Savings, Institutions and Debt Cycle

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Abstract

This paper analyzes the sustainability of current account deficits and develops a model for the dynamics of the balance of payments. The empirical results lead us to the conclusion that institutions indeed have an impact on private savings. We model this impact by making a households' time preference rate dependent on a microeconomic measure capturing the institutional environment the household faces. We then extend the classical debt cycle model by incorporating the institutional dependent time preference rate and show that good institutions can enable a country to enter a beneficial debt cycle. Finally, we apply our findings to the case of South Africa and argue that the South African current account deficit can indeed be sustainable.

Keywords: Balance of Payments Dynamics, Savings, Institutions, Debt Cycle
JEL-codes: H63, F41, H31, O43

1 Introduction

Current account imbalances are a constant source of debate. A trade surplus is usually seen as a sign for a countries' competitiveness, whereas a trade deficit is considered a sign for a lack thereof. This picture, however, is flawed, as it ignores the capital account. Only if trade balance and capital account are incorporated into the balance of payments (BoP), one can get a full picture.

Foreign borrowing can have two impacts on a developing country. It can be used to systematically raise investment and growth, or it may be used to finance consumption and balance of payments disequilibria. The former is clearly desirable, while the latter might lead to a postponing of necessary structural reforms. This problem is well known, and lead (Kindleberger (1963), pp. 458-461) to the hypothesis, that a developing country can go through a beneficial debt cycle (see also World Bank (1985), pp. 47Eu). During this cycle, a country first accumulates debt, thereby running a trade deficit (young debtor stage), second starts to repay the debt with a trade surplus (mature debtor stage), third uses the trade surplus to build up net foreign wealth (young creditor stage), and finally maintains this wealth, financing a trade deficit with capital yields (matured creditor stage).

The debt cycle theory is based on the intertemporal approach (for early contributions, see Boehm-Bawerk (1914), and more recently Obstfeld and Rogoff (1994), see also Corden (2007)) to the balance of payments dynamics. Siebert (1987), Siebert (1989) and de Long

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and Siebert (1989) have derived the debt cycle dynamics from an intertemporal optimization problem. Freytag (2008) argues, that microeconomic drivers of savings and investment have to be taken into account. These comprise of basic freedoms such as civil liberties, political rights, economic freedom and the absence of corruption as well as certain elements of economic

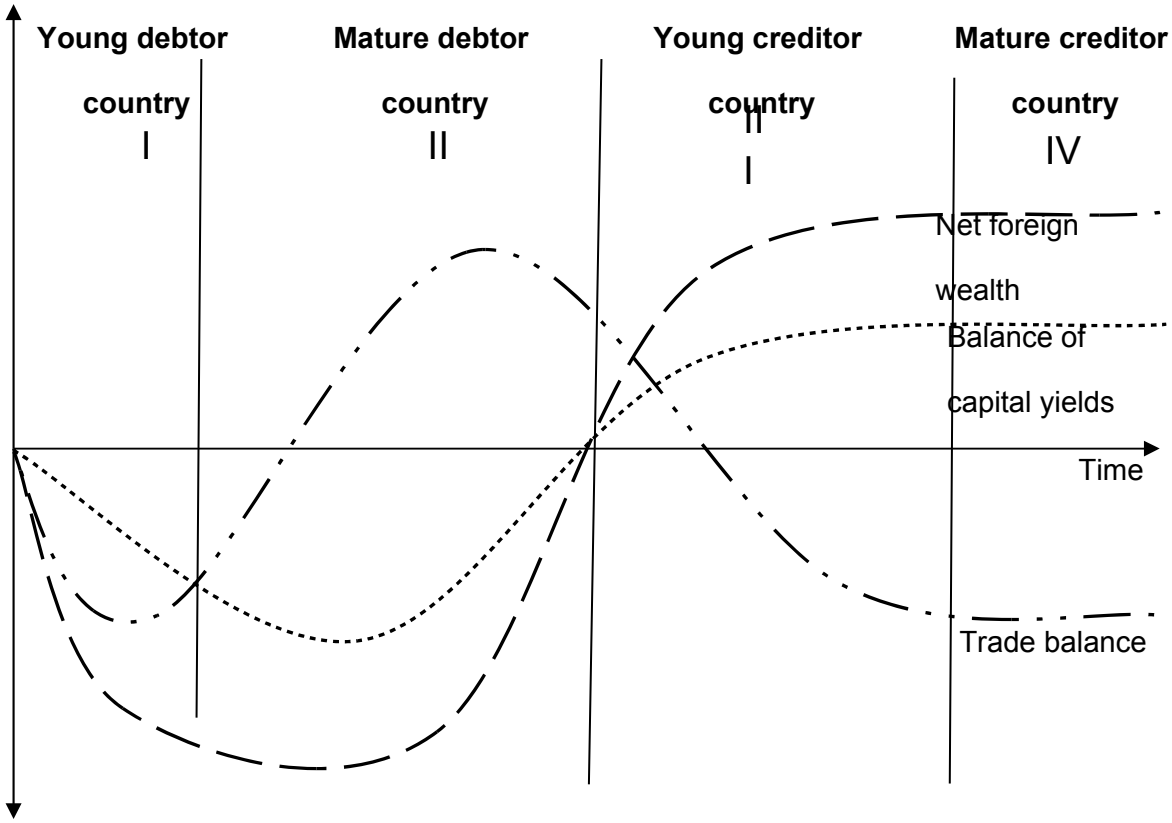
These microeconomic (or rather institutional) drivers of savings and investment have not yet been incorporated in an intertemporal approach to the balance of payments. The scope of this paper is to fill this gap. We present a model that is based on Siebert (1987), but uses time preference and capital depreciation rates which depend on institutional drivers.

2 Literature Overview

2.1 Literature on Debt Cycles

Looked at the balance of payments from the intertemporal perspective, there is no normative implication of a certain current account balance. It cannot be said in advance whether a current account deficit is undesirable or whether a current account surplus is to be achieved rather. In particular the very limited literature on the debt cycle shows this (Freytag 2008, pp.20-22).

Figure 1: The debt cycle in theory



Source: Freytag (2008, p. 21).

It may on the one hand be sensible for developing or emerging countries or a country with a relatively young population to run a current account deficit as response to net capital inflows if these are invested. Ageing economies such as Germany or Japan may be better off with a

current account surplus, investing their savings abroad. On the other hand, developing or emerging countries may run a current account surplus to invest into credibility for future net capital inflows or to import know-how for long-run growth.[1] In any case, an imbalance in the current account is not necessarily a disequilibrium.

To the contrary, the current account deficit may signal a country's economic strength. It is able to attract capital, which can be used to employ complementary factors of production. In the longer run, countries may undergo a debt cycle (Kindleberger 1963, pp. 458-461, Siebert 1987 and 1989). The theory of the debt cycle distinguishes several stages of development on the basis of the net foreign wealth position and thereby links development to the balance of payments. The theory is implicitly based on the intertemporal approach and explains current account deficits for young and emerging economies in need of capital from abroad. The country (in fact: its individuals and firms) borrows from abroad. These capital inflows are invested into yield achieving entrepreneurial activities. If successful, these activities lead to future sales abroad, with which the country repays the debt.

During the debt cycle, a country goes through four stages with respect to its net foreign position (figure 1).[2] 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 because foreigners demand a return on their net assets.[3] The capital inflows are invested, so that the country is able to increase future sales abroad and to finance further investment from own savings. The capacity built up with this investment is used to produce internationally competitive goods and services. Then the country becomes a matured 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.

The debt cycle can be explained with both savings and investments. The capital owners search for safe and sustainable investment opportunities. The debt cycle theory thus implicitly assumes that only those countries experience a beneficial debt cycle that offer good investment opportunities. In the remainder of the paper, we focus on savings. Worldwide, savings have increased in the last decades. They need a safe heaven, which implies that with increased saving rates, international capital flows have the tendency to also rise. Therefore, we need to learn more about the drivers of savings to understand the phenomena, which are labelled global imbalances.

2.2 Literature on non-constant time preferences

Among the first to provide experimental evidence of non-constant discounting is Thaler (1981), who designed an experiment where subjects could choose between different prices in a lottery that were receivable now, or at a later time. He finds large implicit discount rates,

[1] See Dooley, Garber and Folkerts-Landau (2007) for the first argument and Bhide and Phelps (2007) for the second.

[2] Kindleberger (1963, p. 460) distinguishes six phases by adding one phase for the debtor country and one for the creditor country respectively. The additional information of this extension, however, is limited.

[3] This holds as long as the return on the investment is equal for assets and liabilities. If there is a systematic difference between returns abroad and at home, the country may have a net liability position and still show positive net capital yields. Such a situation has been found for the US and is described as dark matter (Hausman and Sturzenegger 2006)..

albeit with a wide variation around the median. The discount rates drop sharply with an increasing size of the lottery price or waiting time. Ainslie (1992) shows that dynamically inconsistent human behaviour can best be explained by a hyperbolic discounting function. Laibson (1997) develops a model of a hyperbolic consumer with access to an illiquid asset that serves as a commitment technology. He uses a discount function where events t periods away will be discounted with a factor

$$(1+\alpha t)^{\gamma/\alpha}, \alpha > 0, \gamma > 0$$

Frederick et.al. (2002) give an extensive overview of various forms of time preferences, including hyperbolic and quasi-hyperbolic discounting. They point out that models with hyperbolic discounting can help explain a number of empirical facts, such as excess comovement of income and consumption, asset-specific marginal propensities to consume, excessive credit card debt, and low levels of precautionary savings. A critical account of hyperbolic discounting is given by Rubinstein (2003), who argues that the same evidence that leads to the justification of hyperbolic discounting can also be used to its rejection. He proposes a decision-making procedure that is based on similarity relations to explain experimental results that shows time inconsistent behaviour of humans in smaller-sooner, larger-later decisions.

2.3 Literature overview on private national savings formation

National savings are one prerequisite for capital formation and economic growth. Therefore, the determinants of private savings in developing economies have gained attention since the 1970s, culminating in an extensive empirical research project of The World Bank which has been finished by the year 1998 and lead to consensus on the empirical findings for the time period from 1965 to 1994 (see Loayza et al. (2000)).

Albeit there has been no interest in the role of the institutional environment in savings formation, macroeconomic determinants have been well researched. Table 1 summarizes the expected influences of savings determinants as presented by consumption theory and shows empirical findings from different panel studies so far, which we will discuss briefly in the following part.

The dependence of consumption and thus saving on their past levels can be supported with two arguments. First, consumption and saving change only sluggishly and are determined to a big part by habit formation. Habits are shaped over a longer time period and do not react very quickly (Alessi and Teppa (2010)), therefore the past savings ratio is a relevant explanatory for actual savings. Second, as a result of intertemporal optimization of rational individuals, consumption will only be changed after new information or shocks. Therefore, consumption can be modeled as an AR(1) process (see Hall (1988)), which in turn makes inclusion of the lagged saving into a savings model necessary. Therefore, the preferred specification for analyzing saving rates over time is a dynamic framework.

Higher income levels go hand in hand with higher savings, as people at subsistence levels can only afford little saving. A rise in per capita income leads to higher savings. . The influence of income and productivity growth for aggregate savings is more ambiguous: According to Modiglianis life-cycle theory (Modigliani (1966), pp.167), higher income growth can lead to higher aggregate savings but also to higher consumption today, if income growth in the future is correctly anticipated (Tobin (1967)).

Income and substitution effects of rate of return movements work in opposite directions. Therefore, exact determination of the interrelation of savings and interest rates is not possible. A rise in the real interest rate raises the cost of actual consumption relative to future consumption, leading to a substitution effect and lower saving rates. The income effect of a rise in the real interest rate works against this direction, as the targeted consumption level in the future can be achieved via lower savings. Even if both effects cancel out each other, the wealth effect can push private savings upwards, as rising interest rates lower the present value of future labor and fixed-interest income streams (Schmidt-Hebbel et al. (1992), pp.532). Additionally, inflation can have further effects on national savings than through the real interest channel. As higher levels of inflation are often correlated with higher volatility, higher inflation serves as an approximation of macroeconomic stability. Here, high inflation stands for macroeconomic uncertainty, which should shift precautionary saving upwards.

Table 1: Macroeconomic determinants of private saving decisions

Category	Variable	Expected Sign	Empirical Findings[a,b]
Behavioral persistence	Lagged savings	+	+ (1, 5, 6, 7)
Income and Growth	Income level, actual	+	+ (1, 3) 0 (2)
	Growth of income, actual	+/-	+ (1, 2, 3, 6, 7) 0 (5)
	Productivity growth	+/-	+ (4)
	Terms of Trade, % change	+	+ (1, 4, 5, 7) 0 (2)
Rates of Return and Macroeconomic uncertainty	Inflation rates	-	+ (1) 0 (2, 4, 5, 6)
	Real interest rates	-	- (1, 3, 4) 0 (5, 6, 7)
	Political Stability	+	0 (3)
	Political Assassinations	-	0 (3)
Domestic borrowing constraints	broad money growth /private credit growth	-	- (1) 0 (7)
Foreign Borrowing constraints	Current Account Balance	+	+ (3, 6)
Development of Financial Sector	Broad Money/GDP or M2/GDP or private Sector Credit/GDP	-	0 (1) + (3) –(6, 7)
Fiscal Policy	Public Saving	-	- (1, 3, 4, 6) + (7)
	Public Sector Surplus	-	- (2, 5)
	Public Consumption	-	- (2, 5)
Social Security System	Social Expenditures	-	- (3) 0 (6)
Demographics	Old age dependency ratio	-	- (1, 7), 0 (4)
	Young age dependency ratio	-	- (1)
	Dependency ratio	-	0 (2, 5, 6) – (3)
	Urbanization	-	- (1, 3)
Wealth and Income distribution	Income concentration	+	- (3)
	Wealth/GDP	-	0 (2, 5)

a) (1) Loayza et al (2000), table 4, column 7; (2) Masson et al (1998), table 2, column 4; (3) Edwards, 1996, table 2; (4) de Serres and Pelgrin (2003) table 5, column 3; (5) Haque et al (1999), table 5 and table 6, column 6; (6) Schroten and Stephan (2005) table 3; (7) Terrones and Cardarelli (2005), table 2.2, column 2;

b) significant coefficients are indicated by a '+' or '-'; insignificant findings are indicated by a zero

Concerning the international market integration it is argued that higher capital market integration leads to lower national private savings, as consumption smoothing is possible via foreign credit. Usually, the current account balance is used as an approximation for worldwide capital market integration (Schmidt-Hebbel et al. (1992)). The argument can also be applied to national capital markets: If these are less developed, intermediation between lenders and borrowers is costly. In this case, consumption smoothing via lending is not possible for many citizens on an individual basis, and the precautionary savings motive drives national savings in aggregate upwards (Edwards (1995), p. 23).

Public consumption enters the private savings decisions in a direct way, as private national savings are often calculated as the residual between national and general government savings. The argument often put forward for the theoretical influence of public savings on private savings is that of Ricardian equivalence. Strict equivalence means a one-to-one off-set of public deficits via private savings (Barro, 1974), stating that private agents do not see government bonds as net wealth, as they will have to pay the principal plus interest in future periods, but increase their savings by the public deficit amount instead. Even if strict Ricardian equivalence of public debt can be denied as the overall transmission mechanism is very complex, the influence of public savings on private savings is expected to be negative as confirmed in the empirical literature.

Demographic factors are likely to influence aggregate private savings, as predicted by the life-cycle model: If the old age dependency-ratio is rising, dissaving out of accumulated wealth is likely. The conventional view on the role of the youth-dependency ratio expects a nevative sign: Children are not productive workers and consumption expenditures rise in child-rearing stages of the lify-cycle (Higgins (1998)). Furthermore, strong family ties can be a substitute for precautionary savings in cases where capital market development is very poor, like expected in many developing countries (Gersovitz (1991), pp.401f.)[4]. Nevertheless, at the aggregate level, national savings are found to be lower in countries with higher youth dependency ratio.

3 A Model for the Balance of Payments Dynamics and institutional Aspects

In this section we will introduce a model for the balance of payment dynamics that draws on the seminal work of Siebert (1987) but is subsequently extended to allow the inclusion of institutions.

[4] On the other hand, actual micro-evidence challenges this view: If life-time income is dependent on the investment into education, parents try to save money in the youth of their children to finance this investment when their children become young adults (Chamon and Prasad, (2010)).

3.1 The Baseline Model

Starting point is an economy, that wants to maximise the present value of utility W from consumption C in a given time interval [0,T]:

$$max_C \int e^{-\delta t} W\left[C(t)\right] dt \tag{1}$$

where C is the consumption at time T and δ is a given, constant time preference rate. The utility function has the usual properties $W_C > 0, W_{CC} < 0 \wedge -CW_{CC}/W_C > 0$, where subscript denotes a derivative.

Two points here need further explanation. First of all, it has to be clear, who is optimising what. As the consumption is the control variable, the optimisation is done by a representative household. This household is representative in the sense, that it is endowed with the preferences, life expectancy, education, health, etc., as the average of all households at the time of the optimisation. This is related to the second point, as the terminal time T is the expected time of death of the representative individual in this model. In general it is not neccessary that T coincides with the time of death. In our model, we will take T to be a fixed planning horizon. The government makes a promise for economic development (and manipulates the institutional policies, in order to achieve this development goal) until a given finite time T. Households believe in this promise and plan their consumption until this finite time T. At T, the capital stock will be optimal, which is part of the government's promise.

The output Q is produced by a production function F with capital K:

$$Q(t) = F\left[K(t)\right]$$

The capital stock is changed by gross investment I and depreciation of the capital stock with the depreciation rate m:

$$\dot{K}(t) = I(t) - mK(t)$$

Where the capital depreciation rate is taken to be fixed and given exogenously. We will relax this assumption later. Capital accumulation is financed by debt and domestic savings and is thought to happen instantaneously at time t=0. The transversality condition for an intertemporal optimisation problem for finite time reads as:

$$K(T) - B(T) \geq \bar{K}$$

where B is the stock of debt and $\bar{K}$ is the capital stock handed over to future generations. It is assumed, that the terminal capital stock $\bar{K}$ is the optimal capital stock K^o . This optimal capital stock is obtained from:

$$F_K\left(K^o\right) - m = r$$

where r is the interest rate on the world capital market.

From this optimality condition it follows that capital will be accumulated, if the net marginal productivity of capital is greater than the interest rate:

$$F_K\left(K_0\right) - m > r$$

This equation gives rise to the investment hypothesis, that an investor will realize investment projects as long as the above inequality holds. The optimal capital stock K^o can therefore be derived from the equation $F_K(K^o) - m = r$.

There is a constraint for the balance of payments, that is given as:

$$Q(t) = C(t) + I(t) - \dot{B} + rB \Leftrightarrow \dot{B} = C + I - Q + rB$$

where the left hand side in the rearranged constraint indicates the balance in the capital account. If $\dot{B} > 0$ then capital is imported.

The gross investment I is given by the difference of optimal capital stock and actual capital stock:

$$I(t) = K^o - K(t)$$

Which can be used to obtain the change in the capital stock:

$$\dot{K}(t) = K^o - (1 + m) K(t)$$

which is an ordinary first order differential equation. The boundary condition to solve this equation is given by the assumption, that at time t=0, the initial capital stock is smaller than the optimal capital stock: $K(t = 0) := K_0 < K^o$. The optimization problem can now be solved via the Lagrangian from which the optimal consumption path follows to be given by:

$$\hat{C} \equiv \frac{\dot{C}}{C} = \frac{-1}{\theta} \frac{\dot{\rho}}{\rho} \tag{2}$$

where θ is defined as $\theta \equiv CW_{CC} / W_C$ and ρ is the shadow price of debt. From intertemporal optimization it follows, that:

$$\frac{\dot{\rho}}{\rho} = (\delta - r) \tag{3}$$

which is used to determine the optimal consumption path. Inserting this into the equation for the optimal consumption, one obtains:

$$\hat{C} \sim \exp\left(\frac{-1}{\theta} (\delta - r) t \right)$$

from which it can be seen that the optimal consumption path depends on the time preference rate.

3.2 Including Institutional Policies in the Model

In the presented model, it is possible to derive the main features of a debt cycle from intertemporal optimization. The core of our extended model is formed by the representative consumer, whose decisions are dependent on her rate of time preference. Instead of taking these as given, one can reasonably assume for this variable to be influenced by many factors, amongst which the most import is the economic and institutional environment. As has been pointed out by the OECD (2008), and Freytag (2008), microeconomic and institu-

tional policies play a crucial role in the balance of payments dynamics. Such an analysis is not possible in the model presented so far.

Institutions are defined as formal and informal rules and norms, governing economic and other interactions in a country. In particular, the degree of economic freedom, i.e. the freedom of individuals to make business in developing countries is of importance. The definition of property rights, regulation of economic activities, bureaucratic hurdles and the like have to be analysed if one talks about institutional policies. An appropriate indicator is provided by the Fraser Institute, which regularly publishes cross-country comparisons of the degree of economic freedom (see e.g. Gwartney et al. 2009).

One can now investigate the influence of a number of institutional policy variables on the dynamics of the debt cycle. In Freytag (2008) the most prominent of these variables have been captured in an institutional policy variables IP. In this variable the impact of laws and other government activity on the economic environment are combined.

In order to include institutional policy variables into the model, it has to be clear, at which point this is possible. The representative agent optimizes her consumption C(t) in the interval [0,T] according to her preferences δ and obtains utility W[C(t)] from that. There are three possible choices to include the institutional policy variables. The first is, to make the consumption C directly dependend on IP. However, as the consumption is the state variable of the problem, it cannot depend on other variables. Furthermore, the consumption of the representative agent is the result of the optimization problem and subject to the budget constraint. It would be inconsistent with intertemporal optimization calculus for the consumption to depend on any other variable. The second possibility is to make the agents' utility W dependend on the institutional policy variable. But it is unclear, why an individuums utility per unit of consumption should depend on the institutional setting the household is facing. The third possibility is to make the time preference rate δ dependend on the institutional policy variable. It At this point, however, one must differentiate more between the single ways by which institutions can affect the time preference: On the one hand, high quality institutions can raise the ability to save both today and tomorrow by raising income growth or lowering consumer prices. On the other hand, high quality institutions can also influence the willingness to save, but more in an ambiguous way: Good property rights and good governance may enhance the individuals trust into the security of her savings and accumulated wealth and therefore lead to lower time preferences whereas the trust into the ability to create sufficient income in the future thanks to good institutions might drive the time preference upwards. From an external point of view, it would be hard to distinguish both aspects by observing the realized time preference rate.

Making the time preference now dependent on institutional policies changes the maximisation problem (1). We now have to consider the problem:

$$max_{C(t)} \int e^{-\delta[IP]} W[C(t)] \tag{1b}$$

Now, when the government changes its policy, the institutional policy variables IP are changing according to $IP \rightarrow IP + \Delta IP$ and hence the solution to the Euler-Lagrange equation is no longer given by equation (3), but rather by:

$$\frac{\dot{\rho}}{\rho} = (\delta_{IP} \Delta IP - r) \tag{3b}$$

As the difference between δ and r determines whether a country enters a full or a half debt-cycle, equation (3b) implies that good government policies can turn a country from a half to a full debt-cycle. What now remains to be done is to see whether the institutional setting impacts on the consumption and savings decision of households.

4 Empirical Evidence

4.1 Dataset and description

For our estimation, we consider a wide range of developing, transition and developed countries over the time span from 1980 to 2007. Since the national private savings are often non stationary, pure cross-sectional analysis would lead to unreliable estimates and more observations over time can add the necessary information. Macroeconomic data are drawn from the Penn World Tables as from August 2009 (Heston et al, 2009). Data for private savings and government savings are drawn from the World Bank database and the IMF Government Finance statistics. As dependent variable, we use private savings in relation to GDP. The scaling of saving rates to GDP is necessary given the lack of deflator series for savings. Furthermore, this time series becomes more stationary and less volatile after scaling, as the nominal saving volumes move in part with the GDP series. Overall, this transformation enables the necessary cross country comparisons. Usually, private savings are calculated within the framework of national account statistics as the residual of gross national savings minus general government savings and we use this definition, too. Unfortunately, this is not the optimal measure for our hypothesis. Our measure of private savings especially contains savings of private companies by construction. An optimal measure would be private savings of households in relation to average household disposable income. However, neither of both variables is available for a large number of countries and/or over a long time span, which is necessary on the other hand to isolate the influence of the institutional setting which we are interested in primarily.

For the institutional measures, we use the chain-linked subgroup indices from Gwartney and Lawson (2009), better known as the Economic Freedom of the World Indices. The chain linked indices are comparable over the whole time span, but they use in many years less information than available for one country. Therefore, we checked the correlation between the original and the chain linked series, which is fairly high on average. Furthermore, the base year is 2004, so that countries which were not present in the 2004 series are not added in the years thereafter. A second reason for choosing the chain linked indices is the lower volatility over time, which corresponds more with the view of longer term persistence and gradual evolution of institutions. As the institutional data is only available in 5-year steps from 1970 to 2000 and annually thereafter, we do a linear interpolation between two data points where necessary for our yearly estimations, which has been previously applied on this indicator by de Soysa and Neumayer (2005), for instance. We justify this with two arguments: First, as institutions develop slowly over time, a linear estimation comes close to the gradual development inherent in every evolution of institutional quality. Second, as the indices are constructed from different sources including surveys, the normal measurement error and our error due to linear interpolation are two sides of the same coin, leading us to the conclusion that our error can be tolerated given the long time span and country coverage. Subgroup one of the Economic Freedom Indices, the ‚size of the government', contains information on government consumption, transfers and subsidies, government engagement in enterprises as well as tax rates. The important institution of 'property rights quality' is indexed by subgroup two. Related to the expropriation problem is subgroup three, 'access to sound money', as inflation

works like a tax and hyperinflation like expropriation. This group includes three measures for inflation: Inflation in the last year, money growth and the standard deviation of inflation. Regarding subgroup four of the economic freedom index, 'freedom to trade internationally', different dimensions are contained within this index: First, measures concerning merchandize trade like import tariffs, export taxes and regulations are included. Second, the subgroup contains measures for the access to foreign currency like black market premia and exchange rate and foreign capital controls. The fifth subgroup of the economic freedom index is the degree of labor market, business and credit regulation.

Our basic dataset contains 106 countries with overall 2525 observations and spans the time period from 1970 to 2007. For our yearly estimations, we use the time span from 1980 to 2007 as the number of emerging and developing countries in the dataset before 1980 is very low. We eliminate observations where less than ten consecutive years are available to get a more reliable picture of the savings ratio and its development.. In a next step, we eliminate extreme and inconsistent observations of private savings, real interest rates and consumer price inflation which drops three further countries[5]. Overall, this gives us a basic dataset of 1424 observations over 81 developing, emerging and industrialized economies.[6]

4.2 Econometric Issues

The underlying macroeconomic dataset makes the choice of a fixed effect panel data model reasonable. Here, a time invariant country specific fixed effect is introduced which is allowed to be correlated with the explanatory variables. One can think of this effect as a topological, cultural, institutional or other distinct feature. Taking the fixed effect into account introduces some heterogeneity over the countries by allowing for different absolute terms for the single country (the country specific, fixed effect) but assumes that the slope coefficient of an explanatory variable is pretty much the same for every nation. For the interpretation of coefficients this means that the average reaction of a single country's saving quota to change in an explanatory variable is the same over all countries; or stated otherwise: Variation in one explanatory variable is assumed to have on average the same marginal effect in all countries. In our simple fixed effects model (Model 2, table 3), the logged real GDP squared as well as the youth dependency index and four of our five institutional variables lose significance. Furthermore, only our institutional measure for property rights quality is significant., albeit the sign changes into the negative, implicating that higher security of property rights lead to lower savings.

Testing for autocorrelation of residuals with the method proposed by Wooldridge (2002, pp. 282-283) indicates presence of autocorrelation in our fixed effect model. One remedy is the inclusion of the lagged dependent variable (LDV) into the estimation, which can also be justified by theory: As consumption and saving patterns are rather persistent over time, a dynamic model specification by introduction of the lagged saving rate is appropriate from a theoretical point of view (Alessi, Teppa 2010). Therefore, the basic model specification for our following estimations is as follows:

$$S_{it} = \delta S_{i,t-1} + X'_{it}\beta + \mu_i + \vartheta_{it}$$

Here, *S* are the private saving rates as share of GDP, *X'* is a vector of explanatory variables of interest and control variables, μ_i is the country specific fixed effect characterizing hetero-

[5] Namely Slovenia, Slovakia due to inconsistency in statistics from 1991-1998 and Kuwait due to the first and second Gulf War.

[6] For descriptive statistics, see Appendix A.

geneity of the countries and v_{it} is the country- and time specific error, *i* and *t* are indices for country and time, respectively.

In a fixed effect model, inclusion of the lagged dependent variable biases the coefficient estimates downwards (Nickell, 1981). Nevertheless, Monte Carlo Simulations show that this bias is only severe for very small T and is decreasing with T getting large, with bias of around 15 per cent for T equals 15 and 5 to 10 per cent for 20>T>50. Furthermore, possible corrections for this bias like Kiviet transformation or alternative instrumental variable estimations are often not more efficient than this conventional OLS estimation if instruments are weak and not perfectly exogenous, serial correlation is a problem or the panel dataset is unbalanced (Beck, Katz (2009)). In a next step, we test for heteroscedasticity with the usual Breusch-Pagan Lagrange Multiplier test which states that heteroscedasticity might be a problem, so we use the White-Sandwich estimator for heteroscedasticity and serial correlation adjusted standard errors in the fixed effects OLS model.

As table 2 indicates, our results for the control variables resemble those of earlier empirical studies: the lagged dependent, the demographic variables, government savings, the development of the domestic financial sector as approximated by the domestic credit rate to the private sector and the real interest rate are significant with the expected sign in the estimations. Note that the within-transformation in the fixed effect model leads to poor performance of the fixed effects model in estimating the influence of variables with small variation over time relative to the cross-sectional variation. Here, the within-transformation takes much of this low variation over time out by construction, rendering coefficient estimates inefficient . Furthermore, multicolinearity due to high correlation of logged GDP with many of the control variables lowers significance values. Therefore, the FGLS estimates for variables with low within-variation like GDP and the demographic variables, and perhaps with some of the institutional indicators, are more efficient than the fixed effects estimates albeit standard errors are biased downwards, so we are carefull with interpretation. As we are interested in the influence of our institutional variables on the national private savings ratio, we add each indicator at first stepwise and then altogether to avoid misinterpretation due to multicolinearity.

[Table 2 about here]

4.3 Discussion of Results

In this section, we will discuss the results concerning our institutional variables of interest. As the institutional variables are an aggregate of various measures, we do not interpret the coefficients in a marginal sense, but more with a view on their significance level. At first, in all models, our variable for the quality of property rights protection indicates a negative influence on national private savings formation. From our point of view, this might be explained due to saving behavior as a highly residual and partly unconscious process. Better property rights protection might lead individuals to consume more and companies to invest, therefore the savings are decreasing with better property rights. Specifically, one can imagine that private actors are more likely to spend money into housing and other durables if risk of expropriation is very low. In this way, the time preference is positively influenced by property rights: individuals are more likely to consume if they are good more likely not to and thus save if property rights are weak – all else being equal.

In our FGLS model specification, the size of government is also clearly showing a significant negative influence on private savings formation. Size of government includes the amount of subsidies and transfers, overall government consumption as well as investment, engagement in enterprises and ratings of tax rates. At the one hand one might expect a bigger government depressing saving rates, as it lowers disposable income due to taxes for redistribution or low productivity in state owned enterprises, for instance.

As our dataset comprise a large number of countries in different stages of development and different geographical, cultural and political backgrounds, it might well be that the assumption of similar average coefficients for our variables of interest over all countries is not appropriate in this context. There might be not only some unit specific fixed effect, but also different slopes for certain coefficient estimates. Specifically, the quality of institutions could be expected to have different influences on the saving behavior at different stages of development and income. Therefore, we interact the institutional variables with dummies for OECD, developing or transition countries so we get group-specific institutional variables additionally to our institutional ones. Concerning our group classification, we use the World Bank country classification choosing low and lower-middle income countries as developing and upper-middle income countries as transition economies. The interaction of our institutional variables with one dummy has an interesting result for interpretation of the not interacted institutional variable, which might change it coefficient or significance size. The reason is that adding the group-specific institutional variables adds new variance which might explain large parts of the relevant influence of the not interacted variables.

Table 2: Interaction of Institutions according to country groups

	FE with VCE (robust SE)			FGLS (Random Effects) with AR(1) error structure and panel spezific heteroskedastic errors		
size of government	-0.136	-0.404	-0.342	-0.206	**-0.483*** **	**-0.297***
	(0.247)	(0.274)	(0.334)	(0.125)	(0.134)	(0.171)
property rights quality	**-1.046*** **	-0.209	**-0.786** **	**-0.592*** **	-0.182	**-0.750*** **
	(0.279)	(0.257)	(0.319)	(0.130)	(0.133)	(0.160)
sound money	0.113	0.130	0.239	**0.140***	-0.0791	**0.172** **
	(0.151)	(0.241)	(0.173)	(0.0760)	(0.0961)	(0.0824)
freedom to trade	0.347	0.174	**0.704***	0.182	0.153	**0.867*** **
	(0.345)	(0.378)	(0.383)	(0.161)	(0.187)	(0.197)
regulation	0.278	0.537	0.456	-0.0629	0.364	**0.587*** **
	(0.530)	(0.512)	(0.493)	(0.188)	(0.222)	(0.198)
size of government x developing country	-0.427			-0.159		
	(0.547)			(0.308)		
property rights quality x developing country	**1.107** **			**0.577***		
	(0.445)			(0.298)		
sound money x developing country	0.163			0.0626		
	(0.443)			(0.254)		
freedom to trade x developing country	0.0461			0.309		
	(0.613)			(0.339)		
regulation x developing country dummy	0.612			**1.089** **		
	(0.895)			(0.425)		
size of government x transition country		0.440			**0.432***	
		(0.438)			(0.254)	
property rights quality x transition country		**-1.339*** **			**-1.310*** **	
		(0.426)			(0.240)	
sound money x transition country		-0.0633			**0.211***	
		(0.243)			(0.116)	
freedom to trade x transition country		0.707			**0.765** **	
		(0.563)			(0.308)	
regulation x transition country dummy		0.0981			0.162	
		(0.793)			(0.335)	
size of government x OECD country dummy			0.0125			-0.0256
			(0.442)			(0.221)
property rights quality x OECD country dummy			0.143			**0.374***
			(0.407)			(0.221)
sound money x OECD country dummy			0.00811			-0.161
			(0.228)			(0.125)
freedom to trade x OECD country dummy			**-1.119***			**-0.967*** **
			(0.598)			(0.302)
regulation x OECD country dummy			-0.647			**-0.963*** **
			(0.688)			(0.330)
Constant	-43.60	-55.81	-31.58	-61.51***	-63.67***	-33.18
Observations	1,449	1,449	1,449	1,449	1,449	1,449
R-squared	0.523	0.524	0.520			
number of countries	81	81	81	81	81	81

*control variables not reported, see Appendix B, table 6 for full table of control variable results.

The results sum up to the following: The effect of government size shows no significant robust relationship over all country groups and models. Interestingly, the role of security of property rights deviates for developing countries from its negative influence. As the coefficient of the not interacted property rights variable gets insignificant if the interacted transition variable is inserted, we have to state that the negative influence of property rights on national private savings is mainly driven by this country group, whereas the results from the developing country interaction hint onto a positive effect in lower income economies. For our OECD countries, property rights seem to play a minor, more ambiguous role according to their significance level, but here the institutional variables of freedom to trade and level of business regulation are significant with negative signs. There are two possible interpretations, which might well be combined in its influence: First, low import regulations lead to cheaper consumer goods due to lower import prices, leading more people to consume today than to save for goods tomorrow. A comparable interpretation might hold for the level of business regulation. Therefore, the price level of consumption today is lowered. A second interpretation might focus on competition, efficiency and disposable income: Lower business regulation and easier access to import goods lead to higher competition on domestic markets, enlarging the GDP of the nation as a whole but possibly lowering disposable income of individuals. So we could interpret this as an income effect of institutions on the time preference and thus savings.

The fifth subgroup of the economic freedom index is the degree of labor market, business and credit regulation. Concerning labor markets, low regulations might go hand in hand with a high level of social security. In this case, precautionary savings for the case of unemployment will not be induced. One might also think of the combination of high regulation and high security or high regulation and low security. Therefore, the pure level of regulation gives no hint on the direction of the effect, as it interacts with other institutions in each country. Economic theory provides no clear direction for the influence of business regulation on private savings. It is possible to infer from lower business regulation better services and goods on the markets, meeting the demand of customers and thus leading to a higher consumption share. One direction might also be credit market regulation: If regulation is high, individuals and companies do not have good access to high quality financial services and consumption smoothing is more difficult to obtain, the degree of diversification is lower as well are possible returns. In the first case, savings should be driven upwards, whereas the direction of the latter depends on the degree of income- and price effects. However, as we control for credit market development separately by the degree of private credit to GDP, obtaining significant estimates might be impossible.

Our estimation steps are as follows: We start with two-step system GMM model including the relevant control variables known from the previous literature on this topic and our estimations above. These are variables for logged real GDP and its squared value to capture the nonlinear relationship between savings and income, the real interest rate, CPI, volume of domestic credit to the private sector, the real GDP growth rate, general government savings and the youth and old age dependency ratios. We eliminated stepwise the variable with the highest insignificance level and rerun the regressions until we reach a stable model specification, which eliminates CPI and the real interest rate as they are highly insignificant in the one- and twostep estimations. This gives us our core models (models 17 and 25, table 5).

Looking at the test statistics, we reject the absence of serial correlation of order one but not of order two, so we can use the system GMM approach. Also, the Hansen- (J-) test does not reject that our instruments are valid. For interpretation of the results, it is important to see

how the system GMM estimations are formed: To get rid of the individual fixed effect, first differencing is applied and lagged (level-) values of the variables are used as instruments for the first differences in the so called differences equation. In the level equation, lagged differences of the variables are used as instruments for the levels. From both steps it is expected to get a consistent estimate for the true level coefficients, but we have to keep in mind that the correct interpretation tends more towards the direction of the effects of changes in the explanatory on changes in the dependent, given their individual levels.

In this estimation, all control variables have the expected sign and comparable coefficient size as indicated by Terrones and Cardelli (2005, for logged GDP), Schrooten and Stephan (2005) and Loayza et al (2000). Concerning our institutional variables, they are not significant if included individually into the estimations, as indicated by our models 18-22 and 26-30. However, if included jointly, the indicator for a sound monetary regime and business, labor and credit market regulation are significant in three of our four models. From the latter result, we would infer that a favorable business environment, creating incentives to open an own business, be mobile for job search and to take up credit reduces the propensity to save. We might interpret this effect as lowering the *willingness* to save, as more freedom in case of less business regulation creates work and investment incentives, creating chances for people to enhance their *ability to save* via higher incomes. A sound monetary regime has a positive effect on private savings, albeit at the very low significance level of ten per cent. But we have to stress here that we eliminated the CPI in our core model, because we did not find any effect. Therefore, our result highlights the role of regime type of monetary policy beyond the direct effects of inflation, macroeconomic volatility and real interest rates. A sound monetary regime with access to foreign currency, low interest rate spreads and low inflation creates positive incentives to save. The size of government is only significant once in our onestep-estimation via a negative sign, but this is additional to the government savings, therefore the interpretation adds to the usual ricardian equivalence theorem. In a careful interpretation at such an aggregate measure for the effect of different expenditures and taxes, we would say that a bigger state covers more expenditures of its citizens, for example schooling, health our pensions. Therefore, the *willingness* to save is lowered, but higher taxes reduce disposable income, therefore lowering the *ability* to save, too.

5 Conclusions

The econometric results make clear that savings are not easily changed politically. They rather ambiguously depend on institutions. Nevertheless, better institutions seem rather to reduce than to increase saving rates. This may be the case because individuals in better institutional environments have more trust in their ability to earn future income. Precautionary savings thus, may be less necessary in a good institutional setting than with poor institutions.

Needles to say that the policy conclusion cannot be to decrease institutional quality in order to give incentives for the citizens to raise their savings. Rather the careful policy lessons should be that savings are dependent on expectations about future income. These expectations seem to reflect the institutional quality quite well – better institutions generate more trust in individual abilities and can generate more consumption. It may also attract investments and – implicitly – other countries' precautionary savings. Governments should do a lot to improve the quality of institutions.

Appendix A: Table 3: Empirical results of private savings formations

dependent: private savings	FE with VCE (robust SE)							FGLS (Random Effects) with AR(1) error structure and panel spezific heteroskedastic errors						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
lagged private savings	**0.480*** **	**0.478*** **	**0.470*** **	**0.479*** **	**0.480*** **	**0.479*** **	**0.462*** **	**0.399*** **	**0.391*** **	**0.389*** **	**0.400*** **	**0.403*** **	**0.402*** **	**0.385*** **
	(0.0410)	(0.0422)	(0.0393)	(0.0407)	(0.0409)	(0.0415)	(0.0398)	(0.0181)	(0.0185)	(0.0183)	(0.0181)	(0.0181)	(0.0183)	(0.0189)
log real GDP	10.15	10.31	**12.17***	**11.21***	8.583	9.872	11.17	**12.92*** **	**14.44*** **	**15.14*** **	**13.49*** **	**12.14*** **	**11.71*** **	**15.22*** **
	(6.569)	(6.741)	(6.720)	(6.660)	(6.897)	(6.572)	(7.672)	(3.880)	(3.885)	(4.125)	(3.856)	(3.957)	(3.925)	(4.287)
log real GDP, squared	-0.364	-0.370	-0.461	-0.433	-0.286	-0.339	-0.413	**-0.459** **	**-0.532*** **	**-0.562** **	**-0.494** **	**-0.418** **	**-0.389***	**-0.559** **
	(0.348)	(0.357)	(0.356)	(0.354)	(0.366)	(0.354)	(0.412)	(0.205)	(0.206)	(0.219)	(0.205)	(0.209)	(0.209)	(0.229)
real growth rate, annual	**0.108** **	**0.109** **	**0.114*** **	**0.110** **	**0.105** **	**0.106** **	**0.112** **	**0.0941*** **	**0.0956*** **	**0.0938*** **	**0.0934*** **	**0.0915*** **	**0.0937*** **	**0.0910*** **
	(0.0440)	(0.0443)	(0.0430)	(0.0443)	(0.0438)	(0.0443)	(0.0437)	(0.0171)	(0.0170)	(0.0171)	(0.0171)	(0.0171)	(0.0174)	(0.0175)
government savings	**-0.452*** **	**-0.446*** **	**-0.457*** **	**-0.450*** **	**-0.455*** **	**-0.454*** **	**-0.454*** **	**-0.548*** **	**-0.528*** **	**-0.550*** **	**-0.546*** **	**-0.547*** **	**-0.549*** **	**-0.529*** **
	(0.0478)	(0.0460)	(0.0484)	(0.0478)	(0.0477)	(0.0479)	(0.0465)	(0.0205)	(0.0211)	(0.0210)	(0.0207)	(0.0206)	(0.0212)	(0.0227)
CPI	0.0209	0.0220	0.0241	0.0327	0.0221	0.0243	0.0457	**0.0225** **	**0.0242** **	**0.0218** **	**0.0299*** **	**0.0233** **	**0.0243** **	**0.0335*** **
	(0.0296)	(0.0299)	(0.0287)	(0.0337)	(0.0297)	(0.0301)	(0.0323)	(0.0104)	(0.0104)	(0.0104)	(0.0115)	(0.0104)	(0.0106)	(0.0116)
real interest rate	**-0.108*** **	**-0.108*** **	**-0.100*** **	**-0.108*** **	**-0.111*** **	**-0.108*** **	**-0.101*** **	**-0.0709*** **	**-0.0682*** **	**-0.0645*** **	**-0.0669*** **	**-0.0730*** **	**-0.0705*** **	**-0.0619*** **
	(0.0236)	(0.0235)	(0.0231)	(0.0235)	(0.0231)	(0.0237)	(0.0229)	(0.0111)	(0.0111)	(0.0112)	(0.0112)	(0.0113)	(0.0113)	(0.0115)
domestic credit	**-0.0229** **	**-0.0222** **	**-0.0223*** **	**-0.0230** **	**-0.0220** **	**-0.0240** **	**-0.0214** **	**-0.0237*** **	**-0.0211*** **	**-0.0242*** **	**-0.0241*** **	**-0.0234*** **	**-0.0241*** **	**-0.0229*** **
	(0.00881)	(0.00890)	(0.00813)	(0.00885)	(0.00863)	(0.00915)	(0.00841)	(0.00320)	(0.00333)	(0.00329)	(0.00320)	(0.00319)	(0.00334)	(0.00358)
youth dependency	-6.547	**-7.416***	**-7.321***	-5.942	-5.233	-5.903	-5.328	**-5.371*** **	**-5.772*** **	**-5.427*** **	**-4.313** **	**-4.483** **	**-5.076** **	-3.093
	(4.052)	(4.251)	(3.907)	(4.333)	(4.240)	(4.162)	(4.391)	(2.028)	(2.036)	(2.040)	(2.088)	(2.169)	(2.058)	(2.252)
old age dependency	**-36.56** **	**-36.78** **	**-41.53*** **	**-37.63** **	**-37.35** **	**-39.75** **	**-49.54*** **	**-31.60*** **	**-33.55*** **	**-34.78*** **	**-33.64*** **	**-31.74*** **	**-34.66*** **	**-41.48*** **
	(14.72)	(14.85)	(14.25)	(14.93)	(14.84)	(15.16)	(15.04)	(4.803)	(4.983)	(4.823)	(4.982)	(4.865)	(5.213)	(5.771)
size of government		-0.177					-0.299		**-0.290*** **					**-0.341*** **
		(0.244)					(0.242)		(0.104)					(0.114)
property rights quality			**-0.580** **				**-0.700*** **			**-0.429*** **				**-0.444*** **
			(0.266)				(0.259)			(0.106)				(0.116)
sound money				0.162			0.179				**0.125***			0.107
				(0.152)			(0.161)				(0.0652)			(0.0710)
freedom to trade					0.261		0.419					0.152		**0.302** **
					(0.292)		(0.306)					(0.137)		(0.147)
regulation						0.288	0.376						0.222	**0.280***
						(0.402)	(0.429)						(0.154)	(0.165)
Constant	-41.12	-40.60	-46.48	-46.40	-35.74	-42.25	-45.37	-55.60***	-61.60***	-64.07***	-59.10***	-53.31***	-52.15***	-68.64***
Observations	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449
R-squared	0.507	0.508	0.512	0.508	0.508	0.508	0.517							
number of countries	81	81	81	81	81	81	81	81	81	81	81	81	81	81
r2_a	0.504	0.504	0.509	0.504	0.504	0.504	0.511							

Table 4: Descriptive Statistics

Variable		Mean	Std. Dev.	Min	Max
private savings	overall	23.604	7.909	-3.894	59.543
	between		6.378	10.529	43.550
	within		4.838	-5.275	47.627
logreal GDP	overall	9.179	0.987	6.446	10.706
	between		0.994	6.561	10.578
	within		0.197	8.324	10.020
logreal GDP, squared	overall	85.231	17.461	41.552	114.617
	between		17.395	43.061	111.899
	within		3.641	69.573	99.301
real growth rate, annual	overall	2.420	4.040	-18.399	18.082
	between		2.095	-1.486	8.406
	within		3.565	-18.003	20.916
current account balance to GDP	overall	-1.249	7.041	-38.880	48.669
	between		5.529	-14.328	26.429
	within		4.948	-25.801	25.323
CPI	overall	8.193	8.495	-13.845	49.197
	between		5.727	0.561	25.916
	within		6.606	-15.315	48.006
real interest rate	overall	6.732	7.490	-33.289	47.063
	between		4.975	-3.314	28.589
	within		5.999	-40.872	38.691
domestic credit	overall	59.999	44.510	2.402	319.564
	between		39.259	6.697	169.251
	within		21.345	-43.406	295.995
government savings	overall	-2.090	4.628	-20.787	32.729
	between		3.094	-8.801	11.029
	within		3.493	-30.016	19.609
youth dependency	overall	0.478	0.220	0.194	1.065
	between		0.228	0.216	1.027
	within		0.053	0.296	0.723
old age dependency	overall	0.133	0.071	0.017	0.303
	between		0.071	0.020	0.270
	within		0.011	0.087	0.192
total dependency	overall	0.498	0.181	0.286	1.002
	between		0.188	0.308	0.974
	within		0.045	0.341	0.711
size of government	overall	5.859	1.514	1.627	9.305
	between		1.331	2.688	8.292
	within		0.689	2.153	8.322
property rights quality	overall	6.355	2.100	1.433	9.894
	between		1.962	2.623	9.382
	within		0.616	3.639	8.645
sound money	overall	7.723	1.664	1.130	9.838
	between		1.190	4.874	9.664
	within		1.205	2.157	11.185
freedom to trade	overall	6.822	1.299	2.359	9.705
	between		1.149	3.172	9.521
	within		0.598	3.837	8.807
regulation	overall	6.063	1.062	2.934	8.664
	between		0.947	3.210	8.058
	within		0.429	4.366	8.729
Observations	1576				
Countries	81				
Av. time span	19.4568				

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