# Corruption, satisfaction and social welfare. An empirical estimation across a sample of countries using the technique of anchoring vignettes

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**Corruption, satisfaction and social costs. An empirical investigation across a sample of countries using the technique of anchoring vignettes**

Corruption is a social problem that varies across societies and imposes costs to their citizens. This paper presents results of the estimation of the costs of corruption for a number of countries utilizing the technique of anchoring vignettes applied to individual data. The technique estimates the impact of corruption on satisfaction and corrects for the potential bias of the utilization different response scales across respondents because of different cultural backgrounds. The results show that the there is an empirical inverse relationship between corruption and satisfaction, and that countries with high level of corruption incur higher social costs in terms of satisfaction loss due to corruption.

**Keywords:** vignettes, corruption, satisfaction, social cost.

**JEL Classification:** H00, D73

## I. Introduction

Corruption is one of the most important obstacles facing societies for development and growth, since it involves important costs for both the private and public economic activities (Mauro, 1995; Ades and Di Tella, 1997; Treisman, 2000; Kauffman, Kraay and Zoido-Lobaton, 2000). Corruption leads to higher production costs and lower administrative efficacy, as well as to discretionary decision making without regard for economic efficiency. It also diminishes the efficacy of public policies by imposing economic and procedural burdens on citizens and entrepreneurs. Numerous studies have reported on the economic effects and costs of corruption. The ending result or corruption is an allocation of economic resources in society that can be different from the optimal allocation that would lead to maximum social welfare.

Underlying the social costs of corruption there is a loss in individual welfare or satisfaction. In this paper we estimate the social costs of corruption. Frey and Stutzer (2000) and Helliwell (2003) show that corruption affects individual satisfaction, and therefore has an impact on social welfare. In this paper we estimate the social cost of corruption utilizing a life satisfaction approach and applied to a sample of individual data in six countries: USA, UK, Germany, Argentina, Mexico and France. Welsch (2008) utilized a life satisfaction approach to estimate the social cost of corruption with aggregated country data. This approach relates estimates the relationship between satisfaction and corruption and works out the social cost of corruption by working through the marginal utility of income. The methodology of life satisfaction has been utilized in different applications to estimate the economic costs associated with economic variables that have an impact on individual satisfaction (Frey and Stutzer, 2002, Di Tella and MacCulloch, 2006 and Clark et al., 2008).

Thus, in this paper we utilize the responses that individuals make to their perceptions of corruption and satisfaction to assess the relationships between these variables and therefore estimate the social cost of corruption. However, the perceptions of socioeconomic variables across different individuals can be subject to scale response bias, particularly if these individuals are from different cultures or countries, because subjects might utilize different scales when assessing these variables. This can be also the case with corruption and satisfaction. The implication is that individuals might assign the same level of the scale to different levels of corruption or satisfaction. To deal with the problem of scale perception bias we apply the technique of anchoring vignettes, which allows researchers to assess the extent of difference in scale response, thereby correcting for the use of different scales across individuals.

In general, the measurement of corruption is not an easy task because corruption is normally hidden from the economic activity. It has been measured utilizing subjective methods based on the perceptions of individuals and economic agents. For instance, the Index of Transparency International measures corruption based on the subjective assessment of experts (Lambsdorff, 2003; Kaufmann et al., 2009). Other studies (Rose-Ackerman, 2004; Olken, 2006) have tried to established objective measures of corruption based on tracking governmental and administrative processes.

The correction of the scale perception bias in both corruption and satisfaction responses is tackled with the utilization of the technique of anchoring vignettes developed by King et al. (2004). The methodology involves a correction of the individual assessment based on a general scale of the variables analyzed (corruption and satisfaction) that responds to the hypothetical scenarios defined in the vignettes. The results of using variables of satisfaction and corruption corrected for the perception bias

of the scale may lead researchers to more accurate estimates of the social costs of corruption.

## II. The technique of anchoring vignettes

Anchoring vignettes is a technique that allows for interpersonal comparability resulting from different uses of response scales across individuals. In our empirical application we apply this technique to measure both the corruption perceived by the individuals and their level of satisfaction with life. In the questions of corruption perceptions, participants are asked different questions intended to obtain subjective opinions on various practices related with the involvement of public servants in corruption activities. For instance, in our survey one of the questions on corruption perception was:

> "How important do you think it is the practice of bribing public servants (clerks, police, inspectors, etc.) in order to obtain special treatments?"

The subject is asked to answer in a five points scale from "not important at all" to "very much important". However, different individuals could answer differently to this question because they use different scales to rate similar levels of objective corruption. For instance, individual A might have a more positive view of a given level of corruption than individual B. That is, for the same level of corruption, individual A could answer "very important" to this question, whereas individual B could answer "very much important". The result is that the responses cannot be comparable because subjects use different scales in responses, i.e. there is a response scale bias.

For the question about the level of happiness experienced by individuals, the question is as follows:

"How satisfied are you with your life in general."

Similar to the question about the perception of corruption, the individual had to respond in a five points scale from "very dissatisfied" to "very satisfied". However, as in the question about corruption, there can be differences in the use of the scale by different individuals, so that for the same level of subjective satisfaction, individual A responds a different value than individual B. The technique of the vignettes allows us to homogenize the scales between individuals, making the answers comparable to each other.

Correcting for the difference in response scales, what is called “differential item functioning” DIF (King et al. 2004, King and Wand, 2007), is essential in order to produce accurate evaluations of the relative corruption and satisfaction measures across individuals, allowing for the correction of the scale response bias. This correction is based on the use of questions formulated in vignettes describing hypothetical scenarios of corruption and satisfaction. The individual is asked to evaluate these scenarios utilizing the same scale that she would use to evaluate her personal situation. By asking the individual about scenarios with different levels of corruption or satisfaction, we can obtain information on the subjective scale that the individual is using when answering her perception of corruption or her level of satisfaction.

For instance, one of the vignettes in our questionnaire for appraising corruption reads as follows:

"Javier needs a building permit to build a house. Payments made “under the table” are an important source of income for public servants in this area. Javier has never had an application for a building permit accepted without having made these payments.”

In the survey the subject was asked to put herself in the place of Javier and to rate in the same scale used for the general question on corruption perception (i.e. from 1 to 5) the following question:

> "If someone asked Javier how important it is to make "payments under the table" to civil servants so he can receive special treatment, which box do you think he would mark?."

For the question about the level of satisfaction, one of the vignettes represented the following situation:

> "Miguel works full-time from Monday to Friday. In principle, he is able to organise his work as he wishes but his bosses put a lot of pressure on him to achieve the goals they set him. He works for a large company, his position in the company is stable and he has a permanent contract."

Therefore, the individual would have to evaluate this situation by answering the following question:

> "Put yourself in Miguel's place. If someone asked Miguel how satisfied he is with his job, which box do you think he would mark?"

The responses to these questions allow us to recalibrate the responses of the general question on corruption perception and satisfaction. The necessary assumptions holding for this calibration are: i) *the consistency of responses*, that is, that every individual uses the same scale when responding to vignettes that when responding to her own personal situation (perception of corruption or satisfaction), and ii) *the equivalence of responses*, which implies that all individuals interpret in the same way the level of the variable represented by the vignette. Therefore, the response of one of the individuals in the sample can be used as common reference point for changing the distribution of the evaluations of the other individuals.

## III. The model

The model for the correction of the scale response bias using anchoring vignettes is based on a simultaneous equation approach that jointly models the self-assessment response and the responses to the vignette questions. The model is a generalization of the ordinal probit model, also called HOPIT model (e.g. King et al. 2004; King and Wand, 2007; Rice et al. 2010) that allows for the thresholds defined by categorical variables to be modeled as a function of covariates. Let $c_{rj}$ be the categorical self-assessment response of corruption perception framed in question *r* by individual *j* that can take a value from 1 to 5. Thus, we have the following *behavioral* equation:

$$\tilde{c}_{rj} = \Gamma z_{rj} + \varepsilon_{rj} \qquad (1)$$

Where $\Gamma$ is a vector of parameters, $z_{rj}$ is a vector of socioeconomic covariates that explains the self-assessment responses, and $\varepsilon_{rj} \sim$ N (0, $\sigma^2_r$). Variable $\tilde{c}_{rj}$ is a latent or unobserved variable for which the researcher only observes the categorical response $c_{rj}$ which is assumed to be related with $\tilde{c}_{rj}$ in the following way:

$$c_{rj} = j \text{ si } \tau_j^{i-1} \le \tilde{c}_{rj} < \tau_j^{i}, \; i=1,\ldots,5. \qquad (2)$$

where $\tau_j^i$ are the thresholds between categories that are given by:

$$\tau_j^0 = -\infty, \; \tau_j^5 = \infty, \; \tau_j^i = \beta^i x_j + \mu_j, \; i=1,\ldots,4. \qquad (3)$$

The *reporting behavior* equation in (3) for $\tau^i_j$ models the thresholds as a function of socioeconomic covariates $x_j$ and parameter vector $\beta^i$. The error terms $\mu_j$ are assumed to be normally distributed with zero mean and $\sigma_\mu$ variance, and introduces the unobserved individual effect or heterogeneity in the response scale. In addition, $\mu_j$ is assumed to be independent of $\varepsilon_{rj}$ and $z_{rj}$. Further, the error terms in the threshold or reporting behavior

equation (3) imply that the evaluations of the vignettes are correlated with each other and with the self-assessments, because some respondents might use low thresholds while others might use high thresholds.

The hypothesis of differential item functioning (DIF) follows because of the fact that respondents use different response scales, i.e. this means that $\tau_j^i$ are different across respondents because they depend on socioeconomic characteristics or covariates. The restricted model that does not consider DIF does not allow variation of the thresholds across respondents. The unrestricted model estimates the reporting behavior equations in (3) simultaneously by utilizing the responses to the vignette questions.

That is, let $c_{vj}$ be the categorical response of corruption perception to the vignette questions by individual *j* that can take a value from 1 to 5. We assume that the expected value of the underlying latent variable $\tilde{c}_{vj}$ depends only on the corresponding vignette, i.e.

$$\tilde{c}_{vj} = \alpha_v + \varepsilon_{vj} \qquad (4)$$

where $\alpha_v$ is a fixed vignette parameter that represents the level of corruption represented in the vignette question *v*, and $\varepsilon_{vj} \sim$ N (0, $\sigma^2{}_v$).

Similarly to the self-assessment response model outlined in equations (1)-(3), variable $\tilde{c}_{vj}$ is a latent or unobserved variable for which the researcher only observes the categorical response for each vignette $c_{vj}$ which is assumed to be related with the underlying $\tilde{c}_{vj}$ in the following way:

$$c_{vj} = j \quad \text{if} \quad \tau_j^{i-1} \le \tilde{c}_{vj} < \tau_j^i \text{ , } i=1,\ldots,5. \qquad (5)$$

where $\tau_j^i$ are the thresholds between categories that are given by:

$$\tau_j^0 = -\infty,\ \tau_j^5 = \infty,\ \tau_j^i = \beta^i x_j + \mu_j,\ i=1,\ldots,4. \qquad (6)$$

where it can be seen that equation (6) is identical to equation (3). Therefore, the information provided by the evaluation of individuals to the situations raised in the questions of the vignette on corruption or satisfaction, allows us to correct by the differences in the functioning of the scale between individuals (DIF), through the estimation of the response equations of the thresholds as a function of the relevant socioeconomic variables, simultaneously with the equation to model the responses of self-perception.

## IV. Data

The field works were conducted on-line by random sampling to citizens in Argentina, United Kingdom, United States, Mexico, Germany, and France in 2008. The quality of the survey and the sampling procedures were checked and supervised by a leading professional firm specializing in Web surveys. Prior to the release of the questionnaires, two focus groups were conducted to improve the wordings and the understanding of the hypothetical vignette scenarios, and the other questions in the survey instrument.

In addition, two pre-test samples of 100 individuals and twenty in depth interviews in each country allowed us to check that the questionnaire was understood as expected by researchers. All questions on self perceptions and on the vignettes for corruption and satisfaction were answered based on a 5 point Likert scale that rated the level of

importance from 1 (not important at all) to 5 (of vital importance). The sample size was of 5.485 adult individuals.

Table 1 shows the sample statistics of the responses of individuals to the perception of corruption and satisfaction. In addition to the question on the global importance of corruption in each particular country, individuals were asked about the importance of corruption in four domains: i) practice of bribing public officials to get special treatment, ii) effectiveness of the Government in collecting taxes from individuals, iii) effectiveness of the Government in collecting taxes from private companies, and iv) the importance of being a member of a political party in order to get a job for the Government. As can be seen, the mean values for these measures of the different dimensions of corruption are lower than those obtained for the question about the importance of corruption in general, for all countries except for Argentina and France. Corruption is perceived highest in Argentina and US, and lowest in Mexico and France. Satisfaction is highest in Argentina and lowest in Mexico and USA.

## V. Results

The model for the correction of the scale response bias using anchoring vignettes is based on a simultaneous equation approach that jointly models the self-assessment response and the responses to the vignette questions. The model is a generalization of the ordinal probit model, also called HOPIT model (e.g. King et al. 2004; King and Wand, 2007; Rice et al. 2010) that allows for the thresholds defined by categorical variables to be modeled as a function of covariates[1]. The restricted version of the model

[1] This model consists of two types of equations: i) a self-assessment equation that models the responses of the individual to the personal assessment of the construct (corruption and satisfaction) as a function of

that does not account for DIF considers only equation i) since the parameters of equation ii) are set to zero. The comparison between the restricted and non-restricted models allows us to determine the validity of the hypothesis of DIF, i.e. the scale of response varies between individuals. The simulation of the non-restricted model allows us to obtain a more accurate estimation of the variable of interest (corruption or satisfaction), that is corrected by the bias resulting form the differences in use of the scale of responses between individuals.

Table 2 presents a simple test for scale perception bias, by comparing the responses of the different countries to the same vignette levels defined in the questionnaires, which were assumed to be objectively equal between countries. However, as can be appreciated by the results, the mean values of the different samples in different countries are different for a given vignette level, and this is also the case for all vignette levels. Thus, individuals in different countries attach different response values to the same vignette levels, which is evidence of difference scale functioning, i.e. individuals in different countries do utilize different scale responses when evaluating their perceptions to identical objectively levels of corruption practices.

Table 2 also shows that individuals do not have clear distinctions between some vignettes since the mean values are quite similar or inverted in order. The internal consistency results of the scales across countries are presented in Table 3, where it can be seen that there is high consistency across countries in most of the vignettes responses. Highest consistency is found in the UK, France and US. And the lowest consistency rates are found in Mexico. These results are also corroborated in Table 4 according to different tests of rank order consistency across vignettes and countries.

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socioeconomic variables and, ii) a set of behavior equations that model the thresholds of the categorical construct (boundary values or cutoff points) as a function of socioeconomic variables of the individual.

The model has been estimated incorporating socioeconomic variables that were significant in explaining the answers to the questions of corruption across all countries. Table 5 presents the description of the relevant explanatory variables while Table 6 presents the results of the censored ordered Probit model, and the HOPIT model that corrects by differences in scale between individuals for the perception of satisfaction and corruption. The first two columns show the results of the restricted model or censored ordered Probit which does not incorporate the DIF hypothesis, while the last two columns correspond to the results of the HOPIT model.

If the variables that explain threshold behavior equations (or cutoff points of the underlying ordinal variable) are significant, then the HOPIT model is better than the censored ordinal Probit model, and the restriction that individuals use the same scale in responses to the perception of corruption is therefore rejected. The results of the restricted model (first two columns) show that the perception of corruption and satisfaction are higher for those individuals that pray frequently, vote leftwing parties, have higher incomes and work as civil servants. In addition, corruption perception is lower for those subjects with higher education levels and is not significantly different across genders and age.

Table 6 also presents the results of the two equations of the HOPIT model for the perceptions of corruption and satisfaction. For the threshold behavior equations we present only the results of the first boundary (or cutoff point), since the results do not vary significantly for the other cutoff points. For the equation of self-perception, the impact of socioeconomic variables is greater in the model with DIF than in the model without DIF. Thus, the model without DIF underestimates the impacts of socioeconomic characteristics on corruption perceptions. In addition, a likelihood ratio test strongly rejected the model without DIF in favor of the model that considered the

thresholds of the scale as a function of the socioeconomic characteristics of individuals. The estimation of the threshold behavior equation for the answers to the vignettes of corruption reveals that there are some socioeconomic variables that are significant, and therefore, that explain differences in the scale used in the responses by individuals in the sample. The lowest threshold (or cutoff point) is higher for females, subjects with higher age, higher education levels, who work as civil servants and have higher incomes.

The estimated models allow us to calculate the simulated levels of corruption perception. The variable of perception of corruption is simulated with the non-restricted HOPIT model, and will be used later in estimating the model of happiness that will allow us to evaluate the social cost of corruption. Table 7 presents the results of the simulated rankings of corruption perceptions both for the model that corrects for DIF (HOPIT) and for the restricted model that does not allow differences in scales. In the model without DIF the overall level of corruption perception has a different ranking across countries than in the model with DIF correction. Thus, the correction for DIF in the estimation of corruption perception leads to a more accurate estimate of the corruption level, thereby affecting the rankings of corruption perceptions across countries. The reason is that the HOPIT model corrects for scale perception bias in the low responses to corruption perceptions across individuals.

## VI. Evaluation of the social cost of corruption

The estimation results of the HOPIT model for corruption and satisfaction allow us to estimate the welfare cost of corruption. To this aim, we should take into account that the happiness model that relates corruption and satisfaction can be considered as a

specification of a utility or welfare function. Therefore, by totally differentiating the happiness equation we can obtain the monetary change in satisfaction (utility or welfare) that is produced by a change in corruption levels, by calculating the quotient between the change in corruption and the marginal utility of income.

However, the estimation of the welfare change of corruption with models of individual data that utilize satisfaction scales differs somewhat from the estimation with aggregated data. The reason is that the questions on satisfaction and corruption perceptions are based on a 1 to 5 Likert scale, and therefore the appropriate model is ordinal and not linear. Therefore, the interpretation of the estimated coefficients with the ordinal Probit model differs from the interpretation with linear regression models (Daykin and Moffatt, 2002). The reason is that there is no natural function that reflects the conditional means of the model E [s|z], since the endogenous variable(s) is simply a label that reflects the order in a non-quantitative level of the unobserved latent variable. To calculate the impact of corruption on welfare in the ordinal model, it is necessary to relate the parameters of the model with the choice probabilities of each possible value of the scale, thus obtaining partial effects. That is, the marginal effect of a change in the level of corruption $z_c$ on the probability of ordinal choice is:

$$\alpha(z_c) = \frac{\partial \Pr(h = j / z)}{\partial z_c} = \left[ f(t_{j-1} - \gamma_c z_c^1) - f(t_j - \gamma_c z_c^0) \right] \gamma_c \qquad (7)$$

where $z_c$ is the covariate that represents the perception of corruption, $\gamma_c$ is the parameter of this variable, $z_c^0, z_c^1$ are the initial and final values of the variable respectively, and $t_{j-1}, t_j$ are the thresholds or cutoff points of the scale. Thus, in order to estimate the impact of a change in corruption perception on individual welfare we

must substitute the value of the significant variables explaining satisfaction in equation (7), which can be approximated by the average value of these variables ( $\bar{z}$), i.e.

$$\frac{\partial \Pr(h = j / \bar{z})}{\partial z_c} = \left[ f(t_{j-1} - \gamma_c \bar{z}) - f(t_j - \gamma_c \bar{z}) \right] \gamma_c \qquad (8)$$

By conducting the same procedure to estimate the welfare impact of a change in the level of income ($z_r$), and by using the Delta method (Greene, 2008a, p. 783-785), the monetary cost of corruption (CC) is derived utilizing the following expression:

$$CC = \frac{d(z_c)}{d(z_r)} = \frac{\dfrac{\partial \Pr(h = j / z)}{\partial z_c} = \left[ f(t_{j-1} - \gamma_c z_c^1) - f(t_j - \gamma_c z_c^0) \right] \gamma_c}{\dfrac{\partial \Pr(h = j / z)}{\partial z_r} = \left[ f(t_{j-1} - \gamma_r z_r^1) - f(t_j - \gamma_r z_r^0) \right] \gamma_r} \qquad (9)$$

where subscript *r* refers to the covariate of personal income. The estimation of the social cost of corruption utilizing the results of the HOPIT model in Table 6 is presented in Table 8.

The average of the social cost of a point -in the qualitative scale- of perceived corruption by individuals is € 12.73 per month for the model incorporating the response scale bias (without DIF), and € 19.02 for the model that corrects by scale bias (with DIF). Therefore, the cost of corruption becomes underestimated if scale response bias is not corrected with the use of the anchoring vignette technique. This cost corresponds to the reduction of corruption in one level of the threshold value from the estimated average in each model.

## VII. Conclusions

Corruption is capable of generating important social costs that are commonly approximated by a reduction in the gross domestic product (GDP). However, the

measurement of social costs through market prices can undervalue non-market costs that affect social welfare. In this paper we have provided evidence on the social cost of corruption by estimating the relationship between satisfaction and corruption with microeconomic or individual data. Since both corruption and satisfaction are measured through individual responses to survey questions, we have utilized the method of anchoring vignettes to correct for scale perception bias in the responses.

Scale perception bias in the measurement of corruption and/or satisfaction perceptions follows by the fact that individuals may respond survey questions using different response scales. The implication is that the social cost of corruption would not be accurately measured. The results in this paper show that scale perception bias was significant in the responses to both the corruption and satisfaction questions, i.e. individuals did use different scales when answering the assessment questions on these constructs. Thus, the threshold levels of the categorical responses vary significantly across individuals. A more accurate estimation of the social cost of corruption requires the correction of the measures of satisfaction and corruption by the response scale bias. The technique of anchoring vignettes provides a promising approach to this aim, since it allows researchers to elicit comparable responses across individuals.

The results of this paper show that if the scale response bias is not corrected, then the average levels of corruption and satisfaction are lower. In addition, the social cost of corruption, derived by converting the change in satisfaction in monetary terms, is undervalued with respect to the estimate obtained with a model that corrects for scale response bias. Further research should provide more evidence on the undervaluation effect of the uncorrected responses to satisfaction and corruption. Further, there is need

for the development of methods that improve the comparability of individual responses in surveys of socioeconomic questions.

This paper has shown that the absence of correction for scale response bias does lead to different ranking in the perceptions and costs of corruption across countries. Some countries that are high in the ranking for the perception of corruption do occupy a much lower ranking when the scale perception bias is corrected. The total amount of the social cost of corruption in each of the countries as well as their percentage of GDP do also change as a result of the more accurate estimation based on the correction of scale perception bias.

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**Table 1.** Mean corruption perception levels by country (Likert scale, 1-5).

| Attributes | Germany | UK | USA | Argentina | France | Mexico |
|---|---|---|---|---|---|---|
| Global importance | 4.27 | 4.23 | 4.41 | 4.41 | 4.08 | 4.18 |
| Bribing practices | 4.05 | 4.12 | 4.12 | 4.54 | 4.12 | 4.11 |
| Tax efficacy on individuals | 3.97 | 3.91 | 3.98 | 4.39 | 4.16 | 4.07 |
| Tax efficacy on firms | 3.81 | 4.08 | 3.82 | 4.19 | 4.49 | 3.98 |
| Political party membership for government job | 3.62 | 3.76 | 3.70 | 4.25 | 4.08 | 3.73 |
| **Overall satisfaction level** | **3.98** | **4.09** | **4.01** | **4.42** | **3.99** | **4.01** |

**Table 2.** Average satisfaction for vignettes sets by country (this allow us to test for potential scale perception bias)

| | Germany | UK | USA | Argentina | France | Mexico |
|---|---|---|---|---|---|---|
| Vignette 1 | 4.08 | 3.93 | 4.11 | 4.51 | 4.12 | 4.05 |
| Vignette 2 | 3.98 | 4.03 | 4.07 | 4.39 | 4.01 | 4.06 |
| Vignette 3 | 3.92 | 3.96 | 4.04 | 4.36 | 3.97 | 4.06 |
| Vignette 4 | 3.90 | 4.02 | 4.07 | 4.29 | 3.98 | 4.00 |
| Vignette 5 | 3.93 | 3.90 | 4.10 | 4.30 | 3.92 | 3.99 |

* For the sake of simplicity, and the low range of values that they take, standard deviations are not reported in this table. All values for this statistic lie in a range between 1.13 and 1.92.

**Table 3.** Percentage of consistent ordering by vignettes and countries

| Dimension | Germany | UK | USA | Argentina | France | Mexico |
|---|---|---|---|---|---|---|
| Global importance | 77 | 84 | 88 | 68 | 79 | 72 |
| Bribing practices | 82 | 89 | 87 | 77 | 87 | 75 |
| Tax efficacy on individuals | 86 | 92 | 89 | 79 | 88 | 78 |
| Tax efficacy on firms | 81 | 85 | 88 | 76 | 85 | 74 |
| Political party membership for government job | 84 | 93 | 92 | 85 | 91 | 77 |

**Table 4.** Spearman test. Consistency of vignette orderings and average rank correlation coefficients by country.

| | Test 1 | Test 2 | Test 3 | Test 4 |
|---|---|---|---|---|
| Germany | 62 | 93 | 84 | 16 |
| UK | 65 | 96 | 87 | 13 |
| USA | 85 | 91 | 69 | 23 |
| Argentina | 69 | 89 | 81 | 18 |
| France | 65 | 91 | 88 | 19 |
| Mexico | 72 | 90 | 76 | 15 |

Note: T1=Number of different rank order correlation coefficients; T2= Proportion of individuals whose correlation coefficient is positive; T3=Proportion of individuals whose correlation coefficient is higher than 0.5; T4=Number of rank order correlation coefficients that occur with frequency higher than 1%.

**Table 5.** Description of the explanatory variables in the model

| Covariates | Description |
|---|---|
| Female | Dummy variable that equals 1 if the subject is female, 0 for male. |
| Age | Age of the subject. |
| Ed high | Dummy variable that equals 1 if the subject has a high education or university degree and 0 otherwise. |
| Left Party | Dummy variable that takes the value of 1 if the subject states that votes some leftist party, and 0 otherwise. |
| Civil Servant | Dummy variable that takes the value of 1 if the subject is a civil servant working for the government or has a public job, and 0 otherwise. |
| High income | Dummy variable that takes the value of 1 if the subject receives a net annual income equal or above the upper 30 $^{th}$ percentile of the distribution of income. |
| Net Income | Net monthly income per person in € |
| Corruption | Subjective perception of the global level of corruption in the country (1-5) |

**Table 6.** Estimation results of the HOPIT model (jointly for satisfaction and corruption)

| | Restricted model | | Model with DIF | |
|---|---|---|---|---|
| **Covariates** | **Parameter** | **Std. dev** | **Parameter** | **Std. dev** |
| *Self-perception of satisfaction responsive equation* | | | | |
| Constant | -5.44 | 0.39 | -6.64 | 0.29 |
| Female | -0.14 | 0.20 | -0.48 | 0.41 |
| Age | 0.08 | 26.02 | 0.15 | 19.91 |
| Ed high | -3.03 | 0.25 | -4.13 | 0.35 |
| Left Party | 3.10 | 0.20 | 3.53 | 0.36 |
| Civil Servant | 4.64 | 0.30 | 3.78 | 0.92 |
| High income | 9.77 | 0.37 | 10.48 | 0.49 |
| *Threshold behavior equation* | | | | |
| Constant | - | - | 1.32 | 0.35 |
| Female | - | - | 0.98 | 0.30 |
| Age | - | - | 44.58 | 9.25 |
| Ed high | - | - | 1.28 | 0.47 |
| Left Party | - | - | 0.16 | 0.55 |
| Civil Servant | - | - | 1.51 | 0.54 |
| High income | - | - | 0.84 | 0.32 |
| *Self-perception of satisfaction responsive equation with USA dummy interactions* | | | | |
| Constant | 4.12 | 0.57 | 1.82 | 0.59 |
| Female | 1.09 | 0.64 | 0.33 | 0.62 |
| Age | 21.04 | 24.00 | 74.75 | 29.96 |
| Ed high | 2.83 | 1.11 | 4.33 | 1.20 |
| Left Party | 2.51 | 1.13 | 2.74 | 1.23 |
| Civil Servant | 1.86 | 1.01 | 2.22 | 1.50 |
| High income | 5.41 | 0.97 | 4.53 | 0.90 |

| | | | | |
|---|---|---|---|---|
| *Threshold behavior equation with USA dummy interactions* | | | | |
| Constant | - | - | 2.52 | 0.27 |
| Female | - | - | 0.38 | 0.39 |
| Age | - | - | 1.46 | 0.55 |
| Ed high | - | - | 0.91 | 0.45 |
| Left Party | - | - | 1.06 | 0.30 |
| Civil Servant | - | - | 0.79 | 0.81 |
| High income | - | - | 0.34 | 0.63 |
| *Self-perception of satisfaction responsive equation with UK dummy interactions* | | | | |
| Constant | 3.58 | 0.50 | 1.57 | 0.51 |
| Female | 1.43 | 0.84 | 0.44 | 1.05 |
| Age | 35.33 | 39.70 | 58.37 | 32.71 |
| Ed high | 2.56 | 1.01 | 3.90 | 1.08 |
| Left Party | 2.76 | 1.24 | 2.74 | 1.36 |
| Civil Servant | 2.03 | 1.10 | 2.43 | 1.10 |
| High income | 4.83 | 0.87 | 4.53 | 0.90 |

| | Restricted model | | Model with DIF | |
|---|---|---|---|---|
| **Covariates** | **Parameter** | **Std. dev** | **Parameter** | **Std. dev** |
| *Threshold behavior equation with UK dummy interactions* | | | | |
| Constant | - | - | 0.93 | 0.75 |
| Female | - | - | 1.01 | 0.76 |
| Age | - | - | 1.04 | 0.88 |
| Ed high | - | - | 0.84 | 0.78 |
| Left Party | - | - | 1.05 | 0.73 |
| Civil Servant | - | - | 1.18 | 0.67 |
| High income | - | - | 0.99 | 0.67 |
| *Self-perception of satisfaction responsive equation with France dummy interactions* | | | | |

| | | | | |
|---|---|---|---|---|
| Constant | 4.04 | 0.56 | 1.78 | 0.58 |
| Female | 1.80 | 1.05 | 0.56 | 0.93 |
| Age | 31.29 | 35.26 | 58.37 | 34.54 |
| Ed high | 3.49 | 1.36 | 5.40 | 1.48 |
| Left Party | 2.68 | 1.20 | 2.74 | 1.32 |
| Civil Servant | 2.14 | 1.16 | 2.57 | 1.10 |
| High income | 4.30 | 0.77 | 4.53 | 0.90 |
| *Threshold behavior equation with <u>France</u> dummy interactions* | | | | |
| Constant | - | - | 1.07 | 0.80 |
| Female | - | - | 0.66 | 0.47 |
| Age | - | - | 1.40 | 0.75 |
| Ed high | - | - | 1.23 | 0.96 |
| Left Party | - | - | 0.95 | 0.44 |
| Civil Servant | - | - | 0.68 | 0.32 |
| High income | - | - | 0.74 | 0.37 |
| *Self-perception of satisfaction responsive equation with <u>Argentina</u> dummy interactions* | | | | |
| Constant | 3.91 | 0.54 | 1.73 | 0.56 |
| Female | 1.46 | 0.85 | 0.45 | 0.84 |
| Age | 28.32 | 32.00 | 58.37 | 31.79 |
| Ed high | 2.51 | 0.99 | 3.82 | 1.06 |
| Left Party | 2.76 | 1.24 | 2.74 | 1.36 |
| Civil Servant | 1.97 | 1.07 | 2.36 | 1.00 |
| High income | 4.49 | 0.81 | 4.31 | 0.92 |
| *Threshold behavior equation with <u>Argentina</u> dummy interactions* | | | | |
| Constant | - | - | 0.90 | 0.69 |
| Female | - | - | 0.98 | 0.69 |
| Age | - | - | 0.94 | 0.67 |

| | | | | |
|---|---|---|---|---|
| Ed high | - | - | 0.99 | 0.70 |
| Left Party | - | - | 1.11 | 0.68 |
| Civil Servant | - | - | 0.94 | 0.65 |
| High income | - | - | 0.93 | 0.65 |
| *Self-perception of satisfaction responsive equation with <u>Mexico</u> dummy interactions* | | | | |
| Constant | 4.17 | 0.93 | 1.65 | 0.56 |
| Female | 1.89 | 1.15 | 0.49 | 0.91 |
| Age | 30.12 | 30.04 | 56.15 | 34.52 |
| Ed high | 3.98 | 1.45 | 5.73 | 1.44 |
| Left Party | 2.79 | 1.31 | 2.92 | 1.38 |
| Civil Servant | 2.06 | 1.28 | 2.71 | 1.15 |
| High income | 4.21 | 0.72 | 4.55 | 0.93 |
| *Threshold behavior equation with <u>Mexico</u> dummy interactions* | | | | |
| Constant | - | - | 1.06 | 0.82 |
| Female | - | - | 0.65 | 0.48 |
| Age | - | - | 1.44 | 0.75 |
| Ed high | - | - | 1.23 | 0.92 |
| Left Party | - | - | 0.97 | 0.43 |
| Civil Servant | - | - | 0.68 | 0.39 |
| High income | - | - | 0.71 | 0.31 |

* reference country for dummy variables: Germany.

**Table 7.** Overall perceived corruption ranked by country with and without correcting for DIF.

| Rank | Ordered Probit | HOPIT (corrected model) |
|---|---|---|
| 1 | Mexico | Argentina |
| 2 | France | Mexico |
| 3 | UK | Germany |
| 4 | USA | USA |
| 5 | Argentina | France |
| 6 | Germany | UK |

**Table 8.** Estimation of the average social cost of corruption (€)

| | By average person | |
|---|---|---|
| | Marginal Mean | s.d. |
| Model without DIF | 12.73 € | 2,94 |
| Model with DIF | 19.02 € | 2,16 |