



**Groupe d'économie
Lare-Efi
du développement**

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**Corruption Perceptions:
the Trap of Democratization,
*a Panel Data Analysis***

By

Thomas Roca

PhD student – Lare-Efi, Groupe d'Economie du Développement – Université Montesquieu-Bordeaux IV

Eda Alidedeoglu-Buchner

Former Consultant for OECD Public Governance Directorate

(The views expressed here are the author's own and not in any way to be construed as OECD policy or commentary.)

PhD student – Université Paris-Dauphine



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Thomas Roca

PhD student – Lare-Efi, Groupe d'Economie du Développement – Université Montesquieu-Bordeaux IV
(roca.thomas@gmail.com)

Eda Alidedeoglu-Buchner

Consultant, PhD student – Université Paris-Dauphine

Abstract:

The Corruption Perception Index (CPI) is the most famous corruption evaluation since its first publication by *Transparency International* (TI), in 1995. This index is also considered the most robust measure of corruption perceptions. However, since it precisely refers to perceptions, it inevitably faces some limitations. Although *Transparency International* continuously advocates for a better use of its indexes, policy makers keep using the *CPI* as a decision making tool.

In a previous article we isolated the role played by the media in corruption perceptions. We previously suggested that young democracies were penalized by *Transparency International*. Indeed, we showed that media aperture leads to a better coverage of corruption deeds and therefore drives a stronger perception of already existing - but not yet broadcasted - corruption.

Our previous paper was using cross-section data. Pursuing more consistent evidence and robustness improvement, we collected time series to perform a panel data analysis, questioning the stability and precision of our earlier findings.

In this new paper, we investigate the link between democracy and corruption perceptions, in the light of a possible opening bias, we already called “reflective bias”.

Résumé :

L'indice de perception de la corruption de *Transparency International* (TI) est le plus célèbre des indicateurs de corruption depuis sa première publication, en 1995. Cet indicateur est également considéré comme la plus robuste des mesures de ce fléau. Cependant, puisque il s'agit précisément d'un indicateur basé sur des perceptions, il connaît certaines limites.

Bien que *Transparency International* appelle inlassablement à une utilisation plus prudente de ses indicateurs, les décideurs continuent de lui prêter un rôle d'outil d'aide à la prise de décision.

Nous avons isolé, dans un article précédent, le rôle joué par les médias dans les perceptions de la corruption. Nous avons suggéré que les jeunes démocraties puissent être pénalisées par l'indicateur phare de *Transparency International*. En effet, nous avons montré que l'ouverture des médias conduisait à une meilleure couverture des actes de corruption, entraînant avec elle une plus forte perception de la corruption déjà existante, mais non révélée.

Notre article précédent utilisait des données en coupe transversale. Dans un souci d'amélioration de la robustesse et de la précision de l'analyse précédemment menée, nous avons collecté des séries temporelles afin d'entreprendre une analyse en données de panel. Dans ce nouvel article, nous analysons le lien entre démocratie et perceptions de la corruption à la lueur d'un possible biais d'ouverture des régimes en place, biais que nous avons qualifié de « réflexif ».

Keywords: Corruption, Governance, Corruption perception index, CPI, Transparency International, Corruption measurement, Perception indicators, Press freedom, Freedom house.

JEL classification: O11; O17; O19

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1. Introduction

Transparency International (TI) Corruption Perception Index is the most famous corruption index since its first publication in 1995. This index is also considered as the most robust measure of corruption perceptions. However, since it precisely refers to perceptions, it inevitably faces some limitations. Henceforth, governance index hazards are well documented, a growing literature criticizes governance assessment (Arndt C. & Oman, C.P. (2006); Becker, L. B., Vlad T., & Nusser, N. (2007); Kaufmann, D., & Kraay, A. (2008)...). However, most of the already identified limits focus on methodology, while only a few investigate measurement bias (Razafrindrakoto, M. & Roubaud, F. (2005), Olken, B.A. (2009)...).

Although *Transparency International* continuously advocates for a better use of its index, policy makers keep using it as a decision making tool. This article aims to demonstrate the existence of an aperture bias, calling for a cautious use of the CPI, especially for young democracies.

Seeking to isolate better the impact of a political regime move on corruption perceptions, we collected time series. We first hesitated on the appropriate measure of democracy. *Freedom House* has also been criticized, but remains one of the most followed democracy evaluation producers. Other datasets are nevertheless available proposing dictatorship-democracy distinction or democracy scores (Cheibub, J.A. Gandhi, J. & Vreeland, J.R. (2009); the *Bertelsmann Transformation Index*; the *Democracy Score* from *Economist Intelligence Unit*, etc.). Nonetheless, our purpose here is to analyze the most widespread indicators, therefore we choose two datasets produced by *Freedom House*: “Electoral democracy” and “Freedom in the world”. For the latter, we will more specifically use one of its sub-components: the “Political Rights” index.

In this paper, we also introduce a new measure of the size of shadow economy, compiled by Schneider, F. and *alii* (2010) and available in time series (1999-2007) with a large coverage (162 countries). If their authors appear influenced by the public choice school, their methodology is fully described, allowing data users to make their own judgment of a prospective ideological bias. We introduce this data as a control variable; intuition would command that corruption and the size of shadow economy follow the same direction.

2. Preparatory analysis

A. Data description

Transparency International CPI ranks countries using a 1 to 10 scale¹, 1 standing for widespread corruption and 10, standing for a corruption-free country. We collected time series from 1996 to 2008. During these thirteen years, the CPI coverage widely increased (41 countries were evaluated in 1996, up to 179 countries in 2008), the resulting missing values ultimately provide an unbalanced dataset we will need to check for heteroskedasticity pitfalls.

¹ More information on CPI methodology: *Transparency International* (2010a).

As previously mentioned, we chose two *Freedom House* indexes as democracy indicators²: *Political Rights index* and *Electoral democracy dataset*.

The “Political Rights Index” ranks countries according to the width of democracy. “Countries and territories with a rating of 1 enjoy a wide range of political rights, including free and fair elections. Candidates who are elected actually rule, political parties are competitive, the opposition plays an important role and enjoys real power, and minority groups have reasonable self-government or can participate in the government through informal consensus.”³

Overall, *Freedom House* operates a distinction referring to three categories. A country is qualified as “Free” if it scores between 1 to 3. From 3 to 5, a country is considered “Partly free” and from 5 to 7, it is flagged as “Not free”.

Political Rights have been evaluated this way since 1972. Although the methodology evolved since then, for the period 1996 to 2008 it appears consistent. Political Rights index covers 192 countries.

In our previous article, we used the “Press Freedom Index” to assess regime aperture across countries. However, press freedom indicators have been constructed quite recently, therefore it was not possible to take benefit from consistent time series (e.g. “Freedom of press barometer” (*Reporter Without Borders*) is available since 2002; “Freedom of Press Index” (*Freedom House*) first publication was launched in 2004).

We decided to use also a binary measure, classifying countries in two groups: “Electoral democracies” and “Dictatorship”. We first created a dummy variable - we labeled “Political Regime” - with the table provided by *Freedom House*⁴; 0 standing for “non democratic regimes” and 1 standing for “Electoral democracy”.

As control variables, we selected the logarithm of GDP per capita available in the *World Development Indicators* (World Bank), the Human Development Index (HDI-UNDP) and the size of shadow economy (in percentage of GDP). This last variable is aggregated by Schneider, F. Buehn, A. Montenegro, C.E. (2010), the methodology and the time series are detailed in this article: “Shadow Economies all over the World: New Estimates for 162 Countries from 1999 to 2007”.

As first analysis, we draw a correlation matrix (**Table1** page 5) describing our data. The correlations among these variables are significant. As previously observed⁵, the correlation between press freedom and the selected democracy index (Political Rights) is very strong⁶ ($R^2 = -0.913$).

The Corruption Perception Index is also strongly correlated with HDI, GDP per capita, and the size of shadow economy. To better evaluate the relative impact of these variables on corruption perceptions, we will need to perform further econometrics analysis.

² More information on Freedom House methodology: Freedom House (2010a).

³ Freedom House (2010a).

⁴ Freedom House (2010b).

⁵ Brown, J. Orme, W. Roca, T (2010).

⁶ The negative sign comes from the inverse scale of these indexes. For the Press freedom index, 100 stands for a free press while 0 stands for controlled press.

Table 1. Corruption Perception Index and its determinants, correlation matrix (Pooled dataset)

		Corruption Perception Index (Transparency International)	Political Rights (Freedom House)	Log GDP per capita	HDI (UNDP)	Shadow Economy Size (%GDP)	Shadow Economy Size (%GDP)
Corruption Perception Index (TI)	Pearson correlation	1.000					
	Sig. (2-tailed)						
	N	1495					
Political Rights (Freedom House)	Pearson correlation	-0.587***	1.000				
	Sig. (2-tailed)	0.000					
	N	1495	1495				
Log GDP per capita	Pearson correlation	0.757***	-0.527***	1.000			
	Sig. (2-tailed)	0.000	0.000				
	N	1459	1459	1459			
HDI (UNDP)	Pearson correlation	0.697***	-0.510***	0.860***	1.000		
	Sig. (2-tailed)	0.000	0.000	0.000			
	N	1245	1245	1224	1245		
Shadow Economy Size (%GDP)	Pearson correlation	-0.698***	0.363***	-0.624***	-0.557***	1.000	
	Sig. (2-tailed)	0.000	0.000	0.000	0.000		
	N	1055	1055	1050	1029	1055	
Press freedom (Freedom House)	Pearson correlation	0.662***	-0.913***	0.506***	0.519***	-0.405***	1.000
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	
	N	810	810	777	756	567	810

***. Correlation is significant at the 0.01 level (2-tailed)

B. A first description of CPI and political regime change

In order to have a first taste of the distribution of political regime changes and the CPI, we then constructed a qualitative variable, capturing changes between two benchmark dates within a ten years gap. We chose the last ten years and decided to observe the change of the regimes during two dates: 2009 and 1999. Our “Political Regime Change” variable is then coded this way:

$$\text{Political Regime Change}_i = \text{Country Political Regime}_{i, t=2009} - \text{Country Political Regime}_{i, t=1999}$$

Therefore “Political Regime Change” variable is a cross-section data and takes the following values:

0: no political regime changes recorded.

1: Country *i* became an *Electoral democracy*

-1: Country *i* is no longer an *Electoral democracy*

In the same way, we computed a “CPI Variation” variable:

$$\text{CPI Variation}_{i,t} = \text{CPI}_{i,t=2009} - \text{CPI}_{i,t=1999}$$

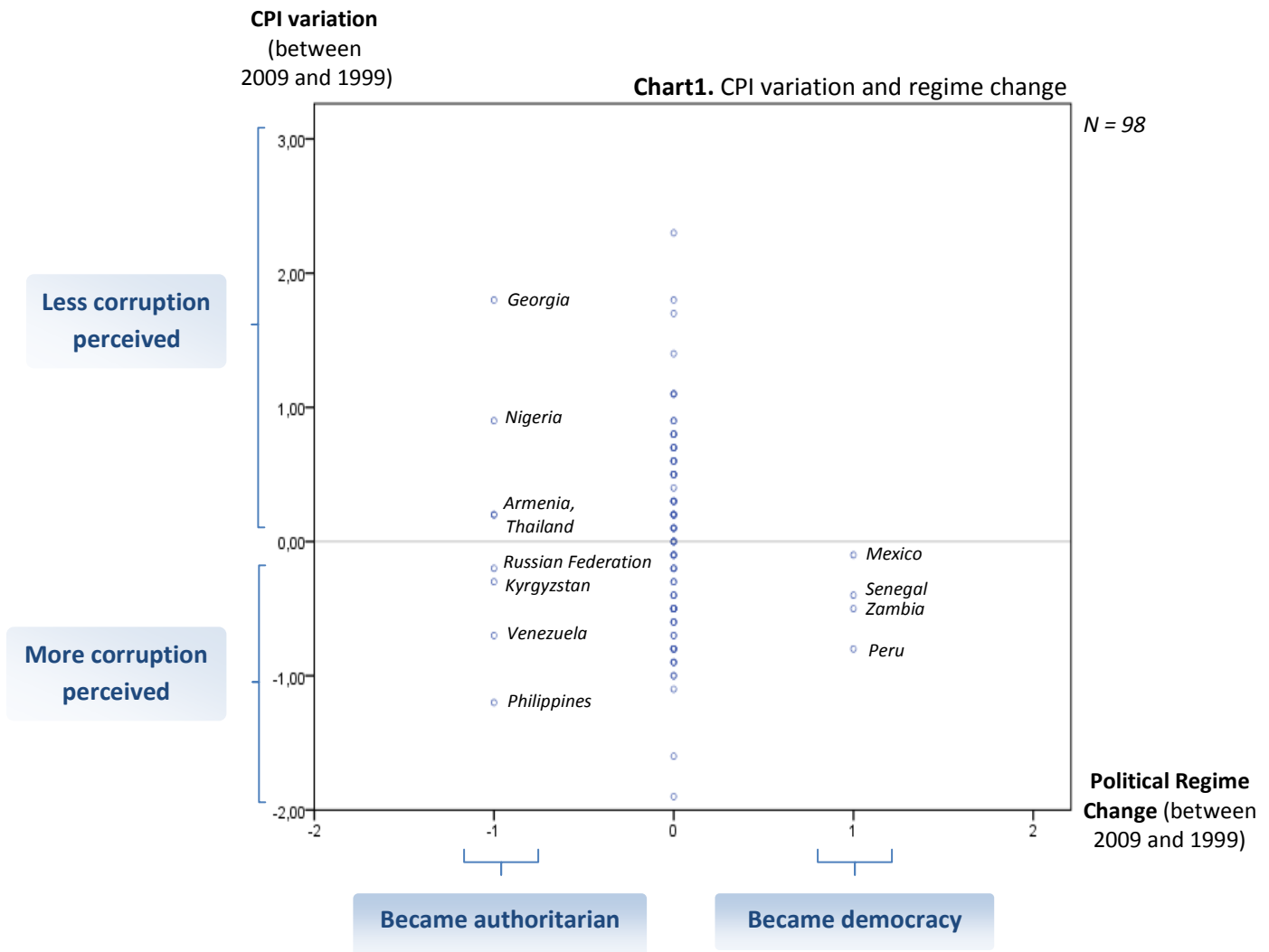
This variable takes the following values:

0: Country *i* have the same CPI score in 2009 and in 1999

>0: Country *i* was perceived less corrupted

<0: Country *i* was perceived more corrupted.

We used these variables to draw a chart, giving a first description of the CPI evolution regarding political regime changes:



Results interpretation

Due to the limited coverage of the CPI ten years ago, our sample is rather small (98 observations). Considering the evolution between 1999 and 2009 we observe a few political regime changes. Only 4 countries became democratic and 8 became authoritarian. Moreover, the classification produced by *Freedom House* may be challenged.

However - but taken with a pinch of salt - it appears that in this sample, the four countries that became democratic also recorded a stronger corruption perception. In the case of countries that became authoritarian, it seems not possible to identify a real trend.

Observing this representation, we might assume that young democracy may record an increase in *Transparency International* index.

Obviously we need to perform a more consistent analysis to state whether or not a democracy deepening leads to a stronger corruption perception and to reveal the dynamics of these variations.

For the next analysis, we will use the *Freedom House* Political Rights Index as measure of democracy depth. With its 1 to 7 scale it appears much more precise. Furthermore, its time and space coverage is at least as broad as the one of the Corruption Perception Index.

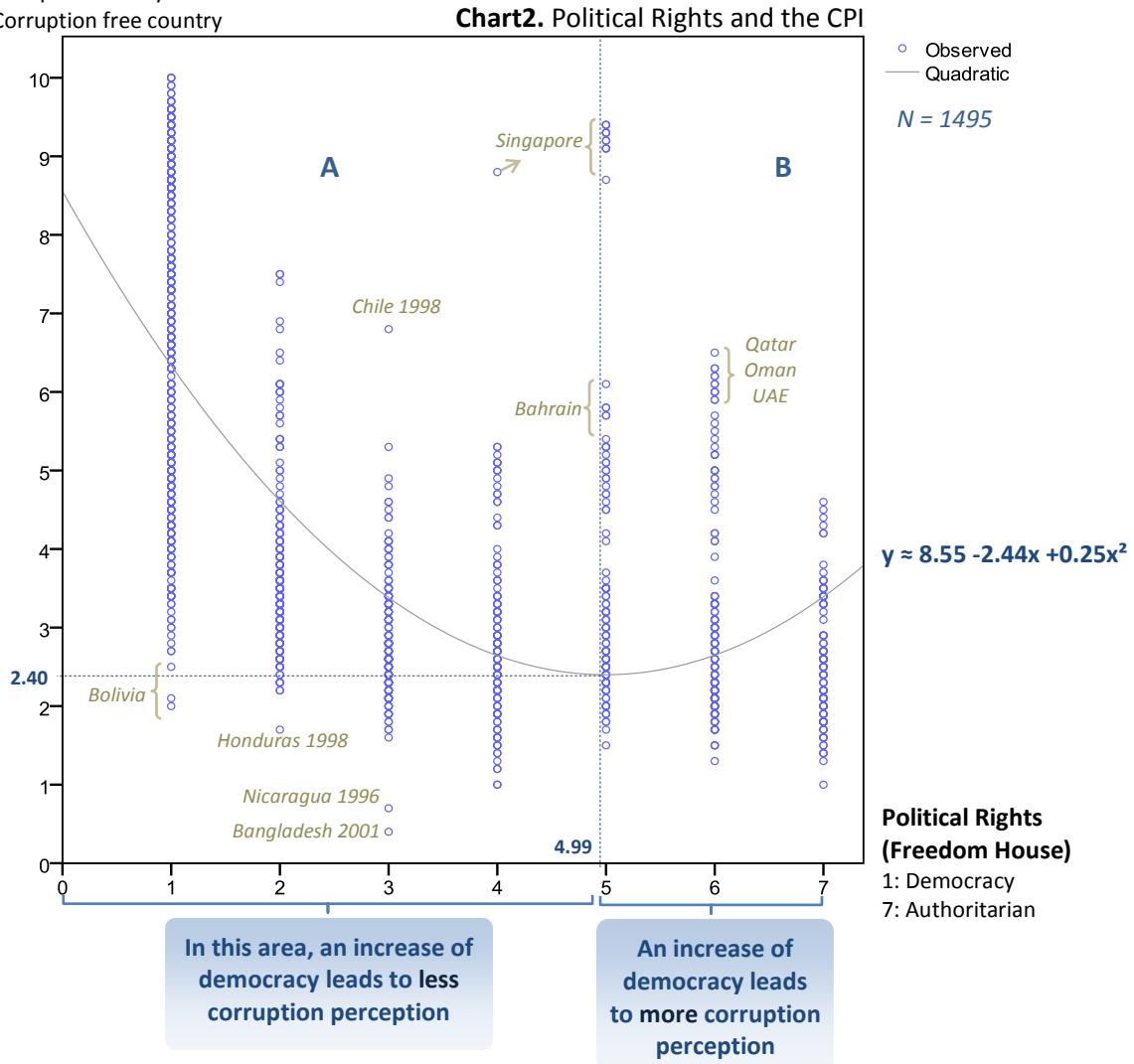
C. Exploring the relation between Political Rights and the Corruption Perception Index

In our earlier paper, we put the light on the quadratic association between the CPI and press freedom. As we showed that Political Rights and press freedom are strongly correlated, we assume that the quadratic association also applies to the Political Rights & CPI relationship. To question this assumption, we draw a curve estimation (pooling our panel dataset) to determine which model fit the best to this association.

Corruption Perception Index

0: Corrupted country

10: Corruption free country



1. Results interpretation

We constructed this chart keeping Singapore, which can be considered as a severe outlier. The adjustment curve estimation confirms our intuition, the association between *Political Rights* and the *CPI* may rather be described by a quadratic model than by a linear one (Quadratic adjustment R^2 (0.533) > Linear adjustment R^2 (0.381)). We display in Table 2, a comparison of the two curve estimations, with and without Singapore. These results show that the relation between democracy and corruption perception is not linear. The underlying idea is that a deepening of democracy has not the same impact on corruption perception whatever the “maturity” of democracy. Calculating the adjustment curve critical point, we will be able to differentiate the impact of a democracy improvement *vis-à-vis* the CPI.

Table 2. Curve adjustments results, freedom of press and population perception of government corruption

Ordinary least squares estimation (Pooled panel dataset)		Coefficients with outlier	Coefficients without Singapore
Linear adjustment			
Variable	Political of Rights t	-0.646*** (-28.027)	-0.668*** (-30.205)
	R ²	0.345	0.381
	Adjusted R ²	0.344	0.381
	Number of observations (N)	1495	1482
Quadratic adjustment			
	Political of Rights t	-2.464*** (-25.316)	-2.611*** (-28.767)
Variables	Political of Rights ² t	0.247*** (-19.114)	0.263*** (-21.900)
	R ²	0.474	0.533
	Adjusted R ²	0.473	0.532
	Number of observations (N)	1495	1482

Dependent variable: Corruption Perception Index (*Transparency International*)

2. Critical point estimation

The adjustment curve estimation gives the following parameters (Singapore included):

$$\text{CPI} \approx 8.55 - 2.46\text{PR} + 0.25\text{PR}^2$$

The minimum of this function is reached for its derivative equal to 0.

$$-2.46 + 2 \times 0.25\text{PR} \approx 0$$

$$\text{PR} \approx 4.99$$

We thus obtain the Political Rights and CPI values for the critical point: (PR; CPI) \approx (4.99; 2.40).

3. Further interpretation

Theoretically, corruption perceptions should be a linear decreasing function of democracy intensity (Brown, J. Orme, W. Roca, T. (2010)). We suggest that the quadratic shape of the estimated curve reveals a measurement bias, resulting from media control in authoritarian regimes, hiding existing corruption deeds that are finally broadcasted in the early hours of democracy.

As described previously, *Freedom House* uses three different categories for countries according to their score. *Freedom House* describes as “Free”, countries with an overall score higher than 5, otherwise countries are labeled “Partly free” and “Not free”.

In this study, a 5 score at *Political Rights* index appears critical to understand perceptions dynamics and democracy maturity. Thus, if we use *Freedom House* terminology, in “Partly free” or “Not free” countries an increase of our democracy proxy, likely widens corruption perceptions. On the other hand, in “Free” countries, a democracy deepening is associated to a lower corruption perception. As we did in our previous paper, we suggest that the Corruption Perception Index is biased for weak democracies and authoritarian regimes. Thereby, we may suggest that the CPI is biased for “Partly free” or “Not free” countries.

We now have a better idea of the dynamic relation between democracy and corruption perceptions. In order to rigorously validate these assumptions, we need to introduce control variables. To have the strongest evidence possible, we perform a panel data analysis, with data from 1996 to 2008.

3. *Corruption perceptions and democracy*

To perform a robust econometrics analysis we first need to investigate heteroskedasticity and autocorrelations issues. Indeed, missing values in our dataset may drive to an unbalanced panel, usually leading to heteroskedasticity.

A. *Heteroskedasticity test*

To detect heteroskedasticity, we use the Breusch-Pagan test. This test evaluates if the estimated variance of the residuals correlated with the explanatory variables; if so, we face heteroskedasticity and should take it into account.

After estimating the residuals u_i of the following equation:

$$CPI_{ij} = \alpha_{ij} + \beta_1 \text{Political Right}_{ij} + \beta_2 \text{square Political Right}_{ij} + \beta_3 \text{Log GDP per capita}_{ij} + u_i + e_{ij}$$

We performed a regression of the square of the residuals on the independent variables:

$$\hat{u}_i^2 = \alpha_{ij} + \beta_1 \text{Political Right}_{ij} + \beta_2 \text{square Political Right}_{ij} + \beta_3 \text{Log GDP per capita}_{ij} + v_i + e_{ij}$$

If the F-test confirms that the independent variables are jointly significant then we must reject the null hypothesis of homoskedasticity.

We display above the results of the estimations of the square of the residuals:

Table 3. Breusch-Pagan test: square residuals estimation

Parameter	Coefficient	Standard error	t	P> t	Confidence Interval 95%	
					lower bound	
Political Rights	-3.746***	0.049	-77.16	0.000	-3.841	-3.651
Political Rights ²	0.334***	0.006	54.47	0.000	0.322	0.346
Log GDP per capita	9.361***	0.043	216.13	0.000	9.276	9.446
Constant	-10.507***	0.215	-48.95	0.000	-10.928	-10.086

N= 1459

F(3,1455)= 53439.30

Prob > F = 0

R²= 0.991

Adjusted R² = 0.991

Dependent variable: square of the residuals

Interpretation:

The F-test shows that the independent variables are strongly associated with the square of the residuals. Therefore, we must reject the null hypothesis: **our panel faces heteroskedasticity.**

Thus, to prevent biased estimations, we will need to perform a Generalized Least Square regression.

B. Autocorrelation test

To detect autocorrelation in a panel data, we used a Wooldridge test, described by Drukker, D.M. (2003). The null hypothesis stands for no first-order autocorrelation.

We display above the F-Test:

$$F(1, 154) = 197.030$$

$$\text{Prob} > F = 0.000$$

The results show that we are not dealing with first-order autocorrelation, no further correction would be necessarily.

C. Estimating the impact of democracy on corruption perception

Our objective is to evaluate the role of democracy on *Transparency International* Corruption Perception Index. We showed previously that Political Rights are strongly correlated with corruption perceptions, fitting a quadratic functional form. To take into account this kind of non linear relation, we added the square of the Political Rights variable in our regressions.

We suppose that corruption perceptions may also be explained by the GDP and the Human Development Index. We assume that richer countries may be less affected by the corruption scourge. Usual thesis defend that “developed” countries provide better salaries to officials and civil servants, reducing the opportunity cost of corruption. Moreover industrialized countries are known to possess stronger institutions, based on formal rules resulting a stronger rule of law, preventing from widespread corruption behaviors.

We equally used as control variable the size of shadow economy relatively to GDP, assuming that the size of shadow economy is a good proxy of the rule of law.

As explained in the previous section, we used a Generalized Least Square estimation to fix the heteroskedasticity issue. We tested 4 different models, using GDP per capita, Human Development Index and the size of shadow economy as control variables:

Model 1.

$$CPI_{ij} = \alpha_{ij} + \beta_1 \text{Political Right}_{ij} + \beta_2 \text{Political Rights}^2_{ij} + \beta_3 \text{Log GDP per capita}_{ij} + u_i + e_{ij}$$

Model 2.

$$CPI_{ij} = \alpha_{ij} + \beta_1 \text{Political Right}_{ij} + \beta_2 \text{Political Rights}^2_{ij} + \beta_3 \text{HDI}_{ij} + u_i + e_{ij}$$

Model 3.

$$CPI_{ij} = \alpha_{ij} + \beta_1 \text{Political Right}_{ij} + \beta_2 \text{Political Rights}^2_{ij} + \beta_3 \text{Shadow Economy Size}_{ij} + u_i + e_{ij}$$

Model 4.

$$CPI_{ij} = \alpha_{ij} + \beta_1 \text{Political Right}_{ij} + \beta_2 \text{Political Rights}^2_{ij} + \beta_3 \text{HDI}_{ij} + \beta_4 \text{Shadow Economy Size}_{ij} + u_i + e_{ij}$$

We display in table 3, 4, 5 and 6 the General Least Square (GLS) estimation of these models.

Estimation results for model 1.**Table 4.** Generalized Least Square estimation of the Corruption Perception Index determinants

Parameter	Coefficient	Standard error	Z	P> Z	Confidence Interval 95%	
					lower bound	upper bound
Political Rights	-1.259***	0.045	-27.78	0.000	-1.348	-1.170
Political Rights²	0.125***	0.006	22.68	0.000	0.114	0.136
Log GDP per capita	2.157***	0.043	50.04	0.000	2.072	2.241
Constant	-1.740***	0.207	-8.38	0.000	-2.146	-1.333

Wald chi2(3) = 10573.92

Prob > chi2 = 0

N= 1459

Multicollinearity test (VIF max value square variables excepted) = 6.23

*Dependent variable: Corruption Perception Index***Estimation results for model 2.****Table 5.** Generalized Least Square estimation of the Corruption Perception Index determinants

Parameter	Coefficient	Standard error	Z	P> Z	Confidence Interval 95%	
					lower bound	upper bound
Political Rights	-1.565***	0.052	-30.09	0.000	-1.667	-1.463
Political Rights²	0.151***	0.006	23.89	0.000	0.138	0.163
HDI	4.286***	0.133	32.29	0.000	4.026	4.546
Constant	4.092***	0.145	28.31	0.000	3.809	4.375

Wald chi2(3) = 6313.34

Prob > chi2 = 0

N= 1245

Multicollinearity test (VIF max value square variables excepted) = 4.21

*Dependent variable: Corruption Perception Index***Estimation results for model 3.****Table 6.** Generalized Least Square estimation of the Corruption Perception Index determinants

Parameter	Coefficient	Standard error	Z	P> Z	Confidence Interval 95%	
					lower bound	upper bound
Political Rights	-1.355***	0.043	-31.45	0.000	-1.440	-1.271
Political Rights²	0.125***	0.006	22.36	0.000	0.114	0.136
Shadow economy size	-0.076***	0.001	-55.16	0.000	-0.079	-0.073
Constant	9.375***	0.054	172.77	0.000	9.268	9.481

Wald chi2(3) = 16057.02

Prob > chi2 = 0

N= 1055

Multicollinearity test (VIF max value square variables excepted) = 8.81

Dependent variable: Corruption Perception Index

Estimation results for model 4.

Table 7. Generalized Least Square estimation of the Corruption Perception Index determinants

Parameter	Coefficient	Standard error	Z	P> Z	Confidence Interval 95%	
					lower bound	upper bound
Political Rights	-0.919***	0.051	-18.11	0.000	-1.019	-0.820
Political Rights²	0.078***	0.006	12.16	0.000	0.065	0.090
Shadow economy size	-0.061***	0.002	-39.42	0.000	-0.064	-0.058
HDI	3.160***	0.104	30.49	0.000	2.957	3.363
Constant	5.990***	0.123	48.81	0.000	5.750	6.231

Wald chi2(4) = 17757.27

Prob > chi2 = 0

N= 1029

Multicollinearity test (VIF max value, square variables excepted) = 8.92

Dependent variable: Corruption Perception Index

D. Results interpretation

As first observation, our results appear strongly significant. Moreover, the multicollinearity test performed⁷ shows no specific multicollinearity issue. Political Rights, GDP and HDI seem to affect corruption perceptions the more.

Moreover, the signs of the coefficients confirm first intuition. We remind that the highest score at the CPI stands for a corruption-free country. Thus, a high GDP and HDI prevent from widespread corruption perceptions, while a broad shadow economy increases corruption feelings.

Our four estimations corroborate the democracy and corruption perceptions dynamics previously unveiled. It confirms that corruption perceptions depend on the “maturity” of democracy and suggests that below a certain level, democracy deepening may lead to an increase of corruption perceptions. However, once overstepped this level, a democracy enhancement finally drives a decrease of corruption perceptions. This way, democracy and corruption perceptions are not linearly associated, resulting a measurement bias.

⁷ Stata calculates the Variance Inflation Factor (VIF). A VIF above 10 diagnoses a multicollinearity trouble.

4. Conclusion

In this paper we investigated the tumultuous relationship between the *Corruption Perception Index* and democracy (using *Freedom House* Political Rights Index as proxy). We performed a panel data analysis to question our earlier findings that had uncovered a measurement bias in the CPI.

Using such an analysis, we were able to cover 1025 to 1459 different cases, within thirteen years. We find out that *Transparency International* likely misevaluates countries scoring above 5 at the *Political Rights index*. Thus, we suggest that *Transparency International* underestimates corruption in authoritarian regimes.

Media and press aperture are the result of a democracy deepening. In this context, corruption behaviors are then more likely flagged in the media and their authors more frequently pursued and punished. Thereby, theoretically, we expect a linear relationship between democracy and corruption, but the devil hides in the details... for instance, it hides in perceptions.

If we assume *democracy* and *corruption* follow a linear association, we observed that *democracy* and *corruption perceptions* do not. Indeed, while authoritarian regimes progressively achieve their transition towards democracy, they face an increase of corruption perceptions – the quadratic functional form identified. We then suggest that we observe an increase of corruption perceptions that are not necessarily backed on an increase of the “real” amount of corruption.

We are therefore bound to confirm that *Transparency International* likely penalizes young democracies in regards to more authoritarian regimes. The CPI is then victim of the *reflective bias*⁸.

In the light of this analysis, we call for a cautious use of *Transparency International* Corruption Perception Index, especially in the cases of authoritarian regimes, in which corruption is probably underestimated.

⁸ Brown, J. Orme, W. Roca, T. (2010).

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