The Impact of Exchange Rate Regimes on Economic Growth with Continuous Classification of de facto Regimes

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Abstract

We construct a new database characterizing the de facto Exchange Rate Regime (ERR) for 145 countries during the full post-Bretton Woods period. With this new database, we firstly investigate the global changes of de facto ERRs over time, and then study the relationship between ERR and economic growth. Our findings contradict both "corner hypothesis" and "fear of floating". It is shown that intermediate ERR are positively related to economic growth at the greatest significance level. We also find this relationship varies among countries at different income levels, and the choice of ERR appears to be more important for low-income countries rather than high-income ones.

Keywords: de facto exchange rate regime; exchange rate flexibility; economic growth

1 Introduction

Barro (1991) studied economic growth with many critical variables in his original cross-country analysis. Nevertheless, he left the exchange rate regime (ERR) aside. Nearly three decades later, the debate about the relationship between ERR and growth is still going on with mixed evidence. The central goal of this paper is to offer some new evidence and insights into this controversial subject.

The relationship between ERRs and economic growth remains controversial in previous studies. Moreover, empirical evidence of study varies. Studies on this topic generally fall into three categories: economists in the first group believe fixed ERR can contribute to faster economic growth; some in the second group hold that float ERRs can amount to faster economic growth; while those in the third group find no significant relationship or influence between ERR and economic growth.

Considering the discipline and predictability of fixed ERR, Robert Mundell (1995), and Calvo (2000a, b) believe it is beneficial to economic performance. Mundell (1995) also looks at the growth performance for industrialized countries before and after the demise of Bretton Woods, finding that the former period was associated with faster average growth. Ghosh et al (2000) finds that (credible) fixed ERRs reduce vulnerability to speculative fluctuations in the foreign exchange market. In the classification of Reinhart and Rogoff (2004), compared with countries adopting managed floating regimes, countries in fixed regimes grow significantly faster.

In contrast to above-mentioned studies, Levy-Yeyati and Sturzenegger (2001) find that, for nonindustrial economies, "long" pegs (lasting five or more years) are associated with lower inflation and slower growth, while "short" pegs clearly underperform floats. Furthermore, in a sample of 183 countries taken from 1974 to 2000, Levy-Yeyati and Sturzenegger (2003) use pooled regression and

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find that less flexible regimes amount to greater output volatility and lower growth. But the results are not as significant in industrial countries as in the non-industrial. Rose (2011) employs a panel regression including 178 countries from 1974 to 2007. He finds economies with narrow crawling band regimes grow significantly faster than those in fixed regimes.

Ghosh et al (1997) ran growth regressions on the de jure ERR defined by the International Monetary Fund (IMF) and reports that, in a sample of 140 countries over 30 years, ERR had no significant impact on economic growth. Huang and Malhotra (2004) also find no influence of ERR on growth in a panel of 18 advanced European countries from 1976 to 2001. The results are not the same, however, in 12 developing and emerging Asian countries.

One of many reasons for this discrepancy may have to do with the gap between the ERRs that countries actually follow (de facto) and the ones they officially announce (de jure). A number of economists have discussed how many countries with alleged float regimes do in fact intervene their exchange rates heavily; a phenomenon Calvo and Reinhart (2001, 2002) call the "Fear of Floating". Reinhart (2000) called it "The Mirage of Floating Exchange Rate", in contrast to "The Mirage of Fixed Exchange Rate" proposed by Obstfeld and Rogoff (1995). Likewise, Klein and Marion (1997) find some countries that claim to fix sometimes devalue when facing economic turbulence. And many countries announce a currency basket to target but do not always follow through, sometimes changing the weights capriciously, as Ghosh, Gulde and Wolf (2000), Reinhart and Rogoff (2004), Shambaugh (2004) and Frankel, Schmukler, and Serven (2000) point out. Therefore, it is not uncommon for countries to ignore the de jure ERRs generally in IMF categories. As Levy Yeyati and Sturzennegger (2005) point out, there is a gap between "deeds and words". Moreover, despite the fact that many attempts have been made to classify the "factual" regimes, there is still no consensus in defining the term of the de facto ERR. For instance, Frankel (2004) and Bénassy-Quéré et al (2006) exposed the inconsistency of correlation in these classifications, which included de facto ERRs defined by Ghosh, Gulde and Wolf (2000), Levy-Yeyati and Sturzenegger (2003), Reinhart and Rogoff (2004) and Shambaugh (2004). The de facto ERR classification method in this paper will be mainly based on the works of Frankel (1993, 1995), Frankel and Wei (1994, 2007), Bénassy-Quéré (1999), and Bénassy-Quéré et al (2004), for several reasons that will be discussed in section 2 of Methodology.

The main contributions of our research are as follows. Firstly, following the methodology proposed in Frankel and Xie (2010), we were able to estimate and endogenously identify the structural breaks in de facto ERRs of each country over time, and then build a panel database of de facto ERRs for 145 countries over the post-Bretton Woods period. Our methodology provides a continuous measure of a country's exchange rate flexibility, which is a real number between 0 and 1. Compared with Reinhart and Rogoff's (2004) definition, for example, which comprised 15 de facto ERR categories, our continuous measure of de facto ERR can capture smaller differences. Moreover, our methodology can identify the accurate time points when a country's ERRs change.

Secondly, while many studies analyze the relationship between de facto ERR and economic growth, this paper examines the relationship using a continuous measure of the ERR flexibility. To the best of our knowledge, this paper is the first to analyze this relationship with the continuous variable to indicate the de facto ERR. An attractive feature of this method is that we are still able to generate dummy variables indicating discrete classifications of de facto ERR by setting thresholds in order to compare with earlier literatures.

Thirdly, in addition to unveiling the relationship between the de facto ERR and economic

growth, we also study the dynamic relationship among different country groups based on their income level. Most previous literatures roughly classify countries into different groups based on their current status. For instance, Levy-Yeyati and Sturzenegger (2003) researched on the relationship of de facto ERRs and economic growth for industrial countries and non-industrial countries. However, this approach might risk ignoring the dynamics of countries' income levels. With panel data merging with countries' income level, the results could be more realistic and convincing if examining the dynamic correlations.

It is worth noting that we are not suggesting that countries should widely adopt floating or fixed ERRs. As fixed exchange rates may in some cases report substantial gains in terms of credibility and inflation performance, particularly in a high inflation context. Additionally, the costs of the transition from floating to a fixed are nonnegligible.

The rest of this paper is organized as follows. In section 2, we discuss our methodology, including the way we captured the degree of the de facto ERRs (on which we built our panel database), and the way we studied its relationship with economic growth. Then in section 3, we will introduce the data we used and explain our data processing methods. After discussing the global changes of de facto ERRs in section 4, based on our panel database, we report and analyze the results of multiple growth regressions in section 5, before making our concluding remarks in section 6.

2. Methodology

This paper focuses on how economic growth relates, not to de jure, but to de facto ERR, which is more theoretically and empirically meaningful. We use a two-step methodology to conduct our cross-country analysis in terms of economic growth. We firstly set up an original database in terms of the de facto ERRs, based on the empirical approaches of Frankel and Wei (2008) and Frankel and Xie (2010), in which both currency basket and degree of ERR can be estimated and parameter breakpoints can be endogenously identified, following contributions of Bai and Perron (1998, 2003). Then after capturing the endogenous dynamics of each country or region by our panel database, using cross-country analysis, we are able to further analyze the relationship between de facto ERRs and economic growth of each nation.

2.1 de facto Exchange Rate Regime

The de facto ERRs we capture are based on techniques developed by Frankel and Wei (2008). The fundamental synthesis equation measuring the de facto regime is

$$\Delta logH_t = c + \sum_{j=1}^{n-1} w_j \Delta logX_{j,t} + \delta \Delta EMP_t + \varepsilon_t \quad (1)$$

where H_t and $X_{j,t}$ stand for the value of home currency and those in the currency basket respectively. Parameters w_j are the coefficients of each foreign currency. If we subtract one foreign currency (the British pound for the purpose of this paper) from both sides of equation 1, then coefficients w_j will represent the de facto basket weights of other foreign currencies, as shown in equation 2;

$$\Delta logH_t - \Delta logX_{n-1,t} = c + \sum_{j=1}^{n-2} w_j (\Delta logX_{j,t} - \Delta logX_{n-1,t}) + \delta \Delta EMP_t + \varepsilon_t \quad (2)$$

The reason for using the first differences rather than levels as dependent variables and independent variables in the equation is the likelihood of nonstationarity. Using differences, or changes, the constant term, c, represents the estimate of a trend appreciation against the US dollar alone or a broader basket.

The term EMP_t represents the Exchange Market Pressure. There are multiple definitions of

Exchange Market Pressure, but generally it is defined as the sum of the change in the value of home currency and the change in its reserves. In accordance with Frankel and Xie's (2010) definition, we define it as:

$$\Delta EMP_t = \Delta logH_t + \Delta Res_t/MB_{t-1} \quad (3)$$

Where MB and Res stand for monetary base and total reserves minus gold. Exchange Market Pressure can give us a measure of shocks in demand for the currency. Central banks possess the power to let these shocks appear on the price of the currency, by allowing a floating exchange rate, or in the quantity of its home currency leading to a fixed exchange rate, or somewhere in between resulting in an intermediate exchange rate regime.

The parameter of EMP, δ, in the equation 1 and 2 is theoretically supposed to be in the interval between 0 and 1 inclusive. If $\delta = 0$, then the de facto ERR of that country is purely fixed to a currency or basket, whereas $\delta = 1$ represents ERR freely floating without any intervention. And δ placed in between indicates what the degree of floating or fixed the regime is. Even though in empirical applications, the parameter rarely equals 0 or 1 exactly and occasionally might jump out of the range, its monotonically continuous property is valuable and representative in capturing the de facto ERR, and will be one of our original contributions in cross-country analysis.

This method successfully clarifies the problem in inferring de facto regimes across the spectrum of flexibility and across the array of possible anchors at the same time, which most other classifications have failed to address. Nevertheless, there is still a limitation. The synthesis equation cannot identify the changes or dynamics of de facto ERRs if there are structural changes over time. In other words, we cannot assume one country will stick to a particular set of basket weights. Thus, endogenous estimation of structural breaks is called for.

2.2 Endogenous Estimation of Structural Breaks

To understand the dynamics of de facto ERRs of different countries and identify each endogenous structural break, we embed the above-discussed model estimating de facto ERR into a multiple structural change model. The model was proposed by Bai and Perron (1998, 2003) and applied to the ERR problem in Frankel and Xie (2010). The core principle of this technique used to estimate the break dates is to minimize the sum of squared residuals, as shown:

$$(T_1^*, T_2^* \dots T_m^*) = arg\,Min \sum_{i=1}^{m+1} \sum_{t=T_{i-1}+1}^{T_i} [\Delta logH_t - c_i - \sum_{j=1}^{k} w_{i,j} \Delta logX_{i,j,t} - \delta_i \Delta EMP_t]^2 \quad (4)$$

After capturing the best *m*-partition, $(T_1^*, T_2^* \dots T_m^*)$, we have *m+1* intervals, each of which corresponds to one particular de facto regime. In each interval or regime, we can reuse the synthesis equation and easily recover the relevant set of coefficients, most importantly, the coefficient of EMP, or as Frankel and Xie called it, the **de facto flexibility** parameter, $\widehat{\delta_i} = (T_1^*, T_2^* \dots T_m^*)$, which is the core parameter representing the de facto ERR.

2.3 The Relationship with Economic Growth

Although there are numerous empirical papers on the determinants of growth, the works of Levine and Renelt (1992) and Barro and Sala-i-Martin(1995) are widely regarded as model studies in this field. Therefore, the baseline specification of our growth regression will mainly borrow from these works along with some other more recent studies in economic growth, such as Barro (2016). Our main intention is not to re-examine determinants of economic growth that are abundantly researched in previous literatures. Thus in the next sections we choose what we regard as a relatively

uncontentious specification of the growth regression, to which we add the de facto flexibility, *ymean_emp*, or its altered forms, such as *emp_new1* and *emp_new2*, representing the de facto ERR. Following the norm among economic growth studies, our variables in growth regressions are five-year averages. The dependent variable in all growth regressions in this paper is the growth rate per year of real GDP per capita (*GDPgrowth*). Although we believed panel regressions would be more appropriate in this study, based on our data structure, we report both the results of panel regressions and pooled regressions. We also convert our continuous definition of de facto ERR into discrete variables for the purpose of comparison.

We were also concerned that the relationship between ERRs and economic growth could perhaps differ from regions or groups of countries. As Martin, Philip and Pierre (2016) discovered, pegged regimes work best for emerging economies and crawling regimes are able to boost economic growth in G20 countries. In our research, we also took time to study the different influence of regimes on growth among different country groups in terms of their income level. To address this concern, we used interactions of de facto ERR and classifications of income level in growth regressions.

3. Data Description and Summary Statistics

Our sample covers over 100 countries in the post-Bretton Woods period. Because our cross-country panel is highly unbalanced, the number of countries and periods might change in different regressions. There are two parts of our data that will be discussed separately.

3.1 Estimating the de facto ERRs

The first part has to do with the above-mentioned synthesis equation, which we use to capture the de facto ERR, or more particularly, the de facto flexibility parameter. All of the data in this part are from the IMF database and are monthly at first until we average them out per year. In this part, we create a panel database to identify the dynamics of the de facto ERRs among 145 countries from July 1974 to May 2018. The numeraire for the "value" of all currencies in our baskets is measured in terms of SDR[4], which was used by Frankel and Wei (1995).

To estimate the synthesis equation, we put the American dollar, British pound and Japanese yen in the currency basket throughout the time span of the panel. Since the European economy as a whole can hardly be ignored, we put the euro in this basket as well. However, the problem with the euro is that it was only available from January 1999, approximately the middle of our time span, which cannot satisfy our interest in the longer period. Thus we choose the French franc and German mark, the two main European currencies before the advent of the euro, to put in our basket to complete the time span for the year before January 1999. We have to acknowledge that this change in the currency basket would statistically affect the estimations of all coefficients in the model, especially when we are estimating structural breaks, since it creates a natural break. We attempted to cover as many countries as we could, nevertheless, data for some countries or regions still remain unavailable because the IMF dataset is limited or some data are excluded from our model. Therefore,

[4] There are various kinds of numeraire that we tried but that did not bring about a significant difference. To name a few, Frankel (1993) adopted purchasing power over a consumer basket of domestic goods as numeraire; Frankel and Wei (1994), Ohno (1999), and Eichengreen (2006) adopted the Swiss franc; Benassy-Quere (1999) used the US dollar; Frankel, Schmukler, and Serven (2000) adopted GDP-weighted basket of five major currencies; and Yamazaki (2006) adopted the Canadian dollar. If the null hypothesis of a tight peg to a basket of currency were to hold perfectly, the choice of numeraire would literally make no difference.

the database is a highly unbalanced panel.

In addition, if the home currency of one country is one of the currencies in the basket, the coefficient of this currency along with the EMP on the right side will always be equal to unit and no structure breaks will be identified. Therefore, we exclude countries that use the euro (Germany, France, Italy, The Netherlands, Belgium, Luxembourg, Ireland, Spain, Portugal, Austria, Finland, Lithuania, Latvia, Estonia, Slovakia, Slovenia, Greece, Malta and Cyprus), and the United States, United Kingdom, Japan are likewise not included. Furthermore, because Zimbabwe and Slovak are using the US dollar and euro as their current currency, we also remove them. Countries and their corresponding periods of the panel can be found in Appendix A.

Following Frankel and Xie (2010), we applied a dynamic programming principle[5] to these monthly data. After identifying each break we re-estimate the synthesis equations in each interval for each country and then our panel database is complete.

To further study the stylized facts of the de facto ERRs across countries and its relationship with economic growth (our primary purpose), we average our monthly panel database into an annual panel. This treatment offers us more convenience when merging with other variables in the growth regression. The new unbalanced panel of de facto flexibility parameters consists of 145 countries over 45 years, from 1974 to 2018.

3.2 Growth Regression

All data we used to merge with panel data of the de facto flexibility parameter in this part were from the IMF database, World Bank's World Development Indicators (WDI) or Penn World Table (pwt9.0), with the exception of the indicator of civil liberty (*CL*), which is from Freedom House. The statistical characteristics of the specifications in growth regressions are listed in the Table 1 below. The list of definitions and sources for all variables in our growth regressions is presented in Appendix B.

[Table 1]

Variable	Obs.	Mean	Std. Dev.	Min	Max
GDPgrowth	1,072	2.063951	4.469693	-42.6236	50.80597
ymean_emp	1,164	0.482529	0.478673	-0.0341	2.006411
lnrgdppop	977	8.803606	1.185873	5.884633	12.12102
POPgrowth	1,136	1.872931	1.479042	-3.67393	14.80338
POP	1,136	3.50E+07	1.37E+08	41392	1.38E+09
csh_g	977	0.206698	0.111275	0.023706	0.911948
csh_i	977	0.211046	0.104758	0.011067	0.708566
OPEN	1,027	40.71788	25.31136	0.109005	220.3702
deltaTT	743	0.070685	0.108717	-0.38991	1.264174
yr_sch	805	5.823869	3.336555	0.15969	13.2954
Inf_cpi	1,052	42.79037	288.9426	-23.8221	6424.987
CL	1,110	3.879069	1.72233	1	7

Because data from different sources vary in terms of their time span or availability, the final panel, including the de facto flexibility parameter and other variables in our growth regression, might be more unbalanced with fewer observations. For example, even though we have observations in the year 2018 in the panel of de facto flexibility parameters, there will be missing data after we

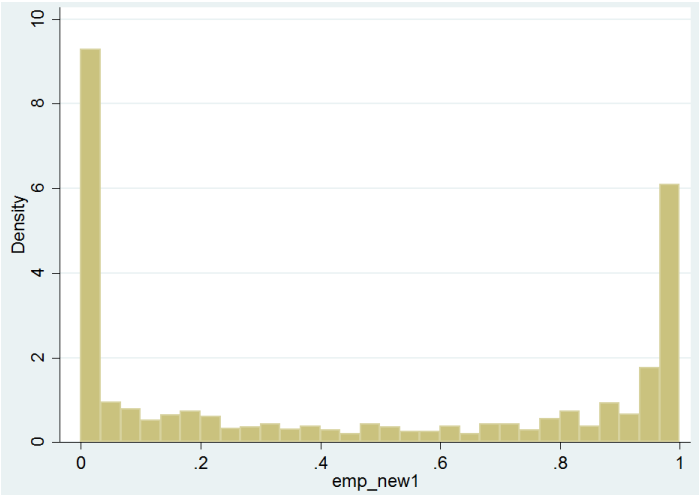
[5] More details on dynamic programming are in Cormen, et al, 2001.

merge with pwt9.0 or WDI, since the last period of pwt9.0 is 2014 and 2017 for WDI. One way to make the panel less unbalanced is to average them over five years, which is also a classical method in empirical growth studies.

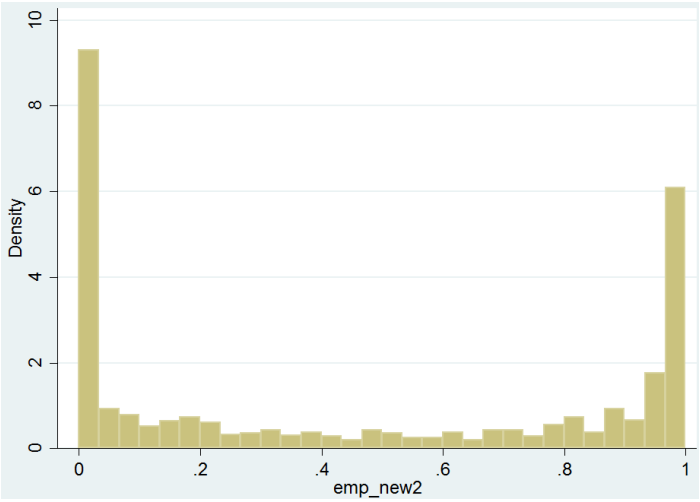
Another point worth noting is our treatment of the de facto flexibility in growth regression. Due to the fact that, empirically, the estimated de facto flexibility in the synthesis equation hardly ever turns out as exactly unit or zero, even if the de facto ERR is actually thought to be purely floating or fixed, we have tried five treatments:

- First treatment-we converted de facto flexibilities that are above unit into 1 and below zero into 0, presented as *emp_new1*;
- Second treatment -we converted de facto flexibilities that are above unit into 1 and below zero into its absolute value, presented as *emp_new2*;
- Third treatment-we ran regression using empirically original results of the de facto flexibilities, indicated by *ymean_emp*;
- Fourth and fifth treatments-we standardized *ymean_emp* in two ways, which is discussed further in section 5.1.

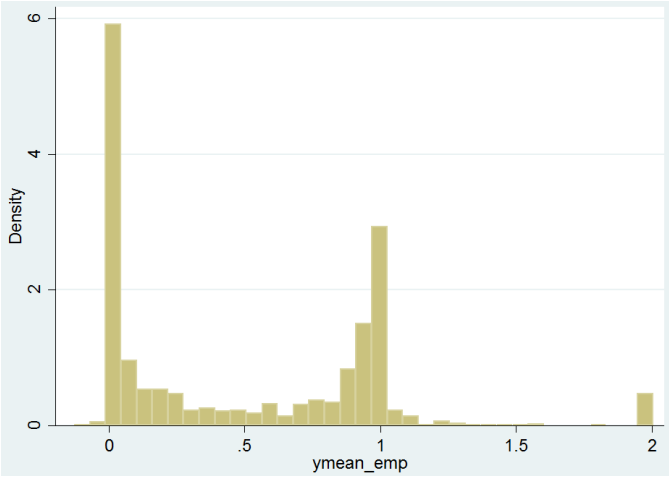
On a positive note, none of these treatments significantly influences our empirical results in cross-country panel analysis, and the difference between the first and the second is too slight to be noticed. The distributions of *emp_new1*, *emp_new2, and ymean_emp* are presented in Figures 1 to 3 respectively.



[Figure 1]



[Figure 2]



[Figure 3]

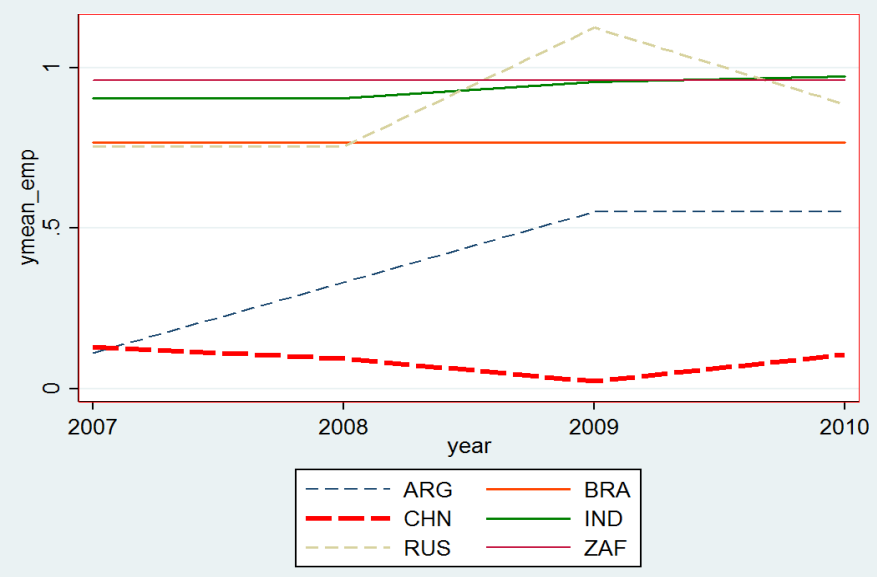
From Figures 1 and 2, we can see that there is very little difference between the distributions of *emp_new1* and *emp_new2*. But there are obviously some outliers in the variable *ymean_emp,* as shown in Figure 3. More details about the outliers can be found in Appendix C. We also implemented two methods of standardization, which converted the estimated de facto flexibility measure into an index between 0 and 1.

4. Changes of de facto Exchange Rate Regimes

Before studying the relationship between de facto ERRs and economic growth, it would be conducive to deepen our understanding of de facto ERRs of each country by looking through the dynamic changes of the de facto flexibilities over time. So this section is an appetizer before our main dishes.

Figure 4 below presents the de facto flexibilities per se and their fluctuations of six countries (Argentina and the BRICS-Brazil, Russia, India, China, and South Africa). As explained in section 2.1, the de facto flexibility measure (coefficient of EMP) represents the degree of how fixed the ERR is. The closer to zero it is, the more fixed regime it has. The lines in Figure 4 show the different reactions in terms of de facto ERRs of these six countries to the global financial crisis.

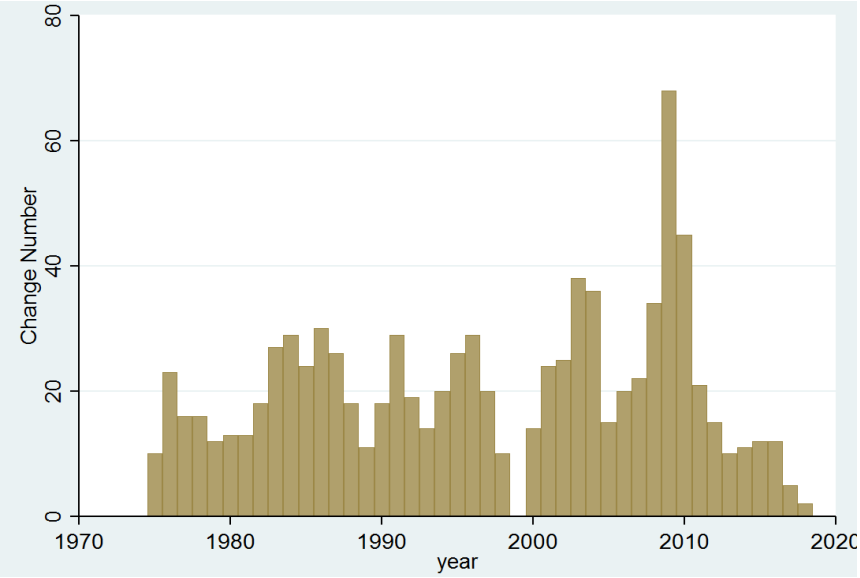
On 22 July, 2005, China implemented an exchange rate reform that let the RMB fluctuate in a relatively more flexible way. But we can see in Figure 4 a declining trend before 2009, when China's de facto regime tends to be nearly as fixed as it was before July 2005. According to our empirical regressions based on the synthesis equation not reported in this paper, the currency basket weight of the US dollar is over 95 percent, indicating that the Chinese government basically chose to go back to peg to the US dollar, which brought us a sense of déjà vu. China's government, however, again let the regime float to some extent two years after the crisis. In contrast, the governments of Argentina and Russia chose to increase the floating degree of their ERR immediately in 2008. Meanwhile, we have not seen any distinct changes of ERRs among Brazil, India and South Africa. The reason that the de facto flexibility for Russia jumped out of 1 in 2009 is discussed in section 2.1.



[Figure 4]

We further examined the changes of de facto ERRs across countries and the frequency of the changes over time. In our definition, if the de facto flexibility of one country in a certain year is different from that in the last year, we consider it as one change. However, the year of 1999 might be a troublemaker. Because we replaced the French franc and German mark with the euro in the currency basket of our synthesis equation, as mentioned in section 3.1, we might have trouble determining whether it is the switch of currency basket that leads to the change of the de facto flexibility, or some actual external events. Therefore, we decided to leave out the year 1999 for the purposes of this part of our analysis. Otherwise there would, for example, be a confusing spurt in our statistics (Figure 5), with little meaningful explanation, in 1999 in terms of the total number of countries that switch their de facto regimes.

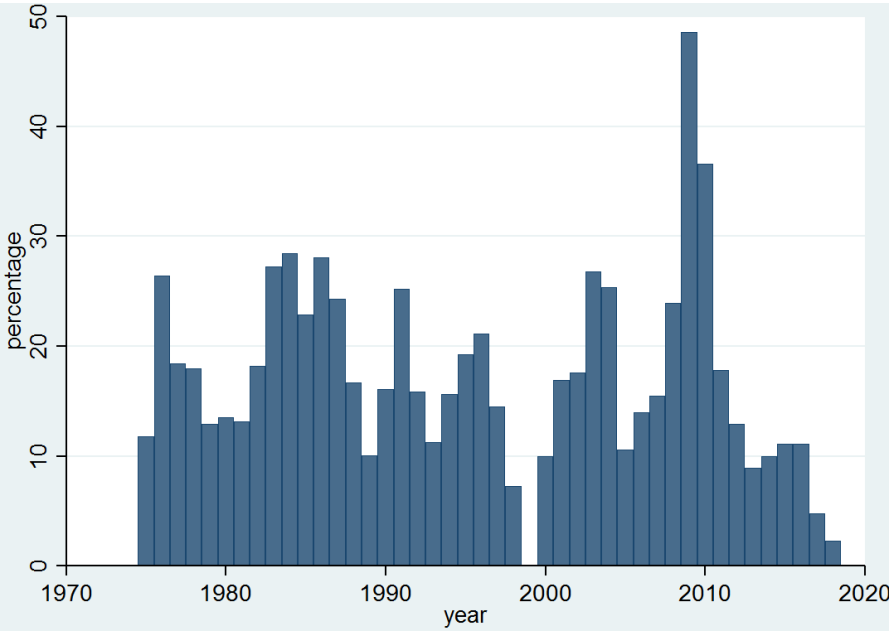
We find the country that changed its regimes the most frequently is the Republic of Burundi, with a total of 26 times under this treatment. And there are 25 countries in our sample that have shown no change. The total number of changes for countries in our sample can be found in Appendix D.



[Figure 5]

We are able to explore the total number of countries that choose to change their de facto ERRs in each year. Figure 5 above, starting from the year 1975, shows countries changing the degree of their ERRs each year. The number fluctuates in a moderate and relatively regular way before 2008. Leaving aside the gap in 1999 created by our treatment of the euro, we found the interesting fact that the number of countries choosing to change their de facto ERRs in a certain year is highly correlated with the state of the global economy. The relatively regular fluctuation in the number of countries changing their de facto ERRs, in some degree, reminds us of business cycles as well as crises in recent history. One conspicuous and abnormal example took place in the year 2009, one year after the infamous global financial crisis. It seems likely that the relatively large number of regime changes in 2009 and 2010 has to do with the 2008 global financial crisis. Countries seem to take their exchange rate policies as one of their weapons against this global economic downturn. The reason why the spurt happens in 2009 rather than 2008 is probably due to a combination of delayed transmission and time-lag effect in terms of pertinent policies.

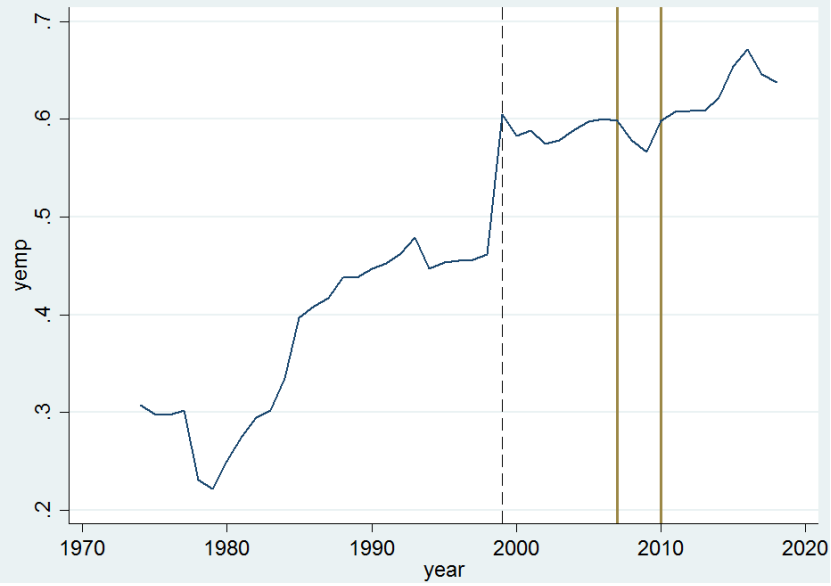
One potential critique of our study may be that our panel sample is highly unbalanced, possibly failing to reflect real trend in fluctuations in terms of de facto regime. Specifically, there is a possibility that the year showing the most change in numbers may result from more countries being in our sample for that year. Therefore, in addition to providing absolute numbers, we further calculated the ratio of the number of countries that chose to change regimes to the total number available in that year in the sample (Figure 6). A strong similarity between Figures 5 and 6 illustrates the robustness of our finding. The percentage also reaches its peak in the year 2009. There are roughly six crests in both Figure 5 and 6.



[Figure 6]

Figure 7 below displays the arithmetic mean value of the de facto flexibilities, which exhibits a general trend of worldwide de facto ERR in the post-Bretton Woods period (1974-2018). A short-term drop at the end of 1970s signifies a move towards fixed de facto ERR. It looks like countries in general were still in the "Fear of Floating" phase after spending a long time pegging to the US dollar. However, when it came to the 1980s, de facto ERRs were generally moving upwards, which

means countries becomes more inclined to letting their exchange rates float, after a long time of sticking to one currency. This trend ran against the "Fear of Floating". Meanwhile, Figure 7 also challenges the "Corner Hypothesis", which posits that countries are forced to choose either fixed or float ERRs and that the intermediate regimes are no longer viable. The dashed line demarcates time span into pre- and post-euro periods and the drastic jump in 1999 is probably the consequence of our currency basket switching, without much realistic importance. Despite that, we find a small dent between 2007 and 2010. This finding may indicate that, in response to the global financial crisis, some countries not only altered their ERRs, but also tended to fix their de facto regimes, with this tendency gradually starting to disperse two or three years later.



[Figure 7]

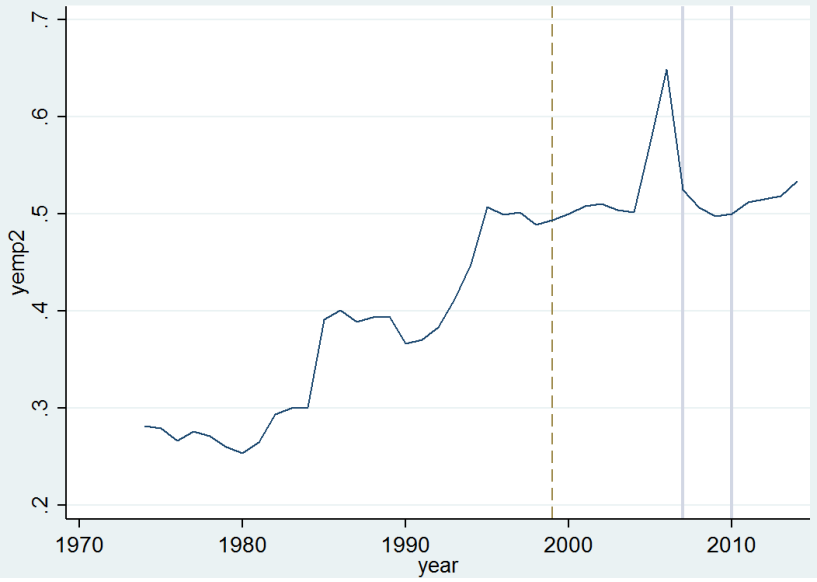
However, if we regard countries in our sample as parts of the international monetary system and wish to study its de facto ERR as a whole, the truth may not be revealed by Figure 7, in which every country has the same weight in calculating the average value of de facto flexibilities. Since countries with bigger economies are generally more influential internationally, it would make more sense if we calculate the weighted average of de facto flexibilities based on nominal GDP[6] (in the unit of US dollar) from WDI. Figure 8 presents these results, which are a little different from those in Figure 7.

In Figure 8, the dent between 2007 and 2010 still exists, but it is a bit smoother. What may seem surprising is a peak in 2006, indicating more flexible de facto ERR in the global system. Moreover, in contrast to Figure 7, the weighted average of de facto flexibilities moves upward with relatively less change in 1999. The reason for these inconsistencies may come from our sample design. In the sample, the weight of nominal GDP for China is over 10 percent after 1997, and even over 15 percent after 2006, compared with less than 1 percent on average for other countries. As already mentioned, China's exchange rate policy was mainly pegged to the US dollar before July 2005, which smoothed the trend in 1999. And the exchange rate reform starting in July 2005 boosted the flexibility in the exchange rate market for a short while. This explains the seemingly abnormal

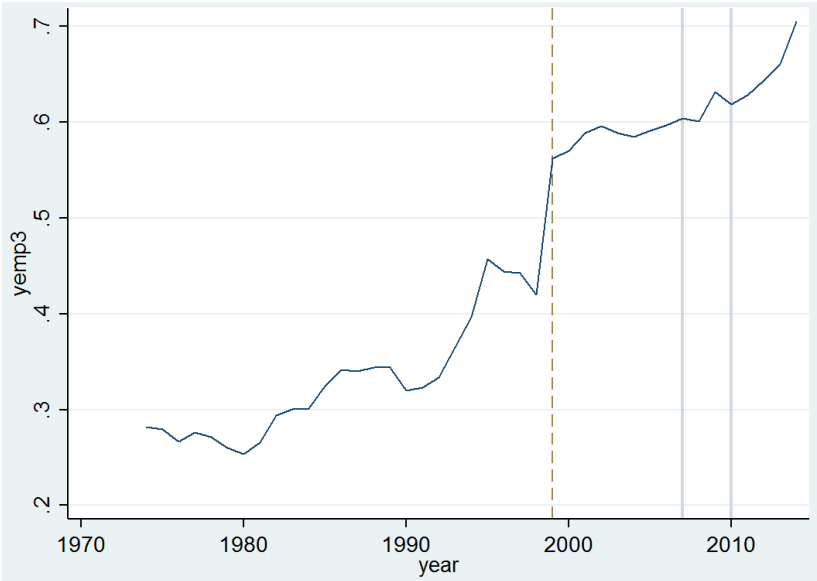
[6] We also tried the real GDP at constant 2011 national prices (in unit of million US dollar) from Penn World Table to calculate the weighted average value, and the results made little difference, except a slight decline in 1999.

jump in 2006. In Figure 9, when excluding China the abnormal jump in 2006 is gone, and the similarity between Figures 9 and 7 lends evidence to our explanations for Figure 8. Besides, the trend declined in 2008 but rose in 2009 and moved downward again in 2010.

In general, the trend is still moving upward after 1980 and is toward flexibility after the demise of the Bretton Woods system. Figures 7 to 9 support that the de facto ERRs are going toward neither firm-fixed nor free-floaters, but rather the "intermediate" worldwide.



[Figure 8]



[Figure 9]

5. The Relationship with Economic Growth

So far we have examined the global changes of ERRs and we noticed that the changes may be correlated with the world economy, reminding us that there might be a particular relationship between economic growth and de fact ERR.

5.1 Basic Growth Regressions

This subsection reports and discusses the basic results of growth regressions in terms of pooled regressions and panel regressions. To begin with, Table 2 presents the basic pooled regression results during the full post-Bretton Woods period in our sample, from 1975 to 2014, in which control variables as well as de facto flexibility behave largely as we expected. The growth rate of GDP per capita (*GDPgrowth*) is significantly and negatively correlated with the five-year lag of the logarithm of real GDP per capita (*L5.lnrgdppop*), the estimated coefficients of which give the conditional convergence rate. And real per capita growth also negatively correlated with the growth rate of population (*POPgrowth*), the ratio to GDP of government consumption (*csh_g*), and the inflation rate (*inf_cpi*). As mentioned by Levy-Yeyati (2003), the choice of ERR usually appears to be closely connected with country size. We control for the population (*POP*) as a measurement of size, which behaves positively related to economic growth. Besides, the GDP per capita growth rate is also positively correlated with the ratio of investment to GDP (*csh_i*), openness ratio, the rate of change of terms of trade (*deltaTT*), average years of schooling in the population aged 25 years and older (*yr_sch*) and civil liberty (*CL*). The data of civil liberty are assigned in seven categories, with one representing the highest degree of freedom and seven the lowest.

Then we divide the full period into two time spans demarcated by the appearance of the euro in 1999: columns 1 to 3 in Table 3 display the first half of the period, with the French franc and German mark instead of the euro in our currency basket, while columns 4 to 6 report the second half with the euro replacing the French franc and German mark. The coefficients of *ymean_emp*, *emp_new1*, and *emp_new2* indicate that the growth rates are higher for more fixed de facto regimes and lower for floating regimes. However, except for the fact that the coefficient of *ymean_emp* is statistically significant after 1999, the coefficients are not as significant as we can see in the first six columns, especially for the sample without the euro. The reason for this insignificance may be due to improper pooled regression in studying economic growth which involves variance across time and countries. Therefore, we use panel regressions that seem to better capture these characteristics.

[Table 2]

VARIABLES	(1)	(2)	(3)
ymean_emp	-0.416		
	(0.260)		
emp_new1		-0.284	
		(0.308)	
emp_new2			-0.284
			(0.308)
L5.lnrgdppop	-1.089***	-1.054***	-1.054***
	(0.164)	(0.168)	(0.168)
POPgrowth	-0.425***	-0.423**	-0.423**
	(0.163)	(0.164)	(0.164)
POP	2.07e-09***	2.07e-09***	2.07e-09***
	(5.28e-10)	(5.28e-10)	(5.28e-10)
csh_g	-1.288	-1.139	-1.139
	(1.588)	(1.579)	(1.579)
csh_i	6.812***	6.719***	6.719***
	(1.537)	(1.539)	(1.539)
OPEN	0.0180***	0.0182***	0.0182***
	(0.00414)	(0.00417)	(0.00417)
deltaTT	10.26***	10.31***	10.31***
	(1.938)	(1.933)	(1.933)
yr_sch	0.233***	0.228***	0.228***
	(0.0705)	(0.0706)	(0.0706)
Inf_cpi	-0.00152***	-0.00149***	-0.00149***
	(0.000140)	(0.000141)	(0.000141)
CL	0.0179	0.0137	0.0137
	(0.0939)	(0.0935)	(0.0935)
Constant	8.476***	8.112***	8.112***
	(1.354)	(1.414)	(1.414)
Observations	539	543	543
R-squared	0.358	0.356	0.356

Robust standard errors in parentheses

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

[Table 3]

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
ymean_emp	-0.117			-0.656**		
	(0.497)			(0.303)		
emp_new1		-0.157			-0.277	
		(0.489)			(0.399)	
emp_new2			-0.157			-0.277
			(0.489)			(0.399)
L5.lnrgdppop	-1.045***	-1.024***	-1.024***	-1.024***	-0.981***	-0.981***
	(0.348)	(0.348)	(0.348)	(0.192)	(0.200)	(0.200)
POPgrowth	0.0135	0.00110	0.00107	-0.641***	-0.627***	-0.627***
	(0.333)	(0.333)	(0.333)	(0.177)	(0.180)	(0.180)
POP	9.67e-10	1.04e-09	1.04e-09	2.40e-09***	2.41e-09***	2.41e-09***
	(1.06e-09)	(1.06e-09)	(1.06e-09)	(6.44e-10)	(6.50e-10)	(6.50e-10)
csh_g	-0.920	-0.730	-0.730	-1.586	-1.704	-1.704
	(2.641)	(2.606)	(2.606)	(1.536)	(1.535)	(1.535)
csh_i	7.739***	7.653***	7.653***	6.096***	5.819***	5.819***
	(2.432)	(2.438)	(2.438)	(2.116)	(2.122)	(2.122)
OPEN	0.0192***	0.0189***	0.0189***	0.00965**	0.0111**	0.0111**
	(0.00666)	(0.00664)	(0.00664)	(0.00484)	(0.00518)	(0.00518)
deltaTT	12.24***	12.36***	12.36***	10.13***	10.25***	10.25***
	(3.709)	(3.675)	(3.675)	(2.185)	(2.185)	(2.185)
yr_sch	0.174	0.173	0.173	0.252***	0.256***	0.256***
	(0.122)	(0.122)	(0.122)	(0.0895)	(0.0900)	(0.0900)
Inf_cpi	-0.00136***	-0.00136***	-0.00136***	-0.0265***	-0.0261***	-0.0261***
	(0.000172)	(0.000171)	(0.000171)	(0.00584)	(0.00611)	(0.00611)
CL	-0.250*	-0.233	-0.233	0.285**	0.266**	0.266**
	(0.148)	(0.146)	(0.146)	(0.113)	(0.113)	(0.113)
Constant	7.934**	7.704**	7.705**	8.204***	7.563***	7.563***
	(3.302)	(3.304)	(3.304)	(1.361)	(1.496)	(1.496)
Observations	282	285	285	257	258	258
R-squared	0.342	0.340	0.340	0.410	0.401	0.401

Robust standard errors in parentheses

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

Table 4 reports the estimates of panel specification for 98 countries with 539 observations. Period fixed effects are controlled in column 1 and 2, while in column 1 and 3 we controlled country fixed effects. Although the magnitude of the coefficient of *ymean_emp* in column 1 is higher and more significant than that in other columns, the information brought by Table 4 is direct: relatively fixed de facto ERRs generally perform better than more flexible regimes in terms of economic growth. Since we controlled for the conditional convergence rate, we can rule out the possibility that countries with fixed regimes are generally poor and thus tend to grow at a more rapid pace. Possible explanations may come from the greater price stability in relatively fixed ERRs and stable investment and trade, compared with more flexible ERRs.

[Table 4]

VARIABLES	(1)	(2)	(3)	(4)
ymean_emp	-1.122***	-0.599*	-0.770*	-0.612*
	(0.382)	(0.318)	(0.417)	(0.319)
L5.lnrgdppop	-4.478***	-1.507***	-4.132***	-1.529***
	(0.518)	(0.237)	(0.510)	(0.235)
POPgrowth	-0.171	-0.292	-0.191	-0.291
	(0.374)	(0.244)	(0.376)	(0.241)
POP	8.85e-09***	2.76e-09**	9.39e-09***	2.58e-09**
	(1.78e-09)	(1.08e-09)	(2.32e-09)	(1.05e-09)
csh_g	-2.441	-0.762	-2.489	-0.834
	(2.197)	(1.962)	(2.401)	(1.981)
csh_i	7.370***	7.733***	8.857***	8.602***
	(2.209)	(1.679)	(2.105)	(1.708)
OPEN	0.0445***	0.0216***	0.0545***	0.0223***
	(0.0125)	(0.00658)	(0.0150)	(0.00677)
deltaTT	8.430***	10.54***	9.115***	10.34***
	(2.017)	(1.943)	(2.217)	(1.997)
yr_sch	-0.0966	0.312***	0.363**	0.288***
	(0.203)	(0.110)	(0.163)	(0.102)
Inf_cpi	-0.000784***	-0.00101***	-0.000843***	-0.00108***
	(0.000150)	(0.000139)	(0.000159)	(0.000119)
CL	-0.149	-0.0642	-0.235*	-0.0959
	(0.130)	(0.109)	(0.121)	(0.106)
Period Fixed Effects	Yes	Yes	No	No
Country Fixed Effects	Yes	No	Yes	No
Observations	539	539	539	539
R-squared	0.425		0.376	

Robust standard errors in parentheses

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

Barro (2015, section 4) argues that fixed effects in panel regressions tend to raise the magnitude of the estimated coefficients due to bias of the Hurwicz (1950)-Nickell (1981) type. Accordingly, the coefficients, such as the conditional convergence rate, appear higher in magnitude in columns 1 and 3 than that in columns 2 and 4. Apart from the magnitude of estimated coefficients, the statistical significance is quite similar under the two effects. Moreover, Table 4 demonstrates that period-specific shocks do matter and make a difference, which meets our expectations as we found before that coefficients changed after the appearance of the euro. Apart from the significance and magnitude of the coefficient of *ymean_emp*, the R-squared is higher in column1 than in column 3.

Based on the reports in Table 4, we find the growth rates of GDP per capita are significantly higher for more fixed de facto ERRs and lower for more flexible regimes. The results are robust in both fixed effects and random effects, and with regard to all three treatments in de facto flexibility. As for other macroeconomic variables, civil liberty (*CL)* behaves negatively related to economic growth, which makes more sense than the positive results in pooled regressions above since the

lower it appears, the more freedom it represents. Nevertheless, population growth (*POPgrowth*) and government consumption share of GDP (*csh_g*) are not significant, in contrast with some previous findings.

[Table 4-A]

VARIABLES	(1)	(2)	(3)	(4)
emp_new1	-1.005**	-0.488	-0.735	-0.588
	(0.389)	(0.377)	(0.452)	(0.377)
L5.lnrgdppop	-4.294***	-1.485***	-4.023***	-1.515***
	(0.527)	(0.242)	(0.533)	(0.241)
POPgrowth	-0.174	-0.286	-0.193	-0.289
	(0.377)	(0.248)	(0.378)	(0.245)
POP	9.09e-09***	2.83e-09***	9.57e-09***	2.66e-09**
	(1.83e-09)	(1.09e-09)	(2.36e-09)	(1.06e-09)
csh_g	-2.388	-0.729	-2.439	-0.734
	(2.198)	(1.953)	(2.397)	(1.978)
csh_i	6.846***	7.525***	8.418***	8.457***
	(2.209)	(1.692)	(2.107)	(1.710)
OPEN	0.0440***	0.0223***	0.0536***	0.0226***
	(0.0127)	(0.00674)	(0.0150)	(0.00686)
deltaTT	8.509***	10.56***	9.124***	10.35***
	(2.007)	(1.940)	(2.204)	(1.993)
yr_sch	-0.131	0.309***	0.333*	0.280***
	(0.214)	(0.111)	(0.173)	(0.104)
Inf_cpi	-0.000801***	-0.000993***	-0.000860***	-0.00107***
	(0.000155)	(0.000142)	(0.000164)	(0.000123)
CL	-0.156	-0.0704	-0.238*	-0.104
	(0.129)	(0.108)	(0.121)	(0.105)
Year Fixed Effects	Yes	Yes	No	No
Country Fixed Effects	Yes	No	Yes	No
Observations	543	543	543	543
R-squared	0.419		0.372	
Number of Countries	98	98	98	98

Robust standard errors in parentheses

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

Table 4-A reports the same regressions on the variable *emp_new1* as a robustness check[7]. Although the estimates of *emp_new1* (in Table 4) are generally less significant than the coefficients of *ymean_emp* (in Table 4), their magnitudes are similar, which means relatively fixed de facto ERRs are significantly associated with better economic growth.

As another robustness check, we also calculated the two kinds of standardized de facto flexibility. In the first one we set the highest value of *ymean_emp* of each five-year interval as unit, the lowest as zero and others in between, the growth regression results of which are presented in

[7] We also tried *emp_new2* of which the estimates were almost the same as Table 2.

columns 1 to 4 of Table 4-B. In the second definition we basically repeated this treatment except rather than using a five-year interval, we applied it to the whole sample. The regression results are reported in the columns 5 to 6. As we can see in the Table 4-B, there is little difference between the two definitions; nevertheless, the magnitudes in Table 4-B are larger. The results of Table 4-B still support our main conclusion about the relationship between de facto ERRs and economic growth.

[Table 4-B]

(*at the end of the paper*)

We also added Table 5, reporting pooled (columns 5 to 6) and panel regression (columns 1 to 2 for fixed effect, and columns 3 to 4 for random effect) with 10-year averaging. The coefficient of *ymean_emp* is still significantly negative, but *emp_new1* behaves insignificantly and its magnitude is obviously minimized.

[Table 5]

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
ymean_emp	-1.462***		-0.613**		-0.336	
	(0.436)		(0.310)		(0.280)	
emp_new1		-0.705		-0.202		0.0538
		(0.881)		(0.449)		(0.359)
L10.lnrgdppop	-5.029***	-4.227***	-1.747***	-1.487***	-1.315***	-1.186***
	(0.567)	(0.822)	(0.249)	(0.281)	(0.170)	(0.193)
POPgrowth	-0.381**	-0.438**	-0.369*	-0.403**	-0.498***	-0.493***
	(0.190)	(0.212)	(0.199)	(0.193)	(0.157)	(0.155)
POP	7.90e-09***	8.24e-09***	3.23e-09***	3.06e-09***	3.06e-09***	2.99e-09***
	(2.08e-09)	(2.21e-09)	(7.38e-10)	(7.23e-10)	(5.60e-10)	(5.60e-10)
csh_g	-2.884*	-2.851*	-1.129	-0.981	-1.374	-1.085
	(1.468)	(1.652)	(1.267)	(1.268)	(1.146)	(1.171)
csh_i	3.808**	3.760*	6.441***	6.451***	6.811***	6.667***
	(1.891)	(2.081)	(1.956)	(1.977)	(1.650)	(1.682)
OPEN	0.0447***	0.0276	0.0219***	0.0181**	0.0160***	0.0152***
	(0.0159)	(0.0245)	(0.00759)	(0.00763)	(0.00519)	(0.00533)
yr_sch	0.677***	0.467**	0.395***	0.352***	0.344***	0.336***
	(0.144)	(0.187)	(0.0852)	(0.0819)	(0.0677)	(0.0674)
Inf_cpi	-0.00213***	-0.00213***	-0.00255***	-0.00242***	-0.00262***	-0.00243***
	(0.000225)	(0.000202)	(0.000156)	(0.000221)	(0.000260)	(0.000354)
CL	-0.314*	-0.287	0.0520	0.125	0.179	0.230*
	(0.169)	(0.184)	(0.135)	(0.145)	(0.112)	(0.124)
Observations	320	322	320	322	320	322
R-squared	0.511	0.395			0.445	0.404
No. of Countries	103	103	103	103		

Robust standard errors in parentheses

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

5.2 Regressions with Threshold Pairs

In a further comparison with previous studies that used discrete variables to represent ERRs, we run panel growth regressions in which we set artificial thresholds or bars to classify our continuous de facto flexibility into three categories: fixed, float and intermediate. Table 6 presents panel growth regressions with four **"threshold pairs"**, which were defined as a pair of thresholds that classify the continuous de facto flexibility into three de facto regimes. For example, in Table 6-A, we define de facto ERRs using thresholds pair, (0.03, 0.97), which means regimes (*fix03*) are defined as fixed when their de facto flexibilities are less than or equal to the first threshold, 0.03, and dummy variable, *interv97*, indicating intermediate regimes are 1 when the de facto flexibilities are more than 0.03 but less than the second threshold, 0.97. Thus, in this case, the float regime with de facto flexibility more than or equal 0.97 need not be included. Two dummy variables are enough to represent the three regimes; otherwise there would be perfect collinearity. We have tried four distinct threshold pairs, the regression results of which are presented in Tables 6-A, B, C and D.

As we can see in Table 6-A, for a sample of 98 countries with 543 observations, the growth rate of GDP per capita significantly and positively correlates with fixed and intermediate regimes with/without period fixed effects or country fixed effects. The positive coefficients of *fix03* and *interv97* indicate that economic growth is positively associated with fixed and intermediate de facto ERRs and this relationship is the most significant for intermediate ones.[8] Likewise, in Table 6-B, the threshold pair is (0.1, 0.9). The coefficients of *fixed10* appear to be minimized with less statistical significance. Meanwhile, the coefficients of *interv90* become minimized but remain significant whether under fixed or random effects. In Tables 6-C and D, where we set threshold pairs to (0.2, 0.8) and (0.33, 0.67), we find the coefficients of our regime dummy variables lessen as the first threshold rises. Even though the coefficients of *fixed20* and *interv80* are not generally as significant as the coefficients under other threshold pairs, dummy variables indicating intermediate regimes are consistently more statistically significant than more fixed and floating regimes.

The results imply that intermediate ERR is positively correlated to economic growth, lending evidence against the "Corner Hypothesis". But this finding does not deny the consequence discussed in the previous subsection, because this proposed a couple of exogenous thresholds and there might be endogenous thresholds in terms of the de facto flexibility as a matter of fact. Moreover, the results are corresponding with the idea proposed by Frankel (2019) that many countries are implementing "systematic managed floating" for their economic considerations. One of the advantages of the intermediate regimes is that they allow an intermediate degree of monetary independence without sacrificing much flexibility of exchange rate policy.

[8] We also used *float03*, replacing of *fixed03*, as the dummy indicating the float regime in the regression, its coefficient is significantly negative as expected

[Table 6-A]

VARIABLES	(1) yy03fe	(2) yn03re	(3) ny03fe	(4) nn03re
fix03	0.991**	0.779*	0.756*	0.889*
	(0.396)	(0.464)	(0.438)	(0.467)
interv97	0.788***	0.757***	0.851***	0.861***
	(0.252)	(0.253)	(0.276)	(0.250)
L5.lnrgdppop	-4.155***	-1.476***	-3.924***	-1.493***
	(0.526)	(0.238)	(0.504)	(0.232)
POPgrowth	-0.185	-0.290	-0.204	-0.297
	(0.373)	(0.247)	(0.373)	(0.244)
POP	9.45e-09***	2.69e-09***	9.96e-09***	2.48e-09***
	(1.74e-09)	(9.74e-10)	(2.16e-09)	(9.10e-10)
csh_g	-2.473	-0.761	-2.536	-0.760
	(2.049)	(1.862)	(2.192)	(1.865)
csh_i	7.180***	7.761***	8.591***	8.642***
	(2.236)	(1.714)	(2.128)	(1.748)
OPEN	0.0458***	0.0230***	0.0550***	0.0233***
	(0.0129)	(0.00681)	(0.0148)	(0.00694)
deltaTT	8.508***	10.52***	9.003***	10.35***
	(1.972)	(1.916)	(2.182)	(1.979)
yr_sch	-0.135	0.316***	0.298**	0.284***
	(0.204)	(0.111)	(0.148)	(0.100)
Inf_cpi	-0.000752***	-0.000962***	-0.000807***	-0.00103***
	(0.000144)	(0.000142)	(0.000148)	(0.000121)
CL	-0.123	-0.0503	-0.198*	-0.0798
	(0.133)	(0.104)	(0.119)	(0.101)
Period Fixed Effects	Yes	Yes	No	No
Country Fixed Effects	Yes	No	Yes	No
Observations	543	543	543	543
R-squared	0.421		0.379	
Number of Countries	98	98	98	98

Robust standard errors in parentheses

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

[Table 6-B]

VARIABLES	(1) yy10fe	(2) yn10re	(3) ny10fe	(4) nn10re
fix10	1.093***	0.423	0.664	0.498
	(0.383)	(0.425)	(0.441)	(0.417)
interv90	0.679***	0.510**	0.665***	0.594***
	(0.216)	(0.232)	(0.245)	(0.221)
L5.lnrgdppop	-4.369***	-1.488***	-4.057***	-1.506***
	(0.537)	(0.240)	(0.532)	(0.239)
POPgrowth	-0.175	-0.272	-0.196	-0.276
	(0.373)	(0.246)	(0.374)	(0.244)
POP	9.55e-09***	2.90e-09***	1.00e-08***	2.68e-09***
	(1.69e-09)	(1.03e-09)	(2.13e-09)	(9.69e-10)
csh_g	-2.366	-0.645	-2.414	-0.604
	(2.199)	(1.960)	(2.374)	(1.988)
csh_i	6.954***	7.567***	8.367***	8.455***
	(2.219)	(1.704)	(2.119)	(1.735)
OPEN	0.0456***	0.0231***	0.0550***	0.0234***
	(0.0129)	(0.00682)	(0.0150)	(0.00691)
deltaTT	8.476***	10.62***	9.178***	10.43***
	(2.012)	(1.942)	(2.210)	(2.000)
yr_sch	-0.146	0.320***	0.320*	0.282***
	(0.202)	(0.111)	(0.162)	(0.103)
Inf_cpi	-0.000799***	-0.000963***	-0.000827***	-0.00103***
	(0.000156)	(0.000150)	(0.000159)	(0.000128)
CL	-0.134	-0.0604	-0.219*	-0.0947
	(0.132)	(0.106)	(0.121)	(0.103)
Period Fixed Effects	Yes	Yes	No	No
Country Fixed Effects	Yes	No	Yes	No
Constant	37.29***	11.33***	31.91***	10.56***
	(4.815)	(1.848)	(4.533)	(1.774)
Observations	543	543	543	543
R-squared	0.422		0.376	
Number of Countries	98	98	98	98

Robust standard errors in parentheses

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

[Table 6-C]

VARIABLES	(1) yy20fe	(2) yn20re	(3) ny20fe	(4) nn20re
fix20	0.712*	0.364	0.521	0.454
	(0.394)	(0.359)	(0.426)	(0.357)
interv80	0.329	0.234	0.364	0.332
	(0.277)	(0.240)	(0.289)	(0.241)
L5.lnrgdppop	-4.238***	-1.475***	-3.982***	-1.497***
	(0.545)	(0.244)	(0.542)	(0.244)
POPgrowth	-0.173	-0.282	-0.193	-0.286
	(0.381)	(0.250)	(0.379)	(0.245)
POP	8.99e-09***	2.84e-09***	9.47e-09***	2.66e-09**
	(1.81e-09)	(1.09e-09)	(2.33e-09)	(1.04e-09)
csh_g	-2.396	-0.707	-2.410	-0.656
	(2.166)	(1.950)	(2.368)	(1.972)
csh_i	6.820***	7.449***	8.348***	8.373***
	(2.235)	(1.687)	(2.114)	(1.705)
OPEN	0.0454***	0.0229***	0.0545***	0.0232***
	(0.0128)	(0.00680)	(0.0150)	(0.00691)
deltaTT	8.645***	10.63***	9.225***	10.41***
	(1.999)	(1.940)	(2.201)	(1.999)
yr_sch	-0.126	0.311***	0.314*	0.277***
	(0.217)	(0.112)	(0.172)	(0.104)
Inf_cpi	-0.000782***	-0.000978***	-0.000837***	-0.00105***
	(0.000157)	(0.000148)	(0.000160)	(0.000124)
CL	-0.158	-0.0707	-0.235*	-0.105
	(0.129)	(0.108)	(0.121)	(0.105)
Period Fixed Effects	Yes	Yes	No	No
Country Fixed Effects	Yes	No	Yes	No
Constant	36.51***	11.52***	31.57***	10.75***
	(4.799)	(1.845)	(4.506)	(1.779)
Observations	543	543	543	543
R-squared	0.417		0.371	
Number of Countries	98	98	98	98

Robust standard errors in parentheses

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

[Table 6-D]

VARIABLES	(1) yy33fe	(2) yn33re	(3) ny33fe	(4) nn33re
fix33	0.552*	0.290	0.370	0.370
	(0.292)	(0.272)	(0.325)	(0.274)
interv67	0.473	0.379	0.537*	0.466*
	(0.292)	(0.260)	(0.307)	(0.279)
L5.lnrgdppop	-4.206***	-1.471***	-3.975***	-1.488***
	(0.522)	(0.239)	(0.511)	(0.239)
POPgrowth	-0.169	-0.276	-0.191	-0.279
	(0.377)	(0.246)	(0.375)	(0.243)
POP	9.14e-09***	2.84e-09***	9.62e-09***	2.62e-09**
	(1.82e-09)	(1.09e-09)	(2.34e-09)	(1.04e-09)
csh_g	-2.454	-0.742	-2.471	-0.686
	(2.157)	(1.952)	(2.350)	(1.970)
csh_i	6.799***	7.488***	8.378***	8.430***
	(2.217)	(1.682)	(2.112)	(1.708)
OPEN	0.0440***	0.0228***	0.0531***	0.0229***
	(0.0128)	(0.00677)	(0.0147)	(0.00682)
deltaTT	8.600***	10.58***	9.165***	10.33***
	(2.016)	(1.954)	(2.220)	(2.003)
yr_sch	-0.136	0.310***	0.300*	0.271***
	(0.212)	(0.111)	(0.167)	(0.103)
Inf_cpi	-0.000773***	-0.000970***	-0.000830***	-0.00105***
	(0.000158)	(0.000144)	(0.000164)	(0.000125)
CL	-0.156	-0.0695	-0.230*	-0.106
	(0.128)	(0.107)	(0.119)	(0.103)
Period Fixed Effects	Yes	Yes	No	No
Country Fixed Effects	Yes	No	Yes	No
Constant	36.41***	11.50***	31.69***	10.75***
	(4.703)	(1.819)	(4.320)	(1.751)
Observations	543	543	543	543
R-squared	0.416		0.372	
Number of Countries	98	98	98	98

Robust standard errors in parentheses

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

5.3 Regressions for Different Country Groups

The choice of ERR is not only influenced by country size, but also related to the income level of countries. Poor countries may depend on ERRs more than rich countries, which could lead to more significant impact of ERRs on economic growth. Another problem arises from the dynamics of countries' classifications. For example, a country may be at a middle income level this year but move to a high income level next year, as did Aruba from 1993 to 1994. To address this potential problem we turned to panel classification used by the World Bank to capture the dynamics of countries' status. Following the World Bank standard in terms of GNI per capita in US dollars, we categorize countries in our sample into three country groups: one with the highest income level, one with the lowest income level, and the one in the middle. Since the standard for differentiating countries with different income levels may vary over time and countries may fall into a different classification over the years, using panel data and interactions may hold a bigger advantage and be more convincing. The World Bank Analytical Classifications are originally provided annually, starting from 1987 and ending in 2014, after merging with the data from Penn World Table. Furthermore, since we adopted five-year averaging before running growth regressions, we convert the annual income classification based on the winner-takes-all principle, which means countries fall into the classification that is most dominant in a certain five-year period.

Results of panel regressions can be seen in Table 7-A and B. We controlled the period fixed effect and country fixed effect respectively. The classified de facto flexibilities are represented by *empHnew*, *empLnew*, *empMnew*, *empHnew1*, *empLnew1*, *and empMnew1*, which are the interactions of classifications and de facto flexibilities under two treatments. Consistent with our findings above, there are slight differences between the two treatments in terms of the coefficients in regressions. And the coefficients for low income countries are more significant than for the countries with middle or high income levels. This result may make sense in that countries with lower income levels typically have underdeveloped financial systems, thus may appear more likely to rely on their exchange rate policies to stabilize their economy, especially when they are facing with economic shocks. Countries with a higher income level, however, generally have a healthier financial system and leave their exchange rate more room for flexibility. Moreover, the exclusion of the troublemaker period will both increase the magnitude and the significance level of the coefficients. More importantly, the finding that growth is negatively correlated with de facto flexibility remains consistent with our previous discoveries.

[Table 7-A]

VARIABLES	(1) yygroup	(2) yngroup	(3) nygroup	(4) nngroup
empHnew	-1.003	-0.889	-0.330	-0.894*
	(0.810)	(0.559)	(0.788)	(0.536)
empLnew	-1.097**	-1.281**	-0.871*	-1.244**
	(0.469)	(0.516)	(0.467)	(0.486)
empMnew	-0.662	-0.312	-0.320	-0.277
	(0.504)	(0.343)	(0.499)	(0.310)
L5.lnrgdppop	-4.276***	-1.538***	-4.108***	-1.588***
	(0.586)	(0.251)	(0.592)	(0.251)
POPgrowth	-0.163	-0.295	-0.193	-0.289
	(0.376)	(0.231)	(0.374)	(0.228)
POP	9.32e-09***	2.57e-09**	9.81e-09***	2.50e-09**
	(1.78e-09)	(1.00e-09)	(2.29e-09)	(1.01e-09)
csh_g	-2.435	-0.939	-2.638	-1.252
	(2.190)	(1.895)	(2.429)	(1.958)
csh_i	7.268***	7.327***	8.408***	7.867***
	(2.253)	(1.642)	(2.215)	(1.676)
OPEN	0.0464***	0.0205***	0.0550***	0.0219***
	(0.0125)	(0.00593)	(0.0148)	(0.00620)
deltaTT	8.633***	10.66***	9.364***	10.66***
	(2.007)	(1.975)	(2.181)	(2.043)
yr_sch	-0.142	0.301***	0.339**	0.300***
	(0.204)	(0.102)	(0.165)	(0.0977)
Inf_cpi	-0.000799***	-0.00110***	-0.000831***	-0.00114***
	(0.000158)	(0.000141)	(0.000154)	(0.000114)
CL	-0.148	-0.0443	-0.223*	-0.0735
	(0.130)	(0.106)	(0.119)	(0.103)
Period Fixed Effects	Yes	Yes	No	No
Country Fixed Effects	Yes	No	Yes	No
Observations	539	539	539	539
R-squared	0.423		0.377	
Number of Countries	98	98	98	98

Robust standard errors in parentheses

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

[Table 7-B]

VARIABLES	(1) yygroup1	(2) yngroup1	(3) nygroup1	(4) nngroup1
empHnew1	-0.702	-0.740	-0.0502	-0.830
	(0.840)	(0.596)	(0.823)	(0.569)
empLnew1	-1.106**	-1.225**	-0.958*	-1.279**
	(0.508)	(0.559)	(0.501)	(0.515)
empMnew1	-0.367	-0.135	-0.0764	-0.192
	(0.558)	(0.426)	(0.551)	(0.371)
L5.lnrgdppop	-4.229***	-1.537***	-4.131***	-1.608***
	(0.600)	(0.258)	(0.608)	(0.260)
POPgrowth	-0.159	-0.278	-0.188	-0.275
	(0.377)	(0.235)	(0.374)	(0.235)
POP	9.27e-09***	2.63e-09**	9.75e-09***	2.58e-09**
	(1.77e-09)	(1.03e-09)	(2.25e-09)	(1.05e-09)
csh_g	-2.460	-0.889	-2.667	-1.126
	(2.190)	(1.899)	(2.426)	(1.980)
csh_i	6.737***	7.211***	8.017***	7.863***
	(2.245)	(1.663)	(2.200)	(1.677)
OPEN	0.0461***	0.0212***	0.0545***	0.0225***
	(0.0126)	(0.00608)	(0.0148)	(0.00632)
deltaTT	8.671***	10.68***	9.331***	10.64***
	(1.986)	(1.967)	(2.154)	(2.039)
yr_sch	-0.170	0.302***	0.309*	0.295***
	(0.213)	(0.104)	(0.174)	(0.0999)
Inf_cpi	-0.000806***	-0.00108***	-0.000842***	-0.00111***
	(0.000159)	(0.000142)	(0.000153)	(0.000115)
CL	-0.139	-0.0486	-0.208*	-0.0832
	(0.130)	(0.105)	(0.121)	(0.101)
Period Fixed Effects	Yes	Yes	No	No
Country Fixed Effects	Yes	No	Yes	No
Observations	543	543	543	543
R-squared	0.419		0.375	
Number of Countries	98	98	98	98

Robust standard errors in parentheses

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

Tables 8-A and B report further on the results of pooled regressions in terms of income levels. The only difference between Table 8-A and Table 8-B is the interactions of the de facto flexibility and income classification of countries, which is explained in Appendix B. As can be seen, the coefficients for low income countries appear more significant than in countries with higher or middle income levels. The statistical significance level even turns out higher than the corresponding results in Table 7. Coefficients in Table 8 still support the theory that growth rates tend to be higher

for relatively fixed de facto ERRs, and especially for countries with a lower income level. The appearance of the euro seems to make little difference to the magnitude. Moreover, the coefficients of other growth determinants are mostly consistent with our previous findings. For example, we can see that conditional convergence still exists in the table based on the significantly negative coefficient of five-year lag of real GDP per capita (*L5.lnrgdppop*).

[Table 8-A]

VARIABLES	(1)	(2)	(3)
empHnew	-0.447	0.788	-0.976*
	(0.462)	(0.950)	(0.512)
empLnew	-1.534***	-1.533**	-1.447**
	(0.438)	(0.720)	(0.578)
empMnew	-0.0889	-0.168	-0.325
	(0.253)	(0.489)	(0.314)
L5.lnrgdppop	-1.349***	-1.332***	-1.190***
	(0.181)	(0.348)	(0.210)
POPgrowth	-0.384**	-0.0377	-0.585***
	(0.161)	(0.318)	(0.180)
POP	2.09e-09***	1.54e-09	2.20e-09***
	(5.30e-10)	(1.20e-09)	(5.69e-10)
csh_g	-1.884	-1.838	-1.560
	(1.547)	(2.672)	(1.465)
csh_i	6.486***	7.087***	5.662***
	(1.516)	(2.427)	(2.172)
OPEN	0.0182***	0.0200***	0.00985**
	(0.00392)	(0.00637)	(0.00476)
deltaTT	10.72***	12.47***	10.32***
	(1.980)	(3.788)	(2.295)
yr_sch	0.259***	0.204	0.253***
	(0.0695)	(0.124)	(0.0887)
Inf_cpi	-0.00156***	-0.00144***	-0.0247***
	(0.000138)	(0.000167)	(0.00598)
CL	0.0238	-0.194	0.251**
	(0.0920)	(0.150)	(0.110)
Constant	10.73***	10.59***	9.834***
	(1.486)	(3.171)	(1.573)
Observations	539	282	257
R-squared	0.381	0.359	0.432

Robust standard errors in parentheses

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

Column 1 is the regression for the sample between 1974 and 2014, while column 2 is for the sample before 1999, when the euro was not in use, and column 3 is for the sample after 1999.

[Table 8-B]

VARIABLES	(1)	(2)	(3)
empHnew1	-0.329	0.818	-0.762
	(0.475)	(0.952)	(0.567)
empLnew1	-1.508***	-1.515**	-1.045*
	(0.453)	(0.672)	(0.583)
empMnew1	0.0774	-0.171	0.132
	(0.308)	(0.489)	(0.448)
L5.lnrgdppop	-1.333***	-1.319***	-1.137***
	(0.184)	(0.347)	(0.219)
POPgrowth	-0.371**	-0.0377	-0.563***
	(0.162)	(0.318)	(0.184)
POP	2.10e-09***	1.56e-09	2.18e-09***
	(5.34e-10)	(1.19e-09)	(5.86e-10)
csh_g	-1.701	-1.733	-1.523
	(1.535)	(2.655)	(1.487)
csh_i	6.477***	7.012***	5.594**
	(1.514)	(2.423)	(2.161)
OPEN	0.0182***	0.0200***	0.0113**
	(0.00391)	(0.00637)	(0.00503)
deltaTT	10.72***	12.42***	10.46***
	(1.968)	(3.734)	(2.306)
yr_sch	0.253***	0.204	0.261***
	(0.0693)	(0.124)	(0.0885)
Inf_cpi	-0.00155***	-0.00144***	-0.0241***
	(0.000137)	(0.000167)	(0.00611)
CL	0.0165	-0.184	0.226**
	(0.0916)	(0.148)	(0.111)
Constant	10.53***	10.43***	8.993***
	(1.515)	(3.169)	(1.603)
Observations	543	285	258
R-squared	0.379	0.357	0.421

Robust standard errors in parentheses

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

Column 1 is the regression for the sample between 1974 and 2014, while column 2 is for the sample before 1999, when the euro was not in use, and column 3 is for the sample after 1999.

5.4 Cross-sectional Regressions

In this final subsection, we see from Tables 9 and 10, our results of cross-sectional regressions of each five-year interval, starting with 1985 to 1989 and ending at 2010 to 2014. While it is natural to include change rate of terms of trade in pooled and panel regressions, especially for the annual data, it is generally excluded from cross-sectional regressions. Table 9 reports cross-sectional regressions for countries with various income levels. Table 10 reports the results of cross-sectional regressions on an altered form of de facto flexibility, *emp_new1*. For the purpose of comparison, we also run cross-sectional regressions of each 10-year interval. Table 11 reports the cross-sectional regressions starting from the period 1975 to 1984.

From the results of cross-sectional regressions, we found that the correlations between de facto flexibility and the growth rate did not always remain negative, and the relationship generally appears statistically insignificant with the exception of the 1990s (columns 5 and 6). The reason for these results may be attributed to two aspects. Firstly, since our panel dataset is highly unbalanced, cross-sectional regressions may not be able to effectively and meaningfully reflect the statistical relationship. Secondly, considering the country heterogeneity in our sample, there are probably threshold effects among different periods or countries that render the cross-sectional regressions ineffectual. From the coefficients of each column, we can see the variance that implies the possibility of these thresholds over time. But it is more likely that the threshold need to be endogenously identified.

6. Conclusions

With the help of estimated structural breaks, we built a panel database including a measure of de facto ERRs expressed as estimated degree of flexibility. Based on this panel, the paper firstly analyzed global evolution of de facto ERRs. The findings run against the "Corner Hypothesis" and did not seem to support the concept of "Fear of Floating". The trend was, rather, toward increased flexibility. This paper further examined and provided evidence for the relationships between the de facto ERRs and economic growth.

We contribute to this field of study in three main respects. First, we use panel data of de facto flexibility that measured a continuous degree of ERR between the purely fixed and the completely floating. Our findings not only strongly suggest that ERRs matter when it comes to the growth rate of GDP per capita, but further reveal that, in contrast to some previous findings, a relatively fixed de facto EER is associated with higher economic growth. The results remain robust regardless of the forms of de facto flexibility and the methods we tried. Second, after converting the continuous de facto flexibility into discrete variables by implementing threshold pairs, we find economic growth is significantly positively correlated with the intermediate ERRs. Third, we analyze the impact of the choice of ERR on economic growth for countries with different income levels. The relationship we found before still appears, even though more significant for countries with lower income levels than those with higher income levels. This highlighted the importance of exchange rate policy for developing countries.

[Table 9]

VARIABLES	(1) 1985~1989	(2) 1990~1994	(3) 1995~1999	(4) 2000~2004	(5) 2005~2009	(6) 2010~2014
empHnew1	-1.780	-14.52***	2.513*	0.832	-0.412	-0.300
	(4.235)	(4.565)	(1.432)	(1.251)	(0.863)	(0.910)
empLnew1	-0.629	-2.083*	-0.149	-0.135	-0.507	-1.616
	(1.286)	(1.229)	(0.942)	(0.765)	(0.800)	(1.600)
empMnew1	1.283	-0.676	1.136	-0.348	0.252	0.00867
	(1.119)	(1.177)	(1.409)	(0.697)	(0.670)	(0.822)
Constant	17.09***	0.0475	9.754*	5.033	7.697***	10.09***
	(4.983)	(5.429)	(5.458)	(3.435)	(2.610)	(3.620)
L5.lnrgdppop	-1.907***	-0.651	-1.378**	-0.761*	-0.995***	-1.271***
	(0.586)	(0.592)	(0.526)	(0.438)	(0.254)	(0.412)
POPgrowth	-0.228	0.310	0.412	-0.859**	-0.579**	-0.185
	(0.512)	(0.410)	(0.588)	(0.346)	(0.240)	(0.306)
POP	2.84e-09	5.69e-09***	3.07e-09**	2.67e-09**	2.84e-09**	2.05e-09**
	(2.12e-09)	(1.56e-09)	(1.22e-09)	(1.06e-09)	(1.14e-09)	(8.44e-10)
csh_g	-3.022	-4.286	-2.920	1.111	-4.620	-0.104
	(4.456)	(4.211)	(4.222)	(4.742)	(3.584)	(2.477)
csh_i	10.30*	12.88**	5.777	-0.786	10.52***	10.21***
	(5.134)	(5.084)	(3.873)	(6.063)	(3.307)	(3.099)
OPEN	0.0334**	0.00125	-0.0105	0.0169	-0.000773	0.00540
	(0.0144)	(0.0171)	(0.0115)	(0.0120)	(0.00916)	(0.0104)
yr_sch	0.232	0.631***	0.427**	0.349**	0.146	0.216
	(0.253)	(0.236)	(0.214)	(0.151)	(0.124)	(0.163)
Inf_cpi	0.00148**	0.00186***	-0.0105	-0.0104	0.148**	-0.00432
	(0.000596)	(0.000250)	(0.0114)	(0.0158)	(0.0707)	(0.0640)
CL	-0.645*	0.537	0.0494	0.748***	0.341*	0.0533
	(0.359)	(0.346)	(0.330)	(0.228)	(0.180)	(0.223)
Observations	64	70	86	96	101	85
R-squared	0.451	0.557	0.221	0.396	0.474	0.300

Robust standard errors in parentheses

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

[Table 10]

VARIABLES	(1) 1975~1979	(2) 1980~1984	(3) 1985~1989	(4) 1990~1994	(5) 1995~1999	(6) 2000~2004	(7) 2005~2009	(8) 2010~2014
emp_new1	0.674	0.753	0.667	-1.320	0.813	-0.184	0.0232	-0.253
	(1.660)	(1.217)	(1.005)	(0.989)	(1.042)	(0.602)	(0.578)	(0.745)
L5.lnrgdppop	-0.943	-1.641**	-1.543***	-0.475	-1.128**	-0.794**	-0.868***	-1.043***
	(0.819)	(0.624)	(0.470)	(0.617)	(0.559)	(0.391)	(0.283)	(0.339)
POPgrowth	-0.291	-1.681**	-0.315	0.288	0.397	-0.811**	-0.609**	-0.251
	(0.491)	(0.733)	(0.477)	(0.471)	(0.562)	(0.317)	(0.236)	(0.263)
POP	-8.38e-10	3.82e-09	2.18e-09	5.33e-09***	2.58e-09**	2.60e-09**	3.10e-09***	2.24e-09**
	(2.42e-09)	(2.41e-09)	(1.98e-09)	(1.70e-09)	(1.18e-09)	(1.04e-09)	(1.08e-09)	(8.70e-10)
csh_g	-0.367	1.814	-2.690	-4.783	-2.766	1.132	-4.792	-0.571
	(5.667)	(4.715)	(4.564)	(4.343)	(4.267)	(4.750)	(3.561)	(2.509)
csh_i	1.798	6.492	9.032*	12.27**	7.443*	0.159	9.944***	10.65***
	(6.918)	(4.952)	(4.734)	(5.146)	(3.860)	(5.845)	(3.346)	(3.136)
OPEN	0.0324*	0.0512***	0.0349**	0.00370	-0.0139	0.0155	0.000344	0.00628
	(0.0174)	(0.0145)	(0.0151)	(0.0198)	(0.0114)	(0.0117)	(0.00948)	(0.00953)
yr_sch	0.342	0.119	0.188	0.472**	0.448**	0.372**	0.141	0.195
	(0.282)	(0.240)	(0.236)	(0.234)	(0.209)	(0.144)	(0.123)	(0.153)
Inf_cpi	-0.0200	-0.00535	-0.00135**	0.00180***	-0.00891	-0.0103	0.152**	0.000785
	(0.0145)	(0.00479)	(0.000602)	(0.000249)	(0.0113)	(0.0155)	(0.0699)	(0.0638)
CL	0.606	0.188	-0.610*	0.537	0.0299	0.733***	0.356**	0.0487
	(0.435)	(0.381)	(0.356)	(0.349)	(0.336)	(0.225)	(0.173)	(0.228)
Constant	6.100	13.51**	14.17***	-0.744	7.214	5.031	6.625**	8.135**
	(5.976)	(5.710)	(3.867)	(5.714)	(6.354)	(3.119)	(2.685)	(3.354)
Observations	54	61	64	70	86	96	101	85
R-squared	0.197	0.491	0.416	0.490	0.204	0.391	0.467	0.276

Robust standard errors in parentheses

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

We also tried ymean_emp in lieu of emp_new1 and the coefficients did not appear much different, even though they are statistical significant in the period of 1995~1999 and 2005~2009.

[Table 11]

VARIABLES	(1) 1975~1984	(2) 1985~1994	(3) 1995~2004	(4) 2005~2014
ymean_emp	0.492	-0.596	-0.486	-0.701
	(1.251)	(0.795)	(0.437)	(0.453)
L10.lnrgdppop	-1.255**	-1.099***	-1.159***	-1.236***
	(0.491)	(0.371)	(0.344)	(0.236)
POPgrowth	-0.982**	-0.148	-0.516*	-0.422**
	(0.452)	(0.530)	(0.296)	(0.167)
POP	2.33e-09	3.44e-09	2.01e-09**	2.07e-09***
	(2.39e-09)	(2.26e-09)	(8.68e-10)	(7.22e-10)
csh_g	-0.0809	-3.572	3.051	-2.729
	(4.642)	(3.009)	(3.777)	(2.177)
csh_i	3.927	10.62**	5.547	10.69***
	(4.744)	(4.680)	(3.581)	(2.947)
OPEN	0.0377***	0.0202	-0.00276	-0.000927
	(0.0126)	(0.0132)	(0.00977)	(0.00809)
yr_sch	0.218	0.250	0.294**	0.219**
	(0.194)	(0.200)	(0.126)	(0.0967)
Inf_cpi	-0.00896	-0.00176***	-0.0185***	0.0797
	(0.00615)	(0.000556)	(0.00649)	(0.0610)
CL	0.320	-0.258	0.329	0.227
	(0.289)	(0.325)	(0.203)	(0.149)
Constant	9.999**	9.018**	8.951***	9.833***
	(4.293)	(3.464)	(2.862)	(2.327)
Observations	59	68	87	101
R-squared	0.388	0.451	0.370	0.445

Robust standard errors in parentheses

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

[Table 4-B]

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
empstandard	-1.420***	-0.751	-1.755***	-1.059**				
	(0.478)	(0.471)	(0.453)	(0.444)				
Empstandard2					-1.448***	-0.766	-1.744***	-1.051**
					(0.486)	(0.478)	(0.463)	(0.452)
L5.lnrgdppop	-4.412***	-1.490***	-4.306***	-1.513***	-4.414***	-1.491***	-4.295***	-1.510***
	(0.516)	(0.239)	(0.498)	(0.236)	(0.515)	(0.239)	(0.497)	(0.236)
POPgrowth	-0.174	-0.286	-0.196	-0.292	-0.174	-0.286	-0.196	-0.292
	(0.374)	(0.245)	(0.369)	(0.243)	(0.374)	(0.245)	(0.369)	(0.243)
POP	8.14e-09***	2.76e-09***	8.46e-09***	2.49e-09**	8.14e-09***	2.76e-09***	8.48e-09***	2.49e-09**
	(1.75e-09)	(1.07e-09)	(2.18e-09)	(1.01e-09)	(1.75e-09)	(1.07e-09)	(2.18e-09)	(1.00e-09)
csh_g	-2.513	-0.789	-2.513	-0.667	-2.513	-0.790	-2.515	-0.666
	(2.196)	(1.972)	(2.440)	(1.993)	(2.197)	(1.972)	(2.440)	(1.992)
csh_i	6.852***	7.542***	7.949***	8.377***	6.851***	7.543***	7.962***	8.377***
	(2.229)	(1.675)	(2.097)	(1.731)	(2.230)	(1.675)	(2.098)	(1.730)
OPEN	0.0459***	0.0221***	0.0516***	0.0213***	0.0459***	0.0221***	0.0516***	0.0213***
	(0.0124)	(0.00658)	(0.0143)	(0.00669)	(0.0124)	(0.00658)	(0.0143)	(0.00668)
deltaTT	8.456***	10.55***	8.877***	10.23***	8.452***	10.55***	8.893***	10.23***
	(1.975)	(1.936)	(2.176)	(1.990)	(1.976)	(1.936)	(2.178)	(1.992)
yr_sch	-0.115	0.311***	0.328**	0.261**	-0.114	0.311***	0.326**	0.261**
	(0.202)	(0.111)	(0.153)	(0.103)	(0.202)	(0.111)	(0.153)	(0.103)
Inf_cpi	0.000809***	0.00102***	0.000876***	0.00109***	0.000810***	-0.00102***	-0.000875***	-0.00109***
	(0.000157)	(0.000142)	(0.000156)	(0.000119)	(0.000157)	(0.000142)	(0.000155)	(0.000119)
CL	-0.127	-0.0610	-0.188	-0.0955	-0.127	-0.0610	-0.190	-0.0961
	(0.130)	(0.111)	(0.127)	(0.106)	(0.130)	(0.111)	(0.127)	(0.106)
Year Fixed Effects	Yes	Yes	No	No	Yes	Yes	No	No
Country Fixed Effects	Yes	No	Yes	No	Yes	No	Yes	No
Observations	539	539	539	539	539	539	539	539
R-squared	0.425		0.389		0.425		0.388	
Number of countrycode	98	98	98	98	98	98	98	98

Robust standard errors in parentheses

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

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Appendix A

country	periods	country	periods	country	periods
Afghanistan	213	Georgia	272	Panama	422
Albania	200	Ghana	526	Papua New Guinea	525
Algeria	526	Grenada	524	Paraguay	525
Angola	267	Guatemala	527	Peru	461
Anguilla	326	Guinea	310	Philippines	414
Antigua and Barbuda	469	Guyana	527	Poland	384
Argentina	527	Haiti	514	Qatar	440
Armenia	294	Honduras	422	Romania	330
Aruba	378	Hongkong	258	Russian Federal	276
Australia	464	Hungary	117	Rwanda	390
Azerbaijan	282	Iceland	526	Samoa	527
Bangladesh	527	India	527	Saudi Arabia	524
Barbados	455	Indonesia	458	Serbia	149
Belarus	277	Iran	105	Seychelles	474
Belize	498	Iraq	522	Sierra Leone	463
Bhutan	389	Israel	431	Singapore	527
Bolivia	527	Jamaica	527	Solomon Islands	482
Bosnia	250	Jordan	513	South Africa	527
Botswana	499	Kazakhstan	294	Sri Lanka	519
Brazil	527	Kenya	421	St. Kitts and Nevis	344
Brunei	196	Kuwait	526	St. Lucia	470
Bulgaria	189	Lao	186	St. Vincent and the Grenadines	470
Burundi	526	Lebanon	524	Sudan	422
Cambodia	281	Lesotho	459	Suriname	422
Cameroon	525	Libya	525	Swaziland	525
Canada	526	Macao	408	Sweden	527
Cape（Cabo） Verdo	354	Macedonia	294	Switzerland	515
Central African Republic	525	Madagascar	527	Syrian	444
Chad	524	Malawi	504	São Tomé and Príncipe	253
Chile	419	Malaysia	519	Tajikistan	122
China	396	Maldives	450	Tanzania	503
Colombia	527	Mauritania	525	Thailand	527
Comoros	398	Mauritius	422	Tonga	347
Congo, Democratic Republic of	521	Mexico	422	Trinidad and Tobago	435
CongoRepublic	525	Moldova	185	Tunisia	518
Costa Rica	422	Mongolia	303	Turkey	527
Croatia	306	Montserrat	407	Uganda	286
Czech Republic	305	Morocco	520	Ukraine	306
Denmark	527	Mozambique	236	Uruguay	527
Djibouti	400	Myanmar	524	Vanuatu	444
Dominica	470	Namibia	210	Venezuela	478
Dominican Republic	526	Nepal	515	Vietnam	279
Egypt	525	Netherlands Antilles	435	Yemen	288
Equatorial Guinea	399	New Zealand	444	Zambia	527
Eritrea	194	Nicaragua	212	kyrgyz Republic	272
Ethiopia	414	Nigeria	522	southKorea	526
Fiji	520	Norway	430	united Arab Emirates	521
Gabon	457	Oman	518		
Gambia	504	Pakistan	527		

Appendix B

Variable	Definition	Sources
GDPgrowth	GDP per capita growth (annual %)	World Bank's World Development Indicators (WDI)
lnrgdppop	Log of Real GDP at constant 2011 national prices (in mil. 2011US$)	Penn World Table (pwt9.0)
POP	Total population	World Bank's World Development Indicators (WDI)
POPgrowth	Population growth (annual %)	World Bank's World Development Indicators (WDI)
yr_sch	Average years of schooling in the population aged 25 years and older	Penn World Table (pwt9.0)
deltaTT	The rate of change of terms of trade, which is defined by exports as a capacity to import (constant LCU)	World Bank's World Development Indicators (WDI)
csh_g	Share of government consumption at current PPPs	Penn World Table (pwt9.0)
csh_i	Share of gross capital formation at current PPPs	Penn World Table (pwt9.0)
inf_cpi	Inflation, consumer prices (annual %)	World Bank's World Development Indicators (WDI)
CL	Political-rights Rating. It is assigned in seven categories, with with one representing the highest degree of Freedom and seven the lowest.	Freedom House (www.freedomhouse.org)
ymean_emp	Estimated de facto flexibility, based on the synthesis equation	All data in synthesis equation are from IMF database
Hnew	Dummy variable indicating the country classification with High Income level. In 5-year averaging panel it was based on winner-take-all principle.	World Bank's World Development Indicators (WDI)
Mnew	Dummy variable indicating the country classification with Middle Income level. In 5-year averaging panel it was based on winner-take-all principle.	World Bank's World Development Indicators (WDI)
Lnew	Dummy variable indicating the country classification with Low Income level. In 5-year averaging panel it was based on winner-take-all principle.	World Bank's World Development Indicators (WDI)
empHnew	Interaction of **ymean_emp** and **Hnew**	
empMnew	Interaction of **ymean_emp** and **Mnew**	
empLnew	Interaction of **ymean_emp** and **Mnew**	
empHnew1	Interaction of **emp_new1** and **Hnew**	
empMnew1	Interaction of **emp_new1** and **Mnew**	
empLnew1	Interaction of **emp_new1** and **Lnew**	

Appendix C-1

>1	Observation No.	>1	Observation No.	>1	Observation No.	>1	Observation No.
Albania	16	Congo, Democratic Republic of	3	Indonesia	12	Rwanda	5
Algeria	4	Congo Republic	20	Iraq	1	Serbia	13
Bangladesh	1	Croatia	7	Kazakhstan	16	Sri Lanka	11
Belarus	12	Czech Republic	16	Lao	6	São Tomé and Príncipe	11
Burundi	7	Dominican Republic	2	Lebanon	2	Tanzania	3
Cambodia	5	Egypt	5	Macedonia	14	Thailand	2
Cameroon	20	Equatorial Guinea	20	Madagascar	21	Uganda	7
Cape（Cabo）Verdo	23	Eritrea	1	Malawi	6	Vanuatu	21
Central African Republic	20	Gabon	14	Mongolia	2	Vietnam	1
Chad	20	Guinea	16	Morocco	16	Zambia	10
Chile	7	Guyana	2	Myanmar	14	southKorea	18
China	14	Hungary	11	Nepal	1		
Colombia	24	Iceland	10	Paraguay	4		
Comoros	20	India	3	Russian Federal	8		

Appendix C-2

<0	Observation No.	<0	Observation No.	<0	Observation No.	<0	Observation No.
Algeria	1	Central African Republic	9	Israel	9	Oman	19
Anguilla	9	Chad	10	Jordan	19	Panama	25
Antigua and Barbuda	20	Comoros	15	Kuwait	20	Peru	25
Argentina	3	Congo, Democratic Republic of	23	Libya	6	Qatar	20
Aruba	19	Congo Republic	9	Macao	18	Rwanda	1
Azerbaijan	6	Dominica	40	Malawi	9	Samoa	25
Barbados	25	Egypt	4	Malaysia	3	Seychelles	2
Belize	20	Equatorial Guinea	2	Mauritius	2	Sierra Leone	5
Bolivia	12	Gabon	10	Mexico	8	St. Lucia	20
Bosnia	4	Ghana	25	Morocco	2	St. Vincent and the Grenadines	40
Botswana	23	Grenada	20	Myanmar	4	Suriname	3
Brazil	20	Guyana	1	Netherlands Antilles	37	Syrian	9
Cameroon	9	Honduras	16	New Zealand	1	Turkey	26

Appendix C-3

>1.5	Observation No.	>1.8	Observation No.	>2	Observation No.
Cameroon	20	Cameroon	20	Congo Republic	6
Central African Republic	20	Central African Republic	20		
Chad	20	Chad	20		
Comoros	20	Comoros	20		
CongoRepublic	20	CongoRepublic	20		
Equatorial Guinea	20	Equatorial Guinea	20		
Gabon	14	Gabon	14		
Macedonia	7	São Tomé and Príncipe	7		
São Tomé and Príncipe	8				

Appendix D

country	totchange	country	totchange
Aruba	0	Saint Kitts and Nevis	0
Afghanistan	4	South Korea	13
Angola	1	Kuwait	2
Anguilla	1	Laos	5
Albania	7	Lebanon	14
Netherlands Antilles	0	Libya	12
United Arab Emirates	0	Saint Lucia	0
Argentina	12	Sri Lanka	15
Armenia	2	Lesotho	0
Antigua and Barbuda	0	Macau	2
Australia	5	Moldova	2
Azerbaijan	10	Madagascar	14
Burundi	26	Maldives	10
Bangladesh	17	Mexico	8
Bulgaria	4	Macedonia	8
Bosnia and Herzegovina	4	Myanmar	16
Belarus	4	Mongolia	4
Belize	2	Mozambique	8
Bolivia	14	Mauritania	12
Brazil	8	Montserrat	0
Barbados	2	Mauritius	4
Brunei	1	Malawi	13
Bhutan	9	Malaysia	14
Botswana	5	Morocco	6
Central African Republic	8	Namibia	0
Canada	0	Nigeria	13
Switzerland	4	Nicaragua	0
Chile	2	Norway	6
China	9	Nepal	5
Cameroon	8	New Zealand	6
Democratic Republic of the Congo	11	Oman	0
Republic of the Congo	12	Pakistan	10
Colombia	14	Panama	0
Comoros	0	Peru	0
Cape Verde	11	Philippines	4
Costa Rica	15	Papua New Guinea	7
Czech Republic	5	Poland	0

Djibouti	0	Paraguay	13
Dominica	0	Qatar	0
Denmark	4	Romania	2
Dominican Republic	10	Russia	6
Algeria	11	Rwanda	13
Egypt	13	Saudi Arabia	0
Eritrea	5	Sudan	3
Ethiopia	8	Singapore	2
Fiji	2	Solomon Islands	13
Gabon	8	Sierra Leone	13
Georgia	1	Serbia	0
Ghana	3	Sao Tome and Principe	2
Guinea	10	Suriname	6
Gambia	13	Sweden	7
Equatorial Guinea	4	Swaziland	2
Grenada	2	Seychelles	15
Guatemala	9	Syria	3
Guyana	22	Chad	8
Hong Kong	0	Thailand	12
Honduras	2	Tajikistan	2
Croatia	1	Tonga	3
Haiti	10	Trinidad and Tobago	3
Hungary	0	Tunisia	6
Indonesia	13	Turkey	10
India	10	Tanzania	6
Iran	0	Uganda	2
Iraq	7	Ukraine	7
Iceland	6	Uruguay	10
Israel	8	Saint Vincent and the Grenadines	2
Jamaica	4	Venezuela	6
Jordan	7	Vietnam	9
Kazakhstan	5	Vanuatu	6
Kenya	14	Samoa	0
Kyrgyzstan	2	Yemen	10
Cambodia	5	South Africa	4
		Zambia	5