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Abstract: We use unique survey data from Bulgaria's tax administration to evaluate the determinants of corruption risk. We construct a novel measure of corruptibility, defined as the gap between actual income and the self-reported corruption-proof income. The survey data show that raising incomes leads to lower corruption risk. However, incomes would have to almost triple to eliminate the risk of corruption, which makes such a policy intervention politically and financially unfeasible. The results suggest that strengthening monitoring and control might be more cost-effective for addressing corruption risks in the case of the tax administration in Bulgaria. They also suggest that gender, age, and tenure can be used to inform human resource allocation.

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Corruption in the Tax Administration: Is there Scope for Wage Incentives?

I. Introduction

Combating corruption is high on the agenda of many governments and international organizations. Corruption creates uncertainty and reduces the transparency of the economic environment, leading to inefficiencies and lower economic growth. Designing and implementing policies to reduce corruption, however, is a serious challenge. Entrenched powerful interests who benefit from corruption have little incentive to change the status quo. Moreover, even if the political will to fight corruption is in place, there is little agreement on the most effective policies.

Raising the salaries of government officials is a case in point. There is a growing body of literature on the effect of compensation on corruption in the tax administration (Besley and McLaren, 1993; Mookherjee and Png, 1995; Haque & Sahay 1996; Mookherjee 1997; Van Rijckeghem and Weder, 1997). There are also practical attempts to apply compensation incentives to curb tax corruption (see for instance Kahn, Silva and Ziliak, 2001, on Brazil). There is, however, little empirical evidence supporting this approach. Does raising salaries lower corruption? Are other policies more beneficial on a net cost basis?

The objective of this paper is to address these questions. Specifically, we use unique survey data from the tax administration of Bulgaria[1] to determine: 1) whether higher income is associated with lower incentives to engage in corruption and 2) what would be the required increase in salaries to achieve a meaningful effect. More than half of the surveyed tax officers

[1] The survey of a representative sample of 699 tax officers from all 28 territorial tax directorates and the central large tax-payer unit was carried out by Vitosha Research. The sample is 7.4% of the entire tax-office workforce of 9389 employees, of which 6.5 is managers, 73.5 percent is the tax officers, and 20 percent is the supporting staff. The results are reported in more details in Pashev (2008).

identified low wages as a leading driver of corruption in the tax administration. Similarly, wage increase is singled out as the most important anti-corruption intervention by 96 percent of the respondents.

The paper uses a novel measure of corruptibility to explore the determinants of these views. The survey asks tax officials to identify the level of income that would be sufficient to reduce corruption substantially. We then use the difference between this "corruption-proof" income and actual income to measure the likelihood of engaging in corruption. We identify a number of attitudinal and demographic characteristics that explain the differences in corruptibility across survey respondents. Most importantly, we find evidence that increasing incomes would lower the likelihood of engaging in corruption. However, to achieve meaningful effects, the increase in incomes would have to be large. Thus, while there is a negative relationship between income levels and corruption, increasing salaries does not appear to be an efficient policy option.

The study contributes to the ongoing research and policy debate on corruption in several ways. First, it is *sector-specific*, with a focus on the tax administration. In contrast, most of the literature assesses corruption in the civil service at large. Identifying the drivers of corruption in the tax service helps design better policies in that specific area. This is important as tax collection is a continuing struggle in many transition and developing countries.

Second, our analysis looks at the *tax officers' side* whereas most of the literature studies the bribe-giving side, relying on surveys of business' and households' perceptions and actual experience. Applied originally to measuring crime rates, this approach presumes that the briber is a victim in the bribery act and responds to surveys as such, e.g. Miller (2006) and Seligson (2006). However, in tax corruption the briber is more likely to be an accomplice than a victim and, therefore, in Bulgaria and many other

countries, the penal code adheres to the assumption that both parties in the bribery are guilty, no matter if the briber had much choice whether or not to give. Thus, while experience-based corruption indexes usually treat bribers as victims, the law treats them as criminals. In that environment, it is difficult to isolate the supply from the demand drivers of corruption. Our survey allows us to analyze the tax officials' side of the transaction separately. This is important as most policy measures target the behavior of these officials as opposed to the behavior of the general public.

Third, we introduce an *innovative measure of corruptibility* – the gap between desired and current income. The survey does not inquire about respondents' actual engagement in corruption, an approach that would almost surely produce underreporting. Rather, it inquires about the corruption-proof income in the respondents' area of occupation. With this generalized formulation, almost all respondents in the survey were willing to provide an answer. Thus, we are able to obtain and analyze a valid measure of corruptibility from a large sample of respondents who otherwise have little incentive to report corruption practices. We use this measure to assess how three groups of variables correlate to corruption risk: wage incentives, ethical and social determinants, and personal characteristics.

Fourth, we differentiate between *"corruption with theft"* and *"grease-the-wheels corruption."* Even though corruption is generally defined as abuse of office for private gain, it makes an essential difference for policymaking whether this private gain is at the expense of the budget or at the expense of the client, and whether the bribe giver is a gainer or a loser in the act of bribery. Shleifer and Vishny (1993) distinguish "corruption with theft", where the official's gain is at the expense of the public office, from "corruption without theft", where the gain is at the expense of the briber. Similarly, we distinguish tax corruption related to non-compliance from the

one related to the delivery of services.[2] In the case of corruption for better and faster services, the bribe may be paid in exchange for due benefit, and the cost is borne by the briber. These corruption practices have been sometimes modeled as efficiency-enhancing, i.e. they "grease in the wheels of business" (Aidt 2003, Lui 1985, and Beck and Maher 1986). In order to distinguish corruption related to tax evasion from that related to services, we study corruptibility in different departments of the tax administration. For example, the opportunities for "corruption with theft" dominate in the Audits and Control, whereas the opportunities for corruption without theft dominate in the Taxpayer Services Department.

The rest of the paper is organized as follows. Section II discusses the theoretical relationship between wages and corruptibility. Section III introduces the survey data. Sections IV and V present the empirical hypotheses and the empirical results. Section VI concludes.

II. The theoretical relationship between income and corruption

Wage incentives can have a different impact as deterrents of corruption depending on the driver of corruption. We review the role of wage incentives in the three main theoretical frameworks explaining corruption: income maximizing behavior, adverse selection, and the fair wage model.

Income maximizing

In a principal-agent setting, Becker and Stigler (1974) explain the enforcer's motivation to engage in malfeasance through expected costs and benefits, i.e. the size of the bribe, the probability of detection, and the cost of the punishment. In the case of dismissal, the cost of being caught is the

[2] According to 66 percent of the tax officers, bribes in Bulgaria are mainly related to tax evasion; only 23 percent see better and faster services as the main reason for corruption. Similarly, tax officers identify the units of Audits and Operational Controls as the ones with higher incidence of corruption; and Audits with the largest bribes (Pashev 2008).

loss of the wage of the enforcer relative to the pay for the position s/he would get elsewhere. If the likelihood of detection is unity, enforcers could be paid what they can obtain in other jobs that require comparable skills, risk, effort, etc. As the probability of detection is less than unity, the solution would be to raise the salary of enforcers above what they could get elsewhere by an amount that is inversely related to the probability of detection, and directly related to the size of the bribe. Then the cost of dismissal would more than offset the gain from malfeasance. In this setting, corruption is deterred by the cost of losing one's job. The higher the relative wage of the enforcer the lower the frequency of bribe transactions and/or the higher the bribe amount demanded. Applying the wage that deters corruption into practice, however, might be prohibitively costly, especially when the benefits of bribery are high and detection rates are low. This leads Becker and Stigler to build a case for assigning enforcement to private agents, which might be more cost–effective than increasing wages.[3]

Adverse selection

Alternatively, the positive effect of higher wage on enforcement is explained by its effect on recruitment. The argument is that low salaries in the public sector cannot attract the types of competent and honest people who have more attractive opportunities elsewhere. This affects adversely the capacity and professional integrity in the public administration (Klitgaard, 1988; Haque and Sahay, 1996). In this context, higher salary is needed not because it imposes a cost on being caught with a bribe, but because higher salaries attract better quality individuals, who would be less likely on average to take bribes.[4]

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[3] These models have been often referred to as "shirking" models (Shapiro and Stiglitz 1984). See Katz (1986) for an overview.

[4] This argument can be traced back to Adam Smith's Wealth of Nations, where he argued that occupations requiring trust paid higher wages in order to attract better quality persons.

Besley and McLaren (1993) is an example of such analysis. In their study of wage incentives in the tax administration they include honesty, and explore the consequences for tax collection of three types of wage regimes:

- The reservation wage is the wage that tax inspectors could get elsewhere. It attracts to the tax service honest and dishonest people in the ratio they are hired elsewhere. The dishonest people would compromise their integrity to maximize their income.
- The efficiency wage is the one that solves the moral hazard problem and deters shirking, providing to all dishonest inspectors income incentives to be honest.
- The capitulation wage is the one which is below the reservation wage, and attracts only the dishonest.

In this setting, if honesty is high the reservation wage yields better results than the efficiency wage, even if monitoring is poor. Strengthening monitoring could even be counterproductive, as more stringent controls and sanctions undermine the impact of ethical brakes (Schulze and Frank, 2003). In contrast, if honesty is low then the capitulation wage yields the best outcome: the government recognizes that inspectors join the tax administration only because of bribe-opportunities, and would try to counter this through better control rather than better wages. In brief, if honesty is in shortage on the labor market, there might be a certain level of monitoring above which wage incentives work against corruption. In comparison to the income maximizing explanation, the policy implications of the adverse selection hypothesis is that the efficiency wage may not only be prohibitively costly, but may yield inferior revenue results compared to the reservation or capitulation wage if internal control is weak, and/or honesty is not so high.

Fair wages

This argument builds on the idea that unfair wages increase corruption as they reduce its moral cost (Rose-Ackerman, 1975). Van-Rijckeghem and

Weder (1997) find empirical evidence of a negative relationship between corruption and civil service wages across countries (though not within countries over time) and study the hypothesis that the level of corruption may not be determined by income-maximizing behavior, but by behavior that seeks to adjust income to what is perceived as its fair level. The level of the fair wage could be determined relative to peers' wages, or perceptions of family well-being, or of social status and reputation. Whatever the benchmark, the effect is that the perceived unfairness of the wage makes the moral justification of taking bribes easier both for the bribe taker and for the public at large. Compared to the income-maximizing hypothesis, fair wage models imply more scope for wage policy: the corruption-proof level of wage is set lower as it does not depend on the size of the bribe. Furthermore, while under the shirking model the anti-corruption effect of the wage depends critically on the effectiveness of controls, this is not the case in the fair wage setting. On the contrary, stronger controls may increase corruption, which is consistent with the experimental evidence by Schulze and Frank (2003) who argue that increased controls decrease the moral costs of corruption in situations where the fair wage hypothesis dominates. However, Van-Rijckeghem and Weder (1997) do not find empirical evidence for the validity of the fair wage hypothesis. On the contrary, their empirical results seem to support – although weakly and not conclusively – the validity of the income-maximizing hypothesis. Similarly, experimental evidence by Abbink (2000) fails to find support of the hypothesis that high relative salaries of public officials lead to less corruption through fairness considerations.

In short, there are ample theoretical reasons to believe that wage increases should lower corruption either by raising the cost of being caught, by increasing perceptions of fairness or by attracting more honest tax

officials. In the words of Tanzi (1998:572) "there may be corruption due to need and corruption due to greed." In a situation with profit-maximizing corruption due to greed, the income gap would not be highly related to income level, but mostly to corruption opportunities. On the other hand, in a situation where "corruption due to need" dominates, the gap would be expected to decrease at higher levels of income. People from richer households might not perceive substantial gain from taking bribes, as their material needs are already satisfied. On the other hand, higher household income could increase the risk tolerance of the official as the penalties associated with being caught would reduce living standards to a lesser degree.

There is, however, only limited empirical evidence on the effect of wages on the likelihood of engaging in corrupt practices.[5] We provide such evidence in the following sections.

III. Corruption-proof income

The survey question of primary interest in this paper was formulated as follows:

"What level of remuneration for your work, including bonuses, would be sufficient to minimize the drivers of corruption?"[6]

At the time of the survey the average monthly wage in the tax administration was BGL 390 (about EUR200), which is significantly lower

[5] Empirical studies of efficiency wages hinge critically on reliable data on private sector wages. In the case of Bulgaria, for example, average public sector wages were statistically almost twice the level of the average private sector wages at the time of the survey, which might look close to the efficiency wage idea. However, taking into account the non-registered labor as well as the higher proportion of high-skilled employees in the civil service relative to the skill composition in the private sector, the wage in the civil service might be closer to the reservation wage. Thus, the average tax service wage of BGL 390 at the time is similar to the average business accountant's wage. However, if the underreporting of wages is taken into account, the pay level of the tax service may look closer to the capitulation wage.

[6] Additional variables used in this analysis are defined in Table 4 in the appendix.

compared to the overall civil service average of BGL 470.[7] Respondents could choose from a range of levels of corruption-proof remuneration starting with 300 leva per month. We use the ratio between the corruption-proof income and actual income as an indicator of corruption risk, or corruptibility, on the individual level. A high level of corruption-proof income relative to actual income implies that respondents are not compensated enough to be dissuaded from taking the risks associated with corruption. This metric is consistent with both the fair wage and the profit-maximizing hypotheses. On one hand, an officer who perceives her salary to be unfairly low would be tempted to make it up by charging extra for her services or engaging in side deals; on the other hand, an officer who is a profit-maximizer would perceive the corruption-proof income level as the level at which the expected benefit of bribe-taking, adjusted for risk, is smaller than the net present value of his/her compensation.

The median corruption-proof income across the entire sample is 650 leva (about 325 euro). This is 2.2 times greater than the self-reported actual income in the survey. The large gap between the self-assessed bribe-proof income and actual income is evidence for a high level of corruption risks in the tax administration.

The relevant policy question is whether wage policy can reduce these risks, to what extent and at what cost. In other words, can higher wages compete with bribe opportunities? The effectiveness of wage policy would depend on how the income gap responds to changes in income. Indeed,

[7] The wage structure has 9 brackets: the lowest (technical support staff) ranges from BGL 120 to BGL 300; the highest (local and territorial directors) wages range from BGL 675 to BGL 1000. The survey targets tax officers in the territorial directorates and the local tax offices, where a tax inspector and a junior officer get between BGL190 and 450 per month; a chief inspector and a senior officer get BGL 275 – 500; a chief expert in a local tax office gets between BGL 300 and 550 and a chief expert in a territorial tax office gets between BGL325 and BGL650. Heads of local tax offices and heads of territorial tax departments are paid between BGL 475 and BGL800; and directors are paid from BGL675 to BGL 1000. In a way of comparison the prevalent bribe rate at the time (as evidenced in a parallel business survey) is between BGL 250 and 500, which is about the range of the monthly wage of a chief inspector or a senior officer. (Pashev 2005:29).

income expectations (or the self-assessed bribe-proof income) may rise with increases in actual income. Even if the level of bribe-proof income increases as actual income increases, raising wages can reduce the gap if bribe-proof income increases at a slower pace than actual income. Thus, the scope for wage policy would depend on the elasticity of bribe-proof income to changes in actual income.

To address this question, we estimate the following empirical specification:

$$CPIncome_i = \alpha + \beta Income + \gamma X + \varepsilon \quad (1)$$

where *Income* is (the natural logarithm of) actual income and *X* is a vector of additional institutional, demographic and attitudinal variables. *CPIncome* is (the natural logarithm of) corruption-proof income. The interpretation of the coefficient β is as follows:

$$\beta \leq 0 \quad (2)$$

implies that the corruption-proof income declines or remains the same (if $\beta = 0$) as actual income increases. Alternatively,

$$0 < \beta < 1 \quad (3)$$

implies that the corruption-proof income increases with actual income but the increase is *less than proportional*. Thus, raising actual income would gradually close the gap between desired and actual income. The closer β is to 1, the less cost-effective wage policy would be. If:

$$\beta \geq 1 \quad (4)$$

raising incomes leads to an ever increasing gap between corruption-proof income and actual income. Raising wages would be counterproductive. In this context the more cost-effective the wage intervention is, the closer the results to the predictions of the fair-wage models, where wages do not need to compete with bribes but only to be adjusted to what is perceived as their fair levels.

Our measure of actual income is constructed as follows: it equals respondents' household income in households with one member and half of the household income in households with more than one member. We use household income as it captures income pooling within the household**.** A tax officer with high family income would be less likely to risk his/her social status by engaging in bribery even if her wage is lower compared to a much better paid tax officer who is the primary income earner in the family, but her wage is not enough to support the desired standards of living. To account for the size of the household, we also include the number of household members. Figure 1 shows that the level of corruption proof income indeed increases in actual income, but at a decreasing rate, consistent with (3).

Before proceeding, note the substantial variation in the answers among the tax administrators. Table 2 shows that about one third of the respondents report a corruption-proof income below 500 leva per month, another third report a level above 1000 leva per month, and the remaining one third fall in-between. Moreover,

Table 3 shows that the Collections department has the largest gap between corruption-proof income and actual income whereas Taxpayer Services and Appeals do not report a large difference between the corruption-proof income and actual incomes. These differences are consistent with the general level of perceived corruption across departments.

IV. The determinants of corruptibility – additional empirical hypotheses

The empirical model (1) includes a rich set of control variables, which are of policy interest in and of themselves. As the model includes actual income, the estimated coefficients γ can be interpreted as the effect of these variables on the gap between corruption proof-income and actual income.

For example, holding income constant, a negative coefficient on respondents' age implies that the gap between corruption-proof income and actual income is lower for older respondents. This would be an indication for lower corruption risk among older respondents. Moreover, since our dependent variable is in logarithm form, we can interpret the coefficient sizes more readily as the percent change in corruption-proof income associated with a given change in the respective independent variable.

We divide these variables into three groups. The first group is related to the more direct levers of policy intervention like control and sanctions, and assignment of responsibilities. These institutional and policy variables are intended to estimate the distribution of risk and corruption opportunities within the administration and reflect largely the rationale of the income-maximizing model. The second group of variables captures attitudes, values, social and ethical constraints that might drive or deter corruption. It includes social status, well-being, perceptions of employment opportunities outside the tax service (i.e. the opportunity cost of being fired), corruptibility of peers and tolerance to bribes. The third group includes such exogenous personal observables as gender, age, years of service, and place of residence. Policy-wise, the second and the third group of variables have practical importance for individual risk profiling and human resource allocation. They are not meant to imply that anti-corruption wages might be optimally set taking into account these personal observables.

Administrative functions

In order to distinguish corruption related to tax evasion from that related to services, we include dummy variables for the departments of the respondent in the tax administration: Audits, Operational Control, and Collections. We expect that officials in the Audits, Control and Collections departments would be exposed to the most significant corruption opportunities. The regression analysis omits the employees in Taxpayer

Services and uses them as a benchmark to assess differences with the other departments in order to allow us to differentiate between corruption risks in services (where opportunities for corruption are in line with “corruption without theft”) from the corruption risks in departments such as Audits and Control where opportunities for “corruption with theft” dominate.

Levels of administration

The respondents specify whether they work in the territorial directorates, or the local tax units. The latter collect only local taxes (mainly property taxes), in which the opportunities for bribe-taking are limited relative to the income and consumption taxes managed at the territorial level. We expect that the corruption-proof income grows when we move up the administrative ladder.

Penalties

We assess the effect of penalties on decreasing corruption risks by including a dummy variable which indicates whether a respondent believes that a colleague who has been implicated in corruption would be fired. We expect that individuals with such believes would have a lower corruption-proof income.

Employment opportunities

The availability of alternative employment opportunities is important in understanding the cost of losing one’s job if found to be corrupt. We construct a dummy variable for professional immobility, indicating the people who believe that they would have a difficulty or it would be impossible to find a job outside the tax administration. Our hypothesis is that the people facing a higher cost related to job loss, i.e. the officials who are less mobile on the labor market, would be less prone to corruption.

Social status

Respondents are asked to rank their social status on a scale from 1 (lowest) to 5 (highest). A low ranking may indicate that the respondent feels

that they have not attained their rightful place in society (given that all respondents are well educated and with stable public sector jobs). According to the fair wage hypothesis people that perceive their social status as unfair might be more likely to justify bribe taking, i.e. their bribe-proof to actual income ratio would be higher.

Tolerance to receiving undue favors

The survey asks respondents whether they consider a number of client interaction situations as acceptable or unacceptable. The situations include accepting a meal invitation in order to resolve a problem for a client, accepting money, a favor or a gift in order to resolve a problem, providing proprietary information for personal gain or accepting fees or commission for providing consulting services to taxpayers. Fifteen percent of the respondents indicate tolerance to corrupt practices. We expect that people who are tolerant would report a higher level of corruption-proof income**.**

Perceptions of corruption levels

Corruption seems to be contagious. This is easier to understand on the bribe-giving end, especially if corruption is prevalent and has become part of the competition among firms or households (for access to the public good). The spread of evasion and related corruption may be driven by information about evasion by others as modeled by Epstein and Gang (2009). The growing literature on corruption as a multiple equilibria phenomenon asserts that this happens as well on the bribe-taking side, where the willingness to engage in corruption is influenced by the perceived activities of peers and other individuals, or the prevalent public perceptions of the spread of corruption (Andvig and Moene 1990, Bardhan 1997, 2006 Mishra 2006, Dong, Dulleck and Torgler 2008). The reason is that with the spread of corruption the reputation damage of being caught declines: it is easier to be corrupt if one is perceived anyway as corrupt. We use a dummy variable to indicate respondents who have in the past year (often or

sometimes) heard of colleagues receiving money, gifts or services in relation to their professional duties.

Gender

A number of papers show that women are less approving of corrupt practices (Torgler and Valev 2009; Dollar et al 2001; Swamy et al 2001). This finding holds in a wide range of countries and at different time periods and we expect to find the same result.

Age

Age could have a dual effect on the predisposition to accept bribes. For older respondents, the risk of monetary penalties or loss of job might be more damaging as their alternative opportunities in the job market are more limited. They may also be more concerned with losing reputation as their social network is better established. However, by virtue of a longer career, older respondents might be in a better position to accept bribes and might be more adept at doing so.

Years of service

The survey inquires how many years each respondent has worked in their current position. The effect of job tenure on the corruption-proof income is similar to that of age. People with longer careers might have more to lose from engaging in corruption but might at the same time have better opportunities to benefit from corruption.

Place of residence

The survey inquires about the size of the town where the tax officials are employed, which generally coincides with their place of residence. Smaller residential establishments in Bulgaria usually have lower cost of living, which should lower the corruption-proof income. Also, smaller establishments are associated with social networks that are more tightly knit. In such an environment, news of corruption might spread more easily and any associated loss of reputation might be more damaging.

Table 4 and Table 5 provide summary statistics of all variables used in the analysis while below we summarize the empirical hypotheses. We group the variables into three categories: Institutional and Policy that could be subject to policy intervention; Social and Ethical Constraints that reflect broad attitudinal characteristics; and Exogenous Demographic related to basic demographic characteristics. We are interested in the relative impact of these factors on corruption risk.

Table I: Summary of Hypotheses

Variable	Expected	Variable	Expected
Institutional and Policy			
Income	-	Penalty	-
Audits	+	Inspections	+
Local tax	-		
Social and ethical constraints			
Social status	-	Tolerance	+
Immobility	-	Corruption	+
Exogenous demographic			
Female	-	Age	+/-
Residence	+/-	Years of	+/-

V. Empirical results

Income

The estimation results in Table 6 show a statistically significant positive effect of actual income on corruption-proof income across specifications. Thus, corruption-proof income increases as income increases. However, the estimated coefficients across different specifications are well smaller than 1: around 0.2. Therefore, while greater actual income is associated with greater corruption-proof income, the increase in corruption-proof income is less than proportional. This indicates that corruption risks (as measured by the bribe-proof income gap) decline with an increase in actual income.[8]

[8] All estimations are performed with robust standard errors to correct for heteroskedastisity. Also, we exclude outliers in terms of the corruption-proof/actual income ratio and analyze the middle 95% of the sample.

An intuitive way to think about the shrinking income gap would be to transform it into a ratio of corruption-proof/actual income and to see how that ratio decreases to approach one. This transformation is equivalent to subtracting one from the coefficient on *ln(income)*. The estimated elasticity reveals that a 10% increase in income would be associated with a 7.2-9.3% decrease in the corruption-proof/actual income ratio. Table 6 summarizes the coefficients of the main drivers of the income gap identified in the regression (the full form including the rest of the controls is presented in Table 7 and Table 8 in the Appendix). The statistically significant negative correlation between household income and the corruption-proof/actual income ratio is consistent across specifications and suggests a potentially strong role for wage policy in reducing the gap and thus reducing losses in tax revenue due to corruption. Furthermore the value of β is in the range that is closer to the fair-wage predictions with fairly promising implications for the efficiency of wage policy.

The prospects of differentiated (risk-weighted) wage policy seem to be even more promising. Department placement holds high degree of explanatory power in accounting for the variation in the reported income gap. As expected, corruption risk is significantly greater in the Audits department, followed by Operating Control where officials have the greatest opportunities for corruption. Working in Audits is associated with 24.4 percentage points larger income gap than working in Taxpayer services, while for Operating Control staff the difference is 15.6 percentage points after controlling for income and other factors.

The interaction terms of income with departments and other control variables suggest that wage policy may have an incrementally stronger effect for the riskier Audit and Operating Control departments as well as for employees in Sofia. For Audits, an increase in income of 10% would

decrease the income gap by an additional 2% compared to a similar wage increase in Taxpayer Services.

Personal (attitudinal and demographic) observables

Besides income, demographic variables play a role in explaining corruption risk. Consistent with the earlier literature, female respondents report 9.7 percentage points lower corruption-proof income. Interestingly, the interaction terms of female with income, city, experience and perceptions of their social environment reveal that the gender effect is concentrated in experience, particularly among those employees with less than three years of experience. Among the newer employees the income gap is 20 percentage points lower for females. The other interaction terms are not statistically significant suggesting that there is no gender difference in the risks of corruption along the dimensions explored.

Another important demographic predictor is living in the capital, Sofia, which is associated with a 16.4% higher desired income while smaller cities are statistically indistinguishable. Being based in a local tax office is associated with a 6 percentage points lower bribe-proof income.

While variables gauging access to corruption opportunities (location, tenure, department) are associated with changes in the corruption-proof income gap, proxies for the costs of corruption (penalties, difficulty in finding another job, disapproval of corruption practices) are not statistically significant. This may indicate a widespread belief that the likelihood of detection and/or the penalty for corruption are very low. Under the income-maximizing hypothesis, if the likelihood of detection and the threat of penalty are negligible the cost of reducing corruption through wage increases might be well in excess of the fiscal benefits of better enforcement.

Alternatively, these results may imply that the demand for bribes is not a simple risk-reward calculation; that ethical (fair wage) considerations

are at play too. A one step increase in the self-assessed social status is associated with a 5.5 percentage point decrease in the bribe-proof income. Awareness of corruption among colleagues is associated with a 10 percentage points higher desired income, corroborating the hypothesis that corruptibility may be driven by perceptions of unfairness of income levels in the administration. We control for the alternative explanation that people who are more exposed to corruption in their surroundings also have higher opportunities for corruption through the department dummies.

Allowing a higher degree of freedom for the coefficients by running separate regressions by department for Taxpayers and Audits (Table 8) reveals that risk is driven by idiosyncratic factors for each department. Gender, living in Sofia, social status, and perceptions of corruption among colleagues remain statistically significant only for Taxpayer Services. For Audits, the sole key driver of corruption risk is experience with the income gap peaking for employees with 11-20 years of tenure.

The regressions by department shed light on possible non-wage policies for containing corruption – particularly in the area of individual risk profiling and human resource allocation. We find that corruption is contagious on the bribe-taking side. Knowledge about corruption practices increases the likelihood of getting involved in bribery. It is indicative that the lower corruptibility of women in Audits is observed only in the first years of service. Later the difference disappears. The importance of the administrative environment to which one is exposed seems to prevail over gender and other personal observables.

There is also high correlation between gender and the dependent variable in the Taxpayer Services. This finding may imply that biasing the gender balance towards females might lower the risk of service-related corruption. In Taxpayer Services, 85% of the respondents are female. For Audits, on the other hand, tenure seems to be an important correlate of

corruption risk. This may prompt the administration to staff employees on teams that include at least one officer from a lower-risk tenure group. Similarly, the results suggest that Operating Control teams that include older employees may be less risky.

VI. Conclusion

This paper investigates the determinants of corruptibility using the gap between actual income and corruption-proof income to measure corruption risk. The main correlates of the corruption-free income gap are income, department and region, with ethical and social factors also producing statistically significant coefficients, albeit smaller in magnitude. The policy implications of our findings are broadly in the areas of the capacity of wage incentives and individual risk profiling for human resource allocation.

The results show that there is scope for wage incentives to mitigate corruption risks. A 10 percent increase in wages is associated with 7-9 percent reduction in corruption risk as measured by the self-assessed exposure to the temptation to take bribes. Despite that optimistic result, a straightforward wage increase may not be politically or financially feasible. Incomes would have to almost triple in order for corruption risk to become negligible, and that may not be the most efficient use of resources. Nonetheless, the concentration of risks in certain departments may still leave a case for differentiated wage adjustments. The differences in the reported wage gap and its elasticity with respect to changes in income among departments can be used to tailor wage increases by department to maximize its anti-corruption impact.

Among the findings that cast doubt on the effectiveness of wage policy is that tax officials in Bulgaria do not feel threatened by a high probability of detection or the penalties associated with it. If the income-maximizing

hypothesis holds, and the probability of detection and penalty are perceived as low, then raising salaries may not produce the anticipated positive effect. Given this low starting point, additional resources devoted to improving control might yield better results than raising wages. Such a conclusion, however, hinges crucially on the validity of the income-maximizing hypothesis. The evidence in this regard is ambiguous.

On the one hand, the value of β in our model seems to be more consistent with the fair-wage model rather than the income maximizing explanation of corruptibility. Furthermore, the combined sample regression shows that social and ethical considerations, such as social status and the corruption level in one's surroundings, impact the difference between the bribe-proof and actual income.

On balance, the availability of corruption opportunities appears to be a better predictor of the size of the gap relative to ethical restraints. Living in the capital or working at a higher administrative level is associated with greater gaps as are the departments Audit and Operating Control, which enforce the law and interact directly with non-compliant taxpayers. This reduces the scope for wage policy and builds a case for strengthening controls. Furthermore, our findings suggest that accounting for attitudinal and other personal observables such as gender, age and years of service may be instrumental in individual risk profiling for improved human resource allocation.

Whether or not our cross-section results hold over time is a question that we leave to future research. Longitudinal data from countries that use wage policy to fight corruption in the tax administration could tell us whether actual, as opposed to hypothetical, increase in salaries has the theoretically predicted effects. Our results cannot conclusively resolve this question but they suggest that a relationship between income and corruptibility does

exist. Given the importance of reducing corruption in the tax administration and elsewhere, we believe that this question merits further investigation.

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Annexes

Figure 1: The relationship between corruption-free income and actual income

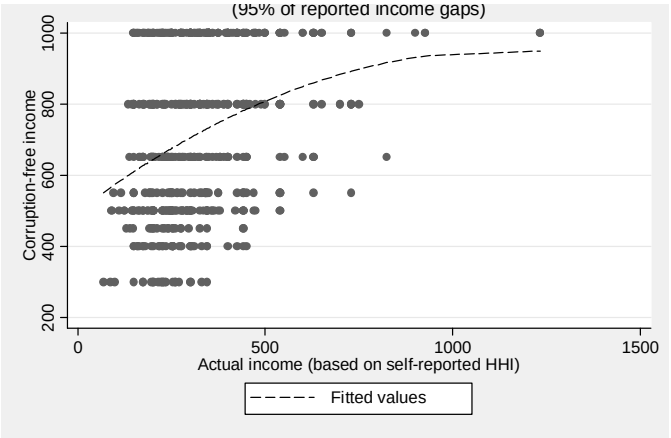

Table 2: The distribution of corruption-proof income.

Corruption-proof	*Number of*	*Percent of total*	*Cumulative*
300 leva	25	4.03	4.03
400 leva	40	6.44	10.47
450 leva	24	3.86	14.33
500 leva	98	15.78	30.11
550 leva	50	8.05	38.16
650 leva	87	14.01	52.17
800 leva	117	18.84	71.01
1000 leva	180	28.00	100.00
Total	621	100.00	

Note: The table reports answers to the following question: “In your opinion, what level of remuneration for your work, including bonuses, would be sufficient to minimize the drivers of corruption?”

Table 3: Income gap as a fraction of income and awareness of corruption by department

Department	Desired	Income	Aware of	No.
Collections	3.02	267	18.52%	27
Audits	2.61	381	18.10%	232
Control	2.71	362	11.94%	67
Taxpayer services	2.39	300	11.10%	288
Other	2.43	340	12.50%	24
Finance/Accounting	2.59	314	2.27%	44
Appeals	1.90	472	14.29%	7

Table 4: Summary statistics

	Mean	SD	Max	Min	Definition
Corruption-free income	710.53	225.96	1000	300	Level of remuneration for respondent's work, including bonuses, which would be sufficient to minimize the drivers of corruption, in leva
Income gap (fraction of income)	1.53	1.18	5.78	-0.25	(Corruption free income – actual income) / actual income
Income	322.93	153.94	1233.3	67.5	A constructed variable which is equal to self-reported household income for one-person households and ½ household income for larger households
HH Income	546.4	224.06	1800	135	Household income in leva
Female	0.75	0.44	1	0	1 if respondent is female
Age	40.79	9.28	62	24	Respondent's age in years
Social Status	2.67	0.71	5	1	Assessment of personal social status on a scale from 1 (lowest) to 5 (highest)
Tolerance	0.16	0.37	1	0	1 if respondent believes that at least one of the following is acceptable in client interactions: (1) accepting an invitation for a free meal in order to resolve a client issue, (2) accepting money, service or a gift to resolve a client issue, (3) providing information acquired through work for personal gain, (4) accepting commission or consultant fees for services to taxpayers
Immobility	0.87	0.34	1	0	1 if respondent believes that changing one's job would be impossible, difficult or rather difficult. Respondents who answered that they do not intend to change their jobs are also marked as 1.
Will be fired if corrupt	0.61	0.49	1	0	1 if respondent believes that a staff member who has accepted money or a gift in exchange for job-related services will be fired. More than one response could be indicated. Other options ranged from no consequence, to seizing the money/gift, administrative sanctions, informal pressure.
Local Tax Office	0.64	0.48	1	0	1 if the respondent is in the local tax office
Taxpayer services	0.42	0.49	1	0	Dummy variables indicating department
Audit	0.33	0.47	1	0	
Operating control	0.10	0.30	1	0	

Collections	0.04	0.19	1	0	
Finance, accounting	0.06	0.23	1	0	
Appeals	0.01	0.09	1	0	
Other	0.03	0.18	1	0	
Experience less than 1 yr	0.02	0.15	1	0	Dummy variables indicating the number of years of experience of the respondent in the tax administration.
Experience 1-3yrs	0.04	0.20	1	0	
Experience 4-10yrs	0.56	0.50	1	0	
Experience 11-20yrs	0.27	0.45	1	0	
Experience over 20yrs	0.09	0.29	1	0	

Table 5: Correlations of main variables (95th percentile of income gap)

	Corruption-free income	Desired/ actual income	Income	Female	Age	Social Status	Tolerance	Immobility	Local tax office
Anticorruption income	1.000								
Income gap (% of income)	0.4319*	1.000							
Income	0.3146*	-0.5886*	1.000						
Female	-0.1815*	-0.074	-0.050	1.000					
Age	-0.1024*	0.025	-0.1110*	-0.012	1.000				
Social Status	-0.078	-0.2002*	0.1298*	-0.022	-0.1319*	1.000			
Tolerance	0.078	-0.002	0.074	-0.020	-0.012	0.002	1.000		
Immobility	-0.1392*	0.0836*	-0.1993*	0.062	0.2320*	-0.041	-0.1167*	1.000	
Local tax office	-0.2096*	-0.043	-0.0844*	0.1376*	0.033	-0.009	0.064	0.0833*	1.000
Taxpayer services	-0.4135*	-0.0994*	-0.1782*	0.2064*	0.1328*	-0.054	-0.034	0.1827*	0.4734*
Audit	0.3452*	0.050	0.1809*	-0.0934*	-0.1038*	0.068	0.049	-0.1604*	-0.1454*
Operating control	0.1049*	0.051	0.038	-0.3155*	-0.068	0.045	-0.081	0.024	-0.2284*
Collections	-0.032	0.082	-0.0867*	-0.014	-0.1110*	0.000	-0.009	-0.035	-0.010
Finance, accounting	-0.037	0.012	-0.041	0.0931*	0.1186*	0.010	0.015	-0.016	-0.1921*
Appeals	0.054	-0.051	0.0912*	0.055	0.014	-0.0892*	-0.041	-0.020	-0.1265*
Other	0.0866*	-0.016	0.044	0.0860*	0.001	-0.023	0.1325*	0.014	-0.2089*

Table 6: Summary of key correlates of corruption

	Variable	Ln(Bribe-proof/ actual income)				
	Interactions	No Interactions	Female		ln(income)	
			Base	var*Femal	Base	var*ln(inc)
	Ln(income)	0.161**	0.122**	0.061	0.276**	
		[0.033]	[0.033]	[0.069]	[0.033]	
Policy Levers	Audit	0.244**	0.246**		1.220**	-0.170*
		[0.033]	[0.033]		[0.417]	[0.072]
	Operating Control	0.156**	0.155**		1.240*	-0.192*
		[0.043]	[0.043]		[0.507]	[0.088]
	Local tax office	-0.058+	-0.067*		-0.062*	
		[0.031]	[0.031]		[0.031]	
Ethical/ Social constraints	Social status	-0.055**	-0.036	-0.025	-0.057**	
		[0.019]	[0.038]	[0.044]	[0.019]	
	Has heard of others taking bribes often	0.099*	0.099*	0.045	0.105*	
		[0.042]	[0.042]	[0.089]	[0.043]	
Personal characteristics	Female	-0.097**	-0.393		-0.132	0.004
		[0.029]	[0.414]		[0.419]	[0.073]
	New (less than 3 years of experience)	-0.017	0.094	-0.199*	0.569	-0.113
		[0.079]	[0.081]	[0.097]	[0.955]	[0.167]
	Sofia	0.164**	0.062	0.124	1.028+	-0.152+
		[0.061]	[0.099]	[0.096]	[0.526]	[0.090]
	R-squared	0.31	0.32		0.33	

Controls for personal characteristics, social and ethical constraints included in the regression but not shown.
Robust standard errors in brackets. + significant at 10%; * significant at 5%; ** significant at 1%

Table 7: Estimation results with different groups of controls

	Variable	Basic personal characteristics	Ethical/social constraints	Including Policy Levers
		Ln(Bribe-proof Income)		
	Ln(income)	0.210**	0.207**	0.160**
		[0.032]	[0.032]	[0.033]
Basic personal characteristics	Female	-0.147**	-0.140**	-0.097**
		[0.030]	[0.030]	[0.030]
	Age	-0.003	-0.005	-0.017
		[0.016]	[0.016]	[0.015]
	Age^2	0	0	0
		[0.000]	[0.000]	[0.000]
	Number of HH members	-0.007	-0.008	-0.007
		[0.012]	[0.013]	[0.012]
	Town pop 20K-100K	0.055	0.067	0.006
		[0.060]	[0.059]	[0.055]
	Town pop 100K-500K	0.130*	0.138*	0.088
		[0.063]	[0.062]	[0.057]
	Sofia	0.212**	0.189**	0.159*
		[0.067]	[0.066]	[0.062]
	Experience less than 3 yrs	0.074	0.063	-0.017
		[0.081]	[0.082]	[0.079]
	Experience 3-10 yrs	0.146*	0.139*	0.055
		[0.060]	[0.061]	[0.063]
	Experience 11-20 yrs	0.093	0.088	0.035
		[0.060]	[0.062]	[0.062]
Ethical/Social Constraints	Socialstatus		-0.044*	-0.054**
			[0.019]	[0.019]
	Tolerant		-0.004	-0.009
			[0.043]	[0.041]
	Difficult to find other job		-0.061	-0.019
			[0.042]	[0.040]
	Has heard of others taking bribes often		0.093*	0.099*
			[0.042]	[0.042]
Policy Levers	Will be fired if corrupt			0.014
				[0.027]
	Local Tax Office			-0.061*
				[0.031]
	Audit			0.241**
				[0.033]
	Operating control			0.158**
				[0.043]
	Collections			0.055
				[0.078]
	Finance & Accounting			0.076
				[0.061]
	Appeals			0.081
				[0.158]
	Other			0.272**
				[0.086]
	Constant	5.288**	5.508**	6.018**
		[0.363]	[0.366]	[0.363]
	Observations	519	514	514
	R-squared	0.19	0.2	0.31

Robust standard errors in brackets. + significant at 10%; * significant at 5%; ** significant at 1%. The omitted dummy in departments is Taxpayer Services. The omitted dummy in experience is over 20 yrs. The omitted dummy in place of residence is under 100K habitants.

Table 8: Drivers of corruptibility by department

	Variable	Taxpayer Services	Audit
		Ln(Bribe-proof incme)	
	Ln(income)	0.253**	0.073
		[0.046]	[0.056]
Basic personal characteristics	Female	-0.153**	-0.057
		[0.053]	[0.044]
	Age	-0.011	0
		[0.023]	[0.024]
	Age^2	0	0
		[0.000]	[0.000]
	Number of HH members	-0.018	0.007
		[0.017]	[0.019]
	Town pop 100K-500K	0.061	0.078
		[0.050]	[0.048]
	Sofia	0.175**	0.098
		[0.067]	[0.067]
	Experience less than 3 yrs	-0.074	0.221
		[0.100]	[0.148]
	Experience 3-10 yrs	0.036	0.209+
		[0.080]	[0.107]
	Experience 11-20 yrs	-0.037	0.277*
		[0.079]	[0.109]
Ethical/Social Constraints	Socialstatus	-0.088**	-0.03
		[0.030]	[0.038]
	Tolerant	-0.022	0.001
		[0.070]	[0.053]
	Difficult to find other job	0	-0.051
		[0.097]	[0.050]
	Has heard of others taking bribes often	0.134+	0.007
		[0.076]	[0.059]
Policy levers	Will be fired if corrupt	0.045	-0.024
		[0.045]	[0.043]
	Local Tax Office	0.019	-0.035
		[0.068]	[0.044]
	Constant	5.485**	6.225**
		[0.522]	[0.666]
	Observations	227	167
	R-squared	0.23	0.1

Robust standard errors in brackets. + significant at 10%; * significant at 5%; ** significant at 1%. The omitted dummy in departments is Taxpayer Services. The omitted dummy in experience is over 20 yrs. The omitted dummy in place of residence is under 100K habitants.