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FINANCIAL CRISES AND THE DISMISSAL OF CENTRAL BANK GOVERNORS: NEW EVIDENCE

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ABSTRACT

This paper examines whether financial crises affect the likelihood that a central bank governor will be replaced. Employing a conditional fixed effects logit model for 101 countries during the period 1970–2007, we find that financial crises significantly increase the likelihood of a central bank governor turnover. When we decompose crises into banking, currency, and debt crises we find that banking crises and debt crises significantly increase the likelihood that a central bank governor will be replaced. Our results also suggest that financial crises increase the probability that a non-government ally will be appointed as new central bank governor. Copyright © 2014 John Wiley & Sons, Ltd.

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KEY WORDS: financial crisis; central bank independence; dismissal of central bank governor

1. INTRODUCTION

Until recently, the independence of central banks increased both in industrial and emerging countries. However, according to several observers, the current global financial crisis threatens the independence of central banks (cf. Bordo, 2010). Anecdotal evidence suggests that financial crises may affect central bank independence. For instance, the central bank governor in Argentina was dismissed in 2010 because he refused to use currency reserves to pay off foreign debt. Similarly, Mexico's president appointed a new governor for the Bank of Mexico in 2009, after he clashed with the bank's former governor who was reluctant to cut interest rates after the country was hit hard by the crisis. Hilsenrath *et al.* (2010) provide other examples.

Up to now, there is hardly any research examining the relationship between financial crises and central bank independence.¹ This study examines whether financial crises in general, and currency, debt, and banking crises in particular, affect the likelihood that a central bank governor will be replaced. Following Vuletin and Zhu (2011), this paper also analyses whether a new central bank governor is more likely to come from the ranks of the executive branch of the government (government ally) or not (non-government ally).

Employing a conditional fixed effects logit model that is similar to that of Dreher *et al.* (2010) and Klomp and De Haan (2010) for 101 countries during the period 1970–2007, we find that banking crises and debt crises significantly increase the likelihood that a central bank governor will be replaced. This result holds no matter we use all turnovers or only irregular turnovers, i.e. replacements that occur before the legal term in office of the central bank governor had ended. Moreover, using a more limited data set about the nature of a turnover, we find that banking crises increase the likelihood that a non-government ally will be appointed as new central bank governor.

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The remainder of the paper is structured as follows. Section 2 outlines our methodology, while section 3 describes the data used. Section 4 presents the main estimation results, while section 5 offers a sensitivity analysis. Section 6 presents the outcomes for the nature of the central bank governor replacement, and section 7 offers some concluding remarks.

2. METHODOLOGY

In order to estimate the effect of financial crises on the probability that a central bank governor will be replaced, we employ a conditional fixed effects logit model. Variants of the following model are estimated:

$$govchange_{it} = \alpha + \beta_1 crisis_{it-1} + \beta_2 elapsed_{it-1} + \beta_3 X_{it-1} + \eta_i + \varepsilon_{it} \quad (1)$$

where *govchange* equals 1 if in year *t* at least one central bank governor turnover occurs and is 0 otherwise; *crisis* equals one if there is a financial (banking, currency or debt) crisis in year *t*; *elapsed* is the share of the governor's legal term in office that has elapsed; *X* is a vector of control variables; η_i is the country specific (fixed) effect and ε_{it} is an i.i.d disturbance term. We include the *share of the official time* in office that has *elapsed* as it becomes more likely that a central bank governor will be replaced if a larger part of the legal term in office has elapsed (Dreher *et al.*, 2010 and Klomp and De Haan, 2010). In the models as discussed in section 6, *govchange* is a dummy variable that is one when the new central bank governor is a non-government ally and zero otherwise.

We follow Dreher *et al.* (2010) and Klomp and De Haan (2010), but extend their work in different directions. First, we examine the effect of financial crises on the likelihood that a central bank governor will be replaced. Second, we examine whether central bank independence and inflation-targeting mediate the effect of financial crises on a central bank governor turnover. Third, we estimate equation (1) by employing conditional logit models with clustered standard errors given the inertial nature of the variables involved. Finally, following Vuletin and Zhu (2011), we investigate whether the new governor who is appointed after the occurrence of a financial crisis is an ally of the government or not.

As control variables, we include several economic and political variables that Dreher *et al.* (2010) and Klomp and De Haan (2010) consider. In addition, we include legal independence of the central bank as well as a dummy that is one if the country concerned has an inflation-targeting regime. The lags of all explanatory variables are used in all estimations in order to avoid endogeneity problems.

As to the economic controls: Inflation is expected to have a positive effect on the probability of a central bank governor turnover because the central bank governor may be held responsible for high rates of inflation. Dreher *et al.* (2010) argue that more restrictions on international transactions increase the probability that a central bank governor will be replaced. Moreover, a higher degree of openness reduces the inflationary bias and therefore reduces the incentive to commit for the government. Finally, countries with a more developed financial sector are less likely to face a situation of fiscal dominance (Sargent and Wallace, 1981).

As to the political controls: elections are predicted to have a positive impact on the probability that the central bank governor will be replaced. A newly elected government may prefer to appoint a new central bank governor who is more closely aligned to those in power. For similar reasons, political and regime instability, for which we use several proxies as explained in section 3, are expected to increase the likelihood that a new central bank governor will be appointed (Dreher *et al.*, 2010). The ideological position of the party in government is included to test for possible partisan effects. Following Dreher *et al.* (2010), also several dimensions of the political system in place are considered, such as the presence of a system with many checks and balances, a bi-cameral political system, and a federal political system. Countries with a political system with strong checks and balances have more independent central banks compared to those with weak or no checks and balances. Likewise, countries with a bi-cameral or a federal political system tend to have an independent central bank (see Bernhard, 1998) in which it may therefore be harder to replace a central bank governor.

In addition to the variables considered in previous studies, we also include the legal independence of the central bank and the presence of an inflation-targeting regime. When a central bank is legally independent, it will be

difficult for the government to replace the central bank governor. For similar reasons we include a dummy that is one if the central bank has an inflation-targeting strategy, and zero otherwise. Under an inflation-targeting regime, arguably only a poor inflation record can be ground for dismissal of the central bank governor.

Both central bank independence and the presence of an inflation-targeting regime may condition the impact of a financial crisis on the probability that a central bank governor will be replaced. The effect of a financial crisis on the likelihood of a turnover of the central bank governor is expected to be diminishing in central bank independence and the presence of an inflation-targeting regime. In order to test for this conditionality, we include two interaction terms: between financial crisis and legal independence of the central bank, and between financial crisis and the dummy for the presence of an inflation-targeting regime.

As Ai and Norton (2003) and Greene (2010) show, the statistical significance of an interaction effect cannot be tested with a simple *t*-test on the coefficient of the interaction term, but must be based on the estimated cross-partial derivative. Following the methodology suggested by Ai and Norton (2003) and Greene (2010), we compute the estimated coefficient and standard error of the *average* marginal effect as well as the individual-specific estimate and standard error for each observation. Moreover, we also use a graphical device to interpret the marginal effect of interaction terms since it is much more informative than test statistics (see Greene, 2010).

3. DATA

Information on central bank governor turnovers and their legal term in office is taken from the KOF Swiss Economic Institute website.² The sample period is 1970–2007. We include 101 countries for which data on financial crises is available for that period (see the Appendix for the list of countries included). In our sample, central bank governors remain in office on average for 3.49 years, while turnovers occur in 21.7% of the country-years. In section 6, we examine the nature of a central bank governor's replacement for 40 countries during 1972–2006 using the data from Vuletin and Zhu (2011).³

The summary statistics for all explanatory variables are presented in Table 1. Financial crises data come from Laeven and Valencia (2008). Financial crises are divided into 3 categories: banking, currency, and debt crises. A banking crisis occurs if a country's corporate and financial sectors experience a large number of defaults and financial institutions and corporations face great difficulties repaying contracts on time. A currency crisis occurs in case the currency depreciates by at least 30 percent, while a debt crisis is identified by sovereign debt default and restructuring. In our sample, there are 83 banking crises, 130 currency crises, and 37 debt crises. Years during which one or more of these crises happen are given score 1; otherwise the variable *financial crisis* is zero. In addition, we construct similar dummy variables for each type of financial crisis.

As economic controls we include inflation, openness, trade restrictions, and financial development. Data on *inflation* come from the World Bank (2010). To reduce the influence of extreme observations, the inflation rate *p* is transformed as follows: $(p/100)/(1 - p/100) = \pi$. *Openness* is measured by the ratio of exports plus imports to GDP drawn from the World Bank (2010). *Trade restrictions* is the weighted average of some variables such as hidden import barriers, mean tariff rate, taxes on international trade, and capital account restrictions drawn from the KOF index of globalization.⁴ The level of *financial development* is measured as the ratio of private credit to GDP. The data is provided by Beck and Demirgüç-Kunt (2009).

We also include several political variables. Our elections variable is based on the number of the month (*M*) when presidential/parliamentary elections are held. In an election year, the variable *election* is measured as $M/12$ and in a pre-election year as $(12 - M)/12$. The information on elections comes from Beck *et al.* (2001). In addition, we include a dummy *new government* that is one if there is a new chief executive (source: Databanks International, 2010) and the variable *percentage of veto players who drop* (source: Beck *et al.*, 2001). The latter is a proxy for instability within the political regime in place. We use three indicators of regime instability. First, following Dreher *et al.* (2010), *regime instability* is the first principal component of a number of regime instability indicators from Databanks International (2010): revolutions, purges, riots, strikes, assassinations, guerilla warfare, major crises, and the number of (successful) coups drop *s* in etat. Second, *change in democracy* is a dummy that is one if the Polity index changes by more than three points (source: Marshall *et al.*, 2010). Third, we use the number of (attempted) *coups* including unsuccessful coups (source: Marshall and Marshall, 2011).

Table 1. Summary statistics

Variables:	All countries			Industrial countries			Developing countries		
	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
Term in office (years)	3.49	0.00	29.00	4.07	0.00	29.00	3.19	0.00	28.00
Share of time elapsed	0.62	0.00	5.67	0.69	0.00	5.67	0.58	0.00	5.60
<i>Financial crisis</i>									
Financial crisis	0.06	0.00	1.00	0.02	0.00	1.00	0.08	0.00	1.00
Banking crisis	0.02	0.00	1.00	0.01	0.00	1.00	0.03	0.00	1.00
Currency crisis	0.03	0.00	1.00	0.01	0.00	1.00	0.05	0.00	1.00
Debt crisis	0.01	0.00	1.00	0.00	0.00	1.00	0.01	0.00	1.00
<i>Economic factors</i>									
Inflation	0.11	−0.28	0.99	0.07	−0.28	0.94	0.14	−0.13	0.99
Openness	0.72	0.05	4.39	0.83	0.11	4.39	0.67	0.05	3.75
Trade restrictions	52.69	5.39	97.69	76.72	32.00	97.69	40.33	5.39	85.60
Financial development	0.45	0.01	2.70	0.74	0.07	2.70	0.27	0.01	1.66
<i>Political factors</i>									
Election	0.21	0.00	1.40	0.25	0.00	1.00	0.19	0.00	1.00
New government	0.19	0.00	1.00	0.23	0.00	1.00	0.17	0.00	1.00
Percentage of veto players who drop	0.13	0.00	1.00	0.13	0.00	1.00	0.13	0.00	1.00
Regime instability	0.01	−0.52	10.92	−0.20	−0.52	5.14	0.11	−0.52	10.92
Change in democracy	0.60	0.00	1.00	0.85	0.00	1.00	0.48	0.00	1.00
Coups	0.06	0.00	3.00	0.01	0.00	3.00	0.08	0.00	3.00
Left government	0.29	0.00	1.00	0.37	0.00	1.00	0.25	0.00	1.00
Checks and balances	3.00	1.00	18.00	3.90	1.00	16.00	2.54	0.00	18.00
Autonomous regions	0.14	0.00	1.00	0.24	0.00	1.00	0.08	0.00	1.00
Two assemblies	0.54	0.00	1.00	0.89	0.00	1.00	0.36	0.00	1.00
<i>Monetary policy arrangements</i>									
Central bank independence	0.46	0.09	1.00	0.53	0.09	1.00	0.43	0.09	0.94
Inflation targeting	0.06	0.00	1.00	0.15	0.00	1.00	0.03	0.00	1.00
Number of countries	101	101	101	34	34	34	67	67	67
<i>The nature of central bank governor replacement</i>									
A government ally	0.01	0.00	1.00	0.00	0.00	1.00	0.02	0.00	1.00
Non-government ally	0.18	0.00	1.00	0.15	0.00	1.00	0.22	0.00	1.00
Number of countries	42	42	42	24	24	24	18	18	18

The dummy variable *left government* comes from updates of Beck *et al.* (2001); it is 1 if the main party in government is a left-wing party; otherwise, it is zero. In addition, we include the variable *checks and balances* provided by Beck *et al.* (2001), a dummy variable *autonomous regions* indicating the existence of autonomous regions, and a dummy variable *two assemblies* indicating of the presence of two chambers in the national assembly (source: Beck *et al.*, 2001).

Monetary policy arrangements are captured by two variables: central bank independence and a dummy for the presence of an inflation targeting strategy. *Central bank independence* is proxied by a legal independence index using data provided by Arnone *et al.* (2007) for the period 1980 and 2003. Since the index of Arnone *et al.* (2007) refers to two points in time only, we construct time series for the index using information about the timing of central bank reform provided by Acemoglu *et al.* (2008). Using the year in which central bank reform took place, we can determine when legal central bank independence has changed during the period 1980–2005. To extend the index to 2007, we checked whether central bank legislation has been changed between 2005 and 2007 using the website of each central bank. The index has been extended for the period before 1980 by checking whether any central bank law reform took place between 1970 and 1980. For that purpose, we compare data on legal independence of Cukierman *et al.* (1992) and Polillo and Guillén (2005). If legal independence

before and after 1989 is the same, we use Arnone's value of the legal index for 1980 also for the period 1970–1980. The data for the adoption of *inflation targeting* is taken from Samaryna and De Haan (2014), Leyva (2008), and Roger (2009).

4. ESTIMATION RESULTS

Table 2 shows the estimation results of equation (1). We start with a model with financial crises and the share of time elapsed as explanatory variables. In columns (2)–(17), each variable as described in section 3 is added one at the time. In all regressions the coefficients of financial crisis and time elapsed are significant at the one percent level with the expected positive sign.

The other control variables which are statistically significant are inflation, election, coups, trade restrictions, new government, regime instability, central bank independence, and inflation targeting. As expected, inflation has a positive and statistically significant effect on the likelihood of a central bank governor turnover. Election, coups, new government, and regime instability also increase the likelihood of a central bank governor turnover, while trade restrictions reduce this likelihood. The presence of an independent central bank and an inflation-targeting regime reduce the likelihood that a new central bank governor will be appointed.

When all explanatory variables are included simultaneously in the model (column 18), the coefficients of several variables turn insignificant. We rerun the model several times, every time dropping the least significant variable until all remaining variables are significant. The result is shown in column (19) of Table 2. The coefficient of financial crises remains statistically significant with a positive sign.

Our results for the control variables that turn out to be significant are in line with those of previous studies (Dreher *et al.*, 2010 and Klomp and De Haan, 2010). In particular, we find that the share of time elapsed is statistically significant with a positive sign, i.e. if a larger part of the legal term in office has elapsed, there is a higher likelihood that a central bank governor will be replaced. Inflation and elections have a positive and statistically significant effect on the likelihood of a central bank governor turnover, while central bank independence has a negative relationship with the likelihood that a central bank governor will be replaced.

In order to check for heterogeneity, the sample is separated into industrial and developing countries. Column (2) of Table 3 presents the estimation results for industrial countries. It turns out that in this sample financial crises significantly increase the likelihood that a central bank governor will be replaced. The marginal effect (shown in squared brackets) suggests that a financial crisis increases the likelihood of a governor turnover by 16.9 percentage points in industrial countries. The other variables that are significant are the share of time in office that has elapsed and elections.

The estimation results in column (3) show that in developing countries financial crises increase the probability that a central bank governor will be replaced by 9.2 percentage points. Most other variables (the share of time elapsed, inflation, and elections) are also statistically significant, but the legal independence of the central bank does not have a significant effect on the likelihood of a central bank governor turnover.

To examine whether the effect of financial crises on the probability that a central bank governor will be replaced is conditioned by central bank independence, we include the interaction term of financial crisis and the legal independence index in column (4) of Table 3. It turns out that the interaction term is not statistically significant, while also the coefficient of financial crisis becomes insignificant. However, the marginal effect of financial crisis on the replacement of central bank governor is statistically significant. The occurrence of financial crisis increases the probability that a central bank governor will be replaced by 9.6 percentage points.

Following Greene (2010), we interpret the interaction effects by plotting the marginal effect of financial crisis and the degree of legal independence of central bank. Figure 1 shows the effect of financial crises on the likelihood that the central bank governor will be replaced (vertical axis), conditional on the degree of central bank independence (horizontal axis). The dotted lines indicate the 95% significance interval. When both lines of the significance interval are below or above zero, the marginal effect of financial crisis is significant.

It follows from Figure 1 that the marginal effect of a financial crisis on the probability of a central bank governor replacement is positive and significant when the legal index of central bank independence is between 0.2 and 0.6. When the central bank is highly independent (index is higher than 0.6), the effect of a financial crisis on

Table 2. Effect of financial crises on the likelihood that CB governor will be replaced (Conditional Logit Model)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Financial crisis	0.711*** (0.182)	0.390** (0.187)	0.714*** (0.194)	0.663*** (0.198)	0.709*** (0.184)	0.647*** (0.183)	0.693*** (0.183)	0.718*** (0.181)	0.685*** (0.181)
Share of time elapsed	0.548*** (0.166)	0.688*** (0.221)	0.546*** (0.185)	0.621*** (0.220)	0.633*** (0.183)	0.566*** (0.180)	0.629*** (0.183)	0.652*** (0.192)	0.632*** (0.182)
Inflation		1.375*** (0.338)							
Election			0.687*** (0.177)						
Percentage of veto players who drop				0.136 (0.179)					
Coups					0.332* (0.177)				
Trade restrictions						-0.010* (0.006)			
New government							0.226** (0.111)		
Change in democracy								0.037 (0.166)	
Regime instability									0.160*** (0.047)
Financial development									
Left government									
Openness									
Check and balances									
Autonomous regions									
Two assemblies									
Central bank independence									
Inflation targeting									
Number of observations	3298	2922	2923	2614	3266	3183	3206	3099	3226
Number of countries	101	101	101	101	101	101	101	101	101
Prob > Chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Estimates of equation (1). Dependent variable: dummy that equals 1 if in year t at least one central bank governor turnover occurs and is 0 otherwise.

***indicates significance at 1% level; **indicates significance at 5% level; *indicates significance at 10% level. The number in parentheses is the robust (adjusted) standard error. The null hypothesis of the Prob > chi2 is that all regression coefficients in the model are equal to zero.

the probability that the central bank governor will be replaced becomes insignificant. Since the interaction term in equation (4) is not statistically significant, the marginal effect of financial crises tends to be flat over the legal independence index (shown by the blue line).

Table 2. (Continued)

(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
0.651*** (0.208)	0.685*** (0.196)	0.723*** (0.183)	0.625*** (0.201)	0.659*** (0.195)	0.708*** (0.196)	0.721*** (0.193)	0.692*** (0.179)	0.638*** (0.240)	0.472** (0.215)
0.663*** (0.222)	0.616*** (0.208)	0.630*** (0.179)	0.600*** (0.214)	0.616*** (0.208)	0.614*** (0.207)	0.875*** (0.150)	0.548*** (0.167)	1.172*** (0.186)	1.055*** (0.164)
								1.539*** (0.440)	1.623*** (0.428)
								0.782*** (0.205)	0.742*** (0.191)
								−0.430* (0.242)	
								−0.080 (0.235)	
								−0.008 (0.011)	
								0.064 (0.167)	
								0.413 (0.284)	
								0.039 (0.084)	
−0.156 (0.277)								−0.028 (0.448)	
	0.026 (0.124)							0.237 (0.172)	
		0.291 (0.329)						0.146 (0.488)	
			−0.060 (0.042)					−0.074 (0.049)	
				−0.091 (0.163)				0.128 (0.204)	
					−0.246 (0.267)			−0.476 (0.383)	
						−1.430*** (0.502)		−0.631 (0.620)	−0.886* (0.511)
							−0.387* (0.200)	−0.079 (0.301)	
2741	2810	3130	2710	2811	2816	2714	3298	1814	2305
101	101	101	101	101	101	101	101	101	101
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

In column (5) of Table 3, we include the interaction term of financial crisis and inflation targeting. The results show that the interaction term is not statistically significant. However, the marginal effect of a financial crisis on the likelihood of a central bank governor will be replaced is still statistically significant.

Next, we decompose financial crises into banking crises, currency crises, and debt crises (see Table 4). The results in column (1) suggest that banking crises and debt crises affect the likelihood of a central bank governor turnover, in contrast to currency crises. The latter result is in line with the findings of Dreher *et al.* (2010). Other

Table 3. Effect of financial crises on the likelihood that CB governor will be replaced (different samples and interaction effects)

	(1)	(2)	(3)	(4)	(5)
Financial crisis	0.472** (0.215) [0.100]**	0.835** (0.414) [0.169]**	0.395 (0.251) [0.092]*	0.466 (0.368) [0.092]**	0.397* (0.207) [0.078]**
Share of time elapsed	1.055*** (0.164) [0.241]***	0.930*** (0.304) [0.217]***	1.141*** (0.164) [0.276]***	1.055*** (0.164) [0.225]**	0.699*** (0.259) [0.147]
Inflation	1.623*** (0.428) [0.370]***	0.855 (0.955) [0.199]	1.750*** (0.457) [0.423]***	1.623*** (0.429) [0.345]***	1.510*** (0.383) [0.317]***
Election	0.742*** (0.191) [0.169]***	0.476** (0.230) [0.111]**	0.894*** (0.254) [0.216]***	0.742*** (0.191) [0.158]	0.682*** (0.180) [0.143]
Central bank independence	−0.886* (0.511) [−0.202]	−0.614 (0.505) [−0.143]	−1.676 (1.177) [−0.405]	−0.887* (0.522) [−0.189]	
Financial crisis × central bank independence				0.013 (0.780)	
Inflation targeting					−0.201 (0.218) [−0.044]
Financial crisis × inflation targeting					−0.044 (1.056)
Number of observations	2305	921	1384	2305	2624
Number of countries	101	34	67	101	101
Prob > Chi2	0.000	0.000	0.000	0.000	0.000

***indicates significance at 1% level; **indicates significance at 5% level; *indicates significance at 10% level. The number in parentheses is the robust (adjusted) standard error. The number in squared brackets is the marginal effect. Estimation results are for the full sample, except for columns (2) and (3) which refer to industrial and developing countries, respectively. Columns (4) and (5) include interaction terms. Column (1) corresponds to column (19) of Table 2. The null hypothesis of the Prob > chi2 is that all of the regression coefficients in the model are equal to zero.

Figure 1. The effect of financial crises on the likelihood of a central bank governor change conditional on central bank independence (Note: The dotted lines indicate the 95% significance interval. When the both lines of the significance interval are below or above zero, the marginal effect of financial crises is significant).

variables which turn out to be significant are the share of time in office elapsed, inflation, elections, and central bank independence. In column (2) we exclude currency crisis.

In columns (3) and (4) of Table 4 we split the sample into industrial countries and developing countries. In industrial countries, a banking crisis does not significantly affect the probability that the central bank governor will be replaced. However, according to the marginal effect, the occurrence of a banking crisis increases the likelihood of a governor turnover by 19.7 percentage points. We do not include the debt crisis dummy into the model of industrial countries because these countries had no debt crisis during the period 1970–2007. In developing countries the occurrence of both a banking crisis and a debt crisis significantly increase the likelihood that the central bank governor will be replaced. A banking crisis increases the likelihood that a central bank governor will be replaced by 18.5 percentage points, while a debt crisis increases this likelihood by 15.7 percentage points.

In columns (5) and (6) of Table 4 we include interaction terms for banking crises and central bank independence, and debt crisis and central bank independence, respectively. The interaction term for banking crisis and central bank independence is not statistically significant, but the marginal effect of banking crisis on the replacement of a governor is still statistically significant. In contrast, both the interaction terms and the marginal effect of the debt crisis are not statistically significant.

Table 4. Effect of banking, debt, and currency crises on the likelihood that CB governor will be replaced (Different samples and interaction effects)

	(1)	(2)	(3)	(4)	(5)	(6)
Banking crisis	0.887*** (0.299) [0.171]***	0.887*** (0.300) [0.171]***	1.020 (0.670) [0.197]*	0.862*** (0.337) [0.185]***	0.915 (0.708) [0.167]***	0.861*** (0.303) [0.165]***
Debt crisis	0.638* (0.380) [0.129]*	0.639* (0.372) [0.130]**		0.713* (0.385) [0.157]**	0.639* (0.369) [0.125]*	−1.028 (1.386) [0.132]
Currency crisis	0.002 (0.261) [0.000]					
Share of time elapsed	1.057*** (0.165) [0.241]***	1.057*** (0.165) [0.241]***	0.940*** (0.302) [0.219]***	1.145*** (0.167) [0.277]***	1.057*** (0.165) [0.225]	1.058*** (0.166) [0.226]*
Inflation	1.703*** (0.426) [0.389]***	1.704*** (0.434) [0.389]***	1.081 (0.865) [0.252]	1.792*** (0.474) [0.434]***	1.703*** (0.438) [0.362]***	1.701*** (0.442) [0.363]***
Election	0.743*** (0.192) [0.170]***	0.743*** (0.192) [0.169]***	0.448 (0.240) [0.104]*	0.903*** (0.256) [0.219]***	0.743*** (0.192) [0.158]	0.731*** (0.194) [0.156]
Central bank independence	−0.910* (0.511) [−0.208]	−0.910* (0.511) [−0.208]	−0.627* (0.497) [−0.146]	−1.737 (1.154) [−0.420]	−0.908* (0.516) [−0.193]	−0.960* (0.521) [−0.198]*
Banking crisis × central bank independence					−0.060 (1.194)	
Debt crisis × central bank independence						3.714 (2.888)
Number of observations	2305	2305	921	1384	2305	2305
Number of countries	101	101	34	67	101	101
Prob > Chi2	0.000	0.000	0.000	0.000	0.000	0.000

***indicates significance at 1% level; **indicates significance at 5% level; *indicates significance at 10% level. The number in parentheses is the robust (adjusted) standard error. The number in the squared brackets is the marginal effect. All estimation results are for the full sample, except columns (3) and (4) which refer to industrial and developing countries, respectively. Columns (5) and (6) include interaction terms. The null hypothesis of the Prob > chi2 is that all of the regression coefficients in the model are equal to zero.

Figure 2 shows the marginal effect of a banking crisis on the likelihood of a governor replacement over the range of the legal central bank independence index. The marginal effect of a banking crisis on the likelihood of a governor replacement is statistically significant when the legal CBI index is lower than 0.8. Because the interaction term in column (5) of Table 4 is not statistically significant, the marginal effect of financial crises tends to be flat over the legal independence index (shown by the blue line).

5. ROBUSTNESS TESTS

So far, we have considered all changes of central bank governors. It may, however, be argued that a distinction should be made between regular and irregular changes, where the latter is defined as a turnover that take place before the legal term in office of the central bank governor has ended. As a robustness test we therefore use only irregular changes as the dependent variable in Table 5. We still find that financial crises significantly affect the likelihood of a central bank governor replacement. Also other variables, such as the share of time elapsed, inflation, elections, and central bank independence, remain significant.

When we split the countries into industrial and developing countries, the effect of a financial crisis on the irregular replacement of central bank governor is significant in industrial countries (see column (2) of Table 5), but not in developing countries (column 3). However, the marginal effect of financial crises on a central bank governor replacement is statistically significant both in industrial and developing countries. The other factors that are significant in the model estimated for the sample of developing countries are share of time elapsed, inflation, and elections.

When we consider specific types of financial crises, banking crises and debt crises are significantly affecting the probability of a central bank governor replacement (see column (1) of Table 6). The marginal effects indicate that a banking crisis increases the likelihood that the governor will be replaced before his term ends by 18.4 percentage points, while a debt crisis increases this likelihood by 15.2 percentage points.

A significant effect of banking crises on the likelihood of irregular central bank replacement is robust for both developing and developed countries (see columns (2) and (3) of Table 6). The other variables such as inflation and elections are also statistically significant determining the probability of a governor replacement in developing countries, but not in industrial countries.

Finally, we have examined whether there is a systematic difference between countries where the central bank is in charge of banking supervision and countries where some other institutions are charged with this responsibility.⁵ The data on banking supervision come from the World Bank (2008) and Masciandaro and Quintyn (2009) from 1998 to 2007 and refer to 57 countries. We find that the probability that a central bank governor will be replaced is not statistically different between countries where a central bank is responsible for banking supervision and the countries where another institution is responsible for banking supervision (results available on request).

Figure 2. The effect of banking crises on the likelihood of a central bank governor change conditional on central bank independence (Note: The dotted lines indicate the 95% significance interval. When both lines of the significance interval are below or above zero, the marginal effect of financial crisis is significant).

Table 5. Robustness test using irregular replacements of a central bank governor

	(1)	(2)	(3)
Financial crisis	0.436** (0.207) [0.099]**	0.799* (0.436) [0.177]**	0.366 (0.235) [0.087]*
Share of time elapsed	0.858*** (0.139) [0.205]***	0.680*** (0.226) [0.166]***	0.980*** (0.145) [0.240]***
Inflation	1.619*** (0.462) [0.387]***	1.171 (1.147) [0.286]	1.711*** (0.493) [0.419]***
Election	0.778*** (0.211) [0.186]***	0.562* (0.311) [0.137]*	0.884*** (0.265) [0.217]***
Central bank independence	−1.073* (0.607) [−0.257]	−0.834 (0.594) [−0.204]	−1.648 (1.423) [−0.404]
Number of observations	2223	844	1379
Number of countries	101	34	67
Prob > Chi2	0.000	0.000	0.000

***indicates significance at 1% level; **indicates significance at 5% level; *indicates significance at 10% level. The number in parentheses is the robust (adjusted) standard error. The number in the squared brackets is the marginal effect. Estimation results in columns (1) are for the full sample. Columns (2) and (3) refer to industrial and developing countries, respectively. The null hypothesis of the Prob > chi2 is that all of the regression coefficients in the model are equal to zero.

Table 6. Robustness test using irregular replacement of a central bank governor and different types of financial crises

	(1)	(2)	(3)
Banking crisis	0.878*** (0.309) [0.184]***	1.230* (0.706) [0.250]**	0.795** (0.342) [0.178]***
Debt crisis	0.706* (0.395) [0.152]**		0.812* (0.409) [0.181]**
Share of time elapsed	0.862*** (0.141) [0.207]***	0.690*** (0.226) [0.169]***	0.987*** (0.148) [0.242]***
Inflation	1.683*** (0.460) [0.403]***	1.361 (1.148) [0.333]	1.743*** (0.492) [0.428]***
Election	0.781*** (0.214) [0.187]***	0.527 (0.321) [0.129]*	0.893*** (0.271) [0.219]***
Central bank independence	−1.109* (0.605) [−0.266]*	−0.854 (0.594) [−0.209]	−1.729 (1.385) [−0.425]
Number of observations	2223	844	1379
Number of countries	101	34	67
Prob > Chi2	0.000	0.000	0.000

***indicates significance at 1% level; **indicates significance at 5% level; *indicates significance at 10% level. The number in parentheses is the robust (adjusted) standard error. The number in the squared brackets is the marginal effect. Estimation results in columns (1) are for the full sample. Columns (2) and (3) refer to industrial and developing countries, respectively. The null hypothesis of the Prob > chi2 is that all of the regression coefficients in the model are equal to zero.

6. THE NATURE OF A CENTAL BANK GOVERNOR REPLACEMENT

Our results suggest that the occurrence of a financial crisis, notably a banking or debt crisis, increases the likelihood that the central bank governor will be replaced. Following Vuletin and Zhu (2011), we finally differentiate between new governors drawn from the ranks of the executive branch of the government (government ally) and new governors who come from outside the executive branch (non-government ally). We investigate whether financial crises increase the probability of appointing a non-government ally, considering all turnovers and irregular turnovers only. Our hypothesis is that in order to increase credibility, it may be more attractive for a government to appoint a non-ally as central bank governor after a financial crisis has occurred.

Table 7 presents the estimation results for a conditional logit model with clustered robust standard errors. Column (1) shows that financial crises increase the probability that a non-government ally will be chosen as a central bank governor. Also inflation significantly increases the probability that a non-government ally will be appointed as a new central bank governor. The results for the samples of industrial and developing countries (shown in column (2) and (3), respectively) suggest that financial crises are statistically significant for developing countries only. However, the marginal effects of a financial crisis on the probability that a non-government ally will be appointed are significant both in industrial and developing countries.

Decomposing financial crises into bank crises, debt crises, and currency crises, we find that only banking crises significantly affect the probability that a non-government ally will be appointed as a central bank governor (see column (4) of Table 7). Similar results are found for the sample of industrial and developing countries (see columns (5) and (6) of Table 7).

Table 7. Financial crises and the nature of central bank governor replacement (Dependent variable: Non-government ally appointed as new governor)

	(1)	(2)	(3)	(4)	(5)	(6)
Financial crisis	0.981*** (0.358) [0.186]***	1.097 (0.743) [0.221]*	0.939** (0.402) [0.144]*			
Banking crisis				1.613*** (0.387) [0.261]***	1.399* (0.816) [0.267]**	1.688*** (0.449) [0.199]*
Debt crisis				0.238 (0.517) [0.052]		0.430 (0.491) [0.071]
Currency crisis				0.063 (0.482) [0.014]	0.859 (1.130) [0.184]	−0.169 (0.507) [−0.032]
Share of time elapsed	0.823*** (0.238) [0.186]***	0.781** (0.327) [0.188]**	0.898*** (0.325) [0.168]**	0.809*** (0.227) [0.184]***	0.776** (0.321) [0.188]**	0.854*** (0.325) [0.158]**
Inflation	1.778*** (0.670) [0.402]***	3.302*** (0.847) [0.793]***	1.804* (0.938) [0.338]***	2.004*** (0.677) [0.456]***	3.191*** (0.839) [0.772]***	2.160** (0.959) [0.399]***
Election	0.423 (0.307) [0.096]	0.351 (0.285) [0.084]	0.480 (0.553) [0.090]	0.419 (0.312) [0.095]	0.334 (0.287) [0.081]	0.517 (0.567) [0.095]
Central bank independence	−0.538 (0.733) [−0.122]	−1.034 (0.855) [−0.248]	0.278 (1.325) [0.052]	−0.596 (0.726) [−0.136]	−1.086 (0.857) [−0.263]	0.292 (1.273) [0.054]
Number of observations	961	531	430	961	531	430
Number of countries	40	22	18	40	22	18
Prob > Chi2	0.000	0.000	0.002	0.000	0.000	0.000

***indicates significance at 1% level; **indicates significance at 5% level; *indicates significance at 10% level. The number in parentheses is the robust (adjusted) standard error. The number in the squared brackets is the marginal effect. Estimation results in columns (1) and (4) are for the full sample. Columns (2) and (5) refer to industrial countries, respectively. Columns (3) and (6) refer to developing countries. The null hypothesis of the Prob > chi2 is that all of the regression coefficients in the model are equal to zero.

Table 8. Financial crises and the nature of central bank governor replacement (irregular replacement with a non-government ally as a dependent variable)

	(1)	(2)	(3)	(4)
Financial crisis	1.078** (0.446) [0.262]**	1.077** (0.508) [0.166]		
Banking crisis			1.796*** (0.532) [0.412]***	1.844*** (0.611) [0.234]
Debt crisis			0.483 (0.589) [0.118]	0.779 (0.614) [0.128]
Currency crisis			−0.059 (0.415) [−0.014]	−0.240 (0.416) [−0.050]
Share of time elapsed	−1.133** (0.469) [−0.275]***	−0.676 (0.570) [−0.130]	−1.282*** (0.479) [−0.302]***	−0.883 (0.612) [−0.176]
Inflation	1.898** (0.752) [0.461]**	2.486** (1.069) [0.479]***	2.122*** (0.780) [0.500]**	2.904*** (1.110) [0.579]***
Election	1.002** (0.496) [0.243]*	0.952 (0.771) [0.184]	1.045** (0.505) [0.246]*	1.070 (0.783) [0.213]
Central bank independence	−0.672 (1.243) [−0.163]	1.280 (1.740) [0.247]	−0.888 (1.266) [−0.209]	1.161 (1.681) [0.231]
Number of observations	680	368	680	368
Number of countries	40	18	40	18
Prob > Chi2	0.000	0.002	0.000	0.000

***indicates significance at 1% level; **indicates significance at 5% level; *indicates significance at 10% level. The number in parentheses is the robust (adjusted) standard error. The number in the squared brackets is the marginal effect. Estimation results in columns (1) and (3) are for the full sample, while columns (2) and (4) refer to developing countries. The null hypothesis of the Prob > chi2 is that all of the regression coefficients in the model are equal to zero.

Finally, we investigate the effect of a financial crisis on the possibility that a non-government ally will be appointed after an irregular replacement of the central bank governor. The results are shown in Table 8. As there are insufficient observations for irregular changes in the sample of industrial countries, we refrain from estimating this model for industrial countries. The estimation results for the full sample (column 1) suggest that financial crises increase the probability that a non-government ally will be appointed after an irregular replacement of the central bank governor. The same result holds for the sample of developing countries (column 2). When we consider specific types of financial crisis, it turns out that banking crises significantly increase the probability that a non-government ally will be appointed as new governor after the crisis. However, debt and currency crises are not found to be significant (column 3). The same result holds for the sample of developing countries (column 4).

7. CONCLUSIONS

This study examines the effect of financial crises on the likelihood that a central bank governor will be replaced. Employing a conditional fixed effects logit model with clustered robust standard errors and using a model that is similar to that of Dreher *et al.* (2010) and Klomp and De Haan (2010) for 101 countries during the period 1970–2007, we find that financial crises make a central bank governor turnover more likely. When we decompose crises into banking, currency, and debt crises, we find that banking and debt crises significantly increase the

likelihood of a central bank governor turnover, in contrast to currency crises. There is some evidence that central bank independence mediates the effect of financial crises on the probability that a central bank governor will be replaced. Above some threshold level of independence, the effect of a financial (banking) crisis on the probability that the central bank governor will be replaced becomes insignificant. Our main findings are robust when we only consider irregular central bank governor turnovers, i.e. replacements before the term in office of the governor has ended. Banking and debt crises have a significant effect on the probability of an irregular replacement of a central bank governor, particularly in developing countries.

Finally, we analyse whether, after a financial crisis, a new central bank governor is more likely to come from the ranks of the executive branch of the government (government ally) or not (non-government ally). Using the data from Vuletin and Zhu (2011) for a much smaller sample than in the rest of the paper, we find that financial crises increase the probability that a non-government ally will be chosen as a central bank governor. Decomposing financial crises into bank crises, debt crises, and currency crises, we find that only banking crises significantly affect the probability that a non-government ally will be appointed as a central bank governor.

APPENDIX

List of countries

Albania	France	Mongolia
Argentina	Georgia	Morocco
Armenia	Germany	Nepal
Australia	Ghana	Netherlands
Austria	Greece	New Zealand
Bangladesh	Guatemala	Nicaragua
Barbados	Guyana	Nigeria
Belarus	Haiti	Norway
Belgium	Honduras	Pakistan
Belize	Hungary	Papua New Guinea
Bhutan	Iceland	Paraguay
Bolivia	India	Peru
Bosnia and Herzegovina	Indonesia	Philippines
Botswana	Iran, Islamic Rep.	Poland
Brazil	Ireland	Portugal
Bulgaria	Israel	Russian Federation
Burundi	Italy	Singapore
Canada	Jamaica	Slovak Republic
Cape Verde	Japan	South Africa
Chile	Jordan	Spain
China	Kazakhstan	Sri Lanka
Colombia	Kenya	Sweden
Costa Rica	Korea, Rep.	Switzerland
Croatia	Kuwait	Tanzania
Czech Republic	Latvia	Thailand
Denmark	Lebanon	Turkey
Dominican Republic	Lesotho	Uganda
Ecuador	Lithuania	United Kingdom
Egypt, Arab Rep.	Luxembourg	United States
El Salvador	Malawi	Uruguay
Estonia	Malaysia	Venezuela, RB
Ethiopia	Maldives	Zambia
Fiji	Mauritius	Zimbabwe
Finland	Mexico	

NOTES

1. Klomp and De Haan (2010) do not investigate the impact of financial crises on the likelihood of a central bank governor turnover, while Dreher *et al.* (2010) only examine whether currency devaluations affect the likelihood that a central bank governor will be replaced. There are two lines of research on related issues. First, some studies suggest that central bank independence reduces financial instability and the incidence of banking crises (see Klomp and De Haan, 2009 and Khan *et al.*, 2013). Second, there is a substantive amount of research on the drivers of financial crises (see, for instance, Angkinand and Willett, 2011 and Licchetta, 2011).
2. See <http://www.kof.ethz.ch/en/indicators/data-central-bank-governors/>
3. We thank the authors for providing their data.
4. See <http://globalization.kof.ethz.ch/>.
5. Several studies (including Peek *et al.*, 1999; Di Noia and Di Giorgio, 1999; and Masciandaro, 2007) examine the advantages and disadvantage of having the central bank in charge of banking supervision.

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