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#### Abstract

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## Working Papers on Global Financial Markets

No. 31

# Comparing good and bad borrowing in developing countries - a study of twin cases 

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# Comparing good and bad borrowing in developing countries - a study of twin cases 


#### Abstract

: Some developing countries borrow abroad and experience good growth (above $2 \%$ ), which we call good growth, while others borrow and have poor growth (below $1 \%$ ), which we label as bad growth. The data comprise all 443 available observations of borrowing for one 5 -year period and average growth rates for the following 10-year period. First, we confirm the standard result: The relation between borrowing and growth is negative, but explains little of the variations in the growth rate. Second, we select a subset of 59 twins of LDCs with matching borrowing (shares of GDP) in the same period. One twin has good growth and the other bad growth. The two sets are compared over a total of 12 main indicators from different fields. The good cases occur in countries with more economic and political freedom; also they are somewhat more developed, and have fewer natural resources. While this pattern is strong between samples, it is weak within samples.


## 1. Introduction

The purpose of this paper is to study causes and effects of international borrowing by less developed countries. Only public and publicly guaranteed debt is considered. The borrower is thus the (more or less democratic) ruler of the borrowing country. It is well known - and confirmed in section 3 - that the relationship between official borrowing and future growth is negative. ${ }^{1}$ This is a problematic finding in the light of standard theory.

Economic theory deals with rational agents. This also applies to the rulers that are the borrowers. Below, we classify rulers by time horizon ( $M$ for myopic and $L$ for long) and benevolence (S for selfish and B for benevolent). ${ }^{2}$ The ( $2 \times 2$ ) classification is

[^1]obviously a crude simplification. Section 2 is a brief discussion of the theory of international borrowing against the background of this distinction and within a political economy framework.

Our data consists of cases extending 15 years, with two observations: The borrowing in one 5 -year period and the average growth in the following decade. The full sample consists of 443 such cases from 1971 until 2004. The analysis in section 3 considers the full sample. It replicates recent results from the literature. From the full sample we select the twin sample of 59 matching cases. The selection process divides the observations in cases of good growth above $2 \%$, and bad growth below $1 \% .^{3}$ All intermediate cases and cases with borrowing below $5 \%$ of GDP are disregarded. The twins are then selected as pairs of good/bad cases where the period is the same and the relative borrowing matches. Our search of the data gave 59 twins with a good match. This reduces the data to $26 \%$ of the sample, but controls for the relative size of the borrowing and time, thus allowing us to compare the twin pairs.

Section 4 presents a set of 12 potential explanatory variables that characterize the economic development and the institutions of the countries. Then a set of predictions of the expected results for the twins is developed. Two types of results are considered: Between groups and within groups. The between group analysis disregards the actual borrowing as it is the same pairwise. Thus, it studies if each explanatory variable has a significantly different average in the good and the bad cases. The within group analysis studies if each explanatory variable is correlated to the borrowing.

The comparison of the 59 pairs of good and bad cases is done in section 5 which consider 12 variables (with altogether 18 variants) that characterize economic development and the economic and political system. The between country results are rather strong, but have a problem. It is possible that the good and bad cases are so, for reasons that have nothing to do with the borrowing. This possibility is termed independence in the paper. The within group results are weaker and actually points to independence, though not to full independence. A main pattern found is: good cases occur

[^2]more often in countries that are relatively wealthy, liberal, ${ }^{4}$ democratic, and have fewer resources. Thus, more dictatorial and regulation prone countries relying more on resources are more likely to go through bad debt.

Figure 1 is a first perspective on the data. They show a debt cycle for about forty years, which has considerable proportions where debt rises to no less than $85 \%$ of GDP, and then falls back to the moderate level from which it started in the early 1970s. Most of the fall is due to debt forgiveness, which took off in the 2000s.

Figure 1. The debt cycle from 1971 to 2009 in the developing world


Note: The data are for all the 70 LDCs where complete data are available. The debt crisis of 1982 is indicated. It has a surprisingly weak relation to the paths of the two curves.

[^3]
## 2. A positive theory of official foreign debt

The theory of foreign borrowing sees borrowing as an expansion of the choice set of rulers: Some of the extra choices are better for people. They are chosen by LB-ruler (long-sighted and benevolent). Others are better for the ruler in the short run. They are chosen by MS-ruler (myopic and selfish).

### 2.1 The theory of rational debt and the debt cycle

Figure 1 shows a large scale debt cycle in reality, which can be backed by the literature. It presents a concise theory of a debt cycle, from Kindleberger (1963, pp. 458-461) and Siebert (1987, 1989). It is based on an interpretation of the history of western countries in the $19^{\text {th }}$ century. The theory of the debt cycle is summarized in Figure 2. It distinguishes four stages of development on the basis of the net foreign wealth position and thereby links development to the balance of payments. The country (or its agents) borrows from abroad. ${ }^{5}$ This leads to capital inflows that are (fully or partly) invested into profitable activities. Thus, the financial budget constraint is shifted outwards. ${ }^{6}$ If successful, these activities lead to future sales abroad, with which the country repays the debt.

[^4]Figure 2. The debt cycle in theory


Source: Kindleberger (1963, p. 460), own modifications.

During the debt cycle, a country goes through four stages with respect to its net foreign position. ${ }^{7}$ First, the country builds up a negative foreign wealth position (phase I and II). As young debtor country (phase I), the country runs a net capital inflow, a trade deficit and a deficit in the balance of capital yields (i.e., a current account deficit) because foreigners demand a return on their net assets. The capital inflows are invested, so that the country is able to increase future sales abroad and to finance further investment from own savings. This can be generalized using the intertemporal approach to the balance of payments, implying that the capital account is driven by saving-investment decision. As an aggregate result of individual as well as official foreign borrowing or lending, a current account balance occurs (Obstfeld and Rogoff 1994).

Public debt does not earn a profit but can be well invested to enable tax-paying firms to achieve yields. Examples for such public investments are roads, ports, airports,

[^5]hospitals, schools and the like. The capacity built up with private investment is used to produce internationally competitive goods and services. Then the country becomes a mature debtor country, running a trade surplus to diminish its liabilities. During this phase (II), the country already exports capital. Once the net wealth position is positive, the country becomes a young (III) and later a matured creditor (IV) country. In the last phase, the country does no longer export or import capital, but runs a trade deficit, financed by capital income inflows. Thus the standard economic theory of rational debt predicts:
(R1) Debt cycles should have the phases of Figure 2.

### 2.2 Rational debt and the theory of economic growth

This picture can be further rationalized by the theory of economic growth. Growth theory considers production $Y=Y(A, H L, K)$, where the factors of production are $A$; technology, $H$; human capital times; $L$; exogenous labor; and $K$ is (physical) capital. The key to growth is the three investment variables: $\mathrm{Z}=\Delta A$, innovation, $E=\Delta H$, education, and $I=\Delta K$, capital investment.

In the theory of rational debt borrowing is a way to finance these investments. Assume that the growth path with and without borrowing is $Y_{t}^{B}$ and $Y_{t} \approx Y_{t}^{A}$ respectively, where $Y_{t}^{A}$ is an estimate of the $Y_{t}$-path. The funds, $B$, borrowed at time $t=0$ are wisely spent if:
(1) $B<\int_{0}^{\infty}\left(Y_{t}^{B}-Y_{t}\right) e^{-r t} d t \approx \int_{0}^{T}\left(Y_{t}^{B}-Y_{t}^{A}\right) e^{-r t} d t$, where $r$ is the interest paid on the loan.

The first integral is the theoretical model, while the second is the one used in the study. Here, $T$ is the time horizon used in the study and $Y_{t}^{A}$ is the estimate of the $Y_{t}$-path.

The theory assumes that the country grows along a stable growth path, and that the borrowing is used to finance a transition to a higher path. The theory can be supplemented with institutional variables: A strong legal system supporting property rights is an obvious precondition for private sector investments in innovation and
physical capital. However, the key to rational borrowing is that the ruler uses the funds borrowed to improve the long-run growth of the country, so that (1) is met. ${ }^{8}$ The most extreme version of (1) occurs if the borrowing country is caught in a low-level equilibrium trap, and the funds borrowed allow the country to escape from the trap. Then it is surely easy to fulfill (1). With a developed international capital market a range of $B s$ is available. The possible $Y_{t}^{B}$-paths are thus a wide choice set. It is likely that some of these paths fulfill (1), for positive $B$-values, especially if the country can borrow at low interest rates, $r$. Such paths are the ones of good borrowing. As future paths are uncertain in any case, LB-rulers are the ones that choose good paths more often than not.

Empirical studies use historical time series, with data for the $T$ years of the time horizon used. Hence the $Y_{t}^{B}$-path is observed. However, the $Y_{t}$-path is not observed, but has to be estimated. Therefore, all empirical studies use some average path, $Y_{t}^{A}$, as the $Y_{t}^{-}$-path. Maybe, the average is controlled for country heterogeneity, but it is difficult to estimate a perfectly controlled $Y_{t}^{A}$-path. The uncertainty of the future and the estimation problems for the $Y_{t}$-path adds noise, but the standard rational economic theory still predicts that rulers of the LB type, will generate:
(R2) Borrowing and growth are positively correlated.

### 2.3 The gulf between empirics and the theory

The theory of rational debt leading to the predictions (R1) and (R2) appears to be separated by a big gulf from the standard empirical findings (E1, E2a and E2b respectively).
(E1) The debt cycle in Figure 1 has three phases: (I) First a wide range of LDCs from low to middle income borrowed heavily for a period of about 20 years. (II) During the last 10 of these years and the next 10 years the debt is consolidated and rescheduled, and it becomes gradually clearer that the indebted countries cannot repay.

[^6](III) During the last 10 year most of the debt is written off. ${ }^{9}$ It appears that most private lenders have been compensated as the debt canceled was largely (if not fully) repaid from development aid. This debt cycle is very different from (R1), which is the rational debt cycle. If borrowers and lenders had perfect foresight, an extortion story of development aid emerges, where future aid is being grabbed by the most reckless borrowers in cooperation with the international capital market. This explanation is clearly not consistent with a rational incentive structure. An alternative story relies on myopia by all parts involved, when short run considerations gradually drive everybody into an untenable situation, which is then solved by the use of development aid (and debt relief).

The picture of an irrational outcome is reinforced when we turn to the growth theory prediction (R2) that borrowing and growth are positively correlated. Here many studies show:
(E2) The correlation between borrowing and growth is negative. The negative findings applies to both (E2a) borrowing $B$ and growth and at (E2b) initial debt $D$ and growth, see Paldam (2008), and section 3 below. It appears that both results are sufficiently strong to survive all attempts to polish the $Y_{t}^{A}$-path. Interestingly it appears that the negative correlation (E2a) between borrowing and growth is more pronounced than the negative correlation (E2b) between initial debt and growth. Much theory has been developed to explain (E2b) while the explanations of (E2a) are less developed.
(E2a) deals with the reasons why countries acquire debt. To explain the negative correlation, it appears necessary to assume that most countries borrow when they are in a political-economic crisis which necessitates painful adjustment. A loan may allow the country to evade the pain. However debt accumulates if adjustments fail to be made. Figure 3a shows the good debt case a, where the funds borrowed are used wisely, and the $Y^{\beta}$-path is above the old $Y$-path, especially after $T$, where the loan is repaid. In case 3 b , the funds are used to generate a short-run rise of the $Y^{B}$-path instead

[^7]of a downswing. However, once the loan is spent and has to be paid the $Y^{\beta}$-path falls below the $Y$-path, and then perhaps a second loan is made. Figure 3 b is more in line with the data than Figure 3a.

Figure 3. The path of consumption with no borrowing and with borrowing


(E2b) is the debt overhang story (Corden 1991), which shows that accumulated debt is harmful to future growth for a variety of reasons. This theory treats debt as exogenous and considers the consequences. The channels for growth reduction are decreasing capital accumulation, higher future taxes, rising interest rates, and increasing inflation, see e.g. Barro (1991). In addition, the level of uncertainty about policies is increasing with rising official debt (Kumar and Woo 2010, pp 5-10). In other words, increasing public debt is decreasing growth mainly via a crowding-out effect. This view is well documented and empirically tested (see 3 below). If debt is too high in LDCs, the debt overhang reduces the growth prospects (Freytag and Pehnelt 2009).

The simplest explanation of the gap between the theory and the empirical results is time inconsistency, arguing that the loans are made with a long time horizon while both borrowers and lenders have a much shorter horizon. The next section develops this argument by calculation the cost of money borrowed as a function of the
political rate of discount and the interest rate. This idea reject that most rulers are of the LB-type.

### 2.4 Myopic politics: The cost of the loan at time $t=0$

Assuming that country $C$ has the option to borrow $B$ on the international market at the annual real rate of interest, $r$. Three simplifying assumptions are made: (i) The loan is fully fungible, so it provides the ruler with the amount B to use, as he pleases. (ii) The loan runs $T$ years, and then it has to be paid in full. (iii) The rate of exchange is adjusted, so that $C$ has the same inflation rate as the world. It is set at zero, so that everything is real. The decision on the loan is taken, at time $t=0$, by $C$ s ruler. The ruler has the rate of discount $\rho$, which differs from the real rate of interest: $\rho \neq r$. This is precisely where time inconsistency enters. Calculated at the time the loan is signed, $t=$ 0 , the cost of the loan, for the ruler per $\$$ borrowed is:
(2) $\beta=e^{-\rho T}+r \int_{0}^{T} e^{-\rho t} d t$

The first term is the cost of repayment and the second is the costs of the interest to be paid. A simple calculation shows:

$$
\begin{equation*}
\beta=e^{-\rho T}+r\left[\frac{e^{-\rho t}}{-\rho}\right]_{0}^{T}=e^{-\rho T}+\frac{r}{\rho}-\frac{r}{\rho} e^{-\rho T}=z+(1-z) e^{-\rho T}, \text { where } z=r / \rho \tag{3}
\end{equation*}
$$

The values of $\beta$ for a range of $z$ 's are shown in Figure 4. Note that $\beta>1$, if $z<1 ; \beta=1$, if $z=1$; and $\beta<1$, if $z>1$. It is also obvious from formula (1).

Figure 4. The political cost per unit of money of a loan, at time $t=0$


Notes: The curves are calculated from $\beta=z+(1-z) e^{-\rho T}$, using the interest rate $r=0.04$. For

$$
T=\infty, \beta=z .
$$

Equation (4) shows that when $T$ rises the second term quickly vanishes. It does not matter how long the loan runs if the politicians are myopic anyhow. This is also illustrated in Figure 4, as the line for $T$ infinite, where $\beta=z$.

Many studies of political decision processes show that they are myopic. ${ }^{10}$ Political pressures are big and power is uncertain. Thus $\rho$ is assumed to be substantial. It is important that this predicts that $\rho>r$, and thus that $z<1$. The key observation is that when the political system is myopic the cost $\beta$ of a $\$$ borrowed is smaller than a $\$$, because the cost of repayment has to be borne far into the future. Consequently, the interesting part of the figure is the right hand side, where $G_{B}$ is myopic. Already for the political discount rate, of $\rho=10 \%$ the cost of borrowing one $\$$ is 50 cents for a loan with $T=20$, and for more realistic rates such as $\rho=20 \%$ the cost is 25 cents, and it

[^8]barely matters if $T$ is 20,50 or 80 years. ${ }^{11}$ For really myopic rates such as $40 \%$ or $50 \%$ the cost estimates are 15 to 10 cents.

Let us then imagine that the political costs of a loan is $\$ 0.25$ per $\$$ borrowed. Thus, the borrowing ruler has a surplus of $\$ 0.75$ for each $\$$ borrowed. Borrowed money is cheap money for the ruler. Contrast this with the political costs of a tax revenue that has to be squeezed out of people: we assume that the ruler faces much higher political cost for tax revenues than for taking a loan abroad. There are several reasons for this assumption: first, many developing countries have only weak revenue collecting authorities. Second, raising taxes in a democracy is always a problem

People should control rulers so that they act wisely. However, we know that people are as politically myopic as rulers, and they are not likely to take much notice of an international loan, as taxes remain constant and the borrowing does not refer to domestic savings. They are content if they get welfare enhancing public consumption for some part, $\alpha$, of the amount. Thus the ruler "profit" from each $\$$ borrowed is:

$$
\begin{equation*}
\gamma=1-(\alpha+\beta)>0 \tag{4}
\end{equation*}
$$

When the ruler borrows $\$ B$ it thus has a profit of $\$ \gamma B$. The reader may contemplate what the ruler will do with that profit. It obviously depends upon its degree of benevolence. Hereby, we have reached the ( 2 x 2 ) classification of rulers from the introduction.

### 2.5 The (2x2) types of rulers and economic systems

The M/L distinction deals with the time horizon of rulers. It is modeled from the relation between the political discount rate and the real interest rate. An M-ruler has $r<\rho$, while an L-ruler will try to meet the condition $r \geq \rho$, leading to $z \geq 1$.

An MS (myopic and selfish) ruler may distribute the money as rents for shortrun political support, for conspicuous consumption, to build a nicer presidential palace, or simply pocket the money, sending them off to a safe haven. An LB (longsighted and benevolent) ruler will invest the money in growth, but build mechanisms so that he himself profit from that growth. Obviously a MS-ruler is bad for development, but it is less obvious for an LB-ruler.

[^9]We do not have data for the benevolence of governments, but the main idea of democracy is that it is a mechanism to 'force' rulers to be benevolent. It is not, of cause, a perfect mechanism in this respect, but our study assumes that 'benevolence' is proportional to the indices of democracy used. The phrase benevolent is not compatible with a textbook style benevolent dictator. The benevolence is enforced by democratic elections. In order to benefit from his behavior, the LB-ruler has to consider the long run as well as the return on public investment, thus a higher likelihood of $r \geq \rho$.

Reinhart and Rogoff (2009) document a large number of instances of sovereign default, i.e., where a sequence of rulers have generated unsustainable debt burdens. Many of these cases have taken place under democratically elected rulers. One of the research questions taken up below is the effect of the degree of democracy on the development effect of the debt.

The discussion so far has given arguments why some rulers may use borrowed funds well and others may use them badly. As already mentioned we ask, do democracies use borrowed funds better? A related factor is economic development. More developed countries have more education and hence a stronger pressure for transparency on the political decisions. Consequently, we have chosen a set of development indicators.

It has often been discussed if capitalism and free trade enforce better policies or if more planned and controlled systems are more efficient. Our study consequently ask: Do more market oriented or more regulated economies use borrowed fund better? We return to these issues in section 4 which presents the variables analyzed and a set of concrete hypothesis tested in section 5 .

## 3. A look at all cases: A weak negative relation

The data used are all public and publicly guaranteed debt as a share of GNI from 1970 to 2004, from the WDI (data sources). The real growth rates are from the Maddison data set. All countries designated as a LDC in the WDI are included. These data con-
tains 443 cases of borrowing in one 5 -year period and the economic growth in the next decade. ${ }^{12}$ The cases are listed in Table 1.

Table 1. Counts of all 443 observations and the 263 cases with borrowing

|  | P1 | P2 | P3 | P4 |  | P5 |  | All |  | In $\%$ |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Borrowing, $b$ | $1971 / 75$ | $1976 / 80$ | $1981 / 85$ | $1986 / 90$ | $1991 / 95$ |  |  |  |  |  |  |  |
| Growth, $g$ | $1975 / 84$ | $1980 / 89$ | $1985 / 94$ | $1990 / 99$ | $1995 / 04$ |  |  |  |  |  |  |  |
|  | All | Pos | All | Pos | All | Pos | All | Pos | All | Pos | All | Pos |
|  | All | Pos |  |  |  |  |  |  |  |  |  |  |
| Good growth | 25 | 8 | 15 | 9 | 24 | 20 | 38 | 18 | 49 | 19 | 151 | 74 |
| 34.1 | 28.1 |  |  |  |  |  |  |  |  |  |  |  |
| Intermediate | 11 | 4 | 13 | 11 | 17 | 16 | 12 | 7 | 24 | 7 | 77 | 45 |
| 17.4 | 17.1 |  |  |  |  |  |  |  |  |  |  |  |
| Bad growth | 40 | 20 | 50 | 43 | 46 | 40 | 47 | 28 | 32 | 13 | 215 | 144 |
| All cases | 76 | 32 | 78 | 63 | 87 | 76 | 97 | 53 | 105 | 39 | 443 | 263 |

Note: see text.

### 3.1 All 443 observations and two divisions

The cases found are divided by period and within each period in two ways which are used in the rest of the paper:

By growth, $g$ : It is $\operatorname{good}(g>2 \%)$, intermediate $(2 \% \geq g \geq 1 \%)$ and $\operatorname{bad}(g<1 \%)$. By borrowing, $b$ : all and positive ( $b>5 \%$ ).

Borrowing is calculated as the difference between the debt burden at the last year of the period and the year before the period. Some countries have falling GDP and thus debt burdens rise, but by setting $\mathrm{b}>5 \%$ all cases counted as pos are actual cases of borrowing.

Figure 5 shows the scatter of the two data in the 443 cases. It uses a kernelregression (with the properties indicated). A kernel regression can be understood as a moving average with a fixed bandwidth - with a small bandwidth the curve becomes quite jerky, and with a high bandwidth it becomes flat, but from about 5 to 20 the picture is rather like the one shown. The Epanechnikov kernel used has good smoothing properties, but the result is the same using other kernels. It shows the best continuous moving average curve with a fixed bandwidth. The curve appears to be fairly linear

[^10]throughout the full range with a downward slope of about -0.1 to -0.15 per 10 pp borrowing.

Figure 5. A scatter of the 443 cases, and the choice of good and bad cases


The average growth rate at zero debt is very close to $1.5 \%$. Hence we chose $1 \%$ and 2 $\%$ as our cut off points: ${ }^{13}$ The two horizontal dotted lines on the figure show the selection by growth, and the vertical dotted line show the cut-off point for the pos-debt cases.

Several authors - notably Reinhart and Rogoff (2010) - identify a vertical part from zero borrowing to some point X , before the curve turns down. Hence, Figure 5 shows that $\mathrm{X} \approx 0.25$, so that it matters little for growth to increase debt by $25 \%$ of GDP in the next 5 -year period, but it is not obvious if the flat section is significantly

[^11]different from the simple linear trend. The fluctuations in the kernel-curve for borrowings above $50 \%$ is supported by so few observations that they are certain to be insignificant. If the observations above $50 \%$ borrowings are disregarded the slope is smaller - clearly below -0.1.

### 3.2 Do the frequencies of good and bad borrowing differ by the size of borrowing?

Table 1 shows that there are twice as many bad as good cases. Figure 6 shows the frequency distribution of good and bad debt increases. For borrowings between $5 \%$ and $10 \% 25$ bad and 13 good cases were found. From $10 \%$ to $55 \%$ are 17 bad and 11 good cases, etc. The strange observation from Figure 6 is that the relation between the bad and the good cases remains fairly constant throughout the range. The explanation may be that the international markets have a certain feeling about the proper debt-to-GDP-ratio, so that ratios beyond 60 per cent are rarely observed, as they are (justified or not) not regarded as being of advantage.

Figure 6. The frequencies of borrowings from $5 \%$ and up, in 20 intervals


When the project started, we have looked for an optimal debt acquisition, so that it paid to borrow up to a point - but if too much debt was incurred it would create trou-
ble in the longer run. One may imagine that debt could overwhelm the decision process and run away. So we expected to find two very different curves where the bad cases peaked much later than the good debt cases. However, the lines are virtually proportional. This possibility was tested by estimating a slope in the relative ratio. It is not significant.

### 3.3 Some linear regressions generating orders of magnitudes: All observations

In the following, we test, whether a standard result of the literature also applies to our dataset, namely that growth is negatively correlated with public debt. In the literature, the usual way of testing it is to regress the growth rates since 1960 on public debt and a number of other standard variables. We look at 5 years of debt increase and 10 subsequent years of growth. Despite this alteration, Table 2 shows that the results of a set of regression between debt and growth are comparable to the standard ones.

Table 2. The growth effect of $10 \%$ borrowing

| T-ratios based upon <br> Robust standard errors | OLS <br> $(1)$ | GLS RE <br> $(2)$ <br> Estimates of equation (5) | FE coun- <br> $(3)$ | FE time <br> $(4)$ |
| :--- | :---: | :---: | :---: | :---: |
| Growth effect: $10 \cdot \beta_{1}$ | -0.050 | -0.043 | -0.013 | -0.040 |
| t-ratio | $(-2.6)$ | $(-2.4)$ | $(-0.7)$ | $(-2.2)$ |
| $\mathrm{R}^{2}$ within | - | 0.006 | 0.002 | 0.006 |
| $\mathrm{R}^{2}$ between | - | 0.270 | 0.051 | 0.270 |
| $\mathrm{R}^{2}$ overall | 0.010 | 0.010 | 0.010 | 0.010 |
| N | 443 | 443 | 443 | 443 |
| Nr of random/fixed effects |  | 5 | 108 | 5 |
|  | $(5)$ | $(6)$ | $(7)$ | $(8)$ |
|  |  | Estimates of equation (6) |  |  |
| Growth effect: $10 \cdot \beta_{2}$ | -0.023 | -0.019 | -0.015 | -0.013 |
| t -ratio | $(-1.7)$ | $(-1.8)$ | $(-0.9)$ | $(-1.0)$ |
| Growth in same period as debt | $\mathbf{0 . 2 9 6}$ | 0.064 | -0.027 | 0.318 |
| t -ratio | $(5.3)$ | $(1.3)$ | $(-0.6)$ | $(5.5)$ |
| Long-run effect, $10 \cdot \beta_{2} /(1-\gamma)$ | -0.033 | -0.020 | -0.015 | -0.019 |
| $\mathrm{R}^{2}$ within | - | 0.000 | 0.003 | 0.088 |
| $\mathrm{R}^{2}$ between | - | 0.200 | 0.052 | 0.014 |
| $\mathrm{R}^{2}$ overall | 0.080 | 0.071 | 0.013 | 0.080 |
| N | 435 | 435 | 435 | 435 |
| Nr of random/fixed effects |  | 5 | 108 | 5 |

Note: OLS is ordinary least square, GLS is generalized least square, RE and FE are random and fixed effects. Regressions (2), (3), and (4) use the panel structure, while it is disregarded in (1). The loss of 1.8 $\%$ of the observation between the upper and the lower panel has no effect on the three first digits of the estimates.

The panel consists of 443 observations for $i=108$ countries and $t=5$ periods. Two equations are estimated:

$$
\begin{align*}
& g_{i t}^{10}=\alpha+\beta_{1} d_{i t-1}^{5}+u_{i t} \quad \text { or }  \tag{5}\\
& g_{i t}^{10}=\alpha+\beta_{2} d_{i t-1}^{5}+\gamma g_{i t-1}^{5}+v_{i t}, \text { where } \beta_{1} \approx \beta_{2} /(1-\gamma) \tag{6}
\end{align*}
$$

Here $g^{n}$ is the average real growth rate per capita for a period of $n=5,10$ years, and, $d^{5}$ is the debt share increase over a 5 -year period. Model (6) is the dynamic version of
model (5) that gives a check of the estimated effect $\beta_{1}$. Due to the lags in (6) only 435 observations can be used in the regressions.

The regressions in Table 2 are simple, but they already tell a story. As expected from Figure 5 and in accordance with the literature there is a negative, but not always significant relation between debt accumulation in one 5 -year period and the subsequent growth in the coming decade. The (numerically) largest coefficient found on debt is -0.05 . This is only $1 / 3$ of the effect assessed from Figure 5 - the difference is due to the concentration of observations between borrowings $-5 \%$ and $30 \%$ where the kernel-curve does have a rather flat slope. This implies that even if debt goes up by $100 \%$ of GDP, it will still only cause a loss of average growth in the next decade of 0.5 pp per year. Once the equation contains fixed effects for countries it vanishes, and it falls if the lagged endogenous is included. The $\mathrm{R}^{2}$-score is only 0.010 . The variation in borrowing is not a major factor explaining the growth rate.

The only really strong result in Table 2 is that the sign to the debt burden is negative in all 8 regressions. So, in line with the recent literature we conclude that the effect of debt acquisition is negative, but rather small. This may be due to the many relief packages received by the borrowers. While the dire effects of high indebtedness can be calculated - the world is not so gruesome as to actually enforce these effects.

Table 3. Regression (1) from Table 2 for good and bad cases

| T-ratios are based upon Robust standard errors | Good growth > 2 \% |  | Bad growth < 1 \% |  |
| :---: | :---: | :---: | :---: | :---: |
|  | OLS, all | OLS, -3 | OLS, all | OLS, -2 |
|  | (1) | (2) | (3) | (4) |
| For all values of borrowing |  |  |  |  |
| Growth effect, $10 \cdot \beta_{1}$ | -0.050 | -0.026 | -0.024 | -0.075 |
| t-ratio | (-1.8) | (-1.2) | (-1.1) | (-2.5) |
| R ${ }^{2}$ | 0.003 | 0.007 | 0.011 | 0.030 |
| N | 151 | 148 | 215 | 213 |
|  | (5) | (6) | (7) | (8) |
| For borrowing $\mathrm{b}>5 \%$ |  |  |  |  |
| Growth effect, $10 \cdot \beta_{1}$ | -0.71 | -0.040 | -0.013 | -0.63 |
| t-ratio | (-1.6) | (-1.4) | (-0.8) | (-1.4) |
| $\mathrm{R}^{2}$ | 0.008 | 0.015 | 0.004 | 0.017 |
| N | 74 | 73 | 144 | 142 |

The data for Figure 5 are used to calculate Table 3 which considers the cases with growth rates over $2 \%$ and under $1 \%$ separately for equation 6 . The bottom part of the table looks only at the pos cases with borrowing $\mathrm{b}>5 \%$. The first observation is the $\mathrm{R}^{2}$-scores which are still very low. The second observation is that all eight estimates are negative, but only one passes the usual criteria for statistical significance. The bad or good cases do not differ systematically.

### 3.4 The choice of the 59 pairs of twins

The data holds 74 good cases. For each of these cases we want to choose a twin that fulfills two criteria: (i) The twins are for the same period; and (ii) the debt share increase matches. Over most of the range, the difference between the two cases is just a couple of percentage points, but to get pairs of cases with borrowing above $100 \%$ twins have been accepted with a difference up to $30 \%$.

Table 4. Count of countries for the 59 twins

| Countries with | All cases | All good | All bad | Mixed |
| :--- | :--- | :--- | :--- | :--- |
| 1 case | 39 | 22 | 17 |  |
| 2 cases | 23 | 7 | 11 | 5 |
| 3 cases | 11 | 5 | 4 | 2 |
| Number countries | 73 | 34 | 32 | 7 |

By criterion (i) six good cases are lost and by (ii) nine cases are lost, so we end up with 59 twins. As will be demonstrated in section 5, the selection gives very much the same average. Most tests use the logarithms to borrowing which makes the scatter around the average line look even better, and also the correlation increases to 0.997 . The appendix lists the 59 pairs. The 59 twins are 118 cases. As seen in Table 4, the cases are from 73 countries. Of these countries 39 have one case; only 23 have 2 of which 5 are one good and one bad. In 11 countries there are 3 cases, of which 2 have both bad and good cases.

## 4. A set of hypotheses

The empirical strategy is made to use the difference between the between group variation and the within groups variation. This is used to analyze the causality of the relations, vs independence. If the variation found is independent of the borrowing it is termed independence.

### 4.1 Two key dimensions in the empirical strategy

The between group tests are easy to do as the groups are controlled for borrowing, as each pair has the same borrowing relatively. They are also controlled for period as each pair is from the same period. However, measured by the growth rate one group is successful and the other unsuccessful. A clear pattern of between group differences is found. This may have two explanations: (1) The members of the good group put the loans taken to a good use, and the bad group members squander the loans. (2) The difference between the groups is independent of loans taken.

The tests for the between groups differences are done by classical methods of statistics on each indicator - the results are presented in Tables 7 and 8. Also, everything is controlled by distribution free tests. Also the size of the effects is documented the strong pattern is not just statistically significant, but has a substantial size. The analysis of dependence/independence is done on the within group variations. The idea is that if borrowing is important for the pattern of the between-group variation, then surely the size of the borrowing will matter. If the outcome within the group is correlated with the size of the borrowing it should increase the effect found in the between group analysis.

Table 5 divides the indicators analyzed in three groups according to a different set of hypotheses: H1 deals with economic development, H2 with institutions, and H3 with miscellaneous factors. The next two subsections consider these groups.

### 4.2 Borrowing and H1: economic development and H3 miscellaneous variables

We consider both borrowing dependence and independence. As regards economic development the case is clear: Since the choice of the groups is based on a growth differ-
ence, development should be better for all growth related variables in the good group than in the bad group. Thus, the investment share is expected to differ.

Also, income should be higher in the good group - hopefully the difference in income is small, but it appears inevitable that income is higher in the successful countries. Given that income is higher, urbanization should also be higher.

We know that more open countries grow more, so openness should be higher in the good cases. Also, part of the borrowing may have been to alleviate the short run costs of adjustment, such as the borrowing related to structural adjustment. This should further cause the openness to be higher in the good cases.

When the within group variation is considered, we expect that the more the good countries borrow the better it goes, and the more the bad countries borrow the worse it goes. If there is independence, there should be no within group variation. So the correlations between borrowing and the four development indicators should be zero.

### 4.3 Borrowing and H2 economic and political institutions

The general idea is that the countries with "good" institutions develop faster and use the funds it borrows better. In connection with financial crises such as the Asian crisis between 1997 and 1999, and the recent one 2008-10, many observers have called for more regulation, so perhaps higher economic freedom would appear in the bad cases. However, most previous studies let us to expect the opposite result: Thus, for the economic freedom index it is expected that the more liberal (in the European sense) the countries are, the faster they develop. Countries mired in regulation are also much more likely do use borrowed money as a stopgap measure to delay reforms, to finance SOEs (state owned enterprises) that eat money, etc. This is also the likely effect within groups. As regards the first difference to the economic freedom index, we expect that countries may borrow to help overcome the short-run social costs of liberalizations.

It is more interesting to analyze the effect of political institutions. The effect is analyzed using the standard democracy indices. These indices are independent of the growth rate, see Doucouliagos and Ulubasoglu (2008). However, the good countries are richer and that will make them a little more democratic, but at the income level of
the countries analyzed the effect should be low, see Gundlach and Paldam (2012). The main reason to expect a connection to democracy in the between results is that democratic systems are more transparent, and it is more likely that rulers will come to answer for their acts, including the use of funds borrowed. Thus the good cases may have more democracy: The first difference series may be more positive in the good cases than in the bad ones.

Finally, the ethnic fractionalization index should be higher in the bad cases, as it is a factor making good economic policies more difficult to implement.

### 4.4 Borrowing and H3: miscellaneous variables

The three indicators in the miscellaneous group are population, latitude and a dummy for resource richness. As regards population it is well-known that there is no relation between economic growth and the size of the population, so no effect is expected here. Latitude is a simple measure of distance from the equator. In line with many studies, such as Gallup et al (1999), countries closer to equator should have a development disadvantage. Finally, by the resource curse theory, countries with resources should develop less well. Both for the latitude and the resource variable, we expect the within group variation to be the same as the between group variation.

Table 5. The effect on growth, between groups and within groups

| Indicators variable see Appendix for exact definition and sources | Between groups | Within |  |
| :---: | :---: | :---: | :---: |
|  |  | good | bad |
| H1 Economic development | + | + | - |
| H1.1 Income, logarithm (natural) to GDP per capita | + | + | - |
| H1.2 Investment share of GDP (in \%) | + | + | - |
| H1.3 The degree of urbanization (in \%) | + | + | - |
| H1.4 The degree of openness ( $\mathrm{X}+\mathrm{M}$ )/Y (in \%) | + | + | - |
| H2 Economic and political institutions | + | + | + |
| H2.1 Economic Freedom Index from Fraser Institute: 3 variables Rising index is more freedom (scale 1 to 10 ) | + | + | + |
| H2.2 The Political Rights indicator from the Gastil democracy index Falling index is more rights (scale 1 to 7) | - | - | - |
| H2.3 The Civil Liberties indicator from the Gastil democracy index Falling index is more rights (scale 1 to 7 ) | - | - | - |
|  |  | Pag |  |


| H2.4 | The Polity index. Rising index is more democracy (scale -10 to +10$)$ | + | + | + |
| :---: | :--- | :---: | :---: | :---: |
| H3.5 | The Ethnic Fractionalization index | - | - | - |
| H3 Miscellaneous | 0 | 0 | 0 |  |
| H3.1 | Population. No expected effect | + | + | + |
| H3.2 | Latitude, i.e., distance from equator | - | - | - |
| H3.3 | Resource richness. Binary. Expectation resource curse | - |  |  |

## 5. Comparing the 59 twins

The statistical analysis is reported in three tables: Table 6 gives some descriptive statistics based on the two groups. Table 7 analyzes the differences between groups, and finally Table 8 looks at the correlations between borrowing and the variables within the two groups. Columns (1) to (3) are the same in all three tables; (1) is series number, where the two D-series are the ones defining the groups, while the 13 H -series are the case characteristics that may differ. When a series has a non-normal distribution it is put in []-brackets and a logarithmic version is added. Note from column (3) that some of the series miss observations. However, all calculations are made for as many observations as are available.

### 5.1 The cross-group descriptive statistics

Table 6 reports some descriptive statistics based on the two groups. Column (4) is a summary of the analysis of the normality of the distribution in Freytag and Paldam (2010). This analysis is rather bulky as each line summarizes 3 tests and a graph for each of the two series. ${ }^{14}$ The tests done in columns (4) and (5) in Table 6 demand normality to be valid, but they are not very sensitive. If the test results are not very close to the test limits the tests can be trusted even in the cases where the normality is dubious. Columns (5) and (6) give the averages and the standard errors for the good and the bad cases.

[^12]Table 6. Descriptive statistics for the variables

| (1) | (2) <br> Variable | (3) $\mathrm{N}$ | (4) <br> Distribution Is normal | (5) <br> Good cases Average (s.e.) | (6) <br> Bad cases <br> Average (s.e.) | (7) <br> Difference <br> Diff (s.e.) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | D: Selection of cases: Results are check of selection |  |  |  |
| [D1] | Borrowing | 59 | No | 35.42 (5.55) | 36.00 (6.07) | -0.58 (4.10) |
| D1 | Ln borrowing | 59 | OK | 3.108 (0.12) | 3.103 (0.12) | 0.006 (0.084) |
| D2 | Growth | 59 | Dubious | 3.56 (0.17) | -1.08 (0.22) | 4.64 (0.25) |
|  |  |  | H1: Economic development indicators |  |  |  |
| [H1.1] | GDP per capita | 59 | No | 2845 (277) | 1982 (301) | 863 (208) |
| H1.1 | Income (ln GDP/ca) | 59 | Dubious | 7.668 (0.104) | 7.171 (0.109) | 0.497 (0.079) |
| H1.2 | Investment share | 59 | Dubious | 22.03 (1.65) | 13.84 (1.12) | 8.18 (1.062) |
| [H1.3] | Urbanization | 59 | Dubious | 34.86 (2.24) | 33.08 (2.68) | 1.77 (1.74) |
| H1.3 | Ln urbanization | 59 | OK | 3.428 (0.067) | 3.304 (0.086) | 0.125 (0.055) |
| [H1.4] | Openness | 59 | Dubious | 74.96 (5.35) | 58.52 (4.04) | 16.44 (3.42) |
| H1.4 | Ln openness | 59 | OK | 4.140 (0.084) | 3.946 (0.065) | 0.194 (0.054) |
|  |  |  | H2: Economic and political institutions |  |  |  |
| H2.1.1 | Econ Free 5 | 36 | OK | 5.53 (0.16) | 4.86 (0.16) | 0.67 (0.12) |
| H2.1.2 | Econ Free 10 | 36 | OK | 5.95 (0.16) | 4.87 (0.14) | 1.07 (0.21) |
| H2.1.3 | $\Delta$ Eco free | 36 | Dubious | 0.42 (0.13) | 0.02 (0.20) | 0.40 (0.12) |
| H2.2 | Gastil PR | 56 | No | 3.97 (0.24) | 5.09 (0.21) | -1.12 (0.17) |
| H2.3 | Gastil CL | 56 | OK | 4.15 (0.21) | 4.97 (0.17) | -0.82 (0.15) |
| [H2.3] | Polity | 46 | No | -0.72 (0.90) | -3.96 (0.81) | 3.24 (0.62) |
| H2.4 | Ethnic fractionaliza- | 48 | Dubious | 49.4 (4.24) | 51.1 (5.17) | -1.69 (3.33) |
|  |  |  | H3: Miscellaneous |  |  |  |
| [H3.1] | Population (in mio) | 59 | No | 63.98 (25.74) | 12.50 (2.52) | 51.48 (13.09) |
| H3.1 | Ln populations | 59 | OK | 8.658 (0.316) | 8.536 (0.18) | 0.122 (0.183) |
| H3.2 | Latitude | 59 | OK | 17.37 (1.47) | 10.75 (0.86) | 6.62 (0.90) |
| H3.3 | Natural resources ${ }^{\text {a }}$ | 59 | Binary | Y 21 N 38 | Y 38 N 21 | -17 17 |

Note: The t-ratios use the combined s.e. The tests in Table 7 used the one for all observations. (a) For the binary variable H 3.3 the numbers are the marginal counts. The bolded differences in column (7) are more than twice the standard error (s.e.).

The differences between the pairs are given in column (7). The difference for the two D-series are as they should be. The two averages calculated for borrowing and the log to borrowing are almost the same, while the growth rates differ very much. They are chosen to differ by more than 1 pp (percentage point) and they actually differ by 4.6 pp.

For the remaining variables Table 6 predicts the sign of all differences correctly except population. For population the difference seems large, but when the log is taken to make the distribution more normal, the difference become tiny. Thus, the size of the population does not matter. We would also have liked income to be irrelevant, but as argued in section 4 this was unlikely to happen, and it did not. Incomes is about 50 $\%$ higher in the countries of the good group than in the bad group. The test in column (7) is significant in most cases, but the test is perhaps too good, in the sense that the s.e. used is too small.

### 5.2 The between group tests

Table 7 gives the more appropriate tests. They are reported in columns (6) and (7). Column (6) is the classical t-test, while (7) is a distribution-free binominal test. For the t -test to be valid the variance has to be the same in the two groups and to be normally distributed.

The normality assumption was analyzed in Table 6 while the classical F-test for variance homogeneity is reported in column (5). It is rejected in the 5 rows where the results are bold. The binomial tests count the number of confirmations of the hypotheses, and calculate the probability that the skewness found or something skewer would occur by chance, if the probability for confirmation is $50 \%$ in each case. Column (8) is our assessment of the results of the test. "Yes" means that the hypothesis is confirmed. [Yes] means that it is confirmed, but the results of the classical tests are unreliable as the conditions for the test are not met. "Maybe" is where the results are just not strong enough.

Table 7. Test for differences between group (e.i., homogeneity rejected)

| (1) | (2) <br> Variable | $\begin{aligned} & \hline(3) \\ & \mathrm{N} \end{aligned}$ | (4) Expected Table 3 | (5) <br> Variances equal | (6) <br> Pairwise <br> T-test | (7) <br> eans equal Binominal | (8) Hypothesis confirmed |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | D: Selection of cases: Results are check of selection |  |  |  |  |
| [D1] | Borrowing | 59 | Zero | 49.69 | [31.8] | 11.7 (2s) | [Yes] |
| D1 | Ln borrowing | 59 | Zero | 92.78 | 27.5 |  | Yes |
| D2 | Growth | 59 | + | 7.39 | 0.00 | 0.00 (1s) | Yes |
|  |  |  | H1: Economic development indicators |  |  |  |  |
| [H1.1] | GDP per capita | 59 | + | 53.85 | [2.64] | 0.00 (1s) | [Yes] |
| H1.1 | Income (ln | 59 | + | 73.19 | 0.14 |  | Yes |
| H1.2 | Investment share | 59 | + | 0.42 | 0.01 | 0.08 (1s) | Yes |
| [H1.3] | Urbanization | 59 | + | 17.25 | [30.36] | 17.91 | No |
| H1.3 | Ln urbanization | 59 | + | 6.04 | 11.71 |  | [Weak] |
| [H1.3] | Openness | 59 | + | 3.44 | [0.53] | 14.88 | [Weak] |
| H1.4 | Ln openness | 59 | + | 5.77 | 3.66 |  | Maybe |
|  |  |  | H2: Economic and political institutions |  |  |  |  |
| H2.1.1 | Econ Free 5 | 36 | + | 94.09 | 0.19 | 0.84 (1s) | Yes |
| H2.1.2 | Econ Free 10 | 36 | + | 42.83 | 0.00 | 0.00 (1s) | Yes |
| H2.1.3 | $\Delta$ Eco free | 36 | + | 1.76 | 2.93 | 8.77 (1s) | Maybe |
| H2.2 | Gastil PR | 56 | - | 23.08 | 0.02 | 0.55 (1) | Yes |
| H2.3 | Gastil CL | 56 | - | 7.61 | 0.18 | 6.32 (1) | Yes |
| [H2.3] | Polity | 46 | + | 46.89 | 0.24 | 14.00 (1) | Maybe |
| H2.4 | Ethnic fractionaliza- | 48 | - | 22.87 | 38.3 | 7.19 (1) | No |
|  |  |  | H3: Miscellaneous |  |  |  |  |
| [H3.1] | Population | 59 | 0 | 0 | [2.62] | 79.5 (2s) | - |
| H3.1 | Ln populations | 59 | 0 | 0.01 | 37.4 |  | Maybe |
| H3.2 | Latitude | 59 | - | 0.01 | 0.01 | 2.40 (1) | Yes |
| H3.3 | Natural resources | 59 | - |  | $0.16{ }^{\text {a }}$ | 0.08 (1) ${ }^{\text {b }}$ | Yes |

Notes: (a) Standard $\chi^{2}(1)$-test on a (2x2)-table. (b) Binominal test of finding a difference in 17 of 59 cases.

### 5.3 The within groups tests

Columns (5) and (7) in Table 8 look at the correlation between each of the indicators and the ln to borrowing. Columns (4) and (6) are the predictions from Table 5. The results are rather weak, implying that independence is high. The most interesting finding is that there is no clear difference between the correlations in column (5) and (7). A number of additional tests showed that the within results are rather weak.

Table 8. Correlations

| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Variable |  | Correlation between each indicator and $\ln$ borrowWithin the good group Within the bad group |  |  |  | Correlation Between |
|  |  |  | Expected | Correlation | Expected | Correlation | Good and |
|  |  |  | D: Variables used in selection of cases |  |  |  |  |
| [D1] | Borrowing | 59 | + | [0.882] | + | [0.859] | [0.982] |
| D1 | Ln borrowing | 59 | 1 | 1 | 1 | 1 | 0.997 |
| D2 | Growth | 59 | + | -0.192 | - | -0.214 | 0.058 |
| H1: Economic development indicators |  |  |  |  |  |  |  |
| [H1.1] | GDP per capita | 59 | + | [-0.035] | - | [-0.234] | [-0.138] |
| H1.1 | Income (ln GDP/cap) | 59 | + | -0.100 | - | -0.241 | -0.112 |
| H1.2 | Investment share | 59 | + | -0.272 | - | -0.133 | -0.085 |
| [H1.3] | Urbanization | 59 | + | [0.125] | - | [-0.023] | [0.033] |
| H1.3 | Ln urbanization | 59 | + | 0.025 | - | 0.065 | 0.093 |
| [H1.4] | Openness | 59 | + | [-0.138] | - | [-0.035] | [0.143] |
| H1.4 | Ln Openness | 59 | + | -0.027 | - | -0.022 | -0.000 |
| H2: Economic and political institutions |  |  |  |  |  |  |  |
| H2.1. | Econ Free 5 | 36 | + | -0.017 | + | -0.131 | 0.073 |
| H2.1. | Econ Free 10 | 36 | + | 0.058 | + | -0.038 | 0.144 |
| H2.1. | $\Delta$ Eco free | 36 | + | 0.094 | + | 0.078 | 0.262 |
| H2.2 | Gastil PR | 56 | - | 0.363 | - | 0.194 | 0.131 |
| H2.3 | Gastil CL | 56 | - | 0.319 | - | 0.171 | 0.028 |
| [H2.3] | Polity | 46 | + | -0.262 | + | -0.056 | 0.182 |
| H2.4 | Ethnic fractionaliza- | 48 | - | -0.031 | - | 0.030 | 0.291 |
| H3: Miscellaneous |  |  |  |  |  |  |  |
| [H3.1] | Population | 59 | 0 | [-0.256] | 0 | [0.021] | [-0.058] |
| H3.1 | Ln populations | 59 | 0 | 0.028 | 0 | 0.011 | -0.071 |
| H3.2 | Latitude | 59 | + | -0.044 | + | -0.082 | 0.083 |
| H3.3 | Natural resources | 59 | - | 0.125 | - | 0.155 | 0.109 |

Note: All correlations above the $5 \%$ level of 0.211 are bolded. If the distribution of the series is nonnormal, the coefficient is placed in []-brackets.

## 6. Conclusion

The possibility to borrow abroad increases the intertemporal choice set of rulers. The choices may include growth-enhancing policies, so that borrowing may cause a faster development. However, this is the exception rather than the rule. The well-known result, that the average relation between borrowing and growth is negative, is con-
firmed. On average the borrowing choices induced rulers to misuse the funds borrowed: This decreases growth in the future. Fortunately, the effect is very small.

It is shown that countries mainly borrow when they are in trouble, and that hence the causal relation between borrowing and growth is due to causality from low growth to borrowing. This possibility is controlled for by considering borrowing in one 5 -year period and growth in the following 10-year period, but maybe the trouble are of an even longer duration. The innovation in the paper has been to compare a set of 59 good and bad twins. Each pair borrows the same amount for the same period of time, but while the good twin grew above average, the bad twin grew below average.

The main finding is that the countries in the good twin group are a bit more developed and had better institutions: In particular, it had more economic and political freedom. Thus, evidence failed to support the popular notion that countries with more regulation handle their relations with the international capital markets better. Also, the resource curse applied so that the good twins had fewer resources than the bad twins. Finally, it appeared that the good twins were significantly more democratic than the bad ones.

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Appendix table A1a. The first 35 of the 59 pairs of debt cases

| $\overline{\mathrm{Nr}}$ | Per | The good cases Country | The bad cases |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Borrowing | Growth | Country | Borrowing | Growth |
| 1 | P4 | Lesotho | 5.06 | 4.17 | Rwanda | 6.25 | 0.39 |
| 2 | P2 | Malaysia | 5.56 | 3.37 | Ghana | 5.30 | -1.22 |
| 3 | P1 | Jordan | 6.30 | 6.86 | El Salvador | 6.11 | -1.41 |
| 4 | P3 | St. Vincent \& | 6.58 | 4.14 | Sudan | 6.08 | -0.99 |
| 5 | P3 | India | 6.76 | 3.30 | Trinidad \& | 6.62 | -1.09 |
| 6 | P2 | St. Vincent \& | 7.51 | 5.22 | Kenya | 7.37 | 0.64 |
| 7 | P5 | Belize | 7.53 | 3.16 | Djibouti | 7.94 | -2.56 |
| 8 | P3 | Bangladesh | 8.01 | 2.20 | Vanuatu | 9.26 | 0.67 |
| 9 | P4 | Grenada | 8.13 | 2.94 | CAR | 7.62 | -0.69 |
| 10 | P4 | India | 8.62 | 3.69 | Venezuela | 8.27 | 0.24 |
| 11 | P4 | St. Lucia | 9.03 | 3.76 | Oman | 8.48 | 0.98 |
| 12 | P1 | Malaysia | 9.88 | 4.86 | Gabon | 10.08 | -3.12 |
| 13 | P4 | China | 10.09 | 6.91 | Chad | 9.84 | -0.79 |
| 14 | P1 | Algeria | 10.31 | 3.29 | Kenya | 10.53 | 0.11 |
| 15 | P2 | Chad | 10.98 | 2.86 | Peru | 9.88 | -2.28 |
| 16 | P3 | Turkey | 11.80 | 2.44 | Guatemala | 9.31 | 0.16 |
| 17 | P2 | Barbados | 13.16 | 2.15 | Sierra Leone | 13.17 | -0.55 |
| 18 | P2 | Thailand | 13.32 | 5.44 | Bangladesh | 13.60 | 0.91 |
| 19 | P3 | Sri Lanka | 13.41 | 2.98 | Haiti | 13.26 | -4.19 |
| 20 | P5 | St. Vincent \& | 14.05 | 2.31 | Niger | 14.69 | -0.39 |
| 21 | P4 | Sri Lanka | 15.08 | 4.04 | Kenya | 15.24 | -0.42 |
| 22 | P2 | Turkey | 15.99 | 2.13 | Zambia | 16.39 | -1.64 |
| 23 | P3 | Indonesia | 16.37 | 4.84 | CAR | 15.71 | -1.51 |
| 24 | P5 | Romania | 16.43 | 3.42 | Comoros | 16.95 | 0.44 |
| 25 | P1 | Equatorial Guinea | 16.61 | 4.38 | Sudan | 15.23 | 0.94 |
| 26 | P1 | Pakistan | 16.72 | 3.27 | Sierra Leone | 16.34 | 0.02 |
| 27 | P4 | Indonesia | 19.63 | 3.56 | Cameroon | 20.31 | -2.10 |
| 28 | P5 | Mali | 19.69 | 3.15 | Madagascar | 18.59 | -0.37 |
| 29 | P3 | Thailand | 19.92 | 7.52 | Venezuela | 19.93 | 0.13 |
| 30 | P3 | Botswana | 21.97 | 3.87 | Malawi | 21.71 | -1.17 |
| 31 | P3 | Colombia | 22.03 | 2.15 | Burundi | 22.24 | 0.32 |
| 32 | P5 | Ghana | 22.20 | 2.24 | Mexico | 19.38 | 0.91 |
| 33 | P3 | Mauritius | 23.31 | 5.72 | Swaziland | 22.47 | -0.12 |
| 34 | P3 | Lesotho | 23.31 | 3.19 | Swaziland | 22.47 | -0.12 |
| 35 | P2 | Sri Lanka | 24.39 | 2.72 | Niger | 24.11 | -3.56 |

Note: " $\alpha$ " indicates that the official country name is longer

Appendix table A1b. The last 24 of the 59 pairs of debt cases

| Nr | Per | The good cases <br> Country | Borrowing | Growth | The bad cases <br> Country | Borrowing | Growth |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 36 | P3 | Solomon Islands | 24.69 | 2.46 | Mexico | 24.67 | 0.60 |
| 37 | P4 | Uganda | 25.60 | 2.70 | Congo, Ki $(\&)$ | 26.23 | -8.25 |
| 38 | P3 | Belize | 26.59 | 5.12 | Togo | 26.57 | -1.69 |
| 39 | P1 | Panama | 26.68 | 2.13 | Nicaragua | 26.42 | -3.83 |
| 40 | P5 | Thailand | 27.23 | 2.30 | Gabon | 26.92 | -0.30 |
| 41 | P2 | Belize | 28.09 | 2.86 | Malawi | 29.58 | -1.56 |
| 42 | P5 | Chad | 32.57 | 6.27 | Zimbabwe | 34.87 | -3.02 |
| 43 | P4 | Trinidad \& | 33.13 | 2.84 | Madagascar | 32.95 | -1.67 |
| 44 | P5 | Yemen | 36.47 | 2.32 | Burundi | 36.43 | -1.28 |
| 45 | P5 | Algeria | 36.54 | 2.18 | Togo | 36.54 | 0.24 |
| 46 | P3 | Dominica | 36.55 | 4.03 | Philippines | 36.11 | -0.01 |
| 47 | P4 | Panama | 37.47 | 3.44 | Gabon | 35.68 | -0.23 |
| 48 | P3 | Malaysia | 41.15 | 4.24 | Sierra Leone | 41.88 | -2.40 |
| 49 | P2 | Egypt | 45.98 | 2.77 | Gambia | 46.04 | -2.83 |
| 50 | P3 | New Guinea $(\&)$ | 61.55 | 3.36 | Madagascar | 60.99 | -1.72 |
| 51 | P3 | Uruguay | 72.70 | 3.25 | Mali | 71.95 | 0.80 |
| 52 | P4 | Syria | 80.07 | 3.17 | Somalia | 85.76 | -2.12 |
| 53 | P3 | Liberia | 80.10 | 2.10 | Comoros | 83.02 | -1.10 |
| 54 | P5 | Malawi | 81.02 | 2.50 | Guinea-Bissau | 84.07 | -2.57 |
| 55 | P3 | Chile | 96.01 | 4.60 | Somalia | 88.66 | -0.87 |
| 56 | P4 | Mozambique | 134.50 | 2.09 | Liberia | 133.08 | 0.40 |
| 57 | P5 | Mozambique | 160.16 | 5.15 | Congo, Ki $(\&)$ | 151.88 | -3.06 |
| 58 | P4 | Laos | 178.12 | 3.19 | Tanzania | 158.48 | -0.16 |
| 59 | P5 | Angola | 207.26 | 2.69 | Congo, Br $(\&)$ | 274.74 | -3.53 |
|  |  |  |  |  |  |  |  |


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[^1]:    ${ }^{1}$. Kumar and Woo (2010) and Reinhart and Rogoff (2010) are referred to as the recent literature. This applies to their surveys of the previous literature and their empirical findings.
    ${ }^{2}$. The two classifications are independent: MS-rulers are 'roving bandits', while LS-rulers are 'stationary bandits'. MB-rulers are maximizing short run welfare, so that debt burdens keep rising, such as we have

[^2]:    seen it in the West. In connection with long-run borrowing rulers should be of the LB-type or at least of the LS-type. The classifications are based on behavior, such as enforced by institutions such as elections.
    ${ }^{3}$. This paper uses the words "good" and "bad" only in this way. The reasons for the choice of the two growth rates are explained in section 3.

[^3]:    ${ }^{4}$. The word "liberal", is used relative to economic freedom. More liberal means fewer restrictions on business.

[^4]:    ${ }^{5}$. In the studies cited the debt is both private and public whereas we only investigate public debt.
    ${ }^{6}$. This is one reason for concentrating on foreign debt and neglecting domestic loans to the country. The other is that foreign borrowing may reduce constraints for the ruler to follow their political targets.

[^5]:    ${ }^{7}$. Kindleberger (1963, p. 460) distinguishes six phases by adding one phase for the debtor country and one for the creditor country respectively. However, the additional information of this extension is limited.

[^6]:    ${ }^{8}$. Many studies exist of the factors generation development. Though much is still uncertain, but the large scale robustness analysis of Sala-i-Martin et al (2004) has pointed to a dozen robust factors, and the prerequisites as regards policies and institutions are also studied by many researchers see Glaser et al (2004) and Paldam and Gundlach (2008). Thus, it would appear that rulers can actually do something to generate long-run growth, once they have funds. It might not work every time, but most of the times.

[^7]:    ${ }^{9}$. For the 70 countries covered by Figure 1, the size of the debt forgiven (since 1988) in the WDI, the debt share would have been about $80 \%$ higher for both the average and median debt in 2009 with no debt forgiven. However, the data in the WDI appears not to cover all the debt written off. We assess that at least $2 / 3$ of the debt reduction is due to write offs. One way to assess the importance of the write offs is to notice that half the reduction happened in the 6 years between 2002 and 2008 where the fall was 67 pp in the two series per year. This is way above the corresponding data on the goods and service balances.

[^8]:    ${ }^{10}$. This is a main result, both from the literature on vote and popularity functions, and on political business cycles, see e.g. Paldam (1997) and Paldam (2003) for surveys. It is also well know that many dictatorial systems are myopic as well. We do not know if, in general, democratic or dictatorial systems are most myopic.

[^9]:    ${ }^{11}$. If the country can roll over loans, $T$ has to be taken as infinite.

[^10]:    ${ }^{12}$. The borrowing periods are non-overlapping, but each growth decades overlaps with $50 \%$ to the next period.

[^11]:    ${ }^{13}$ There is one problem with this definition. A country might experience a growth rate of 2 per cent as unsatisfactory, if it had experienced huge growth rates before. An example would be China: a growth of 2 per cent for ten years would not felt adequate. However, it has to be first considered that this is an almost unique example, which is not based on debt at all. Second, we consider average growth rates for 10 years, which makes a 2 per cent growth rate look quite impressive.

[^12]:    ${ }^{14}$. The normality tests are (i) the skewness/kurtosis, (ii) the Shapiro-Wilk W and (iii) the ShapiroFrancia W'. They disagree quite often, and we have also looked at the probit diagrams. Perfect normality by all tests are quite rare, but most series have reasonably normal looking probit curve either for the series itself or after a logarithmic transformation as indicated.

