restructurings over one year is considered. In columns 1 and 2, no coefficients are significant, and the interaction terms have the opposite sign than is expected. This is not the case in columns 3 and 4, where the interaction term is positive and significant, while the point estimates on the centralization proxy are negative (as expected) though insignificant. It should be kept in mind that the censoring issue noted before might heavily bias the results reported in Table A6 against the proposed hypothesis - and thus we should feel comfortable that the results hold in columns 3 and 4 despite this bias.

Finally, there may also be concern that the "subjective" manner in which I have labeled the protests could lead to misleading results. In the body of the paper, I employed the "alternative index", discussed in Appendix B, which classifies any protest as "1" which could reasonably be considered a small protest. I did this to ensure that any protest considered "severe" was undoubtedly so. For robustness, however, it is worth checking the results using the regular index. These results are reported in Tables A7-A9. Table A7 shows that the probit coefficients have the same signs as in Table 6, although the interaction terms are less frequently statistically significant. This should not be taken to indicate the insignificance of the results, however. Tables A8 and A9 employ these coefficients to determine the probability of a severe protest occurring, as is done in Tables 7 and 8 in the body. Tables A8 and A9 are broadly similar to Tables 7 and 8, showing similar comparative statics and statistical significance.

Table A3: Protest Presence using strike and local protest data (Probit Coefficients)

	Dependent Variable: Protest Presence (0/1)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Use of Funds/Quota (if > 1.25)	0.001	0.018	0.024						
	(0.054)	(0.042)	(0.044)						
Extended Fund Facility/Quota				0.110***	0.086**	0.077**			
				(0.034)	(0.037)	(0.036)			
# of reschedulings/restructurings							0.442***	0.328***	0.326***
							(0.088)	(0.089)	(0.093)
Constraint on Executive		-0.051			-0.053			-0.053	
		(0.057)			(0.058)			(0.057)	
Political Rights			-0.084***			-0.077**			-0.083***
			(0.031)			(0.035)			(0.031)
Urbanization Rate		0.889	0.813		0.841	0.771		0.659	0.579
		(1.335)	(1.328)		(1.289)	(1.290)		(1.189)	(1.177)
Log of Real GDP		-0.108	-0.113		-0.101	-0.102		-0.096	-0.098
		(0.085)	(0.084)		(0.077)	(0.079)		(0.084)	(0.078)
Religious Fractionalization		0.406	0.344		0.416	0.349		0.336	0.267
		(0.819)	(0.769)		(0.853)	(0.798)		(0.807)	(0.761)
Log of Population		0.218**	0.214**		0.207**	0.205**		0.211**	0.208**
		(0.094)	(0.093)		(0.092)	(0.091)		(0.095)	(0.093)
Number of Previous Protests		0.033	0.036		0.034	0.038		0.038	0.042
		(0.038)	(0.029)		(0.042)	(0.033)		(0.038)	(0.028)
Continent Dummies	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	805	801	801	807	803	803	807	803	803
pseudo R-squared	0.000	0.144	0.147	0.012	0.150	0.151	0.032	0.159	0.161

Standard errors, clustered by region, in brackets; *** p<0.01, ** p<0.05, * p<0.1; A constant term included in each regression

Table A4: Protest Presence using strike and local protest data, IMF variables over 2 years (Probit Coefficients)

	Dependent Variable: Protest Presence (0/1)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Use of Funds/Quota (if > 1.25)	0.004	0.016	0.019						
(over 2 years)	(0.090)	(0.098)	(0.097)						
Extended Fund Facility/Quota				0.081***	0.046	0.041			
(over 2 years)				(0.026)	(0.033)	(0.033)			
# of reschedulings/restructurings							0.422***	0.315***	0.316***
(over 2 years)							(0.064)	(0.074)	(0.075)
Constraint on Executive		-0.024			-0.025			-0.027	
		(0.025)			(0.026)			(0.027)	
Political Rights			-0.044**			-0.040			-0.047*
			(0.020)			(0.026)			(0.027)
Urbanization Rate		0.976	0.927		0.926	0.884		0.598	0.542
		(1.103)	(1.088)		(1.096)	(1.084)		(1.046)	(1.022)
Log of Real GDP		-0.197	-0.199		-0.191	-0.192		-0.179*	-0.179
		(0.131)	(0.143)		(0.125)	(0.139)		(0.104)	(0.117)
Religious Fractionalization		0.636	0.602		0.620	0.586		0.615	0.575
		(0.624)	(0.625)		(0.651)	(0.649)		(0.600)	(0.607)
Log of Population		0.194**	0.191**		0.186**	0.184**		0.192**	0.189**
		(0.084)	(0.082)		(0.080)	(0.079)		(0.083)	(0.081)
Number of Previous Protests		0.038**	0.041***		0.038**	0.041***		0.042**	0.045***
		(0.016)	(0.015)		(0.017)	(0.015)		(0.017)	(0.016)
Continent Dummies	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Observations	788	784	784	788	784	784	788	784	784
pseudo R-squared	0.000	0.106	0.107	0.008	0.108	0.109	0.035	0.122	0.123

Standard errors, clustered by region, in brackets; *** p<0.01, ** p<0.05, * p<0.1; A constant term included in each regression

Table A5: Presence of Severe Protest using strike and local protest data (Probit Coefficients)

	Dependent Variable: Dummy = 1 if Protest 2 or 3			
	(1)	(2)	(3)	(4)
# of reschedulings	0.062	-0.044		
	(0.116)	(0.148)		
Constraint on Executive	0.020		-0.033	
	(0.036)		(0.037)	
# of reschedulings*Constraint on Executive	0.030			
	(0.048)			
Political Rights		-0.035		-0.065
		(0.049)		(0.053)
# of reschedulings*Political Rights		0.058**		
		(0.029)		
# of reschedulings (over 2 years)			-0.215***	-0.123
			(0.082)	(0.162)
# of reschedulings (over 2 years)*Constraint on Executive			0.076***	
			(0.027)	
# of reschedulings (over 2 years)*Political Rights				0.064*
				(0.033)
Urbanization Rate	1.286**	1.317**	1.373**	1.392**
	(0.529)	(0.645)	(0.645)	(0.700)
Log of Real GDP	-0.339***	-0.366***	-0.358***	-0.386***
	(0.118)	(0.134)	(0.135)	(0.144)
Religious Fractionalization	0.803	0.808	0.819	0.796
	(0.604)	(0.599)	(0.556)	(0.540)
Log of Population	0.179	0.191	0.187	0.194
	(0.149)	(0.140)	(0.146)	(0.136)
Number of Previous Protests	0.038	0.028	0.028	0.025
	(0.039)	(0.034)	(0.040)	(0.033)
Continent Dummies	Yes	Yes	Yes	Yes
Observations	705	705	690	690
pseudo R-squared	0.132	0.132	0.131	0.128

Standard errors, clustered by region, in brackets; *** p<0.01, ** p<0.05, * p<0.1; A constant term included in each regression

Table A6: Presence of Severe Protest, only protest years (Probit Coefficients)

	Dependent Variable: Dummy = 1 if Protest 2 or 3			
	(1)	(2)	(3)	(4)
# of reschedulings	0.043	0.036		
	(0.368)	(0.447)		
Constraint on Executive	0.208		-0.013	
	(0.175)		(0.178)	
# of reschedulings*Constraint on Executive	-0.028			
	(0.114)			
Political Rights		0.188		-0.044
		(0.191)		(0.228)
# of reschedulings*Political Rights		-0.030		
		(0.080)		
# of reschedulings (over 2 years)			-1.126**	-0.977**
			(0.446)	(0.448)
# of reschedulings (over 2 years)*Constraint on Executive			0.237**	
			(0.108)	
# of reschedulings (over 2 years)*Political Rights				0.222*
				(0.125)
Urbanization Rate	0.975	1.597	0.816	1.434
	(1.960)	(2.338)	(2.272)	(2.529)
Log of Real GDP	-0.418	-0.420	-0.429	-0.413
	(0.361)	(0.371)	(0.375)	(0.385)
Religious Fractionalization	0.731	1.087	0.775	0.968
	(1.081)	(0.848)	(1.177)	(0.931)
Log of Population	0.041	0.101	0.043	0.128
	(0.157)	(0.123)	(0.158)	(0.130)
Number of Previous Protests	0.036	0.003	-0.013	-0.029
	(0.027)	(0.042)	(0.023)	(0.042)
Continent Dummies	Yes	Yes	Yes	Yes
Observations	104	104	103	103
pseudo R-squared	0.104	0.080	0.132	0.094

Standard errors, clustered by region, in brackets; *** p<0.01, ** p<0.05, * p<0.1; A constant term included in each regression

Table A7: Presence of Severe Protest, other index (Probit Coefficients)

	Dependent Variable: Dummy = 1 if Protest 2 or 3			
	(1)	(2)	(3)	(4)
# of reschedulings	-0.105	-0.130		
	(0.315)	(0.101)		
Constraint on Executive	-0.011		0.004	
	(0.034)		(0.039)	
# of reschedulings*Constraint on Executive	0.073			
	(0.064)			
Political Rights		-0.085***		-0.052
		(0.031)		(0.049)
# of reschedulings*Political Rights		0.088***		
		(0.025)		
# of reschedulings (over 2 years)			-0.135	-0.060
			(0.272)	(0.046)
# of reschedulings (over 2 years)*Constraint on Executive			0.041	
			(0.046)	
# of reschedulings (over 2 years)*Political Rights				0.029
				(0.032)
Urbanization Rate	1.249***	1.309**	1.412***	1.496***
	(0.396)	(0.540)	(0.411)	(0.515)
Log of Real GDP	-0.403**	-0.458***	-0.417**	-0.475***
	(0.161)	(0.162)	(0.166)	(0.165)
Religious Fractionalization	1.130***	1.127***	1.182***	1.208***
	(0.418)	(0.393)	(0.438)	(0.428)
Log of Population	0.214	0.231*	0.223*	0.235*
	(0.134)	(0.129)	(0.131)	(0.129)
Number of Previous Protests	0.004	-0.007	-0.005	-0.014
	(0.047)	(0.044)	(0.049)	(0.042)
Continent Dummies	Yes	Yes	Yes	Yes
Observations	705	705	690	690
pseudo R-squared	0.136	0.137	0.126	0.124

Standard errors, clustered by region, in brackets; *** p<0.01, ** p<0.05, * p<0.1; A constant term included in each regression

Table A8: Probability of Large Protest, varying shock and centralization levels, other index

	Pr(Protest = 2 or 3)							
	Constr on Exec = 1	Constr on Exec = 2	Constr on Exec = 3	Constr on Exec = 4	Constr on Exec = 5	Constr on Exec = 6	Constr on Exec = 7	p-value: H_o: Column 1 = Column 7
# of reschedulings = 0	0.024***	0.023***	0.023***	0.022***	0.021***	0.021***	0.020***	0.743
	[0.006]	[0.004]	[0.003]	[0.002]	[0.003]	[0.004]	[0.006]	
# of reschedulings = 1	0.022**	0.026***	0.029***	0.034***	0.039***	0.044***	0.050**	0.273
	[0.011]	[0.009]	[0.008]	[0.008]	[0.010]	[0.014]	[0.020]	
# of reschedulings = 2	0.020	0.028	0.038*	0.051**	0.066**	0.085**	0.108	0.263
	[0.022]	[0.023]	[0.022]	[0.023]	[0.029]	[0.043]	[0.067]	
# of reschedulings = 0	0.026***	0.026***	0.026***	0.027***	0.027***	0.027***	0.027***	0.917
(over 2 years)	[0.009]	[0.007]	[0.005]	[0.004]	[0.003]	[0.004]	[0.006]	
# of reschedulings = 1	0.021**	0.023***	0.026***	0.029***	0.032***	0.035***	0.039***	0.305
(over 2 years)	[0.008]	[0.007]	[0.006]	[0.006]	[0.007]	[0.010]	[0.013]	
# of reschedulings = 2	0.017	0.020	0.025*	0.031**	0.037**	0.045**	0.054*	0.285
(over 2 years)	[0.015]	[0.015]	[0.014]	[0.014]	[0.016]	[0.021]	[0.029]	

Standard errors, clustered by region, in brackets; *** p<0.01, ** p<0.05, * p<0.1
Estimates in the top 3 rows derived from Column 1 of Table 6 and estimates in the bottom 3 rows derived from Column 3 of Table 6

Table A9: Probability of Large Protest, varying shock and centralization levels, other index

	Pr(Protest = 2 or 3)							
	Political Rights = 1	Political Rights = 2	Political Rights = 3	Political Rights = 4	Political Rights = 5	Political Rights = 6	Political Rights = 7	p-value: H_o: Column 1 = Column 7
# of reschedulings = 0	0.044***	0.037***	0.030***	0.025***	0.020***	0.017***	0.013***	0.016
	[0.011]	[0.008]	[0.006]	[0.005]	[0.004]	[0.004]	[0.004]	
# of reschedulings = 1	0.040**	0.041***	0.041***	0.041***	0.042***	0.042***	0.042***	0.917
	[0.016]	[0.014]	[0.013]	[0.013]	[0.013]	[0.014]	[0.015]	
# of reschedulings = 2	0.037*	0.045*	0.054**	0.065**	0.078**	0.092**	0.108**	0.136
	[0.021]	[0.023]	[0.026]	[0.030]	[0.035]	[0.043]	[0.053]	
# of reschedulings = 0	0.043**	0.038***	0.034***	0.030***	0.027***	0.024***	0.021***	0.332
(over 2 years)	[0.018]	[0.012]	[0.008]	[0.005]	[0.004]	[0.005]	[0.006]	
# of reschedulings = 1	0.040**	0.038***	0.036***	0.035***	0.033***	0.031***	0.030***	0.563
(over 2 years)	[0.016]	[0.014]	[0.011]	[0.010]	[0.010]	[0.010]	[0.011]	
# of reschedulings = 2	0.038**	0.038**	0.039**	0.039**	0.040*	0.04	0.041	0.908
(over 2 years)	[0.015]	[0.015]	[0.016]	[0.019]	[0.021]	[0.025]	[0.029]	

Standard errors, clustered by region, in brackets; *** p<0.01, ** p<0.05, * p<0.1
Estimates in the top 3 rows derived from Column 2 of Table 6 and estimates in the bottom 3 rows derived from Column 4 of Table 6

D Proofs

D.1 Proof of Proposition 1

Proof. At $\gamma = 0$, the vertical intercept of the curve is $\frac{1}{2m_1}\left[m_1 - m_2 + m_3\left(1 - b^N\right) + m_4\right]$. This can be seen by plugging in $F(b^*) = 0$ into equation (8). Meanwhile, the value of the curve at μ is always $\frac{1}{2m_1}\left[m_1 + m_3\left(1 - b^N\right) + m_4\right]$ (this can be seen by plugging in $F(b^*) = 0.5$ into equation (8)). Hence, when $\mu \leq \frac{1}{2m_1}\left[m_1 - m_2 + m_3\left(1 - b^N\right) + m_4\right]$, the curve is above the 45-degree line at the inflection point at μ. Moreover, the curve does not reach the 45-degree line at values smaller than the inflection point at μ, since μ equals the vertical intercept and the curve in increasing. Hence, cascades do not emerge and the only equilibrium is the "good" equilibrium. If this is the case at $\gamma = 0$, it must be the case for all γ.

On the other hand, at $\gamma \to \infty$, the largest value of the curve is $\frac{1}{2m_1}\left[m_1 + m_2 + m_3 + m_4\right]$. This can be seen by plugging in $F(b^*) = 1$ into equation (9). If $\mu > \frac{1}{2m_1}\left[m_1 + m_2 + m_3 + m_4\right]$, then the curve must be under the 45-degree line at μ, since the value of the curve at μ is always $\frac{1}{2m_1}\left[m_1 + m_3\left(1 - b^N\right) + m_4\right]$. It must remain under the 45-degree line for all values beyond μ, as well, since the highest point on the curve equals $\frac{1}{2m_1}\left[m_1 + m_2 + m_3 + m_4\right]$, which is less than all values greater than μ. Hence, cascades do not emerge, and the only equilibrium is the "bad" equilibrium. If this is the case at $\gamma = \infty$, it must be the case for all γ. ■

D.2 Proof of Proposition 2

Proof. I first find the condition under which the inflection point is above the 45-degree line at $\gamma = 0$ (which means that it is above the 45-degree line for all γ). From (8), it is clear (subbing $F(b^*) = 0.5$ at $b^* = \mu$) that the curve is above the 45-degree line at $\gamma = 0$ only when $\mu < \frac{1}{2m_1}\left(m_1 + m_3\left(1 - b^N\right) + m_4\right)$. From Proposition 1 we know cascades never occur when $\mu \leq \frac{1}{2m_1}\left[m_1 - m_2 + m_3\left(1 - b^N\right) + m_4\right]$, so here we are concerned with $\mu \in \frac{1}{2m_1}\left(m_1 - m_2 + m_3\left(1 - b^N\right) + m_4, m_1 + m_3\left(1 - b^N\right) + m_4\right]$. As $\sigma \to \infty$, the curve is nearly a straight line connecting the vertical axis to the inflection point, meaning that it remains above the 45-degree line. This means that the curve only crosses the 45-degree line once, at the "good" equilibrium. This remains the case for sufficiently large σ, though at some smaller σ^{**}, the curve at $\gamma = 0$ must cross the 45-degree line (since the curve up to the inflection point is nearly horizontal as $\sigma \to 0$). Since the curve merely shifts upwards for higher γ, it must also be true that the curve crosses the 45-degree line when γ is small (say, $\gamma \leq \gamma^*$) but not when it is larger when $\sigma < \sigma^{**}$. Hence, cascades can emerge when $\sigma < \sigma^{**}$

and $\gamma \leq \gamma^*$, since the curve intersects the 45-degree line three times, but not when $\gamma > \gamma^*$. If $m_2 > m_3 b^N$, meaning that it is possible for the curve to intersect the 45-degree line at $\gamma \to \infty$ at some point in this range, there must also exist $\sigma^* < \sigma^{**}$ where cascades can emerge at all γ when $\sigma < \sigma^*$. This can easily be seen by taking the case where $\sigma \to 0$. ■

D.3 Proof of Proposition 3

Proof. Consider the case where the inflection point is always beneath the 45-degree line. If this is true at $\gamma \to \infty$, it will be true for all γ. From (9), it is clear that this will be the case when $\mu > \frac{1}{2m_1}(m_1 + m_3 + m_4)$. From Proposition 1, we know that cascades never emerge when $\mu > \frac{1}{2m_1}[m_1 + m_2 + m_3 + m_4]$, so we focus here on $\mu \in \frac{1}{2m_1}(m_1 + m_3 + m_4, m_1 + m_2 + m_3 + m_4]$. As $\sigma \to \infty$, the curve will only cross the 45-degree line once at the bad equilibrium. At lower levels of σ, the curve crosses the 45-degree line three times only for sufficiently large γ ($\geq \gamma^{**}$), but not at lower levels of γ (remember, increasing γ merely entails a shift downward in the curve). As $\sigma \to 0$, it must be the case that the curve crosses the 45-degree line three times for all values of γ. Finally, I argue that in cases ii) and iii), as γ increases, C is more insulated from small shocks, but is more susceptible to large protests relative to the pre-shock state after large shocks. This can easily be seen in Figures 9 and 8. For ranges over which a cascade can occur, the threshold bliss point is closer to the pre-shock equilibrium when γ is smaller, meaning that when γ is large, C is more insulated from cascades. However, it is also the case that when γ is large, the pre-shock equilibrium is one with less protest (more citizens choose $a_j = 0$). Since the inflection point is beneath the 45-degree line, the line must be flatter at the "bad" equilibrium than it is at the "good" equilibrium (since the curve is symmetric). Hence, when the shock is large enough that a cascade emerges, the change in equilibrium protest is greater in percentage terms when γ is larger. ■

E Appendix: Extra Proposition

Proposition 4 *If* $\mu \in \frac{1}{2m_1}\left(m_1 + m_3\left(1 - b^N\right) + m_4, m_1 + m_3 + m_4\right]$*, then* $\exists\ \sigma^{\circ}$ *,* $\sigma^{\circ\circ}$*, and* $\sigma^{\circ\circ\circ}$*, where* $\sigma^{\circ} < \sigma^{\circ\circ\circ}$ *and* $\sigma^{\circ\circ} < \sigma^{\circ\circ\circ}$ *such that:*

i) Cascades only emerge at $\gamma \in (\gamma^{***}, \gamma^{****})$ *(for some values* γ^{***} *and* γ^{****}*); all economies with* $\gamma < \gamma^{***}$ *are in a "bad" equilibrium and all economies with* $\gamma > \gamma^{****}$ *are in a "good" equilibrium if* $\sigma \geq \sigma^{\circ\circ\circ}$

iia) Cascades can only emerge at $\gamma \leq \gamma^{*}$ *(for some value* γ^{*}*) and all economies with* $\gamma > \gamma^{*}$ *are in a "good" equilibrium if* $\sigma \in [\sigma^{\circ\circ}, \sigma^{\circ\circ\circ})$

OR

iib) Cascades can only emerge at $\gamma \geq \gamma^{**}$ *(for some value* γ^{**}*) and all economies with* $\gamma < \gamma^{**}$ *are in a "bad" equilibrium if* $\sigma \in [\sigma^{\circ}, \sigma^{\circ\circ\circ})$

iii) Cascades can emerge for all γ *if* $\sigma < \sigma^{\circ}$ *(if iia) or* $\sigma < \sigma^{\circ\circ}$ *(if iib)*

Proof. Consider the case where the inflection point is above the 45-degree line at $\gamma \to \infty$ but below the 45-degree line at $\gamma \to 0$. From (8) and (9), it is clear that this occurs when $\mu > \frac{1}{2m_1}\left(m_1 + m_3\left(1 - b^N\right) + m_4\right)$ and $\mu \leq \frac{1}{2m_1}(m_1 + m_3 + m_4)$. At sufficiently large σ, it must be the case that the curve only crosses the 45-degree line once at both $\gamma \to \infty$ and $\gamma = 0$, but must cross three times for some intermediate values of γ. At lower σ, it must either be the case that the curve crosses the 45-degree line at $\gamma \to \infty$ but not $\gamma = 0$ or at $\gamma = 0$ but not $\gamma \to \infty$. This can be visualized by noting that the slope of the curve around the inflection point is increasing as σ gets smaller, meaning that the curve has to eventually cross the 45-degree line for a second time for either $\gamma \to \infty$ or $\gamma = 0$ at sufficiently small σ. Finally, at very small σ, the curve is steep enough at the inflection point where it must cross the 45-degree line for all values of γ. ■