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Panel Data Analysis of the Time-Varying Determinants of Corruption

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Panel Data Analysis of the Time-Varying Determinants of Corruption*

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Résumé / *Abstract*

Depuis longtemps, des modèles sont utilisés dans le but de déterminer les causes de la corruption. Toutefois, l'analyse empirique demeure complexe. Qui plus est, les données sont difficiles à recueillir et couvrent souvent un nombre restreint de pays et une période limitée. Ce genre d'évaluation présente aussi des complexités inhérentes. Le présent document met l'accent sur le recours à des techniques de données de panels dans le but de mieux connaître les facteurs qui influent sur la corruption bureaucratique. En outre, cette analyse souligne le problème d'endogénéité qui ressort de l'analyse des causes de la corruption et propose une nouvelle variable instrumentale permettant de contrer celui-ci. Pour faciliter la démarche, ce document utilise un ensemble de données fournissant des renseignements sur au moins 135 pays et pour une période de seize ans. Les résultats indiquent que si le problème d'endogénéité n'est pas pris en compte, les résultats sont sérieusement biaisés. De plus, la corruption est décrite comme étant procyclique.

Mots clés : corruption, endogénéité

There is a long history of models attempting to identify the causes of corruption, yet empirical analysis is complicated. Not only is data difficult to obtain and often available only for few countries and a limited number of years, but such estimation involves inherent complexities. This paper focuses on the use of panel data techniques to better identify factors that affect bureaucratic corruption. Furthermore, this paper identifies an endogeneity problem which arises in the analysis of the causes of corruption, and a new instrumental variable is proposed to solve it. To help in this endeavor, a data set is employed which provides information for as many as 135 countries over a span of sixteen years. Results show that neglecting the endogeneity problem leads to severely biased results. Using panel data techniques reveals that the availability of rents is a crucial determinant of corruption and that previous research may have underestimated the economic significance of rents on corruption. Furthermore, corruption is shown to be procyclical.

Keywords: *corruption, endogeneity, income, rents*

Codes JEL *:* H8, K4, C33

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1 Introduction

Bureaucratic corruption is an important phenomenon for many reasons. Corruption might depress investment which in turn reduces growth. It can also result in the misallocation of resources. Furthermore, lack of respect for public service can cause talented inidviduals to shy away from working for the government. Finally, it can affect public finances by making funds from the World Bank and the IMF unavailable. In recent years, these two institutions have decided to crack down on corruption by making funds contingent on efforts to eliminate corruption. This can have dramatic consequences on a country's finances and on its development. For instance, in 1997 the IMF suspended a $220 million loan to Kenya after its President failed to create a new anticorruption authority.

Part of the focus of empirical work on corruption has been on the effects of rents. Ades and Di Tella (1999) suggest that increasing competition in the bidder's market has an ambiguous effect. A decrease in rents due to increased competition reduces the incentives for bureaucrats to engage in corrupt practices. But this also reduces the incentives for the government to monitor them and prompts them to rewrite contracts, thus having the opposite effect.[1]

This sets the stage for two empirical questions. First, does the availability of rents affect the amount of corruption? Second, is this effect positive or negative? One problem that arises is that one of the control variables, income, may be endogenous (see Treisman (2000)), which could bias the estimate of rent on corruption. In this paper I propose a new instrumental variable for income to re-evaluate the effects of changes in rent (and other factors) on variation in corruption. The introduction of a time varying instrumental variable will solve the endogeneity problem even in the presence of unobserved country specific effects.

This paper will be concerned with variables that change over time, and since unobservable country specific effects might be of great importance in this application, the paper will focus attention on fixed-effects estimates.[2] This raises a particular set of issues, such as concern for sample size, and limits the choice of instruments to time varying ones. This paper though, offers solutions to these problems.

The results suggest that accounting for endogeneity and country specific effects as well as dealing with the endogeneity of income is crucial as it reveals that rents are more important than previous estimates

[1] Earlier models focussed on competition amongst bureaucrats, see for instance Rose-Ackerman (1978) and Schleifer and Vishny (1993).

[2] Results without country specific effects are provided in the Appendix for reference. For a more detailed discussion go to http://homepages.nyu.edu/~gf35/print/frechette_corruption.pdf.

have suggested – both in terms of statistical significance and in terms of magnitude. Moreover, such an approach indicates that estimates of the effect of income on corruption are severely biased downward if one doesn't correct for its endogeneity. In fact, the effect of income and education on corruption is found to be the opposite of what has been found in past studies. This implies that corruption is procyclical. Finally, political freedom is shown to have an important, and nonlinear, impact on corruption. A better understanding of the causes of corruption is critical to establishing more effective policies aimed at its reduction. Also, determining the magnitude of the impact of different channels is important as this has a direct impact on the cost of alternative corruption reducing policies.

2 Background, Data, and Methodology

The specification used in this paper closely follows that of Ades and Di Tella (1999, hereafter AD). The reader interested in the details for the specific choice of regressors is referred to their paper. Another paper that is relevant to this study is that of Treisman (2000) who, to our knowledge, is the first to identify the potential endogeneity of income and to propose an instrument for it. Since his focus is mainly on the effects of time-invariant factors such as religious or legal traditions, the focus is on cross-sectional analysis, and the instrument proposed does not vary over time. When he uses distance from the equator as an instrument for log per capita GDP, he finds that this does not affect the results. Without going any further in the details of previous works (for reviews of the literature see Elliott (1997), Jain (2001), and Mauro (1997)), let me summarize the most significant results (at least for time varying variables): (1) higher income implies lower corruption, (2) a higher share of imports in GDP results in lower corruption, and (3) fewer political rights (fewer years of democracy) increase corruption. Result (1) is probably the most stable one, even when Treisman uses 2SLS and instruments for income using distance from the equator neither the sign nor the statistical significance of the coefficient estimate of income change. Result (2) is true even when AD uses 2SLS techniques to deal with the potential endogeneity of the share of imports in GDP. Treisman finds support for this as well, although his results are not as stable. Finally, result (3) doesn't seem robust to the use of fixed-effects (hereafter FE). In both samples used by AD, when estimating FE, the coefficient estimate on the lack of political rights variable becomes insignificant. On the other hand, Treisman consistently finds support for the result that fewer political rights increase corruption. One other result worth mentioning is that Treisman finds strong support for some of the other socio/historical factors he introduced, namely if the country is a former British colony and the percentage of Protestants.

As was previously mentioned, the focus of this paper will be on FE estimation, and there are many reasons for doing so. AD suggests that there may be country unobservables which are correlated to both rents and corruption. Certainly, as Treisman demonstrated, there are time-invariant factors that matter, and taking FE will account for these factors, even those not yest considered or those for which there is no data available. The reason I want to control for such unobservables is evident. Imagine for example that in some countries there is a culture of never telling on people, even if they broke the law. Clearly, if people do not talk about what others are doing, it fosters corruption by reducing the chances of getting caught. Furthermore, imagine that in countries where there are historically low rents, people tend to be less likely to denounce others and also suppose that, conditional on this cultural factor, rents decrease corruption. Then, if one regresses corruption on rents without conditioning on this cultural variable, you might get a negative coefficient estimate on rents since you are confounding the effects of rents and culture. Note also that this bias will be transmitted to all other regressors correlated with rent, even if they are not correlated with culture. One other appealing feature of FE is that it could solve the endogeneity problems. Note that there are two potential endogeneity problems: share of imports in GDP could be endogenous and so could income. If the endogeneity problems arise because of correlation with the country specific part of the error term, then estimating FE could resolve the estimation problem. There is evidence to support the position that country specific unobservables might be important in this application. In AD's paper, FE yielded different results than OLS and 2SLS (both of which gave similar estimates). Finally, there is one more reason why one would want to use FE estimation. Subjective estimates of corruption might be affected by preconceived ideas and biases. However, it seems likely that those affect the level of the estimate but not the changes from one year to the next. If this is true, if despite misconceptions that could affect the level of a country's index, as long as the individuals who determine these indexes can determine changes in corruption correctly, then FE estimates would not be affected by the incorrect level and would be the appropriate estimator.

Similar to previous studies of this type, this paper will rely on a subjective measure of corruption. Hence, one might wonder how accurate or reliable such estimates are. Treisman provides a very complete and eloquent answer to this question which is only summarized here (the interested reader is referred to Treisman pp.410-412). First, these estimates tend to be highly correlated, which suggests that they are to some extent consistent. Second, they tend to be highly correlated with themselves across years, again suggesting that they are picking up something enduring.[3] Third, someone might argue that the previous two

[3]As will be pointed out later, this is not to say that there is no variation. It is sometimes suggested that such index are too noisy in the time dimension to take advantage of the panel structure of the data. The question, of course, is one of the

	In Levels			Deviations From the Mean		
	ICRG	TI	WCR	ICRG	TI	WCR
ICRG	1.000			1.000		
TI	0.869	1.000		0.583	1.000	
WCR	0.782	0.969	1.000	0.418	0.516	1.000

ICRG stands for International Country Risk Guide

TI stands for Transparency International

WCR stands for World Competitiveness Report

Table 1: Correlation Between Corruption Indexes For Overlapping Countries and Years (1996-1997)

arguments are simply by-products of the fact that these estimates are influenced by biases and stereotypes. Nonetheless, as Mauro 1995 shows, corruption, or the subjective estimates of corruption, seem to negatively affect economic growth by depressing investments. Thus, even if these rankings are affected by perceptions, these perceptions have real effects. Two other justifications of a more technical nature which I would propose are the following. First, as mentioned earlier, even if the levels of these indixes were affected by misconceptions, as long as changes from those levels are correct, a FE estimator will result in unbiased estimates. Furthermore, even if these are imperfect measures, if the errors are what is often referred to as classical (mean zero and uncorrelated with the true corruption) then the estimates would be unbiased since such errors are uncorrelated with the regressors.

The specific index I will use is that of the International Country Report Guide (hereafter ICRG).[4] To my knowledge, the ICRG data set has not been used previously to study the causes of corruption.[5] The ICRG index is highly correlated with the indexes used by Treisman as is shown in Table 1 (and to the WCR index used by AD).[6] Furthermore, considering deviations from their mean, which is what FE does, the ICRG data

importance of the signal to noise ratio. As I will show, our estimates indicate statistically significant results, some of which are robust across specifications. This cannot result from changes simply due to noise. Furthermore, these do not follow simple trends since including the year as a regressor in the OLS and IV specifications always resulted in that regressor being statistically insignificant.

[4] The ICRG corruption index ranges from zero to six. It is reported on a monthly basis, but I am using annual averages. This means that for practical purposes, it is continuous between zero and six. Lower scores indicate "high government officials are likely to demand special payments" and that "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, police protection, or loans." For purposes of comparability, I have transformed the variable such that zero is the lowest degree of corruption and higher numbers indicate greater corruption. It is also rescaled to range from zero to ten to make results comparable to previous works.

[5] Although it is considered by Treisman, he decides not to use it because he points out some scores which he finds suspicious. Although I will not argue that the specific examples he gives are not suspicious, I will argue that these must be exceptions.

[6] The countries and years used for each index are reported in the Appendix.

is more correlated with Treisman's main index (TI) than with one of the data sets used by AD (WCR) as illustrated in Table 1. The ICRG data also meets the criterion of high correlation across years exhibiting correlations of at least 0.941 from one year to the next.[7] Thus, even if there are anomalies, they are most likely to be exceptions and, as previously noted, if these errors are classical, should not bias the results. However, the main reason for using the ICRG data is that it is considerably larger than any alternative data sets; it covers 135 countries for as long as sixteen years.[8] Although sample size may not be crucial for all estimators, it is certainly of importance when one uses IV techniques as I will do. The 2SLS's bias decreases with sample size, and even though it is not clear how many observations are required for the estimates to stabilize, more is definitely better.

The rest of the data used is similar to that of AD except that in order to focus on FE, only time varying regressors will be used. Schooling is measured as the ratio of total enrollment in primary school, regardless of age, to the population of the age group that officially corresponds to the primary school level.[9] Estimates are based on the International Standard Classification of Education. Income is GDP per capita divided by 1000. Political freedom is given by the Gastil index of political rights. The Gastil index ranges from one to seven, one being the highest degree of political freedom. Every estimated equation will have as two of its regressors 'high political freedom' and 'lack of political freedom.' High political freedom is an indicator variable taking value one if the Gastil index is less than or equal to three. Lack of political freedom is an indicator variable taking value one if the Gastil index is greater than or equal to six. Thus the excluded values are four and five. Note that this departs from the AD specification which included the Gastil index as a regressor. However, using the Gastil index directly assumes that the effect of political freedom on corruption is the same going from a score of one to two as going from a score of six to seven. Of course this may not be the case and permitting all these scores to enter as a set of seven indicator variables allows for nonlinear effects. It turns out that the hypothesis that the effect is the same for scores one, two and three, the same for scores four and five, and that the effect for scores six and seven is the same cannot be rejected for the crucial regressions (a more detailed analysis of the effects will be offered in the discussion of the results). Thus these are grouped for ease of exposition. The level of profits is accounted for by the share of merchandise imports in GDP and the fraction of fuel and mineral exports in the total exports of goods and services (which will often be

[7] This is not to say that there is no variation over time in the data. On average, countries scores vary by 23% between their highest and lowest levels.

[8] Note that not all the countries are in the data set for all sixteen years. For instance, there were ninety countries in 1982.

[9] This was preferred to AD's measure because it varies over time.

referred to simply as share of fuel and mineral exports)[10]. Two instruments will be used, one to control for the potential endogeneity of share of imports in GDP and the other for income. The instrument for share of import in GDP is one of the two proposed by AD, log of population, which is obtained from the World Development Indicators.[11] As for income I propose a new instrument which is presented bellow. Treisman was the first to identify this potential problem and to suggest an instrument. Although he found no evidence that such a correction mattered, this lack of evidence could be specific to the data set or to the instrument.[12] The new instrument, which will be explained in more detail, is the per capita GDP of a country's greatest importer for the mid-sample year of 1989,[13] and this will be used as an IV for income. This is constructed in part using data from the *Direction of trade statistics* which is published by the IMF. This source gives me the country which is the greatest importer for each country in our data. The complete data sources are provided in the Appendix.

The remainder of this paper will be organized as follows. First, the instruments and first-stage regressions are presented. Then I cover the analysis of the determinants of corruption. Finally, the results are discussed and interpreted.

3 First-Stage Regressions: the Instruments

To correct for endogeneity problems, I will use two methods. First, if the regressors causing problems can be decomposed into a permanent or time-invariant part and a part that varies over time, and the endogeneity

[10] Note that this differs from AD's measure of rents through exports. They take the percentage of fuel, mineral, and metals export in merchandise exports whereas I use the percentage of fuel, ores, and metals export in total exports of goods and services. This is done for two reasons. First, I believe this better captures the importance of rents as merchandise exports may be a negligible portion of all exports for some countries, thus these rents would be of no relevance. It also improves the statistical significance of the estimates for this coefficient without affecting others. This last claim will be elaborated on in the discussion. Note that since the data given to the World Bank for fuel and mineral exports and exports of goods and services are from different sources, there are a few observations that are inconsistent (the former is greater than the latter). These were simply dropped. This affected only twenty observations or only about 2% of the data.

[11] I do not use the other one they propose, land area, since it does not vary over time.

[12] Most of the empirical literature on corruption deals with the effect of corruption on growth. For instance, Shleifer and Vishny (1993) argue that corruption reduces growth. The same argument is made by Mauro (1995) who suggests in his empirical study that corruption reduces investment which in turn reduces growth. Of course, growth and income are different, but they are correlated. In a FE context, the interest is in deviations from the mean.

[13] The choice of year is arbitrary, but there is no reason to believe it affected the results. There are a few exceptions to this, and these are all noted in the Appendix.

results only from the permanent part, then FE will solve this problem. To see this, denote corruption and income at time t for country i: C_{it} and Y_{it}. Let's suppose that $C_{it} = cl_i + c_{it}$ and $Y_{it} = yl_i + y_{it}$, where cl_i and yl_i are country specific corruption and income levels. Assume that the true relationships are (1) $C_{it} = \alpha + \beta(yl_i + y_{it}) + \varepsilon_{it}$ and (2) $yl_i = \gamma + \delta cl_i + \eta_i$. Simply estimating OLS on the corruption equation would not yield consistent estimates since the right hand side determines the left hand side (in (1)) but part of the right hand side is also simultaneously determined by the left hand side (from (2)). Instead, one can estimate the corruption equation using OLS on the differences from the mean (i.e. take FE): $C_{it} - \sum_T C_{it} = \beta\left(yl_i + y_{it} - \sum_T (yl_i + y_{it})\right) + \mu_{it} = \beta\left(y_{it} - T - \sum_T y_{it}\right)) + \mu_{it}$. It is easy to see that this transformation eliminates the endogeneity problem that is present if one simply estimate OLS, since yl_i is eliminated from the right hand side. Of course, there are other reasons to use FE which are valid even if there is no endogeneity problem, for instance, to correct for unobserved time invariant factors.

However the endogeneity may not take the particular form illustrated above. Consequently, another way to solve this problem is used, namely instrumental variable techniques. A valid instrument is one such that the instrument is uncorrelated with the error term in the equation of interest (the second-stage regression) and it has some partial correlation with the endogenous regressor (in the first-stage regression). Note that when estimating FE and IV simultaneously, a valid instrument needs to be redefined in terms of the deviations from the mean.

The endogeneity of the share of imports in GDP has been recognized earlier, when AD suggested it as a proxy for rents (Ades and Di Tella 1999).[14] Clearly bureaucrats can affect imports; therefore their corruption can both determine and result from the share of imports in GDP. The instrument used here is the same as the one used by Ades and Di Tella (1999), the natural log of population. There is no a priori reason why one would expect population to affect corruption, and to my knowledge, no model of corruption suggests that it should depend on population. On the other hand, the effect of population on foreign trade as a portion of GDP is a well established phenomenon. For instance, Perkins and Syrquin (1989) write "the one proposition that is beyond dispute: the larger a nation's population, the lower is the share of foreign trade in that nation's GDP." (p. 1705.) Multiple explanations for this relationship are suggested, including: transport cost favoring domestic producers in large countries, economies of scale enjoyed by large countries, distribution of mineral resources around the globe (small nations have more than they can use at home), and others. In this case however, the variable of interest is not the share of foreign trade in that nation's GDP but a subset of foreign trade, namely imports. Nonetheless, since imports and foreign trade are positively

[14] This was also noted by Treisman (2000): "corrupt officials may themselves create barriers to imports." p. 408.

correlated, the result almost certainly extends (that it does will be shown below).[15] For instance, in the context of analyzing the determinants of growth, Levine and Renelt (1992) conclude that "all findings using share of exports in GDP could be obtained almost identically using the total trade or import share" (p. 959).

If it is difficult to understand why population levels and corruption would be correlated, it is even more difficult to see why variations in population (around a country's average population) would correlate with changes in corruption. This is to say that in FE, it seems unlikely that population is not exogenous in the second stage equation. The first column of Table 2 shows the estimates for imports over GDP as a function of (log) population and other regressors conditional on country FE (labelled FE-IV1). Note that population seems to provide a strong instrument as the F statistic is above the Staiger and Stock (1997) rule of thumb threshold for weak instruments,[16] and the coefficient estimate on (log) population is highly statistically significant, the negative sign, as compared to the previous case. This could be explained if after an increase in the demand in a country, most of the extra demand is fulfilled in the short-run by supply from the rest of the world. This implies that the share of imports in GDP is counter-cyclical. This result is not surprising. When income grows, holding population constant, if not all of the increased demand goes to imports (some of it goes toward domestic production), then the numerator of the left-hand side variable increases by less than the denominator. The coefficient estimate on political freedom implies that when political freedom changes in a country, it increases imports as a share of GDP when it goes toward an intermediate level of political freedom. Finally, the share of fuel and mineral exports in total exports moves in the same direction as the share of imports in GDP.

However, this paper also proposes to control for the endogeneity of income. Thus far, the first stage regression presented would apply if only share as a fraction of income was endogenous. This was provided to allow comparison to Ades and Di Tella's (1999) work and to give a point of comparison to see the effect of allowing and controlling for the endogeneity of income. Here is a description of how I propose to identify the effect of income on corruption. There is little doubt that, over time, a country's per capita GDP is correlated with the per capita GDP of the country to which it sells most of its exports. Note that since this paper focuses on FE estimates, the correlation needs to come from the changes in per capita GDP, not from

[15] To see why this make sense, take the special case where current-account balance equals net investment income from nonresidents, then exports has to equal imports.

[16] Staiger and Stock (1997) argue that when there is only one endogenous variable, instruments should be deemed weak if the first stage F statistic is less than ten.

	FE-IV1	FE-IV2	
Dependant Variable	Imports/GDP	Imports/GDP	Income
Income	0.002***		
	(0.001)		
Schooling	-0.000	-0.000	-0.003
	(0.000)	(0.000)	(0.007)
High political	-0.028***	-0.034***	0.323*
freedom	(0.008)	(0.009)	(0.177)
Lack of political	-0.016**	-0.018*	0.458**
freedom	(0.008)	(0.009)	(0.190)
Fuel and mineral	0.055**	0.065***	2.094***
exports	(0.023)	(0.025)	(0.511)
Log of	0.202***	0.167***	-4.037***
population	(0.021)	(0.034)	(0.683)
Income of		0.002*	0.379***
greatest importer		(0.001)	(0.027)
F	19.62***	16.75***	41.27***
Observations	1169	947	947
Countries	99	81	81

Standard errors in parenthesis (clustered std. errors in OLS, IV1, and IV2).
***,**,* indicate statistical significance at the 1%, 5%, and 10% level respectively.

Table 2: First Stage Estimates (Imports/GDP and Income endogenous)

the levels of GDP. In other words, it's not that rich (poor) countries export to rich (poor) countries – or vice versa – but rather that when the country to which you export the most is getting richer, it is likely to make you richer as well. The reasoning is quite simple. Variations in income are in part affected by variations in demand, and an important part of those variations in demand are determined by the changes in income of the country which buys the most of another country's exports. On the other hand, there is no reason to believe that the changes in (or level of) income of the country to which you export the most are correlated to the changes in your corruption levels. In order for this not to be true, changes in corruption of many countries would need to correlate to the changes in income of very few countries. For instance, over half the countries in this sample have one of three countries as their main export destination. To take a concrete example, even though Bangladesh and England both have the United States as their greatest export destination, the evolution of corruption in each of those countries followed very different paths.

Thus, turning to the first stage regressions under the FE-IV2 heading in Table 2, one notes that again, for the Imports/GDP regressions, the results are similar in terms of sign, magnitude, and statistical significance as in the FE-IV1 case. However, income of greatest importer yields a small positive estimate (as opposed

to small negative for income in FE-IV1). In the Income regression, schooling is not statistically significant, which could be explained if it takes a long time for education to have an impact on income. Political freedom once again exhibits a non-linear relation, but it is the opposite than in the Imports/GDP regressions. That is, ceteris paribus, either reducing or increasing political freedom away from its intermediate level would increase income. Fuel and mineral exports as a share of total exports has a positive impact on income, which is easy to rationalize since increasing exports of a natural resource in the short-run must increase income. The instrument, (log) population, is also highly statistically significant and has the expected sign, reproducing the result that larger countries have a lower share of imports in GDP. But furthermore, it has been argued before that high population growth is likely to lead to a decrease in per capita income if the rate of technological growth is not high enough (Enke 1971). Finally, as expected, income of greatest importer has a positive and highly statistically significant impact on income. Moreover, both instruments are statistically significant in both regressions, and the F statistic soundly rejects the insignificance of the first stage regressions.

Hence, population and income of the greatest importer have been shown to be valid instruments for share of imports in GDP and income controlling for country fixed effects. That is to say that changes in population and income of the greatest importer are orthogonal to the residuals in a corruption equation. Furthermore, explanations for their correlation with and evidence that they are partially correlated with share of imports in GDP and income are offered. But is there a need to perform such a correction, i.e. are share of imports in GDP and income endogenous? Using a Durbin-Wu-Hausman type test suggested by Davidson and MacKinnon (1993), the null hypothesis that these two regressors are exogenous can be rejected at any conventional level.[17]

One additional concern however could be that when both instruments are used, the instrumented variables for income and share of imports in GDP do not have enough variation (multicolinearity). Fortunately, this does not seem to be cause for concern in this case, as the correlation between the predicted values in FE-IV2 is 0.448.[18]

	FE	FE-IV1	FE-IV2
Income	0.072***	0.049**	0.205***
	(0.019)	(0.024)	(0.075)
Schooling	0.011**	0.013**	0.012*
	(0.004)	(0.006)	(0.006)
High political freedom	-0.447***	-0.762***	-0.952***
	(0.119)	(0.157)	(0.199)
Lack of political freedom	0.282**	-0.014	-0.159
	(0.124)	(0.162)	(0.198)
Fuel and mineral exports	1.346***	1.219***	1.095**
	(0.342)	(0.420)	(0.462)
Share of imports in GDP	-0.832*	-11.415***	-12.626***
	(0.458)	(1.975)	(2.576)
Observations	1169	1169	947
Countries	99	99	81

Standard errors in parenthesis.
***,**,* indicate statistical significance at the 1%, 5%, and 10% level respectively.

Table 3: The Determinants of Corruption (ICRG: 1982-1997)

4 Second Stage Regressions: The Determinants of Corruption

Table 3 presents the results for FE estimates, where FE-IV1 are estimates, the share of imports in GDP is instrumented and FE-IV2 are estimates where not only share of imports in GDP is instrumented but income as well.[19] Income is positive, meaning that when income goes up, corruption increases as well. When income is instrumented, its coefficient estimate increases. Schooling is positive in all regressions, which means that when the population becomes more educated, corruption increases. High political freedom has a negative estimate, hence increasing political freedom from the baseline of a Gastil index of four or five to three or less leads to a decrease in corruption. The coefficient estimate on the effect of fuel and mineral exports is positive, and thus a reduction in the importance of fuel and mineral exports as part of all exports implies a decrease in corruption. Share of imports in GDP is positive, and thus when imports become more important, relative to GDP, corruption decreases. Note that in both specifications where the endogeneity of share of imports is taken into account, the coefficient estimate for share of imports in GDP is substantially higher,

[17] Davidson and MacKinnon 1993, p. 237-240.

[18] Note that both instruments need to be used in both first stage regressions for consistency. Given that the instruments meet the required assumptions, 2SLS is known to give consistent estimates (see for instance Chapter 5.2.1 of Wooldridge 2002).

[19] Throughout the paper FE will be used interchangeably to mean the specific FE regression reported in the second column of Table 3 or the set of estimations (FE, FE-IV1, and FE-IV2) that rely on fixed effects techniques.

more than thirteen times greater than in the FE specification. The effect of correcting for the endogeneity of both income and share of imports in GDP is also noticeable in other coefficient estimates, such as that for high political freedom and fuel and mineral exports which both increase. The coefficient estimate for high political freedom more than doubles between the FE specification and the FE-IV2 specification. The only regressor which changes sign, and is only statistically significant once, is lack of political freedom. It is only statistically significant in the FE specification, in which case it is positive, i.e., fewer political rights increase corruption. It is negative in the other two regressions, implying that a lack of political freedom, as compared to the baseline, reduces corruption. In all three specifications, an F test strongly rejects the null hypothesis that the country specific effects are equal.

It is worth noting that if country FE were not included, the results would differ in the following way. First, the coefficient estimates of income and schooling all change signs, going from negative without FE to positive with FE. Second, using both FE and IV methods jointly has a considerable impact on the magnitude of some of the coefficient estimates, namely share of imports but also high political freedom and fuel and mineral exports. Using either FE or IV by itself does not have such a dramatic impact.

5 Discussion

Although some of the results support past research, others are quite different. As with previous papers, these results support the idea that higher rents increase corruption. But unlike previous papers, this effect is found not only through share of imports in GDP but also through share of fuel and mineral exports in total exports. In fact, share of fuel and mineral exports in total exports is statistically significant in the three specifications considered. This is an interesting finding since fuel and mineral exports are less likely than share of imports in GDP to be endogenous, it gives stronger support to the hypothesis that rents affect (positively) corruption. One potential criticism of this finding is that evaluators are biased against "oil exporting countries" and simply assume that those are more corrupt. Such a critique seems less convincing given that the estimates are statistically significant in the FE specifications, where such bias can be absorbed in the country specific effect. To give an idea of the importance of the implied effect of the coefficient estimates, which are all slightly greater than one, consider the following. Increasing a country's share of fuel and mineral exports in total exports by the sample standard deviation of 0.248,[20] which predicts a change in the corruption 'score' of 0.272, is approximately the difference between Belgium's average corruption of 1.211 and Australia's average

[20] This is computed using the sample of 947 observations used in the FE-IV2 estimation.

score of 1.510. It corresponds to about 0.116 standard deviation in the corruption index. This does not seem to be a very strong effect in terms of magnitude, although some countries are clearly outliers in terms of how important fuel and mineral exports are to their economy. Note that, coincidentally, of the two FE estimations performed by AD, one of them yielded a positive coefficient estimate on fuel and mineral exports. There are three potential explanations for this new result that fuel and mineral exports are statistically significant. It could be the source of the data: ICRG versus other indexes. Another possibility is that a large amount of data is required to estimate this effect, at least more data than used by previous studies. Finally, this could be due to the fact that fuel and mineral exports is defined as the share in exports of goods and services instead of the share in merchandise exports: i.e. the former is a better proxy for rents than the latter. To attempt determining which of these explanations is the correct one the estimation is performed with fuel and mineral exports in merchandise exports (see Table 8 in the Appendix). Note that almost all results are identical (qualitatively). This suggests that the source of the differences is not the data set. However, the coefficient estimate on fuel and mineral exports is now statistically significant in only one specification even though the sample size has not changed. This indicates that fuel and mineral exports in exports of goods and services is a better proxy of the relevant rents.

The results for share of imports in GDP are consistent with previous studies that find most estimates are statistically significant and negative. However, combining FE and IV yields lower coefficient estimates. Note that this is true both in terms of the FE-IV estimates of this paper as compared to other estimates in this paper, and as compared to estimates of other papers except for one of AD's FE estimates. AD's estimates are between -1.871 and –12.73 (-2.405 if you exclude the one outlier estimate), and Treisman has estimates between -0.01 and -0.02. How important is an estimate of -12.626? A change of one standard deviation in the share of imports in GDP (the standard deviation is 0.232) implies a change in corruption of -2.925. This is clearly an important effect. It represents over one quarter of the range of possible values (the measure of corruption takes values between zero and ten). It represents a change of 1.181 times the standard deviation of the corruption index. For the sake of illustration, this would be similar to the difference in average corruption between the United Kingdom (1.073) and Brazil (3.875). But what can explain the coefficient changing so much only after FE and IV are combined? This suggests that the endogeneity is really at the level of changes in the import share of GDP rather than at its level. In other words, the kind of endogeneity for which FE is a solution (see the first paragraph of the section *First-Stage Regressions: the Instruments*) is exactly what is not at work in this case. If you add to this the fact that country FE are important and correlated to the share of imports in GDP, you can get a situation where combining FE and

IV gives different results from using either one by itself.

The analysis of the effects of income on corruption yields truly novel results. Controlling for the endogeneity of income increases its coefficient estimate independently of the estimation method. This is entirely consistent with the source of the endogeneity, namely that corruption has a negative impact on income. AD had a similar result for their FE estimation in which they had a positive and statistically significant estimate of the coefficient of income for one of their two data sets (all other estimates of both AD and Treisman were negative).[21] The estimates suggest that income has very important effects on corruption. Once again, taking a change in income of one standard deviation (the standard deviation of income is 8.949) yields a change in corruption of 1.832. Again this is important as it represents slightly more than three quarters of a standard deviation in the corruption index or almost one fifth of the range of possible corruption scores. Thus the effect could be compared to going from the average level of corruption of Mexico, 5.375, to the level of Gabon, 7.222. Corruption being procyclical is not implausible. In economic upturns, it might be that rents are generally increasing (besides what is captured by the import share of GDP and the share of fuel and mineral exports in total exports). This could be the result of the procyclical nature of labor productivity (Aizcorbe 1992). If the two proxies for rents used in this paper do not capture all the relevant rents, which is highly plausible, than this would explain the positive coefficient estimate.

The only prior study that estimates the effect of schooling on corruption is that of AD, and they only do so in their OLS and IV specifications. Surprisingly all the coefficient estimates of schooling are positive and statistically significant. What can explain a positive coefficient estimate on the estimate of the effect of schooling? This cannot be established from this data set, but one possibility is that as the population is getting more educated, and thus better at controlling its bureaucracy, bureaucrats are also becoming more educated and thus better at performing corrupt acts. If bureaucrats are getting better faster than the population is improving its monitoring capability, this could explain the positive sign. A more plausible explanation however is that changes in schooling, as measured here, is more of a proxy for changes in rent than anything else. Figure 1 graphs the standard deviation of the measure of schooling against average income (the points are labelled by their World Bank country code). Clearly, for most developed countries, this variable barely changes in the entire sample. Consequently most of the variation in this variable comes

[21] This does conflict however with Treisman's finding that instrumenting for income doesn't affect the results. This difference is investigated further in the longer version of this paper. It is illustrated that sample size, choice of instruments, and/or the combination of FE and IV techniques are the driving force behind this difference. The interested reader is referred to http://homepages.nyu.edu/~gf35/print/frechette_corruption.pdf.

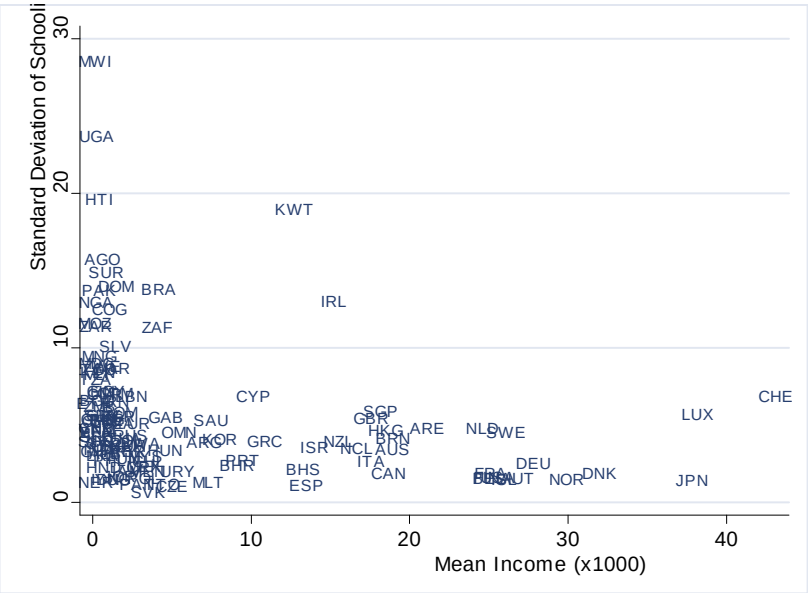

Figure 1: Relation Between Income and Changes in Schooling

from countries with relatively low income. In such countries, increases in the quantity of students is strongly affected by foreign aid,[22] but changes in foreign aid are affecting the opportunities for corrupt behavior. This is particularly true given that aid has been documented to be fungible (World Bank 1998, pp. 60-74). Thus, the schooling variable might reflect something different than the effect of schooling in its variation over time. To make sure other results are not driven by the schooling variable, the estimation is performed without it. It reveals almost identical results which are reported in the Appendix. Thus, if one is uncomfortable with this measure of schooling, the remaining results appear not to be affected by it.

Finally lets turn to political freedom. Clearly results indicate that the effects of political freedom are nonlinear. This might explain why AD found lack of political rights to be rarely significant (remember that they include the Gastil index directly as a regressor). In their own words, "Throughout this paper we fail to find beneficial and significant effects of political rights on corruption. If anything, lack of political rights seems to be associated with less corruption" (AD, p. 987). However, Treisman consistently found that

[22] See for instance Pack and Pack (1990) which establishes a positive relation between aid and education (amongst other things). Also see *Assessing Aid – What Works, What Doesn't, and Why* (1998) from the World Bank: "Most aid is delivered as investment projects in particular sectors such as roads, water supply, or education." p. 3.

uninterrupted democracy resulted in lower corruption. The results presented here are not in contradiction with these earlier results. The insight is that this relation is nonlinear. Going from no political freedom to some is not enough: what is really beneficial is to go one step further to a high degree of political freedom.[23] Interpreting the magnitude of the results is simple. Going from a Gastil score of four or five to one of less than four implies a decrease in corruption of 0.952 points. For example, this would approximately correspond to the difference in mean corruption between Kenya which has a score of 5.000 and Argentina at 4.111. One may be worried about the effect of pooling scores together. As mentioned earlier, the joint hypothesis that the effect of scores one through three is the same, that scores four and five have the same effect, and that scores six and seven have the same effect cannot be rejected for the crucial specifications FE-IV1 and FE-IV2 at any conventional levels (as for the FE estimates, the probability of rejection is 0.041). More importantly, for all specifications, results are qualitatively the same (there are no sign changes for instance). The estimates with one dummy for each level (except level four) are reported in the Appendix for completeness.

6 Conclusion

The results presented in this paper confirm some of the previous conclusions regarding the causes of corruption, but it also sheds light on some new results and raises entirely new questions. One result that is confirmed is that rents foster corruption (This was shown mainly in AD but was also present to a lesser extent in Treisman.). Two new aspects of this relationship are presented in this paper. First, the effect of rents on corruption can be found not only through the effect of share of imports in GDP but also in the effect of fuel and mineral exports. This effect is found to be relatively small in magnitude and that may explain why it did not tend to be statistically significant when using smaller data sets. Second, the effect of share of imports in GDP may be much more important than was previously believed. The joint use of FE and IV techniques, to control for both country unobservables and endogeneity problems, reveals a coefficient estimate which is many times larger than when these corrections are not performed. The use of a time varying measure of education permits analysis of the effects of schooling in FE type specifications. These reveal that contrary to what OLS suggests, an increase in schooling may increase corruption. However, as previously noted, variations in this measure of schooling may be picking up something else. Another result which is confirmed here is that greater political freedom decreases corruption (this found support mainly in

[23] Looking for evidence of an "inverted U pattern on the relation between democracy and rent seeking," which is predicted by their model, Mohtadi and Roe (2003) also observe that corruption and democracy exhibit a nonlinear relation (inverted U).

Treisman, whereas AD had mixed results.). A new aspect of this result however, is that the relation between political freedom and corruption seems to be nonlinear. Finally, an entirely new finding is that increases in income may not decrease corruption but might even increase it! As was explained in this paper however, this is entirely consistent with the endogeneity problem intrinsic in the relation between income and corruption. Furthermore, the procyclical nature of corruption is not counter intuitive once one considers the relation between factors such as productivity and income.

Identification of these new results relied on the use of FE and IV techniques. The former restricts the set of questions that can be asked, and thus there is no doubt that cross-sectional analysis is, for some questions, a better approach. For instance, most of the questions asked in Treisman cannot be considered within this framework. However, to analyze time-varying causes of corruption, such an approach has distinct advantages. The latter is restrictive in that it requires more observations to achieve reliable results and thus limits the choice of data set. Nonetheless, as was argued in this paper, although the ICRG data might not be perfect, it is nonetheless very similar to the other data sets that have been used in determining the causes of corruption. Clearly, one always wants to be cautious in interpreting such results, and eventually there will be enough data sets of substantial size to clarify this issue.

The instrument proposed in this paper to control for the endogeneity of income performed very well. This instrument has several attractive features: it is easy to construct; it is not limited to any specific data set; and it varies over time. It seems plausible that it could be used in other applications investigating the causes of some social factor where income is both a cause and a consequence.

The apparent importance of allowing for country specific effects suggests that corruption might be imbedded in the bureaucratic and legal culture of a country in some significant way. Just as Ades and Di Tella suggest that different individuals may be more or less willing to be corrupted, different countries' bureaucracies may be more tolerant of corruption. This appears true given the result of past research such as that of La Porta et al. 1998 and Treisman 2000. And although this could mean that the way out of corruption may be a long road for some countries, the importance of the effect of share of imports in GDP on corruption might suggest that there are policy variables that can substantially decrease bureaucratic corruption. However, the finding that increasing income and education increases corruption suggests that some policy objectives might work against each other.

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A Countries in the Sample

Code	Country	Partner	Years	ICRG	TI	WCR
ALB	Albania		1996-1996	x		
DZA	Algeria	ITA	1982-1996	x		
AGO	Angola	USA	1990-1991	x		
ARG	Argentina	USA	1982-1998	x	x	x
AUS	Australia	JPN	1982-1997	x	x	x
AUT	Austria		1982-1998	x	x	x
BHS	Bahamas, The	USA	1985-1985	x		
BHR	Bahrain	SAU	1984-1996	x		
BGD	Bangladesh	USA	1982-1984	x		
		USA	1986-1986	x		
		USA	1988-1988	x		
		USA	1993-1994	x		
		USA	1996-1996	x	x	
BEL	Belgium	FRA	1982-1996	x	x	x
BOL	Bolivia	ARG	1982-1983	x		
		ARG	1985-1997	x	x	
BRA	Brazil	USA	1982-1998	x	x	x
BGR	Bulgaria		1996-1998	x	x	
CMR	Cameroon	FRA	1982-1983	x		
		FRA	1986-1987	x		
		FRA	1989-1990	x		
		FRA	1995-1998	x	x	
CAN	Canada	USA	1982-1998	x	x	x
CHL	Chile	USA	1982-1996	x	x	x
		USA	1998-1998		x	x
CHN	China	HKG	1984-1984	x		
		HKG	1987-1998	x	x	x
COL	Colombia	USA	1982-1996	x	x	x
		USA	1998-1998		x	x
ZAR	Congo, Dem. Rep.	BEL	1982-1983	x		
COG	Congo, Rep.	USA	1985-1986	x		
		USA	1994-1995	x		
CRI	Costa Rica	USA	1982-1997	x	x	
CIV	Cote d'Ivoire	NLD	1982-1983	x		
		NLD	1985-1985	x		
		NLD	1995-1998	x	x	
CYP	Cyprus	GBR	1984-1991	x		
		GBR	1996-1996	x		
CZE	Czech Republic		1993-1998	x	x	x
DNK	Denmark		1982-1998	x	x	x
DOM	Dominican Republic	USA	1982-1983	x		
		USA	1986-1987	x		

Code	Country	Partner	Years	ICRG	TI	WCR
		USA	1992-1997	x		
ECU	Ecuador	USA	1982-1998	x	x	
EGY	Egypt, Arab Rep.	ITA	1982-1998	x	x	x
SLV	El Salvador	USA	1982-1984	x		
		USA	1987-1998	x	x	
EST	Estonia	RUS*	1998-1998		x	
ETH	Ethiopia		1993-1993	x		
			1995-1995	x		
			1997-1997	x		
FIN	Finland	SWE**	1982-1998	x	x	x
FRA	France		1982-1998	x	x	x
GAB	Gabon	FRA	1982-1983	x		
		FRA	1994-1994	x		
GMB	Gambia, The	JPN	1995-1996	x		
DEU	Germany		1991-1998	x	x	x
GHA	Ghana	NLD	1984-1984	x		
		NLD	1992-1992	x		
GRC	Greece		1982-1998	x	x	x
GTM	Guatemala	USA	1982-1998	x	x	
GIN	Guinea	USA	1996-1997	x		
GUY	Guyana	GBR	1982-1983	x		
HTI	Haiti	USA	1982-1983	x		
		USA	1990-1991	x		
		USA	1996-1996	x		
HND	Honduras	USA	1982-1988	x		
		USA	1990-1997	x		
HUN	Hungary		1984-1998	x	x	x
ISL	Iceland	GBR	1988-1998	x	x	x
IND	India	USA	1982-1998	x	x	x
IDN	Indonesia	JPN	1982-1996	x	x	x
IRN	Iran, Islamic Rep.	JPN	1982-1983	x		
IRL	Ireland	GBR	1982-1998	x	x	x
ISR	Israel	USA	1982-1998	x	x	x
ITA	Italy		1982-1998	x	x	x
JAM	Jamaica	USA	1982-1996	x		
		USA	1998-1998		x	
JPN	Japan	USA	1982-1998	x	x	x
JOR	Jordan		1982-1989	x		
			1991-1995	x		x
			1997-1998	x	x	
KEN	Kenya	GBR	1982-1988	x		
		GBR	1990-1998	x	x	
KOR	Korea, Rep.	USA	1982-1997	x		x
KWT	Kuwait	JPN	1982-1984	x		
		JPN	1986-1989	x		

Code	Country	Partner	Years	ICRG	TI	WCR
		JPN	1992-1997	x		
LVA	Latvia	RUS*	1998-1998		x	
MDG	Madagascar	FRA	1984-1984	x		
		FRA	1990-1997	x		
MWI	Malawi	GBR	1982-1991	x		
		GBR	1994-1995	x		
MYS	Malaysia	SGP	1982-1998	x	x	x
MLI	Mali	BEL**	1997-1997	x		
MLT	Malta	ITA	1986-1997	x		
MUS	Mauritius		1998-1998		x	
MEX	Mexico	USA	1982-1998	x	x	x
MNG	Mongolia	JPN	1996-1996	x		
MAR	Morocco	FRA	1982-1998	x	x	
MOZ	Mozambique	USA	1994-1996	x		
NLD	Netherlands		1982-1998	x	x	x
NZL	New Zealand	AUS	1982-1997	x	x	x
NIC	Nicaragua	CAN	1982-1986	x		
		CAN	1988-1997	x		
NER	Niger	FRA	1995-1997	x		
NGA	Nigeria	USA	1996-1996	x	x	
NOR	Norway	GBR	1982-1998	x	x	x
OMN	Oman	ARE	1984-1988	x		
		ARE	1990-1994	x		
PAK	Pakistan	USA	1982-1998	x	x	x
PAN	Panama	USA	1982-1996	x		
PNG	Papua New Guinea	JPN	1984-1993	x		
PRY	Paraguay	BRA	1987-1987	x		
		BRA	1991-1998	x	x	
PER	Peru	USA	1982-1998	x	x	
PHL	Philippines	USA	1982-1997	x	x	x
POL	Poland		1990-1997	x	x	x
PRT	Portugal		1982-1998	x	x	x
ROM	Romania		1989-1998	x	x	
RUS	Russian Federation		1996-1996	x	x	x
SAU	Saudi Arabia	USA	1985-1985	x		
		USA	1988-1996	x		
SEN	Senegal	FRA	1982-1983	x		
		FRA	1986-1987	x		
		FRA	1989-1998	x	x	
SGP	Singapore	USA	1982-1996	x	x	x
		USA	1998-1998		x	x
ZAF	South Africa	USA	1982-1982	x		
		USA	1988-1998	x	x	x
ESP	Spain	FRA	1982-1998	x	x	x
LKA	Sri Lanka	USA	1982-1994	x		

Code	Country	Partner	Years	ICRG	TI	WCR
SDN	Sudan	ITA	1982-1983	x		
		ITA	1996-1996	x		
SUR	Suriname	NOR	1988-1991	x		
SWE	Sweden		1982-1998	x	x	x
CHE	Switzerland		1982-1998	x	x	x
SYR	Syrian Arab Republic	ITA**	1982-1987	x		
		ITA	1989-1990	x		
		ITA	1992-1992	x		
		ITA	1995-1997	x		
TZA	Tanzania		1997-1998	x	x	
THA	Thailand	USA	1982-1998	x	x	x
TGO	Togo	CAN	1982-1983	x		
		CAN	1986-1991	x		
		CAN	1995-1997	x		
TTO	Trinidad and Tobago	USA	1982-1996	x		
TUN	Tunisia	FRA	1982-1998	x	x	
TUR	Turkey		1982-1997	x	x	x
UGA	Uganda	NLD	1982-1983	x		
		NLD	1994-1998	x	x	
ARE	United Arab Emirates	JPN	1983-1986	x		
		JPN	1988-1993	x		
GBR	United Kingdom	USA	1982-1998	x	x	x
USA	United States	CAN	1982-1986	x		
		CAN	1989-1998	x	x	x
URY	Uruguay	BRA	1982-1996	x		
		BRA	1998-1998		x	
YEM	Yemen, Rep.		1991-1991	x		
ZMB	Zambia	JPN	1982-1983	x		
		JPN	1993-1993	x		
		JPN	1995-1995	x		
ZWE	Zimbabwe	GBR	1982-1986	x		
		GBR	1990-1997	x		

Table 4: Countries Used in the Estimation

Partner refers to the country which was the greatest importer in 1989 except for countries with * or ** listed beside the partner's World Bank code. * is for countries created after 1989 for which I used data from 1993 in the case of Estonia and 1994 in the case of Latvia. ** is for countries that had the USSR as their main export destination in 1989, in which case I used data from 1991. For countries that had West Germany as their main export destination in 1989, the Partner was left as missing as this created data problem because of the transition and how the statistics are reported. However, this change seems innocuous as in a previous version the West Germany was used and results were not affected. All countries which have a Partner listed are used in all estimations, except those for which there is only one year of data that are not used in the FE type estimations. Countries without a Partner are not used in the IV2 and FE-IV2 estimations. If data on a country is listed as available for years, e.g., 1984-1998, and there is an x for all data corruption

indexes (ICRG, TI, and WCR), it means it was used in the years 1984-1997 when the ICRG data was used, 1996-1998 when the TI data was used, and 1991-1998 when the WCR data was used.

B Data Sources

Variables	Sources
Schooling, income, population, Share of imports in GDP, Fuel and mineral exports:	The World Development Indicators produced by the World Bank.
Political freedom (Gastil Index):	Freedom in the World produced by the Freedom House.
Greatest importer:	Direction of trade statistics produced by the International Monetary Fund.
ICRG corruption index	IRIS-III produced by the International Country Risk Guide.
TI corruption index	Daniel Treisman produced by Transparency International
WCR corruption index	The World Competitiveness Yearbook produced by IMD International.

Table 5: Data Sources

C Results For Principal Specifications Without FE

	IV1	IV2	
Dependant Variable	Imports/GDP	Imports/GDP	Income
Income	0.002***		
	(0.001)		
Schooling	0.001***	0.001***	0.038**
	(0.000)	(0.000)	(0.016)
High political	-0.170***	-0.171***	6.121***
freedom	(0.018)	(0.020)	(0.836)
Lack of political	-0.102***	-0.111***	0.004
freedom	(0.019)	(0.022)	(0.913)
Fuel and mineral	-0.103***	-0.115***	-0.650
exports	(0.025)	(0.022)	(1.172)
Log of	-0.068***	-0.070***	-0.531***
population	(0.003)	(0.004)	(0.167)
Income of		0.002*	-0.117***
greatest importer		(0.001)	(0.040)
Constant	1.431***	1.417***	5.772*
	(0.065)	(0.076)	(3.212)
F	81.03***	63.87***	27.08***
Observations	1177	951	951
Countries			

Standard errors in parenthesis (clustered std. errors in IV1).
***,**,* indicate statistical significance at the 1%, 5%, and 10% level respectively.

Table 6: First Stage Estimates (Imports/GDP endogenous)

	OLS	IV1	IV2
Income	-0.140***	-0.140***	-0.023
	(0.016)	(0.017)	(0.271)
Schooling	-0.011	-0.011	-0.015
	(0.007)	(0.008)	(0.01)
High political freedom	-0.796***	-0.765**	-1.638
	(0.29)	(0.382)	(2.09)
Lack of political freedom	0.047	0.066	-0.031
	(0.261)	(0.284)	(0.367)
Fuel and mineral exports	1.134*	1.139*	1.047
	(0.609)	(0.603)	(0.809)
Share of imports in GDP	-1.220***	-1.03	-1.559
	(0.435)	(1.354)	(2.651)
Constant	6.847***	6.785***	7.106***
	(0.768)	(0.845)	(1.120)
Observations	1177	1177	951

Clustered standard errors in parenthesis.
***,**,* indicate statistical significance at the 1%, 5%, and 10% level respectively.

Table 7: The Determinants of Corruption (ICRG: 1982-1997)

D Specifications Using Fuel and Mineral Exports as a Share of Merchandise Exports

	FE	FE-IV1	FE-IV2
Income	0.070***	0.037	0.266***
	(0.019)	(0.026)	(0.098)
Schooling	0.012***	0.019***	0.020***
	(0.004)	(0.006)	(0.007)
High political freedom	-0.414***	-0.695***	-0.911***
	(0.118)	(0.167)	(0.226)
Lack of political freedom	0.261**	-0.071	-0.259
	(0.124)	(0.178)	(0.235)
Fuel and mineral exports	1.098***	0.338	0.224
in merchandise exports	(0.313)	(0.442)	(0.530)
Share of imports in GDP	-0.666	-12.573***	-14.551***
	(0.414)	(2.457)	(3.471)
Observations	1202	1202	978
Countries	103	103	84

Standard errors in parenthesis (clustered std. errors in OLS, IV1, and IV2).
***,**,* indicate statistical significance at the 1%, 5%, and 10% level respectively.

Table 8: Ades and Di Tella's Specification For Fuel and Mineral Exports

E Excluding Schooling

	FE	FE-IV1	FE-IV2
Income	0.072***	0.046**	0.155**
	(0.019)	(0.023)	(0.075)
High political freedom	-0.404***	-0.686***	-0.838***
	(0.119)	(0.153)	(0.192)
Lack of political freedom	0.249**	-0.058	-0.194
	(0.123)	(0.160)	(0.199)
Fuel and mineral exports	1.400***	1.227***	1.132**
	(0.343)	(0.413)	(0.445)
Share of imports in GDP	-0.806*	-10.880***	-11.702***
	(0.458)	(2.027)	(2.703)
Observations	1208	1208	980
Countries	107	107	85

Table 9: Excluding Schooling

F Including Every Level of Political Freedom

	FE	FE-IV1	FE-IV2
Income	0.071***	0.047**	0.194**
	(0.019)	(0.024)	(0.076)
Schooling	0.011**	0.014**	0.013**
	(0.005)	(0.006)	(0.006)
Gastil = 1	-0.649***	-0.956***	-1.261***
Highest level of political freedom	(0.209)	(0.262)	(0.362)
Gastil = 2	-0.415***	-0.668***	-0.874***
	(0.142)	(0.180)	(0.226)
Gastil = 3	-0.441***	-0.813***	-0.967***
	(0.138)	(0.182)	(0.217)
Gastil = 5	0.378***	0.082	-0.039
	(0.136)	(0.175)	(0.216)
Gastil = 6	0.14	-0.197	-0.367
	(0.155)	(0.199)	(0.235)
Gastil = 7	0.08	-0.027	-0.192
Lowest level of political freedom	(0.199)	(0.244)	(0.276)
Fuel and mineral exports	1.197***	1.088**	0.936**
	(0.349)	(0.428)	(0.467)
Share of imports in GDP	-0.830*	-11.358***	-12.322***
	(0.458)	(1.995)	(2.600)
Observations	1169	1169	947
Countries	99	99	81

Standard errors in parenthesis (clustered std. errors in OLS, IV1, and IV2).
***,**,* indicate statistical significance at the 1%, 5%, and 10% level respectively.

Table 10: All Political Freedom Dummies Included