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Makram El-Shagi

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The Impact of Fixed Exchange Rates on Fiscal Discipline

Makram El-Shagi*

June 3, 2009

Abstract

In this paper, it is shown that, contrary to standard arguments, fiscal discipline is not substantially enhanced by a fixed exchange rate regime. This study is based on data from 116 countries collected from 1975 to 2004 and uses various estimation techniques for dynamic panel data, in particular a GMM estimation in the tradition of Arellano and Bover (1995), and Blundell and Bond (1998). Contrary to previous papers on this topic, the present paper takes into account that the consequences of a new exchange rate regime do not necessarily fully manifest immediately.

JEL: F31, E63, O23

*PD Dr. Makram El-Shagi, Lehrstuhl für VWL insbes. Internationale Wirtschaftsbeziehungen, Universität Mannheim, elshagi@rumms.uni-mannheim.de

1 Introduction

One of the essential arguments in support of fixed exchange rate regimes, especially in developing and emerging economies, is that fixed exchange rates allegedly enhance discipline in fiscal and monetary policies. Based on data from 116 countries from 1975 to 2004, and using various estimation techniques for dynamic panel data, particularly a Generalized Method of Moments (GMM) estimation in the tradition of Arellano and Bover (1995), and Blundell and Bond (1998), the present paper shows that fiscal discipline is at least not substantially enhanced by a fixed exchange rate regime. Contrary to older studies on this topic, the present paper takes into account that the consequences of a new exchange rate regime do not necessarily fully manifest immediately. The paper is structured as follows: Section 2 reviews the current state of the discussion in the literature. Section 3 introduces the data used for estimation, focusing on the measurement of exchange rate regimes, which is based on the index developed by Reinhart and Rogoff (2004). Section 4 presents the employed methods and the basic econometric model that is tested in the present paper. The results and their interpretation are presented in section 5. Section 6 includes some extensions: a fixed effects vector decomposition, which allows for the analysis of the long run effects, and an approach that tests for asymmetries between the regime switches from fixed to flexible and vice versa.

2 Literature Review

The argument that political discipline is allegedly induced by fixed exchange rates has been discussed for several decades, and was already thoroughly addressed by Johnson (1969). The hope for enhanced discipline under a fixed exchange rate regime is founded in the idea that fixed exchange rates and excessive government spending are incompatible without resorting to unfavorable monetary policy. To avoid being punished for the collapse of the fixed exchange rate regime, politicians are expected to enact a policy that is compatible with the fixed exchange rate, i.e., to limit the budget deficit. This argument is most often applied to developing countries that lack other efficient political control mechanisms (Aghevli et al., 1991); however, it is sometimes applied to industrialized nations as well, e.g., the member countries of the European Union in the EMS (Giavazzi and Pagano, 1988). The majority of the relevant literature has focused on individual aspects of this argument. Cooper (1971), Edwards and Santaella (1993), and Frankel (2005) analyzed the political consequences of collapsing exchange rate regimes. Each found evidence for substantial political costs, ranging from the loss of political responsibility (Cooper, 1971; Frankel, 2005) to full-fledged political riots (Edwards and Santaella, 1993). The latter is especially interesting, since developing countries, which are much more likely to resort to fixed exchange rates to improve fiscal discipline than industrialized countries, often do not possess strong democratic institutions. Thus for the potential disciplining effect in autocratic regimes, it is important to know that there exist relevant political costs other than being voted out of office. Another strand of the literature deals with the incompatibility of fixed exchange rates and lax fiscal policy, and with the effects of fiscal policy on exchange rate movements. Especially noteworthy are the seminal papers of Krugman (1979) and Flood and Garber (1984),which formed the first generation of crisis models. Daniel (2000) showed that an increasing budget deficit causes the almost immediate collapse of a fixed exchange rate regime within the general equilibrium framework; however, this extreme result is barely supported by empirical evidence. Another analysis of the interaction of exchange rates and fiscal policy in the modern general equilibrium models is found in Annicchiarico (2002). The most important argument against a positive impact of a fixed exchange rates on fiscal discipline was proposed in Johnson (1969), who stated that although a fixed exchange rate regime with large budget deficits is indeed unsustainable in the long run, the fixed exchange rate regime helps to hide some negative consequences of expansive fiscal policy (e.g., the crowding out of exports following an appreciation of the domestic currency) in the short run. A formalized version of this argument is found in Tornell and Velasco (2000). Empirical evidence concerning the question of whether fixed exchange rates increase political discipline is still scarce and, especially concerning the fiscal effect, quite ambiguous. An analysis of the effects on monetary policy was conducted by DeGrauwe and Schnabl (2005), who showed that fixed exchange rates have almost no impact on inflation.[1] The impact on fiscal discipline was analyzed by Tornell and Velasco (2000) in a brief study that was restricted to some African countries during the first half of the 1980s. They found that countries with a peg were less disciplined than those with floating exchange rates. Their sample includes flexible exchange rate regimes and pegs to the french franc, which were based on former colonial ties between France and the pegging countries. While this approach is intriguing because it allowed the authors to analyze a setup where the pegs were truly exogeneous, it is nevertheless unsuitable for analyzing the within-effects of a peg, since all countries were either permanently floating or permanently pegged within the sample. Additionally the sample selection only included pegs that were upheld with the substantial help of the country to whose currency the domestic currency was pegged, i.e., France. If another country shoulders part of the costs of fixing, the pressure on fiscal discipline to maintain the peg is substantially reduced. Thus, while highly interesting, these results are not necessarily representative for fixed exchange rate regimes in general. One of the few attempts to use a broad set of panel data, including a large number of countries where regime changes did occur, is found in Vuletin (2003). Vuletin employed an Arellano-Bond estimator. He found different impacts of exchange rate regimes on fiscal discipline, depending on the global macroeconomic environment. However, in line with most of the literature, he did not take into account that the impact of a new exchange rate regime does not necessarily

[1] This contradicts most theoretical findings. For example, Aizenman and Glick (2008), found that inflation can be reduced by fixed exchange rates, but that regimes with the highest potential of reducing inflation with fixed exchange rates suffer the most during an exchange rate system collapse.

manifest immediately and he did not include lagged exchange rate regimes as explanatory variables. Therefore, the transformation of the model in the first differences, as performed for the Arellano-Bond estimator, might in some situations lead to flawed estimates, as will be shown in section 3. Two recent papers attempt to test several possible counteracting effects of pegged exchange rates on fiscal discipline explicitly (Alberola et al., 2005; Alberola and Molina, 2004). While this is an interesting approach, the results are dubious due to several methodological problems. Most importantly, these papers ignore almost all control variables, possibly inducing massive omitted variable biases. Furthermore, the first of these two recent papers does not include fixed effects in the panel setup, making it impossible to distinguish between within- and between-effects. While the second paper eliminates this problem, the sample used is very limited. In addition, as with the study by Vuletin, neither paper considers lagged effects in its GMM-setup. In a recent paper, Vuletin (2008) controls for dual exchange rate regimes and finds that fixed exchange rate regimes reduce fiscal discipline in a small sample of emerging markets covering roughly one decade. Our paper adds to this literature in four ways: First, we check for lagged impacts of the exchange rate regime and thus cover the possibility that the final effects of changing exchange rate regimes do not manifest immediately. Second, we use a large sample, which guarantees that the results are not mainly driven by a sample selection bias. Third, we check for eventual asymmetries between switching from a flexible to a fixed regime and vice versa. Fourth, we explicitly cover within- and between-effects in our analysis. This allows us to compare short and medium term effects to permanent effects.

3 Data

3.1 Exchange Rate Regimes

The dummy variables that are used to capture fixed exchange rate regimes are constructed based on the indicator developed by Reinhart and Rogoff (2004), which has most recently been updated by the authors (Reinhart and Rogoff, 2007). Like Levy-Yeyati and Sturzenegger (2005), Frankel (1999), and others, Reinhart and Rogoff emphasize the necessity of distinguishing the officially announced exchange rate regime from the factual exchange rate regime. Many countries that claim to have flexible exchange rates actually intervene strongly in foreign exchange markets, while other countries that announce fixed exchange rates are not able to enforce the peg on the exchange market. The advantage of the Reinhart/Rogoff classification, in comparison to other classifications of "de jure" and "de facto" exchange rate regimes, is that they use data about parallel markets in addition to a five year moving average of exchange rate volatility to construct their index. This allows us to see whether a peg is truly binding for agents in the foreign exchange market, and whether official attempts to peg the exchange rate can, in fact, hinder an adaptation of the exchange rate according to market pressure. For the present paper, we construct two dummy variables to capture the exchange rate regime based on the more detailed classifications of Reinhart and Rogoff, who distinguish 16 types of exchange rate regimes. One dummy variable describes “pre announced peg”, which we define as pegs which are announced “de jure” and are actually enforced according to the “de facto” classification of Reinhart and Rogoff. The other variable considers all de facto pegs as fixed exchange rate regimes, independent of whether the peg has been officially announced or not. We will refer to pegs according to the latter definition as “de facto pegs” or “de facto fixed exchange rates” in the remainder of the paper. It is important to note that “pre-announced pegs” and “de facto pegs” only differ by the formal announcement, which is an additional condition for the former classification. Because this difference is small, it is even more noteworthy that “pre-announced” and “de facto” pegs have substantially different effects on debt, as will be shown. Table 1 on page 6 summarizes the transformation of the Reinhart/Rogoff-indicator into the dummies used within the present paper. Countries which are classified as “hyperinflation” (14) or “freely falling” (15) by Reinhart and Rogoff in some years are not included in our sample in those years. If a peg has obviously failed, further consequences of the fixed exchange rate regime cannot be analyzed, even if the failure of the exchange rate system is a result of the fixed rate policy. At the same time, it is hardly legitimate to attribute the problems arising from failing fixed exchange rate regimes to flexible exchange rates. Due to a lack of data, countries in category 16, i.e., those with missing data from parallel markets, are also excluded from the sample.

Exchange rate regimes are not further broken down by the time the systems persisted, as in Vuletin (2003). Since the ability to maintain a peg is obviously based on the compatibility of the conducted policies, this classification of exchange rate regimes would lead to substantial endogeneity problems.

3.2 Further Variables

Fiscal discipline is captured by new indebtedness, measured by the change in the ratio of government debt to GDP. Income is given as per capita income (in purchasing power parity) in the considered country in relation to the highest per capita income worldwide in that year. All macroeconomic data are taken from the world development indicators of the World Bank, or are derived from World Bank data. The panel includes 116 countries and the observation period spans from 1975 to 2004. However, data are not available for all countries for all years. Data before 1975 are partly available, but are not used for the analysis because fixed exchange rate regimes during the Bretton-Woods era and during the collapse of the Bretton-Woods system did not necessarily have the consequences they have today.[2] On average, data are available for 21 years per country. There are data for at least 10 years for 105 of the 116 countries of the panel.

[2] The policy impact of a peg differs substantially if the peg is not unilateral, since policy makers in one country do not have to guarantee the stability of the peg alone, but can instead rely on the assistance of the partners in the multilateral peg. Additionally, it is hard to econometrically compare exchange rate regimes if almost every country uses the same system.

Table 1: Conversion of the Reinhart-Rogoff-classification of exchange rate regimes into our dummy variables

	Reinhart/Rogoff classification	Dummy variables used in the present paper	
		de facto	pre announced
1	No separate legal tender	1	1
2	Pre announced peg or currency board arrangement	1	1
3	Pre announced horizontal band that is narrower than or equal to +/-2%	1	1
4	De facto peg	1	0
5	Pre announced crawling peg	1	1
6	Pre announced crawling band that is narrower than or equal to +/-2%	1	1
7	De facto crawling peg	1	0
8	De facto crawling band that is narrower than or equal to +/-2%	1	0
9	Pre announced crawling band that is wider than or equal to +/-2%	1	1
10	De facto crawling band that is narrower than or equal to +/-5%	0	0
11	Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time)	0	0
12	Managed floating	0	0
13	Freely floating	0	0
14	Hyperinflation	-	-
15	Freely falling	-	-
16	Dual market in which parallel market data is missing.	-	-

3.3 Stationarity

For most of the methods employed by our econometric analysis, it is necessary that the variables of interest are stationary. Stationarity tests are therefore required for new debt, where the possibility of exploding, self-enforcing indebtedness has to be taken into account, and for relative income, which would not be stationary in the presence of substantial catching-up processes. In the present paper, we use a stationarity test proposed by Maddala and Wu (1999) that is based on a test derived by Fisher (1932). Contrary to the more popular panel data stationarity test of Im et al. (2003), the Fisher test is applicable to an unbalanced panel, since its test statistic is based on the combination of the p-values of stationarity tests of the individual time series within the panel. Furthermore, Maddala and Wu showed that estimates of stationarity with a Fisher test are more precise than the estimates based on the Im-Pesaran-Shin test, given the typical structure of economic datasets. The Fisher test shows that for both new debt and relative GDP per capita, the null hypothesis of non-stationarity can be rejected at the 1% significance level. The test statistics of the Fisher test used here are based on augmented Dickey-Fuller tests[3] for the separate time series of the panel. The results of these separate tests show that most of the individual time series are also stationary, with the exception of some very short time series within the panel. Obviously, the fact that excessive government spending causes further expenses for interest payments does not cause the new debt to follow long-lasting trends. Furthermore, there is no substantial catching up, causing a non-stationarity of relative per capita GDP. While the null hypothesis that at least one series is non-stationary can also be rejected at the 1% level based on the entire panel, more than half of the individual tests indicate non-stationarity. These results are summarized in Table 2 on page 7.

Table 2: Results of the stationarity test

Variable	Fisher's p	Number of stationary series according to individual test
Change of debt over GDP	0.00	84
Real GDP growth	0.00	76
Relative GDP	0.00	34

[3]Some authors have proposed replacing the Dickey-Fuller tests with Phillips and Perron (1988). For the present data set, this does not change the results substantially.

4 Model Structure and Methods

4.1 Basic Model

The basic model underlying the econometric analyses of the present paper is as follows:

$$\Delta D_{it} = \beta_0 + \phi(L)S_i + \beta_1 \Delta D_{it-1} + \beta_2 \hat{y}_{it} + \beta_3 \frac{y_{it}}{y_t^{max}} + u_{it} \tag{1}$$

$$u_{it} = v_i + \varepsilon_{it} \tag{2}$$

where D is the ratio of government debt to GDP (and ΔD analogously is the change of the debt ratio), which is used to measure fiscal discipline. S is the exchange rate system dummy denoting the presence of "pre-announced de facto pegs" or "all de facto" pegs. y is the real per capita income, and $\hat{y}$ is the growth rate of real per capita income. The indices i and t represent the country and the period of the observation, respectively. v is the country-specific error component, and ε is the remaining stochastic error component. Monetary policy (or inflation) is not taken into account as an additional control variable, since it is highly related to the sustainability of the exchange rate system and would thus lead to substantial multicollinearity problems. The model differs from the specification that is commonly found in the literature mainly by taking the lagged exchange rate system into account. This is necessary because most methods applicable to dynamic panel data use first differences instead of level variables. If only the present exchange rate regimes are considered, the long-run effects of a new exchange rate system cannot be attributed correctly to the change in the system, since only immediate effects are apparent in the differences. The problems caused by only including the present exchange rate regime in the model specification are much less severe if estimation techniques based on the level variables are used. In a simple Least Square Dummy Variable (LSDV) estimation, the parameter estimate for the exchange rate system can (roughly) be interpreted as the average difference between new debt in a country under a fixed exchange rate regime and new debt in the same country under a flexible exchange rate regime. While the new level of debt may not be reached immediately after a systemic change, this cannot be seen in the results of this kind of estimation, since the impulse response function is misestimated when not all relevant lagged exchange rate systems are taken into account. However, the distortions are acceptable, because most exchange rate systems exist for several years, and the middle- to long-run effects are of primary interest for political questions. This argument no longer holds if first difference estimators are used. The regression results are then driven only by the immediate impact of a changing exchange rate system. The long-run impacts are not determined correctly. To clarify this problem, the impulse response functions based on LSDV estimates and Arellano-Bond estimates, which include only the present exchange rate system or the present and the lagged exchange rate systems, are compared in section 5.

4.2 Methods

Since the results of LSDV estimations can be significantly biased when applied to dynamic panel data with unit specific effects Nickell (1981), the General Method of Moments estimator developed by Arellano and Bond (1991) has become the standard procedure for dealing with such data in the empirical literature. However, Judson and Owen (1999) presented evidence from Monte-Carlo experiments that the Arellano-Bond estimator, which has been constructed with a short time dimension in mind, is outperformed by a least squares dummy variable (LSDV) estimator for unbalanced panels of 30 years. Thus, an LSDV estimate is legitimate for the data set used as a baseline estimate in the present paper. Additionally, we employ a system GMM estimator, i.e., the expansion of the original GMM estimator by Arellano and Bover (1995) and Blundell and Bond (1998). In this approach, an equation in first differences, where the lagged first differences of the dependent variable are instrumented using the (further) lagged levels, is estimated simultaneously to the level equation, in which the lagged levels of the dependent variable are instrumented using the (further) lagged first differences. The "finite sample correction" procedure of Windmeijer (2005) is used to prevent an underestimation of the error variance. This allows us to use the two step version of the system GMM estimator, which is more efficient, but would lead to substantially downwards biased errors without this addition. GMM and system GMM procedures use all available lagged levels (or lagged first differences in case of the level equation) as instruments. Using the present panel with an average number of more than 20 observations per country, the standard GMM procedure would lead to a very large number of instruments. However, the standard tests of over-identifying restrictions, which are used to assess the quality of the chosen instruments, lose power with an increasing number of instruments.[4]Therefore, we restrict the number of lags used as instruments to three. This adds substantially to the precision of the over-identifying restrictions Tests, and should not distort the results much because the highly lagged variables are quite weak instruments.

4.3 Robustness

To guarantee robustness, some alternate methods are used to verify the results achieved with the methods specified above. In addition to LSDV and the system GMM with limited instruments, we perform a system GMM with all available instruments, a conventional Arellano-Bond GMM and an Anderson-Hsiao-estimation(Anderson and Hsiao, 1981).[5] From first to last, these methods lose efficiency because less information is considered in the set of instruments, but are less dependent on the very strict assumptions concerning moment con-

[4]This is already reported by Sargan himself concerning his widely-used Sargan test (Sargan, 1958). However, the same problem is still true with the Sargan-Hansen-test used in this paper.

[5]Anderson and Hsiao proposed to instrument the first difference of the lagged dependent variable with the level or the first difference of the dependent variable of a further lagged period. Based on a proposal of Arellano (1989), in the present paper the lagged level is used as an instrument.

ditions which are underlying a system GMM estimation. Additionally, we use a LSDV with a bias correction following Bruno (2005). We also test for robustness by adding and changing the set of control variables. Lagged debt level (again measured as debt to GDP ratio), squared lagged debt level (i.e., the interaction of debt level with itself) and inflation are considered as additional controls. Since the current debt level is determined by past changes in the debt level, the lagged debt level is not exogenous, but predetermined. Furthermore, growth is substituted by estimates of the output gap based on the Hodrick-Precott-filter[6] and the Christiano-Fitzgerald-Bandpass filter (Christiano and Fitzgerald, 2003). These variables have been tested on stationarity. The null hypothesis of non-stationarity can be rejected for all of them.

4.4 Endogeneity

Because a fixed exchange rate regime might be implemented as a reaction to debt problems, a third version of the GMM results is reported, where the exchange rate system dummy is considered a predetermined variable and not as strictly exogenous. Essentially, this means that the current and past exchange rate regimes are not considered as instruments for the lagged dependent variable like the other exogenous variables. Instead, they are used analogously to the lagged dependent variable itself, i.e., the past changes of the regime dummy are used as instruments. However, this kind of instrumenting is somewhat problematic: First, variables that change slowly are weak instruments for their own change, as noted by Blundell and Bond (2000). Nevertheless, this is not too much of a problem in the given context. Since the exchange rate regime is not the dependent variable, its lagged values are not the "main instruments"; they are only included in the instrument list to use as much information as possible. While it is unfortunate that these instruments cannot add much information, this should not affect the results too greatly because the other instruments already contribute most of the necessary information. Second, the exchange rate regime is not necessarily truly mean stationary (Vuletin, 2008). Thus, the lagged levels of the exchange rate regime might not be valid instruments at all. This might cause a bias in the estimation. Since the lagged exchange rate regime is a weak instrument, as outlined above, we perform an alternative estimation in which the lagged exchange rate regime is not considered as an instrument at all.

5 Results

5.1 All de facto pegs

While the results clearly indicate that the inclusion of lagged exchange rate system dummies in addition to the present exchange rate system is necessary,

[6]We use the smoothing factors recommended by Ravn and Uhlig (2002) and not the ones from the original paper of Hodrick and Prescott (1980).

it is not entirely clear how many lags should be considered. We report results for a model specification with one lag and an alternative specification with two lags. While the Bayesian information criterion (BIC) rates the "one lag" model best, the Akaike information criterion (AIC) rates the two lags model marginally better. Although AIC-based model choices often produce a better fit and are thus very interesting for forecast, the "true" model is usually closer to models selected based on BIC (Kuha, 2004). Regardless, the results are essentially the same: While the coefficient of the present exchange rate system dummy is negative, the coefficients concerning the lagged dummies are positive. That means that new debt decreases strongly in the first year of a peg, and then starts to return to its original level quickly. While the LSDV regressions suggest that a slightly positive net effect on fiscal discipline remains (i.e., a lower new debt), this result is not robust. According to the results from the system GMM analysis, the fiscal discipline returns roughly to its original level after one to two years.

Table 3: Estimation results using the "all de facto fixed exchange rate regimes"-dummy

	LSDV		GMM	
Lagged fiscal disc.	0.1709414 *** (0.020)	0.1688453*** (0.020)	0.1728619 *** (0.057)	0.1695212 *** (0.059)
EER (t)	-0.0759443 *** (0.016)	-0.0756864*** (0.016)	-0.0561549 ** (0.026)	-0.0631727 ** (0.025)
EER (t-1)	0.0441974 *** (0.016)	0.0227214 (0.020)	0.0465026 ** (0.019)	0.00265099 (0.020)
EER (t-2)	-	0.0274959 * (0.016)	-	0.0325071 ** (0.014)
Real GDP growth	-0.6774553 *** (0.068)	-0.6767572 *** (0.068)	-0.7228221 *** (0.115)	-0.7180347 *** (0.116)
Relative real GDP	0.0672239 (0.074)	0.0676498 (0.074)	0.0092826 (0.014)	0.012061 (0.016)
Constant	0.0489537 *** (0.009)	0.0451756*** (0.009)	0.0394572 *** (0.007)	0.0360127 *** (0.008)
R^2	0.09	0.09	-	-
Hansen's Test	-	-	0.420	0.428
Arellano-Bond-Test of 1^{st} order autocorrelation of residuals	-	-	0.009	0.010
Arellano-Bond-Test of 2^{nd} order autocorrelation of residuals	-	-	0.385	0.379
Net effect of EER (p value of t-test)	0.1607	-	0.7686	-
Dependent variable: New debt Standard errors in parantheses *=significant at 10% level; ** = significant at 5% level; *** = significant at 1% level				

The remaining results concerning the control variables are not surprising: Growth reduces the change of the debt to GDP ratio substantially and significantly. High new debt in a specific period is usually followed by another period of high debt, but the coefficient is quite small, i.e., periods of unusually strict or lax fiscal discipline, which are not driven by the business cycle, do not tend to last very long. According to all four regressions, income has no insignificant impact. The full results of the alternative estimations (partially including additional control variables) used as robustness tests are found in the appendix. The results concerning the impact of the exchange rate regime are generally robust to these changes. The inclusion of none of the control variables changes the results concerning exchange rate regimes substantially. Only according to the estimation in which the exchange rate regime is not included in the instrument matrix (i.e., one of the two model versions taking endogeneity into account) is the impact of the exchange rate regime numerically higher than according to the baseling estimations, though this is not significant. Furthermore, we find a significant, but almost numerically negligible, negative effect of inflation on new debt, which might be due to seignorage effects. According to LSDV, a higher debt level leads to lower new debt. If debt to GDP ratio and squared debt to GDP ratio are considered, it can be seen that this effect is not present at low debt levels but starts if the debt level is already quite high, at roughly 200 percent of GDP, and quickly strengthens. Output gap virtually has the same impact as growth, but explains less of the total variance in new debt.[7]

5.2 Pre-announced pegs

When the definition of pegs is narrowed to pre-announced pegs, the results change only slightly. The model with one lag is clearly superior to the model using two lags. Both the AIC and the BIC identify the model versions, including the present regime and one time lagged regime dummy, as the best model. Further lags have been tested and were invariably found to be insignificant.

In principle, these results are similar to the results concerning all pegs: The implementation of a fixed exchange rate regime reduces new debt substantially, but the lagged exchange rate system has a counteracting effect. That is, the improvement of fiscal discipline is not long lasting. Two aspects are different if only pre-announced pegs are considered: First, the counteracting effect now clearly occurs in the first year after the implementation of a new exchange rate regime. Second, the negative impact of the present exchange rate regime on new debt clearly has the same magnitude as the positive impact of the lagged exchange rate regime on new debt. Neither according to the LSDV estimation, nor according to the system GMM, do the coefficients differ significantly. [8] That is, the remaining effect is very small at best. This is interesting, since the discipline argument is based on the political costs associated with the collapse of

[7]The exception is that the output gap estimated based on the Christiano-Fitzgerald filter is not found to be significant if we use system GMM.

[8]The significance of an according two-sample-t-test is reported in the "net effect of EER" line in the result tables.

Table 4: Estimation results using the "pre-announced fixed exchange rate regimes"-dummy

	LSDV	system GMM
Lagged fiscal disc.	0.1790658 (0.020) ***	0.17618 (0.060) ***
EER (t)	-0.0795795(0.021) ***	-0.0742772 (0.041) *
EER (t-1)	0.074938 (0.020) ***	0.0799377 (0.039) **
Real GDP growth	-0.7019356 (0.069) ***	-0.7335221 (0.114) ***
Relative real GDP	0.0760754 (0.074)	0.0173446 (0.013)
Constant	0.0295366 (0.008) ***	0.0305851 (0.005) ***
R^2	0.09	-
Hansen's Test	-	0.454
Arellano-Bond-Test of 1^{st} order autocorrelation of residuals	-	0.010
Arellano-Bond-Test of 2^{nd} order autocorrelation of residuals	-	0.388
Net effect of EER (p value of t-test)	0.8728	0.9203

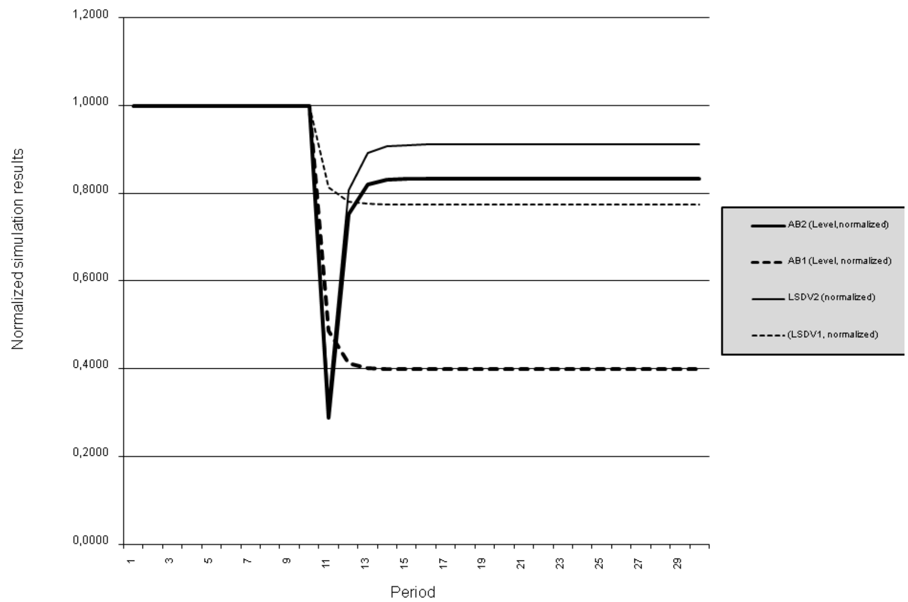
Dependent variable: New debt
Standard errors in parantheses
*=significant at 10% level; ** = significant at 5% level; *** = significant at 1% level.

a peg. These costs are most likely higher if the politicians officially committed themselves to the peg. Thus, according to the discipline argument, the impact of fixed exchange rates on fiscal discipline should be stronger and longer lasting if the peg is implemented "de jure" (i.e., pre-announced). That this is not found in the data is consistent with the Johnson-hypothesis, i.e., that politicians prefer to use fixed exchange rate regimes to veil the negative consequences of their actions. The remaining results concerning the control variables are the same as the ones found in the analysis of all de facto pegs. Table 4 on page 13 reports the results of the LSDV and system GMM estimations. Again, the full results of the alternative estimations (partially including more control variables) are found in the appendix. The results are fully robust to the changes that have been tested, including both specifications where exchange rate regimes are not treated as strongly exogenous but as predetermined.

5.3 A comment on dynamic panels and the lag structure

This specific development after a changing exchange rate regime causes especially highly biased results when the lagged exchange rate regime is omitted in the model specification and traditional dynamic panel methods are applied, which rely on first differences instead of levels. Figure 1 on page 14 demonstrates this using the impulse response functions derived from Arellano-Bonllano-Bond estimations and LSDV estimations with and without taking the lagged exchange rate regime into account.[9]

Figure 1: Simulations of the impulse response functions based on regression results



AB2: Parameters given by a GMM estimation taking into account the present and the lagged exchange rate regime
AB1: Parameters given by a GMM estimation taking into account the present exchange rate regime
LSDV2: Parameters given by a LSDV estimation taking into account the present and the lagged exchange rate regime
LSDV1: Parameters given a LSDV estimation taking into account the present exchange rate regime
All impulse response functions are standardized to a new debt of 1 unit per period in a situation with flexible exchange rates.

It is clearly visible in the figure that the impulse response functions derived from the Arellano-Bond estimation and the LSDV estimation with the present and the lagged exchange rate system differ only marginally. An LSDV estimation that does not consider the lagged exchange rate variable does not catch the transition period correctly, but the new level of debt is roughly the same as in the previously discussed estimates. However, if the GMM estimation without the lagged exchange rate system is used to create an impulse response function, the decline of new debt in the first year of a new exchange rate system

[9]We do not use system GMM for this exercise but traditional GMM, since system GMM takes levels into account. All estimates are based on the "pre announced de facto peg"-dummy

is obviously mistaken as a permanent change. Therefore, a failure to consider the lagged exchange rate system dummy causes substantial biases when typical dynamic panel methods are employed. This is most likely the main reason that some authors find a positive effect of fixed exchange rates on fiscal discipline.

6 Extensions

6.1 The Long Run Impact of Fixed Exchange Rates - A Fixed Effects Vector Decomposition Approach

The estimates discussed in sections 5 are clearly focused on the short and medium term impact of changes in exchange rate policies, since they rely on the analysis of within-series effects. While this helps describe the effects of changes in a country's exchange rate regime choice, the question of whether countries with fixed exchange rate regimes are truly more disciplined in the long run can only be answered based on a between-effects estimate.

Table 5: Results of the fixed effects vector decomposition

	pre announced	all de facto
Lagged fiscal disc.	0.0515168 *	0.0450964 *
	(0.027)	(0.027)
EER	0.0258912 ***	0.0026239
	(0.007)	(0.007)
Real GDP growth	-0.4848286 ***	-0.4644651 ***
	(0.058)	(0.058)
Relative real GDP	0.2578813 ***	0.2177432 ***
	(0.041)	(0.036)
Constant	0.0040567	0.0126203 **
	(0.005)	(0.006)
R^2	0.09	0.10

Dependent variable: New debt
Standard errors in parantheses
*=significant at 10% level; ** = significant at 5% level; *** = significant at 1% level.

To do so, we use a fixed-effects vector decomposition (FEVD) (Pluemper and Troeger, 2007). The sample is limited to countries that did not switch between the fixed and flexible exchange rate classifications during the entire time period covered in the sample. The fixed-effects vector decomposition allows us to divide the country-specific effects into unobserved effects and effects caused by the (also country-specific) exchange rate regime. Except for this difference, the FEVD estimator matches a simple LSDV estimator. There is no significant impact of fixed exchange rates if the "all de facto pegs"-dummy used to capture the exchange rate regime. This confirms the results in the last section. However, these results are noteworthy, since the sample is restricted to countries that did not change the exchange rate system substantially. That is, there is still no restricting effect on debt, even if a peg is sustained for extended periods. The pre-announced pegs even have a significant positive impact on new debt; that is, countries with de jure fixed pegs have less fiscal discipline than others after controlling for income. Even more so than the results presented in the last section, this supports the thesis that fixed exchange rate regimes are used to veil the consequences of lax fiscal policy.

6.2 Asymmetries between regime changes

The impact of switching from a flexible regime to a fixed one is not necessarily symmetric to the impact of switching from a fixed to a flexible regime. It is possible that a period of very high new debt forces the government to abandon a fixed exchange rate regime. A one-time increment of "new debt" might occur when a fixed exchange rate regime collapses and the part of the debt that is denominated in foreign currencies is increasing substantially in value. To make sure that these (or similar) processes do not drive the results, we tested for switches from fixed to flexible and from flexible to fixed separately. The model tested is:

$$\Delta D_{it} = \beta_0 + \beta_1 S_{it} + \phi(L) p_i + \psi(L) f_i + \beta_2 \Delta D_{it-1} + \beta_3 \hat{y}_{it} + \beta_4 \frac{y_{it}}{y_t^{max}} + u_{it} \quad (3)$$

$$u_{it} = v_i + \varepsilon_{it} \quad (4)$$

p and f are dummies indicating a regime switch to "pegged" or "floating". For pre-announced pegs we find no evidence for the significance of the lagged "change of exchange rate dummy" variables. Therefore, only the present exchange rate system and the present change dummy are included in the reported results.

Table 6: Results of the analysis of asymmetric effects of regime switches

	pre announced	all de facto
Lagged fiscal disc.	0.1797412 ***	0.1708873 ***
	(0.020)	(0.020)
EER (t)	-0.0016649	-0.0317338
	(0.014)	(0.011)
Switch to fixed EER	-0.107224 ***	-0.0422733 **
	(0.033)	(0.021)
Switch to flexible EER	0.0546024 **	0.0467198 *
	(0.026)	(0.024)
Real GDP growth	-0.7046965 ***	-0.6768376 ***
	(0.068)	(0.068)
Relative real GDP	0.0749881	0.067352
	(0.074)	(0.074)
Constant	0.0295749 ***	0.0487985 ***
	(0.008)	(0.009=
R^2	0.09	0.09
Standard errors in parantheses		
*=significant at 10% level; ** = significant at 5% level; *** = significant at 1% level.		

While there is some asymmetry, the results from Section 5 are essentially confirmed. Exchange rate regime switches are associated with one-time changes in new debt, which are not persistent. Indeed, this one-time effect is substantially and significantly stronger when the regime switch is from flexible to fixed rather than the opposite. Therefore, the core result from Section 5 concerning pegs clearly holds. Analogous to the results from Section 5.1, we find that we must include the lagged "change of exchange rate dummy" variables if we analyze the impact of all de facto pegs. Quantitatively, most of the asymmetry disappears. However, it can be seen that the uncertainty of whether the return to the normal level of new debt takes one or two years is mostly due to changes from fixed to flexible regimes. If the regime is changed from floating to a peg, only the current change has a significant coefficient.

7 Conclusions

Although one of the most often cited arguments in favor of fixed exchange rates in developing countries is that they allegedly induce fiscal discipline, there is no empirical evidence to support lasting impacts on new debt. Although new debt initially decreases when a peg is introduced, it returns to its original level over time. In previous studies, this initial decline has often been mistaken as a sign of a true disciplining effect. The return to the original level of new debt is especially quick if the peg is officially announced. This result holds true when only those countries where the stabilization attempts were successful, at least for a certain period, are considered. In other words, this negative result persists even when highly indebted states that are trying unsuccessfully to fix their exchange rates are excluded from the sample. Therefore, a positive effect of fixed exchange rates, especially of pre- announced fixed exchange rates, on fiscal discipline is highly unlikely.

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Appendix

Table 7: Estimation results using the "all de facto fixed exchange rate regimes"-dummy; Alternative Estimators

	LSDV-C	AH	AB	BB
Lagged fiscal disc.	0.2195803 *** (0.017)	0.3608917 *** (0.037)	0.1534934 *** (0.057)	0.1725198 *** (0.056)
ERR (t)	-0.075384 *** (0.007)	-0.0468975 ** (0.023)	0.0701271 ** (0.032)	0.0570413 ** (0.024)
ERR (t-1)	0.0440637 *** (0.005)	0.0380361 * (0.023)	0.0221695 * (0.013)	0.0482924 *** (0.017)
Real GDP growth	-0.668123 *** (0.064)	-0.8426922 *** (0.087)	-0.8340089 *** (0.147)	-0.7188847 *** (0.108)
Relative GDP	0.0654721 (0.096)	0.1916503 (0.634)	0.570296 * (0.259)	0.0115962 * (0.016)
Hansen test	-	-	1.000	1.000
Arellano-Bond-Test of 1^{st} order autocorrelation of residuals	-	-	0.032	0.009
Arellano-Bond-Test of 2^{nd} order autocorrelation of residuals	-	-	0.337	0.385

Dependent variable: New debt
LSDV-C: Least Square Dummy Variable estimator with bias correction; the reported standard errors are bootstrapped
AH: Anderson-Hsiao Estimator
AB: Arellano-Bond Estimator with all available instruments (robust standard errors)
BB: system GMM (Blundell-Bond) with all available instruments, one-step estimator (robust standard errors) Standard errors in parantheses
*=significant at 10% level; ** = significant at 5% level; *** = significant at 1% level.

Table 8: Estimation results using the “pre announced de facto fixed exchange rate regimes”-dummy; Alternative Estimators

	LSDV-C	AH	AB	BB
Lagged fiscal disc.	0.2276195 *** (0.024)	0.3598782 *** (0.037)	0.1627533 *** (0.062)	0.1755496 *** (0.059)
ERR (t)	-0.0793291 *** (0.020)	-0.0564138 * (0.029)	0.0905278 * (0.051)	0.0720086 * (0.040)
ERR (t-1)	0.0744731 *** (0.019)	0.0985035 *** (0.029)	0.0611928 (0.039)	0.0773394 ** (0.037)
Real GDP growth	-0.6925793 *** (0.061)	-0.8356608 *** (0.087)	-0.8558422 *** (0.149)	-0.7278694 *** (0.108)
Relative GDP	0.0733024 (0.074)	0.1969943 (0.631)	0.8558422 ** (0.272)	0.0132224 (0.019)
Constant	-	-	-	0.0306393 *** (0.005)
Hansen test	-	-	1.000	1.000
Arellano-Bond-Test of 1^{st} order autocorrelation of residuals	-	-	0.036	0.010
Arellano-Bond-Test of 2^{nd} order autocorrelation of residuals	-	-	0.330	0.387

Dependent variable: New debt
LSDV-C: Least Square Dummy Variable estimator with bias correction; the reported standard errors are bootstrapped
AH: Anderson-Hsiao Estimator
AB: Arellano-Bond Estimator with all available instruments (robust standard errors)
BB: system GMM (Blundell-Bond) with all available instruments, one-step estimator (robust standard errors) Standard errors in parantheses
*=significant at 10% level; ** = significant at 5% level; *** = significant at 1% level.

Table 9: Estimation results using the “all de facto fixed exchange rate regimes” dummy including additional control variables (LSDV-estimations)

Lagged fiscal disc.	0.1634456 *** (0.020)	0.1193735 *** (0.021)	0.0496783*** (0.022)	0.1587815 *** (0.021)	0.1609506*** (0.021)
ERR (t)	-0.0759638 *** (0.016)	-0.0753067 *** (0.016)	-0.0837337 *** (0.016)	-0.0868665 *** (0.016)	-0.0885256 *** (0.016)
ERR (t-1)	0.0482719 *** (0.016)	0.0567274 *** (0.016)	0.0509995 *** (0.016)	0.0536261 *** (0.016)	0.0533618 *** (0.016)
Real GDP growth	-0.6402147 *** (0.068)	-0.6526969 *** (0.067)	-0.76828048 *** (0.066)	-	-
Relative GDP	0.0747989 (0.073)	0.0996338 (0.073)	0.0715972 (0.0721)	0.0935081 (0.074)	0.0837883 (0.074)
Inflation	0.0032533 *** 0.0004	-	-	-	-
Debt to GDP	-	0.0855585 *** (0.010)	-0.0541799 *** (0.018)	-	-
(Debt to GDP)^2	-	-	0.0302775 *** (0.003)	-	-
Gap (HP-Filter)	-	-	-	-0.6454251 *** (0.121)	-
Gap (CF-Filter)	-	-	-	-	-0.6520105 *** (0.124)
Constant	0.0425133 *** (0.009)	-0.0090824 *** (0.010)	0.062363 *** (0.013)	-0.0237945 (0.0089)	0.1015898 *** (0.017)
R^2	0.11	0.12	0.16	0.06	0.06

Dependent variable: New debt
Gap(HP-Filter)=Output gap calculated based on logged real GDP using the Hodrick-Prescott-Filter
Gap(CF-Filter)=Output gap calculated based on logged real GDP using the Christiano-Fitzgerald-Bandpass-Filter
Standard errors in parantheses
*=significant at 10% level; ** = significant at 5% level; *** = significant at 1% level.

Table 10: Estimation results using the "all de facto fixed exchange rate regimes"-dummy including additional control variables(system GMM)

Lagged fiscal disc.	0.1658546 *** (0.050)	0.2302423 *** (0.057)	0.2567077 *** (0.081)	0.1618524 *** (0.060)	0.1745733 *** (0.053)
ERR (t)	-0.0557572 ** (0.026)	-0.0521035 ** (0.021)	-0.0442443 *** (0.015)	-0.0701223 *** (0.026)	-0.0798856 *** (0.028)
ERR (t-1)	0.0493638 ** (0.021)	0.0395219 *** (0.014)	0.0362401 *** (0.012)	0.0532105 *** (0.020)	0.0575961 *** (0.021)
Real GDP growth	-0.7011256 *** (0.115)	-0.7256387 *** (0.131)	-0.7106484 *** (0.122)	-	-
Relative GDP	0.0083742 (0.016)	-0.0439982 (0.041)	0.0159844 (0.025)	0.0532105 (0.005)	-0.0129695 * (0.008)
Inflation	.0023262 *** (0.001)	-	-	-	-
Debt to GDP	-	0.075266 *** (0.029)	0.0448166 (0.042)	-	-
(Debt to GDP)^2	-	-	-0.0255726 *** (0.009)	-	-
Gap (HP-Filter)	-	-	-	-0.88478987 *** (0.171)	-
Gap (CF-Filter)	-	-	-	-	-0.0018353 (0.003)
Constant	0.0352052 *** (0.007)	0.0849535 *** (0.023)	0.0277844 * (0.016)	0.0188329 *** (0.006)	0.0231904*** (0.006)
Hansen test	0.373	1.000	1.000	0.357	0.376
Arellano-Bond-Test of 1st order autocorrelation of residuals	0.014	0.009	0.007	0.013	0.009
Arellano-Bond-Test of 2nd order autocorrelation of residuals	0.366	0.440	0.524	0.350	0.378

Dependent variable: New debt
Gap(HP-Filter)=Output gap calculated based on logged real GDP using the Hodrick-Prescott-Filter
Gap(CF-Filter)=Output gap calculated based on logged real GDP using the Christiano-Fitzgerald-Bandpass-Filter
Standard errors in parantheses
*=significant at 10% level; ** = significant at 5% level; *** = significant at 1% level.

Table 11: Estimation results using the "pre announced de facto fixed exchange rate regimes"-dummy including additional control variables (LSDV-estimations)

Lagged fiscal disc.	0.1705701 *** (0.020)	0.1238631 *** (0.021)	0.0585608 *** (0.021)	0.1670819 *** (0.021)	0.169918*** (0.021)
ERR (t)	-0.0825512 *** (0.021)	-0.0709478 *** (0.021)	-0.0871247 *** (0.020)	-0.0770537 *** (0.021)	-0.0788092*** (0.021)
ERR (t-1)	0.0795165 *** (0.020)	0.0857473 *** (0.020)	0.0778178 *** (0.020)	0.0792293 *** (0.020)	0.0792215 *** (0.020)
Real GDP growth	-0.6614092 *** (0.068)	-0.6713527 *** (0.067)	-0.7082804 *** (0.069)	-	-
Relative GDP	0.0834054 (0.073)	0.1105563 (0.073)	0.0815708 (0.072)	0.1056154 (0.075)	0.0953345 (0.075)
Inflation		-	-	-	-
Debt to GDP	-	0.0881193 *** (0.010)	-0.0487552 *** (0.018)	-	-
(Debt to GDP)^2	-	-	0.0294637 *** (0.003)	-	-
Gap (HP-Filter)	-	-	-	-0.6759069 *** (0.121)	-
Gap (CF-Filter)	-	-	-	-	-0.669804 *** (0.124)
Constant	0.0249723 *** (0.008)	-0.0281487 *** (0.010)	0.00411888 *** (0.012)	-0.000082 (0.008)	0.0791588 *** (0.016)
R^2	0.11	0.12	0.15	0.05	0.05

Dependent variable: New debt
Gap(HP-Filter)=Output gap calculated based on logged real GDP using the Hodrick-Prescott-Filter
Gap(CF-Filter)=Output gap calculated based on logged real GDP using the Christiano-Fitzgerald-Bandpass-Filter
Standard errors in parantheses
*=significant at 10% level; ** = significant at 5% level; *** = significant at 1% level.

Table 12: Estimation results using the "pre announced de facto fixed exchange rate regimes"-dummy including additional control variables (system GMM)

Lagged fiscal disc.	0.168677 *** (0.052)	0.2341049 *** (0.059)	0.2595674 *** (0.083)	0.1681279 *** (0.062)	0.1796558 *** (0.056)
ERR (t)	-0.0754242 * (0.042)	-0.068527 * (0.037)	-0.053147 ** (0.024)	-0.0810536 * (0.042)	-0.0838607 ** (0.043)
ERR (t-1)	0.0832083 ** (0.040)	0.0730171 ** (0.032)	0.0608715 *** (0.023)	0.0880657 ** (0.039)	0.0887559 ** (0.040)
Real GDP growth	-0.7095591 *** (0.114)	-0.7421936 *** (0.130)	-0.7719944 *** (0.119)	-	-
Relative GDP	0.0172748 (0.014)	0.0410294 (0.030)	0.0269891 (0.028)	0.0010029 (0.006)	-0.0033344 (0.005)
Inflation	.0023904 ** (0.001)	-	-	-	-
Debt to GDP	-	-0.0748539 *** (0.029)	0.0459007 (0.042)	-	-
(Debt to GDP)^2	-	-	-0.0257652 *** (0.009)	-	-
Gap (HP-Filter)	-	-	-	-0.7205799 *** (0.159)	-
Gap (CF-Filter)	-	-	-	-	-0.0006389 (0.003)
Constant	0.0275116 *** (0.005)	0.0745527 *** (0.019)	0.0189205 (0.016)	0.0040128 (0.003)	0.0054672 ** (0.003)
Hansen test	0.458	1.000	1.000	0.403	0.390
Arellano-Bond-Test of 1st order autocorrelation of residuals	0.014	0.009	0.007	0.012	0.009
Arellano-Bond-Test of 2nd order autocorrelation of residuals	0.367	0.444	0.528	0.356	0.378

Dependent variable: New debt
Gap(HP-Filter)=Output gap calculated based on logged real GDP using the Hodrick-Prescott-Filter
Gap(CF-Filter)=Output gap calculated based on logged real GDP using the Christiano-Fitzgerald-Bandpass-Filter
Standard errors in parantheses
*=significant at 10% level; ** = significant at 5% level; *** = significant at 1% level.

Table 13: Estimation results with system GMM when the ERR is considered pre determined

	"all de facto pegs"-dummy		"pre announced de facto pegs"-dummy	
	(1)	(2)	(1)	(2)
Lagged fiscal disc.	0.1680525 *** (0.055)	0.1673659 *** (0.056)	0.1767273 *** (0.061)	0.19377 ** (0.079)
ERR (t)	-0.0837153 *** (0.027)	-0.4546219 (0.324)	-0.0760153 ** (0.025)	-0.6628986 ** (0.332)
ERR (t-1)	0.0345129 ** (0.014)	0.370867 (0.279)	0.0770351 ** (0.042)	0.7106034 * (0.394)
Real GDP growth	-0.6877688 *** (0.119)	-0.505608 ** (0.205)	-0.7320703 *** (0.116)	-0.5451813 *** (0.156)
Relative GDP	0.0061241 (0.023)	-0.0185038 (0.041)	0.0235434 (0.024)	0.0385393 (0.045)
Constant	0.0640342 ** (0.012)	0.0837202 ** (0.035)	0.0319203 *** (0.010)	-0.0049526 (0.033)
Hansen test	1.000	0.406	1.000	0.367
Arellano-Bond-Test of 1^{st} order autocorrelation of residuals	0.009	0.017	0.003	0.020
Arellano-Bond-Test of 2^{nd} order autocorrelation of residuals	0.383	0.470	0.388	0.640

Dependent variable: New debt
Estimation: system GMM
(1): The exchange rate regime dummy is used as GMM style instrument (i.e., lagged levels are used as instruments)
(2): The exchange rate regime dummy is not used as instrument
Standard errors in parantheses
*=significant at 10% level; ** = significant at 5% level; *** = significant at 1% level.

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