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Erlend Berg

How Should Corruption be Measured?

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Introduction

Quantitative measures of corruption are useful for many purposes. When monitoring a particular country's anticorruption efforts, how can progress be measured unless there exist numerical indicators which can be compared over time? And when doing economic research on the causes and consequences of corruption, empirical evidence must rely on some quantitative measure.

The essay begins by defining corruption and summarising recent findings on its impact on development. I will then propose a general set of features that are desirable in a corruption indicator, and classify and evaluate existing types of indicators. I propose a specific indicator that has a number of desirable properties. Finally, I will use this measure in a small empirical study.

What is corruption?

Defining corruption

The most popular and simplest definition of corruption is the one used by the World Bank: **"The abuse of public power for private benefit"** (Tanzi 1998). Economically, it is often modelled as a principal – agent problem: A principal delegates some decision power to an agent. The principal's rules of preference in exercising the power are known to the agent. The principal's problem is that the agent may serve his own interests rather than the principal's.

A standard example is a situation in which companies bid to obtain a government contract. The government (principal) is represented by an official (agent). The government has communicated a set of preferences, related to factors such as price, quality and delivery, to guide the official in deciding which company (client) to give the contract to. But the official may be tempted to give the contract to a company from which he receives a bribe, rather than the one that best meets the government's criteria.

Are corruption and bribery synonymous terms?

Corruption is the abuse of public power for private benefit, and that private benefit is most often in the form of an illicit money or in-kind payment from a client to the agent, i.e. a bribe.

Economic literature on corruption tends to focus on bribery. Rose-Ackerman (1999) does not seem to distinguish between the two. Wei (1999), focusing on the public sector, simply defines corruption as "government officials abusing their power to extract/accept bribes from the private sector for personal benefit." It is probable that the general public too would associate corruption very strongly with bribery. This is not unimportant, since many of the existing indicators are based surveys on people's perception of the corruption level (more on this later).

However, a personnel officer who hires a family member rather than the best-qualified applicant, is corrupt. But his gain may be in terms of “family standing” rather than a bribe. And although it is common to focus on bribes paid to government officials, the principal-agent problem may occur in a private organisation as well. For instance, a provisions officer in a company may choose a supplier on the basis of a bribe, rather than on aspects of interest to the company, such as price and quality. Johnston (2000) points out some of the dangers associated with focusing on bribery alone.

But bribery certainly is a form of corruption, and corruption most often involves bribery.

Is corruption bad for development?

Although most theory on corruption points out its damaging effects on economic development, some have argued that it may improve efficiency and aid economic growth. Leff (1964) points out that corruption may allow economically beneficial actions that erroneous policy or rigid bureaucracy would otherwise prevent. Huntington (1968) writes: “In terms of economic growth, the only thing worse than a society with a rigid, over-centralised, *dishonest* bureaucracy is one with a rigid, over-centralised, *honest* bureaucracy” (my italics).

Under specific circumstances, a bribe is simply a transfer from the client or principal to an official, and hence does not have a social cost. In practice, however, the necessary conditions for this situation to arise are rarely, if ever, met. For example, as Schleifer & Vishny (1993) point out, the fact that the bribery must be kept a secret will often make the outcome of the corrupt transaction sub-optimal. The perfect information condition of market theory is not met. Actually, if bribes are economically sensible they should be made legal and called fees to avoid this problem.

Myrdal (1968) argues against the view that “a bribe is simply a transfer and therefore entails no serious welfare losses”. If bribery is tolerated, government officials will have incentives to set up more hurdles to collect more bribes.

Rose-Ackerman (1999) classifies bribery into four main groups according to their nature: Market-clearing bribes, bribes as incentives for officials, bribes to reduce costs and bribes permitting crime. She posits that negative externalities associated with each of these have harmful effects on economic performance.

Some empirical results

Recent empirical research has shown a strong relation between the pervasiveness of corruption and poor development performance in low-income countries.

Mauro (1995) finds that the corruption index he studies (Business International) has a significant negative impact on investment and growth. The impact on investment is robust to the inclusion of other control variables, but the impact on growth is not. An improvement of one standard deviation in the corruption index is associated with an average increase in the investment rate of about 3% of GDP. Mauro claims to establish causality (from corruption to low investment levels) by instrumenting his regressions with a measure of ethno-linguistic fractionalisation, based on the assumption that this demographic quantity will not influence investment other than through corruption.

As part of the preparation of the World Development Report 1997, a large survey was conducted in 58 countries. Almost 3000 firms were asked a number of questions related to the reliability, predictability and quality of government services. Using that data, Brunetti, Kisunko & Weder (1997) construct an indicator measuring "the credibility of rules", one component of which is perceived corruption. In regression of growth and investment rates on the corruption subcomponent, they find that the impact of corruption on investment is negative and significant. The impact on growth is insignificant.

The seemingly stronger impact of corruption on investment than on growth in both these cases may be due to the use of indicators measuring the **perceived** rather than the true level of corruption. This is because investment decisions are usually based on profit opportunity perceptions, one aspect of which is corruption perception. I shall return to this issue later on. (It is possible that the very corruption index used by Mauro has had a direct influence on investment, since it was constructed and marketed as a business information tool.)

Kaufmann, Kraay & Zoido-Lobatón (1999b) use a number of different existing measures to construct six composite governance indicators (more on this later). One of them quantifies "graft". The authors regress data on per capita income, infant mortality and adult literacy on the governance indicators. They instrument with the fraction of population speaking English and the fraction speaking a major European language. In regressions using all country data (155-173 countries), the authors find that the coefficients on all the indicators *except* graft are significant at the 5% level. When using only data from non-OECD countries (131-149), *all* governance indicators are found to be significant at the 95% level.

In 1999 the World Bank and the European Bank for Reconstruction and Development conducted a large survey on the business environment in transition economies (Hellmann, Jones, Kaufmann & Schankerman 2000). It was called the Business Environment and Enterprise Performance Survey (BEEPS). About 3000 firms in 20 countries were interviewed on a variety of issues such as business obstacles, efficiency of public sector services, stability of policies, confidence in the judiciary system, amount of red tape, helpfulness of bureaucracy and pervasiveness of crime and corruption. Hellmann, Jones & Kaufmann (2000) use the BEEPS data set to study petty (administrative) and grand (legislative) corruption and their impact on company performance. They find that in countries in which grand corruption is pervasive ("capture economies"), the growth rate of the enterprise sector is about ten percentage points lower over a 3-year period than in the other countries.

What we want in a good corruption indicator

To some extent, different uses will require different indicators. For instance, a company considering investment opportunities in different countries may be more concerned with the bribe frequency reported by businesspeople than the perceptions of the general population. But for an economist wanting to study the impact of corruption on the economy as a whole, that scope may be too limited.

I believe, however, that there exist some basic qualities, which makes a corruption indicator more useful for most purposes. In general, a good corruption measure is:

- **trustworthy**. If the indicator is based on the personal opinion of one or a few persons, it is likely to be less credible and hence less useful. The same is the case if the people involved in creating the index can be suspected of having an interest in skewing the results either way.
- measuring what we actually are interested in. In the terminology of Johnston (2000), the measure should be **valid**. For example, if we are interested in studying aspects related to corruption in general, measuring the number of corruption convictions would probably not be a good measure since it is likely to reflect the effectiveness of judiciary institutions as much as actual corruption.
- **accurate**. If the index is prone to large measurement errors, it is bound to be less useful. The inaccuracy should be quantified by, say, a standard deviation. In surveys, the typical way of improving accuracy is to increase the number of respondents.
- **precise**. A quantity is precise when everyone agrees on what the quantity measures, and imprecise, or ambiguous, when there are different opinions about what a specific number means. Precision in surveys is attained by asking questions that do not depend upon individual "standards".

To illustrate the difference between accuracy and precision, consider a group of 30 people in a room. A set of respondents (without yardsticks) is asked the question: "How many of these people are taller than 1.75 metres?" In this case, the variation in their answers would be due to inaccuracy, not imprecision. Next assume that a list is distributed to the respondents with the accurately measured heights of the 30 people. They are then asked the question: "How many of these 30 people are tall?" Now the variation in their responses would be due to the imprecise definition of "tall", not inaccuracy. Of course, if no list had been distributed and the initial question had been: "How many of these 30 people are tall?" then the variation in responses would be partly due to imprecision and partly to inaccuracy.

In economic research, policy assessment or in investment research, one often wants to use the indicator to compare corruption levels over time or across countries. The key aspects needed to ensure comparability are precision and accuracy.

Johnston (2000) gives a similar but not equivalent list of desirable qualities. He thinks corruption indicators should be valid, reliable and precise. What he calls “reliability” and “precision” are both related to what I call accuracy.

A Classification of Indicators

Objective measures

Quantifications of corruption at a country level are sometimes classified as “objective” or “subjective” (e.g. Kaufmann, Kraay & Zoido-Lobatón 1999). Objective quantifications are based on objectively verifiable information, such as the number of corruption charges in a given year, or the number of Internet search-engine hits on corruption in a particular country (Tanzi 1998). Hence they are **trustworthy, precise** and relatively **accurate.** However, most objective quantifications are not useful for comparison because of low **validity**. The difference in the number of corruption charges between two countries may depend more on differences in judiciary efficiency than on the level of corruption per se. And the change in the number of hits to the search engine query “corruption Hong Kong” from one year to the next may reflect the media attention given to particularly scandalous instances of corruption, or even the growth of the Internet, more than the change in corruption levels.

Subjective measures

The difficulty in coming up with a valid objective quantification of corruption may explain why recent research has seemed to focus on “subjective” measures (Ades & Di Tella 1996). These are based on surveys or polls in which individuals are asked to assess the level of corruption. Survey respondents are typically a panel of country or region experts, a random sample of locals, or businesspeople. Subjective measures may be further classified according to whether they gauge the respondents’ **perceptions** or **experience**.

An overview of a number of subjective governance measures is provided in the appendix of Kaufmann, Kraay & Zoido-Lobatón (1999b).

Perception-based indicators

Much of the recent empirical research on corruption has focused on one or more perception-based measures of corruption. These are based on surveys or polls asking respondents how they perceive the level of corruption in a country. They are typically valid and trustworthy, but may not be accurate and are often imprecise.

One important class of perception-based measures are produced commercially by risk-assessment companies such as Standard and Poor's DRI unit and Political Risk Services. They typically provide information on a number of aspects related to the business environment, including governance and corruption. Updated indices are periodically released and sent to subscribers for a fee. Although the information they provide is primarily intended for commercial use, recent empirical research on governance, including corruption, has used it extensively.

As an example, consider the data published by the Economist Intelligence Unit (EIU). It is a set of measures on risk and business attractiveness for more than 180 countries. The EIU's indices are based on a global network of more than 500 information-gatherers. Panels of regional experts control and adjust assessments before they are combined into aggregate indicators, some of which quantify corruption. Key advantages of the EIU data include trustworthiness and comparability across countries.

There are several problems associated with the accuracy of perception-based indices. First, it is likely that perceptions of general corruption in a country lag the actual level, resulting in low sensitivity to policy changes. It is also a problem that perception indices may be endogenous. For instance, media coverage of published corruption rankings may influence people's perception of corruption in the country.

Also, perceived corruption may "overweight" well-publicised corruption scandals compared to more colloquial cases of bribery ("headline bias"). This is true even if the respondents have significant personal exposure to corruption. For instance, in constructing their Bribe Payers' Index, Transparency International asked business leaders what their main sources of information on corruption, unfair competition and anticorruption treaties were. "The press media" was the preferred response, chosen by 79% of respondents. "Personal experience" was only third at 59%.

Experience-based indicators

This class of corruption indicators is based on subjective experiences with corruption. Their validity and precision will depend on the question asked, and their trustworthiness and accuracy on the implementation of the survey. In general, experience-based indicators seem to offer the greatest potential for comparability.

It avoids some of the problems associated with perception-based indicators. Experience does not lag true corruption level the way perception does, and it is unbiased by "the headline effect". But like perception-based indicators, experience-based indicators are sometimes hampered by imprecise questions. Answers to questions like: "On a scale from 1 to 10, how often have you had to bribe public officials?" will depend on individual judgements of what “often” means as well as on the frequency of bribery. But asking about people’s own experiences should increase accuracy compared to perception-based indicators.

There may exist cultural or linguistic differences between countries that lead respondents to systematically over- or underestimate the corruption level in their country compared to other countries. A Pakistani businessperson may have a different concept of what frequency of bribery is aptly described as “occasional” from that of a Canadian. Similar worries led Hellman, Jones, Kaufmann & Schankerman (2000) to use survey questions with “verifiable” answers (about telephone infrastructure and exchange rate variability) to check whether some countries’ performance were systematically over- or undervalued by its inhabitants.

There are few examples of experience-based indicators, and fewer still that are based on precise questions. But a few attempts have been made.

In 1994, the German business journalist Peter Neumann wrote an article[1] on bribery (Neumann 1994, Ades & Di Tella 1997). Central to the article was a survey Neumann and his colleagues conducted on German exporters’ experiences with corruption in a set of countries. At least three and on average ten individuals were asked for each country evaluated. Neumann’s survey focused on how much the exporters had to pay in bribes. For each country, he lists ranges of bribe sizes (in percent of total deal value) to be paid when dealing with the public and private sectors. There is also a measure of the proportion of all business transactions that are accompanied by bribes. Of course, the results from such a small survey are necessarily inaccurate.

One of the questions in the 1999 survey BEEPS was: “On average, what percent of revenues do firms like yours typically pay per annum in unofficial payments to public officials?” Only firms who had replied in the positive to a previous question about whether they ever paid bribes, were asked this question. Respondents were given the following alternatives: “0 %”, “Less than 1 %”, “1-1.99 %”, “2-9.99 %”, “10-12 %”, “13-25 %”, “Over 25 %”. Respondents were also asked what proportion of total bribes was spent on each of a list of government services.

The above is an example of poor choice of response alternatives. The accuracy of the results is hampered by the irregularity of the intervals. The last category in particular is extremely uninformative. Stone (1992) gives this advice: “In quantitative multiple choice questions, it is vital to pick categories that will be tractable in the final analysis. In particular, it is important that the mid-point values of each category are evenly spaced.”

[1] I would like to thank Alberto Ades for providing a copy of the original article.

Composite corruption indicators

The indicators considered so far are all directly based on polls, surveys or verifiable information. But an important class of indicators are constructed by aggregating several primary measures. I shall call them composite indicators.[2]

The most well-known corruption indicator in the world is probably the Corruption Perceptions Index (CPI) published annually by Transparency International (TI). In the CPI, evaluated countries are assigned a number from 1 (worst) to 10 (best) representing the "degree to which corruption is perceived to exist among public officials and politicians" (TI 2000).

The CPI is a composite indicator constructed by averaging over a varying set of component measures. TI refers to their index as a "poll of polls". The component information may be up to three years old. This ensures some stability in the indicator, since an "outlier" value in a single year will not have full impact on the CPI. Also, using up to three year old information gives a larger data material from which to construct the indicator.

The CPI is very imprecise, since its components often do not measure the same thing. It is unclear exactly what a score of 5, say, means. The components themselves are often imprecise. In addition to this, the type of data used to create the CPI varies widely from one year to the next. As TI (2000) themselves point out, "comparing the [CPI] ranking of countries from one year to the next demands care".

The accuracy of the CPI will depend on the accuracies of the components in a particular year, but in general averaging over several numbers improves accuracy. However, TI has special accuracy problems in combining component measures that cover different set of countries. A top score in a Latin American study is not necessarily comparable to a top score in a Western European study. TI has devised a way of dealing with this, "standardisation". I will not go in details on this, but it seems fairly arbitrary and "ad hoc".

The validity and trustworthiness of the CPI are probably good since TI takes care in choosing valid and trustworthy component indicators.

Any data source used in the CPI will under the current methodology stay in the index for three years. Therefore I am less impressed than Johnston

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[2] Johnston (2000) uses the term "second-generation measures". Kaufmann, Kraay & Zoido-Lobatón (1999a) refer to them as "aggregate indicators".

(2000) by the fact that its "consistency across time is striking". The consistency is likely to be as much a consequence of the CPI's definition as of its accuracy. And too much smoothing might compromise sensitivity.

Another method for constructing composite indicators is given by Kaufmann, Kraay & Zoido-Lobatón (1999a). As one of their examples, they use twelve different corruption indicators to create a composite "graft" indicator for 155 countries.

The crucial assumption they make is that each component indicator is an imperfect measure of a linear transformation of an underlying, unobserved graft quantity. The composite indicator is an estimate of this assumed underlying quantity.

Like the CPI, this indicator scores high on validity and trustworthiness. But it is imprecise, since its components measure different quantities. The method does provide a standard deviation, which tends to be large.

The large number of model assumptions the authors make also contribute to the inaccuracy of this indicator. For instance, the authors assume that the underlying quantity is normally distributed, which is not at all obvious. The authors themselves point out another weak assumption: It is not implausible that a "headline effect" can cause two or more of the component indicators to overshoot the correct corruption level simultaneously. Unless one can rule out such cases, however, the authors' assumption that errors are independent across indicators is invalid.

The differences in the construction of the component sources represent another group of problems. For instance, suppose that "frequent" is the second-highest possible of 6 answer alternatives in one poll, and the second-highest of 4 in another. Assuming that "frequent" has the same meaning in the two polls, it is misleading to assign a value of 5/6 in the one case and 3/4 in the other.

The "bribe ratio"

In this section I propose a subjective, experience-based corruption indicator, which combines a number of desirable features and avoids some of the weaknesses of existing indicators.

Definition and construction

Let **total bribe value** (TBV) be the total value of all bribes paid in a specified period. Let the **bribe ratio** be TBV divided by total income[3] in the same period. Under normal circumstances, the bribe ratio is a number between 0 and 1. A bribe ratio of 0 indicates absence of bribery. In practice, one will rarely see values approaching 1.

For an individual or a company, TBV may be found by summing the value of all money and in-kind bribes and the net present value of all other "bribes" paid or promised in the specified period. For instance, if an official's useless son has been given a well-paid position in the company in exchange for a government contract, then the net present value of the difference between his salary stream and his real worth should be included in TBV. Time spent entertaining government officials should be valued by using hourly wage rates. In practice, however, it may be necessary to limit oneself to simple money and in-kind bribes. Once calculated, TBV may be divided by period income to find the bribe ratio.

Bribe ratios may be estimated for individuals and companies. Aggregating the measure involves dividing the sum of TBVs by the sum of incomes, and this procedure can yield bribe ratios for a city, district, country, group of countries and the world. Aggregating by industry, one can estimate values for sectors of the national, regional or global economy. Bribe ratios can be calculated for any time span (a week, a year, a decade) for which there is data.

Country bribe ratios may be constructed as follows: Surveys are conducted in which a number of companies, organisations and individuals are asked about their TBV and income. Using information on total number of companies in the various industries, demographics, the survey data and assuming that the respondents are a representative subset of the country's

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[3] Because of constraints on space and time I omit all discussion of which income concept to use. But it is clear that to facilitate aggregation, it would probably be a good idea to use an income concept that when summed yields GDP. This may be more of a problem than it seems.

people and organisations, an aggregate TBV is calculated. Dividing by national income yields the country bribe ratio for the specified period.

As a simple example, assume that the economy consists only of companies, divided uniquely into a specified set of industries. Incomes are known accurately for the whole economy. Assume also that TBVs are normally and independently distributed. A survey is performed, asking a subset of the companies in each industry about their TBV. Regress survey respondents' TBVs on their incomes and on industry dummies. Using the regression coefficients, calculate an estimated TBV for each company in the economy. Sum these and divide by total income to obtain an estimate of the country bribe ratio. Given independence, one may estimate the variance of the national TBV by summing the variances of the individual companies.

Surveys should be conducted regularly to gauge development.

Now refer to the list of desirable indicator attributes put forth earlier, and note the following about the bribe ratio:

- **Precision.** A relatively precise definition reduces problems like "national bias" and error due to ambiguity
- **Accuracy.** Since the bribe ratio is an experience-based indicator, it is sensitive to changes over time and less prone to "headline bias". There will be measurement error both from inaccuracies in the respondents' replies and from the aggregation procedure. However, the error is quantifiable, as indicated in the example above.
- **Validity.** The validity of the bribe ratio is perhaps its greatest weakness. It is discussed further in the next section.
- **Trustworthiness.** As for other indicators, the bribe ratio's trustworthiness will depend on its implementation. (Can anonymity be trusted? Is answering the survey likely to contribute to an improvement?) But the bribe ratio's clear definition should help make its construction a transparent and straightforward process.

Does the bribe ratio really measure corruption?

The bribe ratio covers most corrupt transactions, but there are exceptions. Corrupt acts where no bribes are paid (cronyism) will not be measured. A government official responsible for allocating a certain benefit may "favour" members of his own family without expecting a bribe. This behaviour is arguably corrupt, but is not covered by the bribe ratio indicator.

For comparison, consider how we quantify how "rich" nations are. The concept of GDP is ubiquitous, even though it has serious and well-known drawbacks, such as failure to account for unpaid domestic work and environmental aspects. It does not follow that it is better to go out on the streets and ask questions like: "How rich is your nation, 1-10?" Rather, we use GDP while realising that it is not all-encompassing, supplementing it with other information.

I believe that rather than trying to bend the construction of the indicator so as to include all possible corrupt acts, one should realise that a bribe ratio will not be all-encompassing. There is much to gain from having a simple and easy-to-collect indicator in terms of improving accuracy, ease of explaining survey questions, indisputability and concrete data for research into the cost of corruption.

One might protest that the aggregate value of the bribes paid is not really the quantity of interest. Instead, one should study the **cost** of corruption. The cost certainly is a crucial quantity, and estimating it is an important research topic. But the relationship between bribes and cost is complicated; see Bardhan (1997) for a brief discussion. Any cost estimate is bound to be highly controversial. To ensure clarity and precision it is best to leave cost estimates out of the indicator. Bribe ratios are relatively straightforward to calculate and hence less controversial.

For potential foreign investors, an indicator such as the one proposed here is likely to be of more interest than for instance the cost of corruption. Together with information on the pervasiveness of red tape and other obstacles, it could give a good picture of the business environment in a country.

Some will argue that a system in which one is obliged to pay many small bribes may be more harmful than one in which bribery is “centralised”, even if the total amount paid is the same. This is a valid point, and points to an area of research in which a simple bribe ratio will not be enlightening. They survey data used to construct the ratio, however, will still be useful.

Johnston (2000) criticises existing measures of corruption and warns against the insensitivity of perception-based measures to changes in corruption levels. But he seems to come to a different conclusion. Rather than moving from the abstract to the concrete, he warns against focusing exclusively on bribery. He proposes two new measures: One to incorporate factors that lead to and sustain high corruption levels, such as ineffective institutions and lack of political competition. Another is to incorporate consequences of widespread corruption, such as trends in aggregate development and black-market premiums in foreign exchange. Although these may be less sensitive to “headline effects” and more apt to measure changes in corruption levels over time, he admits that these new indicators will be wrought with some of the same problems as existing measures, including endogeneity, weighting problems, and problems with specifying accuracy.

A small empirical study

This purpose of this section is to use an experience-based corruption indicator in an empirical study. Unfortunately, there is very little data available from which such an indicator may be constructed. A “bribe ratio” was obtained by Hellman, Jones, Kaufmann and Schankerman (2000) in their analysis of the BEEPS data set. Respondents were asked how much “firms such as yours” pay in bribes to public officials, as a fraction of revenue. Table 1 in their paper gives an unweighted average number for each country. I will use that as a rough indicator of the national bribe ratio[4]. Since the BEEPS was conducted in 22 transition economies only, the data set is very small[5].

The BEEPS data were collected in 1999. Therefore the 1999 Corruption Perceptions Index (CPI) published by Transparency International is used as a “benchmark”. The 1999 CPI is a composite indicator, but can be regarded as perception-based since most of its components are.

A first indication that the bribe ratio is not wildly off target as a corruption indicator is given in Figure 1. In spite of being very roughly approximated, its correlation with the CPI is –0.71. The correlation is negative, because a high CPI is “good”, while a high bribe ratio is “bad”.

Figures 2 and 3 plot investment versus corruption as measured by the CPI and the bribe ratio, respectively. In both cases, there is visual indication of a relation between high levels of corruption and low investment. Azerbaijan is an outlier, especially in figure 3.

In Figure 4, which plots growth versus the CPI, one can hardly make out a trend. Figure 5 plots growth against the bribe ratio, and here it seems that high levels of corruption are related to low levels of growth.

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[4] Ideally, the company responses should be multiplied by revenue to obtain dollar amounts. Individuals should be asked as well as companies. The bribe ratio would then be the total dollar value of all bribes divided by national income.

[5] The countries covered by the survey are Albania, Armenia, Azerbaijan, Belarus, Bulgaria, Croatia, the Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Ukraine and Uzbekistan.

I now follow the main outline of Mauro's (1995) work: He separately regresses investment and growth on corruption, controlling for initial output, human capital level and population growth. The aim is to obtain results that are roughly comparable to his, but only simple OLS regressions will be run. None of the residual analysis, instrumental regressions or other techniques that Mauro use when attempting to validate the results and establish causality, will be employed. The regression equations are:

$$\text{investment} = \gamma_0 + \gamma_1 \text{initoutput} + \gamma_2 \text{humcap} + \gamma_3 \text{popgrowth} + \gamma_4 \text{corruption}$$
$$\text{growth} = \beta_0 + \beta_1 \text{initoutput} + \beta_2 \text{humcap} + \beta_3 \text{popgrowth} + \beta_4 \text{corruption}$$

- "investment" is gross domestic investment measured as a proportion of GDP, averaged over 1995-1999.
- "growth" is the percent annual increase in GDP per capita, averaged over 1995-1999.
- "initoutput" is GDP per capita in 1995.
- "humcap" is a proxy for human capital. I follow Mauro in using the proportion of the population enrolled in secondary education (1990).
- "popgrowth" is the average percent annual increase in population 1995-1999.

Data on enrollment in secondary education was obtained from the UNESCO Institute for Statistics. The data on output and population were obtained from the World Bank's World Development Indicators. All outputs are in current international dollars.

Because of the outlying status of Azerbaijan in figures 2 and 3, one set of regressions was run for all 22 countries, and another set excluding Azerbaijan. Note that the outlier Azerbaijan has the highest bribe ratio of all countries in the sample. This is probably not a coincidence: The BEEPS question defining the bribe ratio was designed so that the inaccuracy of the bribe ratio increases with its level (see the section on experience-based indicators). So the bribe ratio is more prone to erroneous deviation the higher it is.

Table 1 gives the results of regressing investment on corruption. Using the complete data set, the CPI is just insignificant at the 5% level. The bribe ratio is significant, but with the wrong sign! Excluding Azerbaijan from the regressions, both corruption indicators are significant in the "right direction", although the CPI more so than the bribe ratio. (Recall that a high CPI is "good", while a high bribe ratio is "bad".) Note the rise in R^2 when Azerbaijan is excluded.

The last column in Table 1 regresses investment on both the CPI and the bribe ratio. The coefficient on the CPI is significant, while that on the bribe ratio is not. The interpretation is that given the CPI, the bribe ratio does not add a significant amount of information on investment.

The results from the regressions of growth on corruption are given in Table 2. Both corruption indicators are significant at the 5% level, using both data sets. But the bribe ratio has much higher explanatory power. Excluding Azerbaijan, R^2 for the CPI regression is 0.10, while for the bribe ratio it is 0.43.

Regressions using both indicators as explanatory variables yield highly significant coefficients on the bribe ratio and insignificant coefficients on the CPI. This shows that in this little data set, learning about the CPI when the bribe ratio is already known adds very little information on growth. Considering the inaccuracy with which the bribe ratio was constructed and the amount of effort that has gone into creating the CPI, this is interesting.

Of course, the conclusions that can be drawn from such a small and unsophisticated study are very weak indeed. Also, cross-country studies in general are often accused of "comparing the incomparable"[6]. But the results seem to indicate that for our data set, the experience-based bribe ratio has a higher explanatory power for growth than the perception-based CPI. Also, the perception-based CPI seems to have higher explanatory power for investment than the experience-based bribe ratio.

[6] One advantage of the data set used in this essay is that the countries involved are all transition economies. Although Kyrgyzstan may be very different from Estonia, they probably have more in common than, say, Germany and Cameroon, which are routinely compared in cross-country studies.

Conclusion

This essay has attempted to analyse how corruption should be quantified and measured. In general an indicator should be **trustworthy**, **valid**, **accurate** and **precise**. Accuracy and precision ensure that the indicator can be compared over time and across countries. In my view, **subjective, experience-based indicators based on precise quantities** show the greatest promise as allround corruption measures. The **bribe ratio** is a concrete example of such an indicator.

The views presented in this essay are in agreement with the conclusion of Kaufmann, Kraay & Zoido-Lobatón (1999a). Their paper on creating composite indicators from various perception-based sources, ends: "… there is room to improve these instruments by asking respondents about their direct experiences with well-defined events and using transparent units to measure governance."

The regressions, although crude, seems to support the following conjectures: Indicators measuring **perceived** corruption levels will be highly correlated with investment, since investment decisions are made on the basis of perceptions. Growth may be poorly explained by such measures, since people's perceptions are imperfectly related to true corruption levels.

Measures that capture people's **experience** with corruption may reflect the true corruption level more accurately. Therefore, they may predict growth better. However, since the true corruption level is generally unobservable, these measures' correlation with investors' decisions may be weaker.

Mauro (1995), using a perception-based indicator from Business International, finds that the impact of corruption on growth is not robust. It is possible that his results would have been stronger if he had used an experience-based indicator.

References

Ades, A. and Di Tella, R. (1996): "The Causes and Consequences of Corruption: A Review of Recent Empirical Contributions", IDS Bulletin: Liberalization and the New Corruption, Vol. 27, No. 2: 6-11.

Ades, A. and Di Tella, R. (1997): "National Champions and Corruption: Some Unpleasant Interventionist Arithmetic", The Economic Journal, CVII, 1023-1042.

Bardhan, P (1997): "Corruption and Development: A Review of Issues", Journal of Economic Literature, Vol. XXXV (September): 1320-1346.

Brunetti, A., Kisunko, G., and Weder, B. (1997): "Credibility of Rules and Economic Growth - Evidence from a World Wide Private Sector Survey", Background paper for the World Development Report 1997(Washington: The World Bank).

Hellman, J., Jones, G. and Kaufmann, D. (2000): "Seize the State, Seize the Day. State Capture, Corruption and Influence in Transition", World Bank Policy Research Paper 2444

Hellman, J., Jones, G., Kaufmann, D., and Schankerman, M. (2000): "Measuring Governance, Corruption, and State Capture: How Firms and Bureaucrats Shape the Business Environment in Transition Economies", World Bank Policy Research Working Paper 2312

Huntington, S. (1968): "Political Order in Changing Societies", New Haven: Yale University Press

Johnston, M. (2000): "The New Corruption Rankings: Implications for Analysis and Reform", presented at the World Congress of the International Political Science Association, Québec City, August 2000

Kaufmann, D., Kraay, A. and Zoido-Lobatón, P. (1999a): "Aggregating Governance Indicators", World Bank Policy Research Working Paper No. 2195, October (Washington D.C.: The World Bank);

Kaufmann, D., Kraay, A., and Zoido-Lobatón, P. (1999b): "Governance Matters", World Bank Policy Research Working Paper No. 2196, October (Washington D.C.: The World Bank);

Lambsdorff, J. (2000): "Background Paper to the Corruption Perceptions Index", Framework Document, Transparency International and Göttingen University

Leff, N. (1964): "Economic Development Through Bureaucratic Corruption", The American Behavior Scientist, November, 8(2): 8-14.

Mauro, P. (1995): "Corruption and Growth", Quarterly Journal of Economics 110: 681-712.

Myrdal, G. (1968): "Asian Drama: An inquiry into the Poverty of Nations", Vol II, New York: Pantheon

Neumann, P. (1994): "Böse: Fast Alle Bestechen", Impulse 4/1994, Hamburg: Gruner+Jahr AG&Co.

Rose-Ackerman, S. (1978): "Corruption: A Study in Political Economy", New York: Academic Press

Rose-Ackerman, S. (1999): "Corruption and government: causes, consequences and reform", New York: Cambridge University Press, 1999.

Schleifer, A. and Vishny, R. (1993): "Corruption", The Quarterly Journal of Economics 108(3), 599-617

Stone, A., (1992): "Listening to Firms: How to Use Firm-Level Surveys to Assess Constraints on Private Sector Development", DEC Working Paper Series Number 923

Tanzi, V. (1998): "Corruption Around the World: Causes, Consequences, Scope, and Cures", IMF Staff Papers. 45 (4) December, 1998: 559-94.

Transparency International (2000): "Press Release: Transparency International Releases the Year 2000 Corruption Perceptions Index", Berlin, September 13, 2000

Wei, S. (1999): "Corruption in Economic Development: Beneficial Grease, Minor Annoyance, or Major Obstacle?" The World Bank Development Economics Working Paper

World Bank (1997): "World Development Report 1997: The State in a Changing World", Washington, D.C.: Oxford University Press for the World Bank

Table 1: Investment on Corruption

Dependent Variable: Investment as Ratio of GDP (1995-1999 Average)

Independent variable	All data	All data	All data	Excluding Azerbaijan	Excluding Azerbaijan	Excluding Azerbaijan
Constant	8.6779 *(3.0534)*	9.4704 *(3.5946)*	4.3540 *(1.3855)*	2.1767 *(1.0310)*	12.6119 *(6.2074)*	4.1167 *(1.7723)*
GDP per capita in 1995	0.0006 *(2.4955)*	0.0013 *(7.9033)*	0.0007 *(3.0070)*	0.0001 *(0.7688)*	0.0010 *(7.8999)*	0.0001 *(0.3406)*
Secondary education in 1990	0.1187 *(4.2397)*	0.1035 *(3.7210)*	0.1134 *(4.0787)*	0.1336 *(6.4899)*	0.1192 *(5.5749)*	0.1366 *(6.6398)*
Population growth	1.1903 *(3.7686)*	0.4637 *(1.1502)*	0.4159 *(1.0388)*	0.2055 *(0.8679)*	0.6315 *(2.0367)*	0.5579 *(1.8848)*
CPI	0.9455 *(2.0299)*		1.4292 *(2.9331)*	2.6017 *(7.4091)*		2.4103 *(6.6364)*
Bribe ratio		0.6803 *(2.2670)*	0.9752 *(3.1031)*		-0.9078 *(-3.7077)*	-0.4780 *(-1.9721)*
$t_{0.975}$ quantile	2.110	2.110	2.120	2.120	2.120	2.132
R^2	0.1684	0.1701	0.1848	0.4073	0.3531	0.4126

All regressions are OLS. t-statistics are shown in parentheses. The t-quantile for testing the significance of individual coefficients at the 5% level, with the appropriate degrees of freedom, is given in a separate row.

Table 2: Growth on Corruption

Dependent Variable: Growth in GDP per Capita (1995-1999 Average)

Independent variable	All data	All data	All data	Excluding Azerbaijan	Excluding Azerbaijan	Excluding Azerbaijan
Constant	-9.8213 *(-2.0323)*	12.1677 *(3.0918)*	15.4002 *(3.2568)*	-13.9477 *(-2.8264)*	15.5056 *(4.2807)*	15.1580 *(3.4881)*
GDP per capita in 1995	-0.0002 *(-0.3877)*	-0.0012 *(-5.1875)*	-0.0009 *(-2.4725)*	-0.0005 *(-1.0871)*	-0.0016 *(-6.9894)*	-0.0016 *(-4.6490)*
Secondary education in 1990	0.0562 *(1.1818)*	0.0934 *(2.2498)*	0.0872 *(2.0849)*	0.0657 *(1.3659)*	0.1102 *(2.8901)*	0.1109 *(2.8819)*
Population growth	-1.0604 *(-1.9743)*	3.4269 *(5.6901)*	3.4571 *(5.7386)*	-1.6855 *(-3.0458)*	3.6051 *(6.5220)*	3.6021 *(6.5047)*
CPI	1.9185 *(2.4221)*		-0.9030 *(-1.2315)*	2.9697 *(3.6181)*		0.0986 *(0.1451)*
Bribe ratio		-5.5019 *(-12.2738)*	-5.6882 *(-12.0291)*		-7.1893 *(-16.4702)*	-7.1717 *(-15.8149)*
$t_{0.975}$ quantile	2.110	2.110	2.120	2.120	2.120	2.132
R^2	0.0589	0.2753	0.2776	0.1045	0.4314	0.4314

All regressions are OLS. t-statistics are shown in parentheses. The t-quantile for testing the significance of individual coefficients at the 5% level, with the appropriate degrees of freedom, is given in a separate row.

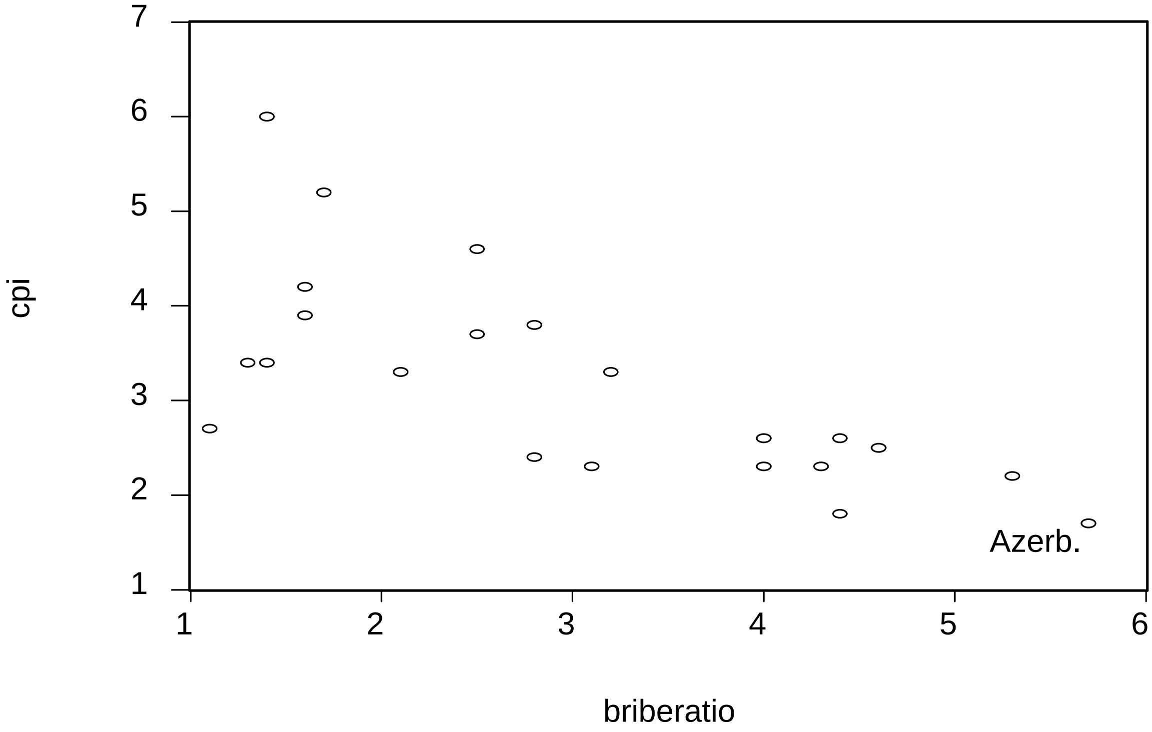

Figure 1: The Corruption Perceptions Index (1999) plotted against the bribe ratio (1999).

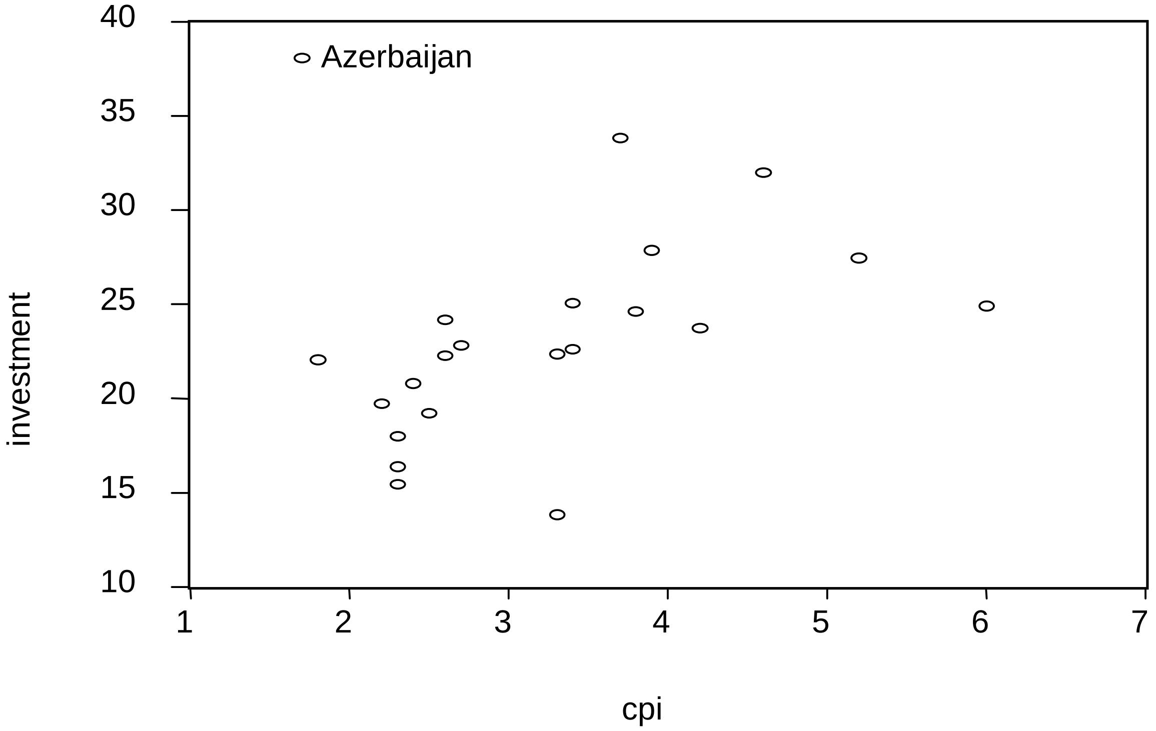

Figure 2: Average investment as ratio of GDP (1995-1999) plotted against the Corruption Perceptions Index (1999).

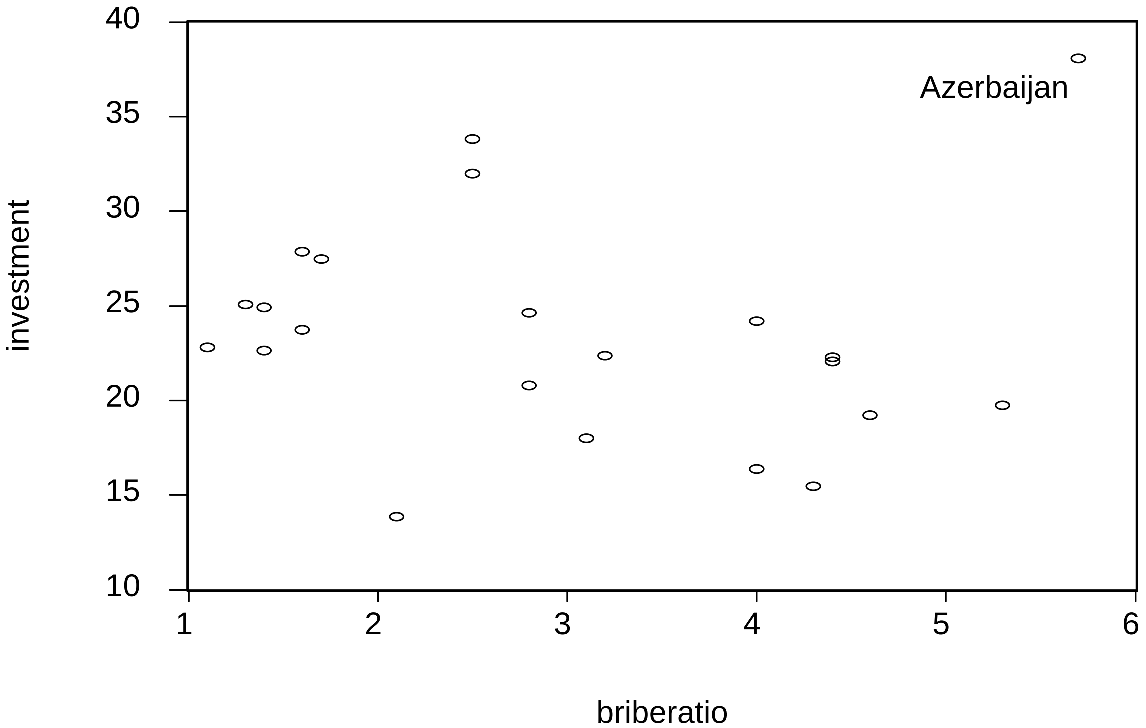

Figure 3: Average investment as ratio of GDP (1995-1999) plotted against the bribe ratio (1999).

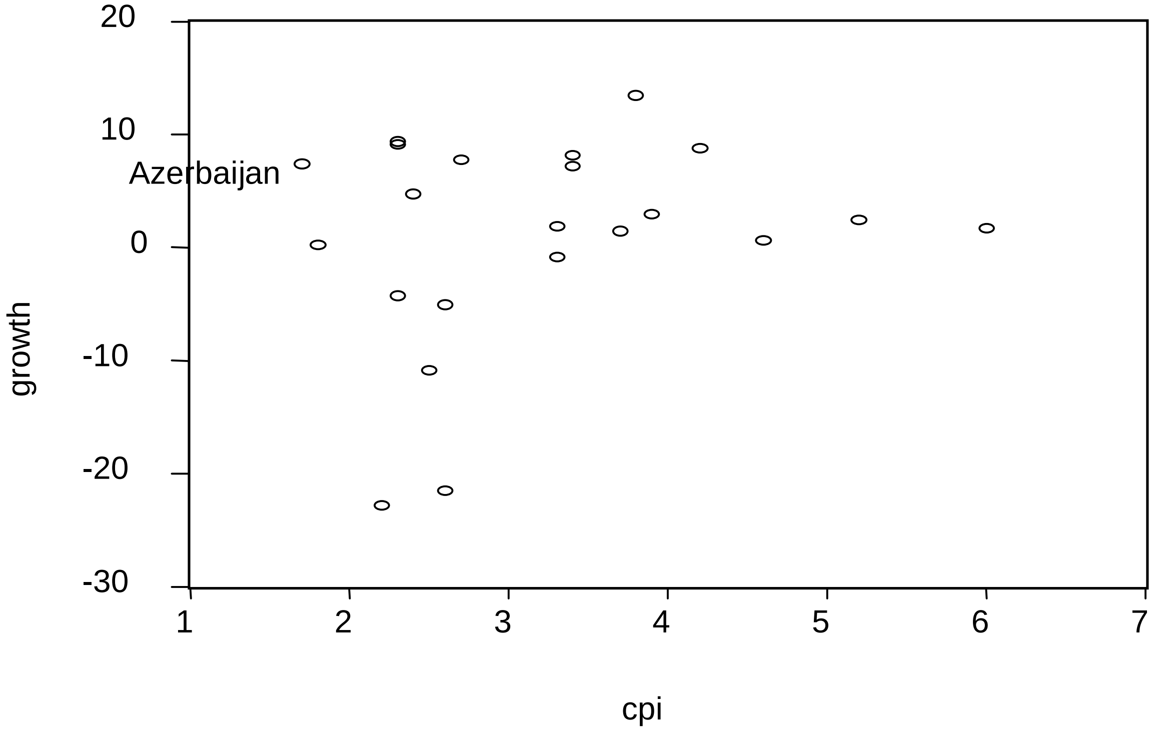

Figure 4: Average GDP per capita growth (1995-1999) plotted against the Corruption Perceptions Index (1999).

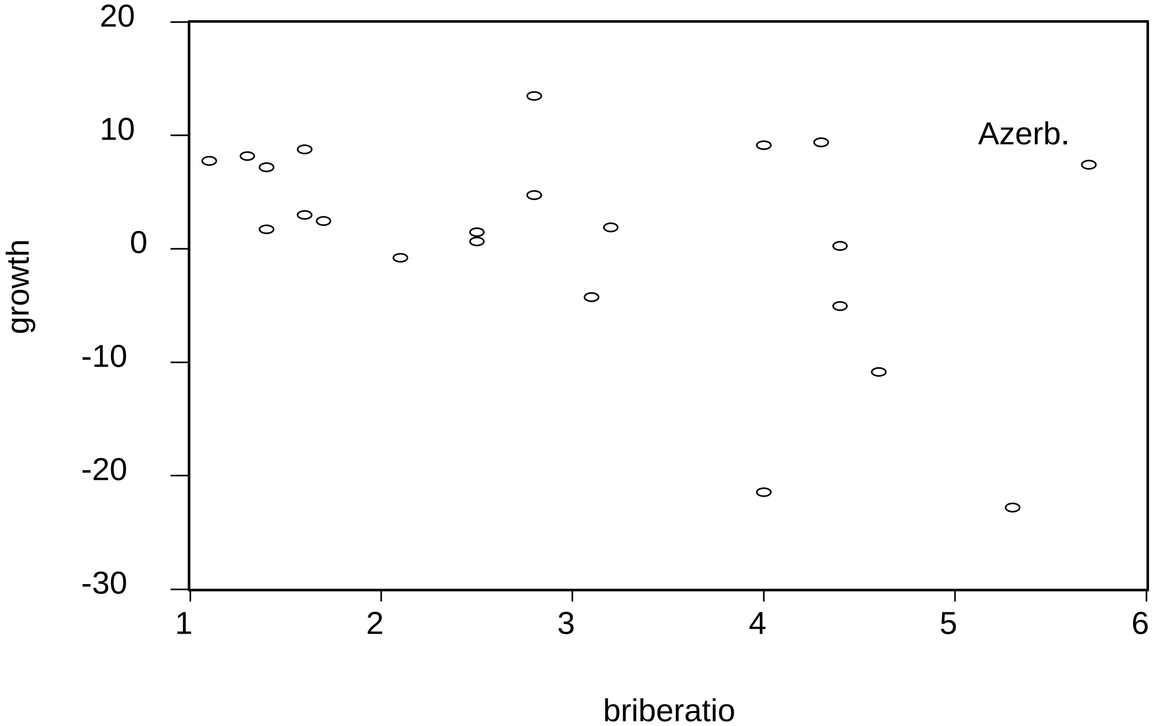

Figure 5: Average GDP per capita growth (1995-1999) plotted against the bribe ratio (1999).