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PRESS FREEDOM, HUMAN CAPITAL, AND CORRUPTION¹

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Abstract

In this paper we investigate the relationship between corruption, human capital, and the monitoring capacities of civil society, as proxied for example by press freedom and an independent judicial system.

In a theoretical model we find the impact of education on corruption to depend on the capacities of civil society to oversee government officials. If those capacities are well developed, education decreases corruption, whereas it may lead to higher corruption if civil monitoring is low. We find empirical evidence to support this result for secondary and higher education.

Furthermore we investigate the direct relation between corruption and press freedom. We find no evidence that corruption negatively affects press freedom. We find, however, strong empirical evidence that a lack of press freedom leads to higher levels of corruption. This implies that strengthening press freedom should be among the priorities in the fight against corruption.

Key Words: Corruption, Political Economy, Press Freedom

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“The more I observe the main effects of a free press, the more convinced I am that, in the modern world, freedom of the press is the principal and, so to say, the constitutive element in freedom.” (Alexis de Tocqueville, 1805-1859)

“Society does not believe the President when he says he will fight against the Mafia because a large part of the public sees him almost as the boss. ...The President doesn’t even believe it himself when he says he is fighting the Mafia¹.”

1 Introduction

Given the overwhelming empirical evidence on its negative consequences², fighting corruption has become an important issue. This fight, in principle, can be led in two ways. The direct way is for governments to tackle corruption in their countries “from above”, by trying to promote honesty and cleaning up bureaucracies. Pressure from international donors, for example making aid payments dependent on “good governance”, can provide additional incentives for reluctant governments to join the crusade. The indirect way is to encourage measures that, by inducing structural changes, would lead to permanently lower corruption levels.

While the direct approach has the advantage of simplicity, it is often problematic because government officials are not always sincerely interested in fighting corruption, as they are potentially its largest beneficiary. Moreover, corruption is usually a deeply entrenched problem, and even politicians sincerely interested in fighting it may simply not have enough time to overcome it. Thus focus has recently started to shift to indirect ways of fighting corruption. Propositions of such structural improvements include from the economic profession³ : increased competition, a more

¹Former Argentine Interior Minister Gustavo Beliz speaking about Carlos Menem, Reuters article quoted from IASOC Criminal Organisations, Vol. 10, No. 4.

²See for example Mauro 1995/1998, Wei 1997/2000, Isham et al. 1997, Friedman et al. 2000 and Del Monte/Papagni 2001.

³See respectively Ades/Di Tella 1999, Ades/Di Tella 1997b, Rauch/Evans 2000, et Swamy et al. 2001.

independent judicial system, meritocratic hiring in bureaucracies, and an increased share and responsibility of women in governments and administrations.

In this spirit the international donor community has started stressing the need for strengthening civil society at large, and press freedom especially. James D. Wolfenson, President of the World Bank, recently argued that “a free press is not a luxury”, but “at the absolute core of equitable development”⁴. This stress on the importance of press freedom has coincided with the simultaneous appearance of economic articles that show a strong correlation between a free press and low corruption levels across countries⁵. This work proposes the strengthening of press freedom as a way of fighting corruption. The empirical relevance of the findings of these articles can, however, be challenged on two grounds. First, the cross-sectional correlation between corruption and press freedom might be spurious. More developed countries have higher levels of press freedom, as well as lower corruption levels, and a correlation might not provide any proof of causation. Second, it has been argued that, even if there was a causal link between corruption and press freedom, this causation might well be mainly in the other direction, that is corruption causing restrictions in press freedom. Besley and Prat (2001) present a model in which voters who have been informed by a free press can vote corrupt officials out of office, but where, at the same time, corrupt politicians can capture and silence the media. The latter deprives citizens of the possibility of making a qualified choice in elections, and hence increases the probability for corrupt incumbents to stay in office. In the model, whether a good incumbent cum free press or a corrupt incumbent cum captured press equilibrium prevails ultimately depends on structural features (as for example press ownership patterns). Djankov et al. (2001) present empirical evidence that countries where governments control larger parts of the media suffer from higher levels of corruption. Though this is no direct evidence on

⁴In a speech to the World Press Freedom Committee, Washington, D.C., November 8, 1999.

⁵Both Stapenhurst(2000) and Brunetti/Weder(1999) show this strong correlation in work undertaken simultaneously with and independently from ours.

possible causation between press freedom and corruption, this finding highlights the possibility of corrupt politicians to restrict press freedom.

In response to the critics we construct a panel data set that allows us to follow the evolution of corruption and press freedom over 12 years in approximately 130 countries. Using a Granger causality test for panels, we investigate whether more press freedom really causes⁶ a diminution in corruption.

In addition to checking for this “direct” link, we use the data-set to investigate an additional indirect channel through which press freedom influences corruption, namely via the effect of education on corruption. As mentioned earlier, there is a high correlation between low corruption levels and most variables that describe a country’s level of development, including human capital. This latter correlation between corruption and education, in turn, has been interpreted as proof that education decreases corruption⁷. We show that this negative correlation between education and corruption levels does not necessarily hold at the margin, that is that increases in education do not necessarily decrease corruption. We develop a simple model where bureaucrats abuse their position to seek bribes, but risk detection for unlawful behaviour. The probability of being detected and fined depends on the efficiency of monitoring technology, such as a free press or an independent judicial system. A general increase in human capital will now lead to an increase in the efficiency of these monitoring agencies, but will at the same time increase the capacity of bureaucrats to extract bribes unpunished.

Our main theoretical result is that the impact of changes in education on corruption depend on how well civil society monitors those who enjoy the power of public office. In a country with well developed monitoring agencies, more education decreases corruption, whereas it may lead to higher corruption elsewhere. Simplifying somewhat, this possible negative impact of education on corruption results from the

⁶In the sense of Granger.

⁷Ades/DiTella(1997a) in a cross-section sample of 32 countries find that education reduces corruption.

fact that, in the absence of any efficient control mechanism, educated agents may simply use their newly acquired capacities to become more efficient corruption rent seekers. Using our panel data set, and considering press freedom as a proxy for the quality of a society's monitoring agencies, we find empirical support for this conjecture. Both higher and secondary education do not have a robust positive or negative impact on corruption in countries with some degree of press freedom. However they are found to aggravate corruption significantly in countries where the press is not free.

Regarding the direction of causation between corruption and press freedom we actually find little evidence that corruption leads to less press freedom. However, we find a strong causation in the opposite sense, that is low levels of press freedom lead to high levels of corruption.

There is little, but growing literature on the relation between corruption and civil liberties. Treisman (1999) argues that while current levels of democracy do not influence corruption levels, long periods of democratic exposure actually decrease corruption. Brunetti/Weder (1999) introduce a differentiation between extorsive and collusive corruption. They define the former as the case where a public agent abuses his power to force citizens to pay a bribe for a service that he is supposed to provide anyway, and the latter as a situation where a public agent provides an illegal service to a citizen in exchange for a bribe. They show empirically that while press freedom is highly correlated with low overall corruption, it is not so with extorsive corruption, and they conclude that press freedom has an impact mainly on collusive corruption. Isham/Kaufman/Pritchett (1997) show that in countries with more developed civil liberties the performance of government projects is greatly improved. Mauro (1998) finds empirical proof that corruption reduces government spending on education. Persson et al. (2001) investigate the link between electoral rules and corruption, and find that proportional elections are associated with more corruption. Finally Acemoglu/Verdier (1998/2000), though mainly occupied with property rights and

market failure, investigate the theoretical relationship between corruption and the allocation of talent in a general equilibrium framework.

In section 2 we develop the theoretical model outlined above. Section 3 gives details on data and methodology, and section 4 presents the empirical results on corruption, press freedom and education. Section 5 investigates the direction of causation between press freedom and corruption. Section 6 briefly comments our results concerning the relationship between corruption and trade openness.

2 A simple model of corruption and education

Suppose an economy consists of bureaucrats and regular citizens, where bureaucrats provide a service that citizens need monopolistically. Monopolists can use their power to extract a rent from citizens in the form of a bribe B . But this gain for bureaucrats does not come without risk. The higher the bribe rate b an official demands (the bribe rate being the percentage of the value of the service he provides that he demands for himself), the higher his risk of being caught and sentenced for corruption. This is because a citizen might prefer not to obtain the service and instead denounce the corrupt official. Distinguishing between the bribe B and the bribe rate b , and using the latter as our measure of corruption, has the advantage that the level of corruption does not increase automatically with the general level of economic activity.

We assume that better educated bureaucrats can provide higher quality goods or services. As the bureaucrat's service is of higher value to his client, he can extract a higher bribe from him for a given bribe rate.

The probability P_D of a corrupt official being detected and sentenced to pay a fine F is not independent from the society he lives in. If there is a monitoring agency M , as for example a free press or an independent justice system, the risk for corrupt agents of being discovered and punished rises with the power and capacity of these

monitoring agencies.

An official's utility is equal to his wage, w , plus the expected bribe minus the expected fine

$$U(b, h, F, w) = w + B(b, h_B)(1 - P_D(h_B, b, M(h_M))) - P_D(h_B, b, M(h_M)) * F. \quad (1)$$

$B(b, h_B)$, the rent he extracts, increases with the bribe level b he chooses and with the quality of his services, described by his human capital h_B . His probability of being detected and sentenced $P_D(h_B, b, M(h_M))$ decreases with his own human capital h_B , but rises with the chosen bribe rate b . In addition it rises with the monitoring of his activity, $M(h_M)$, that itself depends positively on the level of human capital of the monitors h_M .

For simplicity we assume the human capital level of all agents in the economy to be equal, that is $h = h_B = h_M$, and normalise the wage to 0. To gain notational clarity we drop the parameters in the B and P functions. A bureaucrat now chooses his bribe level b such as to maximise his utility, which leads to the following first order condition⁸:

$$B_b(1 - P) - BP_b - FP_b = 0. \quad (2)$$

What is now the impact of a general rise in human capital on corruption measured by the bribe rate? Define $G(b, h) := B_b(1 - P) + BP_b - P_bF$. Implicit differentiation of G yields

$$\frac{\partial b}{\partial h} = - \frac{B_{bh}(1 - P) - B_b [P_M M_h + P_h] - B_h P_b - (B + F)P_{bh}}{\frac{\partial G}{\partial b}}.$$

Straightforward calculations (using the fact that the second order condition of equa-

⁸We drop the index D in the probability function to avoid confusion with partial derivatives.

tion 1 must be negative to insure that the bribe rate is maximised) shows that $\frac{\partial G}{\partial b}$ is always negative. Education will decrease corruption if $\frac{\partial b}{\partial h}$ is negative, that is if

$$\underbrace{B_{bh} [1 - P]}_{1(+)} - \underbrace{P_M M_h B_b}_{2(-)} - \underbrace{P_h B_b}_{3(+)} - \underbrace{P_b B_h}_{4(-)} - \underbrace{(B + F) P_{bh}}_{5(?)} < 0.$$

The first term accounts for the possibility of a more educated bureaucrat to extract higher rents. Making the reasonable and natural assumption of B_{bh} being positive (that is an increase in a bureaucrat's human capital, and thus the value of his service, increases his bribe the more, the higher is his bribe rate) we thus find that an increase in overall education leads to a rise in corruption due to a higher productivity of bureaucrats. The second term, which describes the increase of the probability of being caught due to an increase in the capacities of the monitoring agencies is negative. Consequently an increase in overall education leads to a fall in corruption via this monitoring term. The third term which turns out to be positive captures the increase in corruption due to the fall in the probability of being caught that is caused by a (more educated) bureaucrat's increasing level of sophistication. The fourth term describes the fall in corruption linked to the increase in the probability of being caught due to the fact that better educated bureaucrats go for higher bribe rates. The sign of the fifth term depends on the sign of P_{bh} . This cross derivative shows us how changes in the overall education level impact on a bureaucrat's incentives to change his bribe rate. When P_{bh} is positive this implies that increases in human capital, for a given increase in a bureaucrat's corruptness, increase his risk of detection. If on the contrary P_{bh} is negative, increases in human capital, again for a given increase in a bureaucrat's corruptness, will decrease his risk of detection. The cross derivative P_{bh} is thus a kind of measurement for whether the positive or negative aspects of education dominate bureaucrats' incentives to go for corruption.

The essential information provided by this equation is that an increase in ed-

education can increase corruption through the impact of terms 1 and 3, unless it is counterbalanced by a sufficient increase in the terms 2, 4 and eventually 5. As term 4 is of a more technical nature, our interpretation focuses on terms 2 and 5. Education is more likely to decrease corruption when terms 2 and 5 are large and negative. For term 2 this depends crucially on the size of $P_M M_h^{(+)(+)}$. We can interpret P_M as a proxy for the effectiveness of the monitoring institutions, as for example represented in their independence. For term 5 to be negative, the cross derivative P_{bh} has to be positive, which means that those aspects of education that lead to decreased incentives for bureaucrats to go for corruption must dominate. This is the case when education increases mainly the capacity of the monitoring institutions to detect corruption. Again, such an effect should be more pronounced if monitoring institutions are efficient, including in particular their independence.

Summing up, we can expect education to reduce corruption if a country has sufficiently independent monitoring systems, as for example a free press and an independent judiciary system. Education, however, may fail to do so, and may in the extreme even increase corruption, when the efficiency of the monitoring institutions is hampered by their lack of independence. We test this hypothesis econometrically in the following sections.

3 Data and methodology

We focus on the dynamic dimension and hence do not use the widely known “Transparency International” data for corruption, as these data have only been available on a regular basis since 1996. Instead we use a corruption perception index compiled by a private risk rating agency “Political Risk Services Group” which is regularly published in the International Country Risk Guide (ICRG). This index is compiled using less information than the TI Index, but has the advantage of being consistently available for a relatively long period (we use data from 1984-1995) and for a

larger number of countries (about 130). To measure press freedom, we use yearly data obtained from “Freedom House” yearly reports (1980-1997) on press freedom in the world. We scale variables to fluctuate between 0-10, where higher numbers indicate a better state of affairs, namely higher levels of press freedom, or lower corruption levels. In addition, we use the general classification from Freedom House of countries as having a free press, a partly free press, and no free press, equally available for the 1980-1997 period.

As proxies for a society’s level of education we use enrollment data from the World Bank’s 1999 “World Development Indicators”. More precisely we use net enrollment data for primary and secondary education, and as those data are unavailable for tertiary enrollment we use gross enrollment data for the latter. Furthermore, we use per capita GDP (in PPP terms) and trade openness (the sum of exports & imports as % of GDP) from the same World Bank tables. Lastly, we use rule-of-law ratings from the above-mentioned ICRG publication. All of these data are available annually for the 1984-1996 period. We report summary statistics of the variables in Table 1.

A word of caution is necessary before using this data-set. The ICRG corruption index that we are exploiting is based on the perception of country experts by one single agency only. It might thus be argued that it is less precise than, for example, the Transparency International (TI) index which is compiled from various surveys (there could, in particular, be problems with comparability of data across countries). However, apart from the fact that there is no choice anyway, as the time dimension of the TI data is still too restrictive, correlation of the ICRG corruption index and the TI index is quite high⁹ (around 0.8). Moreover we are convinced that an index compiled by a single agency is more precise than an index compiled from a multitude of sources that vary from year to year to track what we are most interested in, namely the changes in a given country over time.

⁹The exact numerical value depends on the year considered.

Another problem might arise as the length of our sample (12 years) could be considered too short to track variables like education or corruption. However twelve years cover three legislative periods and thus potentially three different governments in most democratic countries¹⁰, thus the chosen time period leaves quite some room for changes in politics and society.

Given very different forms of corruption, empirical work on the subject has been criticised for not having a clear idea of what is actually being measured, or for measuring the wrong type of corruption. The corruption perception of foreign country experts or businessmen, it is argued, is heavily biased to how exactly foreigners or foreign investors are treated in a country, and is not necessarily connected to the local population's experience. Moreover this critique also points out that top level corruption and petty corruption are completely different social phenomena, and therefore not necessarily correlated. It is obvious that these objections do raise points that merit further research, and especially increased efforts to collect more differentiated data. However, in most places different types of corruption seem to be correlated, and the problems that foreign investors face in a country seem to be similar to those local businesses are confronted with - apart from few exceptions. We do therefore strongly believe that the data for corruption that we and others have been using are an interesting and meaningful first proxy. Thanks to these data it has finally become possible to study issues connected with corruption in a serious econometric way, instead of dealing with them in the realm of pure speculation, as was the case until few years ago.

Based on the theoretical model developed in section 2 we can expect education to have a more beneficial impact on corruption in countries with better monitoring institutions (as a free press or an independent judiciary) than in countries where civil monitoring is poorly developed. Although this is not explicitly specified in the

¹⁰Non-democratic countries are often politically unstable and thus also have frequent changes in government.

model, there should be a difference between types of education. In our model, a potential increase in corruption from more education depends on the possibility of better educated bureaucrats becoming more sophisticated corruption rent-seekers. Primary education by itself is, however, rarely sufficient to be employed in a country's administration. Hence we would expect a possible negative effect from education on corruption to be confined to more advanced education.

We divide our sample into three groups, looking separately at countries that are classified as having no press freedom, a partly free press, or a free press.¹¹ Then, for all three samples, we run identical regressions in which we try to explain corruption levels through education, while controlling progressively for other variables that have been identified as influencing corruption. More precisely we run country fixed effects regressions, because unlike other studies, we are not mainly interested in the cross-section distribution (we know that, in general, more developed countries have higher levels of education and lower levels of corruption), but we want to know the impact of changes in a country's education levels on corruption¹².

In a first step we include variables which have been identified by other authors as influencing corruption as controls. However, a large part of the explanatory variables in other econometric studies have concerned structural features such as dominant religions or origin of legal systems that are time invariant (unless one regards extremely long time spans), and that therefore cannot be used in a country-fixed-effects regression. Based on previous studies, apart from education we have been able to identify four potential candidates that play some role in determining corruption and which vary to some degree over time. These are income levels, trade

¹¹We have unfortunately been unable to obtain data on the independence of the judicial system. We decided not to use data on the "rule of law" as a substitute for judiciary independence, because our focus is on the control mechanisms of society to check those in power. A country may be characterised by a high degree of rule of law in general (for example a military dictatorship), but this may still be insufficient when it comes to controlling those at the top. We therefore restrict our examination to the degree of press freedom as a proxy for civic society's monitoring capacities.

¹²Unsurprisingly -as some of our variables have different effects in the time and cross-section dimension- a random effects specification is clearly rejected by Hausman tests.

openness, public sector wages, and the share of natural resources in production or exports. However we were only able to obtain a sufficient amount of observations in the cross-section and time domain for the first two factors. Hence we restrict our control variables in the first step to trade openness (measured as the sum of exports and imports over GDP), and income levels (measured by the logarithm of GDP per capita).

In a second step we include other variables that we believe to have an important impact on corruption in the time dimension, these being press freedom and the Rule of Law. While Rule of Law has obviously been proposed by other authors, we did not want to include it in the first set of controls, as our variable was compiled based on the perceptions of the same individuals as our corruption index. This will lead to the possibility of an artificially high correlation between them. Moreover there may be problems with endogeneity. We include press freedom because we think that even within a group of countries with similar levels of press freedom (i.e. free, partly free, or not free) differences in press freedom will still have some impact on corruption.

We report the results of the regressions both without and with time fixed effects, the latter mainly as a way of ensuring that changes in the compilation of our data over time do not influence our results. We find that in both cases results are similar. Although not reported here, we undertook a series of other robustness checks. We reran our regressions progressively adding the control variables in different orders, and especially excluding Rule of Law. We also excluded some outliers, as well as all transition countries from the regressions. We detrended variables that grow (e.g. GDP), and reran the regressions using the detrended variables. Finally we reran all regressions controlling for serial auto-correlation. We found our results to be qualitatively robust to all these changes¹³.

¹³Regression results not displayed here can be obtained from the author upon request.

4 Econometric results

In this section we report the main regression results. Complete results for higher education are reported in Tables 2–3, for secondary education in tables 4-5, and primary education in tables 6-7.

First we see (Tables 2-3) that for the whole sample, higher education has a negative effect on corruption (i.e. increases corruption) which is significant or at least close to significance. This is in contrast with primary and secondary education, that do not have any significant positive or negative effect on corruption when regarding the whole sample. Furthermore we see (Tables 2-5) that for higher and secondary education there is generally a substantial difference between countries with and without press freedom. Coefficients for education are always significantly negative in the “no free press” sub-sample, but are insignificant, with varying signs, in the “partly free” or “free press” sub-samples. There is one exception; the coefficient of higher education in the regression of the free press country sub-sample with time fixed effects is significantly negative (see Table 3). The same coefficient for the “no free press” sub-sample (highly significant) is however almost ten times bigger, so that even in this case a potential negative effect from higher education on corruption is much stronger in countries that lack press freedom. Our empirical findings corroborate the predictions of our model, namely that increases in education can increase corruption, especially in countries that lack press freedom. Interestingly this effect does not hold for primary education, that does not have a negative influence on corruption in countries that lack press freedom (Tables 6-7). Though apparently in contradiction with our model, this latter feature captures its spirit well. In reality, primary education, by itself, is usually insufficient to allow a person to be admitted to the civil service, and moreover unlikely to noticeably reinforce the rent seeking capacity of a civil servant. Hence, in reality, we would expect a potential negative effect from education on corruption to be observed mainly for more advanced forms of education.

The different relationship between primary and more advanced forms of education with corruption also has the advantage of clearly indicating that our results are not driven mainly by inverse causation. It has been shown that corruption increases “corruption prone” public spending (e.g. for infrastructure projects), and decreases spending on more “corruption proof” items as salaries or education (Mauro 1998). It would be unsurprising if such an effect was stronger in countries that lack mechanisms to monitor those in power, that is e.g. where press freedom is low. Hence corruption may lead to less education, and such an effect could be stronger, the less developed press freedom. However, in such a case, corruption should, for a given level of press freedom, have an impact on all forms of education in the same way. Our empirical finding that, for a given level of press freedom, the relation between corruption and education is different between basic and advanced forms of education is incompatible with the “inverse causation” explanation.

5 Press freedom and corruption - How does causation run?

In this section we turn to the question of causality between press freedom and corruption. Unsurprisingly, both variables are highly correlated. However, this correlation may be spurious. Supposing it was not, it is a priori unclear in which way causation runs. Do corrupt governments reduce press freedom to prevent their wrong-doings from being publicly exposed? Or is it that, in the absence of the monitoring facilities of civil society, bureaucrats and politicians simply exploit the situation for increasing bribe extraction?

The most broadly used approach in econometrics to test for causation is what has become known as “Granger test for causality”¹⁴. “Granger causality” is a mathemat-

¹⁴The concept was introduced in Granger (1969).

ical translation of the idea of causation, which is more narrow than the (somewhat diffuse) meaning of causation as it is used in the general language. The main advantage of Granger causality is that, by being clearly defined, it makes empirical testing possible. Roughly speaking, a variable X is said to Granger-cause a variable Y if past values of X provide additional information for the forecast of Y that is not contained in the past values of Y.

More precisely consider two processes X and Y. X Granger causes Y if, for a suitable lag length q , the past values $x_{t-1}, x_{t-2}, \dots, x_{t-q}$ of X do not provide additional information for the forecast of y_t that is not already contained in the past values $y_{t-1}, y_{t-2}, \dots, y_{t-q}$ of Y.

While testing for Granger causality between time series data has become standard, a Granger causality test for panel data has only recently been defined and applied in Hall et al. (2001). They consider the regression equation $y_{i,t} = \alpha_i + \beta_{t-1}y_{i,t-1} + \delta_{t-1}x_{i,t-1} + u_{i,t}$, where y_i is the dependent variable, x_i the independent variable, the α_i are individual fixed effects, and $u_{i,t}$ is the error term with standard properties.

According to Hall et al. a variable v is said to Granger cause w if in a regression of the above type where v is the independent variable the coefficient δ is economically and statistically significant, while in a regression where w is the independent variable the coefficient δ is statistically insignificant. We apply this test to our panel data on press freedom and corruption. As before we use country fixed effects regressions. Moreover, in a second step, we control for time fixed effects in each regression. As the choice of $q=1$ as suitable lag length is to some degree arbitrary, we also report the results of the test for $q=2$ and $q=3$. More precisely, we consider the regression equation $y_{i,t} = \alpha_i + \beta_{t-1}y_{i,t-1} + \dots + \beta_{t-q}y_{i,t-q} + \delta_{t-1}x_{i,t} + \dots + \delta_{t-q}x_{i,t-q} + u_{i,t}$. In this more general case v is said to Granger cause w if in a regression where v is the independent variable all coefficients $\delta_{t-1}, \dots, \delta_{t-q}$ are jointly statistically significant, while in a regression where w is the independent variable the coefficients $\delta_{t-1}, \dots, \delta_{t-q}$

are jointly statistically insignificant. From the result tables (Tables 8-9), we see that in the regression on corruption many lagged values of press freedom are individually significant with the right sign (i.e. a higher degree of press freedom leading to a better score on corruption - that is less corruption). More importantly, the lagged values of press freedom are always jointly highly significant in explaining corruption, with the exception of one regression where they would only be significant at a 12% level. On the contrary, in the regressions on press freedom, individual coefficients of lagged values of corruption are never statistically significant with the right sign. The few that are statistically significant have negative coefficients, which appears to indicate that corruption should actually increase press freedom. Moreover, in half of the joint significance tests, lagged values of corruption come across as insignificant in explaining press freedom. In those regressions where they are significant, significance levels are way below those in the corresponding regressions on corruption.

We see these results as strong evidence that there is solid causation, in the sense of Granger, from press freedom to corruption, that is increases in press freedom decrease corruption. Results about causation in the inverse sense, that is changes in corruption causing changes in press freedom, are contradictory. They are mainly driven by results indicating that increasing corruption would increase press freedom. This is counterintuitive and strange, given the strong cross-section correlation that indicates that usually high levels of corruption and low levels of press freedom go hand in hand. In any case, if one really interpreted these results as a sign for a causation from corruption to press freedom, the econometric evidence for such a causation would be hugely less significant than the econometric evidence for a causation from press freedom to corruption.

Summing up, we find strong evidence that more press freedom leads to less corruption, and no evidence that more corruption leads to less press freedom. Increasing press freedom is thus an important indirect mechanism for fighting corruption.

6 Corruption and trade openness

While this is obviously not the focus of our paper we would like to comment briefly on our results on the relationship between corruption and trade openness. So far most empirical studies have found a positive cross-section correlation between trade openness and low corruption levels, and so these studies have been advising opening up the economy as a means of decreasing corruption. For example Ades/DiTella (1997b,1999) argue that the existence of rents in a country leads to corruption, and therefore that competition from foreign firms, by reducing rents in a local market, decreases corruption. Using different corruption indexes, they use cross-sections of approximately 30 and 50 countries, as well as a panel with observations for two years in roughly 50 countries to show that a larger share of imports in a country's GDP decreases corruption. To avoid problems of endogeneity (namely that corruption acts as a barrier to imports and thus decreases trade openness) they use population and size of a country as instruments, and find results to be robust in these varying specifications. Larrain/Tavares (2000), in the most careful econometric study on openness and corruption so far, significantly improve the instrumenting by constructing a sophisticated measure of how much a country should trade given a large number of characteristics clearly uncorrelated with its degree of corruption. They find that cross-country, both an increase in a country's import or export share decreases corruption. Treisman (1999) using different corruption indexes in cross-sections of varying size¹⁵ equally obtains the result that higher import shares decrease corruption (although he finds the significance of this result to be of low robustness). Moreover, he shows a potential positive effect of openness on corruption to be extremely small. Finally Brunetti and Weder (1999), in a cross-section regression of roughly 80-100 countries, find that the positive effect of trade openness on corruption defined in the standard way (namely imports plus exports as share of

¹⁵Between 36-64 countries.

GDP) becomes insignificant when controlling for other variables of economic development¹⁶.

Our study seems to indicate that even if there was a cross-section correlation with more open countries being on average less corrupt, within the time dimension a more open economy is correlated with more corruption. This would appear to indicate that opening up an economy might actually increase corruption, at least in the short and medium-term. We hypothesize that more trade could, in the short-run, simply mean more scope for bribe extraction (at customs, to obtain permits or lower tariffs, etc.) and so lead to increases in corruption. Only in the long-term might the beneficial impact of “good practice” or increased competition become relevant and lead to lower corruption levels. However, a closer inspection of this interesting but preliminary empirical finding is beyond the scope of this paper and has to be left open for further research.

Conclusion

With this article, we hope to have drawn attention to an area that, by and large, has been absent from political economy literature in general, and the literature on corruption in particular, namely press freedom. We have presented two channels through which low levels of press freedom can lead to increased corruption. We have argued that in countries with low levels of civil monitoring of those in public office, increases in education (especially more advanced education) might not have the expected positive impact on corruption, as they might principally increase agents’ rent seeking capacity. We provided empirical evidence that increases in secondary and higher education have a negative impact on corruption in countries that lack press freedom. There is, by contrast, no such negative effect from primary

¹⁶The two latter papers do, however, not control for possible endogeneity, Treisman because he finds existing instruments unconvincing, Brunetti/Weder as trade openness is not the main focus of their paper.

education We have then concentrated on the direct link between press freedom and corruption. While it is easily observable and widely acknowledged that high levels of press freedom tend to go hand in hand with low levels of corruption (and vice versa), we have provided evidence indicating that causation runs mainly from press freedom to corruption, that is lack of press freedom leads to increased corruption. Strengthening press freedom is thus an efficient tool in the fight against corruption.

While the relation between trade openness and corruption has not been the primary focus of this article, it seems nevertheless worth mentioning that our results differ substantially from those presented in the empirical literature so far. A minority of articles finds no robust correlation, however the majority finds lower corruption levels go hand in hand with more openness to trade. Surprisingly, we do find a strong opposite effect in the time dimension, that is countries that increase their openness to trade experience rising corruption levels at the same time. As this issue has not been the main focus of this paper we would like to interpret this finding with prudence, and mainly as a way of indicating that there is an urgent need for more profound research. However, while we think that in general opening up an economy to international trade has merits in itself, for the time being we would ask for extreme caution in advocating opening up for the sake of fighting corruption.

Appendix

Data sources / Description of variables

Corruption

This indicator reflects the degree of corruption (a higher score means less corruption). Corruption is expected to be encountered “in the form of demand for special payments and bribes connected with import and export licences, exchange controls, tax assessments, police protection, or loans”. Forms of “excessive patronage, nepotism, job reservations, and ‘favour-for-favours’ are also considered risky for foreign business. Source: International Country Risk Guide (ICRG), various April issues. (the ICRG is a publication from a private risk rating agency called Political Risk Services Group, based in East Syracuse, New York. The publication offers indexes of different kinds of risk, covering about 130 countries).

Rule of Law

This variable reflects “the degree to which the citizens of a country are willing to accept the established institutions to make and implement laws and adjudicate disputes”. A grade corresponding to low risk is assigned to countries “with an established law and order tradition, ... sound political institutions, a strong court system, and provisions for an orderly succession of power” Source: ICGR, various April issues, Political Risk Services Group

Press Freedom

The indexes for press freedom are based on a yearly Freedom House survey on press freedom in the world. In each country surveyed the “system of mass communication is assessed. The degree to which each system permits the free flow of information to and from the public determines the classification of each country’s news and information media as being ‘free’, ‘partly free’, or ‘not free’.” In compiling the survey Freedom House measures the degree to which “law and administrative decisions of the government influence the content of the news media”, the degree of

“political influence or control over the content of the news system”, “the economic influences on the media exerted either by government or private entrepreneurs”, and the degree “of oppression of the news media exhibited in many forms (from killing ... to interfering with news production or distribution)”. Source: Freedom House, yearly press freedom report

Higher Education

Gross school enrollment, tertiary. Gross enrolment ratio is the ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Estimates are based on the International Standard Classification of Education (ICSED). Tertiary education, whether or not to an advanced research qualification, normally requires, as a minimum condition of admission, the successful completion of education at the secondary level. Source: World Bank Development Indicators, 1999

Secondary Education

Net school enrollment, secondary. Net enrollment ratio is the ratio of the number of children of official school age (as defined by the national education system) who are enrolled in school to the population of the corresponding official school age. Secondary education completes the provision of basic education that began at the primary level, and aims at laying the foundations for lifelong learning and human development, by offering more subject- or skill-oriented instruction using more specialised teachers. Source: World Bank Development Indicators, 1999

Primary Education

Net school enrollment, primary. Net enrollment ratio is the ratio of the number of children of official school age (as defined by the national education system) who are enrolled in school to the population of the corresponding official school age. Primary education provides children with basic reading, writing, and mathematics skills along with an elementary understanding of such subjects as history, geography, natural science, social science, art, and music. Source: World Bank Development

Indicators, 1999

GDP_{pc}

- GDP per capita based on purchasing power parity (PPP). GDP PPP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar in the United States. GDP measures the total output of goods and services for final use occurring within the domestic territory of a given country, regardless of the allocation to domestic and foreign claims. Gross domestic product at purchaser values (market prices) is the sum of gross value added by all resident and nonresident producers in the economy plus any taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current international dollars. Source: World Bank Development Indicators, 1999

Trade Openness

Trade openness is the sum of exports and imports of goods and services measured as a share of gross domestic product. Source: World Bank Development Indicators, 1999

Table 1 Summary Statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
Corruption	overall	5.6	2.4	0.0	10.0	N=1215
	between		2.2			n=109
	within		0.9			
LogGDPpc	overall	8.2	1.1	5.6	10.2	N=1215
	between		1.1			n=109
	within		0.2			
Trade Openness	overall	31.8	36.8	0.0	318.5	N=1215
	between		38.9			n=109
	within		10.1			
Higher Education	overall	17.4	16.3	0.1	97.7	N=1215
	between		15.7			n=109
	within		4.2			
Secondary Education	overall	52.8	28.6	4.0	98.3	N=892
	between		28.7			n=78
	within		3.1			
Primary Education	overall	82.6	21.3	17.9	105.0	N=1105
	between		21.3			n=99
	within		3.2			
Rule of law	overall	5.9	2.4	0.0	10.0	N=1215
	between		2.2			n=109
	within		0.9			
Press Freedom	overall	5.4	3.0	0.1	9.5	N=1215
	between		2.6			n=109
	within		1.4			

Table 2 Higher Education & Corruption

	Full sample	Full Sample	Not Free	Partly Free	Free	Not Free	Partly Free	Free
Higher Education	-0.011 (1.73)	-0.010 (1.78)	-0.084 (2.08)*	-0.013 (0.33)	-0.005 (0.80)	-0.111 (2.87)**	-0.048 (1.32)	-0.005 (0.83)
LogGDPpc	1.404 (7.31)**	0.633 (3.63)**	1.437 (3.49)**	1.515 (4.62)**	1.116 (3.28)**	1.024 (2.57)*	0.435 (1.43)	0.954 (2.84)**
Trade Openness	-0.017 (3.44)**	-0.017 (3.43)**	-0.010 (1.19)	-0.023 (2.66)**	-0.026 (2.78)**	-0.008 (0.97)	-0.019 (2.30)*	-0.028 (3.07)**
Rule of Law		0.328 (10.15)**				0.253 (4.03)**	0.473 (6.98)**	0.365 (4.94)**
Press Freedom		0.077 (3.75)**				-0.027 (0.43)	0.089 (1.58)	0.199 (2.76)**
Nb. of Observ.	1215	1215	372	400	443	372	400	443
Nb. of countries	109	109	62	76	55	62	76	55

Robust t statistics in parentheses

* significant at 5% level; ** significant at 1% level

Note: The above table reports the results from panel regressions with robust (Huber/White) standard errors where we control for country fixed effects. We regress corruption on the variables in the column to the left for which results are reported (results for a constant term that is equally included in all regressions are not reported). See the Appendix for a detailed description of variables and sources. Each column of the table presents the estimated coefficient values and t-statistics from one regression, where the sample used for the regression varies as indicated in the first row of the table. Not free, partly free, and free refer to a restriction of the full sample to a subsample of countries and periods where the press has been, respectively, not free, partly free, or free. The last two rows give, respectively, the number of observations used in a regression, and the number of countries from which these observations are taken. Note that the sum of the countries used in different subsamples can exceed the total number of countries of the full sample, as countries can be classified differently with respect to press freedom for different periods.

Table 3 Higher Education & Corruption
(including time fixed effects)

	Full Sample	Full Sample	Not Free	Partly Free	Free	Not Free	Partly Free	Free
Higher Education	-0.025 (3.79)**	-0.016 (2.56)*	-0.110 (2.56)*	-0.063 (1.62)	-0.010 (1.32)	-0.131 (3.34)**	-0.073 (1.91)	-0.019 (2.08)*
LogGDPpc	0.917 (3.14)**	0.461 (1.67)	1.411 (3.43)**	-0.244 (0.34)	1.963 (2.12)*	0.974 (2.37)*	-0.899 (1.33)	1.217 (1.36)
Trade Openness	-0.017 (3.48)**	-0.016 (3.24)**	-0.014 (1.60)	-0.021 (2.18)*	-0.027 (2.60)**	-0.011 (1.25)	-0.015 (1.57)	-0.028 (3.03)**
Rule of Law		0.313 (9.17)**				0.249 (3.80)**	0.432 (5.22)**	0.318 (4.30)**
Press Freedom		0.068 (3.18)**				-0.088 (1.07)	0.071 (0.96)	0.426 (3.24)**
Nb. of Observ.	1215	1215	372	400	443	372	400	443
Nb. of countries	109	109	62	76	55	62	76	55

Robust t statistics in parentheses

* significant at 5% level; ** significant at 1% level

Note: The above table reports the results from panel regressions with robust (Huber/White) standard errors, where we control both for country and time fixed effects. We regress corruption on the variables in the column to the left for which results are reported (results for a constant term that is equally included in all regressions are not reported). See the Appendix for a detailed description of variables and sources. Each column of the table presents the estimated coefficient values and t-statistics from one regression, where the sample used for the regression varies as indicated in the first row of the table. Not free, partly free, and free refer to a restriction of the full sample to a subsample of countries and periods where the press has been, respectively, not free, partly free, or free. The last two rows give, respectively, the number of observations used in a regression, and the number of countries from which these observations are taken. Note that the sum of the countries used in different subsamples can exceed the total number of countries of the full sample, as countries can be classified differently with respect to press freedom for different periods.

Table 4 Secondary Education & Corruption

	Full sample	Full Sample	Not Free	Partly Free	Free	Not Free	Partly Free	Free
Secondary Education	0.008 (0.65)	-0.015 (1.26)	-0.044 (2.16)*	0.055 (1.81)	0.010 (0.49)	-0.067 (3.55)**	0.029 (1.07)	0.005 (0.25)
LogGDPpc	1.411 (6.49)**	0.729 (3.67)**	1.526 (3.03)**	2.176 (5.26)**	1.103 (3.08)**	0.875 (1.73)	1.009 (2.21)*	0.868 (2.46)*
Trade Openness	-0.013 (2.39)*	-0.014 (2.42)*	0.002 (0.17)	-0.004 (0.57)	-0.027 (2.81)**	0.003 (0.22)	-0.008 (1.13)	-0.029 (3.11)**
Rule of Law		0.383 (10.30)**				0.347 (4.55)**	0.426 (4.52)**	0.425 (5.12)**
Press Freedom		0.090 (3.72)**				0.016 (0.20)	0.076 (1.08)	0.169 (2.18)*
Nb. of Observ.	892	892	236	258	398	236	258	398
Nb. of countries	78	78	39	48	48	39	48	48

Robust t statistics in parentheses

* significant at 5% level; ** significant at 1% level

Note: The above table reports the results from panel regressions with robust (Huber/White) standard errors where we control for country fixed effects. We regress corruption on the variables in the column to the left for which results are reported (results for a constant term that is equally included in all regressions are not reported). See the Appendix for a detailed description of variables and sources. Each column of the table presents the estimated coefficient values and t-statistics from one regression, where the sample used for the regression varies as indicated in the first row of the table. Not free, partly free, and free refer to a restriction of the full sample to a subsample of countries and periods where the press has been, respectively, not free, partly free, or free. The last two rows give, respectively, the number of observations used in a regression, and the number of countries from which these observations are taken. Note that the sum of the countries used in different subsamples can exceed the total number of countries of the full sample, as countries can be classified differently with respect to press freedom for different periods.

Table 5 Secondary Education & Corruption
(including time fixed effects)

	Full Sample	Full Sample	Not Free	Partly Free	Free	Not Free	Partly Free	Free
Secondary Education	-0.014 (1.07)	-0.021 (1.73)	-0.061 (2.79)**	0.039 (1.42)	-0.009 (0.41)	-0.074 (3.87)**	0.032 (1.20)	-0.013 (0.58)
LogGDPpc	1.087 (3.05)**	0.948 (2.80)**	1.496 (3.17)**	1.403 (1.16)	2.499 (2.57)*	1.026 (1.96)	1.007 (0.86)	1.502 (1.59)
Trade Openness	-0.014 (2.53)*	-0.014 (2.42)*	-0.003 (0.25)	-0.015 (1.74)	-0.028 (2.68)**	-0.002 (0.19)	-0.012 (1.48)	-0.029 (3.04)**
Rule of Law		0.344 (8.86)**				0.299 (3.64)**	0.339 (2.62)**	0.378 (4.55)**
Press Freedom		0.099 (3.90)**				-0.050 (0.43)	0.081 (0.77)	0.363 (2.58)*
Nb. of Observ.	892	892	236	258	398	236	258	398
Nb. of countries	78	78	39	48	48	39	48	48

Robust t statistics in parentheses

* significant at 5% level; ** significant at 1% level

Note: The above table reports the results from panel regressions with robust (Huber/White) standard errors, where we control both for country and time fixed effects. We regress corruption on the variables in the column to the left for which results are reported (results for a constant term that is equally included in all regressions are not reported). See the Appendix for a detailed description of variables and sources. Each column of the table presents the estimated coefficient values and t-statistics from one regression, where the sample used for the regression varies as indicated in the first row of the table. Not free, partly free, and free refer to a restriction of the full sample to a subsample of countries and periods where the press has been, respectively, not free, partly free, or free. The last two rows give, respectively, the number of observations used in a regression, and the number of countries from which these observations are taken. Note that the sum of the countries used in different subsamples can exceed the total number of countries of the full sample, as countries can be classified differently with respect to press freedom for different periods.

Table 6 Primary Education & Corruption

	Full sample	Full Sample	Not Free	Partly Free	Free	Not Free	Partly Free	Free
Primary Education	0.001 (0.09)	-0.003 (0.26)	-0.013 (0.82)	0.056 (1.82)	-0.078 (2.73)**	-0.012 (0.79)	0.018 (0.64)	-0.067 (2.55)*
LogGDPpc	1.319 (6.75)**	0.581 (3.16)**	0.837 (2.06)*	1.767 (4.29)**	1.208 (3.62)**	0.406 (0.95)	0.657 (1.66)	1.055 (3.25)**
Trade Openness	-0.017 (3.46)**	-0.017 (3.41)**	-0.013 (1.32)	-0.025 (2.68)**	-0.026 (2.74)**	-0.012 (1.23)	-0.023 (2.53)*	-0.028 (3.04)**
Rule of Law		0.320 (9.55)**				0.207 (3.32)**	0.455 (6.07)**	0.336 (4.70)**
Press Freedom		0.074 (3.32)**				-0.057 (0.76)	0.056 (0.88)	0.200 (2.78)**
Nb. of Observ.	1105	1105	326	346	433	326	346	433
Nb. of countries	99	99	55	67	52	55	67	52

Robust t statistics in parentheses

* significant at 5% level; ** significant at 1% level

Note: The above table reports the results from panel regressions with robust (Huber/White) standard errors where we control for country fixed effects. We regress corruption on the variables in the column to the left for which results are reported (results for a constant term that is equally included in all regressions are not reported). See the Appendix for a detailed description of variables and sources. Each column of the table presents the estimated coefficient values and t-statistics from one regression, where the sample used for the regression varies as indicated in the first row of the table. Not free, partly free, and free refer to a restriction of the full sample to a subsample of countries and periods where the press has been, respectively, not free, partly free, or free. The last two rows give, respectively, the number of observations used in a regression, and the number of countries from which these observations are taken. Note that the sum of the countries used in different subsamples can exceed the total number of countries of the full sample, as countries can be classified differently with respect to press freedom for different periods.

Table 7 Primary Education & Corruption
(including time fixed effects)

	Full Sample	Full Sample	Not Free	Partly Free	Free	Not Free	Partly Free	Free
Primary Education	0.000 (0.05)	-0.002 (0.22)	-0.011 (0.72)	0.037 (1.28)	-0.074 (2.61)**	-0.012 (0.76)	0.015 (0.56)	-0.076 (2.72)**
LogGDPpc	0.978 (3.03)**	0.550 (1.78)	0.941 (2.26)*	0.526 (0.55)	1.788 (1.99)*	0.509 (1.13)	-0.497 (0.52)	1.022 (1.15)
Trade Openness	-0.018 (3.64)**	-0.017 (3.31)**	-0.019 (1.86)	-0.030 (2.84)**	-0.026 (2.51)*	-0.017 (1.60)	-0.023 (2.24)*	-0.028 (2.89)**
Rule of Law		0.307 (8.70)**				0.199 (2.79)**	0.437 (4.65)**	0.298 (4.14)**
Press Freedom		0.070 (3.05)**				-0.074 (0.78)	0.005 (0.06)	0.407 (3.32)**
Nb. of Observ.	1105	1105	326	346	433	326	346	433
Nb. of countries	99	99	55	67	52	55	67	52

Robust t statistics in parentheses

* significant at 5% level; ** significant at 1% level

Note: The above table reports the results from panel regressions with robust (Huber/White) standard errors, where we control both for country and time fixed effects. We regress corruption on the variables in the column to the left for which results are reported (results for a constant term that is equally included in all regressions are not reported). See the Appendix for a detailed description of variables and sources. Each column of the table presents the estimated coefficient values and t-statistics from one regression, where the sample used for the regression varies as indicated in the first row of the table. Not free, partly free, and free refer to a restriction of the full sample to a subsample of countries and periods where the press has been, respectively, not free, partly free, or free. The last two rows give, respectively, the number of observations used in a regression, and the number of countries from which these observations are taken. Note that the sum of the countries used in different subsamples can exceed the total number of countries of the full sample, as countries can be classified differently with respect to press freedom for different periods.

Table 8 Granger Causality Tests

Dependent Variable	Coefficient Values for Independent Variable			p-value F-Test	Observations	Countries
	δ_{t-1}	δ_{t-2}	δ_{t-3}			
Press Freedom	-0.059 [2,13]			3.3%	1473	129
Corruption	0.052 [3,60]			0.0%	1344	129
Press Freedom	-0.103 [2,45]	0.056 [1,31]		4.5%	1344	129
Corruption	0.027 [1,35]	0.043 [2,10]		0.0%	1215	129
Press Freedom	-0.088 [2,01]	0.077 [1,46]	-0.005 [0,11]	24.0%	1215	129
Corruption	0.022 [1,03]	0.042 [1,64]	0.008 [0,38]	0.3%	1086	127

Note: Each row of the table reports the results of a country fixed effects regression. The first column designates the dependent variable. If the dependent variable is Press Freedom, the independent variable is Corruption, and vice versa. The second to forth columns report estimated coefficient values for different lagged values of the independent variable (absolute t-values in parentheses) used in the regression. Estimated coefficient values of lagged values of the dependent variable used on the right-hand side of the regression are not reported. The fifth column gives the p-value for the F-test of the hypothesis that all δ coefficients are jointly insignificant. A p-value of 5%, for example, signifies that the hypothesis that all δ coefficients are jointly insignificant can be rejected at the 5% significance level. The last two columns give, respectively, the number of observations used in a regression, and the number of countries from which these observations are taken.

Table 9 Granger Causality Tests
(including time fixed effects)

Dependent Variable	Coefficient Values for			p-value F-Test	Observations	Countries
	δ_{t-1}	δ_{t-2}	δ_{t-3}			
Press Freedom	-0.059 [2,14]			3.3%	1473	129
Corruption	0.044 [2,78]			0.6%	1344	129
Press Freedom	-0.089 [2,16]	0.040 [0,95]		7.6%	1344	129
Corruption	0.030 [1,43]	0.023 [1,06]		1.8%	1215	129
Press Freedom	-0.074 [1,73]	0.077 [1,48]	-0.029 [0,67]	32.4%	1215	129
Corruption	0.025 [1,12]	0.021 [0,78]	0.007 [0,31]	11.8%	1086	127

Note: Each row of the table reports the results of a country fixed effects regression, where in addition time fixed effects have been included. Estimated coefficient values for time fixed effects are not reported. The first column designates the dependent variable. If the dependent variable is Press Freedom, the independent variable is Corruption, and vice versa. The second to fourth columns report estimated coefficient values for different lagged values of the independent variable (absolute t-values in parentheses) used in the regression. Estimated coefficient values of lagged values of the dependent variable used on the right-hand side of the regression are not reported. The fifth column gives the p-value for the F-test of the hypothesis that all δ coefficients are jointly insignificant. A p-value of 5%, for example, signifies that the hypothesis that all δ coefficients are jointly insignificant can be rejected at the 5% significance level. The last two columns give, respectively, the number of observations used in a regression, and the number of countries from which these observations are taken.

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