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MONITORING CROSS COUNTRY CORRUPTION THROUGH PERCEPTION INDEXES: IS IT ENOUGH?

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Monitoring cross country corruption through perception indexes: is it enough?

Preliminary Version, please do not quote.

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Abstract

Subjective indexes of perceived corruption such as the Corruption Perception Index (CPI) allow to compare countries according to their perceived level of public sector corruption. A country's rank indicates its position relative to other countries included in the index. Nevertheless this ranking does not allow to take into account different peculiarities of examined countries. It seems in fact obvious to find economically developed in the upper portion of the ranking, meaning that they are perceived as being more transparent.

This work starts to fill this gap estimating a new index, that we call Excess Perceived Corruption Index (EPCI), which could be a useful tool for cross-country analysis. To this end in fact, the EPCI can be applied along two main dimensions: the comparison of similar countries with respect to their level of development, and the possibility of isolating differential effects inside a homogeneous geographical area. This could be of much help when reasoning about the corruption of countries belonging to the same geographical or cultural areas and about possible remedies.

1. Introduction

A common definition for Corruption is the "misuse of public office for private gain", where the "private gain" may accrue either to the individual official or to groups or parties to which he belongs (Bardhan, 1997). This means that a corrupt transaction occurs when a private citizen gives the gift of a bribe to a public official in return for some service that the official should either provide for free or not provide at all. Looking at cross countries evidence it seems that such exchanges occur more frequently in some countries than in others. A growing body of literature has consequently sought to understand why in some countries governments and bureaucrats are more corrupt than in others.

As pointed out by Treisman (2007) almost around mid-90s there have been two events that boosted the attempts to measure and explain such differences: the Transparency International Organization that began constructing a summary index of countries' "perceived corruption" and the publication, on the Quarterly Journal of Economics, of the work "Corruption and Growth" (Mauro, 1995) that reported evidence of a long-suspected link between higher corruption and slower economic growth. After that, a still growing literature on the topic has developed. For a comprehensive and useful review see for example Lambsdorff (2005).

Subjective indexes of perceived corruption such as the Corruption Perception Index (CPI)[1], an aggregate indicator that combines different sources of information about corruption, allow to compare countries according to their perceived level of public sector corruption. A country's rank indicates its position relative to other countries included in the index.

Nevertheless this ranking does not allow to take into account different peculiarities of examined countries. It seems in fact obvious, as greatly highlighted in the literature, to find economically developed, long-established liberal democracies, with a free and widely read press, a high share of women in government and a history of openness to trade, in the upper portion of the ranking, meaning that they are perceived as being more transparent.

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[1] The Corruption Perception Index, released on a yearly basis by Transparency International, ranks countries/territories based on how corrupt their public sector is perceived to be. A country/territory's score indicates the perceived level of public sector corruption on a scale of 0 to 10, where 0 means that a country is perceived as highly corrupt and 10 means that a country is perceived as very clean.

According to Treisman (2007), the challenge of the next wave of research will be to refine existing measures of corruption and to gather more experience-based measures examining the patterns they reveal.

Overall considered this work starts to fill this gap estimating a new index, that we call Excess Perceived Corruption Index (EPCI), which could be a useful tool for cross-country analysis. To this end in fact, the EPCI can be applied along two main dimensions: the comparison of similar countries with respect to their level of development, and the possibility of isolating differential effects inside a homogeneous geographical area.

This could be of much help when reasoning about the corruption of countries belonging to the same geographical or cultural areas and about possible remedies. The comparison among Latin American countries for example could be most useful than the comparison of, say, Chile and Poland in terms of policy implications.

2. Theoretical background

The economic framework in which causes and consequences of corruption have been studied till now, is clearly understandable by the combined reading of the introductions of the two volumes of the "International handbook of the economics of corruption"[2].

While describing her approach to the theme in fact, Ackerman highlights how the broader interpretation of corruption, that does not necessarily involves a monetary quid pro quo, for a long time has been unsound to economists that "are reluctant to sermonize about right or wrong" and how they just avoided the problem by simply focusing on deals where agents behave corruptly if the economic rewards are high enough (Ackerman, 2006).

But how to define corruption? Most of people would surely be able to recognize a corrupt practice when they see one, but hardly anyone will then agree on what is corruption itself. Let us seek some help from etymology: the word corruption comes from the Latin *rumpere*, that means "to break up, to dismantle". What does corruption dismantle? Well, probably a set of moral or legal rules. This suggests to define corruption as "the (ab)use of public office for private gains" (Bardhan, 1997) or "the sale of government property by government officials aiming at personal gains" (Shleifer e Vishny, 1993).

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[2] International Handbook of the Economics of Corruption. Vol. 1 (2006) edited by S.R. Ackerman; vol. 2 (2011) edited by S.R. Ackerman and T. Soreide. E. Elgar Publishing, Cheltenham, UK – Northampton, MA, USA.

However, not all illegal uses and abuses of public office are corrupted acts: they might be simple theft or fraud. Corruption only takes place, in fact, when both parts, the corrupted and the corrupter, receive a benefit from the illegal payment, i.e. when there is an actual exchange (money vs. favor/ service). Corruption is, then, different from extortion, where the person giving the money is only a victim, and from simple theft, where a civil servant steals from the public but does not provide any service in exchange.

Moreover, such definitions are not satisfactory as corruption is not only a public domain phenomenon. Illegal practices from private citizens that aim to damage other private citizens or enterprises are indeed corruption. Private corruption is made up by practices of offering/accepting bribes to obtain or grant commercial orders and commands. Even if private corruption is believed to be less important than public one, consequences are not always unsubstantial for the public interest: for instance, Enron and WorldCom scandals, originating from private corruptions, have had a huge and persistent impact on investors' confidence and the level of investment in the US.

3. Correcting the Transparency International CPI: the ECPI

The well known Corruption Perception Index (CPI), released on a yearly basis by Transparency International, ranks countries/territories based on how corrupt their public sector is perceived to be. First launched in 1995, the CPI has been widely credited with putting the issue of corruption on the international policy agenda. Behind the numbers is the daily reality for people living in these countries. The index cannot capture the individual frustration of this reality, but it does capture the informed views of analysts, businesspeople and experts in countries around the world.

As already noticed the ranking does not allow to take into account different peculiarities of examined countries. It seems in fact obvious, as greatly highlighted in the literature, to find economically developed, long-established liberal democracies, with a free and widely read press, a high share of women in government and a history of openness to trade, in the upper portion of the ranking, meaning that they are perceived as being more transparent.

Our idea is then that of trying to somehow correct the Transparency International CPI to take into account different peculiarities of different countries.

To do so we have choosen the Human Development Index, yearly released by UNPD starting from 1990, as a proxy for the "development" of a country.

The HDI measures development by combining indicators of life expectancy, educational attainment and income into a composite index, the HDI. The HDI sets a minimum and a maximum for each dimension, called goalposts, and then shows where each country stands in relation to these goalposts, expressed as a value between 0 and 1.

Figure 1: relationship among CPI and HDI (2009)
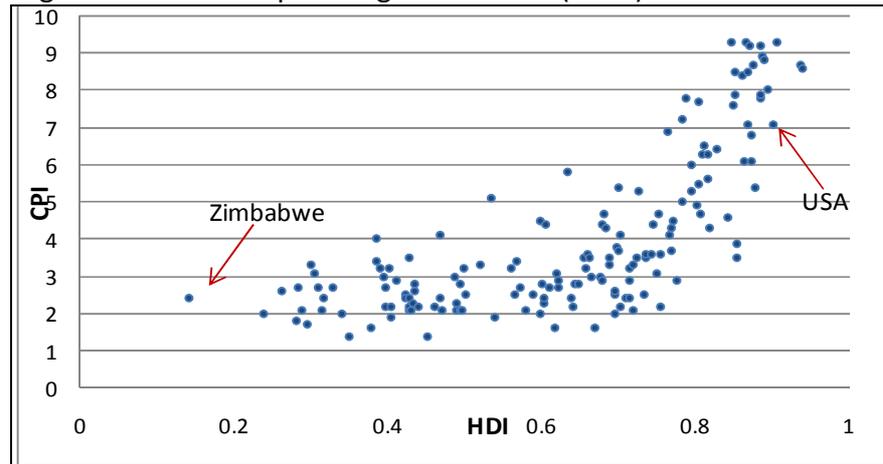
Looking at the relationship among corruption and the HDI a kind of measure of the level of development, we can see that this relationship holds and is non linear, as it is clearly represented in figure 1, where the Human Development Index (HDI)[3] has been used to proxy development and wealth and each dot corresponds to a country. As a consequence it is not surprising that Zimbabwe is perceived less transparent than US and that almost all developed countries can be found in the upper part of the distribution.

Starting from this point we construct a new index, that we call "Excess Perceived Corruption Index" (EPCI), which allows to jointly consider the level of perceived corruption of a country (measured by CPI) and its wealth and/or level of development (measured by HDI).

As showed in Figure 2, the relationship between Y=CPI and X=HDI is nonlinear and so we use a spline function to model this nonlinear relationship[4]. In particular, we estimated a natural cubic spline using a cross-validation procedure to find the position and the number of knots.

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[3] The Human Development Index, yearly released by UNPD starting from 1990, measures development by combining indicators of life expectancy, educational attainment and income into a composite index, the HDI. The HDI sets a minimum and a maximum for each dimension, called goalposts, and then shows where each country stands in relation to these goalposts, expressed as a value between 0 and 1.

[4] An order-M spline with K knots is a piecewise-polynomial of order M and has continuous derivatives up to the order M-2; a natural cubic spline adds additional constraints to force the function to be linear beyond the boundary knots (see Hastie, et. al.).

Figure 2: Estimated relationship between CPI and HDI (2008)
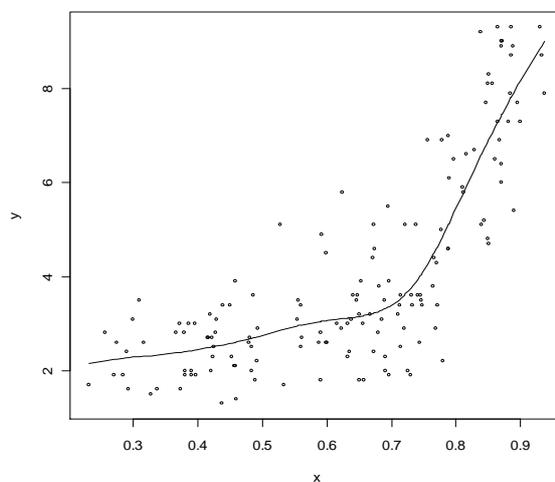
The estimated curve represents the dependence of the expected value of transparency when the level of development changes. In this way, given the level of the development of a country, we obtain the expected level of the perceived transparency.

The residual, which is the difference between the observed value of the CPI for a country and its expected value, explains how the selected country is far from the level of transparency expected given its level of development; this means that a country with a negative residual is perceived more corrupt with respect to a country with the same, but positive, residual.

Figure 3: Scatterplot of residuals (2008)
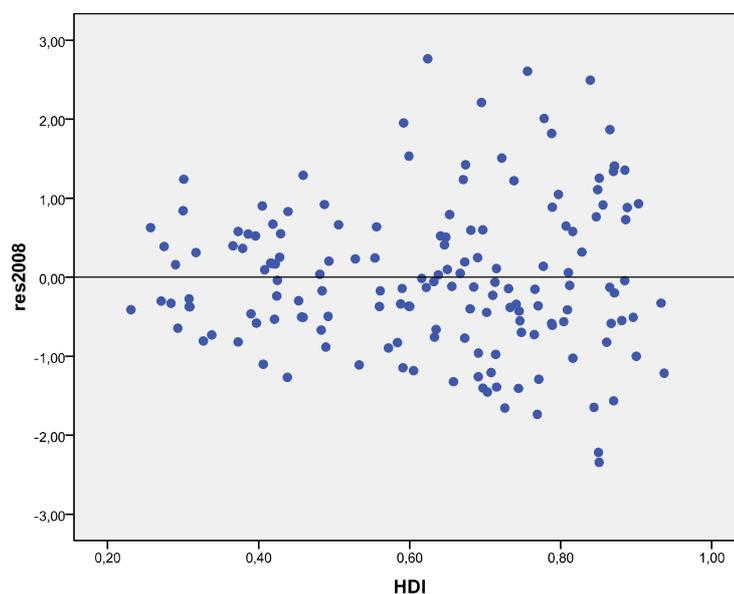
From a methodological point of view it should also be stressed that, as it appears clear from figure 3, the estimated model has a strong heteroskedasticity. In other words the variability of the residuals depends from the level of development: increasing the HDI rises the variability of CPI. So, in order to take into account this effect we have standardized the residuals by dividing them for their estimated standard deviation. We used a nonparametric approach to estimate the residual standard deviation. In particular, we used a k-nearest neighbour technique, with k fixed to 10, to obtain for each residual an estimate of the standard deviation.

To give a more stable estimation we applied to estimated standard deviations a LOESS smoother (*Locally Estimated Scatterplot Smoother*) with a span=0.75 (Cleveland, 1979)[5]. In figure 4, the Loess smoothing of standard deviation estimates is showed. As it possible to see, the variability of standard deviation estimates is very high and the Loess curve smooth in a more stable values.

Figure 4: Estimated LOESS smoother to standard deviation estimates

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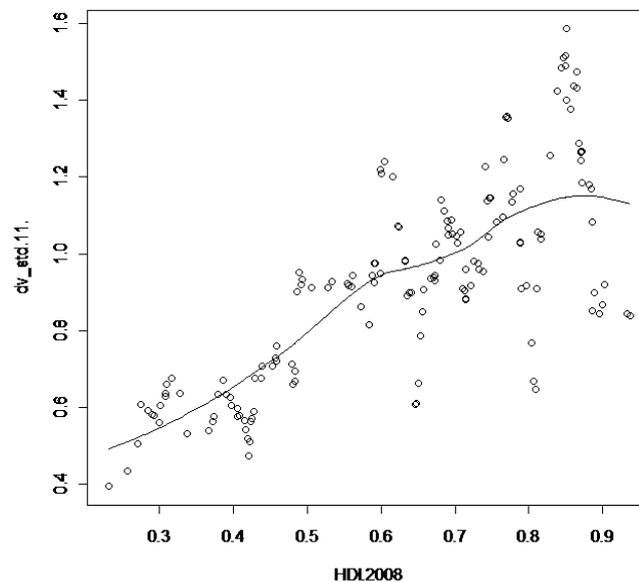
[5]For the estimate of y at point *x*, the fit is made using values of Y in a neighbourhood of *x*, weighted by their distance from *x*. The size of the neighbourhood is controlled by the span α (corresponding to the proportion of sample points in the neighbourhood). For $\alpha < 1$, the neighbourhood includes proportion α of the points, and these have tricubic weighting, proportional to $\left(1 - \left|\dfrac{distance}{max\,distance}\right|^3\right)^3$. For $\alpha > 1$, all points are used, with the 'maximum distance' assumed to be $\alpha^{1/P}$ times the actual maximum distance for *p* explanatory variables.)

Using the Loess values we obtain the standardized residuals. As showed in figure 5, the scatterplot of standardized residuals is conform to the hypothesis of homoschedasticity.

Figure 5: Scatterplot of standardized residuals (2008)
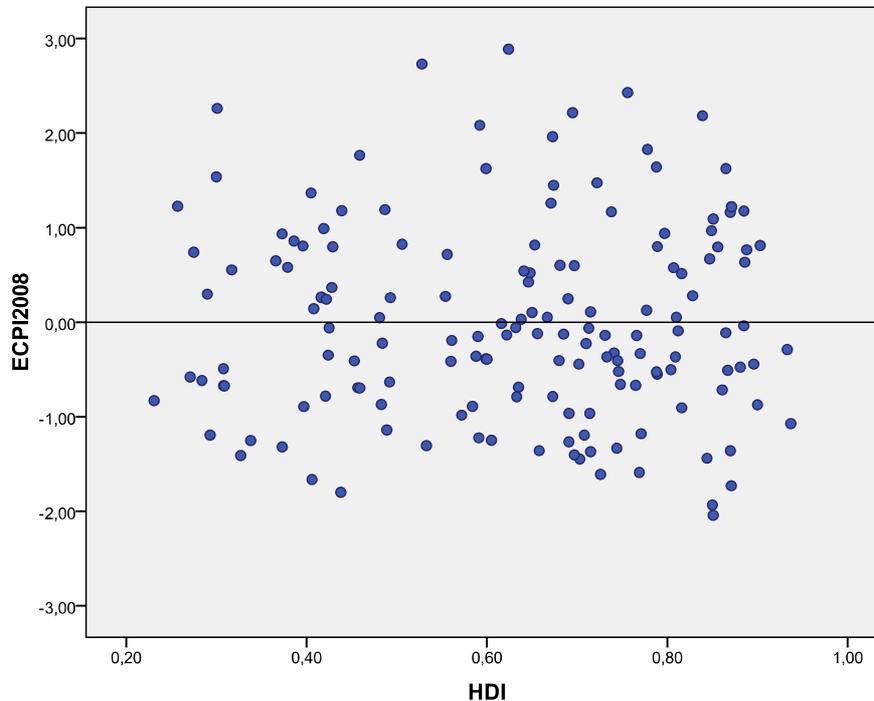
We finally propose to use the standardized residuals we have obtained, as an alternative index of perceived corruption and call it "Excess Perceived Corruption Index".

The following two maps represents the world situation according to our ECPI index (the violet one) and to the Transparency International CPI index (the yellow-red one).

In order to compare them in the correct way, it is important to understand that the colouring of the ECPI map represents how the level of perceived corruption in the selected country diverge from the expected level of the country itself given its level of development. This means that a "clear" country is not necessarily less corrupt than a dark one, but only that the former has a level of perceived corruption which is less than that one would expect considering its level of development.

This new way of ranking countries can be then used to highlight situations of excess/reduction of corruption with respect to the welfare of the country.

Map 1: 2010 ECPI ranking
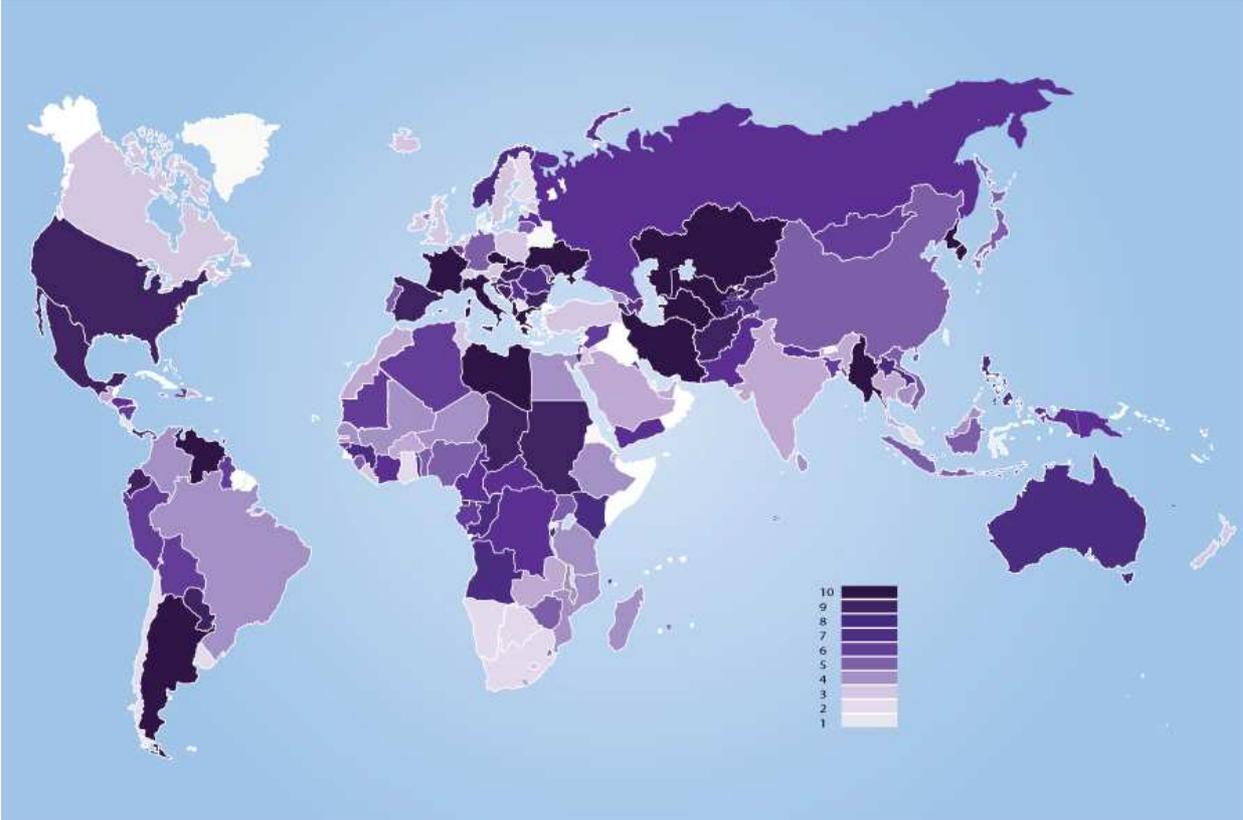
Map 2: 2010 CPI ranking (source http://www.transparency.org/cpi2010/results)
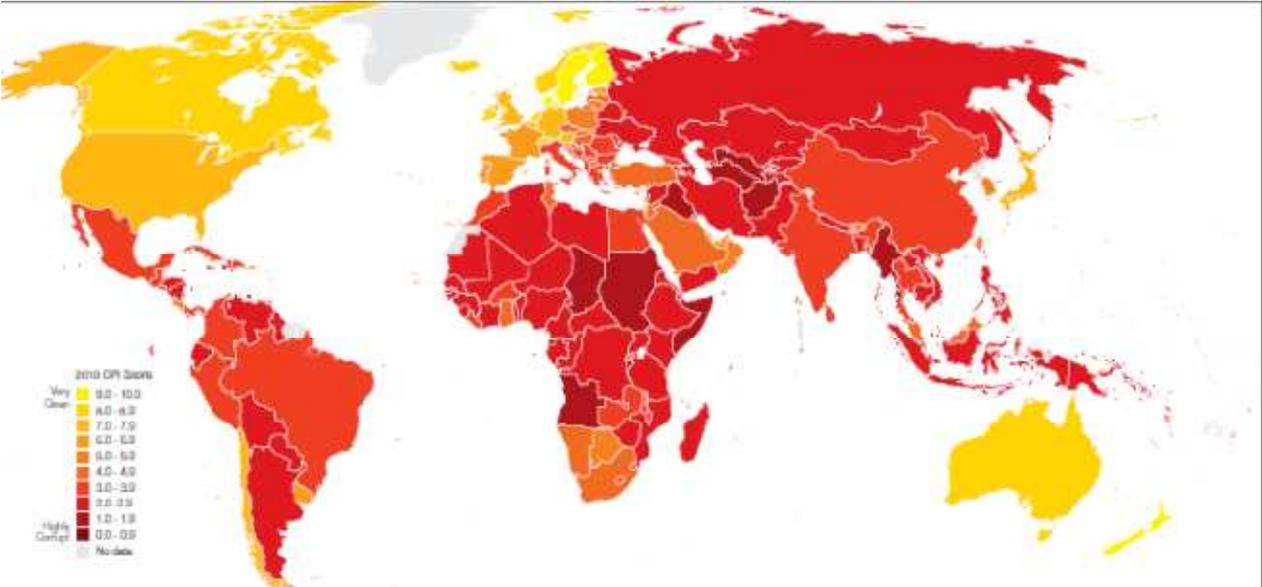
For example US are darker than their expected level of corruption meaning that one would expect, considering their development, a more transparent country; even if they are at the top of the transparency international ranking.

Again, the comparison of US and Zimbabwe, this time depurated from the effect of differences in their development, highlights how US seems highly corrupted with respect to its expected level (9° ECPI class), while the expected and the real level of Zimbabwe are only slightly different (4° ECPI class).

Another interesting example comes from the comparison of Finland and Rwanda which are greatly far both in the HDI ranking (15° and 145°) than in the CPI one (5° and 58°) but closest in the ECPI ranking (2° and 1° class).

Finally Spain and Tajikistan, really far when looking at their development (19° and 105°) and at their perceived corruption (30° and 140°) but with identical and negative residuals that rank both of them above their perceived level of corruption corrected for the development (9° class of ECPI).

4. A further step: looking for the determinants of the non linearity of the model used to estimate the ECPI

Talking more deeply about results, the first striking evidence stands in the very different dynamics of the EPCI with respect to the CPI, which is particularly true for strongly developing countries. Moreover we highlight a significant "internal" variability in areas whose countries should be somehow similar in the level of development achieved, such as for example, Europe. This means that this variability of CPI and EPCI should be linked to some other factors.

In order to shed light to this puzzling question we then estimate the relationship between the EPCI and a set of factors that are commonly believed to cause corruption (economic development, system of government, free press, share of young and women in government, openness to trade, fuel exports, intrusive business regulations, unpredictable inflation, fiscal evasion, crime and so on). The idea is that of trying to explain the highlighted non linearity among CPI and HDI by explicitating its determinants. This means the research of strongest roots of the new index that we have constructed, the ECPI.

After having performed some robustness checks such as descriptive statistics, the use of standardized vs non standardized residuals and the estimation of the relationship using different

models, we regress the ECPI index against many covariates representing economic, social, cultural and political factors of considered countries.

Preliminary results are puzzling and peculiar, especially for African countries, opening space for very interesting considerations.

References

Ackerman, S.R. (2006) – "International handbook of the economics of corruption – Introduction and overview", vol. I (editor), E. Elgar, Cheltenham, UK - Northampton, MA, USA.

Ackerman, S.R. and Soreide, T. (2011) – "International handbook of the economics of corruption – Introduction", vol. II (editors), E. Elgar, Cheltenham, UK - Northampton, MA, USA.

Ades, Alberto; Di Tella, Rafael. 1999. Rents, Competition and Corruption. *American Economic Review 89, no. 4 (September 1999): 982-994.*

Alt, James E. and David Dreyer Lassen. 2003. The political economy of institutions and corruption in american states, *Journal of Theoretical Politics. 15(3): 341-365*

Bardhan, P. (1997) – Corruption and development: a review of issues, *Journal of Economic Literature,* vol. 35, n. 3, pp. 1320 – 1346.

Bardhan, Pranab. 2002. Decentralization of Governance and Development. *The Journal of Economic Perspectives 16 (4): 185-205.*

Bardhan, Pranab, and Dilip Mookherjee. 2006. Decentralisation and Accountability in Infrastructure Delivery in Developing Countries. *Economic Journal 116 (January): 101–27.*

Cleveland, W. S. (1979). Robust locally weighted regression and smoothing scatterplots, J. Amer. Statist. Assoc. 74(368): 829–836.

Fan, Simon; Lin, Chen ; Treisman, Daniel. 2009. "Political Decentralization and Corruption: Evidence from Around the World",Journal of Public Economics*, 93, 14-34*

Fung, Archon; Mary Graham and David Weil. 2007. Full disclosure: The perils and promise of transparency. *Cambridge, UK: Cambridge University.*

Golden, Miriam and Lucio Picci. 2008. Pork barrel politics in postwar Italy, 1953-1994. *American Political Science Review 52 (2): 268-289.*

Goldsmith, A.A. 1999. Slapping the Grasping Hand: Correlates of Political Corruption in Emerging Markets. *The American Journal of Economics and Sociology, Vol. 58 (4):866-883.*

Gregory, Robert. 1995. Accountability, responsibility and corruption: Managing the public production process. In The state under contract. *Edited by Jonathan Boston. Wellington, NZ: Bridget Williams Books.*

Gupta, Sanjeev, Luiz R de Mello and Raju Sharan. 2000. Corruption and military spending. *IMF Working Paper 00/23.*

Hastie T., Tibshirani R., Friedman J., (2011), The elements of statistical learning: data mining, inference, and prediction, Springer.

Lambsdorff, J. G. (2005) - "Consequences and causes of corruption: what do we know from a cross-section of countries?", *Discussion paper of the Economics Department*, Passau University, n. v 34-05, May.

Mauro, P. (1995) – "Corruption and growth", *Quarterly Journal of Economics,* vol. 110 n. 3, pp. 681 – 712.

Treisman, D. (2007) – "What have we learned about the causes of corruption from ten years of Cross-national empirical research?", *Annual Review of Political Science*, vol. 10, pp. 211 - 244.