

Social Interactions and Corruption

An Empirical Investigation

Submitted by

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It is good to have an end to journey toward; but it is the journey that matters, in the end

-Ernest Hemingway

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Abstract

Over the last few decades, corruption has become a key issue in many developing and developed countries. Corruption, by nature, is a clandestine activity that people go to great lengths to conceal. Corrupt practices can be very different and can adapt to specific cultural features of given societies. If people are not corrupt by nature, why do corrupt practices exist? What influences their decision to engage in corrupt activities? What makes them stick to the decision?

In this thesis, I look at corrupt practices as decisions in a social context. People observe corrupt practices to varying degrees and these may feed the perception that corruption pays. The primary question is: how much does this perception result in engagement in corrupt practices? I find that the perception affects the probability of experiencing corruption significantly, and also affects the levels of corruption experienced. The endogeneity issue that often arises in the social interactions work is tackled using instrumental variables techniques.

This work is a prerequisite to identifying key agents in a social group that have a large impact on their neighbors' decision to engage in corruption, which I believe is a policy issue critical to curbing the spread of corruption in an increasingly connected world.

Chapter 1- Introduction

In a large social system, determinants of choices are idiosyncratic in diverse groups of people. One of the key influencing factors is social effects or peer effects. That is, the factor that influences an individual's choice is the perception of societal behaviour. This phenomenon is seen in many anti-social activities like tax evasion or bribe giving.

Determining the extent of influence the perception of the group's choices has on one's choice to engage in anti-social activities is the key focus of this thesis.

This question can be modelled using the social interactions literature. This thesis attempts to evaluate the impact of the perception of corruption in a group on the experience of corruption using the Eurobarometer data from 2005 to 2011. We find the experience of corruption is significantly affected by the perception of corruption across years, while controlling for various demographic characteristics, which is in tandem with the theoretical framework presented in the paper.

Corruption: Definition and its Economic Implication

Transparency International, an internationally recognised anti-corruption organisation defines corruption as follows –

Generally speaking corruption can be defined as “the abuse of entrusted power for private gain”. Corruption can be classified into grand, petty and political, depending on the amounts of money lost and the sector where it occurs.

Grand corruption consists of acts committed at a high level of government that distort policies or the central functioning of the state, enabling leaders to benefit at the expense of the public good.

Petty corruption refers to everyday abuse of entrusted power by low- and mid-level public officials in their interactions with ordinary citizens, who often are trying to access basic goods or services in places like hospitals, schools, police departments and other agencies.

Political corruption is a manipulation of policies, institutions and rules of procedure in the allocation of resources and financing by political decision makers, who abuse their position to sustain their power, status and wealth.¹

This thesis focuses mostly on petty corruption, with some elements of political corruption.

Economics of Corruption

The New Palgrave Dictionary of Economics defines bribery and corruption as a form of rent seeking meant to incentivize officials to service those that are making the payment. This is primarily a principal-agent problem, where the agent seeks to replace objective, meritocratic service provision with payoffs outside the legal requirement for the provision of the said service (Rose-Ackerman 1987).

There is both theoretical and empirical evidence for high corruption leading to low growth (Mauro 1993; Tanzi et al 2000). The main causes of corruption are political corruption, kickbacks in privatisation and major contracts, and in distribution of benefits and services.

The major costs of corruption come from the increased difficulty in doing business, inefficient use of public resources, exclusion of the poor from basic services' access, perpetuating poverty, and most importantly, the erosion of trust within a social system, which is the fundamental fabric of an inclusive, flourishing society (CleanGovBiz 2014).

¹ http://www.transparency.org/whoweare/organisation/faqs_on_corruption/2/#defineCorruption

Corruption, though illegal in most countries, is quite widespread. Corruption alone is expected to cost the EU economy EUR 120 billion each year, which is a little less than the EU annual budget (European Commission 2014). Tax evasion, which is yet another form of corruption, is described by the Greek officials as the ‘National Sport’. This ‘sport’ has led to up to EUR 30 billion taxes uncollected every year. In developing countries like India, schemes such as food and fuel subsidies for the poor have seen over a \$40 billion missing. Combating corruption is critical for decreasing poverty and reducing the income gap. This however requires understanding the practice of corruption and why it is deep rooted in certain societies (Rose-Ackerman 1987).

Perception and Experience of corruption

One of the issues brought up frequently in the empirical work of corruption evaluation, is the discrepancies in the actual measure of corruption. Transparency International, one of the pioneers in the work of evaluating corruption around the world, measures corruption using a Corruption Perception Index.

The Corruption Perception Index (CPI) draws on the various business climate and governance data from across countries, collated and drafted by political, business and economic experts, and select data sources². This perception does not reflect any actual experiences of corruption, which makes it a problematic measure of assessing corruption.

To actually identify corrupt behavior, we require information on engagement in corruption at an individual level. However, corrupt activities are surreptitious, with both the principal and the agent taking great pains to conceal their wrongdoings, resulting in dearth of information.

² http://www.transparency.org/cpi2014/in_detail

Some organisations around the world have tried to capture experience information by asking about bribe giving experience. This information does not actually prove any wrongdoing or corruption, but one could assume that on being asked for a bribe, an agent will comply most of the time. This body of work focuses solely on corruption in democratic, middle income to high income countries within Europe, and looks at petty corruption.

Social Interactions and social networks

A large amount of literature points to the impact of social interaction in criminal networks (Gleaser et al 1996), smoking habits (Enett et al 1993), tax evasion (Fortin et al 2009), and even increasing productivity in the labor force (Mas and Moretti 2006). Social networks and social interactions are far more relevant as agents of influence in this day's increasingly connected society.

The social interactions literature emphasises the significance of the social context in individual decision making. Social interactions are synonymous with peer effects, social capital and neighbourhood effects. As an individual cares about not only his outcomes in a society, he is also influenced by the decision of people around him/her (Ioannides 2008). Here, the focus is to determine the extent of peer effects in decisions to engage in corrupt activities.

Chapter 2 – Literature Review

Social interactions or social networks are increasingly prominent in analysing economic decisions of individuals. Social economics is a study of the impact of group choices and aggregates on individual choices. This field is broadly divided into social preference, social action and peer effects. Social preference studies use methodologies to include social aspects in an agent's preferences or mechanisms which induce indirect preferences. In the social actions methodology, the agent's preferences are taken as a given and the actions taken at the equilibrium as a result of their interactions are studied. Peer and neighbourhood effects study the aggregate neighbourhood effects on individual preference and actions. (Benhabib, Bisin and Jackson 2011).

Social networks have played a key role in information dissemination about jobs, technologies and political opinions. Granovetter (1993) of the early studies of this dissemination was in sociology, which explained the strength of weak ties in bringing novel information about new jobs. Granovetter points to the gap in the literature that ties micro level interactions to macro level outcomes. Granovetter argues that strong ties in social networks are not as advantageous as weak ties for activities like job searches. This is due to the flow of information through weak ties that form bridges in local networks. One of the main implications of this paper is that personal experiences are related to the macro scale of social characteristics (Granovetter 1973).

Crime rates have for long varied across time and space. Glaeser et al (1996) try to discern the phenomenon of crime variance using the social interactions approach. The authors find that social interactions create enough covariance across individuals to explain the varying crime

rates across cities. They hypothesize that the positive correlation between agents' decisions about crime is the only explanation for the high degree of variance in criminal activity across space. In their model, agents' decision to enter into a life of crime is a function of their own characteristics and their neighbour's decisions. Agents are classified as those who influence and influence their neighbours and, 'fixed agents' – those who cannot themselves be influenced. After controlling for city level characteristics, and allowing for unobservable characteristics' influence on the crime rate to correct for unobserved city level characteristics, they find a high degree of social interaction in petty crime, and lower levels of interaction for more serious crime like arson and murder. The paper finds that that either the unobserved heterogeneity is much higher than observed heterogeneity, or that the criminals' decisions are highly interdependent (Glaeser, Sacerdote and Schienkman 1996).

If criminals' decisions are highly interdependent, other unlawful activities such as corruption or tax evasion must also have a high social interaction component. Tax evasion, due to its high impact on the country's economy, is one such activity which has extensive literature.

Fortin et al. (2009) combined standard tax evasion framework (Allingham and Sandmo 1972) with social interactions effects, and uses an experiment to test the model. The effects of guilt and shame on compliance behaviour (Erard and Feinstein 1994), learning about less expensive ways to avoid taxes with reduced risk of penalty (Myles and Naylor 1996), and an individual's tax evasion decision as a function of his perception of fairness are a few examples of the impact of social interaction effects in tax evasion. Taking into account the identification issue (Manski 1993) and estimation problems due to self-selection, Fortin et al. (2009) estimate the impact of social interactions on tax evasion decisions. The experimental data helps avoid identification and sorting issues found in observational data. Experiments ensure random assignments to groups, and determination of group size is exogenous,

enabling easier identification (Moffitt 2001). When the individual group tax behavior is affected by the group means, an anti-conformity effect is seen. This effect is reduced drastically if expectations are assumed to be based on lagged group means, and completely disappear on accounting for simultaneity.

Olken (2009) presents empirical evidence for the deviation of perception of corruption from an objective measure of corruption in Indonesian villages. Perception of corruption is used by international agencies to evaluate governments, as well as in academic research as determinants of corruption. The objective measure of corruption used in this paper is the 'missing expenditures' in a public infrastructure project calculated by the authors. One of the reasons cited for the deviation of beliefs or perceptions from the objective measure is the effective concealment of corruption. Also, ethnic heterogeneity leads to increased perceptions and participation in social activities leads to decreased perceptions, whereas missing expenditures have a negative correlation with ethnic heterogeneity and no relationship with participation in social activities. This could be due to the lower levels of trust in a more ethnically heterogeneous society

Melgar et al (2015) suggest that perception of corruption is affected by the following individual, region level and country level characteristics:- income inequality, political competition, presence of women in the governing bodies, as well as personal characteristics such as age, gender, marital status, occupation and place of residence. The authors find women perceive a higher level of corruption, whereas age is not a significant determinant of perception. They find education has a significant effect, with people having completed at least a secondary level of education having a lower level of perception. They also hypothesize that people with a better socio economic standing see people in a favourable light. The employment sector is another significant factor (Melgar, Rossi and Smith 2015) .

Cabelkova (2001) comes closest to estimating the question of interest using data from Ukraine. This is, question of interest is whether the perception of corruption plays a significant role in a person's willingness to pay a bribe. The author finds that corruption perceptions play a significant role in the willingness of people to give a bribe in Ukraine. Higher perceptions of corruption associated with an agency, increases the willingness of an individual to give a bribe there. The author finds that the perception is overestimated in banks and underestimated in judicial institutions, local government and police. The author also points to the influence of mass media in exacerbating perceptions of corruption, hence increasing the willingness to give a bribe. Friends and personal experience have a significant effect on the perception of corruption (Cabelkova 2001).

Chapter 3 – Data

We use data from Eurobarometer surveys conducted every two years from 2005 to 2013 (Eurobarometer 2005), (Eurobarometer 2007), (Eurobarometer 2009), (Eurobarometer 2011), (Eurobarometer 2013). These surveys attempt to capture citizen sentiment on the corruption levels in their country. They capture both the current sentiment and sentiment over time, across different agencies of national and regional importance.

For this analysis, we use five Eurobarometer surveys from the years 2005, 2007, 2009, 2011 and 2013. The most recent one, in 2013, also includes corruption in financial services. The agencies examined in 2013 are slightly different from the cross sections of the previous years. This makes the data hard to reconcile with the previous years to create a pooled sample. These surveys were conducted every two years with a uniform sample from across both European Union and non EU nations. The 2005 survey however has corruption experience information only for the EU nation sample.

These cross sectional datasets also contain demographic information on gender, age, political identity, occupation, region within the countries and their level in the society for respondents. The key demographic covariates I have used are Country, Occupation, Gender and Age. Other key variables that lets us validate the theory is the historical perception of corruption (histCor) and if corruption affects the respondent's life personally (personalCor). These variables are found in two of the datasets (2011 and 2013) and have significant statistical relationships with both experience and perception of corruption. Another variable of interest is the knowledge of bribe taking in an individual's personal social network (knowsomeone). We define this variable in greater detail below and is available only in the 2013 dataset.

Sampling procedure

Sampling was random and primary units were selected from administrative regional units in every country. The probability of selection was proportional to population size. Random addresses were selected, and from them other addresses were chosen using the random route procedure. The respondent was drawn at random from each household using the closest birthday rule (Papacostas and Magny 2005). [Table 1](#) outlines the different themes captured across the different Eurobarometer surveys used.

Descriptive Statistics

The sample size ranges from 26,663 to 29,193. Using the above sampling procedure, a uniform sample of about 1000 responses was recorded per country each year

[Table 2](#)). We see over 20% of the respondents are over the age of 65 ([Table 3](#)).

The about 25 – 30% of the respondents are retired or unable to work. The following largest occupational categories are Students and people Responsible for store Management or ordinary shopping, with about 8 – 10% of people engaging in each of these professions ([Table 4](#)). There were consistently about 7 – 10% more female respondents (53.60% - 55.70%) than male respondents (44.24% - 46.40%) ([Table 5](#)).

Corruption – Measures of perception and experience

The perceptions and experience of corruption in these surveys across Europe have been measured using different questions asked of the respondents. The key questions that we focus on to draw the perception of corruption are –

Perception of Corruption – “In (Our Country), do you think that the giving and taking of bribes, and the abuse of positions of power for personal gain, are widespread among any of the following? - The people working in the police service, The people working in the customs service, The people working in the judicial services, The politicians at national level, The politicians at regional level, The politicians at regional level, The politicians at local level, Officials awarding public tenders, Officials issuing building permits, People working in the public health sector, People working in the public education sector, Inspectors (health, construction, food quality, sanitary control and licensing), None, Other, DK (Don’t Know). ”

The perception of corruption is an indexed variable created as a sum of all the affirmative responses to the above question. For instance, if the respondent says only one of the above agencies engages in bribe taking activities, or abuse the power of their position, the perception of corruption (perCor) is 1. If the respondent believes Politicians at the National, Regional and Local level engage in corrupt activities, the perception of corruption for that respondent will be 3. [Table 11](#) shows the distribution of perception of corruption values over the years. At the outlook, the perception of corruption seems to be showing an increasing trend over the years.

Another measure of perception that we use from these surveys is retrospective perception i.e. “In the past three years, would you say that the level of corruption in (OUR COUNTRY) has...?” The choices given were “Increased a lot, Increased a little, Stayed the same, Decreased a Little, Decreased a lot, DK”. This retrospective information does not imbue any information into experience of corruption.

The above question appears in the 2011 and the 2013 surveys. [Table 7](#) the distribution of responses for both the years. We find that less than 2% of the people believe that there is no corruption in their country. About 60% of the people believe that the corruption has increased over the last three years or at best stayed the same.

This question can be used as an instrumental variable for the perception of corruption measure. Further, we discuss the use of this instrument to tackle the endogeneity issue that arises with the standard measures.

Experience of corruption – We define any bribery experience a respondent has had as the experience of his or her perception of corruption. The respondents were asked – “Over the last 12 months, has anyone in (Our Country) asked you, or expected you, to pay a bribe for his or her services? - No, nobody did, Yes, from people working in the police service, Yes, from people working in the customs service, Yes, from people working in the judicial services, Yes, from politicians at national level, Yes, from politicians at regional level, Yes, from politicians at local level, Yes, from politicians at local level, Yes, an official awarding public tenders, Yes, an official issuing building permits, Yes, people working in the public health sector, Yes, people working in the public education sector, Yes, an inspector (health, construction, food quality, sanitary control and licensing), Yes, from someone else, People working with private companies, DK. ”

The experience of corruption is an indexed variable created as a sum of all the affirmative responses to the above question. For instance, if the respondent says that they have only one of the above agencies have personally asked them for a bribe, or have personally encountered abuse the power of their position, the experience of corruption (perCor) is set equal to 1. If

the respondent has been asked for a bribe by the Police and the Health care officials, the experience of corruption for that respondent is 2.

[Table 12](#) shows the distribution of experience of corruption values over the years. At the outlook, the experience of corruption seems to be showing an increasing trend over the years. In the sample, 12 – 15% of the respondents report having faced any form of corruption in the last 12 months from the date of the interview. Amongst them, 15 – 28% does not report any particular agency, and 50 – 60% faces corruption from one of the many agencies. Multiple encounters of corruption are under 20%.

Another measure of experience of corruption is from the question “You are personally affected by corruption in your daily life. Choose from the following – Totally Agree, Tend to Agree Tend to Disagree, Totally Disagree, and DK”. [Table 6](#) shows the distribution of responses in 2011 and 2013. 11.25% and 9.65% of the respondents ‘Totally Agree’ in 2011 and 2013, and 41.26% and 46% ‘Totally Disagree’, and the rest of the respondents tend to agree or tend to disagree.

Knowsomeone – This variable corresponds to the question ‘Do you personally know anyone who takes or has taken bribes? Yes, No, Dk and Refusal’. [Table 11](#) shows that 78.57% of the respondents say that they don’t know any one that takes bribes personally, whereas 16.13% say they know someone that has taken a bribe personally.

Recoding variables

histCor, personalCor and knowsomeone are categorical variables. The variables are recoded into a Likert scale, indicating increasing perceptions or experience of corruptions.

Average measures

In this paper, we hypothesise that peer effects have an impact on experience of corruption. To determine the magnitude of this impact, we use the cohort effects (Deaton et al 1994) to determine the average perception of corruption in a group created using one of the key social forces of influence – homophily. We use a combination of status homophily and proximity to create average measures of experience and perception to determine the network effects of corruption. The average measure is created as a mean of the perception of corruption variable over country, age, occupation, gender for each year.

Chapter 4 – Model

I now come to propose a model to determine the relationship between a person's propensity towards corruption and his perception of corruption. The relationship between perception and experience of corruption is modelled by the social interactions literature. In a standard formulation, (Brock and Durlauf (2001), Durlauf and Ioannides (2010), Blume, Brock, Durlauf, Ioannides (2010) and Ioannides (2013), Ch. 2), aggregate behaviours such as corrupt practices emerge through interactions in a population.

The Framework

The Brock-Durlauf framework shows that each individual's choice set is composed of three components

$$V(\omega_i) = u(\omega_i) + \mu(\omega_{-i}) + Z(\omega_i) + \varepsilon(\omega_i)$$

Where $V(\omega_i)$ – is the expected outcome of experience of corruption

ω_i – An individual's choice;

ω_{-i} – An individual's neighbors' choice;

$u(\omega_i)$ – is the utility gained from their choice;

$\mu(\omega_{-i})$ – expected rent - seeking preference of the neighbors, indicated by the individual's own perception of corruption;

$Z(\omega_i)$ – Group characteristics;

Manski decomposes the various effects into endogenous effects, exogenous effects and correlated effects (Manski 1993). Endogenous effects refer to changing experience due to the changing perception of the individual's reference group. The exogenous effect refers to changing experience of an individual due to the change in exogenous characteristics.

Correlated effects refer to the similar behaviour of individuals within a group due to similarity of certain characteristics.

Structural model

We hypothesize that an individual agent's experience of corruption is influenced by the experience of other members of the society. This is his expectation of other agent's actions, which is reflected in his perception of corruption. However, this perception of corruption is also informed by their own experience, perception of other agents and exogenous factors. (Azariadis and Ioannides, 2014).

The exogenous factors can include media, their experience in the past and other individual and group characteristics like country, age, occupation, placement in society, gender etc. This structural model poses identification issues, due to the simultaneous nature of experience and perception of corruption. The following system of equations shows us the simultaneous nature of the relationship.

$$\text{expCor}_i = \beta_0 E(\text{expCor}_{-i}) + \beta_1 Z_i + \varepsilon$$

$$E(\text{expCor}_{-i}) = \text{perCor}_i$$

$$\text{perCor}_i = \alpha_0 \text{expCor}_i + \alpha_1 \text{expCor}_{-i} + \alpha_4 Z_i + \varepsilon$$

expCor_i – Experience of Corruption of agent i

expCor_{-i} – Experience of Corruption of agent I's neighbors

perCor – Perception of Corruption of agent i

Z_i = Demographic Characteristics such as Age, Country, Occupation, Gender of agent i

We posit that an agent's experience is influenced by his expectation of corruption in the society around him. This expectation can be represented by his reported perception of corruption. But each agent's perception is also informed by his own experience of corruption and his neighbours' experiences that he witnesses and other demographic characteristics. For example, a person in Greece could experience more corruption than a person in Denmark. A person that engages with an occupation that requires negotiating with public officials daily may experience more corruption than a salaried individual working at a low level of a large corporation. Country, age and gender characteristics represent the contextual effects, the perception variable would reveal the endogenous effects outlined above.

The structural model has identification issues due to the presence of unobservable group level factors and endogeneity (Blume, Brock, Durlauf and Ioannides 2010). We use instrumental variables to deal with the endogeneity issues.

We use both binary and count models to estimate this relationship. The binary model's outcome is whether a person experiences corruption or not, and the count model estimates to what extent the experience of corruption is influenced by a person's perception of corruption.

Binary Model

Each agent i has an experience set $\{0, 1\}$ that indicates if they experienced corruption in one or more of the various agencies in the country. Correspondingly, each agent also has an experiences set $\omega_i = \{0, 1\}$ that corresponds to their bribe giving experience with any of the public agencies in their country in the last 12 months. The person's experience of corruption is also influenced by his demographic characteristics like their country, age, occupation, gender, and this varies over time.

Count Model

Each agent i has a perception set = $\{0...14\}$ that indicates their perception of the degree of corruption in their society, which comprises of various government agencies or services like the judiciary, healthcare system etc. Correspondingly, each agent has a choice set = $\{0...14\}$ that represents the degree of experience of corruption. We use this choice set as a proxy for willingness to engage in corruption as one can reasonably assume that on being asked for a bribe, most people pay it.

It is possible that different occupational groups have different exposure to practices. This means that different subgroups of the population may cluster into different practices, some at low levels of corruption and others at higher ones.

Endogeneity and Identification Issues

In the above section we identified various measures of experience and perception of corruption. Using alternate measures for experience and perception helps tackle the theoretical simultaneity issue that arises in perception and experience measures. I hypothesise that the decision to engage in corrupt activities is impacted by the average level of corruption in the society around. However, experiencing corruption can significantly impact the perception of corruption, as a person that has experienced corruption is likely to perceive there to be more corruption than someone who has no encounters with corruption. I tackle this problem using instrumental variables, such as the retrospective information on perception of corruption in the country (histCor) and lagged averages of perception and experience of corruption.

Both perception of corruption (perCor) and experience of corruption (expCor) are variables built using micro agency data: perceptions and experiences are reported by each respondent for different government agencies. This could result in high endogeneity of variables, because a person that experiences corruption at the police department is sure to report an affirmative on the perception of the police department being corrupt.

However, we find that the correlation between perception and experience of corruption is quite low (0.132 to 0.178). The correlation between the binary measures is also low, ranging from 0.02 to 0.11 from 2005 to 2011. This could be attributed to the large sample size and the sparseness of the experience of corruption measure in comparison to the experience of corruption. However we find that the correlation between the other measures of experience and perception are also quite low. Also, the percentage of respondents that believe there to be corruption, but who have also experienced some form of corruption is 16.59% ([Table 14](#)). However, we find a larger portion of people that have had no experience of corruption, reporting a perception in corruption 59.12% ([Table 14](#)).

This reporting of perception without any actual experience could mean that the perception is informed by factors other than actual experience of corruption. This along with the small correlation between perception and experience helps diminish the potential for simultaneity in the estimation.

Divergence of Perception and Experience

One obvious relationship would seem that the perception of corruption would reflect the experience of corruption or bribery an individual has had. This however is not reflected in the empirical findings. Olken (2009) attributes this to the clandestine nature of corruption, where the corrupt officials hide corruption in the most unlikely places, making it hard for people to understand the actual degree of corruption.

In [Table 13](#), [Table 15](#), [Table 16](#) and [Table 17](#), we see the divergence between perception and experience of corruption. The causes for this divergence could be manifold. Intuitively, perceptions are not just formed as a function of experiences; they could also be informed from other channels such as the media.

The question on the levels of corruption today as compared to the past indicates what level of corruption the respondent believes there to be in today's society. This measure can be thought of as an instrument for perception of corruption for the level of corruption one indicates a society to have can be thought of as how corrupt they think their society currently is. This however has no direct relationship with their experience of corruption today, the measure we use as our dependent variable to understand the propensity for corrupt activities. Since this is a retrospective measure, we can assume that experience of corruption reported for the last 12 months does not directly impact their experience of corruption (correlation 0.0149 in 2011 and 0.0514 in 2013, both insignificant - [Table 10](#)). It has a closer relationship with the perception of corruption variable (correlation 0.260 in 2011 and 0.261 in 2013, both significant at 0.1% level), and thus can use this as an instrument ([Table 10](#)).

Average measures

Average experience of corruption is the group mean of experience for each occupation, country, gender and age group. We find average experience for corruption over 2005, 2007, 2009 and 2011 by aggregating over occupation, gender, age and country. This average experience acts as the aggregate experience or expected corruption levels an agent has about his neighbours.

Lagged averages of perception and corruption can also be thought of as instrumental variables. Perceptions and experiences in the previous year's affect perception today, but have no effect on the individual's experience of corruption. Today's experience cannot affect yesterday's perception or experience.

With `lag_avgEpxerience`, `lag_avgPerception` and `histCor` as instruments for `perCor`, we can estimate the impact of social interactions on the experience of corruption.

Chapter 5 – Results

The estimation process to understand the impact of an individual's perception on their experience of corruption is plagued with identification issues, due to the endogenous nature of the relationship. To handle the endogeneity issue, I test different instruments for the best fit. The instruments I use are lagged averages of perception and experience of corruption and retrospective information about corruption (histCor).

I use histCor as the instrument for the 2011 and the 2013 datasets and lagged averages as instruments for the 2005 – 2011 datasets. To estimate the binary and count models, I use Poisson, OLS and Probit estimation methods, with instrumental variables. In the binary model, the independent variable is expercount, where 0 indicates no experience of corruption and 1 indicated some experience of corruption. The count model uses expCor as the dependant variable, where $\text{expCor} = [0, 14]$ and expCor is an integer.

To estimate the effect of perception of corruption on the count or level of corruption experienced, I use OLS and Poisson models, with both the histCor and lagged averages as instruments. In the OLS model, I estimate the impact of perception of corruption on the experience of corruption while controlling for demographic characteristics like country, age, occupation and gender across years. The dependent variable of interest is a sum of various experiences of corruption a person has with different governmental agencies in the last 12 years, the counts of experience can be thought of as levels of corruption a person faces. The instrumental variable used for the OLS regressions.

Using the Probit model, I estimate an individual's probability of experiencing corruption given the perception of corruption he has, and other group characteristics such as country, age, gender and occupation. Here perception of corruption represents the expected corruption level of an individual's neighbour. The experience of corruption is a binary variable that indicates whether or not a person has experienced corruption in the last 12 months or not.

I also report results for the regressions without an instrument. The fit or the specification of the model is verified based on how the country dummies behave. All the regressions report robust standard errors. The instrumental variable used is `histCor`, which is defined in the data section.

Columns 1 and 2 in [Table 18](#) present the results of the Probit regressions with and without an instrument respectively. The Probit regression with `histCor` as the instrumental variable uses the two step GMM estimation method. I include country, occupation, age and gender dummies. The dependent variable is a binary outcome variable. The coefficient on perception of corruption is 0.114, and is significant at the 0.1% level. This implies a one unit change in perception of corruption, results in 11.35% increase in probability of experiencing corruption, holding all other variables at mean. The predicted probability of experiencing corruption is evaluated to be 0.06 when all predictors are evaluated at 0. The coefficients for Italy, Great Britain, Northern Ireland, Greece, Finland, Austria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Spain, Bulgaria, Romania and Croatia are significant. The ordering of country coefficients seems plausible. The classification post-estimation shows 90.89% accuracy of prediction. Figure 2 shows the predicted probability of experiencing corruption at different levels of perception of corruption. The expected

probability of experiencing corruption is 0.015 when $\text{perCor} = 0$ and is 0.28 when $\text{perCor} = 14$. The correlation coefficient for the country dummies and Transparency International rankings is 0.57 for the IV Probit regression and 0.71 for the probit regression.

The non-IV probit has a coefficient on perception of corruption is 0.032 and is statistically significant at the 1% level. The semi elasticity is 2.64%. The classification post-estimation reports 91.87% accuracy in prediction.

In [Table 18](#) - Column 5, I present results for the estimation of the impact of perception of corruption on experience count using a Poisson regression with the retrospective corruption variable as the instrument (histCor) with country, occupation, gender and age dummies. Poisson regressions are used to estimate the outcomes when the outcome can be measured as counts. The estimation method used is a two- step GMM. This regression uses the 2011 and 2013 datasets. The coefficient on perception of corruption is 0.204, and is statistically significant at the 1% level. This translates to a one unit increase in perception increases the count of experience by 0.019, at the means of all other covariates. The semi-elasticity is 0.62, but is not statistically significant. The country coefficients are significant for West Germany, Italy, Northern Ireland, Greece, Portugal, East Germany, Finland, Austria, Czech Republic, Estonia, Hungary Latvia, and Lithuania, with expected signs for the coefficients. The ordering of the values of these coefficients seems to be in agreement with our expectations of the levels of corruption across countries. The age coefficients are not significant. The coefficients for dummies of the following occupational categories are significant – Professional, Owner of a shop, Business Proprietors, Employed Professional, General Management, Middle Management etc. 2013 has a lower coefficient than 2011. Figure 1 shows the predicted counts over different levels of perception. As we see in the figure,

experience stays flat at 0 till perCor = 5, and then spikes to 1. The correlation coefficient of the country dummies and Transparency International rankings is 0.56.

In [Table 18](#) columns 3 and 4, I report the results for the Poisson and OLS regressions with lagged averages as instruments, for the years 2005, 2007, 2009 and 2011. These regressions represent the impact of perception on experience for people who have experiences some form of corruption. As a result, the sample size is much smaller, at about 12,939 observations. The coefficients for the perception variable are 0.113 and 0.218, and significant at the 1% level. However the country dummies present a unique problem. For example, the coefficient on Denmark dummy is 0.5 and is significant at a 0.1% level. This is greater than the coefficient on the France dummy, which is not in agreement with either the perception or experience averages reported across countries. This is also not in agreement with other sources such as Transparency International, and confounds our expectation of the levels of corruption on different countries. The correlation between the dummy coefficients and the Transparency International rankings is negative for columns 3 and 4, and is positive for columns 1, 2 and 5. Estimation method for Poisson is GMM and OLS is 2SLS. The Liml estimation for weakly correlated endogenous regressors produces statistically insignificant results³. This is one of the main reasons I do not find the lagged averages of experience and perception to be appropriate instruments.

Conclusion

Although the changing level of corruption is a subjective question, it serves as a highly effective instrument. The perception of corruption increases the probability of experiencing corruption by 11.6%. However, it has no economically significant effect on increasing the

³ <http://www.stata.com/manuals13/rivregresspostestimation.pdf>

level of corruption experienced. Considering perception to be a good metric of the expected corruption in the social cohort around an individual, one can conclude that it has a significant effect on the individual's propensity to experience corruption, but not so much on increasing its level.

Appendix 1

Table 1 - Description of the Eurobarometer surveys

Year	Eurobarometer Series	Archival Subtitle
November – December 2005	EUROBAROMETER 64.3	Foreign Languages, Biotechnology, Organized Crime, and Health Items
September – October 2007	EUROBAROMETER 68.2	European Union Policy and Decision Making, Corruption, Civil Justice, E-Communications, Agriculture, and Environmental Protection
September – November 2009	EUROBAROMETER 72.2	Nuclear Energy, Corruption, Gender Equality, Healthcare, and Civil Protection
September 2011	EUROBAROMETER 76.1	Financial and Economic Crisis, Financial Services, Corruption, Development Aid, and Gender Equality
February-March 2013	Eurobarometer 79.1	

Table 2 - Distribution of responses across years and across countries

Country	2005	2007	2009	2011	2013
France	1012	1024	1017	1046	1058
Belgium	1000	1004	1015	1028	1090
The Netherlands	1031	1000	1006	1002	1021
West Germany	1007	1013	1022	1000	1035
Italy	1000	1039	1040	1043	1020
Luxembourg	501	500	500	502	509
Denmark	1031	1000	1007	1002	1002
Ireland	1000	1000	976	1015	1003
Great Britain	1017	1001	1039	1021	1001
Northern Ireland	304	304	306	307	307
Greece	1000	1000	1000	1000	1001
Spain	1025	1000	1004	1004	1006
Portugal	1000	1000	1009	1035	1026
Germany East	550	506	515	582	510
Finland	1017	1038	1026	1003	1030
Sweden	1054	1015	1005	1020	1010
Austria	1002	1012	1001	1018	1052
Cyprus	502	505	505	506	505
Czech Republic	1029	1169	1073	1069	1000
Estonia	1000	1002	1003	1000	1000
Hungary	1015	1000	1000	1015	1015
Latvia	1000	1009	1006	1014	1014
Lithuania	1011	1018	1026	1031	1029
Malta	500	500	500	500	500
Poland	1000	1000	1000	1000	1000
Slovakia	1044	1055	1029	1013	1000
Slovenia	1030	1016	1026	1024	1012
Bulgaria	1004	1000	1000	1006	1000
Romania	1002	1000	1007	1050	1030
Turkey	1005				
Croatia	1000				1000
Cyprus (TCC)	500				
N	29193	26730	26663	26856	27786

Table 3 - Distribution of responses across different age groups across the years

Age	2005	2007	2009	2011	2013
15 - 24 years	13.54	11.58	12.23	11.49	11.06
25 - 34 years	16.19	14.69	14.72	14.64	14.00
35 - 44 years	17.84	17.04	17.10	16.91	16.99
45 - 54 years	16.26	17.35	17.21	17.13	17.35
55 - 64 years	15.88	17.22	16.28	17.18	17.58
65 years and older	20.28	22.13	22.45	22.65	23.02
Total	100.00	100.00	100.00	100.00	100.00
N	29193	26730	26663	26856	27786

Table 4 - Distribution of responses across occupations over the years

Occupation	2005	2007	2009	2011	2013
Responsible for ordinary shopping	10.28	8.71	7.68	7.22	6.98
Student	9.21	7.86	8.02	7.67	7.28
Unemployed or temporarily not working	5.24	4.70	6.98	8.29	9.27
Retired or unable to work through illness	26.46	28.69	29.08	29.17	29.32
Farmer	1.65	1.44	1.27	1.05	1.01
Fisherman	0.04	0.04	0.03	0.02	0.05
Professional (lawyer, medical practitioner etc)	1.52	1.39	1.37	1.37	1.47
Owner of a shop, craftsmen, etc	3.27	2.56	2.72	2.79	2.73
Business proprietors, owner (full or part)	1.57	1.67	1.64	1.66	1.93
Employed professional (employed doctor etc)	2.73	2.72	2.41	2.61	2.62
General management, director or top management)	1.07	1.04	1.13	1.06	1.10
Middle management, other management	6.37	6.46	6.24	6.52	5.98
Employed position, working mainly at a	8.00	8.51	8.20	7.80	7.92
Employed position, not at a desk but travelling	2.74	2.62	3.00	2.99	3.00
Employed position, not at a desk	6.44	6.82	7.04	6.89	6.86
Supervisor	0.89	0.92	0.83	0.89	0.78
Skilled Manual labor	8.52	9.89	8.99	8.70	8.73
Other, unskilled manual labor	4.00	3.97	3.36	3.27	2.95
Total	100.00	100.00	100.00	100.00	100.00
Observations	29193	26730	26663	26856	27786

Table 5 - Distribution of gender of respondents across the years

Gender	2005	2007	2009	2011	2013
Male	44.24	44.22	45.29	45.92	46.40
Female	55.76	55.78	54.71	54.08	53.60
Total	100.00	100.00	100.00	100.00	100.00
N	29193	26730	26663	26856	27786

Table 6 - Personally affected by corruption in 2011 and 2013

	2011		2013	
	Perc	Freq	Perc	Freq
Totally agree	11.25	3020	9.65	2682
Tend to agree	20.73	5566	17.00	4725
Tend to disagree	22.99	6173	22.10	6141
Totally disagree	41.26	11080	46.51	12924
DK	3.79	1017	4.73	1314
Total	100.00	26856	100.00	27786
N	26856		27786	

Table 7 - Distribution of respondent opinion on the level of corruption compared to the last three years

	2011		2013	
	%	Freq	%	Freq
Increased a lot	21.73	5835	26.35	7321
Increased a little	24.56	6597	25.87	7188
Stayed the same	34.62	9298	31.73	8817
Decreased a little	7.58	2035	6.18	1717
Decreased a lot	1.17	314	0.79	220
There is no corruption (in our country)	1.69	454	0.73	203
DK	8.65	2323	8.35	2320
Total	100.00	26856	100.00	27786

Table 8 - Summary statistics of perception of corruption over the years

Year	Count	Mean	Sd	Min	Max
2005	24682	5.50	4.31	0	14
2007	26730	4.23	3.50	0	13
2009	26663	5.29	3.85	0	13
2011	25479	5.44	3.95	0	14
2013	25725	5.56	4.16	0	15

Table 9 - Summary statistics of experience of corruption over the years

Year	N	Mean	SD	Min	Max
2005	3041	1.06	1.19	0	14
2007	3300	1.18	1.11	0	13
2009	3225	1.32	1.27	0	13
2011	3404	1.11	1.03	0	13
2013	1328	1.29	0.77	1	9

Table 10 - Table of correlations between all measures of experience and perception of corruption, 2011 and 2013

Variable 1 – Variable 2	2011	2013
perCor – expCor	0.132***	0.178***
perCor – personalCor	0.260***	0.261***
perCor – histCor	0.223***	0.264***
expCor – personalCor	0.134***	0.137***
expCor - histCot	0.0149	0.0514

*** - indicates significance at the 1% level

Table 11 – Distribution of perception of corruption over the years

Perception of corruption	2005		2007		2009		2011		2013	
	Per	Freq.	Per	Freq.	Per	Freq.	Per	Freq.	Per	Freq.
0	9.36	2311	13.97	3734	8.87	2366	7.74	1972	6.20	1595
1	14.21	3508	9.21	2463	8.05	2147	8.56	2181	8.58	2207
2	8.56	2112	12.06	3223	9.31	2481	9.45	2408	11.35	2921
3	9.31	2297	17.36	4641	15.46	4123	14.30	3643	13.29	3418
4	9.04	2231	11.16	2982	10.30	2747	10.40	2650	10.94	2814
5	6.81	1680	8.10	2165	8.03	2142	8.38	2136	8.77	2255
6	6.18	1526	5.71	1525	6.57	1753	6.77	1725	7.23	1861
7	5.15	1272	4.47	1195	5.18	1382	5.94	1514	5.90	1518
8	4.73	1168	3.21	859	4.50	1200	5.02	1280	5.08	1306
9	3.89	959	2.90	774	3.94	1051	3.99	1017	4.09	1053
10	3.46	855	2.38	636	3.20	852	3.73	950	3.53	909
11	3.51	866	2.00	534	3.35	894	3.28	835	2.99	768
12	3.64	899	7.43	1986	12.99	3463	3.42	871	2.37	610
13	12.06	2977	0.05	13	0.23	62	8.85	2255	2.26	581
14	0.09	21					0.16	42	1.88	483
15									5.54	1426
Total	100.00	24682	100.00	26730	100.00	26663	100.00	25479	100.00	25725

Table 12 – Distribution of experience of corruption over the years

Experience of Corruption	2005		2007		2009		2011		2013	
	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq
0	28.28	860	20.58	679	15.94	514	20.09	684		
1	54.00	1642	58.15	1919	59.41	1916	61.37	2089	81.85	1087
2	10.10	307	11.48	379	12.65	408	11.52	392	12.35	164
3	4.14	126	6.61	218	6.98	225	4.47	152	3.54	47
4	1.55	47	1.55	51	2.51	81	1.38	47	1.05	14
5	0.85	26	0.73	24	1.18	38	0.53	18	0.53	7
6	0.39	12	0.42	14	0.43	14	0.26	9	0.30	4
7	0.23	7	0.24	8	0.19	6	0.03	1	0.30	4
8	0.16	5	0.03	1	0.28	9	0.12	4		
9	0.07	2	0.03	1	0.22	7	0.09	3	0.08	1
10	0.03	1	0.06	2			0.03	1		
11	0.03	1	0.03	1	0.03	1	0.03	1		
12	0.07	2	0.06	2	0.09	3	0.03	1		
13	0.07	2	0.03	1	0.09	3	0.06	2		
14	0.03	1								
Total	100.00	3041	100.00	3300	100.00	3225	100.00	3404	100.00	1328

Table 13 - Average perception and experience of corruption across age groups

Age	perceptcount	expercount
15 - 24 years	82%	9%
25 - 34 years	83%	13%
35 - 44 years	83%	13%
45 - 54 years	82%	11%
55 - 64 years	81%	9%
65 years and older	78%	6%
Total	81%	10%
Observations	109442	

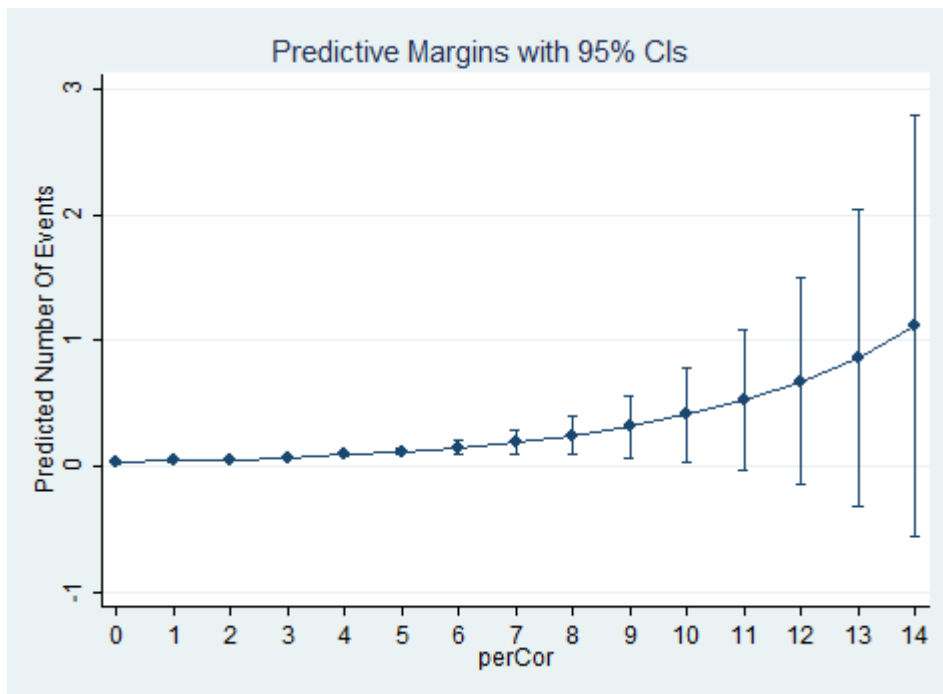


Figure 1 - Predicted experience counts over different levels of perception of corruption (2011-2013)

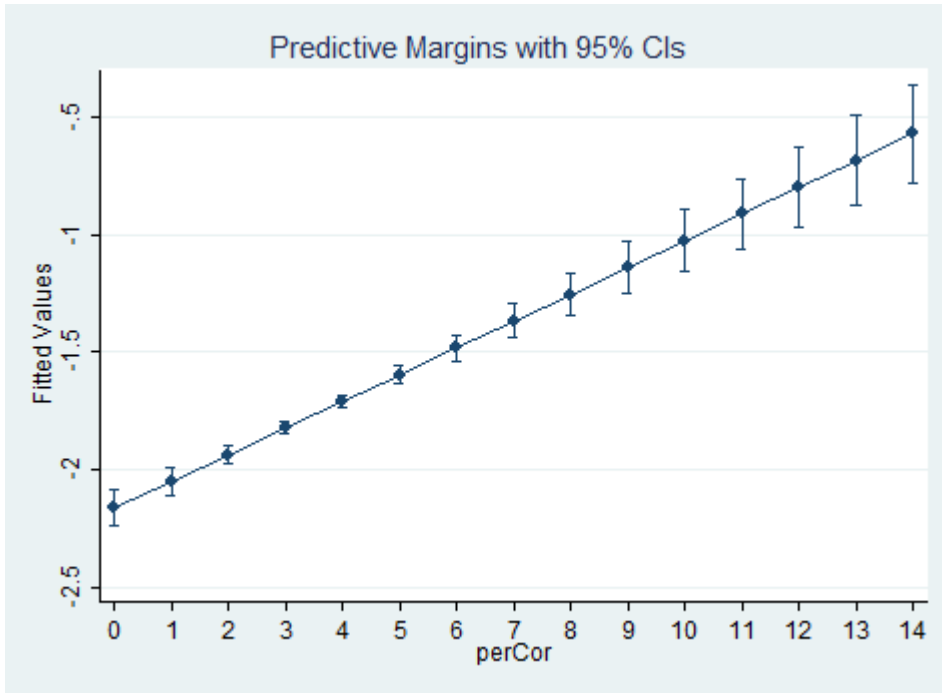


Figure 2 - Predicted probability of experiencing corruption over different levels of perception of corruption (2011-2013)

Table 14 - Crosstab of perception and experience of corruption over the years

		Perception of Corruption															
Experience of Corruption		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
0		836	226	194	263	169	143	138	121	88	85	61	75	150	165	0	2,714
1		115	925	535	811	674	609	492	426	372	393	376	374	842	607	7	7,558
2		9	103	229	186	106	103	83	82	71	68	62	83	170	127	4	1,486
3		4	51	65	204	75	48	36	29	19	16	30	34	66	43	1	721
4		3	12	12	27	48	21	13	9	9	13	12	10	18	18	1	226
5		0	8	1	8	13	17	11	10	7	1	2	6	14	8	0	106
6		0	1	1	4	6	6	11	5	1	2	2	1	7	2	0	49
7		0	0	2	2	1	2	2	3	6	1	0	0	0	2	1	22
8		0	1	0	0	0	0	2	6	1	4	0	0	2	3	0	19
9		1	0	0	0	0	0	2	2	1	5	0	1	1	0	0	13
10		0	0	0	1	1	1	0	0	0	0	0	0	0	1	0	4
11		0	1	0	1	1	0	0	0	0	0	1	0	0	0	0	4
12		0	2	0	0	0	0	0	0	0	0	1	1	3	1	0	8
13		0	1	1	0	0	0	0	0	0	1	0	0	2	3	0	8
14		0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Total		968	1,331	1,040	1,507	1,094	950	790	693	575	589	547	585	1,275	981	14	12,939

Table 15 - Perception and experience of corruption across occupations

Occupation	percepcount	expercount
Responsible for ordinary shopping, etc.	82%	7%
Student	82%	7%
Unemployed, temporarily not working	81%	12%
Retired, unable to work	79%	7%
Farmer	87%	13%
Fisherman	92%	21%
Professional (lawyer, etc.)	80%	13%
Owner of a shop, craftsmen, etc.	86%	16%
Business proprietors, etc.	81%	19%
Employed professional (employed doctor, etc.)	83%	15%
General management, etc.	79%	12%
Middle management, etc.	79%	11%
Employed position,at desk	83%	12%
Employed position, travelling	83%	15%
Employed position, service job	82%	9%
Supervisor	81%	15%
Skilled manual worker	84%	12%
Unskilled manual worker, etc.	79%	11%
Total	81%	10%
Observations	109442	

Table 16 - Average perception and experience of corruption across genders

Gender	percepcount	expercount
Male	81%	11%
Female	81%	9%
Total	81%	10%
Observations	109442	

Table 17 - Average perception and experience of perception across countries

Country	percepcount	expercount
France	82%	3%
Belgium	83%	4%
The Netherlands	79%	2%
Germany West	79%	4%
Italy	84%	14%
Luxembourg	75%	2%
Denmark	56%	2%
Ireland	79%	3%
Great Britain	67%	2%
Northern Ireland	73%	1%
Greece	92%	14%
Spain	77%	7%
Portugal	77%	6%
Germany East	79%	5%
Finland	79%	3%
Sweden	73%	3%
Austria	70%	13%
Cyprus (Republic)	82%	5%
Czech Republic	91%	18%
Estonia	81%	6%
Hungary	83%	20%
Latvia	89%	17%
Lithuania	90%	29%
Malta	78%	4%
Poland	86%	13%
Slovakia	89%	27%
Slovenia	83%	6%
Bulgaria	88%	21%
Romania	89%	30%
Total	81%	10%
Observations	109442	

Table 18 - Regression results

	histCor IV		Lagged Average IV		histCor IV
	Probit IV	Probit Non IV	GMM - Poisson	2SLS - OLS	GMM - Poisson
	expercent	expercent	expCor	expCor	expCor
Perception of Corruption	0.114***	0.0322***	0.113**	0.218**	0.204***
France	0	0	0	0	0
Belgium	0.0489	0.0468	0.607***	0.619***	0.334
Netherlands	-0.173	-0.176	0.434**	0.533***	-0.194
Germany - West	0.128	0.0871	0.636***	0.690***	0.782***
Italy	0.367***	0.461***	0.814***	0.974***	1.053***
Luxembourg	0.0522	-0.0619	0.625***	0.605**	-0.0524
Denmark	0.172	-0.000374	0.489**	0.669***	0.516
Ireland	0.021	-0.0355	0.207	0.184	0.202
Great Britain	-0.325**	-0.422***	0.243	0.488*	-0.267
Northern Ireland	-0.460*	-0.507**	-0.476	-0.252	-1.296*
Greece	0.425***	0.654***	0.0988	-0.253	0.999***
Spain	-0.247**	-0.157	0.661***	0.792***	-0.312
Portugal	-0.00305	0.105	0.752***	0.884***	0.811***
Germany East	0.154	0.123	0.406***	0.376**	0.639*
Finland	0.303***	0.0873	0.622***	0.698**	0.915***
Sweden	-0.152	-0.243*	0.446***	0.400**	-0.237
Austria	0.576***	0.590***	0.780***	0.934***	1.679***
Cyprus (Republic)	0.0323	0.205*	0.253	-0.0423	0.193
Czech Republic	0.697***	0.803***	0.131	-0.11	1.511***
Estonia	0.214*	0.195*	0.199	0.197*	0.628**
Hungary	0.967***	0.998***	0.321***	0.206*	2.009***
Latvia	0.596***	0.675***	0.0371	-0.234	1.447***
Lithuania	1.176***	1.290***	0.125	-0.16	2.302***
Malta	0.0475	0.0631	0.0523	-0.182	0.306
Poland	1.057***	0.960***	0.406***	0.323***	2.131***
Slovakia	1.133***	1.190***	0.446***	0.289*	2.317***
Slovenia	-0.00265	0.234**	0.132	0.206	0.480*
Bulgaria	0.838***	1.005***	0.212	0.00111	1.810***
Romania	1.103***	1.234***	0.296*	0.057	2.206***
Croatia	0.231*	0.494***			0.538*
2005			0	0	
2007			0.268***	0.390***	
2009			0.326***	0.426***	
2011	0	0	0.407**	0.798**	0
2013	-0.354***	-0.375***			-0.696***

Responsible for ordinary shopping, etc.	0	0			0
Student	-0.133*	-0.136*			-0.242
Unemployed, temporarily not working	0.0582	0.114*			0.138
Retired, unable to work	-0.014	0.0199			-0.0945
Farmer	0.145	0.139			0.232
Fisherman	0.484	0.504			1.343
Professional (lawyer, etc.)	0.359***	0.372***			0.662***
Owner of a shop, craftsmen, etc.	0.215***	0.276***			0.509***
Business proprietors, etc.	0.525***	0.594***			1.031***
Employed professional (employed doctor, etc.)	0.117	0.146*			0.293*
General management, etc.	0.411***	0.410***			0.785***
Middle management, etc.	0.184***	0.215***			0.457***
Employed position, at desk	0.026	0.0517			0.166
Employed position, travelling	0.136*	0.190**			0.300*
Employed position, service job	0.0119	0.0426			0.0347
Supervisor	0.299**	0.333***			0.596***
Skilled manual worker	-0.0284	0.0264			-0.00876
Unskilled manual worker, etc.	-0.042	-0.00921			-0.111
15 - 24	0	0			0
25 - 34	0.0695	0.125**			0.0755
35 - 44	0.0678	0.115*			0.0854
45 - 54	0.00733	0.0518			-0.0137
55 - 64	-0.0374	-0.0165			-0.0697
65+	-0.0848	-0.106			-0.185
Male	0	0			0
Female	-0.0353	-0.0379*			-0.066
Constant	-2.348***	-2.071***	-1.139***	-0.583	-4.748***
Observations	45885	49497	12939	12939	45885

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