

Income Growth and Institutional Quality: Evidence from International Oil Price Shocks

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Abstract

In this paper, we study the causal effect of income growth on institutional quality in the 1984-2007 cross country panel. To focus on exogenous income windfalls, we employ international oil price shocks as an instrument for income growth. While national incomes and measures of institutional quality are highly correlated, our analysis fails to identify a clear pattern of a causal effect, and estimations often yield statistically insignificant coefficients, albeit with positive signs. We then explore the possibility that fixed country characteristics may mediate the effect of income on institutions. Focusing on measures of ethnic heterogeneity, we find that ethnic polarization acts adversely as a mediating factor in this regard.

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1. Introduction

Economic development and institutional quality are closely related. There are strong correlations in the cross-country data, often times above 0.70, between the level of economic development – as measured, for example, by national income per capita – and various measures of institutional quality, suggesting a positive relationship between them. This is illustrated in Figure 1, where income per capita is separately plotted against three measures of institutional quality used in this paper, across countries for the 1984-2007 period. The three measures are the lack of corruption; law and order; and an aggregate index of the lack of political risk of expropriation. In all three cases, high correlations with countries' incomes are evident. Also noteworthy is the fact that institutional measures display a large degree of variability. For example, the “law and order” variable, scaled between 1 and 6, obtains its maximal values for North European countries, and its minimal value for several countries in Africa; its standard deviation being 1.5 (with the mean of 3.6).

While the above correlations can obviously be interpreted in a number of ways, recent empirical work, employing ingenious sources of exogenous variation to alleviate concerns about reverse causality, uncovers causal effects of institutional quality on cross-country income differences (Acemoglu et al., 2001, 2002, Hall and Jones, 1999, Rodrik et al., 2004; see, however, Glaeser et al., 2004). In contrast, causal effects of economic development on institutions have received much less attention. But this issue is important in and of itself. It should be on the agenda precisely because institutions are a growth factor, and also in order to better understand how institutions emerge and, in particular, to explain the variability of

institutional quality – which is of an independent interest. In theory, economic prosperity could affect the formation of institutions in a variety of ways. It, for example, could promote the development of democracy, in accordance with Lipset’s, 1959, modernization hypothesis, and thereby enhance institutional quality. Or, it could foster the building of state capabilities – as emphasized in recent work, Besley and Persson, 2011. Indeed, a simple income effect would seem to suggest that, as the economy becomes more prosperous, its institutions should improve. On the other hand, however, another literature, on “resource curse”, qualifies these understandings by suggesting that the conclusion may ultimately depend on the exact channel through which prosperity has accrued, and that it could conceivably also be detrimental for institutions. Focusing on minerals’ windfalls, particularly, on oil revenues, this line of work has generated a lively debate on the benefits of prosperity materialized through this channel. Karl, 1997, Ross, 2001, and Sachs and Warner, 1995, 2001, are some leading contributions in this regard. Additional papers, some supporting the above claim, others refuting it include Alexeev and Conrad, 2009, Caselli and Michaels, 2011, Caselli and Tesei, 2011, Haber and Menaldo, 2011, Ross, 2009, Tsui, 2010, and Wacziarg, 2011.

One major difficulty in disentangling the causal effect of economic development on institutional quality, of course, is the endogeneity of both, which in turn, implies the need for instrumental variables as proxies for development. In this paper, we employ oil price shocks as such a source of exogenous variation in national income to identify the effect of the latter on institutional quality. The oil shocks variable exists from 1960s, which makes it possible to use it in order to predict subsequent institutional changes. This estimation strategy is

plausible because, as will be argued below, international oil price shocks are extremely persistent.

We employ several key measures from the International Country Risk Guide (the ICRG) as proxies for institutional quality. It is important to recognize that, as observed by Glaeser et al., 2004, these measures pertain to institutional outcomes, not institutional constraints. Thus, variations in the ICRG variables should not be viewed as reflecting constraints on the government, but, instead, as reflecting the growth promoting potential of pursued policies – whether in the context of democracies or autocracies. This differentiates our paper’s substantive contribution from the emerging work on the effect of economic development on democracy and democratic transitions, see Acemoglu et al., 2008, Barro, 1999, Benhabib et al., 2011, Burke and Leigh, 2010, Bruckner and Ciccone, 2011, Bruckner et al., 2011, Murin and Wacziarg, 2011. In particular, our focus does not require taking a stand on whether or not democracy should necessarily be associated with better institutions; while there is an overlap between the two concerns, we view these two research questions as distinct and separate. Our other contribution is of a methodological nature. The “income and democracy” literature (see, in particular, Benhabib et al., 2011, Murin and Wacziarg, 2011) typically employs dynamic panel analyses to tackle causality. The estimates it generates are highly sensitive, however, to specification details (see, e.g., Benhabib et al., 2011, Bobba and Coviello, 2007, Castelló-Climent, 2008, for a sample of various specifications giving rise to very diverse conclusions). Methodologically, therefore, we complement that literature by identifying a plausibly exogenous source of variation in national income.

Our findings indicate that income per capita, as instrumented by oil price shocks, controlling for country fixed effects, has a positive effect on institutional quality, which, however, depending on the measure used, is not always statistically significant.¹ This is consistent with the work on the resource curse, which comes up with ambiguous effects of oil windfalls on democratic institutions (Alexeev and Conrad, 2009, Ross, 2001, 2009, Haber and Menaldo, 2011, Tsui, 2010, Wacziarg, 2011). Yet, it is noteworthy that our estimated 2SLS coefficients are always positive. Taken together, our results should be interpreted as suggesting that economic prosperity, even when it accrues through the benefits of oil, is on average not detrimental for institutional quality, thus providing evidence to the contrary of the resource curse. In this regard, our results by and large concur with recent work Alexeev and Conrad, 2009, and Wacziarg, 2011 who, using related but different methodologies, fail to uncover adverse effects of oil windfalls. Specifically, Alexeev and Conrad, 2009, employ geographic conditions as an instrument for oil windfalls, whereas Wacziarg, 2011, relies on time series, and both papers find that such windfalls do not slow down income growth; the former paper also finds no evidence of institutional quality deterioration. In contrast, we instrument for income using international oil price shocks; it is gratifying that this approach yields similar substantive results.² Our results also complement existing literature in suggesting that the observed correlations between economic development and institutional

1 This result complements Chong and Gradstein, 2007, where, employing GMM-IV analysis, it is found that income inequality adversely affects institutional quality.

2 It is also noteworthy that Alexeev and Conrad, 2009, ignore country fixed effects while controlling for measures of ethnic diversity; we do the opposite in the belief that this is a more accurate approach.

quality do not imply a strong causal effect of the former, whereas a causal effect of the latter has been already established (Acemoglu et al., 2001, 2002, Hall and Jones, 1999, Rodrik et al., 2004).

We then explore how countries' fixed salient characteristics may mediate the effect of economic development on institutions. To this end, we introduce an interaction term between oil price shocks and proxies for ethnic heterogeneity. This follows the guidance of voracity theories of Lane and Tornell, 1998, 1999, as well as of Alesina et al., 1999, suggesting that windfall benefits may well be (more than) dissipated by rival population groups. Empirically, existing literature (Alesina et al., 1999, Easterly and Levine, 1997, Montalvo and Reynal-Querol, 2005b) finds that measures of ethnic heterogeneity are detrimental for public policies and economic growth. Following this literature, we employ two measures of ethnic heterogeneity, of fractionalization (Alesina et al., 2003) and of polarization (Montalvo and Reynal-Querol, 2005a, b) and introduce interaction terms between income and measures of ethnic heterogeneity in the second estimation stage. Literature suggestion (Montalvo and Reynal-Querol, 2005a, b) is that the polarization index is the more appropriate one to use as a proxy for potential conflict. Consistent with this literature and guided by a simple extension of a theoretical model in Alesina et al., 1999, we find that ethnic polarization is a mediating factor through which oil price induced income changes affect institutional quality. Specifically, the larger polarization the more adverse is the oil price driven income effect on institutional quality. In contrast, interaction terms that include ethnic fractionalization are statistically insignificant. These results, therefore, lend support to the idea that ethnic

polarization is a mediating factor through which economic development (adversely) affects institutional outcomes. These results are well consistent with those in Montalvo and Reynal-Querol's, 2005a, b, that finds adverse effects of ethnic polarization. Note, however, that in our paper these adverse effects are not direct, but instead act as an interfering factor.

The rest of the paper proceeds as follows. Data description, in the next section, is followed by the presentation of our estimation methodology in Section 3. Section 4 contains the basic estimation results. Section 5, motivated by a simple extension of Alesina et al., 1999, explores the effect of ethnic polarization. Section 6 then concludes with brief remarks.

2. Data

Oil Price Shocks. The data on our oil price shock instrument are from Bruckner et al. (2011). The oil price shock instrument is constructed as follows:

$$(1) \quad \text{OilPriceShock}_{ct} = \Delta \ln(\text{OilPrice})_t * \theta_c$$

where data on the international oil price are from UNCTAD Commodity Statistics and data on oil exports and imports from the NBER-United Nations Trade Database. For the 1984-2007 period, the AR(1) coefficient on the international oil price, when detrended with a linear time trend, is 0.999 (standard error 0.09); for the change in the international oil price the AR(1) coefficient is -0.025 (standard error 0.219). The augmented Dickey Fuller test does not

reject the null hypothesis of a unit root in the level of the oil price (p-value 0.86), but rejects at the 1% level the null hypothesis of a unit root in the first-differenced oil price (p-value 0.0001). Given this unit root behavior of the international oil price during the sample period, oil price shocks are identified by the change in the log of the international oil price.

We note that equation (1) takes into account that the impact of the oil price shock is larger for countries that are very dependent on oil exports (imports), by weighting the oil price by the average (i.e. time-invariant) share of net oil exports in GDP θ_c .³ The average share of net oil exports in GDP is computed as the period average value of oil exports minus imports divided by GDP. The sample maximum (minimum) value of θ_c is 0.18 (-0.03); the mean (median) is 0.009 (-0.001); and the interquartile range is [-0.005, 0.002].

Institutional Quality. Data on institutional quality are from the International Country Risk Guide (2010). These data are available on a monthly basis from 1984 onwards. We aggregate these monthly data to the annual level using a simple linear average.

In our empirical analysis we focus on three variables to characterize the institutional quality of countries. The first variable is corruption. According to ICRG, this variable measures demands for special payments and bribes, form of excessive patronage, nepotism, job reservations, 'favor-for-favors', secret party funding, and suspiciously close ties between

3 This functional form of the oil price shock is motivated by log-linearizing output around steady-state and taking the total differential with respect to output, $y_{c,t}$, and the oil price, P_t . This yields that $\Delta \log(y_{c,t}) = \theta_c \Delta \log(P_t)$, where θ_c is the steady-state share of net oil exports in output of country c . Also note that the constructed oil price shock variable does not use within-country changes in the amount of oil produced to identify the oil price shock, because within-country changes in the amount of oil produced could be endogenous to within-country changes in output.

politics and business. The corruption variable ranges from 1 to 6, with higher values denoting less corruption.

The second variable that we focus on is “law and order”. According to ICRG, the law sub-component is an assessment of the strength and impartiality of the legal system, while the order sub-component is an assessment of popular observance of the law. This variable ranges from 1 to 6, with higher values denoting stronger levels of law and order.

To capture the overall political risk prevalent in a country, we use the ICRG political risk index. In addition to corruption and law and order, this index reflects government stability (measuring the government’s ability to carry out its declared program(s), and its ability to stay in office); socio-economic conditions (measuring the socioeconomic pressures at work in society that could constrain government action or fuel social dissatisfaction); the investment profile (measuring contract viability and expropriation, profits and repatriation, and payment delays), internal conflict (measuring political violence in the country and its actual or potential impact on governance); external conflict (measuring the risk to the incumbent government from foreign action, ranging from non-violent external pressure to violent external pressure); military in politics (measuring the degree of military participation in politics); religious tensions (measuring the domination of society and/or governance by a single religious group); ethnic tensions (measuring the degree of tension within a country attributable to racial, nationality, or language divisions); democratic accountability (measuring the responsiveness of government to its people); and bureaucracy quality

(measuring the strength and expertise to govern without drastic changes in policy or interruptions in government services).

The correlations of the within-country change in these three variables are: 0.18 for corruption and the rule of law; 0.08 for corruption and the political risk index; 0.18 for the rule of law and the political risk index. We interpret these relatively moderate correlations as suggesting that the three variables pertain to different substance. In particular, the aggregate political risk variable, while correlated with both corruption and the rule of law indices, is also loaded with many additional dimensions that may ultimately have a bearing on the protection of private property rights and the risk of expropriation.

As noted by Glaeser et al. (2004), the ICRG variables measure institutional outcomes, not institutional constraints. Thus, variations in the ICRG variables should not be viewed as pertaining to constraints on government, but rather as reflecting the fact that dictators, too, can potentially pursue growth promoting policies.

Ethnic Fragmentation Data. Data on ethnic polarization are from Reynal-Querol (2001). The Reynal-Querol polarization index is constructed as follows:

$$Pol_i = 1 - 4 \sum_{r=1}^N (0.5 - \pi_{ir})^2 \pi_{ir}$$

where π_{ir} is the proportion of people who belong in country i to group r . This polarization index measures the normalized distance of a particular distribution of groups from a bimodal distribution. The index is maximized when there are two groups which are of equal size. The

polarization index therefore emphasizes that conflict tensions are greatest when there are two equally powerful groups.

Note that the polarization index differs from the well-known fractionalization index, defined as:

$$Frac_i = 1 - \sum_{r=1}^N \pi_{ir}^2$$

A key property of the fractionalization index is that, in contrast to the polarization index, it is strictly increasing in the number of groups. Intuitively, the fractionalization index measures the probability that two randomly selected individuals in a country will not belong to the same group. For further discussion on fractionalization vs. polarization with an application to conflict, see Montalvo and Reynal-Querol (2005a,b).

GDP Data. Data on annual real per capita GDP are from the Penn World Table, version 6.3 (Heston et al. 2009). Table 1 reports some summary statistics on the above variables.

3. Estimation Framework

We use the following econometric model to estimate the within-country effect that changes in income per capita have on changes in institutions:

$$(2) \quad \Delta Inst_{ct} = a_c + b_t + \beta \Delta \ln(GDP)_{ct} + \gamma Inst_{ct-1} + z_{ct}$$

where a_c and b_t are country and year fixed effects; $\Delta \ln(GDP)$ is the annual change of the log of real GDP per capita; $\Delta Inst_{ct}$ is a measure for the within-country change in political institutions; $z_{c,t}$ is an error term that is clustered at the country level.

Our main method of estimation is two-stage least squares. In the two-stage least squares estimation we instrument real GDP per capita by our oil price shock variable. By doing so, we use a plausibly exogenous source of variation in countries' GDP per capita to examine the link between income and institutional quality. Because year-to-year variations in the international oil prices are very persistent (see the discussion in Section 2), it is important to note that in the two-stage least squares estimation we identify the effects that permanent shocks to GDP per capita have on institutional quality. The exclusion restriction for the two-stage least squares estimation is that oil price shocks should have no systematic effects on countries' institutional quality beyond their effects on GDP. We will discuss and examine this exclusion restriction in detail in the next Section.

We note that one of the key advantages of our annual panel data approach is that it allows us to examine short run as well as longer run effects of within-country changes in income on institutions. Equation (2) is a dynamic panel data model for the level of institutional quality, and thus takes into account dynamics in the institutional quality score. Because these scores are bounded, there is mean reversion by construction. The short-run effect of a within-country permanent change in income per capita growth on institutional quality is given by β ; the long-run effect is given by $\beta/(1+\gamma)$. As an alternative to this

dynamic panel approach we will also present results that are based on estimating equation (2) using changes over five years. The disadvantage of this alternative approach is that it has less statistical power. It also obscures potentially important short-run effects of income per capita growth on institutional dynamics.

4. Results

4.1. Baseline Estimates

Panel A of Table 2 presents our baseline two-stage least squares estimates of the effects that oil price driven GDP per capita growth has on measures of institutional quality.⁴ Column (1) shows estimates for the absence-of corruption score. The estimated coefficient is positive but not statistically significant at any of the conventional confidence levels. Likewise column (2) shows that there is no significant response of the law and order variable. However, when using the composite political risk index, column (3) yields a coefficient on GDP per capita growth that is quantitatively large and statistically significant. The estimated coefficient implies that on average a one standard deviation of an increase in the GDP per capita growth induces a 0.15 standard deviations change in the political risk index in the short-run and a 0.65 standard deviations change in the long-run. Hence, while at face value columns (1) and (2) show that permanent income per capita shocks had no significant average within-country

⁴ Note that, following Acemoglu et al., 2008, 2009, all regressions include country fixed effects.

effect on corruption and the rule of law, column (3) suggests that the overall political risk environment in a country improves following increases in income per capita.

To facilitate the comparison with these baseline two-stage least squares estimates, we report in Panel B of Table 2 the corresponding least squares estimates. We also report in Panel C system-GMM estimates to address the concern that the inclusion of the lagged dependent variable introduces a bias in the presence of country fixed effects. The main result is that similarly to Panel A, the least squares estimates and system-GMM estimates yield a quantitatively small and statistically insignificant effect of GDP per capita growth on corruption. With regard to law and order and the political risk index, the least squares and system-GMM estimates produce positive and statistically significant coefficients, see columns (2) and (3). Quantitatively, these estimated coefficients are, however, less than 70 percent the size of the estimated IV coefficients.

There could be a number of reasons for the difference in IV and least squares and system-GMM estimates. An obvious candidate is measurement error in GDP per capita growth. If this measurement error is classical, it will attenuate the least squares and system-GMM estimates towards zero but not the two-stage least squares estimates. Reverse causality running from better institutional quality to income is unlikely to be the cause of the difference in estimates since this type of endogeneity bias would introduce an upward bias on the least squares and system-GMM estimates. In principle, omitted variables such as, for example, the colonial experience of countries (e.g. Acemoglu et al., 2008, 2009) could be

another explanation for the difference in IV and LS estimates. However, note that our regressions control for country fixed effects, hence, historical factors are already accounted for.

A more subtle explanation for the larger 2SLS coefficient is that it reflects the effect that permanent oil-price driven changes in income per capita have on measures of institutional quality. If transitory income shocks have a negative effect on institutions – as has been corroborated in empirical work such as Bruckner and Ciccone (2011) – then even in the absence of endogeneity bias will the least squares estimate be smaller than the two-stage least squares estimate. The reason is that the 2SLS estimator, that uses variations in the international oil price as a source of permanent variation in income per capita captures the effects that permanent changes in income per capita have on institutional quality. The least squares estimator, on the other hand, reflects the average effect that permanent and transitory changes in income per capita have on the ICRG institutional quality measures.

4.2. Discussion of Instrument Quality

How about the quality of oil price shocks as an instrumental variable? In terms of the first-stage fit the instrument performs reasonably well: oil price shocks, as defined in equation (1), have a highly significant positive effect on income per capita growth during the 1984-2007 period with an F-statistic that exceeds 80. Hence in terms of first-stage fit, the F-statistic on

the excluded instrument is well above the Staiger and Stock (1997) rule-of-thumb criteria of 10 for instruments to be declared weak.

The second important criteria for two-stage least squares estimation to yield consistent estimates is that the oil price shocks instrument should only affect institutional quality through income per capita. This restriction would, for example, be violated if (i) oil price shocks have a significant effect on income inequality; and (ii) beyond average income, there is a significant direct effect of income inequality on institutional quality.

To examine empirically whether oil price shocks are a valid instrument, we follow Acemoglu et al. (2008), using the lagged savings rate as an additional instrument for GDP per capita growth. Panel A of Table 3 reports the two-stage least squares estimates that use both the oil price shock variable and the savings rate as excluded instruments. The main finding in Panel A is that the 2SLS estimates with respect to the corruption score are insignificant. The 2SLS coefficients on law and order and the political risk index are significant and of similar magnitudes as the 2SLS estimates reported in Panel A of Table 2. The Hansen J test fails to find evidence that the instruments violate the exclusion restriction: in all specifications the p-value of the joint hypothesis that the instruments are uncorrelated with the second stage error term is well above 0.1.

To show also in a more intuitive way that, indeed, beyond income per capita the effects of oil price shocks on institutional quality are insignificant, we report in Panel B instrumental variables estimates where we instrument income with the savings rate and

include the oil price shock variable on the right-hand side of the second-stage equation. The result is that the oil price shock variable does not exhibit a significant effect on any of the institutional quality measures. Hence, conditional on per capita income Panel B shows that oil price shocks do not have a systematic average effect on institutional quality.

4.3. Extensions and robustness

Our identifying assumption for the two-stage least squares estimation is that, because the majority of the countries in our sample are price takers on the international oil market, variations in the international oil price are a plausibly exogenous source of variation in permanent income per capita. To demonstrate that our results are robust to excluding those countries from our sample where changes in politico-economic conditions might have an effect on year-to-year variation in the international oil price, we report in Table 4 instrumental variables estimates that exclude potentially large oil importing and oil exporting countries. We find that in this case there continues to be a significant positive first-stage fit, although the F-statistic is around 15 and thus somewhat smaller than in our baseline regression. Resonating this weaker first-stage F-statistic, we find that the standard errors in the second stage are larger. Only for the political risk index is there a significant positive effect of income growth, while for the corruption and the law and order score the effect is insignificant.

In Table 5 we show that the instrumental variables analysis produces similar results if we exclude those countries where oil companies are nationalized. This is a relevant robustness check because it allows us to examine whether the response of the institutional quality measures is a consequence of oil revenues accruing directly to the government sector, or, whether the response reflects a more general average effect that income changes have on institutional quality. Table 5 shows that when we exclude countries where oil companies are in the hands of the government, estimates are similar to the baseline results reported in Table 2: there is a positive and significant effect of within-country changes in income per capita on the political risk index, while the average responses of corruption and law and order are insignificant.

A commonly held view in the popular press is that increases in the international oil price are a curse for economic and political development for oil exporting countries (e.g. Friedman, 2006, 2008). Table 6 shows that, with respect to institutional outcomes, this view is a fallacy: restricting the number of observations to only those countries that are net oil exporters yields an insignificant effect of oil price driven variations in GDP per capita on corruption and the law and order scores (see Alexeev and Conrad, 2009, for related results). The effect on the political risk index is even positive and marginally significant. Hence, if anything, the results in Table 6 indicate that higher oil prices, due to their positive effect on income per capita, have a weakly positive effect on institutional quality in oil exporting countries.

In Table 7 we explore how results differ if we use instead of annual changes in income and institutional quality changes over a longer period, of five years. The main finding is that quantitatively the estimates are very similar to the baseline estimates reported in Table 2. However, standard errors in Table 7 are larger. Consequently, none of the coefficients reported in Table 7 are significant at the conventional confidence levels.

5. The Role of Ethnic Polarization

The results presented so far yield no clear support for the hypothesis that permanent changes in income per capita have a significant average effect on corruption. The results also yield little support for the hypothesis that income per capita has a significant positive average effect on law and order, although with regards to overall political risk the results for the average effect are somewhat stronger. We now turn to exploring whether there is a systematic heterogeneity in the marginal effect of income on institutional quality as a function of cross-country characteristics.

We focus herein on ethnic polarization. This focus is motivated by the extensive literature on the direct effects that ethnic divisions have on policy outcomes; see, for example, Alesina et al., 1999, Easterly and Levine (1997). We begin by rationalizing the role of polarization in our empirical estimation, through a straightforward extension of the model in Alesina et al., 1999, by allowing for income effects there.

5.1 Extending Alesina et al., 1999

The model stipulates an economy populated by a measure one of individuals who derive utility from public and private goods, denoted g and c , respectively.⁵ The public good can be of different types, and institutional quality is interpreted as a type of the public good. Individual preferences are:⁶

$$(3) \quad U_i = g^\alpha(1-l_i) + \ln(c), \quad 0 < \alpha < 1$$

where l_i is the distance between the most preferred public good type of individual i and the actual type, and we assume that these types belong to the unit interval. The only difference from Alesina et al., 1999, is that, by assuming the utility function is concave in the private good, we allow for income effects.

All individuals have the same income y , and uniform taxation is used to provide the public good, so that $c = y - g$, so that the utility can be written as follows:

$$U_i = g^\alpha(1-l_i) + \ln(y-g),$$

As in Alesina et al., the individuals first vote on the size of the public good g , then on its type, and we consider the subgame perfect voting equilibrium, whose analysis proceeds backwards.

5 This model extension is for illustrative purposes. A richer model of ethnic interaction is presented in, for example, Caselli and Coleman, 2011; one of its important features is the distance between ethnic groups.

6 We keep the notation as close as possible to Alesina et al., 1999. And the logarithmic sub-utility is chosen for simplicity.

In the second stage, given g , the chosen type of the public good will be determined by the median voter; and we write:

$$(4) \quad U_i = g^\alpha(1-l(i,m)) + \ln(y-g)$$

where $l(i,m)$ is the distance between the types preferred by individual i and the median voter. In the first stage, the first order condition determining the individual i 's preferred size of the public good is:

$$\alpha g^{\alpha-1}(1-l(i,m)) - 1/(y-g) = 0$$

Its total differentiation reveals that the preferred size decreases in the distance $l(i,m)$; hence, voting equilibrium is determined by the median distance from the median voter's preferred type of the public good, $l(M,m)$,

$$(5) \quad \alpha g^{\alpha-1} (1-l(M,m)) - 1/(y-g) = 0$$

As pointed out in Alesina et al., 1999, $l(M,m)$ can be interpreted as the polarization in preferences in the population. Totally differentiating (5) we obtain:

$$(6) \quad dg/dl(M,m) = \alpha g^{\alpha-1} / [\alpha(\alpha-1)g^{\alpha-2}(1-l(M,m)) - 1/(y-g)^2] < 0$$

and, clearly, the equilibrium amount of the public good increases in income, because of the standard income effect.

Differentiating again, we obtain:

$$(7) \quad d^2g/dl(M,m)dy = -2\alpha g^{\alpha-1} / \{[\alpha(\alpha-1)g^{\alpha-2}(1-l(M,m)) - 1/(y-g)^2]^2 (y-g)^3\} < 0$$

This, in turn, implies that the effect of an income increase on the equilibrium amount of the public good is mediated through polarization in preferences. Specifically, we obtain the following testable implication that is used to motivate the empirical analysis below:

Proposition 1. A greater degree of polarization induces a smaller income effect on the amount of the public good: in other words, polarization tends to dissipate income windfalls.

5.2 Empirical results

We now turn to the empirical analysis of the above implications. Of course, the direct effects of ethnic divisions on institutional quality are already captured by our country fixed effects. Yet, ethnic divisions could conceivably affect the marginal effect that income has on institutional quality. For instance, the voracity models in Lane and Tornell (1998, 1999) suggest that beneficial terms of trade shocks lead to excessive fiscal redistribution in countries where groups, seeking transfers from the government budget, are strongly polarized. The amended version of Alesina et al., 1999, above – implying an adverse effect of polarization on the relationship between income windfalls and public good provision – leads, however, much more directly to our testable hypothesis. Specifically, conceiving of institutional quality as a public good type, and recalling that the ICRG measures reflect

institutional outcomes, we expect that ethnic polarization of a country adversely affects the marginal impact of income windfalls on institutional quality.

In line with this reasoning, Table 8 shows that the marginal effect of income growth significantly varies with ethnic polarization. This is true for all three measures of institutional quality. The heterogeneity in the marginal effect is so strong that in countries with low levels of ethnic polarization income increases are predicted to lead to a significant reduction in corruption, a significant increase in law and order, and a significant decrease in the overall political risk environment. On the other hand, in countries with high levels of ethnic polarization increases in income are predicted to lead to a significant increase in corruption, a significant decrease in law and order, and a significant increase in the overall political risk. Figure 2 illustrates this heterogeneity in the marginal effect graphically.

A related measure of ethnic fragmentation is the fractionalization measure. In contrast to the polarization measure, this measure strictly increases in the number of groups (Montalvo and Reynal-Querol, 2005a, b). To see the model implications of these two alternative measures, suppose that population preferences are distributed uniformly, and, further, that the population consists of three distinct groups (the size of each being, therefore, $1/3$). For concreteness, suppose that 0, $1/2$, and 1 are the bliss points of each of the three groups, respectively, so that $m=1/2$ is both the mean and the median. Consider now a mean preserving spread, whereby the size of the middle group is $1/\eta$, and the size of each of the extreme groups is $(\eta-1)/2\eta$, $\eta>3$; larger values of η correspond, therefore, to a larger spread.

An increase in η decreases the fractionalization index (which is, essentially, one minus the Herfindahl index), but it increases the polarization index, see Section 2 for their respective formal definitions. Going back to the theoretical model, note that an increase in γ decreases the distance $l(M,m) = (\eta-1)/2\eta$, which is consistent with the polarization index, but not with the fractionalization index (see Montalvo and Reynal-Querol, 2005a, b, for a further discussion of the relationship between the two indices).⁷

To explore this alternative, but conceptually different measure, we repeat the exercise interacting GDP per capita growth with ethnic fractionalization, see Panel A of Table 9. For all three measures the interaction estimates insignificant. Hence, when using ethnic fractionalization – a measure that, in contrast to the polarization measure, is not closely tailored to the theoretical model – there is no significant effect. In Panels B and C we also show that there is no significant heterogeneity in the marginal effect of changes in income on changes in institutional quality in terms of cross-country differences in the lagged institutional quality score or cross-country differences in average income per capita.

6. Concluding Remarks

Whereas institutions matter for economic growth, the extent of institutional improvements in the course of economic development is an important open research question. While existing literature has recently addressed this issue using the degree of democracy as a proxy for

⁷ This analysis generalizes to any number of groups, provided that the distribution of preferences is unimodal.

institutional constraints, here we broaden the inquiry, employing instead the widely used ICRG indices – whether in the context of democracies or autocracies. Thus, our focus here, while to some degree overlapping with the “income and democracy” literature, is different in not taking an a priori stand on whether democracy should necessarily bring about better institutional quality outcomes, as reflected in measures of corruption or political risks.

While a simple income effect would suggest that institutional quality should improve as the economy grows richer, the “resource curse” literature suggests that, where oil windfalls are the source of the economy’s wealth, its institutional benefits are likely to be dissipated as a result of struggle between competing groups. This suggestion leads us to employ oil price shocks as an exogenous – and persistent – source of income windfall. Instrumenting for national income with oil price shocks, our 1984-2007 cross country panel fixed effects analysis fails to uncover evidence for resource curse. If at all, we find – as does the recent related paper Alexeev and Conrad, 2009 – that institutional quality improves on average, albeit not in a consistently significant manner for most of the specifications and variables, as a result of oil price generated income. These results seem to be robust across a variety of estimations, as discussed in the robustness section above.

Motivated by theoretical suggestions that potential institutional benefits of oil induced income may be dissipated in the context of a struggle among population groups, we then explore whether ethnic heterogeneity plays a role in mediating the effect of income growth on institutional quality. A simple extension of existing models informs us the degree of ethnic

polarization, not of fractionalization, should matter in this regard. Our empirical results affirm the adverse role of ethnic polarization, specifically, the marginal effect of income on institutional quality varies with a measure of ethnic polarization in a manner consistent with the theory. In particular, where ethnic polarization is low enough, countries' institutional quality tends to benefit from oil induced income growth, whereas in the context of a high enough polarization, the opposite holds.

In conclusion, therefore, this paper provides a framework for studying causal effects of oil induced income growth on institutions. Its identification strategy enables us to explore with some accuracy potential channels for such effects. It is hoped that this, in turn, will further advance our understanding of causal effects behind institutional improvements, as well as of the “resource curse” phenomenon.

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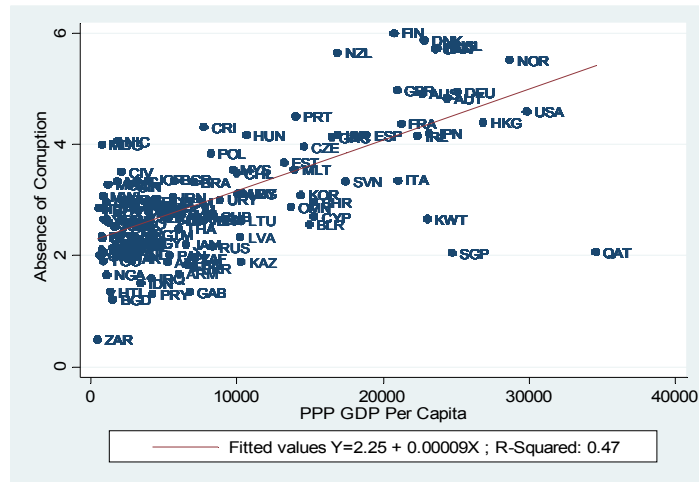
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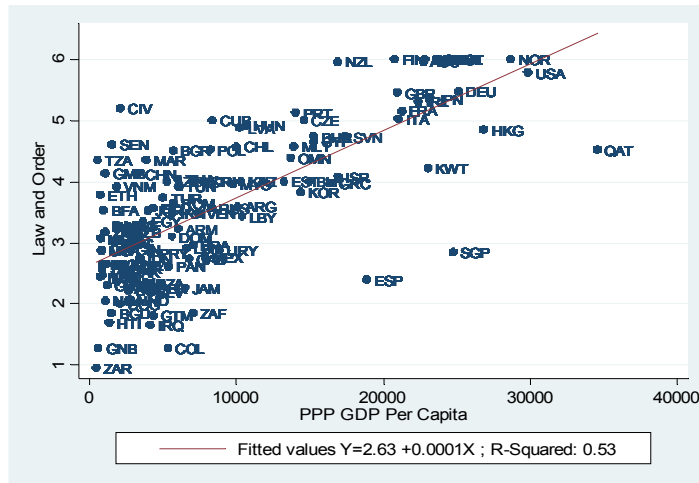
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Figure 1. Cross-Country Scatter Plots: Income and Institutional Quality

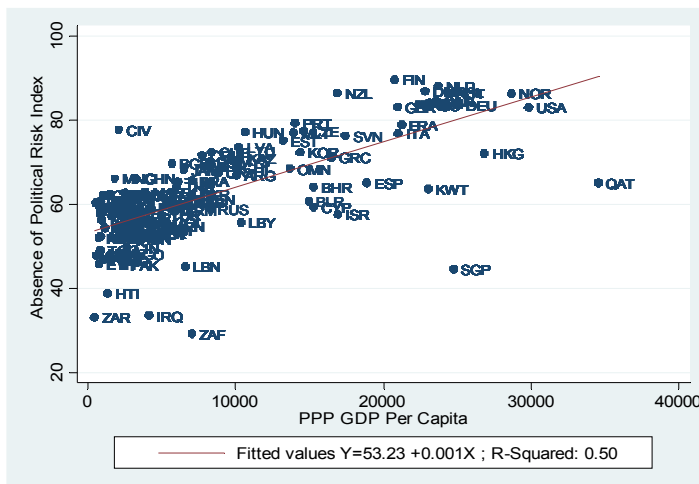
Panel A. Absence of Corruption



Panel B. Law and Order

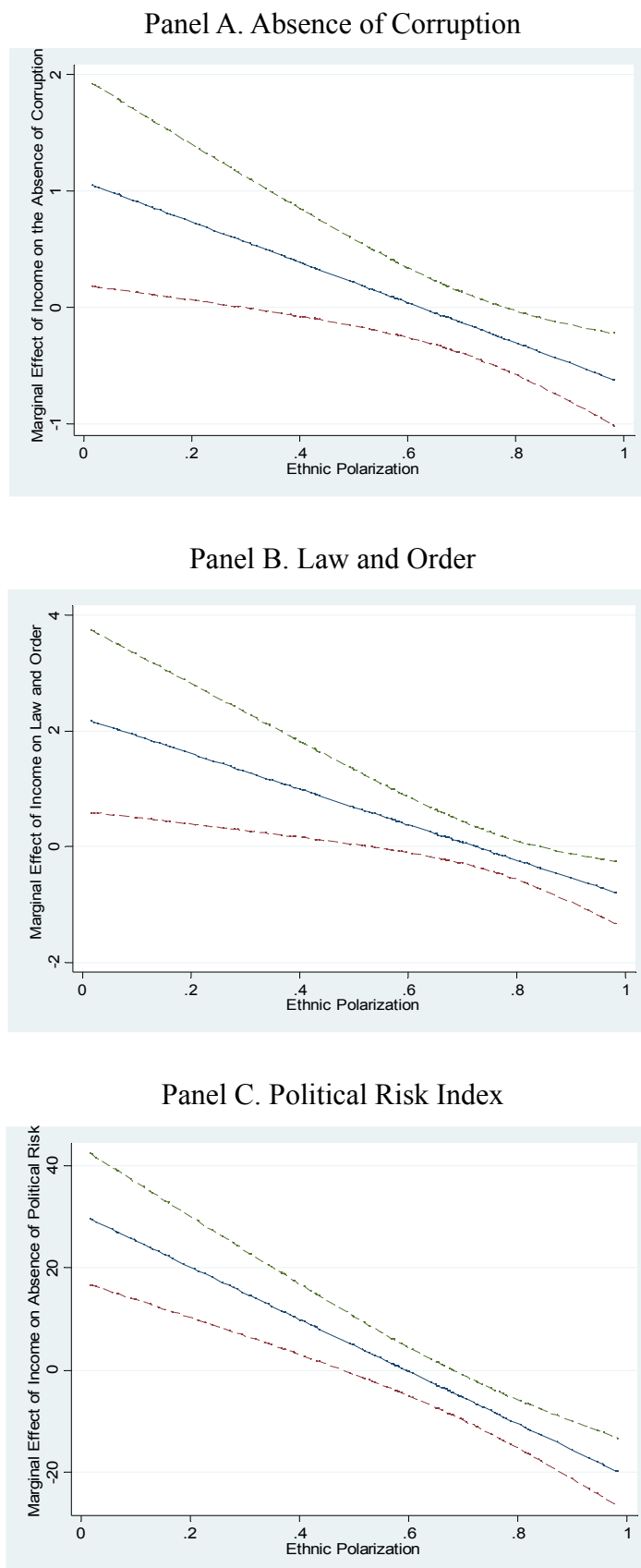


Panel C. Political Risk Index



Note: The scatter plots are for the 1984-2007 country average of GDP per capita and the respective ICRG score.

Figure 2. Income Growth, Ethnic Polarization, and Institutional Quality



Note: The figures are based on the estimates reported in Table 8. Dashed lines are 90 percent confidence bands.

Table 1. Descriptive Statistics

Variable	Source	Mean	Stdv.	Obs
Δ Absence of Corruption	ICRG	-0.04	0.45	2354
Δ Law and Order	ICRG	0.02	0.47	2354
Δ Absence of Political Risk	ICRG	0.48	4.45	2354
Absence of Corruption	ICRG	3.03	1.36	2354
Law and Order	ICRG	3.63	1.50	2354
Absence of Political Risk	ICRG	62.98	15.08	2354
$\Delta \ln(\text{GDP Per Capita})$	PWT	0.04	0.08	2354
GDP Per Capita	PWT	9077	9709	2354
Ethnic Polarization	Reynal-Querol	0.49	0.25	1953
Ethnic Fractionalization	Reynal-Querol	0.44	0.30	1953

Table 2. Income Growth and Institutional Quality
(Baseline Estimates)

	Δ Absence of Corruption	Δ Law and Order	Δ Absence of Political Risk
	(1)	(2)	(3)
Panel A: 2SLS			
$\Delta \ln(\text{GDP})$	0.07 (0.21)	0.45 (0.30)	8.73** (2.14)
Lagged IQ	-0.24*** (0.02)	-0.22*** (0.01)	-0.24*** (0.02)
First-Stage F-stat	85.47	83.93	82.31
First-Stage for $\Delta \ln(\text{GDP})$			
Oil Price Shock	2.58*** (0.28)	2.58*** (0.28)	2.58*** (0.28)
Panel B: LS			
$\Delta \ln(\text{GDP})$	-0.02 (0.09)	0.34*** (0.11)	6.04*** (1.05)
Lagged IQ	-0.24*** (0.02)	-0.21*** (0.01)	-0.24*** (0.02)
Panel C: SYS-GMM			
$\Delta \ln(\text{GDP})$	0.07 (0.09)	0.21** (0.11)	5.26*** (1.27)
Lagged IQ	-0.14*** (0.03)	-0.15*** (0.03)	-0.24*** (0.07)
Country Fe	Yes	Yes	Yes
Year Fe	Yes	Yes	Yes
Observations	2346	2346	2346

Note: The method of estimation in Panel A is two-stage least squares; Panel B least squares; Panel C system-GMM. Standard errors shown in parentheses are Huber robust and clustered at the country level. The instrumental variable in the two-stage least squares estimation is the oil price shock. The dependent variable in column (1) is the change in ICRG corruption score; column (2) the change in the ICRG rule and order score; column (3) the change in the ICRG political risk index. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 3. Income Growth and Institutional Quality
(Test of Exclusion Restriction)

	Δ Absence of Corruption	Δ Law and Order	Δ Absence of Political Risk
	(1)	(2)	(3)
	2SLS	2SLS	2SLS
Panel A: IV is Oil Shock and Lagged Savings Rate			
$\Delta \ln \text{GDP}$	0.19 (0.27)	0.34* (0.20)	5.93** (2.10)
Lagged IQ	-0.23*** (0.02)	-0.21*** (0.01)	-0.24*** (0.02)
First-Stage F-stat	99.73	98.54	99.56
Hansen J, p-value	0.45	0.13	0.61
First Stage for $\Delta \ln \text{GDP}$			
Oil Price Shock	2.50*** (0.21)	2.50*** (0.21)	2.50*** (0.21)
Lagged Savings Rate	0.02*** (0.005)	0.02*** (0.005)	0.02*** (0.005)
Panel B: IV is Lagged Savings Rate			
$\Delta \ln \text{GDP}$	0.99 (1.18)	1.42* (0.79)	10.56 (10.47)
Lagged IQ	-0.23*** (0.02)	-0.21*** (0.01)	-0.24*** (0.02)
Oil Price Shock	-2.51 (3.22)	-3.34 (2.31)	-14.54 (29.64)
First-Stage F-stat	22.05	22.34	24.02
First Stage for $\Delta \ln \text{GDP}$			
Lagged Savings Rate	0.02*** (0.005)	0.02*** (0.005)	0.02*** (0.005)
Country Fe	Yes	Yes	Yes
Year Fe	Yes	Yes	Yes
Observations	2346	2346	2346

Note: The method of estimation is two-stage least squares. Standard errors shown in parentheses are Huber robust and clustered at the country level. The instrumental variable in Panel A is the oil price shock variable and the lagged savings rate; in Panel B the instrumental variable is the lagged savings rate. The dependent variable in column (1) is the change in ICRG corruption score; column (2) the change in the ICRG rule and order score; column (3) the change in the ICRG political risk index. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 4. Income Growth and Institutional Quality
(Robustness to Excluding Large Oil Importers and Exporters)

	Δ Absence of Corruption	Δ Law and Order	Δ Absence of Political Risk
	(1)	(2)	(3)
	2SLS	2SLS	2SLS
$\Delta \ln(\text{GDP})$	0.18 (0.43)	0.26 (0.35)	12.13* (6.96)
Lagged IQ	-0.23*** (0.02)	-0.21*** (0.02)	-0.24*** (0.02)
First-Stage F-stat	15.40	15.59	14.33
	First Stage for $\Delta \ln \text{GDP}$		
Oil Price Shock	2.55*** (0.65)	2.55*** (0.65)	2.55*** (0.67)
Country Fe	Yes	Yes	Yes
Year Fe	Yes	Yes	Yes
Observations	1927	1927	1927

Note: The method of estimation is two-stage least squares. Standard errors shown in parentheses are Huber robust and clustered at the country level. The instrumental variable is the oil price shock. The dependent variable in column (1) is the change in ICRG corruption score; column (2) the change in the ICRG rule and order score; column (3) the change in the ICRG political risk index. The excluded countries are Algeria, Canada, China, Germany, Indonesia, Iran, Iraq, Italy, Kuwait, Libya, Mexico, Netherlands, Nigeria, Norway, Oman, Qatar, Russia, Saudi Arabia, United Arab Emirates, United Kingdom, United States, and Venezuela. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 5. Income Growth and Institutional Quality
(Robustness to Excluding Countries where Oil Companies are Nationalized)

	Δ Absence of Corruption	Δ Law and Order	Δ Absence of Political Risk
	(1)	(2)	(3)
	2SLS	2SLS	2SLS
$\Delta \ln(\text{GDP})$	0.26 (0.42)	0.12 (0.34)	6.10** (2.91)
Lagged IQ	-0.23*** (0.02)	-0.21*** (0.02)	-0.24*** (0.01)
First-Stage F-stat	15.05	15.32	13.93
	First Stage for $\Delta \ln \text{GDP}$		
Oil Price Shock	2.77*** (0.72)	2.79*** (0.71)	2.79*** (0.75)
Country Fe	Yes	Yes	Yes
Year Fe	Yes	Yes	Yes
Observations	1905	1905	1905

Note: The method of estimation is two-stage least squares. Standard errors shown in parentheses are Huber robust and clustered at the country level. The instrumental variable is the oil price shock. The dependent variable in column (1) is the change in ICRG corruption score; column (2) the change in the ICRG rule and order score; column (3) the change in the ICRG political risk index. The excluded countries are Algeria, Angola, Argentina, Bahrain, Bangladesh, Bolivia, Burma, Cambodia, Chad, Colombia, Republic of Congo, Ecuador, Egypt, Ethiopia, Gabon, Ghana, Guyana, India, Indonesia, Iran, Iraq, Kuwait, Libya, Malaysia, Morocco, Mozambique, Nepal, Nigeria, Oman, Pakistan, Peru, Philippines, Qatar, Russian Federation, Saudi Arabia, Sudan, Trinidad and Tobago, Uganda, United Arab Emirates, Venezuela, Yemen, Zambia. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 6. Income Growth and Institutional Quality
(Robustness to Using Oil Exporters Only)

	Δ Absence of Corruption	Δ Law and Order	Δ Absence of Political Risk
	(1)	(2)	(3)
	2SLS	2SLS	2SLS
$\Delta \ln(\text{GDP})$	0.21 (0.39)	0.83 (0.47)	10.19* (6.02)
Lagged IQ	-0.24*** (0.02)	-0.22*** (0.02)	-0.25*** (0.03)
First-Stage F-stat	64.72	62.58	62.97
	First Stage for $\Delta \ln \text{GDP}$		
Oil Price Shock	2.42*** (0.30)	2.43*** (0.31)	2.42*** (0.31)
Country Fe	Yes	Yes	Yes
Year Fe	Yes	Yes	Yes
Observations	786	786	786

Note: The method of estimation is two-stage least squares. Standard errors shown in parentheses are Huber robust and clustered at the country level. The instrumental variable is the oil price shock. The dependent variable in column (1) is the change in ICRG corruption score; column (2) the change in the ICRG rule and order score; column (3) the change in the ICRG political risk index. The oil exporting countries are Albania, Algeria, Angola, Argentina, Azerbaijan, Bahrain, Bolivia, Cameroon, Canada, Chad, Colombia, Democratic Republic of Congo, Ecuador, Egypt, Equatorial Guinea, Gabon, Indonesia, Iran, Iraq, Kazakhstan, Kuwait, Libya, Malaysia, Mexico, Niger, Nigeria, Norway, Oman, Papua New Guinea, Peru, Qatar, Republic of Congo, Russia, Saudi Arabia, Singapore, Trinidad and Tobago, Tunisia, Turkmenistan, United Arab Emirates, United Kingdom, Uzbekistan, Venezuela, Vietnam, and Yemen. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 7. Income Growth and Institutional Quality
(Robustness to Using 5-Year Changes)

	Δ Absence of Corruption	Δ Law and Order	Δ Absence of Political Risk
	(1)	(2)	(3)
	2SLS	2SLS	2SLS
$\Delta \ln(\text{GDP})$	0.49 (0.54)	0.80 (0.49)	8.03 (5.31)
Lagged IQ	-0.90*** (0.04)	-0.85*** (0.04)	-0.91*** (0.03)
First-Stage F-stat	14.04	13.85	14.13
	First Stage for $\Delta \ln \text{GDP}$		
Oil Price Shock	2.67*** (0.71)	2.67*** (0.72)	2.65*** (0.70)
Country Fe	Yes	Yes	Yes
Year Fe	Yes	Yes	Yes
Observations	1893	1893	1893

Note: The method of estimation is two-stage least squares. Standard errors shown in parentheses are Huber robust and clustered at the country level. The instrumental variable is the oil price shock. The dependent variable in column (1) is the change in ICRG corruption score; column (2) the change in the ICRG rule and order score; column (3) the change in the ICRG political risk index. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 8. Income Growth, Ethnic Polarization, and Institutional Quality

	Δ Absence of Corruption	Δ Law and Order	Δ Absence of Political Risk
	(1)	(2)	(3)
	2SLS	2SLS	2SLS
$\Delta \ln(\text{GDP})$	1.08* (0.56)	2.22** (1.01)	30.38*** (8.19)
$\Delta \ln(\text{GDP})$ *Ethnic Polarization	-1.73** (0.73)	-3.07** (1.28)	-51.06*** (11.00)
Lagged IQ	-0.23*** (0.02)	-0.21*** (0.02)	-0.24*** (0.02)
First-Stage F-stat	10.62	10.62	10.62
Country Fe	Yes	Yes	Yes
Year Fe	Yes	Yes	Yes
Observations	1954	1954	1954

Note: The method of estimation is two-stage least squares. Standard errors shown in parentheses are Huber robust and clustered at the country level. The instrumental variable is the oil price shock and the interaction between the oil price shock and ethnic polarization. The dependent variable in column (1) is the change in ICRG corruption score; column (2) the change in the ICRG rule and order score; column (3) the change in the ICRG political risk index. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.

Table 9. Income Growth and Institutional Quality
(Alternative Interactions)

	Δ Absence of Corruption	Δ Law and Order	Δ Absence of Political Risk
	(1)	(2)	(3)
	2SLS	2SLS	2SLS
Panel A: Ethnic Fractionalization			
$\Delta \ln(\text{GDP})$	-0.73 (0.65)	1.38 (1.03)	-1.01 (11.46)
$\Delta \ln(\text{GDP})$ *Ethnic Fractionalization	1.30 (0.88)	-1.96 (1.44)	-1.07 (13.55)
Lagged IQ	-0.23*** (0.02)	-0.21*** (0.01)	-0.24*** (0.01)
First-Stage F-stat	7.65	7.58	7.63
Observations	1954	1954	1954
Panel B: Lagged IQ			
$\Delta \ln(\text{GDP})$	1.28 (0.99)	-0.30 (0.88)	-24.94 (34.37)
$\Delta \ln(\text{GDP})$ *Lagged IQ	-0.45 (0.41)	0.21 (0.19)	0.43 (0.50)
Lagged IQ	-0.22*** (0.02)	-0.22*** (0.01)	-0.25*** (0.02)
First-Stage F-stat	16.55	7.89	11.90
Observations	2354	2354	2354
Panel C: GDP Per Capita			
$\Delta \ln(\text{GDP})$	1.74 (1.53)	2.53 (1.91)	32.04 (25.60)
$\Delta \ln(\text{GDP})$ *Average GDP Per Capita	-0.18 (0.18)	-0.24 (0.20)	-3.51 (3.13)
Lagged IQ	-0.23*** (0.01)	-0.22*** (0.01)	-0.24*** (0.02)
First-Stage F-stat	4.57	4.70	4.66
Observations	2354	2354	2354
Country Fe	Yes	Yes	Yes
Year Fe	Yes	Yes	Yes

Note: The method of estimation is two-stage least squares. Standard errors shown in parentheses are Huber robust and clustered at the country level. The instrumental variable is the oil price shock and the interaction between the oil price shock and ethnic fractionalization (Panel A), the lagged institutional quality score (Panel B), and average GDP per capita. The dependent variable in column (1) is the change in ICRG corruption score; column (2) the change in the ICRG rule and order score; column (3) the change in the ICRG political risk index. *Significantly different from zero at 90 percent confidence, ** 95 percent confidence, *** 99 percent confidence.