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# Rebundling Institutions

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## Abstract

This study investigates the joint effects of legal property rights and contracting institutions on economic development. In a two-step panel estimation procedure that uses data of 130 countries over the period 2005-2015, I find that the long-term income effects of legal property rights institutions depend on the quality of legal contracting institutions. This supports the hypothesis that the two different types of institutions provide interrelated incentives and constraints on economic decisions and productive activities. According to the estimates, the marginal effects of increasing executive constraints are significantly higher in countries with a legal system that efficiently enforces private contracts. Further decomposing the interaction effect for groups of countries with different quality combinations reveals that the fit of the two types of legal institutions matters for the size and direction of the interaction effect. In poor countries with absent or bad legal institutions, reforms considering only one single type can backfire.

**Keywords:** legal institutions; property rights; contracting; interrelated incentives; joint effects; economic development.

**JEL: C23; H13; O11; P51.**

# 1 Introduction

The state plays a crucial role in the building of institutions which North (1991):97 defines as "humanly devised constraints that structure political, economic and social interaction". The state has the authority to issue and enforce laws and regulations that put incentives and constraints on a wide area of human interaction. Acemoglu and Johnson (2005) open *Unbundling Institutions* with a reference to North (1981), pointing at two spheres of state regulation that ascribe the state a different role for organizing national economies: The first, the "predatory theory" of the state, emphasizes the state's role in distributing political power and allocating resources in the society, underlining the importance of property rights institutions for economic performance (see, e.g., Jones, 2003; De Long and Shleifer, 1993; Olson, 2000; Besley and Ghatak, 2010)). The second, the "contract theory" of the state, emphasizes the state's role in providing a legal framework that enables private contracts and facilitates economic transactions (Coase, 1960; Williamson, 1989), underlining the importance of contracting institutions for economic performance (see, e.g., Grossman and Hart, 1986; Hart and Moore, 1990; Hart, 1995).

While Acemoglu and Johnson (2005) acknowledge that the state is responsible for providing a legal framework that regulates *both* the distribution of power and resources and the enforcement of private contracts, they *"(...)attempt to unbundle the broad cluster of institutions and learn more about the relative importance of contracting versus property rights institutions at the macro level."* In a cross-country study on former European colonies, Acemoglu and Johnson find strong and significant effects of legal property rights institutions and much weaker—for non-financial outcomes non-significant—effects of legal contracting institutions. They conclude that individuals may find informal ways to avoid the adverse effects of a weak legal system to enforce private contracts, but find it harder to mitigate the risk of government expropriation. *Unbundling Institutions* has given development economics a push. It has become a starting point for a number of studies aiming to isolate and compare the economic effects of different types of institutions (see, e.g., Fernandez and Kraay, 2005; Bhattacharyya, 2009; Williamson and Kerekes, 2011; Asongu, 2016). It, however, relies on the assumption that the economic effects of legal property rights and contracting institutions are independent of each other.

This paper deviates from the assumption of independent effects and brings the investigation on how legal property rights and contracting institutions influence economic development back to North (1981), Milgrom and Roberts (1994) and towards the Varieties-of-Capitalism literature (e.g., Soskice and Hall (2001); Amable (2003);

Rougier (2015)). This stream of literature suggests that it is not single (sets of) institutions but bundles of (sets of) institutions which together and in their combination organize production, exchange and income distribution. Voigt and Gutmann (2013) have taken one step towards rebundling the effects of legal property rights institutions. They argue that precisely defined property rights are unlikely to have any economic effects unless accompanied by some credible commitment of the government to enforce these rights and provide empirical evidence that property rights increase growth rates only if the judicial system is independent enough to guarantee their enforcement. The underlying paper goes further and provides arguments and empirical evidence that implementing or improving legal property rights institutions may not suffice to spur economic development and can be ineffective or even countereffective when legal contracting institutions are absent or of bad quality. This is because property rights and contracting institutions provide interrelated incentives and constraints on economic decisions and productive activities, e.g., on private investment. A lack in the definition and enforcement of only one of the two different types of institutions as well as a poor fit of the incentives and constraints they provide may block economic development.

I draw on data of 130 countries from all world regions for the period 2005-2015 and implement a two-step panel estimation procedure to test the hypothesis that the different types of legal institutions are jointly effective. The two-step estimation strategy allows to consider different channels and timespans of effects. In the first step, I use a fixed effects least squares estimator to identify short-term individual and interaction effects of legal property rights and contracting institutions on real GDP per capita levels whilst controlling for country-specific unobserved heterogeneity, time effects and a set of control variables. In the second step, I apply a between effects least squares estimator to identify long-term individual and interaction effects of the two types of legal institutions. As second-step dependent variable I use the estimate of the country-specific unobserved heterogeneity term obtained in the first-step regression since it explains the the time-invariant component of GDP per capita levels that varies across countries. Concerning the choice of institutional variables, I closely follow Acemoglu and Johnson (2005) and use the Polity IV Project's variable on executive constraints as baseline measure for legal property rights institutions and the World Bank's indicator on legal enforcement of private contracts as baseline measure for legal contracting institutions.

The baseline estimation results and a number of robustness tests support the hypothesis of joint effects. I find positive individual and interaction effects of legal property rights and contracting institutions on countries' long-term income levels,

all at considerable sizes and statistically highly significant. The marginal effects of increases in executive constraints vary to a considerable degree among countries in both direction and size dependent on how efficient the prevalent legal system enforces private contracts. This result relates to and extends Acemoglu and Johnson (2005). Moreover, and building up on Djankov et al. (2003) who finds systematic differences in the efficiency of the legal system dependent on the legal orgin, I find significantly smaller marginal effects for countries that have a French legal legacy.

Decomposing the interaction effect shows that the baseline estimation results are driven by two groups of countries with distinctive quality combinations of legal property rights and contracting institutions. Increasing executive constraints is most income-enhancing in countries with a good quality of both types of legal institutions. This concerns countries at higher levels of economic development. In countries with absent or a bad quality of both types of legal institutions the positive individual effect of increases in executive constraints are eaten up by the negative interaction effect. In 27 sample countries the net effects on long-term income levels can even be negative. This concerns countries at lower levels of economic development and implies that if non-legal institutional solutions are applied to organize national economies, reforms that consider installing only one type of legal institutions while leaving the other type unchanged can be countereffective. This result relates to literature on lawlessness and second-best institutions which argue that the economic challenges and constraints in countries at early stages of economic development need institutional solutions different from those of more advanced economies. The result is in accordance with Dixit (2011) who puts forward that an effort to strengthen judicial enforcement of private property rights can easily backfire in the presence of relational contracting. The result is also in line with Rodrik (2008) who argues that conducting piecemeal reforms towards a best-practice system of legal institutions may do more harm than good if the legal institutions are at odds with and disturb the integrity and functioning of prevalent institutionalized rules and practices.

The remainder of this paper is structured as follows: Section 2 elaborates on why the assumption of independent effects is too strong and property rights and contracting institutions are jointly effective. Section 3 puts forward some theoretical considerations on the channels and timespans of effects, discusses estimation challenges and presents the identification strategy and the empirical models. Section 4 addresses some measurement issues that are considered in the choice of institutional variables and describes the dataset. Section 5 presents the baseline and decomposition results as well as the results for the robustness tests. Section 6 concludes.

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# 2   The argument

The hypothesis is that successful economic development requires an adequate specification and enforcement of both property rights and contracting rules as well as compatibility and complementarity of these rules. To see more clearly why this should be the case, consider the role of transaction costs in the work of Coase (1937, 1960). The Coase theorem says: *When transaction costs are zero the allocation of resources will be efficient regardless of the initial assignment of property rights.* Everything can be contracted upon efficiently as long as transaction costs are zero and information is complete. In the real world, transaction costs are not zero and information is incomplete. Contracting is costly and property rights are not perfectly defined (Allen, 1999; Barzel, 1997). Consequently, it matters how property rights are specified and resources are allocated and utilized in a society Libecap (1993); Lueck and Miceli (2007) and it matters how the organisational and regulatory framework in which private contracting takes place is set up (Hart, 1995; Goldberg, 1976).

Property rights institutions assign asset ownership to individuals, groups, or the state. Different property rights regimes (e.g., open access, private ownership, common property, state property) produce a specific and predictable allocation and utilization of resources in a society. Regardless of the prevalent regime, property rights must be clearly specified and enforced to be effective. They are determined through a political process that invovles negotiations among immediate group members and lobbying activities (Lueck and Miceli, 2007). There are negative effects on economic performance when property rights are not well defined or when they are attenuated by governments or ruling elites which are not constrained in their decision making power and rule by decree. Ho (2016) argues that a poor quality of property rights institutions due to, e.g., lax crime enforcement, weak court system, excessive regulations and poor patent protection, creates a wedge between the marginal product of capital and the rate of return that can be appropriated: In the absence of a legal title for property, one is not confident to purchase a house; when corrupt authorities evict people from their lands, one is unwilling to invest in it.

Contracting institutions help to organize free economic exchange. They enable private parties without political power to engage in bargaining and undertake private transactions, i.e., transfer or modify property rights on assets. Contracting institutions reduce incentives for contract breach and increase certainty on how others behave which allows non-simultaneous transactions. Clague et al. (1999) argue that good contracting institutions become more important as economies become more complex: When there is lending and borrowing, capital is lent in expectation of a

later return; when a demander and a supplier are some distance apart, one must be at risk for the value of the goods in transit; when there is insurance, some party must make payments now in hope of indemnification if specified contingencies occur.

For both contracting and property rights institutions informal mechanisms can sufficiently organize an economy until a certain degree of complexity. Property rights and private contracts can be defined and enforced by custom, norms and repeated interactions (Ellickson, 1991). However, as investment becomes large, long-lived and highly asset-specific and as trade in goods and services occurs outside of repeated exchange relationships, informal contract enforcement mechanisms become an increasingly imperfect institutional solution (Trebilcock and Leng, 2006). An increasing number of and heterogeneity among economic agents and intensifying competition for assets that can be transfered to high-valued uses require formal governance structures to supplement informal institutions (Lueck and Miceli, 2007; Libecap, 1993). The state has the authority to define and enforce property and contracting law and provide courts as legal mechanisms to enforce these laws. In this respect, legal institutions play an important role in coordinating the usage, maintenance, and investment in assets in more complex economies (Demsetz, 1967).

Among the various economic decisions and productive activities for which good property rights and contracting institutions matter, their importance for investment is crucial for economic development (North, 1981). The impact of institutional quality on growth rates that runs via fostering investment is sizeable (see, e.g., Gwartney et al., 2006; Besley, 1995). Property rights and contracting institutions jointly reduce transaction costs and uncertainties and foster investment in physical capital, human capital and technology (see, e.g., North and Thomas, 1973; North, 1981; Jones, 2003). While property rights institutions ensure investors about a legal title to property and secure the fruits of investment from being seized by others, contracting institutions enable the fruits to be traded upon with others. A lack in the definition and enforcement of only one type or their misfit may constitute a bottleneck for economic development and produce an inefficient allocation and utilization of resources: Despite a clear title to property and a low probability of experiencing government expropriation, great inefficiencies in the enforcement of private contracts increases uncertainties and costs for economic transactions which constrains non-simultaneous transactions and an efficient transfer of assets to high-valued uses. Despite a set of institutionalized rules that efficiently regulates private transactions, private parties will not engage in productive activities and undertake investment if the title to property is unclear or the probability of being expropriated by the government or powerful elites is high.

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# 3    Implementation

Before disentangling the effects of legal property rights and contracting institutions on income levels some more general issues on the channels and timespans of effects have to be addressed as this carries important implications for the design of short-, medium-, and long-term policies. A salient feature of time series on GDP per capita levels is that they are rather inert or sluggish. There is a momentum built into GDP per capita levels that makes them continue to grow steadily or stagnate. This empirical phenomenon indicates the influence of constant factors. The huge and persistent differences in GDP per capita levels and growth rates across countries indicates that these constant factors are country-specific. Yet, GDP per capita levels and growth rates do show some short-term variations. A glance into growth theory helps to understand the features of time series on GDP per capita levels and to get a better understanding of when and how institutions play a role for economic development which leads the way to the appropriate estimation strategy.

## 3.1    Theoretical background and channels of influence

Growth literature differentiates between proximate and fundamental causes of growth. Proximate causes refer to the input factors in the production function. Traditional neoclassical growth theory explains differences in output $Y$ with differences in the accumulation of capital $K$ and labor $L$ which in turn stem from differences in saving rates that are either exogenously given (Solow, 1956; Swan, 1956) or evolve endogenously (Ramsey, 1928; Cass, 1965; Koopmans, 1965). Yet, differences in factor inputs can only explain parts of the variations in output. The remainder is considered due to differences in total factor productivity and exogenous. North and Thomas (1973):2, argue that factor accumulation and innovation *"(...) are not causes of growth; they are growth"*. In line with this, Acemoglu et al. (2005) differentiate proximate causes from fundamental causes of growth. The fundamental causes underlie the proximate causes and drive investment in phsyical capital, human capital and technology. While also considering geography, culture and luck as fundamental causes, Acemoglu et al. (2005) put emphasis on institutions.

To analyze the role of institutions in necolassical growth models, reconsider a human capital augmented version of the Solow–Swan model of long-run economic growth with a constant returns to scale Cobb-Douglas production function and a labor-augmented technological progress:

$$Y(t) = K(t)^\alpha H(t)^\beta (A(t)L(t))^{1-\alpha-\beta}. \tag{1}$$

$Y(t)$ represents the output, $K(t)$ the stock of physical capital, $H(t)$ the stock of human capital, and $A(t)L(t)$ represents the stock of effective labor. $A$ and $L$ grow from given initial levels $A(0)$ and $L(0)$ at exogenous rates $g$ and $n$, such that $A(t) = A(0)e^{gt}$ and $L(t) = L(0)e^{nt}$. While $L(0)$ refers to the initial size of labor force, $A(0)$ stands for the initial state of technology. $K$ and $H$ grow endogenously. The stocks of physical and human capital increase over time via saving a constant fraction of output $s = s_K + s_H$, where $s_K$ is the fraction of savings $s$ invested in physical capital, e.g., buying and inventing new machines, and $s_H$ is the fraction of savings $s$ invested in human capital, e.g., educating the working population. Physical and human capital depreciate at a constant rate $\delta$. In equilibrium, physical capital per effective unit of labor, $k(t) = K(t)/A(t)L(t)$, and human capital per effective unit of labor, $h(t) = H(t)/A(t)L(t)$, are constant. Actual physical and human capital investment equal the break-even investment needed to prevent $k(t)$ and $h(t)$ from falling. The steady state values of $k$ and $h$ are determined by:

$$
\begin{aligned}
k^* &= \left( s_K^{1-\beta} s_H^{\beta}/(n+g+\delta) \right)^{1/(1-\alpha-\beta)}, \\
h^* &= \left( s_K^{\alpha} s_H^{1-\alpha}/(n+g+\delta) \right)^{1/(1-\alpha-\beta)}.
\end{aligned}
\tag{2}
$$

Based on equation (1), output per worker can also be written as:

$$
Y(t)/L(t) = A(t)k(t)^{\alpha}h(t)^{\beta}.
\tag{3}
$$

As $k(t)$ converges to $k^*$ and $h(t)$ converges to $h^*$, $Y(t)/L(t)$ converges to the growth rate of $A(t)$, which is $g$. The economy moves alongside a steady state growth path with $Y(t)/L(t)$ steadily growing at rate $g$ as long as $k(t)$ and $h(t)$ are constant over time. The steady state growth path can contemporarily be disturbed. A change in any right hand-side term of equations (2) causes a change in $k(t)$ and $h(t)$ until they reach new steady state values. Consequently, $Y(t)/L(t)$ temporarily also grows at some rate different from $g$. When the new steady state values are reached, however, the growth rate of $Y(t)/L(t)$ goes back to $g$.

Neoclassical growth theory misses to explicitly address the role of institutions. Libecap (1993) argues this is because the neoclassical paradigm bases on the assumption that the underlying institutions are well defined, operational amd adapt to marketlike forces so that they can not stray far from what is considered optimal. From Coase (1937, 1960), North (1981, 1991) and Acemoglu et al. (2005) it has become clear that it is necessary to discuss the role of institutions in economic decision taking and performance which includes reevaluating and extending growth theory.

Consider equation (3). First, institutions can affect $Y(t)/L(t)$ via $A(t)$ as a fundamental cause of growth. Mankiw et al. (1992):411 argue that $A(0)$ not only reflects the initial state of technology but also resource endowments, climate and institutions. If institutions that determine $A(0)$ are country-specific, then one should expect production functions, steady state income levels and growth rates to be country-specific as well. If institutions that determine $A(0)$ are moreover persistent, then one should expect the cross-country differences in income levels to be persistent as well. Second, and again considering equation (3), institutions can affect $Y(t)/L(t)$ via $k(t)$ and $h(t)$, i.e., affecting proximate causes of growth. Institutions can determine $k^*$ and $h^*$ via any term at the right hand-side of equations (2). If institutional changes at any time point $t$ alter saving rates $s_K$ and $s_H$, the population growth rate $n$, the technology growth rate $g$ and the depreciation rate $\delta$, one should expect temporary deviations from the steady state growth path which manifests in short-term variations in $Y(t)/L(t)$ levels and growth rates.

## 3.2 Identification strategy and empirical models

Rodrik and co-authors strongly suggest to distinguish between short-term and long-term growth effects. Rodrik et al. (2004) formulate a long-term growth model that concentrates on the effects of fundamental causes of growth and suggests to distinguish these effects from the short-term effects of growth collapses (Rodrik, 1999) and growth accelerations (Hausmann et al., 2005) which can give very different policy implications. To take account of the different channels and timespans of effects, I apply a two-step panel data approach that allows to estimate the time-invariant component of GDP per capita levels caused by country-specifc constant factors, i.e., the fundamental causes of growth, in a first-step regression and use this estimate as proxy for countries' long-term income levels in a second-step regression. This identification strategy complies with Islam (1995)'s approach of estimating "country effects" and constructing country-specific measures $A(0)_i$ in order to allow for long-term cross-country differences in aggregate production functions and steady state income levels. Correspondingly, I see my proxy for countries' long-term income levels closely related to growth theory's steady state or target value of output per worker and as a qualified indicator for countries' levels of economic development.[1]

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[1]Alternatively, one could use the 2005-2015 average GDP per capital levels as measures for countries' long-term income levels and estimate a cross-section model to identify the effects of institutions on long-term income levels as done in Acemoglu and Johnson (2005). This alternative second-step estimation approach, however, does not "clean" the dependent variable from short-term effects of proximate causes of growth. Moreover, the coefficient estimates may suffer from omitted variable bias since the constant country-specific factors—which are very likely correlated

Panel data has the potential advantage of utilizing within and between country variation. However, (i) the strong autocorrelation of GDP per capita levels over time, (ii) the endogenous relationship between institutions and income, and (iii) the persistence of institutions make a proper identification complicated. Because of (i) and (ii), formulating a linear panel data model and using a pooled ordinary least squares estimator is not feasible. The strong autocorrelation of GDP per capita levels requires to formulate an empirical model that takes unobserved heterogeneity caused by country-specific constant factors into account. The endogenous relationship between income and institutions and the theoretical consideratons on the channels of influence require to allow the country-specific constant factors to be correlated with the explanatory variables, especially with the proximate causes of growth. Challenges (i) and (ii) require to apply a fixed effects (FE) estimation approach. There are, however, two downturns of the FE estimator in this application: First, the FE estimator uses within-country variation only. Yet, the majority of variation in income levels is between countries. Second, the effects of observable country-specific constant variables cannot be estimated as there is no way to distinguish them from the effects of unobservable country-specific factors. This is especially problematic because of (iii), the persistence of institutions.

The two-step estimation approach allows to deal with these issues. In the first step, I take full account of the panel structure of the underlying dataset and use a FE least squares estimator to identify individual and interaction effects of legal property rights and contracting institutions on GDP per capita levels whilst controlling for the effects of proximate causes of growth, the effects of country-specific constant factors and time effects. The first-step model is given by:

$$ln(y_{it}) = \beta_1 PR_{it} + \beta_2 C_{it} + \beta_3 PR_{it} \times C_{it} + z'_{it}\zeta + \mu_i + \theta_t + e_{it}, \qquad (4)$$

where $ln(y_{it})$ is the natural logarithm of the real GDP per capita level of country $i$ at time period $t$. $PR_{it}$ refers to legal property rights institutions, $C_{it}$ refers to legal contracting institutions, $PR_{it} \times C_{it}$ measures the interaction effect of the two types of legal institutions and $\beta_1$, $\beta_2$ and $\beta_3$ are the respective coefficients and parameters of interest. $z_{it}$ is a vector of control variables that includes measures for proximate causes of growth and $\zeta$ is a vector capturing the effects of them. $\mu_i$ is the unobserved heterogeneity term that captures the effects of country-specific constant factors. $\theta_t$ is a set of dummies capturing year fixed effects. $e_{it}$ are robust idiosyncratic errors.

with the explanatory variables—are ignored. Islam (1995):1132 states that it is only possible to correct for this bias in panel data frameworks.

As $\mu_i$ explains long-term cross-country differences in the GDP per capita levels, the remainder is short-term variation of GDP per capita levels that is left to be explained by institutional changes in legal property rights and contracting institutions over the time period considered, physical and human capital accumulation, other control variables and unobserved time-variant factors captured in the errors.

In the second step, I apply a between effects (BE) least squares estimator that uses variation between countries to identify the long-term income effects of legal property rights and contracting institutions. I proxy countries' long-term income levels with the estimate of the unobserved heterogeneity term $\hat{\mu}_i$ which gives the time-invariant component of GDP per capita levels that is explained by country-specific constant factors, i.e., the fundamental causes of growth. The corresponding second-step model is:

$$\hat{\mu}_i = \alpha + \gamma_1 \overline{PR}_{i.} + \gamma_2 \overline{C}_{i.} + \gamma_3 \overline{PR}_{i.} \times \overline{C}_{i.} + \overline{z'}_{i.}\eta + (\alpha_i - \alpha + \overline{\epsilon}_{i.}), \quad (5)$$

where bars indicate mean values and dots formally define that time has been averaged out. I regress $\hat{\mu}_i$ on the random intercept $\alpha$, the means of the two types of legal institutions and their interaction, the set of control variables, including proximate causes of growth and an error that consists of country-specific random effects $\alpha_i$, the random intercept $\alpha$ and robust mean idiosyncratic errors $\overline{\epsilon}_{i.}$. $\gamma_1$, $\gamma_2$ and $\gamma_3$ are the parameters of interest and $\eta$ captures the effects of control variables in the second-step model. An alternative variant of the second-step model would be taking first period values. I prefer using mean values rather than first period values as the former allow to capture the cumulative effects of institutions on income levels over the period 2005-2015, put less weight and rely less heavily on accurate assessments at single points in time. Using first period values, however, has the advantage of being less prone to endogeneity issues. I therefore present the results when using this alternative variant of the second-step model alongside with and as a reduced form of an IV estimation approach in the robustness section.

## 3.3 Marginal effects

In empirical models that exclude the interaction term the marginal effects of improvements in legal property rights institutions simply are the partial derivatives of the income measures. This coincides with $\beta_1$ for the short-term marginal effects and $\gamma_1$ for the long-term marginal effects. Such an empirical model, however, assumes independence of these effects from the quality of legal contracting institutions. The

arguments put forward in Section 2 give reason to relax this assumption and allow the marginal effects to vary with the quality of legal contracting institutions. For the second-step model given in (5), the marginal effects of improvements in legal property rights institutions on countries' long-term income levels are:

$$\frac{\partial \hat{\mu}_i}{\partial \overline{PR}_{i.}} = \gamma_1 + \gamma_3 \times \overline{C}_{i.}. \tag{6}$$

The marginal effects consist of two parts: The first part, $\gamma_1$, captures the individual effect of an increase in the average quality of legal property rights institutions. The second part, $\gamma_3 \times \overline{C}_{i.}$, captures the interaction effect of an increase in the average quality of legal property rights institutions which depends on the country-specific average quality of legal contracting institutions. One can easily see that including the interaction term produces country-specific marginal effects. In empirical models that exclude the interaction term, $\gamma_3$ is zero by assumption and the estimated marginal effects are the same for all countries.

# 4    Data and summary statistics

I utilize panel data of 130 countries for the period 2005-2015. Table A1 in the appendix reports the countries and the number of observations for each country considered. In general, the sample covers a quite even split of low, middle and high income countries from all world regions: 20 Western democracies including Japan, 23 countries from Eastern Europe and the former Soviet Union, 14 Asian countries, 14 countries from Northern Africa and the Middle East, 37 Sub-Saharan African countries and 22 countries from Latin America and the Caribbean. The dataset includes variables on institutions, macroeconomic outcomes, demographic and cultural factors. Table A2 in the appendix reports the definitions of variables and sources of data.

## 4.1    Measurement issues

The literature points at the issue of finding a reliable way to measure institutions. Glaeser et al. (2004) name two main characteristics of institutions that should be considered for accurate measurement: (i) institutions constrain behavior, and (ii) institutions are persistent. According to Glaeser et al., many empirical studies purporting to show how institutions affect economic outcomes are based on flawed measures that neither measure constraints nor are persistent. Moreover, many stan-

dard measures for political institutions provided by the World Bank, the Polity IV project and International Country Risk Guide capture too broad phenomena.[2] The problem with using multidimensional indices is that they capture a number of different constraints which makes it hard to grasp what they actually measure and what policy recommendations can be drawn from coefficient estimates.

Voigt (2013) raises further theoretical considerations on what should influence how we define and measure institutions. One consideration is that institutions consist of two components: The first component is the substantial content of a rule, e.g., the specification of the degree to which property rights are protected. The second component is the factual implementation of the rule, e.g., the means used to enforce property rights, such as impeachment proceedings against those who violate the rules. The factual implementation depends on the behavior of the enforcers which includes legislators, judges, police, prosecutors, prison staff, but also the press, lobby groups and the public. While non-compliance with economic institutions, such as contracting institutions, can be checked by political institutions, the factual implementation of political institutions, such as property rights institutions, is often extremely precarious. Checks and balances on governments are an attempt to reduce the expected utility of non-compliance with political institutions.

## 4.2   Institutional variables data

I choose measures that cover both the content and the legal implementation of institutionalized rules. These measures infer on the quality levels of legal property rights and contracting institutions from a mixture of written laws and regulations, action choices and outcomes of political and juridical processes that allow to assess to which degree private parties are legally protected from government expropriation and how costly it is to enforce private contracts via a legal process. This entails that two countries may differ in rule content and implementation but yield the same scores in institutional quality if the different mixtures produce the same degree of legal protection of property or the same costs of legally enforcing private contracts.

As baseline measure for legal property rights institutions I make use of the Polity IV Project's *Executive Constraints* variable which is also the preferred property rights institutions measure in Acemoglu and Johnson (2005) and described in Gurr

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[2]A number of authors critically evaluate these frequently used indicators, see Woodruff (2006) on the issues of multicollinearity among different institutional indicators, Keefer (2004) on the issue of measurement errors, Cheibub et al. (2010) on the need for a clear theoretical formulation on the phenomena that should be measured, Munda and Nardo (2005) on the aggregation rules to construct indicators, and Oman and Arndt (2010) on the lack of transparency in the construction of indicators.

(1997). Initially referred to as "decision rules" (Eckstein and Gurr, 1975), the variable measures to what extent institutionalized rules constrain the decision-making powers of chief executives, whether individuals or collectives. The constraints may be imposed by any accountability groups. In Western democracies these are usually legislators, others are the ruling party in a one-party state, councils of nobles or powerful advisors in monarchies, military in coup-prone polities and in many states a strong independent judiciary. Experts monitor and rate countries on a yearly basis alongside a seven-category scale. Since the variable measures the rules and regulations protecting citizens against the power of the government and ruling elites, it captures to what extent the property of citizens is protected against government expropriation. As laid out in Acemoglu and Johnson (2005), this measure has two advantages: First, it corresponds to the procedural rules constraining government action, and second, it highlights the close relationship between property rights institutions and political institutions. Its disadvantage is that it ignores constraints on expropriation by other powerful bodies and actors.

As baseline measure for legal contracting institutions I make use of the World Bank's "Enforcing Contracts" indicator, thereafter called *Legal Contract Enforcement*. The indicator is constructed from a number of questions taken from the Doing Business survey. It measures the time and costs of resolving a commercial dispute as well as the quality of the judicial process, i.e., an assessment of whether a country has adopted a series of good practices that promote quality and efficiency in the court system. The data is collected through studies of codes of civil procedure and other court regulations as well as questionnaires completed by local litigation lawyers and judges. A country's final score in a given year is the simple average of the scores for each of the three indicator components in that year: time, costs and quality of the judicial process. This methodology builds up on Djankov et al. (2003). The advantage of this measure is that it encompasses and evaluates several aspects that contribute to the functioning of the legal system and rates countries alongside this aggregated score. The downside of this measure is that it is difficult to draw precise policy implications from its coefficient estimates as it is a construct of three different aspects. To deal with this issue, I first reduce the aspects considered in the indicator down to two and then down to one aspect in robustness exercises.

## 4.3 Dependent and control variables data

In the first-step regression, I use the log level of GDP per capita in constant 2010 US Dollars as dependent variable. In the second-step regression, I use $\hat{\mu}_i$ as dependent

variable, the estimate of the unobserved heterogeneity term obtained in the first-step regression. As described in Section 3, $\hat{\mu}_i$ reflects the country-specific constant part of GDP per capita levels and serves as proxy for countries' long-term income levels. There is a broad literature on which factors influence countries' income levels and growth rates. In a cross-country study, Barro (1996) finds significant effects of physical capital investment, human capital investment, macroeconomic policies, trade openness, fertility, life expectancy and rule of law on GDP per capita growth. Tabellini (2010) stresses the role of culture and institutions for output per capita. Following existing literature, I include a set of observable neoclassical growth variables (investment, education, population), a trade variable, and a variable measuring cultural fractionalization as controls.

## 4.4  Descriptive statistics

Table 1 reports the summary statistics of the dataset. The two dependent variables are highly, almost perfectly, correlated with a coefficient of 0.9961.[3] This reassures that $\hat{\mu}_i$ carries valuable information on differences in countries' long-term income levels. The variation in both income measures between countries is substantial which hints at large cross-country differences in growth theory's $A(0)$ term. To exemplify: Over the period 2005-2015 the Netherland's average per capita income is $50,423$ US\$. This is 50 times the average per capita income of Senegal which is 998 US\$. Accordingly, with a $\hat{\mu}_i$ value of $+2.211$, the Netherlands reach place 8 on the list that ranks the 130 sample countries according to their level of economic development. Senegal ranks 103 with a $\hat{\mu}_i$ value of $-1.693$. In comparison, countries with an average per capita income around $5,000$ US\$ (Iraq, Azerbaijan, Jamaica and China) rank around place 60 and are close to the sample's average long-term income level where $\hat{\mu}_i = 0$.

The institutional variables also show a substantial variation between countries. I adjust the scalings, substract the means and devide by the standard deviations of the two institutional variables and their interaction term, respectively. I do this for two reasons: First, demeaning the values solves the issue of multicollinearity which occurs when interaction terms are included alongside the interacted variables in regression analysis.[4] Second, demeaning and normalizing the standard deviations

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[3]This confirms that GDP per capita levels are strongly autocorrelated over time. This underlines the importance to investigate ultimate causes of growth to understand economic development.

[4]Not demeaning the values of the institutional variables increases the variance inflation factors (vif) significantly and clearly above the threshold of 20, especially for the interaction term. This indicates severe multicollinearity. Demeaning the values solves this issue while leaving the coefficient estimates qualitatively unchanged.

Table 1: Summary statistics

|  | Obs | Mean | St.dev | Min | Max |
|---|---|---|---|---|---|
| *Dependent variables* | | | | | |
| Log real per capita income | 1,246 | 8.576 | 1.517 | 5.726 | 11.425 |
| Level of economic development ($\hat{\mu}_i$) | 1,246 | 0.000 | 1.495 | -2.639 | 2.969 |
| | | | | | |
| *Institutional variables* | | | | | |
| Executive Constraints | 1,246 | 0.000 | 1.000 | -2.196 | 0.920 |
| Legal Contract Enforcement | 1,246 | 0.000 | 1.000 | -2.868 | 2.662 |
| Legal Contract Enforcement II | 1,253 | 0.000 | 1.000 | -2.709 | 2.360 |
| Number of Procedures | 1,246 | 0.000 | 1.000 | -2.651 | 2.594 |
| Property Rights Protection | 1,126 | 0.000 | 1.000 | -3.194 | 2.188 |
| | | | | | |
| *Control variables* | | | | | |
| Investment (% of GDP) | 1,246 | 23.908 | 6.784 | 1.525 | 61.469 |
| Population (per sqkm) | 1,246 | 180.777 | 681.271 | 2.468 | 7,807 |
| Trade (% of GDP) | 1,246 | 88.497 | 45.961 | 19.101 | 441.604 |
| Cultural fractionalization | 1,246 | 0.312 | 0.212 | 0 | 0.733 |
| Years of schooling | 1,246 | 9.308 | 2.071 | 4 | 15 |

of the institutional variables to one makes interpretation of the results easier. The coefficient estimates then correspond to the marginal effects on income levels after an one standard deviation increase in the quality of legal institutions. Investment and trade as percentage of GDP show between and within country variation. Population density has a positive linear trend over the years. Since for cultural fractionalization no panel data is available, I draw back to Fearon (2003)'s cultural fractionalization index constructed for the year 2003. Because the data on cultural fractionalization is time-invariant, it is omitted in the first-step regression. However, it is a valuable carrier of information to explain cross-country differences in long-term income levels in the second-step regression. As proxy for human capital I use Barro and Lee (2011)'s variable on years of educational attainment. Since there are many missing values over time, I follow Voigt and Gutmann (2013) and use 3-year moving averages.

In order to be able to disentangle the effects of the institution variables and their interaction term, it is crucial that the measures for legal property rights and contracting institutions capture different phenomena that are not too strongly correlated. Theoretically, this could be an issue. A high correlation of legal property rights and contracting institutions would be in accordance with Acemoglu and Robinson (2006, 2008) who see economic institutions as equilibrium outcomes of political institutions. Hence, good (bad) economic institutions could be the consequence of good (bad) political institutions.
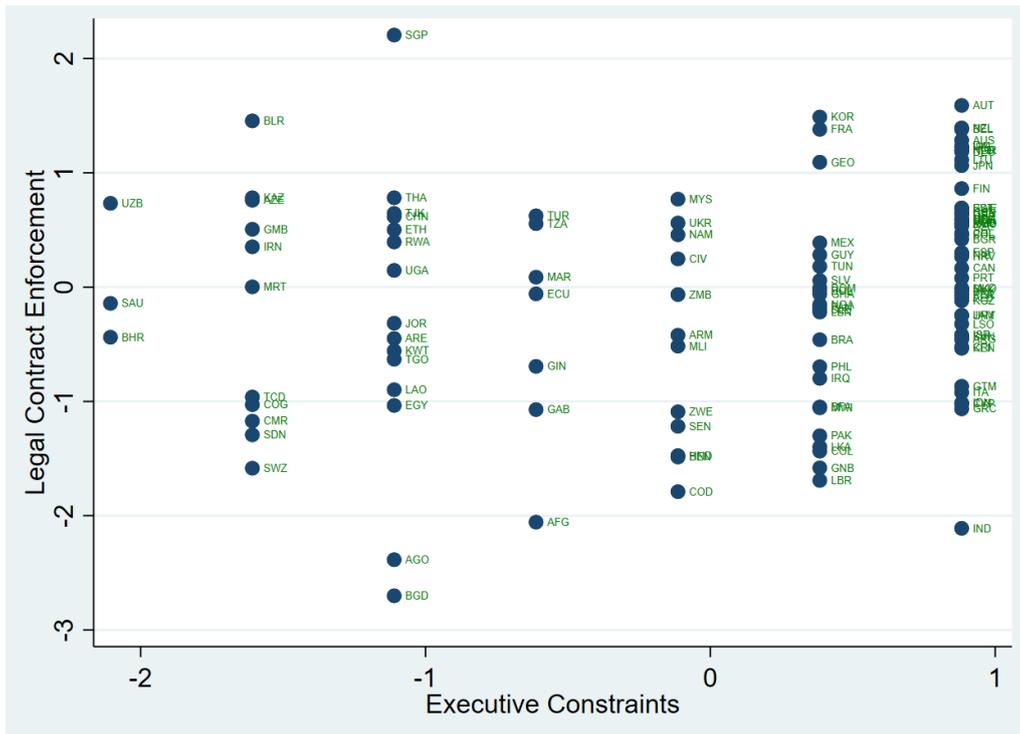
Figure 1: *Executive Constraints* and *Legal Contract Enforcement* scores in 2015

Figure 1 plots countries' scores on the quality of the legal property rights institutions measure in 2015 on the x-axis against countries' scores on the quality of the legal contracting institutions measure in 2015 on the y-axis. Countries score quite differently in the quality levels of the two types of legal institutions. There are all sorts of combinations of high and low quality levels of *Executive Constraints* and *Legal Contract Enforcement*. While, e.g., Austria scores high and Bangladesh scores low in the quality levels of both types of legal institutions, India shows the highest quality of *Executive Constraints* and the third lowest quality of *Legal Contract Enforcement* out of all 130 sample countries in 2015. Singapore, as another example, shows the highest quality of *Legal Contract Enforcement*, but is rated clearly at a below sample average quality of *Executive Constraints*. For the 2015 cross-country sample the correlation coefficient of the two legal institution variables is 0.1828. For the 2005-2015 panel sample it is somewhat higher at 0.2626. This reassures that the two measures of legal institutions capture different phenomena with a minor correlation which should enable a proper identification of individual and joint effects.

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# 5 Results

The results are based on the model given in (4) using a FE least squares estimator and the model given in (5) using a BE least squares estimator to disentangle the effects of legal property rights and contracting institutions on countries' income levels as described in Section 3.2. I find strong and significant individual and interaction effects on countries' long-term income levels which underline the crucial role of institutions as a fundamental cause of growth. Because of the second part of (6), the marginal effects are country-specific and larger for countries that do not have a French legal origin. A further decomposition shows that the size and direction of the interaction effect vary strongly among groups of countries with different quality combinations of the two types of legal institutions. The results remain robust when alternative institution measures are used and when efforts are made to account for the endogenous relationship between income and institutions.

## 5.1 Baseline estimation results

Table 2 presents the estimation results of the main model specifications. Columns (1) show the coefficient estimates and respective standard errors for the first-step FE estimation. I can not relate within-country variations in real GDP per capita levels over the period 2005-2015 to institutional changes in the the two types of legal institutions when controlling for proximate causes of growth, other potentially growth-relevant factors and time effects. However, I do find significant positive effects of the capital investment ratio and education, my measures for the proximate causes of growth. This finding is in accordance with the theoretical considerations presented in Section 3.1 which explains short-term variations in income levels with variations in factor accumulation. Also in accordance with the theoretical considerations, although I find that institutional changes do not have direct short-term effects, they may have indirect short-term effects via influencing factor accumulation.

Columns (2) show the coefficient estimates and respective standard errors for the second-step BE estimation. I find positive and statistically highly significant effects of legal property rights and contracting institutions. This suggests that legal roperty rights and contracting institutions are important fundamental causes of growth that enter growth theory's $A(0)$ term and affect long-term income levels both individually and in their combination. While for the capital investment ratio I find no significant effect, I find a positive and significant effect of education on long-term income levels. This suggests while investment in physical capital seems to be a proximate cause

Table 2: Baseline and decomposition estimation results

| | 1st step: FE | | 2nd step: BE | | | |
| | (1) | | (2) | | (3) | |
| | Coeff. | SE | Coeff. | SE | Coeff. | SE |
|---|---|---|---|---|---|---|
| Executive Constraints | 0.016 | (0.015) | 0.352*** | (0.118) | 0.331** | (0.155) |
| Legal Contract Enforcement | 0.037 | (0.032) | 0.492*** | (0.100) | 0.575*** | (0.130) |
| EC * LCE | 0.023 | (0.018) | 0.346*** | (0.091) | | |
| EC * LCE * $\mathcal{D}_{++}$ | | | | | 0.771** | (0.337) |
| EC * LCE * $\mathcal{D}_{--}$ | | | | | 0.641*** | (0.174) |
| EC * LCE * $\mathcal{D}_{+-}$ | | | | | −0.418 | (0.293) |
| Investment (% of GDP) | 0.004*** | (0.001) | 0.008 | (0.015) | 0.007 | (0.014) |
| Population (per sqkm) | −0.000 | (0.000) | 0.000** | (0.000) | 0.000 | (0.000) |
| Trade (% of GDP) | −0.001*** | (0.000) | 0.006** | (0.003) | 0.007** | (0.003) |
| Years of schooling | 0.018*** | (0.005) | 0.170*** | (0.048) | 0.176*** | (0.048) |
| Cultural fractionalization | | | −1.260*** | (0.442) | −1.250*** | (0.406) |
| Observations | 1,246 | | 130 | | 130 | |
| Groups | 130 | | . | | . | |
| R² | 0.5195 | | 0.5375 | | 0.5601 | |

*Notes:* Dependent variables: *Log real per capita income* in the first-step FE regression in (1) and $\hat{\mu}_i$ in the second-step BE baseline and decomposition regressions in (2) and (3). *, **, *** indicate 10, 5, 1 % significance levels. Robust standard errors in paranetheses. Constants are included in both steps but not reported. The first-step FE regression controls for time and country-specific constant factors. The second-step decomposition regression includes group dummies $\mathcal{D}$ which allow the interaction effect to vary among groups of countries with different combinations of above (+) and below (−) sample average quality levels of legal property rights and contracting institutions. The group of countries with a −+ quality combination is omitted and serves as reference.

of growth and able to explain short-term variations in GDP per capita levels only, human capital seems to be both a fundamental and a proximate cause of growth. This ascribes human capital an important role for economic development which is in accordance with, e.g., Wilson and Briscoe (2004). The results on the other control variables are as expected and in line with literature. I find a positive and significant long-term effect of trade openness. This effect is six times the magnitude of the negative short-term effect estimated in the first-step regression which may reflect implementation costs or result from entanglement with the country-specific constant factors captured in the unobserved heterogeneity term. The overall effect of trade on income levels is positive, which is in line with, e.g., Brunner (2003). Lastly, I find a very strong and highly significant negative effect of cultural fractionalization. The more culturally distant different groups within a country are the lower is the country's long-term income level which supports the findings of Alesina et al. (2003); Fearon (2003).

## 5.2 Cross-country differences in marginal effects

The baseline estimation results entail country-specific marginal effects. Recall equation (6): The first part, $\gamma_1$, captures the individual effect which is the same for all countries. The second part, $\gamma_2 \times \overline{C}_{i\cdot}$, refers to the interaction effect which varies across countries. The difference in countries' marginal effects due to the second part can be remarkable as the following country examples show.

Consider the income effects of improving legal property rights institutions for two different African countries: Chad and Gambia both score 2 on the 1-to-7 ranking of Polity IV's *Executive Constraints* variable throughout the period. The baseline estimation results suggest that the same one standard deviation increase in checks and balances on executives yields an increase in the long-term income level of more than 30% in Gambia and roughly zero in Chad.[5] While the individual effect increases both African countries' long-term income level by 23.55%, the above sample average legal efficiency of enforcing private contracts in Gambia that scores 0.397 for $\overline{C}_{i\cdot}$ and the below sample average legal efficiency of enforcing private contracts in Chad that scores $-1.021$ for $\overline{C}_{i\cdot}$ produces an interaction effect that is positive and supplements the individual effect in Gambia by 9.20% and that is negative and diminishes the individual effect in Chad by 23.63%. Strikingly, for 27 out of the 130 sample countries the net effects of increasing checks and balances on executives are negative. This concerns 16 Sub-Saharan African, 7 Asian, 2 Latin American, 1 Western (Italy) and 1 Northern African country (Egypt).

Studying further examples of African countries suggests that the legal origin matters for whether a country benefits more or less from increases in executive constraints. Mali, Cote d'Ivoire, Namibia and Zambia all score 5 on Polity IV's *Executive Constraints* variable throughout the period. They, however, differ widely in their $\overline{C}_{i\cdot}$ scores: $-0.762$ for Mali, $-0.117$ for Cote d'Ivoire, $-0.069$ for Zambia and 0.418 for Namibia. An one standard deviation increase in checks and balances on executives leads to an increase in the long-term income level of 5.93% in Mali, 20.86% in Cote d'Ivoire, 21.95% in Zambia and 33.23% in Namibia. Chad, Mali and Cote d'Ivoire are—like Chad—former French colonies, apply civil law and have a legal efficiency below the sample average. Namibia and Zambia are—like Gambia—former British colonies, apply common law and have a legal efficiency above the sample average. This finding is in accordance with Acemoglu and Johnson (2005) who

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[5]The marginal effects can easily be calculated by plugging the coefficient estimates of $\gamma_1$, $\gamma_3$ and countries' mean *Legal Contract Enfocement* scores into equation (6) and then devide the outcome by the standard deviation of $\hat{\mu}_i$ which yields the formula: $\frac{0.352+0.346\times\overline{C}_{i\cdot}}{1.495}$.

show in a sample of world ex-colonies that French ex-colonies have worse contracting institutions than British ex-colonies.

The examples of African countries indicate that having a French legal origin is disadvantageous when intending to gain in income levels via improvements in legal property rights institutions. To test whether this result is generalizable to the underlying world sample, I perform a two-sample t test on the means of magrinal effects for the group of countries with a French legal origin as compared to the group of countries with other legal origins. Table 3 presents the results. The mean marginal effects are significantly smaller for the 59 sample countries with a French legal origin as compared to the 71 sample countries with British, German, Scandinavian or other legal origin. For the group of countries with a French legal origin the mean marginal effects are 13.67%. For the group of countries with other legal origins the mean marginal effects are 28.27%. The difference is statistically significant at the 1% level and stems from smaller or negative interaction effects in countries with a French legal origin which show a worse quality of legal contracting institutions. This finding relates to Djankov et al. (2003) who report in a global sample that countries' legal origin explains about 40 percent of the variation in the degree of legal formalism.

Table 3: Two-sample t test comparing means of marginal effects

| Group | Obs | Mean | St. err. | Std. dev. | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| Legal origin: Other | 71 | .2827 | .0295 | .2483 | .2239 | .3415 |
| Legal origin: French | 59 | .1367 | .0266 | .2040 | .0835 | .1898 |
| combined | 130 | .2164 | .0210 | .2398 | .1748 | .2580 |
| diff | | .1460 | .0404 | | .0661 | .2259 |

diff = mean(0) - mean (1)                                         t = 3.6145
H0: diff = 0                                       degrees of freedom = 128

| Ha: diff < 0 | Ha: diff ! = 0 | Ha: diff > 0 |
|---|---|---|
| Pr(T < t) = 0.9998 | Pr(|T| > |t|) = 0.0004 | Pr(T > t) = 0.0002 |

## 5.3 Interaction effect for different quality combinations

For the baseline estimates I pooled information of the 130 sample countries to find that the marginal effects of improvements in legal property rights institutions vary significantly with the prevalent quality level of legal contracting institutions. The marginal effects of improvements in legal property rights institutions may, however,

also vary with the prevalent quality level of legal property rights institutions themselves and the quality fit of the two types of legal institutions. It is possible that the baseline results are driven by a subset of countries with a distinctive quality combination of legal property rights and contracting institutions. To study this, I further decompose the interaction effect by dividing the sample into four groups of countries with different combinations of above and below sample average quality levels of the two types of legal institutions. 43 countries display above sample average and 36 below sample average quality levels of both types of legal institutions. 31 countries have an above sample average quality of legal property rights institutions, but a below sample average quality of legal contracting institutions. 20 countries demonstrate the opposite. To measure whether the interaction effect differs among these groups of countries, I include group dummies in the second-step model:

$$\hat{\mu}_i = \alpha + \gamma_1 \overline{PR}_{i.} + \gamma_2 \overline{C}_{i.} + \gamma_3 \overline{PR}_{i.} \times \overline{C}_{i.} \times \mathcal{D}_{qq} + \overline{z'}_{i.}\eta + (\alpha_i - \alpha + \overline{\epsilon}_{i.}). \qquad (7)$$

$\mathcal{D}_{qq}$ assigns each country to one of the four groups of quality combinations. The subscript $q$ refers to the quality of each type of legal institutions, where the first $q$ refers to the quality of legal property rights institutions and the second $q$ refers to the quality of legal contracting institutions. If $q$ turns $+$ ($-$), then the quality level of the respective type of legal institutions is above (below) the sample average. Columns (3) in Table 2 show the estimation results when three group dummies are included in the model specification and the fourth dummy is omitted to serve as reference. The results suggest that the baseline estimate for the interaction effect is driven by two groups of countries: (i) the group with above sample average quality levels of both types of legal institutions for which the interaction effect is significant, large and positive, and (ii) the group with below sample average quality levels of both types of legal institutions for which the interaction effect is significant, large and negative.[6]

The findings suggest that the quality combination of the two types of legal institutions prevalent in a country matters for the income effects of institutional changes in terms of both the strength and the direction of effects. Increases in checks and balances on executives are most effective when a stock of executive constraints already exists and when it is complemented with a legal system that efficiently enforces private contracts. In 43 sample countries good quality levels of both types of legal institutions seems to constitute crucial parts of an investment-friendly institutional

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[6]Note that a positive estimate of $\gamma_3$ produces a negative interaction effect for countries with a below sample average quality of legal contracting institutions. This can be seen from (6).

framework. A bad quality of legal contracting institutions, instead, seems to render (further) improvements in legal property rights institutions ineffective as it is suggested for the 31 sample countries with a $+-$ quality combination. For these 31 sample countries a bad quality of legal contracting institutions seems to constitute a bottleneck for economic development. For 36 sample countries with below sample average quality levels of both types of legal institutions improvements in legal property rights institutions produce a negative interaction effect. For 27 out of these 36 sample countries the negative interaction effect is stronger than the positive individual effect suggesting that in 27 sample countries improving legal property rights institutions even reduces long-term income levels if not accompanied with complementary institutional changes in legal contracting institutions.

One explanation for this finding is that the 36 sample countries with below sample average quality levels of both types of legal institutions apply alternative (non-legal) systems of institutions to coordinate their economic activities and transactions. Institutional changes towards directions at odds with the prevalent systems may disrupt the smooth workings of the systems if the incentives and constraints provided by the institutions are interrelated. This explanation is in accordance with Dixit (2011) who argues that an effort to strengthening judicial enforcement of private property rights can easily backfire in the presence of relational contracting. At early stages of economic development reforms off the legal path can be more efficient then formal institutional solutions which have proved successful in countries at later stages of economic development. This also complies with Rodrik (2008) who argues that it is the function and not the form of institutions that matters, and that policy implications should not be derived from a best-practice model. Instead, different environmental conditions in different stages of economic development require different institutional solutions.

Table A3 in the appendix reports the estimation results of the second-step model when the interaction effect is estimated separately for each group. This allows not only the slope but also the intercept to vary among the four different groups. The estimation results of this exercise support the findings presented above. What is more, they provide even stronger support for the quality fit argument. The interaction effect is less strong or insignificant for countries with poorer fitted quality levels of the two types of legal institutions. Increasing the fit is income-enhancing. This provides further evidence that institutions provide interrelated incentives and constraints and have to be adjusted to build a framework conducive for economic development. Figure 2 in the appendix illustrates the findings in two graphs.

## 5.4 Robustness: Alternative institution measures

I am confident that the baseline measures are good proxies for legal property rights and contracting institutions following the considerations in Section 4.1 and given present limits on panel data availability. However, there exist alternative measures which capture partly the same, partly similar and partly additional information on the two types of legal institutions. These alternatives have some drawbacks and some advantages over the baseline measures. Table 4 presents the second-step regression results when using alternative measures and shows that the main findings of the baseline estimation are preserved.[7]

Table 4: Estimation results for alternative institution measures

| | 2nd step: BE | | | | | |
| | (1) | | (2) | | (3) | |
| | Coeff. | SE | Coeff. | SE | Coeff. | SE |
|---|---|---|---|---|---|---|
| Executive Constraints | 0.307** | (0.128) | 0.516*** | (0.122) | | |
| Legal Contract Encorcement | | | | | 0.258** | (0.110) |
| Legal Contract Encorcement II | 0.633*** | (0.010) | | | | |
| Number of Procedures | | | 0.233* | (0.124) | | |
| Property Rights Protection | | | | | 0.683*** | (0.110) |
| EC * LCE II | 0.227** | (0.096) | | | | |
| EC * NoP | | | 0.619*** | (0.113) | | |
| PRP * LCE | | | | | 0.166* | (0.090) |
| Investment (% of GDP) | −0.006 | (0.018) | 0.019 | (0.015) | 0.001 | (0.013) |
| Population (per sqkm) | 0.000 | (0.000) | 0.001*** | (0.000) | −0.000 | (0.000) |
| Trade (% of GDP) | 0.009*** | (0.003) | 0.006** | (0.003) | 0.007** | (0.003) |
| Years of schooling | 0.187*** | (0.052) | 0.209*** | (0.044) | 0.196*** | (0.051) |
| Cultural fractionalization | −1.450*** | (0.447) | −1.509*** | (0.414) | −1.532*** | (0.436) |
| Observations | 124 | | 130 | | 125 | |
| R$^2$ | 0.5531 | | 0.5497 | | 0.6404 | |

*Notes:* Dependent variable: $\hat{\mu}_i$ as measure for countries' long-term income levels obtained in the respective first step regressions. *, **, *** indicate 10, 5, 1 % significance levels. Robust standard errors in parantheses. Constant included but not reported.

First, I make use of an alternative variant of the legal contracting institutions measure. I draw on the "Legal Enforcement of Contracts" indicator which is part of the Economic Freedom index published by the Fraser Institute. Like the baseline

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[7]The first-step regressions were estimated but results are not reported as they are almost identical with the results of the baseline estimation: There are no significant direct short-term effects of the two institutional variables and their interaction term on log real GDP per capita.

measure, this indicator utilizes World Bank's Doing Business data but it differs in two ways: First, it utilizes only cost and time information to measure the efficiency of commercial dispute resolution. Second, a different formula is used to calculate the scores, see Table A2 in the appendix. Second, I proxy legal contracting institutions with the number of procedures involved in collecting a commercial debt which allows to assess the quality of the judicial process, the one component that is omitted in the first alternative measure vis-a-vis the baseline measure. Columns (1) and (2) in Table 4 show that the coefficient estimates of the two types of legal institutions and their interaction term remain robust but vary in sizes when using alternative measures for legal contracting institutions.

Third, I make use of an alternative legal property rights institutions measure. I use Fraser Institute's "Protection of property rights" indicator which is based on information from the World Economic Forum's Executive Opinon survey question: *In your country, to what extent are property rights, including intellectual property, protected?* In contrast to the baseline measure, this alternative measure has the advantage of having the explicit focus on measuring how well property rights are protected rather than assessing the quality of a broader set of political institutions. The downside of this measure, however, is that it builds up on subjective evaluations of business executives which were asked on specific aspects of the business environment in the country they operate in. These evaluations may be prone to changes in business cycles and deliberate contortions of respondents. Nevertheless, and as presented in columns (3) in Table 4, the coefficient estimates of the two types of legal institutions and their interaction term remain statistically significant.

## 5.5   Robustness: Restricted and extended models

Many studies rely on the assumption that the marginal effects of different types of institutions are independent. For comparison, I formulate alternative first-step and second-step models that exclude the interaction term. The aim of this exercise is to evaluate how much the estimates of the marginal effects differ from the baseline estimation when relying on the independence assumption. Columns (1) of Table 5 show the coefficient estimates and respective standard errors of the second-step restricted model. The resticted model estimates of $\gamma_1$ and $\gamma_2$ are quantitatively and qualitatively similar to the baseline model estimates. The restricted model results suggest that an one standard deviation increase in executive constraints increases long-term income levels by 22.41%. The baseline results, however, reveal that these estimates are only accurate for countries with a quality level of legal contracting

institutions close to the sample average, such as Namibia. They are not accurate for countries with legal contracting institutions closer to the lower and upper end of the quality, such as Gambia and Chad.

Table 5: Estimation results for restricted and extended models

| | 2nd step: BE | | | |
| | (1) | | (2) | |
| | Coeff. | SE | Coeff. | SE |
|---|---|---|---|---|
| Executive Constraints | 0.335*** | (0.124) | 0.198** | (0.096) |
| Legal Contract Enforcement | 0.449*** | (0.106) | 0.243*** | (0.092) |
| EC * LCE | | | 0.186** | (0.078) |
| Investment (% of GDP) | 0.000 | (0.016) | 0.003 | (0.011) |
| Population (per sqkm) | 0.000 | (0.000) | 0.000** | (0.000) |
| Trade (% of GDP) | 0.007** | (0.003) | 0.007*** | (0.002) |
| Years of schooling | 0.149*** | (0.051) | 0.117*** | (0.045) |
| Cultural fractionalization | −1.386*** | (0.454) | −0.443 | (0.420) |
| Northern Africa/Middle East | | | −0.585* | (0.337) |
| Latin America | | | −1.663*** | (0.233) |
| Eastern Europe | | | −1.710*** | (0.244) |
| Asia | | | −1.725*** | (0.321) |
| Sub-Saharan Africa | | | −2.496*** | (0.290) |
| Observations | 130 | | 130 | |
| $R^2$ | 0.4872 | | 0.7642 | |

*Notes:* Dependent variable: $\hat{\mu}_i$ as proxy for countries' long-term income levels. *, **, *** indicate 10, 5, 1 % significance levels. Robust standard errors in parantheses. Constant included but not reported. The Western Democracies and Japan region is omitted and serves as reference in the second step regression.

Rich and poor countries are not equally distributed around the world but cluster in world regions. This suggests that there exist some growth factors that are region-specific or more similar for countries from the same world region, including geographic and climate conditions, contemporary and historical political events or cultural traits. Moreover, countries located in the same world region are more connected via trade and migration flows. I include region dummies to control for region-specific effects in an extended model. This enables to analyze the maginal effects of legal property rights and contracting institutions in a more homogeneous setting. Columns (2) of Table 5 show the results when region dummies extend the baseline models. The increase in the $R^2$ statistic suggests that region-specific effects explain a substantial part of the variation in long-term income levels around the world. All five regions have lower income levels as compared to the sixth omitted

reference region Western democracies and Japan. The region-specific effects capture all cross-regional differences in institutional quality. This absorbs half of the effects of legal property rights institutions, legal contracting institutions and their interaction term as compared to the baseline model. Nevertheless, there are still significant individual and interaction effects left to explain within-region variations in long-term income levels.

## 5.6 Robustness: Endogeneity

The findings suggest a strong relationship between income and legal property rights and contracting institutions. The argument so far was that the latter two affect the former one and the estimation results have been interpreted in this way. Yet, the channel of influence may also run the other direction from income to institutions. Increases in income may enable to channel more resources into enhancing institutional quality. Endogeneity among income and institutions is a critical issue, which makes a causal interpretation of models (4) and (5) problematic. Existing literature (e.g., Dollar and Kraay, 2003; Acemoglu et al., 2005; Bluhm and Szirmai, 2012) and the first-step estimation results suggest that income and institutions are not immediately and directly responding to each other. In the long term, however, they very likely are. The applied FE and BE estimators do not take care of the issue of reverse causality.

Acemoglu et al. (2001); Acemoglu and Johnson (2005) suggest to exploit exogenous variation in institutions and performing IV estimation procedures in order to tackle the endogeneity issue and be able to give causal interpretations. Since then it has become standard to use historical data as instruments for present institutions. This practice, however, is not seen without criticism. Albouy (2012) shows that the settler mortality data used in Acemoglu et al. (2001); Acemoglu and Johnson (2005) and many following studies to instrument measures of property rights institutions is not reliable. Przeworski (2004a,b) rejects the search for principal causality in institutional theory and econometric analysis altogether on the grounds that institutions and income are mutually endogenous. Although countries' income levels and quality levels of legal property rights and contracting institutions are very likely endogenous outcomes of a co-evolution process, I want to acknowledge the issue of endogeneity for the consistency of the coefficient estimates. In a final robustness test, I perform an IV estimation procedure to give some hint that the baseline estimation results are not severely biased by reverse causality.

I instrument the 2005-2015 values of legal property rights and contracting institutions with past values, which obviously do not respond to 2005-2015 income levels.[8] Table A4 in the appendix provides the summary statistics on the instruments. Fortunately, for *Executive Constraints* there is information dating back several decades. I use ratings for the period 1985-1995 and their square as instruments for the 2005-2015 ratings. Unfortunately, 2000 is the first year in which questions on time, money and quality of contract enforcement were included in the World Bank's Doing Business survey. My instrument for *Legal Contract Enforcement* is therefore time-invariant information from the year 2000. To instrument the interaction term, I simply interact the 1985-1995 ratings for executive constraints with the scores for the legal enforcement of private contracts in 2000.

Table A5 in the appendix presents the results of the first-stage IV estimation. The institutional variables show a strong autocorrelation over time which confirms the persistence of institutions. The reported F-statistics allow to reject the null hypothesis that the instruments are weak.[9] Colums (1) in Table 6 present the results of the second-stage IV estimation. The coefficient estimates of the instrumented institutional variables support the baseline estimation results. The individual and interaction effects of the two types of legal institutions remain economically and statistically significant. The increase in the magnitude of the coefficient estimates is in accordance with Acemoglu and Johnson (2005) and Voigt and Gutmann (2013). The Kleibergen-Paap rk LM and Sargan statistics in the lower part of Table 6 provides an LM test of whether the equation is identified. The null hypothesis can be rejected, which indicates that the instruments are relevant. The Hansen J statistic is a test of overidentifying restrictions. I can not reject the joint null hypothesis that the instruments are valid, i.e., uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation.

Columns (2) and (3) presents the results when estimating equation (5) using first period values rather than mean values. This alternative estimation approach for the second-step model represents a reduced form of the IV estimation approach. The results presented in columns (2) refer to a specification that uses values of the year 2005 and considers the same set of sample countries as the second stage of the IV estimation approach. The results presented in columns (3) refer to a specifica-

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[8]Besides for what Albouy (2012) puts forward, I use past values rather than colonial history data for two reasons: First, colonial history data is time-invariant information while for the past values I (partly) obtain panel data. Panel data allows me to construct $m > k$ instruments for $k$ endogenous institutional variables and perform an overidentification test on whether the instruments are valid. Second, colonial history data fails to reject the null hypothesis that the equation is underidentified which suggests that colonial history data is a poor instrument for the underlying world sample.

[9]This follows Staiger and Stock (1997) who suggest that instruments are weak if $F \leq 10$.

Table 6: Estimation results for models tackling endogeneity issues

| | 2nd step: BE | | | | | |
| | (1) | | (2) | | (3) | |
| | Coeff. | SE | Coeff. | SE | Coeff. | SE |
|---|---|---|---|---|---|---|
| Executive Constraints | 1.764*** | (0.308) | 0.364*** | (0.129) | 0.370*** | (0.07) |
| Legal Contract Enforcement | 0.564*** | (0.216) | 0.527*** | (0.126) | 0.498*** | (0.099) |
| EC * LCE | 0.800** | (0.386) | 0.193* | (0.116) | 0.326*** | (0.091) |
| Investment (% of GDP) | 0.025 | (0.029) | 0.002 | (0.015) | 0.014 | (0.012) |
| Population (per sqkm) | 0.000 | (0.000) | 0.000 | (0.000) | 0.001*** | (0.000) |
| Trade (% of GDP) | 0.005 | (0.003) | 0.004 | (0.003) | 0.003 | (0.002) |
| Years of schooling | 0.053 | (0.076) | 0.147** | (0.061) | 0.186*** | (0.052) |
| Cultural fractionalization | 0.015 | (0.700) | $-1.071$** | (0.521) | $-1.158$*** | (0.434) |
| Observations | 101 | | 101 | | 130 | |
| (Centered) $R^2$ | 0.5812 | | 0.4988 | | 0.5378 | |
| Kleibergen-Paap rk LM statistic | 9.172 | | | | | |
| Chi-sq(2) P-val | 0.0102 | | | | | |
| Hansen J statistic | 1.033 | | | | | |
| Chi-sq(1) P-val | 0.3094 | | | | | |

*Notes:* Dependent variable: $\hat{\mu}_i$ as measure for countries' long-term income levels obtained in the respective first step regressions. *, **, *** indicate 10, 5, 1 % significance levels. Robust standard errors in parantheses. Constant included but not reported. In specification (1) the institution variables are instrumented with past values. In specification (2) values of the year 2005 are used for the right hand-side variables. In specification (3) values of the first observed year are used for the right hand-side variables.

tion that uses values of countries' first observed year and considers the same set of sample countries as the baseline second-step BE estimation approach. The estimation exercises confirm previous results. Accordingly, all robustness exercises tackling endogeneity issues suggest that the baseline results are not seriously biased by the endogenous relationship between income and institutions and institutions exhibit significant individual and interaction effects on long-term income levels. However, I can not exclude the possibility of omitted variable bias. Both income and institutions may be affected by other ultimate causes of growth captured in growth theory's $A(0)$ term, e.g., ecological and geographic conditions or other institutions.

# 6  Concluding remarks

Motivated by Acemoglu et al. (2005), this study has re-evaluated the effects of legal property rights and contracting institutions on economic development. Unlike previous literature which assumes independent effects, this study has considered that

the two different types of legal institutions may be effective in their combination. The argument is that they provide interrelated incentives and constraints on private investment and thereby jointly determine the accumulation of physical capital, human capital as well as the utilization of existing and adoption of new technologies.

This study contributes to existing literature by revealing that the assumption of independent effects of these two types of institutions is too strong. Ignoring the interaction effect leads to an underestimation (overestimation) of the long-term income effects of improvements in the quality of legal property rights institutions for countries with a strong (weak) legal enforcement of private contracts, occasionally to a substantial degree. Moreover, it has been shown that the fit of the two types of legal institutions is crucial for the size and the directon of the marginal effects. For countries with absent or very bad qualities of both types of legal institutions, installing or improving legal property rights institutions only produces negative interaction effects, presumably caused by interferences with incentives and constraints provided by non-legal contracting institutions. The negative interaction effect can exceed the positive individual effect, especially in countries at lower levels of economic development. This insight adds to literature that addresses the difficulties of institution-building and institutional change in poor countries and may help to get one step closer in understanding the slow, incomplete, and controversial privatization efforts that contributed to the stagnation of transitioning economies, such as Russia or the Ukraine.

The policy implications that can be drawn from this study for institution-building and institutional change in poor and transitioning countries are in favor of deviating from a best-practice model that forsees piecemeal reforms towards implementing a specific arrangement of legal institutions and that does not sufficiently take account of institutional complementarities. Instead, institution-building and institutional change should be tailored to local challenges and based on prevalent institutional set-ups. This, however, requires to understand all important prevalent institutionalized rules and practices that put incentives and constraints on economic activities and as well as the nature of the relationships among them. The institutional solution for economic development is country-specific but may be more alike within groups of countries. Future research may investigate more closely similarities and differences in the configuration and interplay of property rights and contracting institutions within and across groups of countries applying different property rights regimes and relate them to differences in economic performance.

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# Appendix

## Table A1: Sample composition

| Country | Region | Obs. | Country | Region | Obs. |
|---------|--------|------|---------|--------|------|
| Argentina | Latin America + Caribbean | 11 | Korea, Rep. | Asia | 11 |
| Armenia | Eastern Europe + form. Sovjet | 11 | Korea, Rep. | Asia | 11 |
| Australia | Western democracies + Japan | 11 | Kuweit | Northern Africa + Middle East | 11 |
| Austria | Western democracies + Japan | 11 | Kyrgyz Rep. | Eastern Europe + form. Sovjet | 10 |
| Azerbaijan | Eastern Europe + form. Sovjet | 11 | Lao PDR | Asia | 11 |
| Bahrain | Northern Africa + Middle East | 8 | Latvia | Eastern Europe + form. Sovjet | 11 |
| Bangladesh | Asia | 2 | Lebanon | Northern Africa + Middle East | 11 |
| Belarus | Eastern Europe + form. Sovjet | 11 | Lesotho | Sub-Saharan Africa | 7 |
| Belgium | Western democracies + Japan | 11 | Liberia | Sub-Saharan Africa | 9 |
| Benin | Sub-Saharan Africa | 11 | Lithuania | Eastern Europe + form. Sovjet | 11 |
| Bolivia | Latin America + Caribbean | 11 | Macedonia | Eastern Europe + form. Sovjet | 11 |
| Brazil | Latin America + Caribbean | 2 | Malawi | Sub-Saharan Africa | 11 |
| Bulgaria | Eastern Europe + form. Sovjet | 11 | Malaysia | Asia | 11 |
| Burkina Faso | Sub-Saharan Africa | 11 | Mali | Sub-Saharan Africa | 10 |
| Cameroon | Sub-Saharan Africa | 11 | Mauritania | Sub-Saharan Africa | 11 |
| Canada | Western democracies + Japan | 11 | Mauritius | Sub-Saharan Africa | 11 |
| Centr. African Rep. | Sub-Saharan Africa | 8 | Mexico | Latin America + Caribbean | 2 |
| Chad | Sub-Saharan Africa | 11 | Moldova | Eastern Europe + form. Sovjet | 11 |
| Chile | Latin America + Caribbean | 11 | Morocco | Northern Africa + Middle East | 11 |
| China | Asia | 2 | Mozambique | Sub-Saharan Africa | 6 |
| Colombia | Latin America + Caribbean | 11 | Myanmar | Asia | 2 |
| Congo, Dem. Rep. | Sub-Saharan Africa | 10 | Namibia | Sub-Saharan Africa | 11 |
| Congo, Rep. | Sub-Saharan Africa | 11 | Netherlands | Western democracies + Japan | 11 |
| Costa Rica | Latin America + Caribbean | 11 | New Zealand | Western democracies + Japan | 11 |
| Cote d'Ivoire | Sub-Saharan Africa | 5 | Nicaragua | Latin America + Caribbean | 11 |
| Croatia | Eastern Europe + form. Sovjet | 11 | Nigeria | Sub-Saharan Africa | 2 |
| Cyprus | Northern Africa + Middle East | 7 | Norway | Western democracies + Japan | 11 |
| Czech Republic | Eastern Europe + form. Sovjet | 11 | Pakistan | Asia | 2 |
| Denmark | Western democracies + Japan | 11 | Panama | Latin America + Caribbean | 11 |
| Dominican Rep. | Latin America + Caribbean | 11 | Paraguay | Latin America + Caribbean | 11 |
| Ecuador | Latin America + Caribbean | 11 | Peru | Latin America + Caribbean | 11 |
| Egypt, Arab Rep. | Northern Africa + Middle East | 10 | Philippines | Asia | 11 |
| El Salvador | Latin America + Caribbean | 11 | Poland | Eastern Europe + form. Sovjet | 11 |
| Eritrea | Sub-Saharan Africa | 3 | Portugal | Western democracies + Japan | 11 |
| Estonia | Eastern Europe + form. Sovjet | 11 | Romania | Eastern Europe + form. Sovjet | 11 |
| Eswatini | Sub-Saharan Africa | 7 | Rwanda | Sub-Saharan Africa | 11 |
| Ethiopia | Sub-Saharan Africa | 5 | Saudi Arabia | Northern Africa + Middle East | 11 |
| Finland | Western democracies + Japan | 11 | Senegal | Sub-Saharan Africa | 11 |
| France | Western democracies + Japan | 11 | Sierra Leone | Sub-Saharan Africa | 11 |
| Gabon | Sub-Saharan Africa | 10 | Singapore | Asia | 11 |
| Gambia | Sub-Saharan Africa | 10 | Slovak Rep. | Eastern Europe + form. Sovjet | 11 |
| Georgia | Eastern Europe + form. Sovjet | 11 | South Africa | Sub-Saharan Africa | 11 |
| Germany | Western democracies + Japan | 11 | Spain | Western democracies + Japan | 11 |
| Ghana | Sub-Saharan Africa | 11 | Sri Lanka | Asia | 11 |
| Greece | Western democracies + Japan | 11 | Sudan | Sub-Saharan Africa | 11 |
| Guatemala | Latin America + Caribbean | 11 | Sweden | Western democracies + Japan | 11 |
| Guinea | Sub-Saharan Africa | 11 | Switzerland | Western democracies + Japan | 11 |
| Guinea-Bissau | Sub-Saharan Africa | 10 | Tajikistan | Eastern Europe + form. Sovjet | 10 |
| Guyana | Latin America + Caribbean | 11 | Tanzania | Sub-Saharan Africa | 11 |
| Haiti | Latin America + Caribbean | 4 | Thailand | Asia | 11 |
| Honduras | Latin America + Caribbean | 11 | Togo | Sub-Saharan Africa | 11 |
| Hungary | Western democracies + Japan | 11 | Tunisa | Northern Africa + Middle East | 8 |
| India | Asia | 2 | Turkey | Northern Africa + Middle East | 11 |
| Indonesia | Asia | 2 | Uganda | Sub-Saharan Africa | 9 |
| Iran, Islamic Rep. | Northern Africa + Middle East | 11 | Ukraine | Eastern Europe + form. Sovjet | 11 |
| Iraq | Northern Africa + Middle East | 6 | Un. Arab Emir. | Northern Africa + Middle East | 11 |
| Ireland | Western democracies + Japan | 11 | United Kingdom | Western democracies + Japan | 11 |
| Israel | Northern Africa + Middle East | 11 | United States | Western democracies + Japan | 2 |
| Italy | Western democracies + Japan | 11 | Uruguay | Latin America + Caribbean | 11 |
| Japan | Western democracies + Japan | 2 | Uzbekistan | Eastern Europe + form. Sovjet | 11 |
| Jordan | Northern Africa + Middle East | 11 | Venezuela, RB | Latin America + Caribbean | 10 |
| Kazakhstan | Eastern Europe + form. Sovjet | 11 | Zambia | Sub-Saharan Africa | 6 |
| Kenya | Sub-Saharan Africa | 11 | Zimbabwe | Sub-Saharan Africa | 11 |

## Table A2: Definitions of variables and sources of data

| Variable | Description |
|---|---|
| Log real per capita income | Logerithm of GDP per capita in constant 2010 US Dollars.<br>*Source:* World Bank national accounts data and OECD national accounts data files. |
| Executive Constraints | The extent of institutionalized constraints on the decision-making powers of executives imposed by any accountability groups. Originally on a seven-category scale, where (1) Unlimited Authority, (3) Slight to Moderate Limitation on Executive Authority, (5) Substantial Limitations on Executive Authority, (7) Executive Parity or Subordination, and (2), (4) and (6) are Intermediary Categories. I demean the scores and devide them by the variable's standard deviation to obtain normalized values in the range [-2.196,0.920].<br>*Source:* Polity IV Project, following Eckstein and Gurr (1975). |
| Legal Contract Enforcement | Index measuring the efficiency and quality of commercial dispute resolution. It considers cases where the value of the claim is equal to 200% of the economy's income per capita or US$5,000, whichever is greater. The original score ranges between 0 and 100 and is a simple average of the scores for each of the three component variables (time, cost, quality of judicial process). The methodology builds up on Djankov et al. (2003). I multiply the index scores by 0.1 to obtain values between 0 and 10, demean the values and devide them by the variable's standard deviation to obtain normalized values between [-2.868,2.662].<br>*Source:* World Bank Doing Business data based on studies of codes of civil procedure, court regulations, questionnaires completed by local litigation lawyers and judges. |
| Legal Contract Enforcement II | Index measuring the efficiency of collecting a commercial debt equal 200 percent of the country's per capita income or worth US$5,000, whichever is greater. Time cost and monetary costs are considered. The former is measured in number of calendar days required from the moment the lawsuit is filed until payment, the later as a percentage of the debt. The formula used to calculate the ratings is $(V_{max} - V_i)/(V_{max} - V_{min})$. Vi represents the time or money cost value. The values for $V_{max}$ and $V_{min}$ are set at 725 days and 82.3 percent (1.5 standard deviations above average in 2005) and 62 days (1.5 standard deviations below average in 2005) and 0 percent, respectively. Countries with values outside the $V_{max}$ and $V_{max}$ range receive ratings of either 0 or 10, accordingly. The two scores get averaged into one. I demean the variable's scores and devide them by the variable's standard deviation to obtain normalized values between [-2.709,2.360].<br>*Source:* Fraser Institute's "Legal Enforcement of Contracts", an indicator of the Economic Freedom index, based on the World Bank's Doing Business estimates. |
| Number of Procedures | Number of procedures involved in collecting a commercial debt valued at 200 percent of the country's per capita income. The minimum number is 21, the maximum number 55 procedures. Based on the number of procedures, countries are rated on a score betwen 0 and 100, whereas higher scores indicate a lower number of procedures. I multiply the orignial scores by 0.1, demean them and devide them by the variable's standard deviation to obtain normalized values in the range [-2.651,2.594].<br>*Source:* World Bank Doing Business data based on studies of codes of civil procedure, court regulations, questionnaires completed by local litigation lawyers and judges. |
| Property Rights Protection | Measure on how well property rights are protected based on the World Economic Forum's survey question: "Property rights, including over financial assets, are poorly defined and not protected by law (= 1) or are clearly defined and well protected by law (= 7)." The Fraser Institute converts the original value to a 0-to-10 scale using the formula: $EFW_i = ((GCR_i - 1) \div 6) \times 10$, where 10 refers to the highest protection. I take the variable constructed by the Fraser Institute, demean and devide the values by the variable's standard deviation to obtain normalized values in the range [-3.194,2.188].<br>*Source:* Fraser Institute's "Protection of property rights", an indicator of the Economic Freedom index, which is a component of the Human Freedom index. |
| Investment (% of GDP) | Gross capital formation as percentage of GDP (formerly gross domestic investment).<br>*Source:* World Bank, World Development Indicators. |
| Population (per sqkm) | Population density (people per sq. km of land area), midyear population.<br>*Source:* Food and Agriculture Organization and World Bank population estimates. |
| Trade (% of GDP) | Sum of exports and imports of goods and services measured as a share of GDP.<br>*Source:* World Bank Open Data, data from World Federation of Exchanges database. |
| Cultural fractionalization | 0-to-1 scale index on how culturally fractionalized the population is in the year 2003.<br>*Source:* Fearon (2003). |
| Years of schooling | Duration of compulsory education (years) for population 25+, 3-year moving averages.<br>*Source:* Barro and Lee (2011). |
| Group dummies | 4 dummies, assigning countries to one of four combinations of above and below sample average quality levels of measures of legal property rights and contracting institutions. |
| Region dummies | 6 dummies, assigning countries to one of six world regions, see Table A1.<br>*Source:* Fearon (2003). |

Table A3: Results for the interaction effect separately estimated for different quality combinations

| | 2nd step: BE | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | (1) | | (2) | | (3) | | (4) | |
| | Coeff. | SE | Coeff. | SE | Coeff. | SE | Coeff. | SE |
| Executive Constraints | 0.227* | (0.124) | 0.501*** | (0.132) | 0.340** | (0.143) | 0.165 | (0.160) |
| Legal Contract Enforcement | 0.264** | (0.109) | 0.637*** | (0.100) | 0.449*** | (0.116) | 0.589*** | (0.122) |
| EC * LCE * $\mathcal{D}_{++}$ | 1.188*** | (0.303) | | | | | | |
| EC * LCE * $\mathcal{D}_{--}$ | | | 0.730*** | (0.160) | | | | |
| EC * LCE * $\mathcal{D}_{+-}$ | | | | | 0.023 | (0.332) | | |
| EC * LCE * $\mathcal{D}_{-+}$ | | | | | | | 0.616** | (0.303) |
| Investment (% of GDP) | 0.006 | (0.015) | 0.007 | (0.014) | 0.001 | (0.016) | 0.003 | (0.016) |
| Population (per sqkm) | 0.000 | (0.000) | 0.000 | (0.000) | 0.000 | (0.000) | 0.000 | (0.000) |
| Trade (% of GDP) | 0.007** | (0.003) | 0.007** | (0.003) | 0.007** | (0.003) | 0.006** | (0.003) |
| Years of schooling | 0.171*** | (0.049) | 0.170*** | (0.048) | 0.150*** | (0.051) | 0.150*** | (0.050) |
| Cultural fractionalization | −1.366*** | (0.426) | −1.206*** | (0.418) | −1.376*** | (0.456) | −1.360*** | (0.460) |
| Observations | 130 | | 130 | | 130 | | 130 | |
| $R^2$ | 0.5332 | | 0.5402 | | 0.4932 | | 0.5112 | |

*Notes:* Dependent variable: $\hat{\mu}_i$ as proxy for countries' long-term income levels obtained in the first-step regression. *, **, *** indicate 10, 5, 1 % significance levels. Robust standard errors in parantheses. Constants included but not reported.
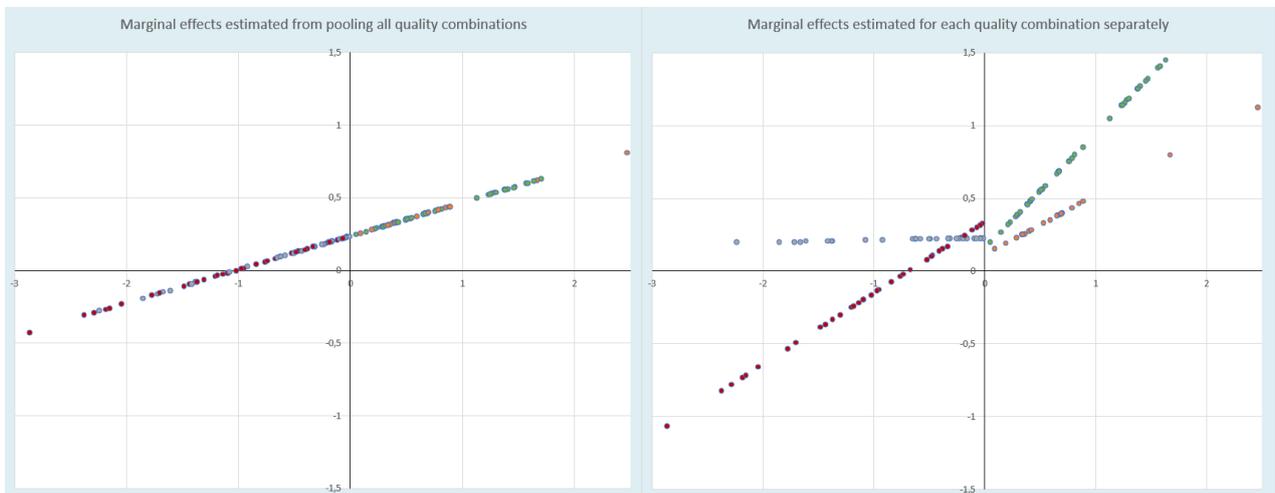
Figure 2: The x-axis gives countries' 2005-2015 average *Legal Contract Enforcement* scores. The y-axis gives the estimated marginal effects of an one standard deviation increase in *Executive Constraints*. The left diagram plots the average marginal effects estimated from model (5) and presented in Table 2 columns four and five pooling all 130 sample countries. The right diagram plots the marginal effects when the interaction effect is estimated separately for groups of countries with different quality combinations of legal property rights and contracting institutions as presented in Table A3. Countries represented by green dots have a ++ quality combination. Countries represented by red dots have a −− quality combination. Countries represented by grey dots have a +− quality combination. Countries with orange dots have a −+ quality combination.

Table A4: Summary statistics on instruments

|  | Obs | Mean | St.dev | Min | Max |
|---|---|---|---|---|---|
| EC1985-1995 | 902 | 0.000 | 1.000 | -1.663 | 1.013 |
| EC1985-1995sq | 902 | 0.000 | 1.000 | -1.348 | 1.105 |
| CE2000 | 902 | 0.000 | 1.000 | -2.535 | 2.300 |
| EC1985-1995 * CE2000 | 902 | 0.000 | 1.000 | -2.079 | 3.418 |

Table A5: IV estimation results: First stage

| *Dependent Variable* | Executive Constraints | | Legal Contract Enforcement | | EC * LCE (2005-2015) | |
|---|---|---|---|---|---|---|
|  | Coeff. | SE | Coeff. | SE | Coeff. | SE |
| Investment (% of GDP) | $-0.008$ | (0.017) | 0.011 | (0.009) | $-0.011$ | (0.012) |
| Population (per sqkm) | $-0.000^{**}$ | (0.000) | $-0.000$ | (0.000) | $-0.000^{*}$ | (0.000) |
| Trade (% of GDP) | 0.002 | (0.002) | $0.005^{***}$ | (0.002) | 0.002 | (0.003) |
| Years of schooling | 0.037 | (0.038) | 0.043 | (0.030) | $-0.039$ | (0.061) |
| Cultural fractionalization | $-0.508$ | (0.352) | $-0.357$ | (0.284) | $-0.244$ | (0.340) |
| EC1985-1995 | $-0.658$ | (0.514) | $-0.654$ | (0.473) | 0.772 | (0.799) |
| EC1985-1995square | $1.121^{**}$ | (0.487) | 0.635 | (0.458) | $-0.649$ | (0.702) |
| CE2000 | 0.056 | 0.068 | $0.747^{***}$ | (0.064) | 0.104 | (0.120) |
| EC1985-1995 * CE2000 | $-0.032$ | (0.080) | 0.099 | (0.067) | $0.456^{***}$ | (0.090) |
| Observations | 101 | | 101 | | 101 | |
| Partial $R^2$ of excl. instruments | 0.3268 | | 0.6818 | | 0.2658 | |
| F (4,91) | 13.03 | | 48.01 | | 17.21 | |

*Notes:* Dependent variables: baseline measures for institution variables. Excluded instruments: Executive constraints 1985-1995, its square, contract enforcement in 2000, and the interaction of the past executive constraints and contract enforcement scores. *, **, *** indicate 10, 5, 1 % significance levels. Robust standard errors in parantheses. Constants are included but not reported.

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