Subjective Well-Being and the Welfare Costs of Corruption: A Panel Data Approach[1]

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Abstract

This paper provides an estimate of the welfare costs of corruption. We follow the approach proposed by Welsch (2008), which uses self-rated subjective well-being ("happiness") as an empirical approximation to general welfare. Subjective well-being allows us to include both material and intangible welfare costs associated to corruption. We estimate our econometric model using a panel of 84 countries. Results suggest that nonmaterial welfare effects associated to corruption are significantly higher than the material ones. This means that using GDP per capital as a measure of societal well-being could severely underestimate corruption costs.

Keywords: happiness, corruption, welfare analysis.

Resumo

Este artigo estima os custos de bem-estar associados à corrupção. Seguindo a abordagem proposta por Welsch (2008), utiliza-se a avaliação subjetiva de bem-estar ("grau de felicidade") como uma aproximação empírica do nível de bem-estar. A utilização do bem-estar subjetivo permite que se inclua tanto os custos materiais quanto os intangíveis associados à corrupção. Estima-se um modelo econométrico para um painel de 84 países. Os resultados sugerem que os efeitos intangíveis associados à corrupção são significativamente maiores que os custos materiais. Isto coloca em xeque a utilização do PIB per capita como uma medida de bem-estar social, que pode estar subestimando substancialmente os custos da corrupção.

Palavras-chave: felicidade, corrupção, análise de bem-estar.

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1. INTRODUCTION

Corruption may be broadly defined as the abuse of public office for private economic gain. The effect of corruption has many dimensions related to political, economic and social aspects. The World Bank (2011) has recognized corruption as "… among the greatest obstacle to social and economic development".

Empirical research provides evidence that corruption affects the rates of investment (Mauro, 1995; Brunetti and Weder, 1998; Campos, Lien and Pradham, 1999), GDP per capita (Tanzi and Davoodi, 1997; Lambsdorff 1999), government expenditures (Mauro 1997; Tanzi and Davoodi, 1997). Corruption may also undermine a country´s ability to attract foreign capital (Hines, 1995; Fons, 1999).

A recent estimate by World Bank (2013) puts the total amount of bribes paid in both developed and developing countries in 2000/2001 to 1 trillion dollars, about 3% of world GDP at the time. As observed by OECD (2014), shocking as these figures can be, they are not a good measure of the cost of corruption because they represent transfers of financial assets between individuals, affecting income and distribution but not necessarily output. The real (social) cost of corruption is inflicted indirectly by changing individuals´ and firms´ incentive structures, which can lead to lower productivity of scarce resources, including labor as well as physical and human capital. In addition it is likely to reduce the accumulation of both physical and human capital and/or lower their quality. Corruption's detrimental effect on the efficiency of resource allocation operates through the weakening of market mechanisms, the reduction in the quantity and quality of public goods supplied by governments, the diversion of entrepreneurial talent and real resources to rent seeking, and the subversion of government regulation aimed at mitigating the effects of externalities. In combination, these effects tend to lower the level of output and its growth rate. Apart from the substantial output losses entailed by corruption, its most corrosive effect consists of eroding public trust and ultimately delegitimizing the state.

How corruption costs can be evaluated? For a long time there have been concerns on the relevance of GDP per capita as a measure of societal well-being. Disappointment with corruption may entail psychological costs associated with unlawfulness and similar intangibles. Such costs may not be captured by GDP per capita, which would underestimate total corruption costs.

In this paper, we intend to provide an estimate of the welfare costs of corruption. We follow the approach proposed by Welsch (2008), which uses self-rated subjective well-being ("happiness") as an empirical approximation to general welfare. Adopting a subjective well-being (SWB) approach presents two main advantages with respect the conventional GDP-related welfare analysis. First, reported subjective happiness is a satisfactory empirical approximation of individual utility, allowing us to capture human well-being directly (Frey and Stutzer, 2002). Second, SWB allows us to include both material and intangible welfare costs associated to corruption.

We estimate our econometric model using a panel of 84 countries. The use of panel data allows us to control for time-invariant, country-specific characteristics such as stable cultural differences. This represents an improvement compared to the cross-section estimates provided by Welsch (2008), which may suffer from omitted variable bias.

Our results suggest that nonmaterial welfare effects associated to corruption are significantly higher than the material ones. In monetary terms, changes in corruption in the period 2004-2008 relative to 2000-2004 are equivalent to a change in capital stock worth approximately 4% of GDP (median)

The paper is organized as follows. After this introductory section, Section 2 describes the economic model and the. Section 3 presents the econometric model and estimation results. Finally, section 4 concludes.

2. ECONOMIC MODEL

The model closely follows Welsch (2008), which proposes a two-equation system to disentangle the material and nonmaterial welfare costs associated to corruption. The decomposition is achieved by specifying a happiness equation and an income equation.

Specification of the happiness equation is based on previous findings on the determinants of happiness, which include socioeconomic, cultural and institutional factors (Frey and Stutzer, 2002). Various studies provide evidence that, on average, people living in rich countries are happier than those living in poor countries. In addition to our social aspect of interest – corruption – people´s happiness seem also to be influenced by education attainment and age (Clark and Oswald 1994, Helliwel 2003, Salinas-Jimenez et al. 2011). Institutional factors such as political, economic and individual freedom may also influence happiness (Veehoven, 2000). The happiness equation can be written as follows:

$$v = f(y, c, z) \qquad (1)$$

where v = average national happiness, y = per capita income, c = corruption measure, z = vector of control variables (age, education, institutional variables). The partial derivative with respect to y is expected to be positive, while the partial derivative with respect to c is expected to be. The relationship between education attainment and happiness is ambiguous. Education allows better adaptation to changing environments. However, this higher predisposition to well-being may be compensated by a proportional increase in aspiration levels. Therefore, we cannot assume any *a priori* for the sign of the partial derivative of happiness with respect to education attainment (Noval and Gavi, 2013). The relation between age and happiness is also ambiguous. The increasing health problems and loss of important social relationships through mortality with increasing age lead to predictions of a decrease in quality of life over the life course (George, 2006). The “role theory” of the aging process, on the other hand, suggests that self-integration, insight, and positive psychosocial traits such as satisfaction and self-esteem grow with age and that these signs of maturity in turn increase quality of life with age (Gove, Ortega, and Style 1989). Findings from empirical studies are mixed (Yang, 2008). Finally, the derivative with respective to institutional variables such as rule of law index should be positive.

The income equation is a standard growth equation in which income is determined by physical and human capital, extended to account for corruption

$$y = g(k, h, c) \qquad (2)$$

where k = physical capital per capita and h = human capital per capita. Partial derivatives with respect to *k* and *h* are expected to be positive, since capital accumulation is positive related to economic growth. On the other hand the partial derivative with respect to c is expected to be negative. Corruption's detrimental effect on the efficiency of resource allocation operates through the weakening of market mechanisms, the reduction in the quantity and quality of public goods supplied by governments, the diversion of entrepreneurial talent and real resources to rent seeking, and the subversion of government regulation aimed at mitigating the effects of externalities.

By substituting (2) into (1), we obtain the reduced form of the model

$$v = (g(k, h, c), c, z). \qquad (3)$$

Taking average happiness prevailing in a country as a measure of welfare, the marginal welfare effect of corruption can be stated as follows:

$$MWE = \frac{dv}{dc} = \frac{\partial f}{\partial y}\frac{\partial g}{\partial c} + \frac{\partial f}{\partial c} \qquad (4)$$

The right-hand side of equation (5) shows the decomposition of the marginal impact of corruption on SWB. The first term refers to the indirect channel through which corruption affects SWB via income. The second term corresponds to the direct effect of corruption in well-being, reflecting the nonmaterial impacts such as psychological costs associated with unlawfulness and similar intangibles.

Monetization of the marginal costs may be obtained by dividing MWE by the marginal welfare impact of income. This yields the monetized marginal welfare effect (MMWE) of corruption:

$$MMWE = \frac{\frac{dv}{dc}}{\frac{\partial f}{\partial y}} = \frac{\partial g}{\partial c} + \frac{\frac{\partial f}{\partial c}}{\frac{\partial f}{\partial y}} \qquad (5)$$

MMWE thus consists of the marginal product of corruption (first term of the right-hand side) and the marginal rate of substitution (second term of the right-hand side), both expected to be negative.

The general life satisfaction approach permits to assess the compensating variation for changes in the corruption level. The compensation surplus (CS) is the amount by which the expenditure on income can be reduced when public goods supply increases by a given amount and welfare is to remain constant. A difficulty with the CS or similar measures in the present case is that income available for expenditure is itself affected by the public good (bad) in question, an effect unaccounted for by CS. Welsch (2008) derived an analogue measure to CS that incorporates both effects of corruption in a comprehensive way. It relies on the circumstance that income is produced by means of capital, and measures the overall effect of reduced corruption in terms of the amount by which the expenditure on capital can be reduced when corruption drops by a given amount and welfare is to remain unchanged.

When corruption changes from the initial situation c_0 to c_1, the capital cost saved (CCS) at constant welfare v_0 is

$$CCS = e(v_0, w_0; c_0) - e(v_0, w_0; c_1) \qquad (6)$$

where *e(.)* is the capital expenditure function that gives the capital cost to be expended to attain a predefined level *v*, given *c* and *w*. Subscript "0" refers to the initial situation and subscript "1" to the final situation. Capital cost saved (CCS) is positive when corruption drops and negative when corruption increases.

The actual way of computing CCS proceeds according to the following set of equations:

$$CCS = w_0k_0 - w_0k_1 \qquad (7a)$$

$$v_0 \equiv f(g(k_0,h_0,c_0),c_0,z_0) = f(g(k_1,h_0,c_0),c_1,z_0) \qquad (7b)$$

$$w_0 = g_k(k_0,h_0,c_0) \qquad (7c)$$

Equation (7a) states that CCS corresponds to the amount by which the expenditure on capital can be reduced (augmented) if corruption increases (decreases) by a given amount $\Delta c = c_1 - c_0$. Equation (7b) implicitly determines (the hypothetical) k_1 so as to maintain social welfare level at v_0 for a given Δc. Finally, (7c) determines the price of capital, where $g_k = \partial g/\partial k$ denotes the marginal product of capital.

In the next section, we use an empirical counterpart to the CCS variation in order to evaluate the changes in corruption levels that have occurred from 2000 to 2008.

3. EMPIRICAL IMPLEMENTATION

3.1 Database

Our basic dataset comprises data for 84 countries from 2000 to 2008. Since data is not available to estimate our model on an annual basis, we have grouped the data into two periods: 2000-2004 (period 1) and 2004-2008 (period 2). The value of the variable in period *i* (*i=1,2*) corresponds to the average value for the available information within the time period.

Happiness data

Average happiness by country comes from the *World Database of Happiness* (Veehoven 2005). Life satisfaction is assessed according to the four-point scale defined by table 111B of the Catalogue of Happiness in Nations: not at all happy = 1; not too happy =2; quite happy=3; very happy=4[2]. The World Database of Happiness reports the average happiness by country from representative surveys. Aggregating individual happiness into national averages implicitly assumes the cardinality and interpersonal comparability of individual statements of well-being. Economists are likely to be skeptical about both assumptions. However, both of them may be less of a problem on a practical level than on a theoretical level, as observed by Kahneman (1999) and Frey and Stutzer (2002). Ordinal and cardinal treatments of satisfaction scores generate quantitatively very similar results in microeconometric happiness functions (Frey and Stutzer, 2000).

Measuring corruption

How can one measure the role of corruption in a country? Corruption generally involves illegal activities, which are deliberately hidden and only come to light with scandals, investigations and prosecutions. In this context, how can one systematic and credibly capture its scale and depth? There is virtually no meaningful way to assess absolute levels of corruption based on hard empirical data. Researchers have to resort to *proxies* for the real level of corruption.

The vast majority of empirical studies on corruption rely on the Transparency International´s *Corruption Perception Index* (CPI). This is a composite index which aggregates 13 surveys on the perception of corruption by business people and country analysts. CPI is expressed in a 10-point numerical scale, and higher CPI values are associated to more corrupt countries. Despite the widespread use of CPI, the index is not immune from criticism. Since CPI is to a large extent a subjective assessment of the level of corruption, some analysts have pointed out that the index may embed an elite bias, not reflecting the average perception of the population (Corbhan, 2013).

An alternative approach has been taken by Goel and Nelson (1998) and Fisman and Gatti (1999), who use the number of public officials convicted for abuse of public office. However, such measure cannot be taken as a definitive indicator of corruption levels. Higher conviction rates may be related to the effectiveness of the judiciary system (and/or the midia) of the country. A country with effective courts may present higher conviction rates than a more corrupt country with a fragile judiciary system. In this case, conviction rates may not be an adequate indicator of the actual incidence of corruption, but rather reflect the quality of the judiciary.

[2] The phrasing of the question varies slightly across national surveys. For example, some questionnaires ask the question "Taking all things together, you would say you are - not at all happy, not too happy, quite happy or very happy?", while others use "Do you feel your life at present is - not at all happy, not too happy, quite happy or very happy?". Nevertheless, the four-point scale remains the rule for all of them.

In our application, we adopt the CPI as our proxy for the actual incidence of corruption. Despite the potential measurement errors due to an "elite bias", using CPI allows us to compare our estimates with other results found in the empirical literature. In addition to that, we think that CPI is a more reliable method to comparing corruption levels across countries than alternative measures based on judicial procedures concerning corruption. In the empirical application, we rescale the CPI index so that 0 refers to minimum level of corruption and 10 to the maximum level.

Additional socioeconomic and institutional variables

Gross domestic product per capita is extracted from World Bank´s World Development Indicators (WDI). It is calculated in terms of purchasing power parity to control for the international differences in the cost of living. GDP per capita are expressed in current international dollars based on the 2011 ICP round[3].

Capital stock measured at current purchasing power parities is extracted from Penn World Table 8.1 We divide it by the total population in order to obtain the capital stock per capita.

In order to account for age structure, we use the median age of the country provided by the United Nations Human Development Report. Human capital stock is measured as the enrollment ration at secondary school, obtained from the WDI database. Enrollment ratio is computed as the total enrollment in secondary education, regardless of age, expressed as a percentage of the population of official secondary education age[4]. Finally, since the likelihood of crime and violence may influence SWB, we introduce

We use two governance indicators provided by the World Bank as control variables, namely, the government effectiveness index and the rule of law index. They may be interpreted as broader measures of institutional quality and social capital. Government effectiveness is an index that reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Rule of law reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Both indexes range from approximately -2.5 (weak) to 2.5 (strong) governance performance.

Table 1 presents descriptive statistics of the database.

[3] An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States.
[4] Note that enrollment rate can exceed 100% due to the inclusion of over-aged and under-aged students because of early or late school entrance and grade repetition.

Table 1: Descriptive Statistics

Variable	Unit	Mean	Std. Deviation	min	max
Happiness	[1, 4]	3.011121	0.2430191	2.42	3.58
GDP per capita	PPP$	13709.48	16897.04	439.2629	116939.1
Corruption	[0, 10]	5.332316	2.359214	0.2	8.9
Age	years	26.02297	7.877313	15.11176	43.03535
Education	(%)	74.50261	31.13056	7.35183	154.0504
Crime	(by 100.000 inh.)	8.277644	11.48867	0.45	60.52
Government effectiveness	[-2.5, 2.5]	-0.00223	0.9918063	-2.31942	2.248272
Rule of law	[-2.5, 2.5]	0.001245	0.9937079	-2.51321	1.969905
Capital per capita	(1,000 PPP$)	35578.04	42119.75	817.9959	256555.8

3.2 **Econometric model**

The happiness and income equations are specified in a log-log form. The core estimating equations can be written as follows:

$$ln(happy_{it}) = \alpha_0 + \alpha_1 ln(GDP\ per\ capita_{it}) + \alpha_2 ln(corruption_{it}) + \alpha_3 ln(age_{it}) + \alpha_4 ln(education_{it}) + D\_period2 + \varepsilon_{it} \quad (8)$$

$$ln(GDP\ per\ capita_{it}) = \beta_0 + \beta_1 ln(capital\ stock\ per\ capita_{it}) + \beta_2 ln(education_{it}) + \beta_3 ln(age_{it}) + \beta_4 ln(corruption_{it}) + D\_period2 + \xi_{it} \quad (9)$$

where subscripts *i* and *t* refer to country and period, respectively. Variable *D_period2* is a dummy for period 2, which is supposed to capture unobserved factors common to all countries that may affect happiness during 2004-2008. Coefficient vectors (α_1, …, α_4) and (β_1, …, β_4) are the parameters to be estimated, and error terms are expressed by ε_{it} and ξ_{it}.

The use of panel data allows us to control for time-invariant, country-specific characteristics such as stable cultural differences. This represents an improvement compared to the cross-section estimates provided by Welsch (2008), which may suffer from omitted variable bias. For example, religious beliefs and unobserved cultural traits may influence happiness. If they are also correlated to explanatory variables such as GDP per capita, cross-section estimates would be biased. Panel data methods may circumvent such problem. We explore the panel structure of our data by estimating the happiness and income regressions with different panel data models.

Before proceeding to the estimation analysis, it is worth remarking two aspects of our equation system given by (8) and (9). First, the specification assumes that the system is not interdependent. Income is assumed to affect happiness, but not the other way around. Second, estimation results of equation (8) cannot be interpreted in terms of causality, since reverse causation may occur: happier societies may hold lower levels of corruption. Establishing causality would require a valid instrument for corruption in equation (8). It is not clear which instruments might serve this purpose. Therefore, the issue of endogeneity of corruption must be disregarded in what follows.

We have estimated several variations of equation (8) and (9), which are presented in the Appendix. Alternative specifications include additional controls such as crime rate, Gini coefficient and governance indicators (government effectiveness and rule of law indexes). In general, results are quite robust to alternative specifications. However, due to multicollinearity, several explanatory variables were not significant. In what follows, we restrict our analysis to the core specifications (8) and (9).

Table 2 presents the happiness equation results. We have applied five different estimation methods, namely: pooled ordinary least squares (POLS), between estimation, fixed-effects estimation and generalized least squares and maximum likelihood random effects estimation methods. Bootstraped standard errors clustered by period were computed by using 500 replications (Table 2 also presents default standard errors and panel robust standard errors).

Results are quite robust to the different estimation methods, excepting the fixed-effects estimator that does not provide statistically significant results. The lack of significance may be due to the minor changes over time in variables such as median age and education. Application of the Haussman test provides evidence that the random-effects models are preferred to the fixed-effects method.

The income and corruption coefficients have the expected sign. Higher average income goes with higher average happiness. On the other hand, corruption has a direct negative effect on happiness: higher levels of corruption are associated to lower happiness. Our results provide evidence that the age structure also determines happiness: countries with lower median age are associated to higher levels of happiness. This result contradicts Yang (2008). However, as discussed in Section 2, theory does not provide an unambiguous guidance regarding the sign of our age variable. Finally, the random effects estimators (our preferred method) suggest that the education does not determine happiness. They suggest also that, controlling for the other explanatory variables, on average countries experienced higher levels of happiness during the period 2005-2008 when compared to 2004-2008.

Table 3 presents the income regression results. All the coefficients have the expected signs. Higher physical and human capital stocks are associated to higher income levels. Higher corruption perception is associated to lower income. Consistent with life-cycle arguments, countries with a higher median age are associated to higher income.

In line with Welsch (2008), our estimates support the basic hypothesis that corruption has both indirect (income related) and direct (income independent) effects on welfare

Table 2 - Happiness Equation Estimation Results

	(1) POLS	(2) Between	(3) FE	(4) RE-GLS	(5) RE-MLE
constant	**1.328*** **	**1.38*** **	**0.937**	**1.386*** **	**1.389*** **
Robust SE	0.102	n/a	2.627	0.110	n/a
Bootstraped SE	0.112	0.090	6.026	0.156	0.119
Default SE	0.115	0.125	2.192	0.121	0.119
ln(GDP per capita)	**0.074*** **	**0.068*** **	**0.097**	**0.070*** **	**0.069*** **
Robust SE	0.013	n/a	0.104	0.015	n/a
Bootstraped SE	0.013	0.011	0.266	0.023	0.017
Default SE	0.014	0.016	0.129	0.016	0.015
ln(corruption)	**-0.039*** **	**-0.047*** **	**-0.034**	**-0.044** **	**-0.044*** **
Robust SE	0.011	n/a	0.028	0.011	n/a
Bootstraped SE	0.012	0.010	0.342	0.021	0.012
Default SE	0.013	0.014	0.047	0.014	0.013
ln(age)	**-0.143*** **	**-0.154*** **	**-0.170**	**-0.168*** **	**-0.170*** **
Robust SE	0.041	n/a	0.941	0.049	n/a
Bootstraped SE	0.045	0.034	1.746	0.060	0.038
Default SE	0.042	0.052	0.786	0.048	0.048
ln(education)	**-0.088** **	**-0.072** **	**-0.028**	**-0.071**	**-0.070**
Robust SE	0.034	n/a	0.165	0.038	n/a
Bootstraped SE	0.035	0.028	0.523	0.061	0.047
Default SE	0.029	0.032	0.145	0.030	0.030
Period 2 dummy	**0.014**	**-0.012**	**0.019**	**0.023***	**0.024** **
Robust SE	0.014	n/a	0.044	0.010	n/a
Bootstraped SE	0.015	0.019	0.113	0.012	0.012
Default SE	0.014	0.025	0.042	0.010	0.010
N	98	98	98	98	98
R^2	0.445	0.444	0.395	0.469	n/a

Notes: columns (1) – (5) show estimation results for the happiness equation using pooled ordinary least squares (POLS), between, fixed-effects (FE) and random effects generalized least squares (RE-GLS) and maximum likelihood (RE-ML). Standard, panel robust and bootstrapped standard errors were computed for each coefficient. Statistical significance is assessed according to the bootstrapped standard error. (*) Significant at 10%; (**) significant at 5%; (***) significant at 1%.

Table 3: **Income Equation Estimation Results**

	POLS	Between	Within	RE-GLS	RE-MLE
constant	**1.688*** **	**1.88*** **	**3.553**	**1.145** **	**1.157*** **
Robust SE	0.418	n/a	2.320	0.603	n/a
Bootstraped SE	0.435	0.270	3.213	0.468	0.394
Default SE	0.385	0.541	2.107	0.495	0.489
ln(age)	**0.075**	**0.070**	**0.638**	**0.659** **	**0.647** **
Robust SE	0.165	n/a	0.568	0.214	n/a
Bootstraped SE	0.170	0.123	0.812	0.275	0.276
Default SE	0.184	0.258	0.559	0.211	0.220
ln(corruption)	**0.173*** **	**-0.166*** **	**-0.044**	**-0.129** **	**-0.13** **
Robust SE	0.047	n/a	0.041	0.056	n/a
Bootstraped SE	0.048	0.032	0.111	0.065	0.051
Default SE	0.047	0.067	0.071	0.050	0.050
ln(education)	**0.379*** **	**0.431*** **	**0.173**	**0.266** **	**0.267*** **
Robust SE	0.094	n/a	0.081	0.066	n/a
Bootstraped SE	0.102	0.074	0.131	0.109	0.095
Default SE	0.086	0.122	0.080	0.068	0.068
ln(capital stock)	**0.581*** **	**0.566*** **	**0.273** **	**0.483*** **	**0.485*** **
Robust SE	0.074	n/a	0.080	0.062	n/a
Bootstraped SE	0.075	0.050	0.115	0.071	0.066
Default SE	0.048	0.067	0.078	0.050	0.051
Period 2 dummy	**0.083**	**-0.398*** **	**0.179*** **	**0.112*** **	**0.112*** **
Robust SE	0.052	n/a	0.042	0.018	n/a
Bootstraped SE	0.051	0.101	0.055	0.018	0.020
Default SE	0.053	0.274	0.034	0.015	0.015
N	162	162	162	162	162
R^2	0.914	0.871	0.891	0.910	n/a

Notes: columns (1) – (5) show estimation results for the income equation using pooled ordinary least squares (POLS), between, fixed-effects (FE) and random effects generalized least squares (RE-GLS) and maximum likelihood (RE-ML). Standard, panel robust and bootstrapped standard errors were computed for each coefficient. Statistical significance is assessed according to the bootstrapped standard error. (*) Significant at 10%; (**) significant at 5%; (***) significant at 1%.

Parameter estimates from the happiness and income regressions allow us to calculate the marginal welfare effect of corruption and its monetized value. The empirical counterpart for the MWE expressed in (4) may be obtained by computing

$$MWE = \hat{\alpha}_2 * (happy_{it} / corruption_{it}) + \hat{\alpha}_1 * \hat{\beta}_3 * (happy_{it} / corruption_{it})$$

where the first term in the right-hand side of equation (10) corresponds to direct effect and second term to the indirect one. Table 4 presents the marginal welfare. The median value (50th percentile) of the total effect is -0.022. This means that in 50% of the cases an increase in corruption by 1 point reduces happiness by approximately -0.022 (on the ten-point scale). We observe that the direct effect is substantially higher than the indirect effect of corruption. This result suggests that the indirect channel through which corruption affects SWB via income plays a minor role when compared to the direct channel. This means that using GDP per capital as a measure of societal well-being could severely underestimate corruption costs. The monetary equivalents are substantial. The median value for the total effect is about USD 1,069 per capita per year.

Table 4: Marginal effects of corruption

Percentile	Marginal welfare effect			Monetized marginal effects		
	Total	Indirect	Direct	Total	Indirect	Direct
10th	-0.017	-0.001	-0.016	-330	-22	-308
25th	-0.019	-0.001	-0.018	-536	-35	-500
50th	-0.022	-0.001	-0.020	-1069	-70	-999
75th	-0.031	-0.002	-0.029	-2496	-164	-2332
90th	-0.061	-0.004	-0.057	-10837	-711	-10125

After computing the marginal effects of corruption, we present the valuation of the changes in corruption during the period 2004-2008 with respect to 2000-2004. Figure 1 shows that these changes range from -1.1 to 0.5 on the 10-point scale

Figure 1: changes in corruption 2004-2008 with respect to 2000-2004

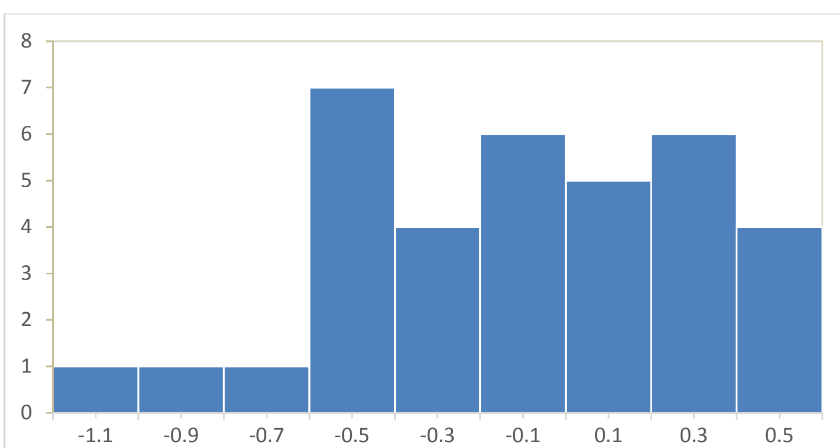

Table 5 shows the economic value of these changes for the countries that improved and those that deteriorated. In the countries that have succeeded in reducing corruption, the median value of compensating CCS is 4.3% of GDP. The median value of CCS in countries where corruption increased is -3.9% of GDP.

Table 5: capital cost savings due to changes in corruption

ercentile	Decrease in corruption (n=20)	Increase in corruption (n=15)
10th	0.004	-0.009
25th	0.020	-0.016
50th	0.043	-0.039
75th	0.059	-0.065
90th	0.130	-0.093

4. CONCLUSION

How corruption costs can be evaluated? For a long time there have been concerns on the relevance of GDP per capita as a measure of societal well-being. Disappointment with corruption may entail psychological costs associated with unlawfulness and similar intangibles. Such costs may not be captured by GDP per capita, which would underestimate total corruption costs.

In this paper, we intended to provide an estimate of the welfare costs of corruption. We followed the approach proposed by Welsch (2008), which uses self-rated subjective well-being ("happiness") as an empirical approximation to general welfare.

The direct effect was found to be substantially larger than the indirect effect and to imply a considerable welfare loss. This means that using GDP per capital as a measure of societal well-being could severely underestimate corruption costs.

In monetary terms, the changes in corruption in 2004-2008 relative to 2000-2004 are equivalent to a change in the stock of physical capital. In monetary terms, changes in corruption in the period 2004-2008 relative to 2000-2004 are equivalent to a change in capital stock worth approximately 4% of GDP (median). The welfare costs of corruption, as measured by the monetized effect of corruption on subjective well-being, are thus of considerable magnitude.

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