# Investment and Institutional Uncertainty: A Comparative Study of Different Uncertainty Measures

By

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Contents: I. Introduction. – II. Evidence on Institutional Uncertainty and Investment in the Recent Empirical Literature. – III. Categorization of Institutional Uncertainty Indicators. – IV. Empirical Approach and Specification. – V. Empirical Results. – VI. Conclusions. – Appendix.

## I. Introduction

A number of analytical and empirical studies have recently re-emphasized the importance of uncertainty for investment decisions. The analytical basis for this resurgence was given by the real option theories which have shown that irreversibility and timing considerations can significantly magnify uncertainty's effects in investment decisions.[1] The subsequent empirical studies have indeed found that aggregate investment and different measures of uncertainty are negatively associated. Most of these studies have concentrated on the effects of some specific form of uncertainty. For instance, some studies focused on macroeconomic volatility measures such as the standard deviation of the inflation rate, others on measures of government instability or measures of policy volatility.[2] Not many studies try to test measures of institutional instability in standard specifications that could be compared with other work.[3] In addition, most cross-section studies do not hold constant the country sample; regressions are usually estimated for

[1] See for example Pindyck (1991) for an introduction or Dixit and Pindyck (1994) for a detailed analysis.

[2] See for example Barro (1991), Aizenman and Marion (1995) or Easterly and Rebelo (1993).

[3] See Brunetti (1997) for such a comparative study of political variables which, however, concentrates on growth.

as many countries as possible. This has the advantage of using all available information but it comes at the cost of reducing the comparative quality of the results. From the point of view of the policymaker, it would be interesting to know which forms of uncertainty are most damaging for investment, e.g. is macroeconomic volatility more important than political instability or corruption?

The purpose of this paper is to present a comparative analysis of a large number of uncertainty variables in a standardized data set and to draw comparative conclusions on the magnitude of their effect on investment. For this purpose we have selected a set of 60 countries, the largest country set for which all variables were available. We proceed to test 24 uncertainty variables in the same specification. In other words, in this study we keep the specification, the country sample as well as the time period constant. Differences in results are, therefore, not driven by differences in samples – which are in turn dictated by random data availability – but are only related to the size of the effect of different forms of uncertainty on investment.

The paper is organized as follows. In Section II, we briefly discuss the recent empirical literature on uncertainty and the investment decision and the typical variables that were used. Section III presents a categorization for the variables of institutional uncertainty and Section IV explains the empirical approach used in the cross-country analysis. Section V shows the regression results of these measures of institutional uncertainty in a standard investment equation using a standardized data set. Section VI concludes by identifying the statistically significant variables and evaluates the magnitude of their effect on investment.

## II. Evidence on Institutional Uncertainty and Investment in the Recent Empirical Literature

By now, a considerable number of empirical studies exist which incorporate measures of uncertainty in investment regressions. A list of variables that have been used include: the standard deviation of GDP growth rate and variance of real GDP, the volatility of inflation rates, fluctuations in the terms of trade, the volatility of the real exchange rate, measures of corruption, the security of property rights, the quality of political rights, the number of significant government changes.

The largest part of the empirical literature has been cross-country studies using measures of *macroeconomic volatility*. For instance Servén and Solimano (1993) report a negative impact of inflation and real exchange rate volatility on private investment in a sample of devel-

oping countries. Along similar lines, Aizenman and Marion (1995) find a negative correlation between indicators of macroeconomic volatility (of the terms of trade, inflation, and the real exchange rate) and private investment. Gunter (1997) follows a slightly different path by arguing that the measures of volatility only refer to the tendency of a variable to fluctuate and do not necessarily indicate whether uncertainty about these fluctuations is present. He therefore calculates the standard deviation of the residuals of a time-series process as a measure of macroeconomic uncertainty and proceeds to test this variable in investment regressions.[4] He finds that uncertainty about exchange rate variation and money supply are negatively related with aggregate investment as well as with private investment.

A second, smaller strand of the literature is concerned with the effect of *political uncertainty* on investment. These studies have focused on the role of government instability, rapid government turnover, unstable incentive frameworks, social unrest, and fundamental uncertainties about property rights. The study by Barro (1991) for instance finds that measures of government instability (the number of revolutions) and political violence (the number of assassinations) are significantly related to cross-country differences in investment. Knack and Keefer (1995) show that indicators of property-rights enforcement (i.e. perceived risk of expropriation and repudiation of contracts) derived from expert opinion surveys vary negatively with investment rates across countries. Along similar lines, Mauro (1995) finds that an aggregate institutional indicator, which he calls "corruption indicator" is negatively associated with investment in his sample of countries. Recently Brunetti et al. (1998) present results from a large-scale survey among entrepreneurs showing that perceived government instability, corruption, and reliability of the judiciary all influence cross-country differences in aggregate investment.

Other studies have concentrated on a specific region. For instance, Servén (1996) tests a number of instability indicators in a sample of African countries. He finds significant negative associations between investment and terms-of-trade variability, black-market premium variability, real exchange rate variability, and restriction on civil liberties. Similar results have been presented by Hausmann and Gavin (1996) for Latin-American countries. For their sample, they report a negative association between an index of macroeconomic volatility (composed of

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[4] See Aizenman und Marion (1993) for a similar study.

real GDP volatility and the variability of the real exchange rate) and the aggregate investment rate.

Most of the studies find that their measure of economic instability and uncertainty has a statistically significant negative impact on investment. However, as mentioned above, the different studies are not readily comparable because of the differences in sample and specifications used.

### III. Categorization of Institutional Uncertainty Indicators

As the short survey in the previous section indicates, institutional uncertainty is a broad concept that encompasses very different forms of uncertainties created in the political environment. At the same time such uncertainties are hard to measure and only more or less crude proxies can be used in systematic cross-country investigations. We can distinguish four categories of uncertainties in the institutional framework: Government instability, political violence, policy uncertainty, and enforcement uncertainty.

*Government instability indicators* concentrate on the past history of government changes or on the likelihood that the government stays in power. The hypothesis is that every significant change of executive power is likely to be accompanied by policy changes that introduce an element of uncertainty into the institutional framework. The higher the instability of the government, the higher, therefore, institutional uncertainty.

*Political violence indicators* measure all forms of violent events associated with the political process. The higher the degree of violence in the political process, the less secure are people and property. This creates all kinds of uncertainties and so reduces investment.

*Policy uncertainty indicators* are somewhat more focused than the first two categories as they concentrate on uncertainties created by changes in "policies" rather than in "politics". Policy uncertainty can be expressed either through the volatility of the institutional framework (e.g. the number of changes in the constitution) or through the volatility of outcomes (e.g. the volatility of the inflation rate).

*Enforcement uncertainty indicators* focus on yet another dimension of the relation between the private sector and the state, i.e. the degree of confidence private firms can have that their property and contract rights are unarbitrarily enforced. These measures concentrate on the discretionary behavior of the judiciary as well as the bureaucracy.

## IV. Empirical Approach and Specification

As mentioned above, in this study we aim at maximum comparability of results. We test a number of measures of institutional uncertainty in each of the categories mentioned by using: the same country sample, the same specification, and the same time period.

The remainder of this section provides a more detailed discussion of each of these three points.

### 1. Country Sample

Our data set comprises 60 countries. We selected the largest possible country sample for which a considerable number of uncertainty variables as well as all other control variables were available. The data set is quite equilibrated across regions – there is no obvious bias in continent coverage or in the development stage in this sample.[5] All regressions in the following sections use all of these 60 countries.

### 2. Specification

The specification used in the comparative tests follows the standard approach in the recent empirical growth and investment literature. The variables we use are typically included when analyzing long-term macroeconomic relationships in a cross-country setting.[6] The specification is as follows:

$$Invest = a_0 + a_1 GDPbase + a_2 Secbase + a_3 Govaver$$
$$+ a_4 Trdaver + a_5 Inst + \varepsilon. \tag{1}$$

The endogenous variable always is the average rate of investment in the period 1974–1989. *Inst* is the variable of interest, i.e. the proxy for institutional uncertainty. The higher uncertainty, the lower investment so that we expect a negative sign.

The four right-hand variables control for the most important determinants of cross-country differences in investment considered in the recent literature. *GDPbase* is the real per capita GDP in 1974. This variable from the data set by Summers and Heston (1991) captures the absolute convergence effect emphasized in neoclassical growth theory. *Sec-*

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[5] A country list is provided in the Appendix, Table A1.
[6] See e.g. Barro (1991), Easterly and Rebelo (1993), Levine and Renelt (1992) or, more recently, Barro (1997).

*base* measures the enrollment ratio in secondary school in the base year.[7] This variable from the UNESCO *Statistical Yearbook* is a frequently used proxy for human capital. Together, *GDPbase* and *Secbase* control for the conditional convergence effect identified in cross-country macroeconomic data by e.g. Mankiw et al. (1992). In the investment regressions *GDPbase* is expected to have a negative and *Secbase* a positive sign.

*Govaver* is the average ratio of government consumption in percentage of GDP in the period 1974–1989 provided by the World Bank. This variable controls for the degree of government involvement in markets and is usually interpreted as a proxy for all forms of government-induced distortions in the economy.[8] In this interpretation the expected sign in the investment regressions is negative.

*Trdaver* is the most basic indicator of the openness of the economy measuring the average sum of exports and imports as a percentage of GDP in the period 1974–1989. This variable is provided by the World Bank and captures how strongly the economy is exposed to foreign markets. For various reasons, more openness is expected to positively affect the rate of investment. For example, increased export possibilities increase the size of the potential market which enables firms to take advantage of economies of scale. On the import side, an open economy enhances inflows of new technology which raises the productivity of investment projects.[9]

To economize on space, in the empirical parts we will not display the entire regression output for each of the regressions but we only report sign and significance of the institutional variables of interest.[10] To show the performance of the other control variables we, therefore, first present results for the investment regression without an institutional variable:

$$Invest = 0.19*** - 0.000001 GDPbase + 0.04 Secbase$$
$$(0.02) \quad (0.00001) \qquad (0.05)$$

$$- 0.12 Govaver + 0.06 Trdaver*** \qquad (2)$$
$$(0.13) \qquad (0.01)$$

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[7] The UNESCO data on school enrollment is only provided occasionally so that we take the year that is closest (1970).

[8] See e.g. Barro (1991).

[9] For a more detailed discussion of these and other benefits from openness see e.g. Harrison (1996).

[10] Full regression outputs as well as regression results for subsets of the control variables as well as for a number of additional control variables are available on request.

Adjusted $R^2$: 0.26; standard deviation in parenthesis; ***: significant at the 1 percent level.

Regression (2) shows that for this sample and time period all explanatory variables have the expected sign. However, only the trade share is significant on conventional levels. All other controls are insignificant, a result which prevails for all regressions estimated below. In an attempt to improve the specification we experimented with a number of other control variables that have been used – less frequently – in this kind of analysis. However, neither the variance of the growth rate of GDP, nor the enrollment in primary school, nor the growth rate of domestic credit, nor the average rate of inflation had any significant impact on investment. Neither of these variables improved the fit of the regression. It seems that many of the standard variables on economic conditions are poor at explaining aggregate investment at least for our sample and period. On the other hand, as we show below, many measures of institutional uncertainty *do* significantly contribute to explain differences in rates of investment.

## 3. Time Period

Control variables as well as investment figures are for the same period (1974–1989) in all regressions. Some of the institutional variables, however, are not available for the entire period. Nevertheless, these institutional variables have routinely been used in long-term cross-country studies based on the assumption that they are unlikely to change much over time. Therefore, using the nearest possible coverage to the time period should not bias the results too much. In order to check the possible sensitivity of the results to variations in the period, Table A3 in the Appendix compares the t-values of the institutional variables for estimations with the same specification for the period 1960–1989. In these regressions all control variables as well as the investment rate are for the longer period, but for the institutional variables we work with the same values as in our main analysis. The comparison shows that the t-values are not very sensitive to changes in the period covered; in most cases the t-values for the two periods are very similar and the level of significance of the institutional variables is not affected.[11] The results

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[11]  To be more precise, changing the period has notable, but small effects on the significance level in only 3 of the 24 cases. "Demonstrations" are insignificant for 1974–1989 but significant at the 10 percent level in 1969–1989 and "terrorism" as well as "social change" are significant at the 10 percent level in 1974–1989 but insignificant in 1960–1989.

indicate that the lack of a perfect match of some of the institutional variables with the time period of the other variables is not introducing a large bias – which might have undermined the comparative value of the results.

## V. Empirical Results

Before proceeding to the presentation of the results we will briefly discuss the main data sources.

### 1. Main Data Sources

A small number of data sets are available that allow the construction of broad indicators of institutional uncertainty as averages for an extended time period. The two most important cross-country data sets with political indicators are provided by political scientists.

The first political data set is the *World Handbook of Political and Social Indicators* by Taylor and Jodice (1983). This handbook is the result of a long-term data collection by the Yale World Data Project. Starting from 1948, yearly data is available for a large number of political indicators and for all major countries. The most recent version on the electronic data set includes an update until 1982. The data set encompasses indicators of political protest, state coercive behavior, and national elections. The *New York Times Index* is the primary source and a number of regional secondary sources were used for cross checks. The data is compiled using objective entry rules and special care is taken to avoid different forms of reporting biases.[12]

The second cross-country data set compiled by political scientists is the *Cross-National Time Series Data Archive* provided and updated by Banks (1979) and his collaborators. Similar to Taylor and Jodice, this data set uses media sources to keep record of government changes and acts of political violence in most countries of the world on an annual basis.

In addition to these dominating sources of political variables, a number of other data sets have been used to construct indicators of institutional instability. One is the *International Financial Statistics* by the International Monetary Fund that keeps track on monetary variables on an annual basis. Another is *Pick's Currency Yearbook* that calculates

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[12] For details see Taylor and Jodice (1983).

annual indicators of black-market premiums for a large cross-section of countries. A last data source are Delphi-method surveys among country experts that have been provided commercially for multinational firms. Typical for this approach are the data calculated by *Business International*, or *International Country Risk Guide* that contain a number of experts' evaluations on the degree of institutional instability for a large cross-section of countries.

## 2. Government Instability[13]

*Measures of government instability* concentrate on events that are related to the constitutional or unconstitutional transfer of political power in a country. The idea is that significant government changes, high probability of opposition takeover, and the like increase the uncertainty on the future institutional framework. In this sense, they intend to provide a measurable proxy of institutional uncertainty.

Table 1 summarizes the results of estimating investment regressions with four of these measures in the specification discussed above. The table indicates the sign of the coefficient of the respective measure of government instability and the level of significance.

We test four indicators that measure aspects of government instability. The first two, the numbers of revolutions and the numbers of coups from 1960–1985, are both from the data set provided by Banks (e.g. 1979). These indicators were used in the influential paper by Barro (1991) and are regularly integrated in cross-country growth and investment regressions. Both indicators have the expected negative sign in the investment regression but only the indicator of the number of revolutions is significantly related to cross-country differences in aggregate investment.

The third proxy for government stability is the number of protest demonstrations per year for the period 1960–1982. This variable is from Taylor and Jodice (1983) and is defined as a nonviolent gathering of people organized for speaking against a regime or government or one or more of its leaders. These protests are perceived as important on the national level and, therefore, at least potentially are a threat for the ruling government. In the investment regressions, this variable always has the expected sign but is insignificant at conventional levels.

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[13] Descriptive statistics for all indicators used in the empirical analysis can be found in Table A2 in the Appendix.

Table 1 – *Coefficients, t-Values, and Adjusted Coefficients of Determination of Indicators of Government Instability in Investment Regression*

| Institutional variable | Coefficient (t-statistic) | Adjusted $R^2$ |
|---|---|---|
| Revolutions | −0.102** (−2.279) | 0.314 |
| Coups | −0.160 (−1.387) | 0.274 |
| Political demonstrations | −0.00039 (−0.989) | 0.261 |
| Probability of opposition takeover | −0.007 (−1.639) | 0.284 |

*Note:* The table summarizes sign and significance of the indicators of institutional uncertainty in an investment regression that controls for GDP in base year, school enrollment in base year, average government consumption per GDP, and average sum of exports and imports per GDP. – * = significant on 10 percent level; ** = significant on 5 percent level; ***= significant on 1 percent level.

The fourth indicator of government instability is a measure from the expert's surveys done by the private firm Business International. It measures the probability of opposition takeover in 1980. This indicator is negatively related to aggregate investment but it is just insignificant at the 10 percent level.

## 3. Political Violence

*Measures of political violence* concentrate on violent events that are rooted in political conflicts in the broadest sense. In the context of this paper, political violence can be thought to proxy for uncertainties in the security of persons and property. Table 2 summarizes the results of testing nine different indicators of political violence in the standard specifications of investment regressions.

The first three variables are from Banks (e.g. 1979), i.e. the average number of assassinations per million of population per year, the average number of political strikes per year, and the average number of riots per year, all for the period 1960–1985. A political strike is a work stoppage by a larger number of workers to protest against a regime and its leaders' policies. Such an event is potentially accompanied by vio-

Table 2 – *Coefficients, t-Values, and Adjusted Coefficients*
*of Determination of Indicators of Political Violence*
*in Investment Regression*

| Institutional variable | Coefficient (t-statistic) | Adjusted $R^2$ |
|---|---|---|
| Assassinations | −0.006 (−0.337) | 0.250 |
| Strikes | −0.010 (−0.441) | 0.250 |
| Riots | 0.0005 (0.109) | 0.248 |
| Armed attacks | −0.0001 (−0.742) | 0.256 |
| Deaths form political violence | −0.000001 (−0.686) | 0.255 |
| Political executions | −0.002** (−2.160) | 0.308 |
| War casualties | −3.191** (−2.202) | 0.310 |
| Violent social change | −0.010* (−1.954) | 0.298 |
| Terrorism | −0.007* (−1.707) | 0.287 |
| *Note:* See Table 1. | | |

lence. A riot is defined as a demonstration or disturbance that becomes violent. These three variables measure events of political violence that are significant but not very far-reaching on a national level. The results for all three variables are weak. The number of assassinations and strikes have the expected negative sign but they are insignificant on conventional levels. The number of riots is clearly insignificant as well and it even has the "wrong" sign.

Three variables that measure strong forms of political violence are taken from Taylor and Jodice (1983). They are the average number of armed attacks per year, the average number of deaths reported in connection with political events per year, and the average number of political executions per year for 1960–1982. An armed attack is an act of violent political conflict carried out by an organized group with the aim of weakening the power of another organized group within the country.

This indicator has the expected negative sign but is insignificant. The number of deaths resulting from domestic political violence is a measure of the magnitude of internal war. Again this indicator is negatively, but insignificantly related to aggregate investment. A political execution is an event in which a person or group is put to death under orders of the national authorities while in custody. This indicator measures the degree of violence from the government rather than from the people. The indicator of political executions has the expected negative sign and is significant on the 5 percent level.

The indicator of the number of war casualties on domestic territory in 1970–1988 is provided by Easterly and Rebelo (1993). This indicator enters the investment regressions with the expected sign and is significant.

Finally, two indicators of political violence were calculated from the "Business International" survey of experts. A first indicator is based on the evaluation of the country experts whether the orderly political process tends to disintegrate and/or becomes violent, and a second indicator is based on the evaluation of the probability that individuals or businesses are subject to acts of terrorism. Both indicators are for the year 1980 and exhibit the same pattern; they have the expected sign and are significant on the 10 percent level.

## 4. Policy Uncertainty

*Policy uncertainty* can be captured either through the volatility of the institutional framework (e.g. the number of changes in the constitution) or through the volatility of outcomes (e.g. the volatility of the inflation rate). Table 3 summarizes the results of testing five typical measures of policy volatility in the standard specification.

The first indicator of policy volatility is the standard deviation of the black-market premium on foreign exchange for 1960–1987 from Pick's Currency Yearbook. The indicator has the expected negative sign and is significant on the 5 percent level.

The second indicator of policy volatility is the standard deviation of inflation for 1960–1989 which is frequently used in cross-country analysis. This variable is from the IFS-data-series provided by the International Monetary Fund. The indicator has a negative sign but it is insignificant on conventional levels.

As a third indicator of policy volatility we use the coefficient of variation of real exchange rate distortions for the period 1976–1985. This indicator is constructed from different sources by Dollar (1992). In con-

Table 3 – *Coefficients, t-Values, and Adjusted Coefficients
of Determination of Indicators of Policy Uncertainty
in Investment Regression*

| Institutional variable | Coefficient (t-statistic) | Adjusted $R^2$ |
|---|---|---|
| Standard deviation of black-market premium on foreign exchange | −0.0001** (−2.229) | 0.311 |
| Standard deviation of inflation | −0.000003 (−0.084) | 0.248 |
| Coefficient of variation of real exchange rate distortions | −0.275*** (−3.048) | 0.385 |
| Changes in the constitution | −0.163* (−1.958) | 0.298 |
| Changes in the institutional framework | −0.003 (−0.672) | 0.254 |
| *Note:* See Table 1. | | |

structing this indicator he starts from the observation that measures of
the real exchange rate are distorted by the existence of nontradables.
Dollar tries to correct this by first regressing the relative price levels to
the US$ on per capita GDP and continent dummies (this is done to cor-
rect for differences in factor endowment which in turn proxy for differ-
ences in prices of nontradables). He then uses the regression to calcu-
late the predicted relative price level for each year and each country.
The actual price level divided by this predicted price level is the index
of real exchange rate distortion and the coefficient of variation of this
variable is used as a measure of policy volatility. This indicator exhib-
its the expected negative sign in the investment regression and is sig-
nificant on the 1 percent level.

The last two measures of policy uncertainty directly test the vola-
tility of the institutional framework. First we use a measure of the num-
ber of changes in the national constitution for 1960–1985 from the data
set of Taylor and Jodice (1983). This indicator is negatively related to
investment and significant on the 10 percent level. Finally, an indica-
tor of the probability of institutional change in 1980 is considered which
is based on Business International's experts' opinion and measures the
perceived possibility that the institutional framework will change by
elections or other means. This indicator has the expected negative sign
but is not significant.

## 5. Enforcement Uncertainty

Objective cross-country data on the degree of uncertainty on the enforcement of laws and regulations is not available. The only data that exists for the cross-section of 60 countries used in this study is from the surveys of experts provided by "Business International" and "International Country Risk Guide". Table 4 summarizes the results of our standard investment regressions with six indicators of enforcement uncertainty.

The first three indicators are from the data set provided by "Business International" (BI) and are for the year 1980, and the other three from the data set by "International Country Risk Guide" (ICRG) for the 1982–1995 period.

The first indicator from BI measures the quality of the legal system meaning the efficiency and integrity of the legal environment as it affects business, in particular foreign firms. The indicator has the expected negative sign, but is insignificant at conventional levels. The second BI indicator concentrates on the general quality of the bureaucracy as perceived by the country experts. It measures the regulatory environment foreign firms must face when seeking approvals and permits and the

Table 4 – *Coefficients, t-Values, and Adjusted Coefficients of Determination of Indicators of Enforcement Uncertainty in Investment Regression*

| Institutional variable | Coefficient (t-statistic) | Adjusted $R^2$ |
|---|---|---|
| Unreliability of the judiciary | −0.002 (−0.423) | 0.251 |
| Bureaucracy and red tape | 0.001 (0.370) | 0.250 |
| Corruption (BI) | 0.003 (0.661) | 0.254 |
| Lack of rule of law | −0.017* (−1.84) | 0.292 |
| Corruption (ICRG) | −0.014* (−1.781) | 0.290 |
| Low quality of the bureaucracy | −0.010 (−1.246) | 0.269 |
| *Note:* See Table 1. | | |

degree to which this represents an obstacle for business operations. This indicator has an unexpected positive sign but is insignificant. The third of these indicators measures "the degree to which business transactions involve corruption or questionable payment." It is as well positively, but insignificantly related to investment.

The first indicator from ICRG measures the general perception on rule of law reflecting "the degree to which citizens of a country are willing to accept the established institutions to make and implement laws and adjudicate disputes." This is a very general indicator on the law-and-order tradition in the enforcement of legislation. In contrast to the first three indicators of enforcement uncertainty from BI, this one is significant with the expected sign on the 10 percent level. The second ICRG indicator is an alternative measure of "corruption in government" that intends to measure the phenomenon more broadly by not only focusing on narrow business transactions as is the case with the Business International measure. It asks whether "high government officials are likely to demand special payments" and whether "illegal payments are generally expected throughout lower levels of government" in the form of "bribes connected with import and export licenses, exchange controls, tax assessment, policy protection, or loans." In contrast to the other corruption measure, this more comprehensive indicator proves to be significant and exhibits the expected negative sign. This result shows that different measurement approaches can make a considerable difference. Finally, the third indicator from ICRG provides an alternative measure of the quality of bureaucracy. The indicator focuses on the "autonomy (of the bureaucracy) from political pressure" and the "strength and expertise to govern without drastic changes in policy or interruptions in government services." This indicator has the expected sign and is insignificant at conventional levels.

## VI. Conclusions

In the previous section, we tested a large number of different uncertainty indicators in a framework holding constant the country sample (60 countries), the period (1974–1989), and the specification. Most of the variables tested had the expected negative relation with aggregate investment. Table 5, left row, shows the variables which were significant at least on the 10 percent level.

The comparative test seems to indicate that different forms of institutional uncertainty are important for cross-country differences in aggregate investment rates. In all of the categories at least one of the

Table 5  –  *Significant Variables and Magnitude of the Uncertainty –
Investment Relationship*

| Variable name | Effect of one standard deviation rise in variable value on invest- ment rate in percentage points |
|---|---|
| *Government instability indicators:* | |
| Number of revolutions | −1.8 |
| *Political violence indicators:* | |
| Number of political executions | −1.5 |
| Number of war casualties | −1.5 |
| Violent social change | −1.9 |
| Terrorism | −1.3 |
| *Policy uncertainty indicators:* | |
| Number of changes in constitution | −1.8 |
| Volatility of the real exchange rate distortion | −2.1 |
| Volatility of the black-market premium on foreign exchange | −1.6 |
| *Indicators of uncertainty in enforcement:* | |
| Corruption (ICRG) | −2.7 |
| Low rule of law | −2.8 |

tested indicators proved to be significant in the specifications tested. Of
course, these indicators tend to measure different aspects of the same
phenomenon, i.e. uncertainty on the institutional framework. For this
reason, we did not estimate regressions integrating more than one indi-
cator of institutional uncertainty. This would have introduced the prob-
lem of multicollinearity which tends to reduce the validity of such esti-
mations.

As a last step, we consider the relative importance of the different
indicators of institutional uncertainty for investment rates. The ques-
tion is whether these variables are not only significant but also econom-
ically relevant and which of them have the highest impact. To evaluate
this, we study the effects of a one-standard deviation rise in the respec-
tive variable on the aggregate investment rate given the coefficients cal-
culated in the regression analysis.[14] The right column of Table 5 dis-
plays the change in percentage points of the investment rate for a one-

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[14] This should be viewed as illustrative as the adjusted Rs squared are not very high.

standard deviation change in the respective indicator. For instance, if Ghana had been able to reduce the volatility of the real exchange rate distortion by one-standard deviation, according to our regression results, the average annual investment would have risen by 2.1 percentage points from 8.7 percent of GDP to 10.8 percent of GDP.

Changes in the two uncertainty indicators (rule of law and corruption) have the largest effect on investment. To give an example, if Nigeria had been able to reduce the level of corruption to that one of Hong Kong, it would have been able to increase the investment rate by more than five percentage points, from 16 percent to over 21 percent of GDP. Even if it had only reached the level of Argentina, the payoff in terms of higher investment would have been an increase to about 19 percent of GDP. These are certainly not negligible amounts especially given that these figures refer to differences in *annual* rates of investment. This suggests that a reduction in institutional uncertainty can have considerable payoffs in terms of economic performance.

For some of the institutional uncertainties it is not straightforward to derive policy conclusions because they cannot be influenced by deliberate government action; at least not directly.[15] The number of revolutions, the number of coups or the occurrence of violent social change are no policy variables and can only be changed by subtle, long-term adjustment in the political system – if at all. On the other hand, governments can do more about the distortion of the real exchange rate, the black-market premium on foreign exchange, the rule of law and corruption. In particular, frequent, discretionary interventions in the foreign trade regime or the regulation of prices can be substituted by a steady, clear intervention policy that may still be interventionist and inefficient but that at least reduces uncertainty on the policy framework.

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[15] Drawing policy conclusions is also hampered by the fact that the causality could in part be running from low rates of investment to institutional uncertainty.

# Appendix

## Table A1 – *Country List*

| | | |
|---|---|---|
| Algeria | India | Pakistan |
| Angola | Indonesia | Panama |
| Argentina | Ireland | Peru |
| Australia | Israel | Philippines |
| Austria | Italy | Portugal |
| Bangladesh | Ivory Coast | Singapore |
| Brazil | Jamaica | South Africa |
| Canada | Japan | Spain |
| Chile | Jordan | Sri Lanka |
| Colombia | Kenya | Sweden |
| Denmark | Korea | Switzerland |
| Dominican Republic | Liberia | Thailand |
| Ecuador | Malaysia | Trinidad + Tobago |
| Egypt | Mexico | Turkey |
| Finland | Morocco | United Kingdom |
| France | Netherlands | United States |
| Germany | New Zealand | Uruguay |
| Ghana | Nicaragua | Venezuela |
| Haiti | Nigeria | Zaire |
| Hong Kong | Norway | Zimbabwe |

## Table A2 – *Mean and Standard Deviation of Variables Used*

| | Mean | Standard deviation |
|---|---|---|
| Invest | 0.23 | 0.06 |
| GDP/Cap | 4905.82 | 3999.49 |
| School | 0.41 | 0.26 |
| Gov.Cons. | 0.15 | 0.06 |
| Trade | 0.63 | 0.44 |
| Revol | 0.14 | 0.18 |
| Coup | 0.04 | 0.07 |
| Opptkvr | 8.85 | 1.67 |
| Demons | 6.44 | 18.86 |
| Assass | 0.24 | 0.40 |
| Strike | 0.18 | 0.30 |
| Riot | 1.03 | 1.66 |
| Attack | 21.49 | 70.81 |
| Execut | 2.01 | 7.06 |
| Deaths | 2172.62 | 11595.84 |
| WarCas | 0.0012 | 0.0048 |
| Socch | 7.77 | 1.89 |
| Terrorsm | 8.23 | 1.87 |

Table A2 – (continued)

|  | Mean | Standard deviation |
|---|---|---|
| Bms | 43.67 | 110.37 |
| Stpi | 52.48 | 187.91 |
| Varer | 0.14 | 0.08 |
| Constch | 0.10 | 0.11 |
| Instch | 8.47 | 2.03 |
| Judiciar | 7.28 | 2.26 |
| Corruptn | 7.12 | 2.68 |
| Bureaucr | 6.55 | 2.65 |
| Rulelaw | 3.61 | 1.67 |
| Corrupticrg | 3.67 | 1.59 |
| Burqual | 3.80 | 1.59 |

Table A3 – *Sensitivity to Variation of Period*

| Variable | 1974–1989 | 1960–1989 | Variable | 1974–1989 | 1960–1989 |
|---|---|---|---|---|---|
| Revol | −2.28 | −2.42 | Terror | −1.70 | −0.71 |
| Coup | −1.39 | −1.30 | Bms | −2.23 | −1.89 |
| Opptkvr | −1.64 | −1.46 | Stpi | −0.08 | 0.67 |
| Demons | −0.99 | −1.79 | Varer | −3.05 | −2.66 |
| Assass | −0.34 | −0.13 | Constch | −1.96 | −2.52 |
| Strike | −0.44 | 0.04 | Instch | −0.67 | −0.64 |
| Riot | 0.11 | −0.58 | Judiciar | −0.42 | −0.76 |
| Attack | −0.74 | −1.40 | Corrupt | 0.66 | 0.22 |
| Execut | −2.16 | −2.53 | Bureaucr | 0.37 | −0.13 |
| Death | −0.69 | −1.09 | Rulelaw | −1.84 | −1.85 |
| Warcas | −2.20 | −2.16 | Burqual | −1.25 | −1.41 |
| Socch | −1.95 | −1.39 | Corrupticrg | −1.78 | −2.24 |

*Note:* T-values of institutional variables in investment regressions for periods 1960–1989 and 1974–1989.

Specification estimated: $Invest = a_0 + a_1 GDPbase + a_2 Secbase + a_3 Govaver + a_4 Trdaver + a_5 Inst$. Institutional variables are the same in both regressions, but all control variables as well as investment are varied.

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Abstract: Investment and Institutional Uncertainty: A Comparative Study of Different Uncertainty Measures. – There is ample empirical evidence of a negative relationship between aspects of institutional uncertainty and investment. Most studies, however, do not allow a comparison between different dimensions of such uncertainty because they focus on specific indicators, particular regions or different periods. The paper concludes with an evaluation of the quantitative effects of the significant uncertainty indicators on investment finding that a lack of rule of law, high corruption, and volatility in real exchange rate distortions are the most detrimental for investment. JEL no. E22, O11

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Zusammenfassung: Investitionen und institutionelle Unsicherheit: Eine vergleichende Studie verschiedener Unsicherheitsmaße. – Es gibt reichlich empirische Belege für eine negative Beziehung zwischen der Unsicherheit über Institutionen und den Investitionen. Die meisten Untersuchungen gestatten aber keinen Vergleich zwischen unterschiedlichen Dimensionen solcher Unsicherheit, weil sie sich auf spezifische Indikatoren, bestimmte Regionen oder verschiedene Perioden konzentrieren. Die Verfasser schließen mit einer Bewertung der quantitativen Wirkungen der signifikanten Unsicherheitsindikatoren und finden, daß Rechtsunsicherheit, ein hohes Maß an Korruption und Unbeständigkeit der realen Wechselkursverzerrungen besonders hinderlich für Investitionen sind.