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Impact of National Financial Regulation on Macroeconomic and Fiscal Performance After the 2007 Financial Shock

Econometric Analyses Based on Cross-Country Data

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Das Wichtigste in Kürze

Die empirische Studie untersucht, welche Auswirkungen die im Jahr 2007 begonnene Finanzkrise auf 88 Länder in Abhängigkeit von deren Finanzmarktregulierung im Durchschnitt hatte. Es zeigt sich, dass die Produktionseinbrüche, die Beschäftigungsverluste und die staatlichen Budgetdefizite umso größer ausfielen, je liberalisierter die Finanzmärkte der Länder waren. Die Ergebnisse sind ein weiterer Beleg dafür, dass im Rahmen der weit verbreiteten Finanzmarktderegulierungen in den Jahrzehnten zuvor entscheidende Fehler gemacht wurden.

Methodisch geht die Untersuchung folgendermaßen vor: das Ausmaß der Finanzmarktderegulierung wird durch den „Finanzreformindex" (*FRI*) von Abiad et al. (2008) gemessen. Dieser deckt den Zeitraum 1973 bis 2005 für 91 Länder ab und umfasst sieben Themenfelder im Bereich Finanzmarktregulierung. Die *FRI* kann Werte zwischen 0 (stark reguliert) und 21 (vollständig liberalisiert annehmen. In die Analyse geht der Durchschnitt des *FRI* für die Jahre 2001 bis 2005 ein. Tendenziell weisen einkommensstarke Volkswirtschaften einen höheren *FRI* auf als Entwicklungs- und Schwellenländer. So haben die USA, Großbritannien, Spanien, Irland, Kanada, Frankreich, Australien und Dänemark einen *FRI* von 21, d.h. einen vollständig liberalisierten Finanzmarkt. Deutschland weist bspw. nur einen Wert von 19, Japan ist bei 18 und Finnland hat einen Wert von 17. Interessanterweise hat China mit einem Wert von 8,85 den am zweitstärksten regulierten Finanzmarkt der betrachteten Länder; und auch Indien gehört mit einem Wert von 12,4 immer noch zu den stark regulierten Finanzmärkten.

Die zugrundeliegenden makroökonomischen Daten stammen größtenteils von der Weltbank. Es werden drei Ergebnisvariablen analysiert: (1.) Vierjahres-Wachstumsrate des realen BIP pro Kopf der Jahre 2008 bis 2011, (2.) Dreijahres-Wachstumsrate der Erwerbstätigenquote der Jahre 2008 bis 2010 sowie (3.) durchschnittliche Staatsbudgetdefizitquote der Jahre 2008 bis 2010. Die Wahl der drei Ergebnisvariablen ergibt sich daraus, dass die Finanzkrise nicht nur in vielen Ländern zu Rezessionen (also Rückgängen des realen BIP) geführt hat, sondern auch zu Arbeitsmarktkrisen und – ggf. nach diversen Bankenrettungen – zu fiskalischen Krisen. Diese drei Variablen werden nun jeweils im Rahmen von Regressionsanalysen durch den *FRI* sowie durch viele weitere Variablen vor Beginn der Krise (2006) erklärt.

Es zeigt sich, dass der *FRI* auf alle drei Ergebnisvariablen einen negativen Effekt hatte, d.h. Länder, die stärker liberalisierte Finanzmärkte aufwiesen, waren im Durchschnitt stärker negativ von den Auswirkungen der Finanzkrise in Bezug auf ihr Wachstum, ihren Arbeitsmarkt und ihre Staatsfinanzen betroffen als vergleichbare Länder, die eher regulierte Finanzmärkte aufwiesen. Beispielsweise zeigt sich in Bezug auf die Wachstumsrate des realen BIP, dass ein um eine Einheit höherer *FRI* im Durchschnitt zu einer jährlichen Wachstumseinbuße von ca. 0,25 Prozentpunkte geführt hat und die jährliche Defizitquote um ca. 0,4 Prozentpunkte erhöht hat. Die Ergebnisse sind wenig sensitiv in Bezug auf die Nutzung unterschiedlicher methodischer Ansätze.

Zwar kann diese Studie nicht die genauen Wirkungsmechanismen aufzeigen, die zu diesen Resultaten geführt haben, recht eindeutig ist jedoch die Feststellung, dass „weniger" Finanzmarktliberalisierung in den Jahren vor 2007, in vielen Ländern – *nicht nur in den USA als dem Ursprung* – dazu geführt hätte, dass die individuellen und gesellschaftlichen Kosten der Krise deutlich geringer ausgefallen wären.

Impact of National Financial Regulation on Macroeconomic and Fiscal Performance After the 2007 Financial Shock – Econometric Analyses Based on Cross-Country Data

By TOBIAS HAGEN*

Using cross-country data, this paper estimates the impact of the 2007 financial shock on countries' macroeconomic developments conditional on national financial regulations before the crisis. For this purpose, the "financial reform index" developed by Abiad et al. (2008) is used. The econometric analyses indicate that countries with more deregulated financial markets experienced deeper recessions, stronger employment losses, and larger government budget deficits. Against the background of the ongoing global crisis and the results of other studies, the usefulness of liberalized financial markets for macroeconomic stability and economic development should be rigorously reconsidered.

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1. Introduction

The global financial crisis that began in 2007, led to the most severe recession since the Great Depression. It was a synchronized shock for almost all countries around the world, which led to substantial output losses and, partly, to long-lasting crises. At the same time, the depths of the recessions and the degrees to which the countries have been affected, varied significantly (see Masciandaro *et al.* 2011). Countries with higher income per capita have experienced the most severe output losses (see Rosea and Spiegel 2011). Furthermore, the recessions led to employment losses and government debt crises in many countries. For this reason, this paper not only analyses GDP growth rates after the 2007 financial shock, but also employment changes as well as government budget deficits.

The global recession took off in the financial sector, and the following years were characterised by threatening bankruptcy, scandals, and bailouts of some of the biggest financial intermediaries. Hence, the point of departure is the question: which role did financial liberalization and deregulation of the financial markets play with regard to the severity and extent of output and employment losses as well as budget deficits during the global recession? For the empirical analyses the „New Database of Financial Reforms", developed by Abiad *et al.* (2008), is used as an indicator for financial liberalization. It covers 91 economies over the time period 1973-2005 and includes seven aspects of financial sector policy.

With regard to empirical studies, analysing the role of financial market regulation in the crisis, one may differentiate between studies directly using indicators for financial market regulation and studies using measures for the size of the financial market. Even though both types of variables are correlated, this difference should be kept in mind.

The paper by Giannone *et al.* (2011) analyses the role of market freedom on average GDP growth in 2008 and 2009 using a cross-country dataset. Their results indicate that the set of policies that favour liberalization in credit markets are negatively correlated with countries' resilience to the recession as measured by output growth in 2008 and 2009. Furthermore, they find that the negative correlation remains after the inclusion of a wide range of controls, and the conduction of several robustness tests. Moreover, credit market regulation is found to be one of the more significant (with a negative sign) explanatory variable for the decline in output growth in 2008 and 2009.

Besides other concepts, Masciandaro *et al.* (2011) make use of the same financial reform index as this paper. They reveal that the countries with the most liberalized financial system were hit the hardest by the crisis. They focus on the effects of various features of supervisory architecture and governance on economic resilience of a set of about 100 countries. Their findings show that they were *negatively* correlated with economic resilience.[1]

Rosea and Spiegel (2011) empirical cross-country analyses of the post 2007 recession indicate that countries with higher income and looser credit market regulation seemed to suffer worse crises.

In its "Global Financial Stability Report" the IMF (2012) performs cross-country panel regression models to relate economic outcomes (real GDP per capita growth, volatility of real GDP per capita growth, and financial stress) to financial structures for 58 economies during the 1998–2010 period. Here, only some of the findings for volatility of real GDP per capita

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[1] Another paper using also the financial reform index to analyze banking crises more general is Angkinand *et al.* (2010).

growth are summarized. Volatility is positively affected by the share of foreign banks in the domestic market, and is negatively affected by the higher concentration in the banking sector. A higher ratio of equity to total assets is associated with lower volatility. The IMF (2012, Chap. 4) draws the conclusion that protective financial buffers within banks have been associated with better economic outcome and a domestic financial system that is dominated by some types of non-traditional bank intermediation has in some cases been associated with adverse economic outcomes.

This paper builds on Giannone *et al.* (2011) since it analyses the effects on output growth rates too, and makes use of some of the methodological approaches applied by them. However, with regard to the following aspects, this research paper aims to go beyond previous research:
(i)   This paper not only analyses the effects on output growth after the 2007 shock. It estimates the effects on employment rates and on budget deficits as well. The latter seems to be a matter of particular interest since the financial crisis transformed into fiscal crises in many countries.
(ii) Also the years 2010 to 2011 in case of output growth and the year 2010 in case of the other two outcome variables can be included. Using also data for 2010 and 2011 accounts for the fact that the recessions have been long-lasting in several countries.
(iii) This paper takes some methodological difficulties into account. Especially, since the dataset is only cross-sectional, unobserved heterogeneity may bias the results. Further issues being considered are outliers and functional form assumptions.

The econometric analyses find evidence that financial liberalization has had a strongly negative effect on countries´ performance after the year 2007. Thus, our paper refers to similar findings of the studies, as mentioned above: the countries which followed the IMF´s agenda of financial market liberalization (see, e.g., Joyce and Noy 2008) the most, have also been hit the hardest economically, with regard to all three outcome variables. Note, however, that this paper is not able to identify the channel through which financial liberalization works. Consequently, it cannot give answer to the question, *why* national financial regulations affect the processes of the crises.[2]

The remainder of the paper is as follows. In the next section, the dataset used is described and preliminary correlation analyses are performed. Note, that more information on the dataset can be found in the Appendix. Section 3.1 describes the econometric methods used considering several methodological difficulties. Sections 3.2, 3.3, and 3.4 present the results of the econometric analyses of the three outcome variables. Finally, Section 4 offers some conclusions.

2. Dataset and Correlation Analyses

The empirical analyses are based on the financial reform index (*FRI*) developed by the IMF (Abiad *et al.* 2008) for 91 countries covering the time period 1973-2005. The *FRI* is a time-varying index for 91 countries, which can have values between 0 (=fully repressed) and 21 (=fully liberalized). Due to restrictions of the other data sources only 88 countries are included. These countries can be found in Table A 1 in the Appendix.

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[2] Some evidence can be found in IMF (2012) as well as Chudika and Fratzscher (2011).

The *FRI* consists of 7 different dimensions of financial sector policy (see also Angkinand *et al.* 2010): (i) *reduction of credit controls and excessively high reserve requirements*[3], (ii) *reduction of interest rate controls*[4], (iii) *reduction of entry barriers*, (iv) *reduction of state ownership in the banking sector*[5], (v) *reduction of capital account restrictions*[6], (vi) *enhancement of prudential regulations and supervision of the banking sector*[7], (vii) *liberalization of securities market policy*[8].

A natural approach would be to use the *FRI* for 2005 only. However, the average of the *FRI* over the time period 2001 to 2005 is used for the following two reasons. Firstly, one may argue that the state of the national financial system at the time of the shock in 2007 not only depends on the regulation of one year (2005), but also on the regulation of a longer time period before. The year 2001 is defined as the beginning of this time period, since this is the first year after the end of the dot-com bubble. Secondly, by using not only the *FRI* of 2005, it is possible to gain more variation of this variable. For example, 10 out of 18 advanced countries have the highest value of 21 in 2005. By using the average *FRI* for 2001 to 2005, only 8 out of 18 advanced countries have the value 21. The second main data sources are the World Bank databases (World Development Indicator, World Bank Financial Structure Dataset). Other data sources used as well as the exact variable definitions can be found in the Appendix.

In the following, some figures are presented in order to give an overview of the data. Table 1 shows that the advanced economies are the countries which are liberalized to a high extent. Furthermore, within the advanced economies the variation of the *FRI* is rather low (see the last column showing the total index).

The impression is confirmed in Figure 1, Figure 2 and Figure 3 showing that richer countries have a higher *FRI* and that the variance of the *FRI* is low within the advanced economies. This has to be taken into account in the econometric analyses, mainly because – as demonstrated by Figure 4 – richer countries (real GDP per capita) were more affected by the recession (in terms of cumulated GDP growth rate in 2008 to 2011) than poorer countries. Within the developing and transition Economies (Figure 2) only Estonia and Latvia have a *FRI* value of 21. Already at this point it is worth noting that these countries were hit particularly hard by output losses (see Figure 6).

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[3] Based on the questions: (1) Are reserve requirements restrictive? (2) Are there minimum amounts of credit that must be channeled to certain sectors? Are there ceilings on credit to other sectors? (3) Are there any credits supplied to certain sectors at subsidized rates?

[4] Based on the questions: (1) Are interest rates subject to ceilings/floors or determined by the central bank? (2) Are interest rates allowed to float within a band or are partially liberalized? (3) Are interest rates determined at market rates?

[5] Based on the questions: (1) To what extent does the government allow foreign banks to enter into a domestic market? (2) Does the government allow the entry of new domestic banks (3) has the government eased branching restrictions? (4) Does the government allow banks to engage in a wider range of activities?.

[6] Based on the questions: (1) Is the exchange rate system unified? (2) Does a country set restrictions on capital inflow? (3) Does a country set restrictions on capital outflow?

[7] Based on the questions: (1) Has a country adopted a capital adequacy ratio based on the Basle standard? (2) Is a banking supervisory agency independent from the executives' influence? (3) Does a banking supervisory agency conduct effective supervisions through on-site and off-site examinations?

[8] Based on the questions: (1) Has a country taken measures to develop security market? (2) Is a country's equity market open to foreign investors?

TABLE 1
THE FINANCIAL REFORM INDEX BY ITS COMPONENTS AND REGIONS, AVERAGE 2001 – 2005

		Credit Controls	Interest Rate Controls	Entry Barriers	Bank Regu-lations	Privatiz-ation	Capital Account	Securi-ties Market	Total Index
Advanced	Mean	2.78	3	2.98	2.58	2.35	3	3	19.7
Economies	Min	1.5	3	2	1	0	3	3	17
n=22	Max	3	3	3	3	3	3	3	21
Emerging and	Mean	2.34	2.5	2.27	1.43	1.13	2.13	2.25	14.05
Developing	Min	1	0	1	0	0	1	1	7.25
Asia n=12	Max	3	3	3	2	3	3	3	20
Latin America	Mean	2.25	2.91	2.67	1.55	2.05	2.4	1.99	15.81
and Caribbean	Min	0	0	1	0	0	0	1	11
n=17	Max	3	3	3	2	3	3	3	20
Sub-Saharan	Mean	2.3	2.46	2.64	1.34	2.29	1.61	1.51	14.16
Africa	Min	0.75	1	1	0	0	0	1	7
n=14	Max	3	3	3	3	3	3	3	18.25
Transition	Mean	2.36	2.6	2.67	2.06	1.84	2.45	2.07	16.04
Economies	Min	1.5	0	0	1	0	1	0	7.5
n=17	Max	3	3	3	3	3	3	3	21
Middle East	Mean	2.37	2.86	2.43	1.71	1.06	1.86	2.09	14.37
and Northern	Min	1.5	2	0	1	0	0	1	11
Africa n=7	Max	3	3	3	3	3	3	3	19.25

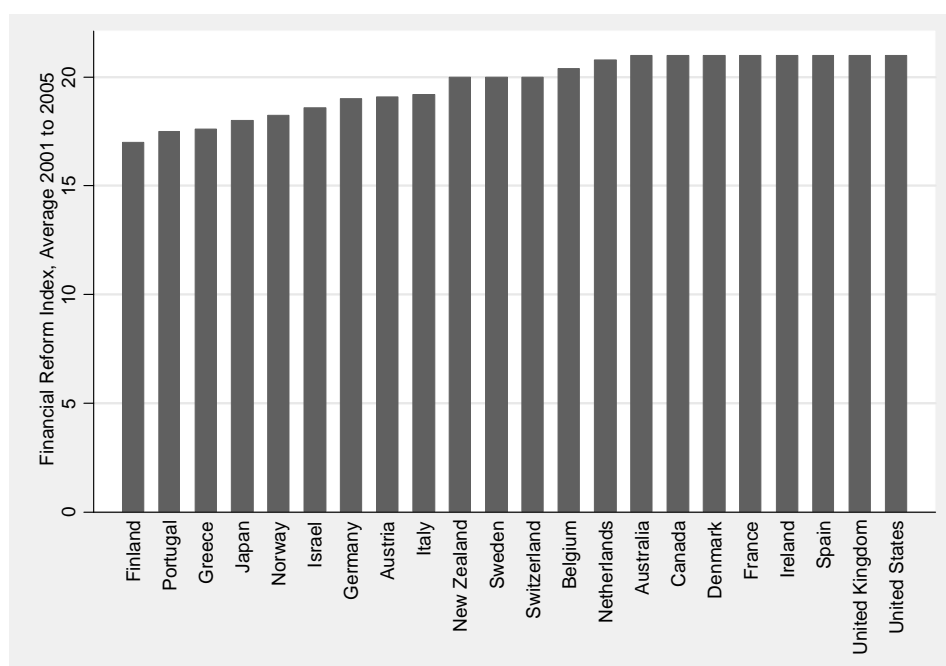*Source*: Author's calculations based on Abiad *et al.* (2008).

FIGURE 1: FINANCIAL REFORM INDEX OF THE ADVANCED ECONOMIES, AVERAGE 2001 – 2005

Source: Author's calculations based on Abiad *et al.* (2008).
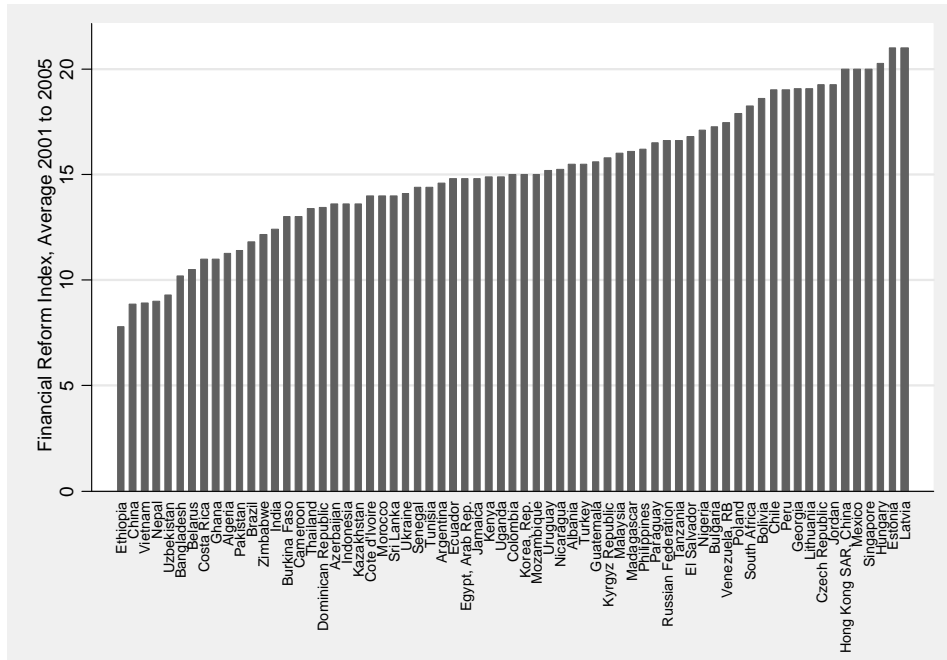
FIGURE 2: FINANCIAL REFORM INDEX OF DEVELOPING AND TRANSITION ECONOMIES, AVERAGE 2001 – 2005

Source: Author's calculations based on Abiad *et al.* (2008).

FIGURE 3: NATURAL LOG OF GDP PER CAPITA IN USD IN 2006 AND THE FINANCIAL REFORM INDEX, AVERAGE 2001 – 2005

Notes: The Bravais Person correlation coefficient (corresponding p-value) is 0.7182 (0.0000) and Spearman's rank correlation coefficient is 0.7265 (0.0000). *N*=88.

Source: Author's calculations based on Abiad *et al.* (2008) as well as the World Bank.

FIGURE 4: NATURAL LOG OF GDP PER CAPITA IN USD IN 2006 AND
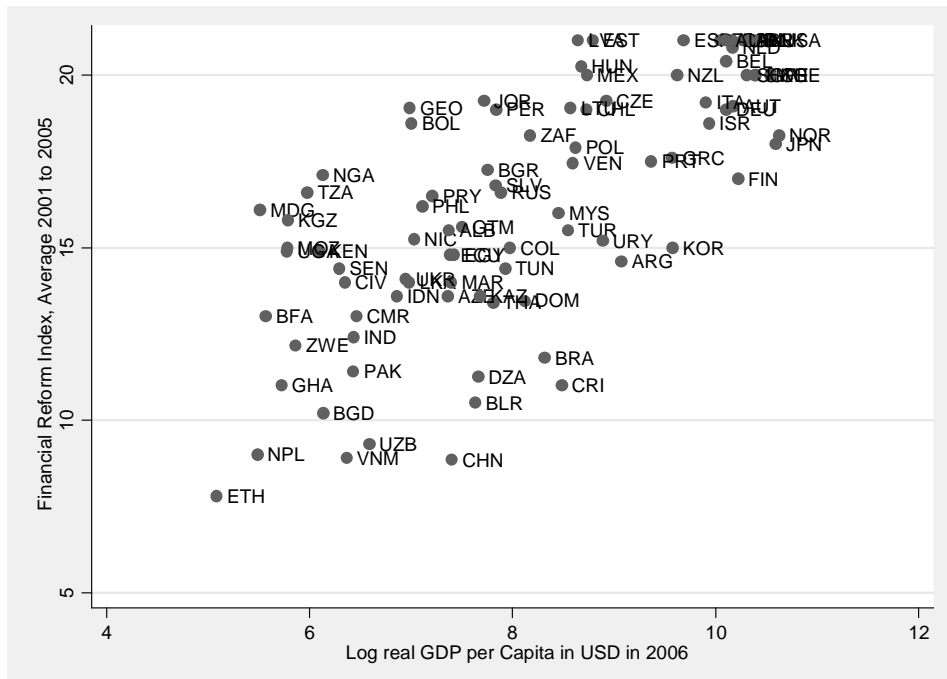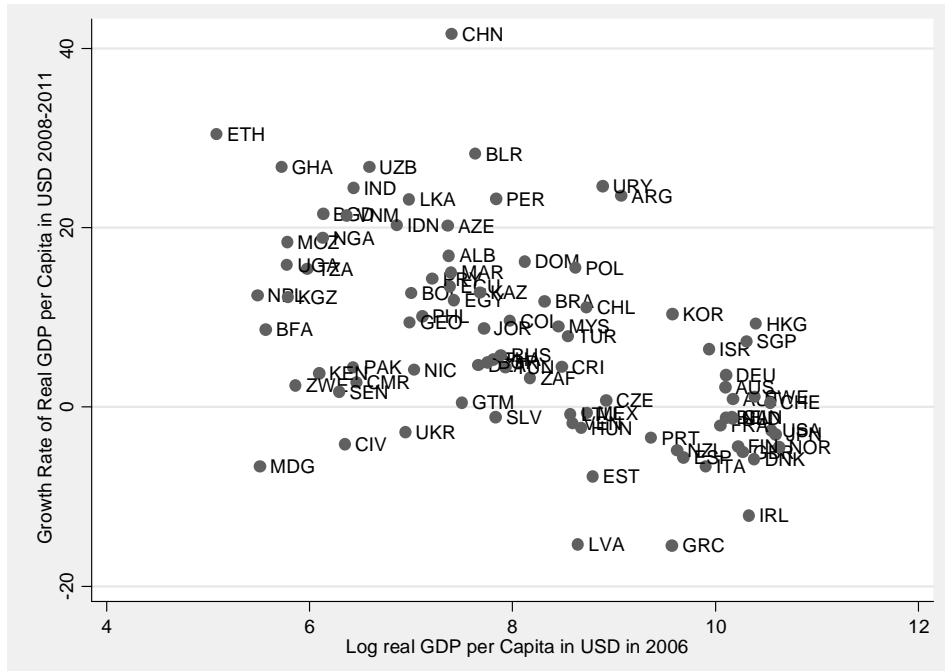CUMULATED GDP GROWTH 2008-2011

Notes: The Bravais Person correlation coefficient (corresponding p-value) is -0.5224 (0.0000) and Spearman's rank correlation coefficient is -0.5445 (0.0000). *N*=88.

Source: Author's calculations based on Abiad *et al.* (2008) as well as the World Bank.

A drawback of the large dataset used with a wide range of countries is that there is no detailed information available on labor market institutions and regulations such as those published by the OECD for the advanced economies (see OECD 2012). Labour market institutions and regulations have turned out to be important determinants for the explanations of cross-country differences in labour market performance during the crisis (OECD 2012). Hence, this is an important control variable. In order to control for labour market institutions and regulations, the "Economic Freedom Dataset" of the Fraser-Institute is used (see Gwartney *et al.* 2011), which includes also data on national labour markets. The variable "Labour Market Freedom Index" is coded, such as a high value means a deregulated labour market. Figure 5 indicates that countries with highly deregulated labour markets experienced greater employment losses than more regulated countries.
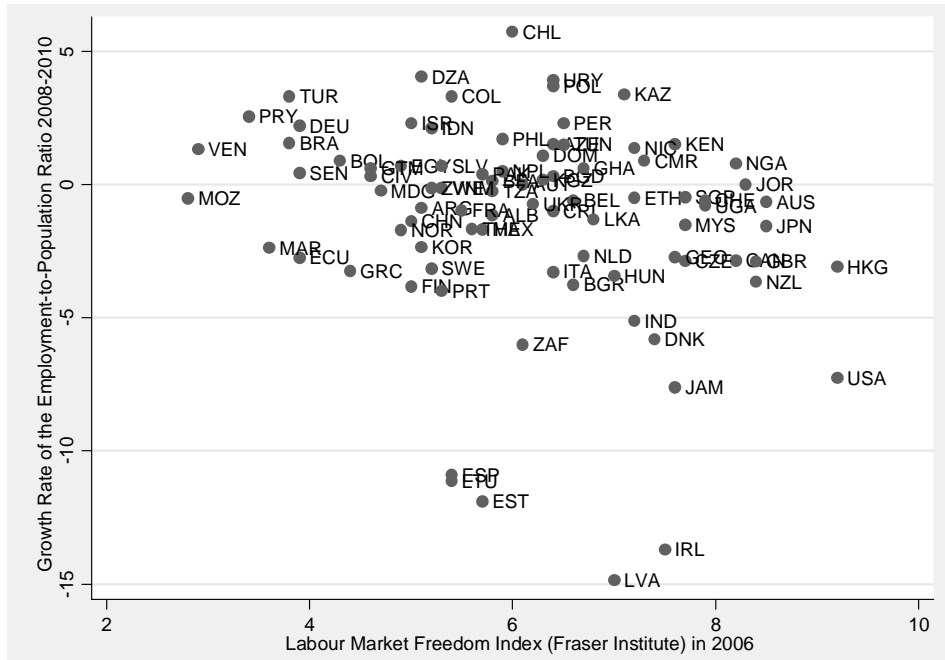
FIGURE 5: LABOUR MARKET DEREGULATION IN 2006 AND CUMULATED GROWTH RATE OF EMPLOYMENT 2008-2010

Notes: The Bravais Person correlation coefficient (corresponding p-value) is -0.2346 (0.0297) and Spearman's rank correlation coefficient is -0.2615 (0.0150). *N*=86.

Source: Author's calculations based on Gwartney *et al.* (2011) as well as the World Bank.

Finally, by applying correlation analyses it is investigated whether the *FRI* is directly inter-related with the outcome variables of interest. Figure 6 is a scatter plot of the *FRI* and the cumulated growth rate of GDP per Capita measured in USD over the period 2008 to 2011. The strong negative relationship is visually obvious and confirmed by correlation coefficients (see the notes to Figure 6). However, note that this may not be causal as Figure 3 and Figure 4 indicate that high income countries also have a higher *FRI* and that high income countries have deeper recessions. Hence, this must be taken into account in the econometric analyses. Furthermore, Figure 6 indicates that it might be important to consider the problem of outliers (see, e.g., China).

FIGURE 6: FINANCIAL REFORM INDEX (AVERAGE 2001–2005) AND CUMULATED GROWTH RATE OF GDP PER CAPITA IN USD 2008–2011
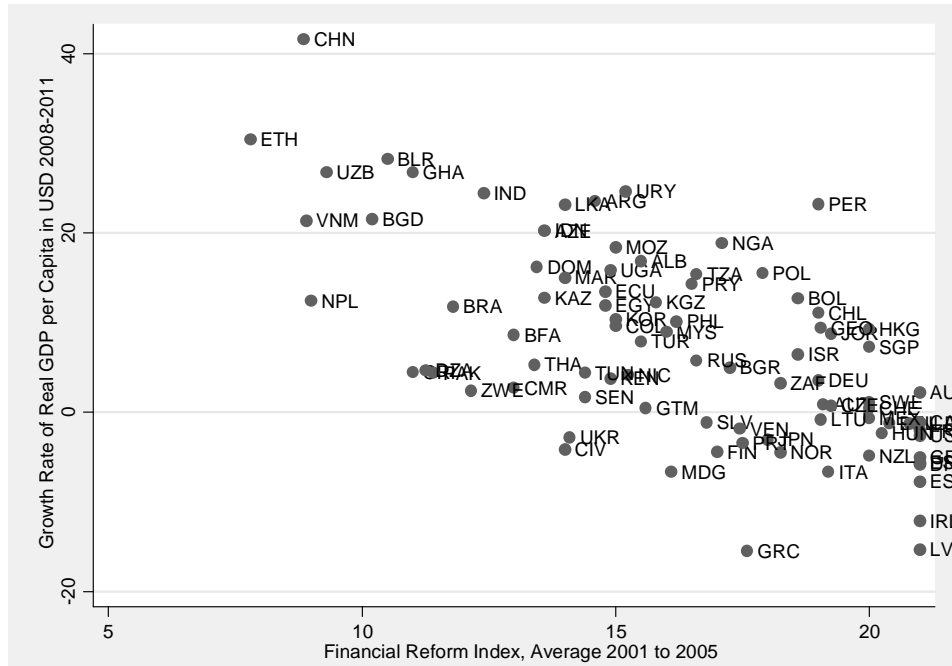
Notes: Taking all countries into account, the Bravais Person correlation coefficient (corresponding p-value) is -0.6501 (0.0000) and Spearman's rank correlation coefficient is -0.6366 (0.0000). Restricting the sample to the 22 advanced economies, both coefficients are insignificant 0.0849 (0.7070) und -0.0423 (0.8518). Using a sample with the 22 advanced economies, 12 emerging and developing Asia countries as well as 17 transition economies the coefficients are -0.8032 (0.0000) and -0.7512 (0.0000)

Source: Author's calculations based on Abiad *et al.* (2008) as well as the World Bank.

FIGURE 7: FINANCIAL REFORM INDEX (AVERAGE 2001–2005) AND CUMULATED GROWTH RATE OF THE EMPLOYMENT TO POPULATION RATIO 2008–2010

Notes: Taking all countries into account, the Bravais Person correlation coefficient (corresponding p-value) is -0.4165 (0.0000) and Spearman's rank correlation coefficient is -0.4389 (0.0000). Restricting the sample to the 22 advanced economies, both coefficients are insignificant -0.3288 (0.1352) und -0.2207 (0.3237). Using a sample with the 22 advanced economies, 12 emerging and developing Asia countries as well as 17 transition economies the coefficients are -0.4508 (0.0009) and -0.5228 (0.0001).

Source: Author's calculations based on Abiad *et al.* (2008) as well as the World Bank.
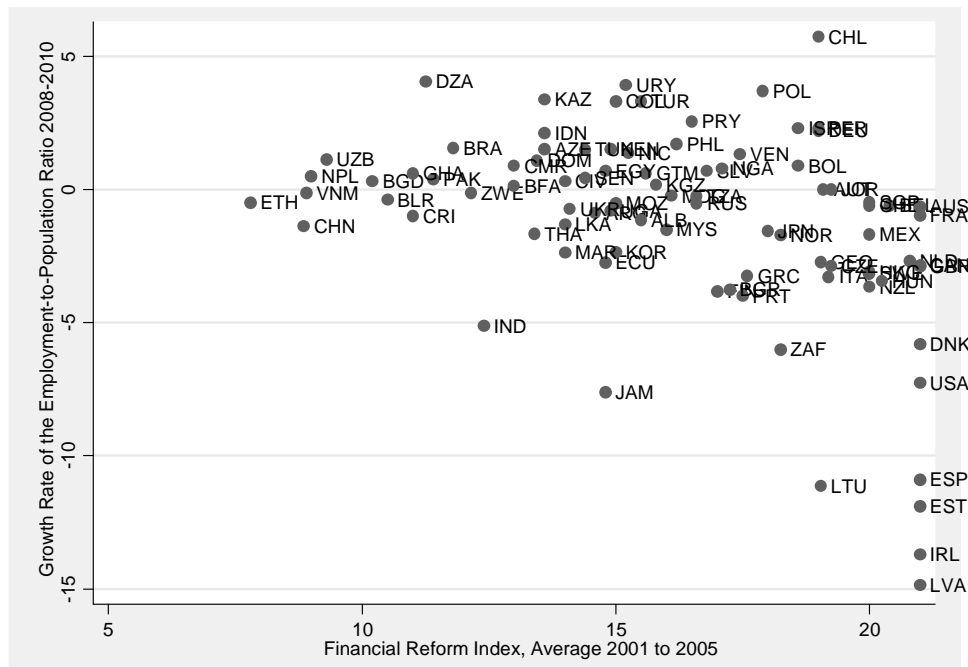
FIGURE 8: FINANCIAL REFORM INDEX (AVERAGE 2001–2005) AND
AVERAGE DEFICIT RATIO 2008–2010

Notes: All correlation coefficients are near zero and statistically insignificant. *N*=67.

Source: Author's calculations based on Abiad *et al.* (2008) as well as the World Bank.

In Figure 7 the cumulated growth rate of the employment to population ratio is plotted against the *FRI*. Less clear-cut but still significantly, a negative relationship can be concluded (see the notes to Figure 7).

At last, Figure 8 cannot find any correlation of the *FRI* with average deficit ratio over the time period 2008-2010. However, it becomes clear in the regression analysis in the subsequent section, that – after controlling for other factors – the *FRI* has a strong negative effect on the deficit ratio.

3. Econometric Analyses

3.1 Econometric Models

Our aim is to go further than the simple correlation analyses in the previous section and to estimate the causal effects of banking regulations on the outcome variables GDP growth rate, employment growth rate and the budget deficit ratio using regression analyses. The GDP model includes the year 2011. Due to data restrictions the employment growth rate model as well as the deficit rate model ranges only to year 2010.

Firstly, the *GDP growth rate model* is explained. Based on the "Finance and Growth" literature (see Levine 2005) and building on Giannone *et al.* (2011), the determinants of the 4-years cumulated growth rate over the period 2008-2011 is specified as the following regression function

(1) $$\frac{y_{i,2011} - y_{i,2007}}{y_{i,2007}} = \alpha + \beta_1 \ln(y_{i,2006}) + \beta_2 FRI_i + \gamma X + u_i$$

9

for $i=1,\ldots,n$ countries, where $\ln(y_{i,2006})$ is the natural logarithm of real GDP per capita of country i in USD in 2006, FRI_i is the financial regulation index of country i, X is a matrix of control variables which may affect GDP growth, too, u_i is a classical error term, and α, β_1, β_2, γ are the parameters to be estimated.[9] The parameter of interest in this study is β_2, the ceteris paribus effect of FRI_i on the dependent variable.

Secondly, the *deficit ratio model* is

$$
(2) \qquad \frac{\sum_{t=2008}^{2010} B_{i,t}}{\sum_{t=2008}^{2010} Y_{i,t}} = \alpha + \beta_1 \ln(D_{i,2006}) + \beta_2 FRI_i + \gamma X + u_i
$$

where B is the nominal budget balance in current local currency, Y is the nominal GDP in current local currency and, $D_{i,2006}$ is the stock of government debt in % of GDP of country i in year 2006. Hence, the left-hand side of equation (3) is the average government debt-to-GDP ratio over the years 2008-2010. A comparable time-series regression equation is proposed by Bohn (2008) for the analysis of the sustainability of government debt.[10] Note that GDP growth has a direct effect on the deficit ratio by affecting the denominator in Equation (2).

Thirdly, analogous, the *employment growth rate model* is specified as follows

$$
(3) \qquad \frac{E_{i,2010} - E_{i,2007}}{E_{i,2007}} = \alpha + \beta_1 \ln(E_{i,2006}) + \beta_2 FRI_i + \gamma X + u_i
$$

where E is the employment per population ratio of persons being at least 15 years old in percent. Hence, the dependent variable is the cumulated growth rate of the employment population ratio over the period 2008 to 2010. X includes the Labour Market Freedom Index by the Fraser Institute (Gwartney *et al.* 2011)

Trying to identify the causal quantitative effects of *FRI* on the outcome variables of interest by estimating the equations (1) to (3) is associated with some methodological difficulties.

First of all, all kinds of countries (not only advanced economies) are included. This *large heterogeneity* of the countries is likely to lead to an *omitted variable bias*, that is, a biased estimate of β_2 due to the fact that variables are omitted being correlated with the outcome variable and as well as FRI_i (see Angrist and Pischke 2009). This is often hard to handle if only cross-sectional data and no panel data are available. The approach chosen here is to include as much control variables as available into X. For example, X includes in all (in most) regression models the size of the population in 2006, dummies for country groups (advanced countries, emerging Asia, transition countries, Sub-Saharan Africa, Latin America, Middle East and North Africa, members of the Euro area), lagged values of the dependent variable (see Table A 1 in the Appendix), openness of the economy (exports + imports / GDP) in 2006, and the size of the financial sector in 2006. The explanatory variables used are discussed in more detail in the following sections as well as in the Appendix.

A second difficulty may arise due to *outliers* (see Rousseeuw and Leroy 2003). OLS tends to award an excessive importance to observations with very large residuals and, consequently, distort parameters' estimation in case of the existence of outliers (see Verardi and Croux 2009). Examples may be China in case of the growth model (Figure 6) and Norway in case of

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[9] Note that the neo-classical growth model predicts $\beta_1 < 0$.

[10] However, the dependent variable in Bohn's (1998) approach is the primary budget balance. Here we have only data on total budget balance ("headline deficit"). Furthermore, Bohn (1998) does not use the log of D.

the deficit ratio model (Figure 8). A first approach is to use different samples and to exclude those "outlier countries". A second approach is to apply median (quantile) regression (see Angrist and Pischke 2009, Chap. 8). A third approach is to use robust regression techniques. Here, the so-called MM-estimator is applied (see Yohai 1987; Jann 2010a and Jann 2010b).

A third difficulty may arise due to *non-linear effects* of *FRI* on the outcome variables. Equation (1), (2), and (3) assume a linear relationship between the dependent variables and *FRI*. However, the relationship may be non-linear. Here, the problem is dealt with by testing whether *FRI*, specified as four dummy variables, renders the results. Furthermore, a statistical test is performed in order to reveal whether a non-parametric specification of the effects of FRI_i affects the results and if it is justified to assume a linear specification of FRI_i. For example, in case of the GDP growth model the following semiparametric regression equation is estimated (see Robinson 1988, and Verardi and Debarsy 2012):

$$(4) \qquad \frac{y_{i,2011} - y_{i,2007}}{y_{i,2007}} = \beta_1 \ln(y_{i,2006}) + f(FRI_i) + \gamma X + u_i$$

Afterwards, the null hypothesis (H0) is tested that the parametric fit (linear specification) and the non-parametric fit are not different (see Härdle and Mammen 1993, and Verardi and Debarsy 2012).

A fourth difficulty is the *low variance of the FRI variable*, especially the fact that 8 out of 18 advanced economies have a *FRI* value of 21. As mentioned above, this is one reason for using the average *FRI* for the time period 2001–2005 because doing so decreases the number of FRI_i=21 countries from 10 to 8 compared to the situation only the year 2005 is included. Furthermore, it is examined if excluding the FRI_i=21 countries render the results.

Fifth, one may ask whether FRI_i is *endogenous with regard to the outcome variable*s, in the sense that FRI_i may be a function of the respective outcome variable, even if controlling for other variables. Due to the time structure of the models (the outcome variables are measured 2007 to 2010/11 and FRI_i is measured over the period 2001 to 2005) as well as the fact that the financial crisis was an unexpected shock for all governments, this is very unlikely. Note that this endogeneity would require that governments have chosen their regulation in 2001 to 2005 in expectation of the post-2007 events. Again, this seems very unlikely.[11]

Finally, there is the widely neglected issue of *model uncertainty* about the choice of explanatory variables (see Magnus *et al.* 2010). As stressed by De Luca and Magnus (2012) standard econometric practice of using the same data for model selection (the choice of explanatory variables) and estimating, while ignoring that the resulting estimators are in fact pretest estimators, leads to false inference, since traditional statistical theory is not directly applicable. An approach to deal with this difficulty is the "Bayesian model averaging" technique within a linear regression model (see Magnus *et al.* 2010, and De Luca and Magnus 2011). The idea is to define two sets of explanatory variables: focus regressors which are included in the model on theoretical or other grounds, and auxiliary regressors which contain additional explanatory variables of which the researcher is less certain. Here, FRI_i is defined as an "auxiliary regressor". The reason for doing so is to ensure that FRI_i should be included into the model. A similar approach is chosen by Giannone *et al.* (2011).

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[11] The determinants of financial reforms are studied by Abiad and Mody (2005).

3.2 Estimation Results of the GDP Growth Rate Model

Table 2 includes the GDP growth rate model with 11 different specifications. They differ with regard to the estimation technique as well as the explanatory variables. As mentioned in the previous paragraph, besides OLS also quantile (median) regressions, as well as robust regression techniques (MM estimator) are applied. All estimated standard errors are robust with regard to heteroscedasticity.[12]

Column (1) shows the simplest specification, where $(y_{i,2011} - y_{i,2007})/y_{i,2007}$ is explained only by the FRI_i, the natural logarithm of GDP per capita in USD in 2006, $\ln(y_{i,2006})$, as well as the natural log of the population size, $\ln(pop_{i,2006})$. The coefficient of the FRI_i is highly statistically significant at the 1% level.

Column (2) includes the estimation results if country group dummies are included. Compared to the base group of emerging Asian economies, advanced economies have a four-year growth rate which is about 6.7 percentage points lower. An additional growth reduction of more than 4 percentage points occurs for member countries of the Euro area which may result from the impossibility to conduct a national monetary policy (including nominal exchange rate adjustments).

The preferred specification with regard to the explanatory variables is in column (3). Additionally, the openness of the economy (measured as imports + exports in percentage of GDP) in 2006 as well as the lagged growth rate in 2002 to 2006 are included. The estimated coefficient of FRI_i has the following quantitative interpretation: an increase of the FRI by one unit (for example, from the sample mean 16.2 to 17.2) reduces the four year growth rate by 1.235 percentage points (for example, from the sample mean 7.2% to 6.0%).

The following columns show robustness checks to this result. In column (4) are the results of the quantile (median) regression which are less sensitive to outliers. The estimated coefficient of FRI_i halved to 0.6 and becomes statistically insignificant. Note, however, that the median regression answers a different question, since it predicts the median (instead of the mean) of the dependent variable. The MM estimator in column (5) is a direct approach to deal with outliers. An increase of FRI by one unit decreases the GDP growth rate by almost one percentage point on average. However, the coefficient estimate of FRI_i is only weakly statistically significant.

In column (8) the sample is reduced with respect to two aspects: countries with FRI_i=21 (the highest value)[13] and China (with a low FRI and a very high GDP growth rate) are excluded. The central result is that the estimated coefficient is still statistically significant and amounts to -0.94.

One may argue that not national financial regulation, but the size of the national financial market determined the severity of the recession. Hence, in column (6) and (7) it is additionally controlled for the size of the national financial market. Several variables of the World Bank Financial Structure Dataset (Beck and Demirgüç-Kunt 2009) are tested, but only the results of two variables (financial system deposits to GDP, stock market capitalization to GDP) both

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[12] In case of OLS the Huber/White standard errors are estimated. For the quantile regression the stata command "*qreg2*" by Machadoy and Santos Silva (2011) is applied. For the MM estimator standard errors as suggested by Croux *et al.* (2003) are calculated using the stata command "*robreg*" by Jann (2010b).

[13] The following countries have a *FRI* of 21: Australia, Canada, Denmark, Estonia, France, Ireland, Latvia, Spain, United Kingdom, United States.

measured in 2006, are shown for the sake of clarity. Both variables are positively correlated with the *FRI*: the Bravais-Pearson correlation coefficients (corresponding p-values) are 0.48 (0.000) and 0.35 (0.002). However, both variables do not affect the dependent variable within the regression. The same is true for other measures, such as "private credit by deposits money banks and other financial institutions to GDP" or "stock market total value traded to GDP". Most important, the estimated coefficient of FRI_i is still statistically significant. Note that the sample size is affected due to missing values in the variables on the size of the financial market. Hence, the coefficients are not directly comparable across the specifications.

Finally, in column (9) and (10) of Table 2 a dummy variable specification of FRI_i is used in order to test the issue of functional form. While the OLS results in column (9) indicate a negative strongly monotone effect, the *t* statistics of the MM estimator suggest no effect of the FRI_i dummies on the dependent variable.

As mentioned in the last section, in order to explore the issue of functional form further, a semi-parametric regression is estimated, where FRI_i is included non-parametrically $f(FRI_i)$ in a parametric regression (see Verardi and Debarsy 2012). Then the H0 is tested that the parametric fit (linear specification) and non-parametric fit are not different (see Härdle and Mammen 1993). The results of the parametric part can be found in Column (11) of Table 2. More important, the non-parametric fit of $f(FRI_i)$ in Figure 9 indicates that – taking the confidence interval into account – it seems reasonable to assume a linear relationship. This is confirmed by the statistical test that cannot reject the H0 (see the notes below Figure 9).
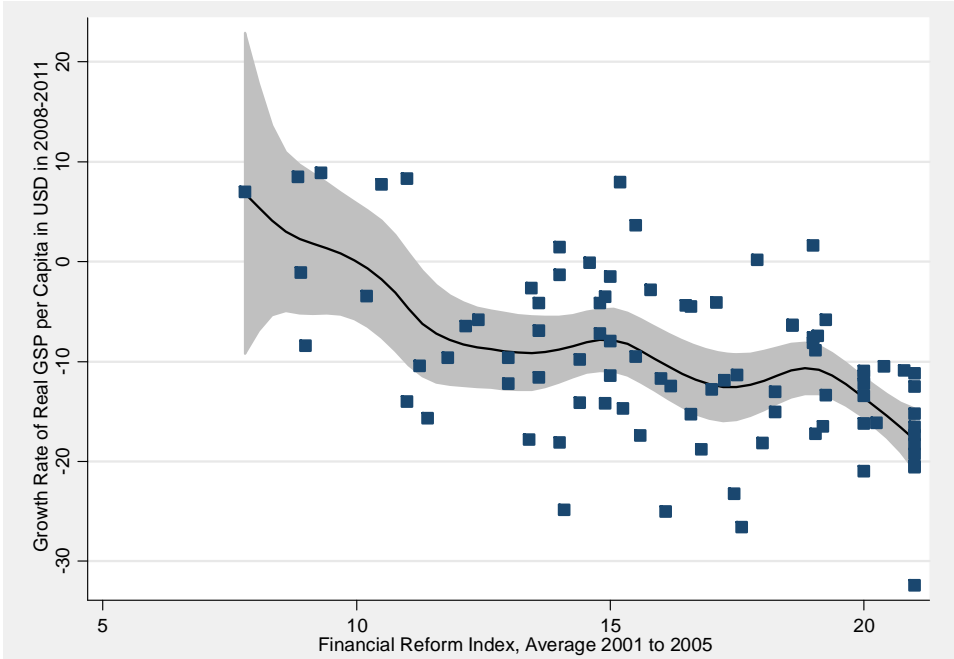

FIGURE 9: NON-PARAMETRIC FIT OF $f(FRI_i)$ IN THE GDP GROWTH RATE MODEL

Notes: The 95 % confidence interval is indicated by the shaded area around the non-parametric fit.

Statistical test based on 500 bootstrap replication: H0: The linear specification and the non-parametric fit is not different; Standardized Test statistic T: 1.347; Critical value (95%): 1.96; Approximate P-value: 0.202

A problem with the results presented so far is the remaining uncertainty of the statistical significance of FRI_i. For example, even within OLS estimates the *t* statistics varied significantly between the specifications. Following Giannone *et al.* (2011), an approach to deal with this difficulty is the "Bayesian model averaging" technique (see Subsection 3.1). FRI_i is de-

fined as an "auxiliary regressor" and the estimation results clearly indicate that *FRI* has a statistically significant impact and should therefore be included into the regressions.[14]

All in all, the regression results can be summarized in the following way: even after controlling for further variables, taking into account outliers and functional form issues, there is a significantly monotone negative effect of the financial reform index on the GDP growth in 2008 to 2011.

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[14] According to Magnus *et al.* (2010) as a rough guideline for robustness of a regressor a value of posterior inclusion probability (pip) of 0.5 is sometimes recommended which corresponds approximately with an absolute t-ratio of 1. Here the *t*-ratio of *FRI* is 2.56 and the pip amounts to 0.95. The detailed results are available upon request from the author.

Explanatory variables	(1) OLS	(2) OLS	(3) OLS	(4) Median	(5) MM	(6) OLS	(7) OLS	(8) OLS	(9) OLS	(10) MM	(11) Semi
FRI_i	-1.585*** (-3.63)	-1.333*** (-2.90)	-1.235*** (-2.89)	-0.598 (-1.35)	-0.972* (-1.95)	-1.112** (-2.45)	-0.750* (-1.69)	-0.942** (-2.34)			$f(FRI_i)$ (Figure 9)
$\ln(y_{i,2006})$	-0.905 (-0.98)	-0.523 (-0.44)	-1.685 (-1.30)	-4.423*** (-3.14)	-3.086* (-1.88)	-1.767 (-1.36)	-2.808* (-1.90)	-1.515 (-1.11)	-2.392* (-1.97)	-3.623** (-2.16)	-1.382 (-1.08)
$\ln(pop_{i,2006})$	1.228* (1.67)	1.296* (1.73)	1.527* (1.72)	1.619 (1.63)	1.931** (2.01)	1.450 (1.56)	1.387 (1.48)	0.743 (0.78)	1.821* (1.95)	2.184** (2.46)	1.539* (1.69)
Country groups (base: emerging Asia)$_{i,2006}$											
advanced		-6.654** (-2.23)	0.412 (0.09)	6.878 (1.10)	4.417 (0.70)	-0.355 (-0.07)	0.272 (0.05)	-2.150 (-0.34)	1.937 (0.36)	5.121 (0.87)	-0.916 (-0.18)
transition		-2.473 (-0.78)	-4.639 (-1.25)	-5.990 (-1.61)	-3.901 (-0.95)	-5.702 (-1.44)	-8.447** (-2.12)	-4.218 (-1.11)	-4.656 (-1.15)	-4.046 (-1.02)	-5.040 (-1.31)
Sub-Saharan Africa		-6.044 (-1.56)	-3.930 (-1.12)	-1.731 (-0.49)	-3.762 (-0.99)	-3.788 (-1.07)	-3.557 (-0.89)	-3.961 (-1.01)	-4.576 (-1.35)	-4.801 (-1.34)	-3.415 (-0.85)
Latin America		-1.456 (-0.45)	2.046 (0.56)	4.060 (0.88)	1.950 (0.48)	1.973 (0.55)	2.739 (0.71)	0.734 (0.18)	2.046 (0.55)	1.815 (0.48)	1.269 (0.35)
Middle East and North Africa		-6.899** (-2.01)	-4.854 (-1.31)	-1.154 (-0.26)	-3.065 (-0.66)	-4.970 (-1.37)	-4.486 (-1.21)	-4.971 (-1.22)	-4.788 (-1.24)	-3.135 (-0.64)	-4.800 (-1.42)
Euro member		-4.161** (-2.13)	-4.786** (-2.36)	-4.760** (-2.14)	-4.603*** (-2.58)	-4.620** (-2.24)	-4.193* (-1.96)	-3.937 (-0.92)	-4.797** (-2.34)	-4.653*** (-2.64)	-4.229** (-2.24)
openness$_{i,2006}$			0.0208 (1.19)	0.0341 (1.62)	0.0329 (1.53)	0.0173 (0.86)	0.0155 (0.86)	0.00993 (0.45)	0.0274 (1.38)	0.0381* (1.88)	0.0134 (0.70)
$(y_{i,2006} - y_{i,2002})/y_{i,2002}$			0.213*** (3.03)	0.312** (2.52)	0.257* (1.91)	0.230*** (2.69)	0.263** (2.13)	0.218*** (2.82)	0.230*** (2.98)	0.255* (1.85)	0.209*** (3.44)
Fin.system deposits in % of GDP$_{i,2006}$						0.0076 (0.33)					
Stock market capitalization in % of GDP$_{i,2006}$							0.0094 (0.75)				
FRI dummies (base: [0 –13.5])											
[13.6–16.0]									-2.860 (-0.98)	-1.557 (-0.40)	
[16.1–19.05]									-6.670** (-2.05)	-4.062 (-0.81)	
[19.1–21.0]									-10.06** (-2.53)	-7.197 (-1.38)	
Constant $\hat{\alpha}$	19.54 (1.39)	15.70 (0.94)	11.59 (0.68)	16.88 (0.84)	8.855 (0.49)	11.39 (0.62)	14.70 (0.77)	20.51 (1.06)	-3.694 (-0.21)	-3.948 (-0.24)	
N	88	88	88	88	88	86	74	77	88	88	88
adj. R^2 / §pseudo R^2	0.429	0.476	0.520	0.382§		0.506	0.533	0.395	0.491		
Mean (median) dependent variable	7.2 (5.2)	7.2 (5.2)	7.2 (5.2)	7.2 (5.2)	7.2 (5.2)	7.2 (5.2)	6.3 (4.7)	8.4 (7.8)	7.2 (5.2)	7.2 (5.2)	7.2 (5.2)
mean FRI_i	16.2	16.2	16.2	16.2	16.2	16.4	16.8	15.7	16.2	16.2	16.2

Notes: t statistics based on robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

3.3 Estimation Results of the Deficit Ratio Model

Table 3 shows the results of the deficit ratio model. The methodology is analogous to the GDP growth model of the last paragraph. However, there are two additional explanatory variables: the natural logarithm of the stock of government debt in % of GDP of country i in year 2006, $\ln(D_{i,2006})$, and the mean deficit ratio over the years 2002-2006, that is, $\sum_{t=2002}^{2006} B_{i,t} / \sum_{t=2002}^{2006} Y_{i,t}$. In the columns (1) to (3) the number of explanatory variables is increased. In the columns (4) and (5) estimation techniques are applied being robust against outliers. Apart from column (2) the estimated coefficients of FRI_i are statistically significant and indicate that an one-unit increase in FRI_i raises the average deficit ratio by about 0.4 percentage-points.

Controls for the size of the financial markets are included in columns (6) and (7). Both variables are not statistically significant and in column (7) based on a reduced sample size the estimated coefficient of FRI_i becomes statistically insignificant.

Again, the estimated regression results in column (8) are based on a restricted sample excluding $FRI_i = 21$ countries with (highest value; see footnote 13) as well as China (with a low *FRI* and very high GDP growth rates) and Norway (with large budget surpluses). The estimated coefficient of FRI_i is still statistically significant and amounts to -0.3.

The estimates in column (8), (9), (10) again deal with the non-linearity issue and indicate a negative monotone effect of FRI_i on the government budget.

Again, the problem of model uncertainty (the question whether FRI_i should be included into the model) is examined by applying the "Bayesian model averaging" technique (see subsection 3.1. as well as footnote 14). Once more it turns out that FRI_i is an important regressor and should be included into the model.[15]

Hence, the empirical analyses have found clear evidence that financial liberalization has deepened the fiscal crises in many countries. While the approach chosen here cannot identify the exact channel through which financial deregulation led to the fiscal crises, it seems plausible to guess that financial intermediates in countries with deregulated financial markets behaved in a way before the crises that they had to be rescued by governments after the 2007 shock, which then led to larger budget deficits. An obvious example for this explanation is Ireland (see Figure 8).

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[15] Here the *t*-ratio of *FRI* is -1.43 and the pip amounts to 0.77. For the interpretation of these results see footnote 14. The detailed results are available upon request from the author.

TABLE 3: DETERMINANTS OF AVERAGE DEFICIT RATIOS 2008 TO 2010

Explanatory variables	(1) OLS	(2) OLS	(3) OLS	(4) Median	(5) MM	(6) OLS	(7) OLS	(8) OLS	(9) OLS	(10) MM	(11) Semi
FRI_i	-0.456** (-2.23)	-0.352 (-1.56)	-0.428*** (-3.06)	-0.465** (-2.13)	-0.393*** (-2.66)	-0.416*** (-2.85)	-0.333 (-1.58)	-0.301* (-1.97)			$f(FRI_i)$ Figure 10
$\ln(D_{i,2006})$	-0.543 (-0.98)	-0.417 (-0.69)	1.172 (1.56)	-0.0953 (-0.15)	0.198 (0.41)	1.120 (1.47)	1.445 (1.46)	0.425 (0.86)	1.322* (1.77)	0.725 (1.05)	1.319* (1.83)
$\ln(y_{i,2006})$	0.792 (1.47)	1.021** (2.04)	0.885** (2.18)	0.621 (0.93)	0.614** (2.04)	0.929** (2.33)	0.647 (1.14)	0.664** (2.06)	0.623 (1.51)	0.509 (1.26)	1.136 (1.67)
$\ln(pop_{i,2006})$	-0.713* (-1.74)	-0.884* (-1.81)	-0.354 (-1.05)	-0.584 (-1.41)	-0.423 (-1.55)	-0.304 (-0.86)	-0.450 (-0.98)	0.0938 (0.31)	-0.343 (-0.93)	-0.432 (-1.38)	-0.451 (-1.12)
Country groups (base: emerging Asia) $_{i,2006}$											
advanced		-2.464 (-1.21)	-3.362* (-1.76)	-2.402 (-1.15)	-2.075 (-1.52)	-3.206 (-1.64)	-4.337* (-1.98)	0.0804 (0.06)	-3.644 (-1.65)	-2.501 (-1.55)	-4.934* (-1.75)
transition		-2.712* (-1.75)	1.000 (0.64)	-0.501 (-0.17)	-0.736 (-0.59)	0.777 (0.50)	1.360 (0.65)	0.676 (0.41)	0.848 (0.55)	0.333 (0.20)	0.901 (0.43)
Sub-Saharan Africa		-2.112 (-1.49)	-0.774 (-0.53)	-0.802 (-0.23)	-1.060 (-0.63)	-0.807 (-0.55)	-2.506 (-1.08)	0.293 (0.19)	-1.068 (-0.61)	-0.680 (-0.38)	-0.918 (-0.37)
Latin America		-1.920 (-1.33)	0.0780 (0.05)	-0.654 (-0.26)	0.0833 (0.05)	-0.00301 (-0.00)	0.0545 (0.03)	1.721 (1.18)	-0.0766 (-0.05)	0.325 (0.23)	0.101 (0.05)
Middle East and North Africa		-2.885** (-2.16)	-0.831 (-0.58)	-2.169 (-0.66)	-1.106 (-0.59)	-0.719 (-0.49)	-1.275 (-0.66)	0.299 (0.20)	-0.845 (-0.52)	-0.534 (-0.33)	-1.192 (-0.57)
Euro member		-3.438 (-1.59)	-2.129 (-1.44)	-1.373 (-1.20)	-0.597 (-0.73)	-2.151 (-1.45)	-1.883 (-1.48)	-2.462** (-2.26)	-2.026 (-1.31)	-0.894 (-1.05)	-1.732 (-1.51)
openness $_{i,2006}$			0.00464 (0.59)	0.0128* (1.86)	0.010*** (2.66)	0.00709 (0.84)	0.00124 (0.10)	0.0142** (2.54)	0.00409 (0.48)	0.00861 (1.28)	-0.00198 (-0.18)
$\sum_{t=2002}^{2006} B_{i,t} / \sum_{t=2002}^{2006} Y_{i,t}$			0.932*** (7.23)	0.605*** (4.03)	0.681*** (4.78)	0.913*** (6.67)	0.989*** (7.68)	0.746*** (5.41)	0.956*** (7.15)	0.918*** (3.50)	0.962*** (7.56)
$(y_{i,2006} - y_{i,2002})/y_{i,2002}$			-0.100* (-1.93)	-0.0914 (-1.00)	-0.0561 (-0.80)	-0.100* (-1.94)	-0.140** (-2.23)	-0.0601 (-0.87)	-0.0993* (-1.83)	-0.0866 (-1.23)	-0.133* (-1.87)
Fin. system deposits in % of GDP $_{i,2006}$						-0.00693 (-0.51)					
Stock market capitalization in % of GDP $_{i,2006}$							0.00357 (0.27)				

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.... Table 3 continued

Explanatory variables	(1) OLS	(2) OLS	(3) OLS	(4) Median	(5) MM	(6) OLS	(7) OLS	(8) OLS	(9) OLS	(10) MM	(11) Semi
FRI dummies (base: [0 –13.5])											
[13.6–16.0]									-1.501	-1.457	
									(-1.27)	(-1.27)	
[16.1–19.05]									-2.283	-2.781**	
									(-1.54)	(-2.00)	
[19.1–21.0]									-2.915*	-3.052*	
									(-1.83)	(-1.84)	
Constant $\hat{\alpha}$	12.23**	13.69	2.471	12.62	7.212	1.413	4.653	-5.597	-1.123	2.610	
	(2.08)	(1.34)	(0.29)	(1.06)	(0.72)	(0.16)	(0.40)	(-0.70)	(-0.12)	(0.34)	
N	66	66	58	58	58	58	53	47	58	58	58
adj. R^2 / §pseudo R^2	0.044	0.111	0.546	0.469		0.537	0.664	0.722	0.500		
Mean (median) dependent variable	-2.8	-2.8	-2.8	-2.8	-2.8	-2.8	-2.9	-2.7	-2.8	-2.8	-2.8
	(-2.6)	(-2.6)	(-2.7)	(-2.7)	(-2.7)	(-2.7)	(-2.7)	(-2.7)	(-2.7)	(-2.7)	(-2.7)
mean *FRI$_i$*	16.9	16.9	17.2	17.2	17.2	17.2	17.7	16.4	17.2	17.2	17.2

Notes: t statistics based on robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
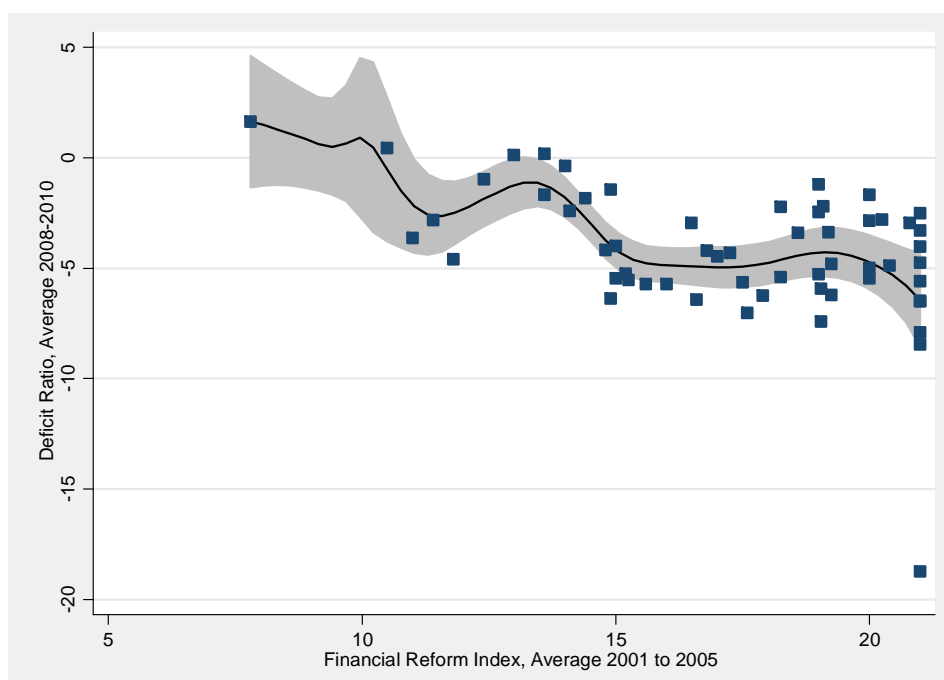
FIGURE 10: NON-PARAMETRIC FIT OF $f(FRI_i)$ IN THE DEFICIT RATIO MODEL

Notes: The 95 % confidence interval is indicated by the shaded area around the non-parametric fit.

Statistical test based on 500 bootstrap replications: H0: The linear specification and the non-parametric fit is not different; Standardized Test statistic T: 1.455; Critical value (95%): 1.96; Approximate P-value: 0.15

3.4 Estimation Results of the Employment Growth Rate Model

Table 4 shows the estimation results of the regressions of the cumulated growth rate of the employment ratio, $(E_{i,2010} - E_{i,2007})/E_{i,2007}$. Since the method is quite similar to the two previous models, the findings are only briefly summarized.

An estimated coefficient of *FRI*$_i$ of -0.4 indicates that an one-unit increase of *FRI* leads to a decrease in the employment growth rate of -0.4 percentage points. Note, however, that the estimated coefficient of *FRI*$_i$ is not statistically significant in case of the median (quantile) regression (column (4)) and the MM estimator (column (5)) as well as the reduced sample excluding *FRI*$_i$ =21 countries (columns (8)). This may be a problem of the linearity assumption, which is in line with the result of the dummy specification in column (9).The latter suggest, that only countries with a very deregulated financial market suffered from stronger employment losses.

This linearity assumption issue is investigated further using the semi-parametric regression method (column (11)). Though the non-parametric estimate of *f(FRI*$_i$) in Figure 11 indicates at least for *FRI*$_i$ >13 a negative monotone effect of *FRI*$_i$ on the employment growth rate, the statistical test rejects the linear specification (see the notes below Figure 11).

Explanatory variables	(1) OLS	(2) OLS	(3) OLS	(4) Median	(5) MM	(6) OLS	(7) OLS	(8) OLS	(9) OLS	(10) MM	(11) Semi
FRI_i	-0.386*** (-2.78)	-0.345** (-2.25)	-0.433** (-2.53)	-0.254 (-1.40)	-0.121 (-0.93)	-0.424** (-2.44)	-0.392* (-1.86)	-0.185 (-1.32)			$f(FRI_i)$ Figure 11
$\ln(E_{i,2006})$	-2.170 (-1.33)	-4.727 (-1.29)	-8.243** (-2.56)	-5.630 (-1.23)	-3.585 (-0.50)	-8.504** (-2.52)	-9.121** (-2.52)	-1.453 (-0.49)	-4.671 (-1.39)	-1.244 (-0.12)	-2.868 (-0.88)
$\ln(y_{i,2006})$	-0.214 (-0.82)	-0.504 (-1.10)	-0.884* (-1.83)	-0.762 (-1.12)	-0.666 (-1.32)	-0.892* (-1.69)	-0.792 (-1.46)	-0.388 (-0.78)	-0.897* (-1.81)	-0.626 (-1.16)	-0.520 (-1.10)
$\ln(pop_{i,2006})$	0.188 (0.53)	0.0591 (0.19)	0.291 (0.89)	0.0886 (0.29)	-0.000593 (-0.00)	0.307 (0.90)	0.378 (1.06)	0.197 (0.56)	0.515 (1.57)	0.0721 (0.24)	0.560* (1.88)
Labour market freedom index		-0.192 (-0.73)	-0.335 (-1.32)	-0.186 (-0.57)	-0.239 (-0.71)	-0.322 (-1.13)	-0.261 (-0.72)	-0.0206 (-0.09)	-0.0573 (-0.21)	-0.0990 (-0.24)	0.0476 (0.18)
Country groups (base: emerging Asia) $_{i,2006}$											
advanced		2.243 (1.44)	4.887** (2.50)	2.611 (1.00)	1.431 (0.81)	5.020** (2.50)	3.535** (2.02)	2.068 (0.91)	4.928** (2.53)	1.758 (0.90)	4.959*** (2.81)
transition		-1.420 (-0.92)	0.729 (0.46)	-0.620 (-0.69)	-0.758 (-0.59)	0.562 (0.35)	1.153 (0.68)	0.483 (0.37)	0.867 (0.60)	-0.187 (-0.12)	1.507 (1.07)
Sub-Saharan Africa		0.286 (0.21)	1.331 (1.11)	0.901 (0.69)	0.455 (0.39)	1.222 (0.99)	0.295 (0.22)	0.732 (0.68)	0.959 (0.86)	0.331 (0.24)	1.547 (1.12)
Latin America		2.585** (2.30)	4.694*** (3.63)	2.970*** (2.83)	2.464* (1.93)	4.680*** (3.60)	4.735*** (3.30)	3.384*** (2.86)	4.626*** (3.87)	2.865 (1.44)	4.737*** (3.97)
Middle East and North Africa		-0.00176 (-0.00)	0.506 (0.28)	0.327 (0.16)	0.754 (0.23)	0.458 (0.24)	-0.565 (-0.29)	2.187 (1.25)	2.104 (1.06)	1.789 (0.50)	2.614 (1.36)
Euro member		-3.152* (-1.88)	-3.600*** (-2.65)	-2.890 (-1.11)	-0.909 (-0.40)	-3.616** (-2.63)	-3.322** (-2.45)	-1.102 (-0.74)	-2.822* (-1.98)	-0.253 (-0.09)	-2.397* (-1.97)
Openess $_{i,2006}$			0.0163** (2.27)	0.00843 (0.85)	0.00543 (0.93)	0.0170** (2.21)	0.0158* (1.89)	0.00549 (0.82)	0.0195*** (2.79)	0.00721 (1.22)	0.0143** (2.18)
$(E_{i,2006} - E_{i,2002})/E_{i,2002}$			-0.281*** (-3.14)	-0.171 (-1.42)	-0.110 (-0.85)	-0.289*** (-3.04)	-0.348*** (-3.23)	-0.102 (-1.45)	-0.232*** (-2.67)	-0.126 (-0.61)	-0.163** (-2.15)
$(y_{i,2006} - y_{i,2002})/y_{i,2002}$			-0.0304 (-0.78)	-0.0270 (-0.60)	0.00740 (0.28)	-0.0260 (-0.58)	-0.0925** (-2.15)	-0.00805 (-0.28)	-0.0328 (-0.83)	0.00564 (0.27)	-0.0328 (-0.96)
Fin. system deposits in % of GDP $_{i,2006}$						-0.0027 (-0.29)					
Stock market capitalization in % of GDP $_{i,2006}$							-0.0002 (-0.03)				

... Table 4 continued

Explanatory variables	(1) OLS	(2) OLS	(3) OLS	(4) Median	(5) MM	(6) OLS	(7) OLS	(8) OLS	(9) OLS	(10) MM	(11) Semi
FRI dummies (base: [0 –13.5])											
[13.6–16.0]									0.306 (0.33)	0.339 (0.15)	
[16.1–19.05]									-0.624 (-0.64)	-0.353 (-0.37)	
[19.1–21.0]									-3.689*** (-2.82)	-1.360 (-0.69)	
Constant $\hat{\alpha}$	12.48 (1.35)	27.50 (1.62)	41.46*** (2.68)	30.83 (1.28)	21.65 (0.77)	42.12** (2.51)	43.23** (2.28)	6.739 (0.47)	14.99 (0.85)	7.585 (0.17)	
N	88	85	85	85	85	84	73	74	85	85	85
adj. R^2 / §pseudo R^2	0.164	0.269	0.373	§0.275		0.364	0.401	0.078	0.372		
Mean (median) dependent variable	-1.2 (-0.5)	-1.2 (-0.5)	-1.2 (-0.5)	-1.2 (-0.5)	-1.2 (-0.5)	-1.2 (-0.6)	-1.5 (-0.8)	-0.4 (-0.1)	-1.2 (-0.5)	-1.2 (-0.5)	-1.2 (-0.5)
mean FRI_i	16.2	16.2	16.2	16.2	16.2	16.6	16.8	15.8	16.2	16.2	16.2

Notes: t statistics based on robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
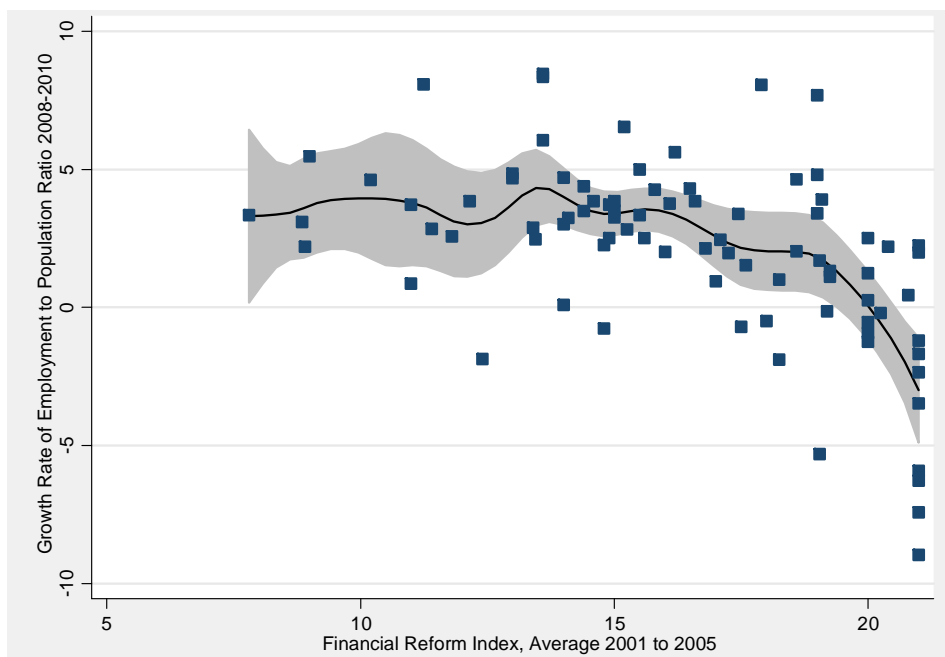
21

FIGURE 11: NON-PARAMETRIC FIT OF $f(FRI_i)$ IN THE EMPLOYMENT GROWTH MODEL

Notes: The 95 % confidence interval is indicated by the shaded area around the non-parametric fit.

Statistical test based on 500 bootstrap replications: H0: The linear specification and the non-parametric fit is not different; Standardized Test statistic T: 3.405; Critical value (95%): 1.96; Approximate P-value: 0.00

Hence, column (3) of Table 4 is newly estimated on a reduced sample of 71 countries with $FRI_i > 13$ assuming linearity (columns (12), (13), and (14)).[16] For clarity purposes, only the estimated coefficients of FRI_i are shown in Table 5. The columns (15), (16), and (17) show the results if additionally countries with $FRI_i = 21$ are excluded.

TABLE 5: DETERMINANTS OF EMPLOYMENT TO POPULATION GROWTH RATE – REDUCED SAMPLES

	(12) OLS	(13) Median	(14) MM	(15) OLS	(16) Median	(17) MM
FRI_i	-0.707***	-0.545**	-0.521*	-0.425	-0.313	-0.374**
	(-2.96)	(-2.11)	(-1.87)	(-1.65)	(-1.09)	(-2.01)
N	71	71	71	61	61	61
adj. R^2 / §pseudo R^2	0.4817	§0.3471		0.1795	§0.314	
Mean (median) dependent variable	-1.4 (-0.7)	-1.4 (-0.7)	-1.4 (-0.7)	-0.5 (-0.5)	-0.5 (-0.5)	-0.5 (-0.5)
mean FRI_i	17.5	17.5	17.5	16.9	16.9	16.9

*Notes: t statistics based on robust standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ The estimated coefficients of column (12), (13), and (14) are based on a re-estimation of column (3) of Table 4 excluding countries with $FRI_i \leq 13$. The estimates in column (15), (16), (17) are based on samples in which additionally $FRI_i = 21$ countries are excluded. The complete regression results are available upon request.*

At least for the first sample, the results are clear-cut: All estimation methods show a statistically negative effect. In the further reduced sample, at least the robust MM estimator delivers statistically significant results. Furthermore, the "Bayesian model averaging" technique indicates that in the whole sample as well as in the reduced sample ($FRI_i > 13$), FRI_i is an important regressor and should be included into the models.[17]

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[16] As a result, the following countries are excluded: Algeria, Bangladesh, Belarus, Brazil, Burkina, Faso, Cameroon, China, Costa Rica, Ethiopia, Ghana, India, Nepal, Pakistan, Uzbekistan, Vietnam, and Zimbabwe.

[17] For the whole sample the *t*-ratio of *FRI* is -1.43 and the pip amounts to 0.77. For the reduced sample, the *t*-ratio of *FRI* is -2.09 and the pip amounts to 0.90. For the interpretation of these results see footnote 14. The detailed results are available upon request from the author.

Hence, it can be concluded, that a more liberalized financial market aggravated the employment loss after the shock.

4. Conclusions

In a comprehensive survey of the research Levine (2005, p. 866) concludes that "*...theory and evidence imply that better developed financial systems ease external financing constraints facing firms, which illuminates one mechanism through which financial development influences economic growth.*". While the approach chosen in this paper cannot identify the channels through which financial liberalization amplifies macroeconomic instability, the result of a causal negative effect of financial liberalization on macroeconomic stability is quite robust. In concrete terms, it has been found that the higher the financial regulation index by Abiad *et al.* (2008), and, hence, the more liberalized the national financial markets were before the shock in 2007, the more severe were the subsequent output and employment losses as well as the fiscal crises. One essential conclusion can be clearly drawn: more restrictions on financial activities could have reduced the likelihood of suffering large output and employment losses and government debt increases after the 2007 shock.

Hence, this paper continues the series of empirical research indicating the adverse effects of financial deregulation on macroeconomic stability and economic development. Even if the mechanisms of financial regulation are unclear, the empirical results stress that the euphoric affirmation of financial deregulation as an effective policy for economic development cannot be maintained.

It is quite amazing that the analogous arguments had been put forward subsequent to another "great recession" – the Asian financial crisis in 1997. For example, Stiglitz stated in 2000:

> "*It has become increasingly clear that financial and capital market liberalization – done hurriedly, without first putting into place an effective regulatory framework – was at the core of the problem. It is no accident that the two large developing countries that survived the crisis – and continued with remarkably strong growth in spite of a difficult global economic environment – were India and China, both countries with strong controls on these capital flows.*" (Stiglitz 2000, p. 1075).

Again, it should be stressed that the paper could not reveal the mechanisms that led to this outcome. Hence, in line with Giannone *et al.* (2011), one may conclude that future research should detect those mechanisms in detail.

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APPENDIX

TABLE A 1: LIST OF COUNTRIES IN DIFFERENT COUNTRY GROUPS (COUNTRY CODE)

Advanced Economies (N=22)	Australia (AUS), Austria (AUT), Belgium (BEL), Canada (CAN), Denmark (DNK), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Ireland (IRL), Israel (ISR), Italy (ITA), Japan (JPN), Netherlands (NLD), New Zealand (NZL), Norway (NOR), Portugal (PRT), Spain (ESP), Sweden (SWE), Switzerland (CHE), United Kingdom (GBR), United States (USA)
Emerging and Developing Asia (N=12)	Bangladesh (BGD), Hong Kong (HKG), China (CHN), India (IND), Indonesia (IDN), Korea (KOR), Malaysia (MYS), Nepal (NPL), Philippines (PHL), Singapore (SGP), Sri Lanka (LKA), Thailand (THA)
Latin America and Caribbean (N=17)	Argentina (ARG), Bolivia (BOL), Brazil (BRA), Chile (CHL), Colombia (COL), Costa Rica (CRI), Dominican Republic (DOM), Ecuador (ECU), El Salvador (SLV), Guatemala (GTM), Mexico (MEX), Nicaragua (NIC), Paraguay (PRY), Peru (PER), Uruguay (URY), Venezuela (VEN)
Sub-Saharan Africa (N=14)	Burkina Faso (BFA), Cameroon (CMR), Cote d'Ivoire (CIV), Ethiopia (ETH), Ghana (GHA), Kenya (KEN), Madagascar (MDG), Mozambique (MOZ), Nigeria (NIG), Senegal (SEN), South Africa (ZAF), Tanzania (TZA), Uganda (UGA), Zimbabwe (ZWE)
Transition Economies (N=17)	Albania (ALB), Azerbaijan (AZE), Belarus (BLR), Bulgaria (BGR), Czech Republic (CZE), Estonia (EST), Georgia (GEO), Hungary (HUN), Kazakhstan (KAZ), Kyrgyz (KGZ), Latvia (LVA), Lithuania (LTU), Poland (POL), Russian Federation (RUS), Ukraine (UKR), Uzbekistan (UZB), Vietnam (VNM)
Middle East and Northern Africa (N=7)	Algeria (DZA), Egypt (EGY), Jordan (JOR), Morocco (MAR), Pakistan (PAK), Tunisia (TUN), Turkey (TUR)
Members of the Euro Area (N=11)	Austria (AUT), Belgium (BEL), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Ireland (IRL), Italy (ITA), Netherlands (NLD), Portugal (PRT), Spain (ESP)

TABLE A 2: DATA DESCRIPTIONS AND SOURCES

Variable	N	Sample Mean (Std. Dev)	Description	Source
FRI_i	88	16.22 (3.52)	Financial reform index, average 2001 to 2005, 0 to 21, of country i	Abiad *at al.* (2008)
Real GDP per capita $y_{i,2006}$	88	9,217 (11,864)	GDP per capita (constant 2000 US$) of country i in 2006	World Development Indicator (WDI)
$(y_{i,2011} - y_{i,2007})/y_{i,2007}$	88	7.23 (11.033)	Cumulated 4-years growth rate of real GDP per capita over the year 2008-2011 in %	Calculation of the author based on WDI
$(y_{i,2006} - y_{i,2002})/y_{i,2002}$	88	17.84 (15.077)	Cumulated 4-years growth rate of real GDP per capita over the years 2003-2006 in %	Calculation of the author based on WDI
pop_i	88	56,48 Mio. ($1.594 \cdot 10^8$)	Countries population; own calculation from GDP and GDP per Capita in 2006	WDI
$openess$	88	88.83 (60.97)	Exports + Imports in % of GDP in 2006	Calculation of the author based on WDI
Financial system deposits in % of GDP	86	53.61 (42.67)	Demand, time and saving deposits in deposit money banks and other financial institutions as a share of GDP in 2006. (International Monetary Fund, International Financial Statistics, and World Bank GDP estimates).	World Bank Financial Structure Dataset (Beck and Demirgüç-Kunt, 2009)
Stock market capitalization in % of GDP	73	65.88 (71.12)	Total value of all listed shares in a stock market as a percentage of GDP in 2006. (Standard & Poor's, Global Stock Markets Factbook and supplemental S&P data).	
$E_{i,2006}$	88	59.14 (10.30)	Employment to population ratio, age≥15, in %	WDI
$(E_{i,2010} - E_{i,2007})/E_{i,2007}$	88	-1.16 (3.68)	Cumulated 3-years growth rate of the employment to population ratio over the years 2008-2010 in %	Calculation of the author based on WDI
$(E_{i,2006} - E_{i,2002})/E_{i,2002}$	85	2.39 (4.08)	Cumulated 3-years growth rate of the employment to population ratio over the years 20082-2006 in %	
Labour market freedom index	85	6.09 (1.45)	Labour market regulation index [0 – 10], with a value of 10=totally deregulated	Fraser Institute Gwartney, Hall, and Lawson (2011)
$\sum_{t=2008}^{2010} B_{i,t} / \sum_{t=2008}^{2010} Y_{i,t}$	66	-2.76 (4.07)	Average deficit ratio over the years 2002 – 2006 in % of GDP. Government cash surplus or deficit in % of GDP. Cash surplus or deficit is revenue (including grants) minus expense, minus net acquisition of nonfinancial assets.	Calculation of the author based on WDI
$D_{i,2006}$	66	49.54 (31.79)	General government gross debt in % of GDP in 2006	IMF World Economic Outlook Database 2012
$\sum_{t=2002}^{2006} B_{i,t} / \sum_{t=2002}^{2006} Y_{i,t}$	66	-1.05 (3.42)	Average deficit ratio over the years 2002-2006 in % of GDP	Calculation of the author based on WDI