Does regional disadvantage affect health-related sport and physical activity level?

A multi-level analysis of individual behaviour

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Abstract

This study examines the role of regional government quality in health-related participation in sport and physical activity among adults (18-64 years) in 28 European countries. The importance of the analysis rests in the relative autonomy that regional (and local) governments have over policy decisions connected with sport and physical activity. While existing studies have focused on economic and infrastructural investment and expenditure, this research investigates the quality of regional governments across 208 regions within 28 European countries. The individual-level data stem from the 2013 Eurobarometer 80.2 (*n*=18,675) and were combined with regional-level data from Eurostat. An individual's level of participation in sport and physical activity was measured by three variables reflecting whether an individual's activity level is below, meets, or exceeds the recommendations of the World Health Organization. The results of multi-level analyses reveal that regional government quality has a significant and positive association with individual participation in sport and physical activity at a level meeting or exceeding the guidelines. The impact is much larger than that of regional gross domestic product per capita, indicating that regional disadvantage in terms of political quality is more relevant than being disadvantaged in terms of economic wealth.

Keywords: Health; Modeling; Policy; Quantitative study

1. Introduction

It is now widely recognised globally that individuals do not undertake enough physical activity (World Health Organization [WHO], 2016). This is despite the well-established health benefits (Reiner, Niermann, Jekauc, & Woll, 2013). The WHO (2010) emphasises that performing 150 minutes or more of moderate to vigorous physical activity each week is required to harness these benefits. As well as health benefits, there are important spillover effects to society through, for example, savings in health-care costs. These have been estimated to be €80.4 billion per year in Europe, which is equivalent to 6.2% of all European health spending (International Sport and Culture Association [ISCA] and Centre for Economics and Business Research [CEBR], 2015). Other national estimates have estimated substantial costs of inactivity in various countries, including Canada (Krueger, Krueger, & Koot, 2015) and the United States (Carlson, Fulton, Pratt, Yang, & Adams, 2015).

Whilst public authorities are aware of the impact of a lack of healthy behaviour, the behaviour is often attributed to individual characteristics and efforts (Bauman et al., 2012). However, individual participation in sport and physical activity is not only affected by individual characteristics or personal traits, but also by the characteristics of the municipality, region, or nation (Derom & VanWynsberghe, 2015). Such ecological and interventional studies have explored the role of the social and physical environment and the influences associated with green-space and urban planning, transport, and access to facilities (Downward, Lera-López, & Rasciute, 2014; Stahl, Rütten, Nutbeam, & Kannas, 2002; Wicker, Hallmann, & Breuer, 2013).

Fewer studies have investigated the role of specific national or regional factors on participation. On the national level, the degree of urbanisation and per capita gross domestic product (GDP) have been found to be positively associated with participation in sport and physical activity (Ruseski & Maresova, 2014; van Tuyckom, 2011). Existing studies have also shown that European countries with higher public expenditure on health have significantly

higher participation rates (van Tuyckom, 2011; van Tuyckom, de Velde, & Bracke, 2012) and that national health and education spending is positively associated with individual participation in sport and physical activity (Lera-López, Wicker, & Downward, 2016). Moreover, national government quality has been found to be positively related with national participation rates (van Tuyckom, 2011) and individual health production through sport and physical activity (Wicker & Downward, 2017). Only a few studies have investigated the regional level. A feature of this research generally is that it has also only focussed on economic and infrastructure investment, such as government spending or the provision of facilities (Humphreys & Ruseski, 2007; Kokolakakis, Lera-López, & Castellanos, 2014). What is less understood is how the quality of regional government administration could influence individual sport and physical activity behaviour.

In many European countries, regional governments are quite autonomous in behaviour and many policy decisions about culture, sport, health care, and education are at their discretion (Charron, Dijkstra, & Lapuente, 2015). Importantly, sport policies include not only promotion of physical activity, but also promotion of elite sport (European Olympic Committees [EOC], 2011), while physical activity promotion policies encompass further aspects beyond sport (Public Health England, 2017). In general, sport falls within the discretion of national governments for European countries, as it is subject to the subsidiarity principle. Consequently, specific countries have developed distinct sports systems that are typically organised hierarchically with national and regional associations being involved (e.g., Gratton, Taylor, & Rowe, 2013; Lera-López & Lizalde-Gil, 2013; Petry & Hallmann, 2013). It follows that these engage with national and regional public policy agencies in the development and implementation of policy. In this regard a regional government is considered "a coherent territorial entity situated between the local and national levels with a capacity for authoritative decision making" (Hooghe, Marks, & Schakel, 2010, p. 9).

Even though many political decisions that are relevant to citizens' opportunities to participate in sport and physical activity are taken at the local level, such as the provision of sport infrastructure (Stahl et al., 2002; Wicker et al., 2013), regional governments also represent an administrative mechanism for promoting sport and physical activity through, for example, the allocation of resources (Hooghe et al., 2010). It is important to note, however, that they do this in many different ways. For instance, in Germany, regional governments promote sport for all through subsidising local sport clubs directly and indirectly via regional, district, and municipal sport confederations (Petry & Hallmann, 2013). Likewise, regional governments support local sport clubs in other countries, including Spain (Lera-López & Lizalde-Gil, 2013), Finland (Vehmas & Ilmanen, 2013), and Poland (Zysko, 2013). In England, County Sport Partnerships work with regional and local sports associations, local governments, and the private sector to deliver sport (Gratton et al., 2013). Consequently, throughout Europe there are distinct emphases to different countries' regional organisations and policies with respect to sport and physical activity.

Notwithstanding such specificities, however, theoretically it can be established that government quality might be expected to affect individual behaviour because of spillover, or contextual effects from policy development and implementation regardless of the specific policy priorities and objectives of particular agencies. Such spillover effects have a theoretical foundation in the concept of externalities (Downward, Dawson, & Dejonghe, 2009). This means that when governments commit resources to their activities, such as physical activity promotion, there are likely to be effects beyond the simple commitment of resources upon individual behaviour. Hence, individuals living in specific areas could be disadvantaged in terms of the quality of government policy and its implementation, which may affect their participation behaviour in sport and physical activity.

There are at least two possible and related mechanisms by which the externalities may have an effect (Wicker & Downward, 2017). The first is of a structural orientation and

suggests that, regardless of the specific policy priorities of the government, better quality governments are more likely to invest public funds in initiatives that will have the desired outcomes. Other things being equal, therefore, *if* resources are committed to the promotion of sport and physical activity, which is shown to be the case across Europe, then it follows that better quality governments will commit resources to initiatives that are more likely to yield the relevant outcomes for their society. It should be recognised in this respect that this is not always the case: For instance, governments continue to invest in major sport events and infrastructure despite very little independent evidence showing that they have met their desired outcomes, e.g., in creating jobs (Downward et al., 2009) and increasing sport participation rates (Weed et al., 2015). This suggests that the effectiveness and accountability of government spending is not to be assumed, but will vary.

The second avenue is more qualitative and connected with values and integrity. Whilst recent discussion in the media has focussed on the need for integrity in sport (Alm, 2013), political scandals and corruption have the potential to influence wider trust in government, which could undermine the implementation of any policy including that associated with the promotion of sport and physical activity, however it is expressed or sought to be implemented. In general, if governments are perceived to be untrustworthy and corrupt, then this will undermine the credibility of policy announcements and possibly the change in behaviour that is desired in society as individuals resist policy initiatives. For example, sport policy is a policy area where powerful organizations aim at promoting a certain kind of physical activity, typically competitive and club-based sports, and where consequently policy announcements may be perceived as less credible when citizens suspect the government to be strongly influenced by lobbyists. Moreover, it is important to the current context that sport and physical activity have gendered, ethnic, and socio-economic influences (Downward et al., 2014; Humphreys & Ruseski, 2007), with female and ethnic participation as well as participation of those experiencing socio-economic disadvantage being typically lower. It is

clear, therefore, that promoting sport and physical activity has to challenge these traditional behaviours (HM Government, 2015). Other things being equal, policies that challenge these norms of behaviour are more likely to be prioritised, and convincingly championed in a more open transparent political environment in which prevailing cultural and political norms are more readily scrutinised.

The purpose of this study, therefore, is to examine the relationship between regional government quality and health-related participation in sport and physical activity. Individual survey data from the Eurobarometer 80.2 which captures the EU-28 countries are combined with regional-level data for 208 regions within these countries. Given this European research context, the present study is based on the conceptualisation of sport and physical activity suggested by the European sport charter (Council of Europe, 2001). In this charter, " 'sport' means all forms of physical activity which, through casual or organised participation, aim at expressing or improving physical fitness and mental well-being, forming social relationships or obtaining results in competition at all levels" (Council of Europe, 2001, n.p.). While the term sport is considered an umbrella term for all types of physical activity in this definition, it must be noted that playing sport, exercising, and being physically active can have different meanings in different European countries (van Tuyckom, Bracke, & Scheerder, 2011). For example, in Germany the term sport is more common, even though the term physical activity would be more appropriate for some activities, such as walking or cycling to work (Wicker et al., 2013). Hence, identical wording of survey questions across countries does not necessarily imply equivalence of meaning in multinational comparative studies (van Tuyckom et al., 2011). The present study takes these aspects into account by using a participation measure which considers both sport and physical activity in an effort to capture all forms of sport and physical activity despite country-specific differences in meaning.

2. Method

2.1. Data sources

Ethical approval for this research was obtained from the ethics committee of one of the universities involved in the research (approval number: SSEHS-2066). The study used two datasets. First, individual-level data containing information about sport and physical activity levels and socio-demographic characteristics were obtained from the 2013 Eurobarometer 80.2 – a face-to-face survey of citizens in all countries of the EU with individuals being randomly selected for the interviews (European Commission, 2014). Approximately 1,000 individuals were surveyed for all countries except Cyprus, Luxembourg, and Malta, where only approximately 500 individuals were sampled. The initial dataset contained 27,919 individuals from 28 countries. After deleting cases with missing values on some of the variables of interest, 25,135 observations were left. Since this study examines health-related sport and physical activity levels, it closely follows the WHO (2010) guidelines for adults aged 18 to 64 years. Thus, the sample was restricted to respondents in this age group, leaving n=18,675 observations for the empirical analysis.

The second dataset contained information about 208 NUTS2 regions[1] within these 28 European countries. In Germany and the UK, the NUTS1 regions were included because no information about the NUTS2 level was provided. The respective regions were the key variable for linking the regional data with the individual Eurobarometer data. Depending on the political system of a country, these regions represent a country's (federal) states (e.g., Germany, Austria), autonomous communities (e.g., Spain), provinces (e.g., the Netherlands), or regions (e.g., France, Italy). The 2013 regional-level data on GDP and population density were retrieved from Eurostat (2015). Information about regional government quality was obtained from Charron et al. (2015).

2.2 Measures and variables

An overview of the variables used in this study is provided in Table 1. The Eurobarometer contained a set of variables measuring the frequency, duration, and intensity

[1]NUTS=Nomenclature des Unités Territoriales Statistiques.

of respondents' participation in sport and physical activity (including walking) in the week prior to the interview. Since this study aims to examine health benefits associated with participation in sport and physical activity following the WHO (2010) guidelines, three variables were constructed that reflect different participation outcomes. The first variable is *Active* which takes the value of 1 when people are physically active, but have an activity level that is below the WHO (2010) guidelines. In other words, their activity level is below 150 minutes of moderate-intensity activity or 75 minutes of vigorous-intensity activity per week or an equivalent combination of both (with bouts of at least 10 minutes of duration). The variable *Pass* is 1 when individuals have an activity level that meets the WHO (2010) guidelines, but does not secure additional health benefits. As emphasised by the WHO (2010), such extra health benefits can be obtained when adults engage in 300 or more minutes of moderate-intensity activity or 150 minutes of vigorous-intensity activity or an equivalent combination of both (with bouts of at least 10 minutes of duration). The variable *Extra* takes the value of 1 when an individual's activity level meets the requirements for these extra health benefits. The sport and physical activity measures are mutually exclusive; for example, individuals who score 1 on *Extra* score 0 on *Active* and *Pass*.

Insert Table 1 here

Since existing studies have shown that participation in sport and physical activity is affected by various individual factors (e.g., Downward et al., 2014; Humphreys & Ruseski, 2007), several individual socio-economic determinants are included in the analysis: gender; age and its squared term; marital status; number of children in the household; employment; difficulty paying bills; and self-assessed class in society (Table 1). Existing research also shows that an individual's educational level is significantly related with participation in sport and physical activity (e.g., Wicker et al., 2013). However, the Eurobarometer survey only assessed a respondent's age when he/she stopped full-time education. The distribution of this

variable suggests that it is not a meaningful representation of an individual's educational background and was, therefore, not considered in this research.

Three regional-level variables were included in the analysis. The independent variable of interest is regional government quality which reflects potential political (dis)advantage. It is captured by an index encompassing three pillars: quality, impartiality, and level of corruption. Within each pillar, the focus is on three core public services that are financed and administered by regional authorities: education, healthcare, and law enforcement (Charron et al., 2014; 2015). Existing studies have indicated that these public services are associated with sport and physical activity levels: For example, van Tuyckom (2011) documented a positive relationship between rule of law (i.e., the extent to which agents have confidence in and abide by rules of society, in particular quality of contract enforcement, property rights, police and courts, as well as likelihood of crime and violence) and physical activity levels in several European countries. Likewise, public sector spending on health and education was positively associated with participation levels (Lera-López et al., 2016; van Tuyckom, 2011). The latter relationships can be explained with both direct and indirect effects: for instance, better educated individuals are more aware of the health benefits of a physically active lifestyle and when elderly parents are looked after by public healthcare, individuals have more time for sport and physical activity (Lera-López et al., 2016).

The government quality index for every region was estimated based on a comprehensive survey of approximately 34,000 EU citizens which included 16 questions about regional government quality (Table 2). While respondents were sampled by region, the wording of questions ('in your area') suggests that respondents may have not only considered the regional government in their assessment of government quality, but also the local government. Hence, the regional measure proxies conflagrations of local influence and is suggestive of local effects that can spread beyond individual communities. The quality and corruption pillars consisted of five equally weighted items each, the impartiality pillar of six

equally weighted items. The three pillars were equally weighted for the construction of the index which ranges from -3 (poor government quality) to +3 (good government quality) (Charron et al., 2014; 2015).

Insert Table 2 here

Since previous research has documented that participation in sport and physical activity is also affected by GDP (Ruseski & Maresova, 2014), this study included regional GDP per capita to control for differences in economic conditions between regions. The analysis also controls for regional population density which captures urbanisation and agglomeration effects as well as the physical environment which were found to affect participation levels, too (van Tuyckom, 2011).

2.3. Empirical analysis

At least two issues had to be considered in the empirical analysis. First, the hierarchical structure of the data must be taken into account, i.e., individuals who live in the same region share the same regional characteristics in terms of government quality, GDP, and population density. Conventional regression analyses would treat the data as purely aggregate or individual. The former is problematic because the within-group variation (i.e., within-region variation) would be neglected (Todd, Crook, & Barilla, 2005). The latter would also yield biased estimates because too many degrees of freedom in the higher-level variables (regional level) would lead to an inflated Type I error (Tabachnick & Fidell, 2007). Moreover, higher-level effects would be misleadingly ascribed to the lower (individual) level, which is referred to as an ecological fallacy (Tabachnick & Fidell, 2007). Multi-level models or hierarchical (non)linear models represent an appropriate statistical method for such multi-level data because the data must be measured at the appropriate level. These models estimate separate regression models for each level of data (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011). They require a large number of observations on the higher level (regional level).

Snijders and Bosker (1999) suggest at least 20 cases – a criterion which this study met given the 208 observations on the regional level.

Second, the regional variables may be correlated. While government quality is uncorrelated with population or area size measures as intended by its developers (Charron et al., 2015), it is significantly and positively correlated with GDP. Therefore, the residuals of government quality (*Govtqual_res*) were obtained by regressing government quality on GDP and population density following an approach which has been applied in previous research (Wicker & Downward, 2017). Using this measure of government quality rather than its actual values removes the effect of GDP and population density; that is, it is a measure of government quality that is independent of economic factors and population claims on resources (Table 1).

Altogether, three multi-level models were estimated – one model for each dependent variable (*Active*, *Pass*, *Extra*). In addition to *Govtqual_res*, *GDP*, and *Density*, all independent variables from Table 1 were entered in the models. The latter were also checked for multicollinearity using bivariate correlation analyses. With the exception of age and its squared term which are naturally highly correlated, all correlation coefficients were below 0.4 and, thus, well below the suggested threshold of 0.9 by Tabachnick and Fidell (2007). Therefore, multicollinearity should not be an issue in the present models. An α-level of 0.05 is used for the analysis.

3. Results and discussion

Table 1 displays the summary statistics. Altogether, 45.2% of respondents are male and the average age is 43.4 years. Concerning sport and physical activity levels, 14.0% of respondents engage in some form of sport and physical activity, but their activity level is below the WHO (2010) recommendations in terms of duration and intensity. The activity level of 10.9% of respondents meets these guidelines, but it does not allow securing any

additional health benefits. The latter is the case for 52.1% of respondents who reported an activity level exceeding the WHO (2010) guidelines.

Regional government quality is close to zero on average, but positive (Table 1). This suggests, quite naturally, almost neutrality in quality as indicated by the construction of the variable. However, the range of values, as indicated by the standard deviation, suggests variability in government quality across the 208 European regions. Table 3 gives an overview of government quality by country. A comparison between countries indicates that government quality was rated highest on average in Danish, Finnish, and Swedish regions and lowest in Romanian, Bulgarian, and Croatian regions. Within country variation in government quality was highest in Bulgaria, Italy, and Belgium.

Insert Table 3 here

The results of the multi-level analyses are reported in Table 4. The discussion of results focuses on the relationship between regional characteristics and individual behaviour because the role of individual characteristics has already been widely studied (Bauman et al., 2012). The results show a positive association between regional GDP per capita and individual participation in sport and physical activity which is statistically significant in the models for an activity level meeting (*Pass*) and exceeding the guidelines (*Extra*). The significant positive relationship between population density and an activity level exceeding the guidelines (*Extra*) may be mediated by educational level which this analysis could not control for. However, the odds ratios of *GDP* and *Density* indicate that the effects are essentially neutral with respect to participation in sport and physical activity.

The residuals of government quality, which are cleaned for the effects of GDP and population density, have a statistically significant and positive association with an activity level that contributes to health production (*Pass*) or even leads to additional health benefits (*Extra*). The odds ratios increase as we move from an activity below the guidelines to activity levels meeting or exceeding the guidelines. Hence, political regional disadvantage in terms of

poor government quality seems to be much more important than economic disadvantage in terms of GDP, keeping in mind that the regional government quality index does not measure governmental quality in the field of sport and physical activity specifically. While previous research has had difficulty identifying significant effects for government spending at the regional level (Humphreys & Ruseski, 2007; Kokolakakis et al., 2014) and economic activity had a neutral effect in this study, the effects of government quality, in contrast, are not only significant, but also associated with greater sport and physical activity levels. It could be the case, therefore, that government quality actually overlaps potential government spending effects because essentially governments make decisions about public expenditure – an interpretation which is supported by empirical evidence (Wicker & Downward, 2017). The present study further indicates that it is not only national government quality that is relevant to individual health production (Wicker & Downward, 2017), but also government quality at the regional level (including local levels).

Insert Table 4 here

4. Conclusions

This study analysed the relationship between regional-level factors and individual health-related sport and physical activity level in 28 European countries. The results indicate that regional government quality (including local effects) has a significant positive association with participation at an activity level meeting or exceeding the WHO (2010) recommendations. The effect is relatively large compared to other regional characteristics (GDP, population density) and gains in magnitude as we move from an activity level below the WHO (2010) recommendations to an activity level meeting or exceeding these guidelines. Hence, this research shows that a neglected factor in the analysis of sport and physical activity, the process of government itself, is significantly related with individual behaviour. Therefore, national policy makers and their regional agencies need to recognise that their reputation is part of the process by which they can deliver health outcomes across Europe. It

follows that the focus of the EU on the process of government integrity across its member states is an important factor in achieving its ambitions with respect to health promotion.

Like all studies relying on official surveys and databases, this study is limited to the available data. While it would have been interesting to include further regional variables, like government spending, welfare state typology, and cultural factors, these data are not available from Eurostat. Likewise, an appropriate measure of respondents' educational level would have benefited the analysis because it may not only affect an individual's level of sport and physical activity, but also his/her assessment of government quality. Questions on sport and physical activity are only included approximately every four years in a Eurobarometer wave and do not consistently ask for participation duration and intensity which allows examining health-related activity levels as specified by the WHO (2010). The changing nature of these questions only allows analysing cross-sectional data rather than exploiting panel data. Future studies should examine how developments in government composition and quality affect individual behaviour.

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Table 1

Overview of variables and summary statistics

Variable	Description	n	Mean	SD	Min	Max
Dependent variables						
Active	Individual participates in sport and physical activity, but activity level is below the WHO (2010) guidelines (1=yes)	18675	0.140	---	0	1
Pass	Individual participates in sport and physical activity and his/her activity level passes the WHO (2010) guidelines (1=yes)	18675	0.109	---	0	1
Extra	Individual participates in sport and physical activity and his/her activity level allows securing extra health benefits according to the WHO (2010) guidelines (1=yes)	18675	0.521	---	0	1
Regional variables						
Govtqual	Regional quality of government index	208	0.19	0.95	-2.60	1.76
Govtqual_res	Unstandardized residuals of the following regression: Govtqual = β_0+ β_1 GDP+ β_2 Density+ε	208	0.00	0.76	-2.70	1.32
GDP	Regional GDP per capita at current market prices in purchasing power probabilities (PPP; in €)	208	23996.73	9279.42	7220.00	66300.00
Density	Population density in the region (number of inhabitants per square km)	208	319.20	770.72	3.32	7061.66
Individual variables						
Male	Gender (0=female, 1=male)	18675	0.452	---	0	1
Age	Age of the respondent (in years)	18675	43.38	12.89	18.00	64.00
Age_sq	Squared term of age	18675	2048.11	1100.87	324.00	4096.00
Relationship	Individual is married or in a relationship (1=yes)	18675	0.688	---	0	1
Kids_u9	Number of children aged 9 years and younger in the household	18675	0.367	0.731	0	11
Kids_10-14	Number of children between 10 and 14 years in the household	18675	0.174	0.477	0	12
Self-employed	Occupation: self-employed (1=yes); including farmer, fisherman, professional, owner of a shop, craftsmen, business proprietor	18675	0.091	---	0	1
Employed	Occupation: employed (1=yes); including employed professional, general or middle management, employed position (at desk,	18675	0.552	---	0	1

Variable	Description	n	Mean	SD	Min	Max
	travelling, service job), supervisor, (un)skilled manual worker					
Not_working	Occupation: not working (1=yes); including responsible for ordinary shopping, student, unemployed, temporarily not working, retired, unable to work	18675	0.357	---	0	1
Paybills_mostly	Difficulty paying bills: most of the time (1=yes)	18675	0.141	---	0	1
Paybills_sometimes	Difficulty paying bills: from time to time (1=yes)	18675	0.310	---	0	1
Paybills_never	Difficulty paying bills: never/almost never (1=yes)	18675	0.550	---	0	1
Working_class	Self-assessed social class: working class (1=yes)	18675	0.465	---	0	1
Middle_class	Self-assessed social class: middle class (1=yes)	18675	0.509	---	0	1
Upper_class	Self-assessed social class: upper class (1=yes)	18675	0.026	---	0	1

Table 2

Overview of items used for calculating the regional government quality index (Charron et al., 2015, p. 334)

Pillar	Item	Scale
Quality	How would you rate the quality of public education in your area?	0 (extremely poor quality) to 10 (extremely high quality)
	How would you rate the quality of the public health care system in your area?	0 (extremely poor quality) to 10 (extremely high quality)
	How would you rate the quality of the police force in your area?	0 (extremely poor quality) to 10 (extremely high quality)
	Elections in my area are clean from corruption.	0 (strongly disagree) to 10 (strongly agree)
	I trust the information provided by the local mass media on matters of politics and public services in my area.	0 (strongly disagree) to 10 (strongly agree)
Impartiality	Certain people are given special advantages in the public education system in my area.	0 (strongly disagree) to 10 (strongly agree)
	Certain people are given special advantages in the public health care system in my area.	0 (strongly disagree) to 10 (strongly agree)
	The police force gives special advantages to certain people in my area.	0 (strongly disagree) to 10 (strongly agree)
	All citizens are treated equally in the public education system in my area.	1 (agree) to 4 (disagree)
	All citizens are treated equally in the public health care system in my area.	1 (agree) to 4 (disagree)
	All citizens are treated equally by the police force in my area.	1 (agree) to 4 (disagree)
Corruption	Corruption is prevalent in my area's local public school system.	0 (strongly disagree) to 10 (strongly agree)
	Corruption is prevalent in the public health care system in my area.	0 (strongly disagree) to 10 (strongly agree)
	Corruption is prevalent in the police force in my area.	0 (strongly disagree) to 10 (strongly agree)
	In your opinion, how often do you think other people in your area use bribery to obtain other special advantages that they are not entitled to?	0 (never) to 10 (very frequently)
	In the past 12 months have you or anyone living in your household paid a bribe in any form to: (a): Education services? (b): Health or medical services? (c): Police? (d) any other public service?	yes/no

Table 3

Variations in government quality within countries and differences between countries

No.	Country (in alphabetical order)	Number of NUTS2 regions included	Mean	SD
1	Austria	9	0.93	0.29
2	Belgium	11	0.69	0.60
3	Bulgaria	6	-1.44	0.86
4	Croatia	2	-1.21	0.10
5	Cyprus	1	0.23	---
6	Czech Republic	8	-0.32	0.24
7	Denmark	5	1.66	0.13
8	Estonia	1	0.13	---
9	Finland[1]	4	1.56	0.05
10	France[1]	21	0.66	0.25
11	Germany[2]	16	0.81	0.23
12	Greece[1]	10	-0.93	0.11
13	Hungary	7	-0.52	0.15
14	Ireland	2	0.83	0.10
15	Italy[1]	17	-0.78	0.85
16	Latvia	1	-0.67	---
17	Lithuania	1	-0.61	---
18	Luxembourg	1	1.32	---
19	Malta	1	0.20	---
20	Poland	16	-0.38	0.23
21	Portugal[1]	5	0.24	0.46
22	Romania	8	-1.66	0.34
23	Slovakia	4	-0.56	0.14
24	Slovenia[3]	2	-0.02	---
25	Spain[1]	17	0.22	0.31
26	Sweden	8	1.47	0.07
27	The Netherlands	12	1.34	0.12
28	United Kingdom[2]	12	0.76	0.20

Note: [1]Only NUTS2 regions with respondents in the individual-level (Eurobarometer) data could be considered. [2]Information was only provided at the NUTS1 level. [3]The country value was assigned to both regions because no separate value was provided for the two regions (Charron et al., 2014; 2015).

Table 4

Results of the multi-level models (displayed are the odds ratios)

	Model 1: Active	Model 2: Pass	Model 3: Extra
Regional variables			
Intercept	0.082***	0.077***	1.870**
Govtqual_res	1.091	1.173***	1.356***
GDP	1.000	1.000**	1.000***
Density	1.000	1.000	1.000**
Individual variables			
Male	0.771***	0.881**	1.443***
Age	1.020	0.998	0.951***
Age_sq	1.000	1.000	1.000***
Relationship	1.006	1.085	1.005
Kids_u9	0.996	1.016	0.965
Kids_10-14	1.045	1.010	1.054
Self-employed	0.849	1.061	1.191**
Employed	0.976	1.070	1.110**
Not_working	REF	REF	REF
Paybills_mostly	REF	REF	REF
Paybills_sometimes	1.142	1.185*	1.009
Paybills_never	1.082	1.278*	1.165*
Working_class	REF	REF	REF
Middle_class	1.136*	1.282***	1.086*
Upper_class	1.122	1.369**	1.261*

Note: *p<0.05; **p<0.01; ***p<0.001; REF=reference category.