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## Rebundling Institutions

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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 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. The findings imply that legal reforms have to be coordinated across different types of institutions and consider possible interference with non-legal institutional solutions in place.

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

**JEL:** C23; H13; O11; P48; P51.

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# 1 Introduction

The state plays a crucial role in the building of institutions that [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 development (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 development (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 legal system that poorly enforces 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 empirical study 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 that 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. Voigt and Gutmann provide empirical evidence that property rights increase growth rates only if the judicial system is independent enough to guarantee 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., 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 two 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 use a between effects least squares estimator to identify individual and interaction effects of the two types of legal institutions on countries' long-term income levels. 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 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 find systematic differences in the quality of the legal system dependent on the legal origin, I find significantly smaller marginal effects for countries that have a French legal origin.

Decomposing the interaction effect reveals 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 a negative interaction effect. In 27 sample countries, the net effects on long-term income levels are even 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 argues that the economic challenges and constraints in countries at low levels of economic development need institutional solutions different from those of more advanced economies. It 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. It 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 study is structured as follows: In [Section 2](#), I elaborate on why the assumption of independent effects is too strong and legal property rights and contracting institutions are jointly effective. In [Section 3](#), I put forward some theoretical considerations on the channels and timespans of effects, discuss estimation challenges, and present the identification strategy and the empirical models. In [Section 4](#), I address some measurement issues that are considered in the choice of institutional variables and describe the dataset. In [Section 5](#), I present the base-

line and decomposition estimation results as well as the estimation results for the robustness tests. In Section 6, I conclude.

## 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 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 organizational 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, 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 (Lueck and Miceli, 2007). There are negative effects on economic development when property rights are not well defined or when they are attenuated by governments or ruling elites that 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.

Contracting institutions help to organize economic exchange. They enable private parties without political power to engage in bargaining and undertake 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 in 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 as well as intensifying competition for assets that can be transferred to high-valued uses require formal governance structures to replace or 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. Therefore, legal institutions are important to coordinate 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 role for investment is crucial for economic development ([North, 1981](#)). The impact of institutional quality on growth rates that runs via fostering investment is sizeable ([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 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 as well as their poor fit may constitute a bottleneck for economic development and produce an inefficient allocation and utilization of resources. Consider that 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. This constrains non-simultaneous transactions and an efficient transfer of assets to high-valued uses. Likewise, despite a set of institutionalized rules that efficiently regulates private transactions, private parties are reluctant to 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.

### 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 policy reforms. 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 variation. A glance into growth theory helps to understand these features of time series on GDP per capita levels and to get a better understanding of where and how institutions play a role for economic development. This will then lead 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 input factors can only explain parts of the variation in output. The remainder is considered due to differences in total factor productivity and exogenous. North and Thomas (1973):2, however, argue that factor accumulation and productivity “(...) *are not causes of growth; they are growth*”. In line with this, Acemoglu et al. (2005) differentiate the proximate causes from fundamental causes of growth. The fundamental causes underlie the proximate causes and drive investment in physical 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 neoclassical growth models, reconsider a human capital augmented version of the Solow-Swan model of long-term economic



growth with a constant returns to scale Cobb-Douglas production function and a labor-augmented technological progress:

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

$Y(t)$  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  $L(t) = L(0)e^{nt}$ .  $L(0)$  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  $s$  invested in physical capital, e.g., buying and inventing new machines, and  $s_H$  is the fraction of  $s$  invested in human capital, e.g., educating the labor force. 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:

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

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

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

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  $h(t)$  remain constant over time. The steady state growth path can contemporarily be disturbed. A change in any right-hand side term of (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 address the role of institutions explicitly. [Libecap \(1993\)](#) argues this is because the neoclassical paradigm bases on the as-

sumption that the underlying institutions are well defined, operational, and adapt to marketlike forces so that they cannot stray far from what is considered optimal. From Coase (1937, 1960), North (1981, 1991) and Acemoglu et al. (2005) it has become apparent that institutions may be ill defined, not adapt to market forces and cause frictions. This makes it necessary to reevaluate growth theory and discuss the role of institutions for economic development.

Consider (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 (3), institutions can affect  $Y(t)/L(t)$  via  $k(t)$  and  $h(t)$ , the proximate causes of growth. Institutions can determine  $k^*$  and  $h^*$  via influencing any term at the right-hand side of (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  $g$ , or the depreciation rate  $\delta$ , then one should expect temporary deviations from the steady state growth path which manifests in short-term variation in the growth rate of  $Y(t)/L(t)$ .

### 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 components of GDP per capita levels caused by country-specific constant factors, i.e., the fundamental causes of growth, in a first-step regression and use these estimates as proxies 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 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.<sup>1</sup>

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 serial autocorrelation of GDP per capita levels over time requires to formulate a model that takes unobserved heterogeneity caused by country-specific constant factors into account. The endogenous relationship between income and institutions and the theoretical considerations on the channels of influence require to allow a correlation between the country-specific constant factors and the explanatory variables, especially the proximate causes of growth. Challenges (i) and (ii) require the application of a fixed effects (FE) estimator. There are, however, two downturns of the FE estimator in this setting: 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 factors cannot be estimated in a FE estimation approach as there is no way to distinguish them from the effects of unobservable country-specific constant 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:

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

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

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<sup>1</sup>Alternatively, one could use the 2005–2015 average GDP per capital levels as measures for countries’ long-term income levels and estimate a cross-sectional model to identify the effects of institutions as done in [Acemoglu and Johnson \(2005\)](#). This alternative second-step estimation approach, however, does not “clean” the dependent variable from short-term variation in 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 with the explanatory variables) are ignored. [Islam \(1995\):1132](#) states that it is only possible to correct for this bias in panel data frameworks.

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

In the second step, I use 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  $\hat{\mu}_i$  that gives the country-specific, time-invariant component of GDP per capita levels. The corresponding second-step model is:

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

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  $\bar{\epsilon}_{i.}$ .  $\gamma_1$ ,  $\gamma_2$  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 on 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 in the robustness section alongside with and as a reduced form of an IV estimation approach.

### 3.3 Marginal effects

In linear regression models that exclude the interaction term, the marginal effects of improvements in legal property rights institutions are simply 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 a model, however, assumes independence of short-term and long-term marginal 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:

$$\frac{\partial \hat{\mu}_i}{\partial \overline{PR}_i} = \gamma_1 + \gamma_3 \times \overline{C}_i. \quad (6)$$

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 that 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 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 standard measures for political institutions provided by the World Bank, the Polity IV project, and the International Country Risk Guide capture too broad phenomena.<sup>2</sup> 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 their 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, and prison staff but also the press, lobby groups, and the public. While non-compliance with economic institutions can be checked by political institutions, the factual implementation of political institutions is often 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. The 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, which allows to assess to which degree private parties are legally protected from government expropriation

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<sup>2</sup>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 phenomenon 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.

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 that is also the preferred property rights institutions measure in [Acemoglu and Johnson \(2005\)](#) and described in [Gurr \(1997\)](#). 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 threats to be expropriated 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 that is an assessment of whether a country has adopted a series of good practices to 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 natural logarithm of GDP per capita levels 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 the 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.<sup>3</sup> 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 Netherlands' average income per capita was 50,423 US\$. This is 50 times the average income per capita of Senegal which was 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 income per capita 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, subtract the means, and divide by the standard deviations

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<sup>3</sup>This confirms that GDP per capita levels are strongly autocorrelated over time and underlines the importance to investigate fundamental causes of growth to understand economic development.



Table 1: Summary statistics

	Obs	Mean	St.dev	Min	Max
<i>Dependent variables</i>					
Log real income per capita	1,246	8.576	1.517	5.726	11.425
Long-term income level ( $\hat{\mu}_i$ )	1,246	0.000	1.495	-2.639	2.969
<i>Institutional variables</i>					
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
<i>Control variables</i>					
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 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.<sup>4</sup> Second, demeaning and normalizing the standard deviations 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 on [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 a variable on years of compulsory educational attainment constructed by the UNESCO Institute for

<sup>4</sup>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.

Statistics and provided by the World Bank. 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 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.

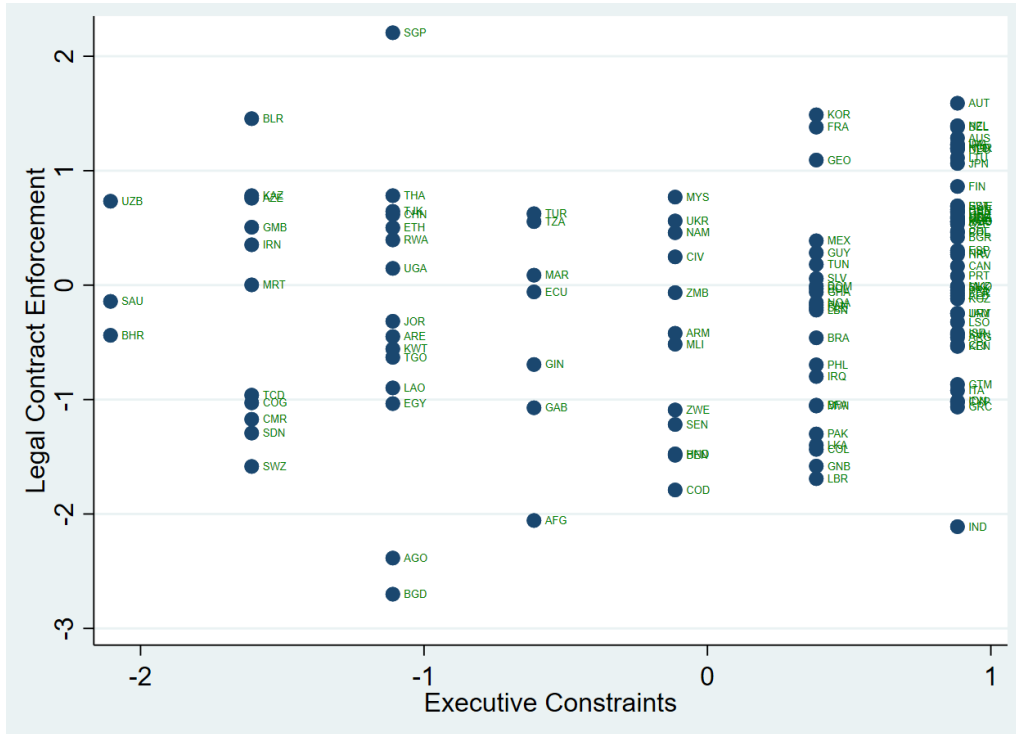


Figure 1: *Executive Constraints* and *Legal Contract Enforcement* scores in 2015

Countries score quite differently in the quality levels of the two legal institutions. There are all sorts of combinations of high and low quality levels of *Executive Constraints* and *Legal Contract Enforcement*. While 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 Con-*

*tract Enforcement* out of all 130 sample countries. 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 measures 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 interaction effects.

## 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 the right-hand side in (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 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 results

Table 2 presents the estimation results of the baseline models. Columns (1) show the coefficient estimates and respective standard errors for the first-step FE estimation. I cannot relate variation 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 country and time fixed effects. However, I do find significant positive effects of the capital investment ratio and education, the measures for proximate causes of growth. This finding is in accordance with the theoretical considerations presented in Section 3.1, which explain short-term variation in income levels with variation in input factor accumulation. However, following the theoretical considerations, institutional changes may have indirect short-term effects via influencing input factor accumulation.

Table 2: Results for the baseline and decomposition models

	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		.		.	
R <sup>2</sup>	0.5195		0.5375		0.5601	

Notes: Dependent variables: *Log real income per capita* 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 parantheses. 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  $\mathcal{D}$  that 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.

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 property 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 of growth and able to explain short-term variation 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. This is in line with the findings of [Alesina et al. \(2003\)](#) and [Fearon \(2003\)](#).

## 5.2 Cross-country differences in marginal effects

The baseline estimation results entail country-specific marginal effects. Recall (6). The first part,  $\gamma_1$ , captures the individual effect that is the same for all countries. The second part,  $\gamma_2 \times \bar{C}_i$ , refers to the interaction effect that 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.<sup>5</sup> While the individual effect increases both African countries' long-term income levels by 23.55%, the above sample average legal efficiency of enforcing private contracts in Gambia, that scores 0.397 for  $\bar{C}_i$ , and the below sample average legal efficiency of enforcing private contracts in Chad, that scores  $-1.021$  for  $\bar{C}_i$ , 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

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<sup>5</sup>The marginal effects can easily be calculated by plugging the coefficient estimates of  $\gamma_1$ ,  $\gamma_3$ , and countries' mean *Legal Contract Enforcement* scores into (6) and divide the outcome by the standard deviation of  $\hat{\mu}_i$ , which yields the formula:  $\frac{0.352 + 0.346 \times \bar{C}_i}{1.495}$ .

in their  $\overline{C}_i$  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 levels 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 show in a sample of former colonies of European powers 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 world sample, I perform a two-sample t test on the means of marginal 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 that show a worse quality of legal contracting institutions. This finding relates to and extends [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 may, however, also vary with (i) the prevalent quality level of legal property rights institutions themselves, and (ii) the quality combination 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:

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

$\mathcal{D}_{qq}$  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 and the fourth is omitted to serve as reference. The results suggest that the baseline estimate of the interaction effect is driven by two groups of countries: First, 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 second, the group with below sample average quality levels of both types of legal institutions, for which the interaction effect is significant, large, and negative.<sup>6</sup>

This finding suggests that the quality combination of the two types of legal institutions 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 seem to constitute crucial parts of an investment-friendly institutional set-up. 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. This suggests 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 may disrupt the smooth workings of the systems if the incentives and constraints provided by the new, legal institutions are at odds with interrelated incentives and constraints provided by prevalent institutions. This explanation is in accordance with the theoretical framework presented in Chapter 3 as well as Dixit (2011), who argues that an effort to strengthening judicial enforcement of private property rights can easily backfire in the presence of relational contract-

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<sup>6</sup>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).



ing. At low levels of economic development, reforms off the legal path can be more effective institutional solutions than reforms aiming to adopt the legal institutions applied in countries at high levels of economic development. This 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 growth. Figure [2](#) in the appendix illustrates the findings in two graphs.

## 5.4 Robustness: Alternative institution measures

Following the considerations in Section [4.1](#) and given present limits on panel data availability, I am confident that the baseline measures are good proxies for legal property rights and contracting institutions. However, there exist alternative measures that 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 results of the baseline estimation are preserved.<sup>7</sup>

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

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<sup>7</sup>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 income per capita.

Table 4: Results for alternative institution measures

	<b>2nd step: BE</b>					
	(1)		(2)		(3)	
	Coeff.	SE	Coeff.	SE	Coeff.	SE
Executive Constraints	0.307**	(0.128)	0.516***	(0.122)		
Legal Contract Enorcement					0.258**	(0.110)
Legal Contract Enorcement 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 <sup>2</sup>	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.

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. Columns (1) and (2) in Table 4 show that the coefficient estimates of the two types of legal institutions and their interaction term remain positive and statistically significant 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 that 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 who 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 positive and statistically significant.

## 5.5 Robustness: Restricted and extended models

The results of [Acemoglu and Johnson \(2005\)](#) and the policy recommendations that can be derived thereof rely on the assumption that the marginal effects of legal property rights and contracting institutions are independent. In the following, I estimate 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 estimates when assuming  $\gamma_3 = 0$ . Columns (1) in Table 5 show the coefficient estimates and respective standard errors of the second-step restricted model. The restricted 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 estimation 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 distribution such as Gambia and Chad.

Rich and poor countries are not equally distributed around the world but cluster in world regions. The clustering could be due to spatial heterogeneity caused by growth factors that are region-specific or more similar for countries from the same world region. Besides institutions, these region-specific factors could include geographic and climate conditions, contemporary and historical political events, or cultural traits. The clustering could partly also be due to spatial spillovers caused by economic and political integration of countries as well as trade and migration flows, which are more intensiv among countries located in the same world region. In an extended model, I include region dummies to control for all region-specific effects. This enables to analyze the maginal effects of legal property rights and contracting institutions in a more homogeneous setting.

Columns (2) in 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

Table 5: 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 <sup>2</sup>	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.

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 estimation results. Nevertheless, there are still significant individual and interaction effects left to explain within-region variation in long-term income levels.

## 5.6 Robustness: Endogeneity

The argument so far was that institutions affect income and the estimation results have been interpreted in this way. Yet, the channel of influence may also run the other direction, hence, 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 that makes a causal interpretation of models (4) and (5) problematic. The 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. The estimation results presented so far merely identify correlations.

[Acemoglu et al. \(2001\)](#) and [Acemoglu and Johnson \(2005\)](#) suggest to exploit exogenous variation in institutions and perform IV estimation procedures in order to be able to give causal interpretations. Since then it has become standard to use historical data as instruments for present institutions. However, this practice is not seen without criticism. [Albouy \(2012\)](#) shows that the settler mortality and legal origin data used in [Acemoglu et al. \(2001\)](#), [Acemoglu and Johnson \(2005\)](#), and many following studies to instrument measures of property rights and contracting 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 that obviously do not respond to 2005–2015 income levels.<sup>8</sup> 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* therefore is time-invariant information from the year 2000. To instrument the interaction term, I simply interact the 1985–1995 ratings for executive constraints with countries' scores for the legal enforcement of private contracts in 2000.

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<sup>8</sup>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.

Table 6: Results for models tackling endogeneity issues

	<b>2nd step: BE</b>					
	(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 <sup>2</sup>	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 (1) the institution variables are instrumented with past values. In (2) values of the year 2005 are used for the right-hand side variables. In (3) values of the first observed year are used for the right-hand side variables.

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.<sup>9</sup> Columns (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 size 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 cannot reject the joint null hypothesis that the

<sup>9</sup>This follows Staiger and Stock (1997), who suggest that instruments are weak if  $F \leq 10$ .

instruments are valid, i.e., uncorrelated with the error term, and that the excluded instruments are correctly excluded from the structural equation.

Columns (2) and (3) in Table 6 present the results when estimating (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 specification 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 results of these estimation exercises confirm previous results. All robustness exercises tackling endogeneity issues suggest that the baseline results are not seriously biased and institutions exhibit significant individual and interaction effects on long-term income levels. This does, however, not exclude the possibility of omitted variable bias. Both income and institutions may be affected by other fundamental causes of growth captured in growth theory's  $A(0)$  term, e.g., geographic and climate conditions, cultural traits, or other institutions. To take account of this issue, we need more theoretical and empirical work on the coevolution process of economic outcomes, institutions, and other factors that constitute fundamental causes of growth.

## 6 Conclusion

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 that assumes independent effects, this study has considered that the two different types of legal institutions may be effective in their combination. The argument was that legal property rights and contracting institutions provide interrelated incentives and constraints on private investment and thereby jointly determine the accumulation of physical and human capital, as well as the utilization of existing and adoption of new technologies.

This study contributes to the 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 reveals that the fit of the two types of legal institutions is crucial for the size and the direction of the marginal effects. For coun-

tries with absent or very bad qualities of both types of legal institutions, installing or improving only legal property rights institutions produces negative interaction effects. Presumably, this is caused by interferences with incentives and constraints provided by non-legal contracting institutions. The negative interaction effect can exceed the positive individual effect, which applies mostly for 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 in how far and why the slow, incomplete, and controversial privatization efforts 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 foresees 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, 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 development.



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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	Tunisia	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	Logarithm of GDP per capita in constant 2010 US Dollars. <i>Source:</i> 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 divide them by the variable's standard deviation to obtain normalized values in the range [-2.196,0.920]. <i>Source:</i> Polity IV Project, following <a href="#">Eckstein and Gurr (1975)</a> .
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 <a href="#">Djankov et al. (2003)</a> . I multiply the index scores by 0.1 to obtain values between 0 and 10, demean the values and divide them by the variable's standard deviation to obtain normalized values between [-2.868,2.662]. <i>Source:</i> 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 $(V_{max} - V_i)/(V_{max} - V_{min})$ . $V_i$ 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 $V_{min}$ range receive ratings of either 0 or 10, accordingly. The two scores get averaged into one. I demean the variable's scores and divide them by the variable's standard deviation to obtain normalized values between [-2.709,2.360]. <i>Source:</i> 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 between 0 and 100, whereas higher scores indicate a lower number of procedures. I multiply the original scores by 0.1, demean them and divide them by the variable's standard deviation to obtain normalized values in the range [-2.651,2.594]. <i>Source:</i> 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: $EFW_i = ((GCR_i - 1) \cdot 10) / 6$ , where 10 refers to the highest protection. I take the variable constructed by the Fraser Institute, demean and divide the values by the variable's standard deviation to obtain normalized values in the range [-3.194,2.188]. <i>Source:</i> 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). <i>Source:</i> World Bank, World Development Indicators.
Population (per sqkm)	Population density (people per sq. km of land area), midyear population. <i>Source:</i> 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. <i>Source:</i> 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. <i>Source:</i> <a href="#">Fearon (2003)</a> .
Years of schooling	Duration of compulsory education, that is the number of years that children are legally obliged to attend school, 3-year moving averages. <i>Source:</i> World Bank Open Data, data from the UNESCO Institute for Statistics.
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 <a href="#">Table A1</a> . <i>Source:</i> <a href="#">Fearon (2003)</a> .



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

	<b>2nd step: BE</b>							
	(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 <sup>2</sup>	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.

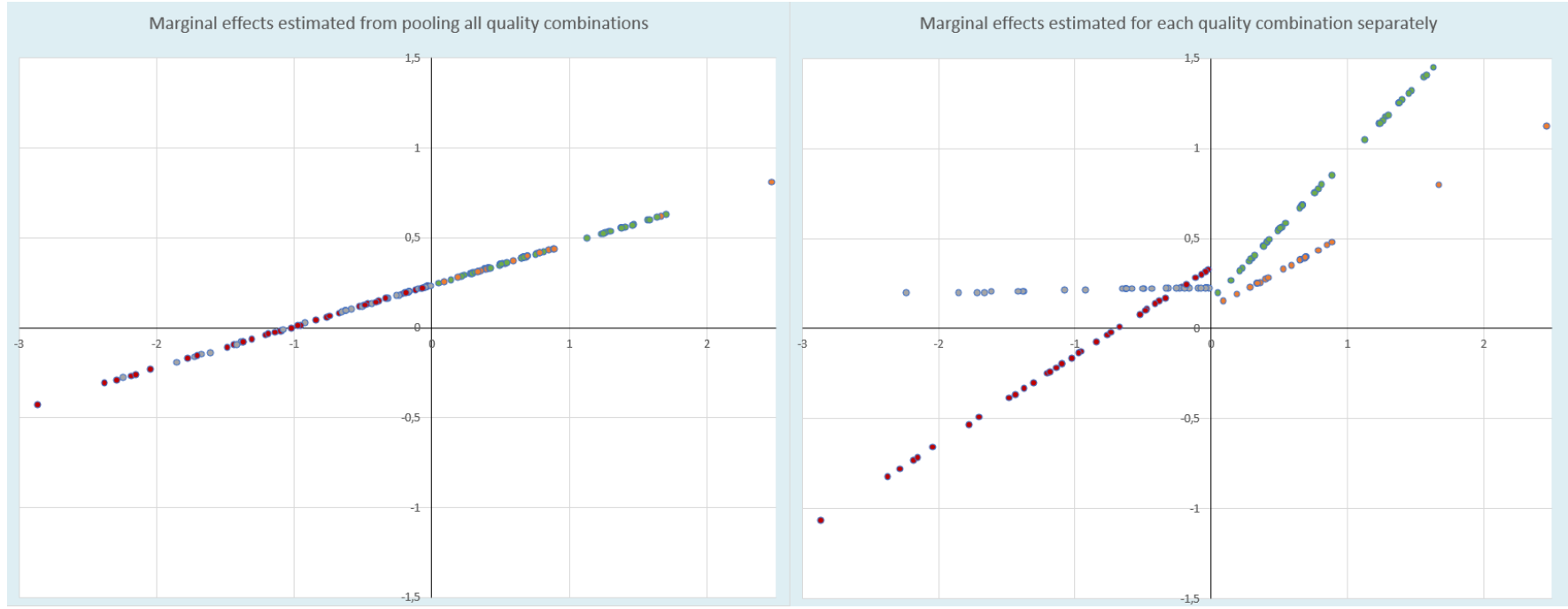


Figure 2: The x-axis gives countries' 2005-2015 average *Legal Contract Enforcement* scores. The y-axis gives the estimated marginal effects of an one standard deviation increase in *Executive Constraints*. The left diagram plots the average marginal effects estimated from model (5) and presented in 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

<i>Dependent Variable</i>	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 <sup>2</sup> 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.