Institutional quality, corruption, and impartiality: the role of process and outcome for citizen trust in public administration in 173 European regions

2 authors:

Steven Van de Walle
KU Leuven
175 PUBLICATIONS   **3,571** CITATIONS

Koen Migchelbrink
Erasmus University Rotterdam
4 PUBLICATIONS   **10** CITATIONS

Some of the authors of this publication are also working on these related projects:

Project TROPICO - Transforming into Open, Innovative and Collaborative Governments View project

Project Serie Toekomst Bestuurskunde (in 'Bestuurskunde') View project

Institutional quality, corruption, and impartiality: The role of process and outcome for citizen trust

in public administration in 173 European regions

Steven Van de Walle   Koen Migchelbrink

steven.vandewalle@kuleuven.be   koen.migchelbrink@kuleuven.be

KU Leuven Public Governance Institute[1]

Abstract

We empirically study whether citizens´ trust in public administration is influenced by the outcomes delivered by public services or by due process (administrative impartiality or absence of corruption) from a regional perspective. The paper fits a multilevel model on a unique dataset with a total of 129,773 observations nested in 173 European regions, using data from a series of pooled Eurobarometer surveys and from the European Quality of Government Index. We find that both public service outcomes and processes have a significant impact on citizens´ trust in public administration, but that process, and in particular absence of corruption is the strongest institutional determinant.

Keywords: trust, public administration, quality of government, corruption, impartiality

---

Introduction

Citizens´ trust in their public administration is an important indicator for evaluating public services and government bureaucracies. Whether or not such subjective assessments reflect the quality and performance of public administrations, they drive behaviours of citizens towards the administration (Marien & Hooghe, 2011; Van de Walle, 2017). While assertions of continually declining trust appear not to be entirely supported by the data (Van de Walle, Van Roosbroek, & Bouckaert, 2008; Van Ryzin, 2011), trust in public administration is low in many countries (Charron & Rothstein, 2018; Houston & Harding, 2013). Indeed, in a recent Eurobarometer survey, it was found that the number of European citizens stating that they tend to trust their public administration is only slightly higher than the number stating they do not trust it (European Commission, 2017d).

Research shows that there are important country-level differences in peoples' attitudes to public administration and the civil service (Newton & Norris, 2000; Van de Walle, 2007), but it remains unclear to what extent institutional quality explains such differences. Furthermore, despite the fact that many public services are organized and provided below the national level, existing studies have mostly ignored this regional level perspective. Regional variation on service quality and performance can be high. In this paper we study the role of institutional quality in terms of process and outcomes for citizens trust in their public administration from a regional perspective. We develop a hierarchical model using a unique pooled dataset of citizens´ trust in public administration at the individual level, and the three main predictors (quality, impartiality, and absence of corruption) at the regional level (Charron, Dijkstra, & Lapuente, 2014, 2015; Charron, Lapuente, & Annoni, 2019). We use data from 173 subnational regions in Europe.

We build and extent current research on the relation between institutional quality and citizen trust in public administration and services in two ways. First, earlier work on trust in public administration and its determinants has focused on single countries (see e.g., del Pino, Calzada, and Díaz-Pulido 2016; Rego, Sarrico, and Moreira 2006; Rölle 2009; Vigoda-Gadot and Yuval 2004; Yackee and

Lowery 2005) but increasingly, scholars have started doing cross-national studies as well (Choi, 2018; Houston, Aitalieva, Morelock, & Shults, 2016; Van Ryzin, 2011). Yet, most studies lack a sufficient number of level-2 units (countries or geographic units) thereby severely limiting the number of country-level predictors on institutional quality that can statistically be included in the analysis, and reducing the robustness of the findings. The data from the International Social Survey Programme (ISSP), which has been used in most attempts to measure and explain variation in trust in the civil service (see recently e.g., Choi 2018; Houston et al. 2016; Van Ryzin 2011), only has data for 33 countries, spread across the globe.

Second, some institutional quality-related explanations for variation in citizens' trust in public administration have suffered from common method bias by using indicators of attitudes on institutional quality and subjective trust measured in the same survey. Some earlier studies (see above) have solved this problem by relying on the World Bank Governance Indicators (WGI), but continue to suffer from a relatively low n at the country level. In this paper we attempt to solve this problem by combining data from two different large-n datasets for level 1 (individual) and level 2 (regional) observations in a dataset with 129,773 observation nested in 173 European regions.

Supply-side theories for explaining trust in public administration: Do outcomes and processes matter?

Government does not only have to "deliver the goods" (Córdova & Layton, 2016, p. 77), it also needs to respect procedure. Good governance has an impact on political trust (Spiteri & Briguglio, 2018) as well as on trust in public administration (Houston et al., 2016; Van Ryzin, 2011). Our paper follows what Norris (2011) has called 'supply-side theories' that seek to explain citizens´ satisfaction with the political system by looking at the structure, process and performance of institutions. One of the crucial debates in scholarship on trust in institutions has been whether citizens look mainly at outcomes or at process when forming opinions (Tyler 2006(1990)). This distinction is quite

commonly used in research (Córdova & Layton, 2016), and earlier work on trust in civil servants has called for more attention to process to explain such trust (Van Ryzin, 2011).

A lot of the older work on trust in institutions paid attention to outcomes of the (political) system as drivers of changes in trust. This includes outcomes such as macro-economic developments or government performance. Citizens also have normative expectations regarding fairness, impartiality and the absence of corruption when evaluating public institutions. Recently we have seen more attention for process and procedures, largely inspired by the work of Tom Tyler on procedural justice (Tyler, 2006b). Scholars have used this approach to focus on various institutions, such as trust in the police and the courts (Young and Hassan, 2018), political trust (van der Meer & Hakhverdian, 2017), or trust in local government (Gustavsen, Røiseland, & Pierre, 2014). A recurring finding is that both outcome and process are sources of trust, but that process matters more.

Public administration scholarship has also looked at the role of process and outcome evaluations for trust in public services or in civil servants. One of the earliest major studies on trust in civil servants was Anderson and Tverdova's (2003) paper, in which the authors looked at the effects of corruption on trust in civil servants in 16 countries, using ISSP data. Most other international studies have relied on the 2006 ISSP data. Van Ryzin, in a study using data from 33 countries, found that not only outcomes and service quality drive citizens´ trust in civil servants, but also, and perhaps even more, administrative process (Van Ryzin, 2011, 2015, p. 438). Houston et al. (2016) performed a 21-country analysis of trust in civil servants looking at, amongst other, government performance and corruption perceptions, taken from the World Bank Governance Indicators and Transparency International. They found that "institutional quality accounts for variation in the level of trust across countries." (p. 1210). More recently, Choi (2018) looked at citizen trust in the civil service in 18 OECD countries, using bureaucratic characteristics to explain variation. Just like our study, it also relies on the QOG data, whereas the dependent variable is taken from the ISSP. Choi finds higher trust when bureaucracy is more impartial and more representative.

Our paper is an expansion of Van Ryzin´s (2011) study in the Journal of Public Administration Research and Theory and Houston et al.´s (2016) article. In our paper, we simultaneously look at the effect of outcomes (institutional quality) and process (impartiality and absence of corruption) on citizen trust in public administration. However, our paper uses regional-level data rather than nation-level data.

According to proponents of the performance movement, citizens' trust in public administration is dependent on government outcomes and results (Kettl, 2006; Osborne & Gaebler, 1992). The assumption is that citizens evaluate government on what it delivers and a perceived lack of trust has been the explicit rationale for widespread output-oriented government reforms (Van de Walle, 2018; Van Ryzin, 2011, 2015). These arguments are not without merit. A number of studies have found strong and positive associations between trust and government performance (Van Ryzin, 2015; Eran Vigoda-Gadot, 2006). Based on these studies, we hypothesize that citizens' trust in public administration is positively related to public service outcomes:

> H_1 (outcomes): Public service outcomes are positively related to citizen trust in public administration

However, in forming attitudes about the public sector, citizens might care as much about how outcomes are produced as about what those outcomes actually are (Tyler, 2006b, 2006a). According to Van Ryzin (2011) process characteristics have a bigger impact on citizens' trust in public administration than outcomes do. He argues that citizens might have a clearer understanding of how services should be provided than about what those services should be (Van Ryzin, 2011). Building on this research, Choi (2018) finds that impartiality is one of the most important drivers of citizens' perceptions of public administration in the OECD. At the same time, a number of studies have found clear evidence that citizens' trust in public services and public administration is negatively related to the level of corruption (Anderson & Tverdova, 2003; Dahlström, Lapuente, & Teorell, 2012; Houston & Harding, 2013; Van Ryzin, 2015). Citizens expect public officials to act

ethically and restrain from corrupt practices (Anderson & Tverdova, 2003; Van Ryzin, 2015). Building on these studies, we hypothesize that citizens' trust in public administration is positively related to the impartiality of and absence of corruption in public services:

> H_2 *(process): Impartiality of public services is positively related to citizen trust in public administration*

> H_3 *(process): Absence of corruption in public services is positively related to citizen trust in public administration*

Why looking at regional disparities is important

Attention for regional variation in institutional performance started with Putnam et al.´s (1993) classic "Making democracy work", in which he explored regional institutional performance in Italy (Putnam et al., 1993). Differences can be due to different factors, such as centre-periphery inequalities, both macro-economically and in terms of the regional allocation and availability of public services, or historical factors having an effect on the (political) integration of regions into the wider country. Within Europe, and beyond, there exist important regional disparities in how citizens view government and public services. Examples are the North and South of Italy, the former East and West of Germany, as well as Belgium and Spain (Charron & Rothstein, 2018). Government, and its administration, is in some of the regions highly distrusted and met with suspicion, whereas in others this is less the case, despite regions sharing the same formal national institutions (Charron & Lapuente, 2013).

The focus in existing scholarship on explaining national-level variation in trust in public administration has some drawbacks. The samples used are often very heterogeneous and tend to contain countries located on different continents. Analyses on continental subgroups, which have been mainly performed for European and Asian countries, suffer from small numbers of countries, thereby

reducing the number of variables that can be included at level 2 in multilevel models. Yet, most analyses about the citizen perspective on public administration have focused on the national level, because more extensive data did not (yet) exist (Choi, 2018; Houston et al., 2016; Rölle, 2009; Van Ryzin, 2011).

However, some studies have found significant intra-country regional differences. Lee and Van Ryzin (2018), for instance found regional differences in their study of bureaucratic reputation of US Federal Agencies. They explained this variance by referring to the different impact policies have on regions and communities (Lee & Van Ryzin, 2018, p. 5). Likewise, del Pino, Calzada, and Díaz-Pulido (2016) observed considerable within-country regional variation in attitudes towards public administration in Spain and in evaluations of its performance. They however failed to find an explanation for this substantial 17-region variation. Charron and Rothstein (2018), in what can be considered the first large scale study of trust at the regional level, found that regional variation in generalised trust is for 78% explained by country-level variation and 22% by regional-level variation (Charron & Rothstein, 2018). They found that quality of government is by far the best predictor for such variation in trust. Berman (1997) also found jurisdictional variance in citizen cynicism, something he attributes to local economic conditions.

In an attempt to explain this regional variation, the current paper will analyse levels of trust in public administration measured at the individual level among individuals nested in 173 regions in 28 EU countries, using regional level data for both the dependent variable and the predictors.

Data and Method

We examine predictors of citizens' trust in public administration using outcome- and process-related predictors at the regional level, controlling for individual-level factors, using a multilevel binomial logit analysis. The dependent variable and the individual-level control variables have been taken

from five subsequent Eurobarometer surveys that have been pooled. The independent variables at the regional level have been taken from the European Quality of Government Index (EQI) survey. Figure 1 show the provenance of the main variables.

Figure 1: Structure of the analysis
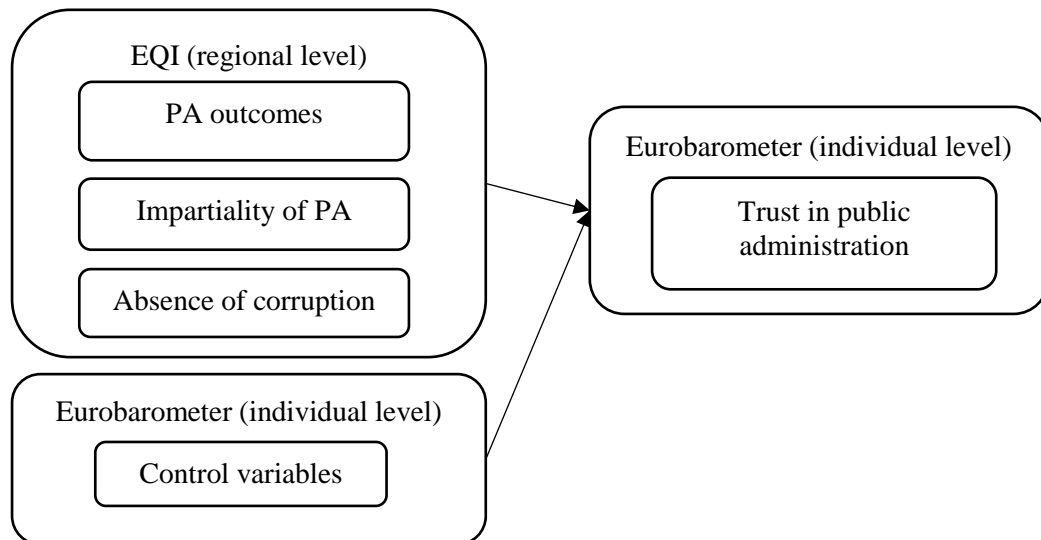
Dependent variable

The Standard Eurobarometer contains a number of questions on respondents' trust in institutions. One of these questions asks respondents whether they tend to trust their public administration: "*I would like to ask you a question about how much trust you have in certain institutions. For each of the following institutions, please tell me if you tend to trust it or tend not to trust it: Public administration in (OUR COUNTRY) ".* We excluded the 6.7% "don't know" responses from the analysis. In regional aggregates, we refer to the percentage of citizens that indicated to trust the public administration their country (see figure 2).

The Standard Eurobarometer is a bi-annual public opinion survey that collects data on the attitudes and opinions of EU-residents of 15-years and older. For each wave, approximately 1,000 individuals

per country are interviewed (except for Cyprus, Malta, and Luxembourg, where the sample is half that size). A three-stage random probability procedure is used to produce nationally representative samples (Bethlehem & Holsteyn, 2017; Leibnitz-Intstute für Sozialwissenschaften, n.d.; Nissen, 2014). We pooled data from five Standard Eurobarometer surveys, conducted between spring 2016 and spring 2018 (EB 85.2, EB 86.2, EB 87.3, EB 88.3, and EB 89.1; European Commission, 2017a, 2017b, 2017c, 2018a, 2018b) in order to obtain a sample which is sufficiently large to be representative at the regional level. .

Regional affiliation is indicated using the Nomenclature of Territorial Units for Statistics (NUTS) classification. Where possible, NUTS regions follow member states' existing administrative units (e.g., German Bundesländer or Belgian Regions). We used the NUTS 2 levels to identify regions in the Eurobarometer data, except when only information on the respondents´ NUTS 1 level was available. We excluded exclaves and European oversees areas from the analysis. In a final step, regional nomenclature was harmonized according to the NUTS 2016 classification (European Commission, 2016). Newly created regions were assigned scores according to their former constituent parts (See appendix 1). Despite the pooling of the data, five regions still had fewer than 50 respondents in our data set, and were removed to increase reliability.[1] This resulted in a multilevel sample of n = 173 regions and a total of n = 129,773 respondents.

Independent variables

To measure outcomes and process of public services at the regional level, we use data from the 2017 regional edition of the European Quality of Government Index (EQI) survey by the Quality of Government Institute (QOG) at the University of Gothenburg (Charron, 2013; Charron et al., 2015; Charron & Lapuente, 2018). This index is based on a survey among 78,000 respondents from 192 European NUTS 1 and NUTS 2 regions, with samples of 400-450 individuals per NUTS region (Charron et al., 2015). The regional EQI was developed especially to measure "average citizens' perceptions and

experiences with corruption, and the extent to which they rate their public services as impartial and of good quality in their region of residence" (Charron & Lapuente, 2018, p. 6).

Public administration outcomes were measured by asking respondents to assess the quality of the delivery of public services like education, health care, and law enforcement in their region, ranging from 'extremely poor quality' (1) to 'extremely high quality' (10) (see also appendix 2).

Public administration impartiality was measured using three survey items: whether certain citizens received preferential treatment in the delivery of services, whether the tax authorities treat all people equally, and whether all citizens were treated equally in the provision of services.

Absence of corruption was measured by asking whether corruption was needed to get (a) basic public services and (b) special and unfair privileges, as well as whether regional elections were free of corruption. Furthermore, respondents were asked whether they had ever been asked to pay a bribe, and whether they ever paid a bribe (Charron, 2013; Charron & Lapuente, 2018).

The three sets of items were aggregated into three composite indicators ('impartiality', 'absence of corruption', and 'outcome quality'). According to the Quality of Government institute (Charron, 2013; Charron & Lapuente, 2018), the item-scores were first recoded so that higher scores indicate higher quality of government. Second, the attribution of items to the 'pillars' was assessed using principal components analysis. Before aggregation, the items scores were normalized using standardization. Finally, using equal weighting, the items were aggregated into the composite indicators (Charron & Lapuente, 2018; Charron et al., 2019; Rothstein, 2013).[3] Furthermore, we grand-mean centred these indicators to improve interpretability for multilevel analysis use (Hox, Moerbeek, & Van de Schoot, 2018).

Table 1. Descriptives level-2 variables

Variables	Mean	Std. Deviation	Min	Max
Quality	.0349	.934	-2.586	2.229

Impartiality	.0784	1.013	-1.715	2.651
Absence of Corruption	.0074	1.057	-2.695	2.045

Control variables

A number of control variables are added to account for variation in levels of trust in public administration due to factors that have been identified in earlier research. We control for ideology. Earlier work on trust in public administration found an effect of political affiliation on confidence in public administrators (del Pino et al., 2016; Houston & Harding, 2013). Citizens' political left-right self-identification is likely to provide them with a schema (Sears, 2001; Zaller, 1992) to come to opinions about the public sector, and the outcome and process of public administration. The mechanism through which political ideology works is not clear though. It could be that those on the right prefer small government and therefore distrust government (Kumlin, 2001). An alternative argument is that those on the left are more sceptical of government, and institutions in general (Listhaug & Wiberg, 1995, p. 315). Finally, a relation between ideology and trust could also be explained by the congruence hypothesis, according to which a government that is in line with one's views is trusted more, and likewise the association between ideology and trust changes after a change in power.

Political ideology was measured as respondents' self-placement on a ten-point scale ranging from left (1) to right (10). We recoded the original responses into three groups: left: (1-4), centre (5-6), and right (7-10). Other response categories were dropped.

Individuals' political interest was operationalized as the frequency with which they discussed national, European, and local matters on a yearly basis. Respondents were asked: *When you get together with friends or relatives, would you say you discuss frequently, occasionally or never about: national political matters / European political matters / Local political matters?* Answers ranged from

(1) 'Frequently', and (2) 'Occasionally', to (3) 'Never'. A political interest index was constructed by summating the three dimensions into a single compound variable with four answer categories (1) 'Strong', (2) 'Medium', (3) 'Low', and (4) 'Not at all'.

Economic strain is a measure of the difficulty with which people make ends meet on their current income and is generally inversely related to social and political trust (Reeskens & Vandecasteele, 2017). It is assumed that such strain increases respondents´ dependence on public services, and we know this variable also has an impact on political trust (Andrews, Jilke, & Van de Walle, 2014; Reeskens & Vandecasteele, 2017). Respondents were asked: *During the last twelve months, would you say you had difficulties to pay your bills at the end of the month?* Answers ranged from: 'most of the time' (1) and 'from time to time' (2), to 'almost never\never' (3). The answer categories were recoded into a positive relation, while the 'don't knows' and refusals were dropped from the analysis.

We also control for respondents' gender, age, and educational status. Lee and Van Ryzin (2018), in their study of bureaucratic reputation, found that female respondents have a more positive view of the reputation of agencies. Gender was coded dichotomously (men = 0, women = 1). A higher education is associated with more awareness of how public administration works, and the quality it delivers, but also better insights into quality problems of public services (Van de Walle, 2007). To control for education, we add educational status based on the age when respondents ended their full-time education. Categories range from 'no full-time education to stopped before the 16th birthday' (1) and 'stopped between the 16th and 20th birthday' (2), to 'stopped full-time education after the 20th birthday' (3). Respondents who indicated to still be studying were assigned to the categories 1, 2, or 3 depending on their age. 'Refusals' and 'don't knows' were recoded as missing. Age is recoded into four age categories (15 to 24, 25 to 39, 40 to 54, and 55 years and older).

Finally, we control for community type. Access to public services is different for rural areas than for larger towns, and regional disparities and economic inequalities may drive trust. These serve as

heuristics for judging government fairness or procedural justice in the area (Cordova & Layton, 2016). Community type was measured on a four-item categorical scale: "*would you say you live in a: rural area or village (1); small or middle sized town (2); Large town (3); Don't Know (4)?".* The 'don't know' category was dropped from the analysis.

Analysis

The analysis includes 129,773 responses from 173 regions, gathered between the spring of 2016 and the spring of 2018. Figure 2 shows the percentage of respondents per region that indicated to trust their public administration. Regions with a dark blue (green) colour are the regions with the highest trust, regions with a dark red (yellow) colour are the regions with the lowest trust. The regions in which the largest proportion of respondents indicated to trust public administration were Burgenland (AT, 91.5%), Salzburg (AT, 86%), Luxembourg (LU, 85.5%), and Carinthia (AT, 82.3%). The regions in which the smallest proportion of respondents indicated to trust their public administration were Sardinia (IT, 1.2%) and Peloponnesus (EL, 8.2%). Overall, the regions with the highest levels of trust are located in North and North-West Europe, while the regions with the lowest levels of trust are located in the South, South-East, and East of Europe.
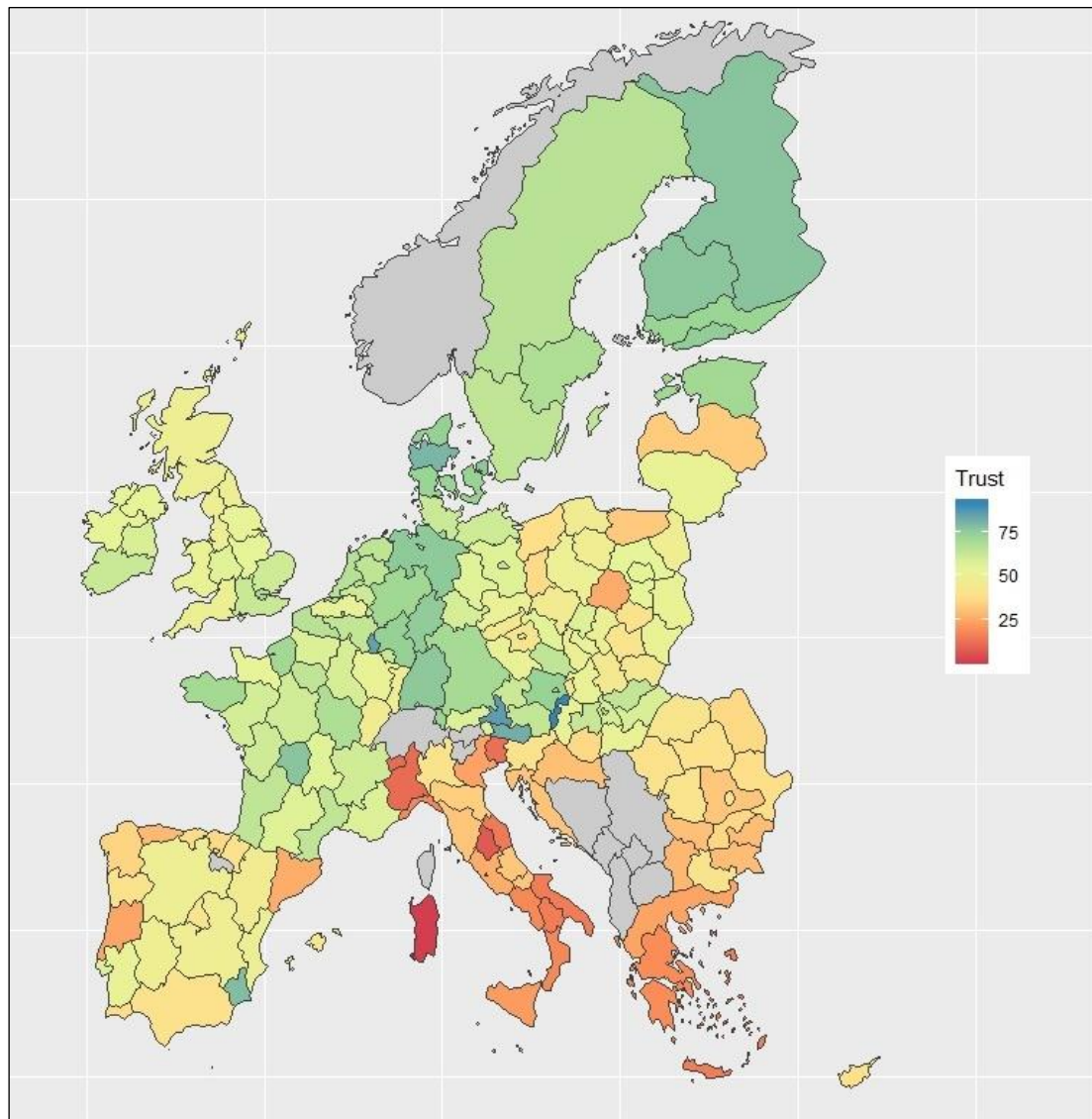
Figure 2. Respondents' trust in their national public administration per region

The regional variation in trust in public administration within countries can be large. Figure 3 presents the proportions of country variance explained by regional differences per country (in percentages). Regional differences are most pronounced in Italy, Austria and Spain. The countries in which the regional-level contributes least to the variance in trust are Croatia, Finland, the Netherlands, and Sweden. Countries without between-region variance were measured as a single region, for which no regional disaggregation is possible. These are all relatively small countries.
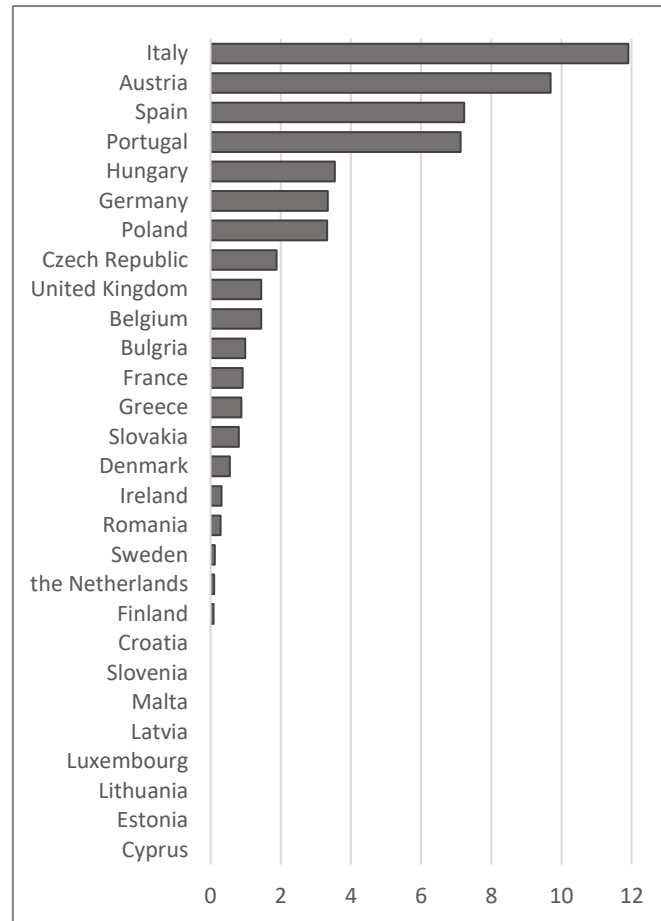
Figure 3. Proportion of variation explained by regional variance per country (in percentages)

A multilevel binomial logit model

We estimate a multilevel fixed effects binomial logit model using the generalized mixed-effects

(glmer) function of the lme4 package in the software program R (Bates, Mächler, Bolker, & Walker,

2015). Results are displayed in odds ratios, indicating the change in the odds of respondents trusting

their public administration compared to not trusting their public administration.

First, we estimated the need for a multilevel approach by estimating the proportion of variability in

the logits of respondents trusting their public that could be explained by regional differences. We

used an intercept-only or unconditional mean model (model 0) to estimate the intraclass correlation

coefficient (ICC) (Hox et al., 2018; Luke, 2004; Sommet & Morselli, 2017). With an ICC of .155 we

conclude that 15.5% of the variation in the logits of respondents' trust in public administration can be explained by regional differences (e.g., level-2 variability).[2]

Findings

In the second step, we estimated the effects of the level-1 predictors, which are the control variables in our model (model 1). The results show that two individual level predictors significantly affect respondents´ trust in public administration: economic strain and political interest. First, respondents who experience economic strain have lower trust in public administration than respondents who do not experience economic strain. This effect becomes stronger as the experience of economic strain increases. Whereas the odds of respondents trusting their public administration are 29.3% lower for respondents who experience economic strain from time to time compared to never, these odds increase to 46.5% for respondents who experience economic strain most of the time compared to never. Second, respondents with low and medium political interest have higher odds of trusting their public administration than respondents with no political interest. The odds of respondents with low political interest to trust their public administration were 10.6% higher than respondents with no political interest, respondents with medium political interest were 17.9% more likely to trust public administration than respondents with no political interest. Interestingly, respondents with high political interest do not appear to be more trusting of their public administration than respondents with no political interest are. Political ideology does not have a significant direct effect on respondents´ trust in public administration in our analysis.

We also find that gender, age, and education significantly affect respondents' odds of trusting their public administration. First, women are modestly more trusting of their public administrations than men are. Second, the odds of trusting the national public administration are lower for respondents in the age categories 25-39, 40-54, and 55+ than for respondents in the age category 15-25. In line with earlier findings, this effect is most pronounced for respondents in the age category 40-54 years

compared to respondents in the age category 15-25 years. Third, the number of years of formal education significantly affects respondents' trust public administration as well. For higher educated respondents the odds of trusting their public administration were 17.4% higher than those of respondents who had no formal education or who quit before their 15th birthday. Finally, the type of community does not significantly affect the odds of individuals trusting public administration according to our analysis.

Do public administration process and outcomes matter?

In the third step, we estimated the model with both individual-level variables (controls) and regional-level predictors (model 2). The regional-level predictors (public administration outcome and process). The three predictors are added one by one, and then together. First, the effects of the individual-level predictors are roughly stable across all models. All three regional-level predictors (absence of corruption, impartiality and outcomes) have a significant and strong individual effect on the odds of trust in public administration. The direct effect is strongest for the absence of corruption. When all three predictors are entered simultaneously, impartiality of public services loses statistical significance in its effect on trust because this indicator captures a similar latent construct as the absence of corruption (also: endnote 3).

The absence of corruption and the perceived outcome quality of public services significantly influence respondents´ trust in public administration. Of these, the perceived absence of corruption has the strongest effect. For each standard deviation increase in the absence of corruption, the odds of trusting public administration rise by 39.1%. This corroborates Houston et al.´s 2016 findings where a similar strong effect of corruption on trust in civil servants was found in a 21-country study. This effect is almost double the size of the effect of the perceived outcome quality of public services. For each standard deviation increase in the perceived outcome quality of public services, the odds of trusting public administration increase by 22.3%. Controlled for the absence of corruption, the

perceived impartiality of public services does not have a statistically significant effect on respondents´ trust in public administration in our analysis. This shows that both outcome and process of public administration have an impact on individuals´ trust in public administration, but that the effect is stronger for process. We conclude that hypotheses 1 and 3 are confirmed.

Table 2. Trust in public administration: Fixed-effects parameter estimates in odds ratios (standard errors between brackets)

	Model 0		Model 1		Model 2		Model 3		Model 4		Model 5	
Intercept	1.055	(.062)	1.243	(.072)***	1.253	(.073)***	1.264	(.074)***	1.226	(.071)**	1.230	(.072)**
Political interest - Not			-		-		-		-		-	
Political interest - low			1.106	(.064)***	1.107	(.064)***	1.105	(.064)***	1.106	(.064)***	1.107	(.064)***
Political interest - Medium			1.177	(.069)***	1.179	(.069)***	1.177	(.069)***	1.178	(.069)***	1.179	(.069)***
Political interest - Strong			1.035	(.06)	1.036	(.06)	1.034	(.06)	1.034	(.06)	1.034	(.06)
Ideology - Left			-		-		-		-		-	
Ideology - Centre			.991	(.058)	.992	(.058)	.991	(.058)	.992	(.058)	.992	(.058)
Ideology - Right			1.000	(.058)	1.001	(.058)	1.000	(.058)	1.002	(.058)	1.002	(.058)
Economic strain - Never			-		-		-		-		-	
Economic strain - From time to time			.705	(.041)***	.706	(.041)***	.706	(.041)***	.707	(.041)***	.707	(.041)***
Economic strain - Most of the time			.463	(.027)***	.464	(.027)***	.464	(.027)***	.465	(.027)***	.465	(.027)***
Outcome quality					1.457	(.085)***					1.222	(.071)***
Impartiality							1.359	(.079)***			.957	(.056)
Absence of Corruption									1.505	(.088)***	1.391	(.081)***
Gender - Men			-		-		-		-		-	
Gender - Women			1.046	(.061)***	1.047	(.061)***	1.047	(.061)***	1.047	(.061)***	1.047	(.061)***
Education < 16			-		-		-		-		-	
Education 16-19			1.008	(.059)	1.010	(.059)	1.008	(.059)	1.010	(.059)	1.011	(.059)

Education > 20			1.172	(.068)***	1.174	(.068)***	1.171	(.068)***	1.173	(.068)***	1.174	(.068)***
Age < 25			-		-		-		-		-	
Age 25-39			.844	(.049)***	.844	(.049)***	.844	(.049)***	.844	(.049)***	.845	(.049)***
Age 40-54			.813	(.047)***	.813	(.047)***	.813	(.047)***	.813	(.047)***	.813	(.047)***
Age > 55			.864	(.05)***	.865	(.05)***	.864	(.05)***	.864	(.05)***	.865	(.05)***
Community type - Rural			-		-		-		-		-	
Community type - Small/Middle town			1.026	(.059)	1.026	(.059)	1.026	(.06)	1.026	(.06)	1.026	(.06)
Community type - Large town			1.009	(.059)	1.011	(.059)	1.009	(.059)	1.010	(.059)	1.011	(.059)
ICC	.155		.127		.095		.104		.083		.077	
Deviance	164,391.9		131,390.4		131,338.4		131,356.8		131,315.4		131,302.6	
df.resid	129,771		104,604		104,603		104,603		104,603		104,601	
AIC	164,395.9		131,424.4		131,374.4		131,392.8		131,351.4		131,342.6	
BIC	164,415.5		131,568.9		131,546.4		131,564.9		131,523.5		131,533.8	
N level-1	129,773		104,621		104,621		104.621		104,621		104,621	
N level-2	173		173		173		173		173		173	

*** P < .001; ** P = .01, * P = .05

In total, the variables included in this model explain about half the variation of region-based trust in public administration (i.e. 8.29%). The remaining 8.91% of region-level based variation remains unexplained or random.

Because model 5 is nested in models 2, 3, and 4, we use χ2 test to see whether model 5 provides a significant reduction in deviance compared to its three preceding models. The reduction in deviances by model 5 compared to models 2, 3, and 4 is 35.8, 54.2, and 12.8 respectively. These reductions are larger than the critical value under the χ^2 distribution at two degrees of freedom (Δ df. compared to model 5) at a significance level of p.005 (e.g., 10.828). Model 5 is therefore a significant improvement to models 2, 3, and 4 (see appendix 3). These findings are corroborated by the AIC and BIC indices.

Discussion and conclusion

Using opinion data on trust in public administration among nearly 130,000 respondents nested in 173 regions, we find that public service outcomes (H_1) and absence of corruption (H_3) positively influence citizen trust in public administration. While the impartiality of public services is statistically significant and positively related to citizens' trust in public administration on its own, it loses statistical significance when controlled for the absence of corruption and the quality of public services. This is not to say that the impartiality of public services is an unimportant determinant of citizens' trust in its own right – we showed that it is – but that the effects of absence of corruption and the impartiality of public services on citizens' trust in public administration are closely related.[3] In fact, both variable serve as process indicators in our study. Future research could explore the relationship between impartiality and absence of corruption.

Both process and outcome of public services have a significant effect on citizen trust. These findings confirm earlier studies about the effect of process and outcomes on levels of institutional trust. This paper has also revealed that it is essential to look at the subnational level when analysing citizens´ attitudes to public services, because in some countries within-country regional variation can be substantial.

While not the purpose of the paper, a preliminary screening of the data also shows that outcome and process appear to have a different effect on trust in public administration among different groups. Respondents´ political leanings are relevant to whether outcomes or process are more important for trust in public administration. For left-leaning respondents, process (absence of corruption) is more important, whereas for right-leaning ones, outcomes of public administration are more important as determinants of trust in public administration. Trust in public administration among citizens who experience economic strain is influenced more by the outcome than by process. Presumably this is because they are personally directly affected by poor quality public services on which they are heavily dependent in their strained situation. These factors deserve further exploration.

In this analysis we looked at region-based explanations. Future research could combine regional and country effects and examine the proportions of variance attributable to differences in regions and differences in counties. Though data requirements pose a barrier, such a model could provide valuable insight in the interaction between region and country based differences, as well as the varying effects of regional differences in different countries.

In addition to its large sample, this paper innovates through disaggregating to the regional level, and through using different datasets for the dependent and independent variables. The focus on 173 regions means that the total number of level-2 units is sufficiently large to be able to run a robust analysis. It hereby improves on earlier analyses which have focused on the national level only.

The paper has a number of limitations. The dependent variable is dichotomous (tend to trust/tend not to trust) which means answers are not very nuanced. Also, we have no means of checking whether trust attitudes have a foundation in respondents´ direct personal experience with public service, even though our control variables have captured at least part of this aspect. The number of observations per region are sometimes relatively small (though regions with fewer than 50 respondents were excluded from the analysis), which may have an effect on the reliability of the results. Finally, data on the process and outcome of public administration are based on a survey and therefore subjective. Fully objective data allowing to compare the quality of public administration at the regional level (or even at the national level) do not exist.

In this study we examined the effects of the outcome and process quality of regional public services on citizen trust in their regional public administration. Such subjective measures are important indicators for analysing and evaluating public services and government bureaucracies from a citizen perspective. Governments aiming at increasing citizens' trust in regional public administrations are well advised to focus on both the process and outcome quality of public services.

Endnotes:

[1] Due to the small number of observations per region, we excluded the regions Cantabria (n = 28), Limousin (n = 31), Liguria (n = 14), Friuli-Venezia Guilia (n = 38), and Umbria (n = 37) from our analysis. We tested whether our results were robust to the exclusion of these five regions and concluded that their exclusion did not change our results.

[2] Conducting a similar analysis on the proportion of variance in respondents' trust in their public administration attributable to between-country differences, we observe that 13.6% of the variance can be explained by country differences. This proportion is 1.9 percentage points lower than the proportion of variance attributable to between-region differences.

[3] The Pearson correlations between quality and impartiality, absence of corruption and quality, and absence of corruption and impartiality are .528 (p < .001), .562 (p < .001), and .761 (p < .001) respectively. As expected, the correlation between impartiality and absence of corruption is substantial.

References

Anderson, C. J., & Tverdova, Y. V. (2003). Corruption, Political Allegiances, and Attitudes toward

   Government in Contemporary Democracies. *American Journal of Political Science*, *47*(1), 91.

   https://doi.org/10.2307/3186095

Andrews, R., Jilke, S., & Van de Walle, S. (2014). Economic strain and perceptions of social cohesion

   in Europe: Does institutional trust matter? *European Journal of Political Research*, *53*(3), 559–

   579. https://doi.org/10.1111/1475-6765.12052

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting Linear Mixed-Effects Models Using

   lme4. *Journal of Statistical Software*, *67*(1), 1–48. https://doi.org/10.18637/jss.v067.i01

Bethlehem, J., & Holsteyn, J. van. (2017). Eurobar? Onderzoekstechnische haken en ogen van de

   Eurobarometer. In A. E. Bronner, P. Dekker, E. de Leeuw, L. J. Paas, K. de Ruyter, A. Smidts, & J.

   E. Wieringa (Eds.), *Ontwikkeling in het Marktonderzoek: Jaarboek MartkOnderzoek-Associatie*

   (Spaar en H, pp. 111–128). Haarlem. Retrieved from http://hdl.handle.net/11245/1.408696

Charron, N. (2013). QoG at the sub-national level and the EQI. In N. Charron, V. Lapuente, & B.

   Rothstein (Eds.), *Quality of Government and Corruption from a European Perspective. A*

   Comparative Study of Good Government in EU Regions (1st ed., pp. 70–137). Cheltenham &

   Northampton: Edward Elgar Publishing.

Charron, N., Dijkstra, L., & Lapuente, V. (2014). Regional Governance Matters: Quality of

   Government within European Union Member States. *Regional Studies*, *48*(1), 68–90.

   https://doi.org/10.1080/00343404.2013.770141

Charron, N., Dijkstra, L., & Lapuente, V. (2015). Mapping the Regional Divide in Europe: A Measure

   for Assessing Quality of Government in 206 European Regions. *Social Indicators Research*,

   122(2), 315–346. https://doi.org/10.1007/s11205-014-0702-y

Charron, N., & Lapuente, V. (2013). Why Do Some Regions in Europe Have a Higher Quality of

Government? *The Journal of Politics*, *75*(3), 567–582.

https://doi.org/10.1017/S0022381613000510

Charron, N., & Lapuente, V. (2018). Quality of Government in EU Regions: Spatial and Temporal

Patterns. *QoG Working Paper Series*, *1*, 1–40.

Charron, N., Lapuente, V., & Annoni, P. (2019). Measuring quality of government in EU regions

across space and time. *Papers in Regional Science*, *98*(5), 1925–1953.

https://doi.org/10.1111/pirs.12437

Charron, N., & Rothstein, B. (2018). Regions of trust and distrust: how good institutions can foster

social cohesion. In *Bridging the Prosperity Gap in the EU* (pp. 220–242). Edward Elgar

Publishing. https://doi.org/10.4337/9781786436672.00017

Choi, S. (2018). Bureaucratic characteristics and citizen trust in civil service in OECD member nations.

International Area Studies Review, *21*(2), 114–133.

https://doi.org/10.1177/2233865917753899

Córdova, A., & Layton, M. L. (2016). When is "Delivering the Goods" Not Good Enough? *World

Politics*, *68*(01), 74–110. https://doi.org/10.1017/S0043887115000441

Dahlström, C., Lapuente, V., & Teorell, J. (2012). The Merit of Meritocratization. *Political Research

Quarterly*, *65*(3), 656–668. https://doi.org/10.1177/1065912911408109

del Pino, E., Calzada, I., & Díaz-Pulido, J. M. (2016). Conceptualizing and Explaining Bureauphobia:

Contours, Scope, and Determinants. *Public Administration Review*, *76*(5), 725–736.

https://doi.org/10.1111/puar.12570

European Commission. Commission Regulation (EU) 2016/2066 of 21 November 2016 amending the

annexes to Regulation (EC) No 1059/2003 of the European Parliament and of the Council on

the establishment of a common classification of territorial units for statistics (NUTS) (2016).

Brussels: European Commission.

European Commission. (2017a). Eurobarometer 85.2 (2016). Cologne: GESIS Data Archive.

  https://doi.org/10.4232/1.12800

European Commission. (2017b). Eurobarometer 86.2 (2016). Cologne: GESIS Data Archive.

  https://doi.org/10.4232/1.12853

European Commission. (2017c). Eurobarometer 87.3 (2017). Cologne: GESIS Data Archive.

  https://doi.org/10.4232/1.12847

European Commission. (2017d). *Standard Eurobarometer 87. Annex. Public opinion in the European*

  Union.

European Commission. (2018a). Eurobarometer 88.3 (2017). Cologne: GESIS Data Archive.

  https://doi.org/10.4232/1.13007

European Commission. (2018b). Eurobarometer 89.1 (2018). Cologne: GESIS Data Archive.

  https://doi.org/10.4232/1.13154

Gustavsen, A., Røiseland, A., & Pierre, J. (2014). Procedure or performance? Assessing citizen's

  attitudes toward legitimacy in Swedish and Norwegian local government. *Urban Research &*

  Practice, *7*(2), 200–212. https://doi.org/10.1080/17535069.2014.910924

Houston, D. J., Aitalieva, N. R., Morelock, A. L., & Shults, C. A. (2016). Citizen Trust in Civil Servants: A

  Cross-National Examination. *International Journal of Public Administration*, *39*(14), 1203–1214.

  https://doi.org/10.1080/01900692.2016.1156696

Houston, D. J., & Harding, L. H. (2013). Public Trust in Government Administrators. *Public Integrity*,

  16(1), 53–76. https://doi.org/10.2753/PIN1099-9922160103

Hox, J. J., Moerbeek, M., & Van de Schoot, R. (2018). *Multilevel Analysis. Techniques and*

  Applications (3rd ed.). New York & London: Routledge.

Kettl, D. F. (2006). *The Global Public Management Revolution: A Report on the Transformation of*

Government. Retrieved from

https://books.google.be/books?hl=en&lr=&id=l50FBD7Z0YEC&oi=fnd&pg=PP1&dq=kettl+2005
+the+global+public+management+revolution&ots=svipHH1n9w&sig=TvXoXmE5r83kNoJViVowL
iBzQ6M#v=onepage&q&f=false

Kumlin, S. (2001). Ideology–Driven opinion formation in Europe: The case of attitudes towards the
third sector in Sweden. *European Journal of Political Research*, *39*(4), 487–518.

Lee, D., & Van Ryzin, G. G. (2018). Bureaucratic reputation in the eyes of citizens: an analysis of US
federal agencies. *International Review of Administrative Sciences*, 002085231876912.
https://doi.org/10.1177/0020852318769127

Leibnitz-Intstute für Sozialwissenschaften. (n.d.). Sampling and Fieldwork. Retrieved November 27,
2018, from https://www.gesis.org/eurobarometer-data-service/survey-series/standard-
special-eb/sampling-and-fieldwork/

Listhaug, O., & Wiberg, M. (1995). Confidence in political and private institutions. In H.-D.
Klingemann & D. Fuchs (Eds.), *Citizens and the state* (pp. 298–322). Oxford: Oxford University
Press.

Luke, D. A. (2004). *Multilevel Modeling*. Thousand Oaks: SAGE Publications Inc.

Marien, S., & Hooghe, M. (2011). Does political trust matter? An empirical investigation into the
relation between political trust and support for law compliance. *European Journal of Political
Research*, *50*(2), 267–291. https://doi.org/10.1111/j.1475-6765.2010.01930.x

Newton, K., & Norris, P. (2000). Confidence in public institutions: faith, culture, or performance? In S.
J. Pharr & R. D. Putnam (Eds.), *Confidence in public institutions: faith, culture, or performance?*
(pp. 52–73). Princeton: Princeton University Press.

Nissen, S. (2014). The Eurobarometer and the process of European integration. *Quality & Quantity*,
48(2), 713–727. https://doi.org/10.1007/s11135-012-9797-x

Norris, P. (2011). *Democratic Deficit: Critical Citizens Revisited*. Cambridge, MA: Cambridge University Press.

O'Sullivan, S., Healy, A. E., & Breen, M. J. (2014). Political legitimacy in ireland during economic crisis: Insights from the European social survey. *Irish Political Studies*, *29*(4), 547–572. https://doi.org/10.1080/07907184.2014.942645

Osborn, D. E., & Gaebler, T. (1992). *Reinventing Government: How the Entrepreneural Spirit is Transforming the Public Sector*. Reading, MA.: Addison-Wesley Publishing Company.

Putnam, R. D., Leonardi, R., & Nanetti, R. (1993). *Making democracy work : civic traditions in modern Italy*. Princeton University Press. Retrieved from https://press.princeton.edu/titles/5105.html

Reeskens, T., & Vandecasteele, L. (2017). Hard times and European youth. The effect of economic insecurity on human values, social attitudes and well-being. *International Journal of Psychology*, *52*(1), 19–27. https://doi.org/10.1002/ijop.12387

Rego, A., Sarrico, C. S., & Moreira, J. M. (2006). Trust in Portuguese Public Authorities. *Public Integrity*, *8*(1), 77–92. https://doi.org/10.2753/PIN1099-9922080106

Rölle, D. (2009). Vertrauen in die öffentliche Verwaltung – Zwischen Systemstabilität und Modernisierungsdruck. *Der Moderne Staat – Dms: Zeitschrift Für Public Policy, Recht Und Management*, *2*(1). Retrieved from https://www.budrich-journals.de/index.php/dms/article/view/2876

Rothstein, B. (2013). Conceptualizing QoG. In N. Charron, V. Lapuente, & B. Rothstein (Eds.), *Quality of Government and Corruption from a European Perspective. A Comparative Study of Good Government in EU Regions* (1st ed., pp. 16–34). Cheltenham & Northampton: Edward Elgar Publishing.

Sommet, N., & Morselli, D. (2017). Keep Calm and Learn Multilevel Logistic Modeling: A Simplified Three-Step Procedure Using Stata, R, Mplus, and SPSS. *International Review of Social*

Psychology, *30*(1), 203–218. https://doi.org/10.5334/irsp.90

Spiteri, J., & Briguglio, M. (2018). Does Good Governance Foster Trust in Government? An Empirical

Analysis (pp. 121–137). https://doi.org/10.1108/S1569-375920180000099006

Tyler, T. R. (2006a). Psychological Perspectives on Legitimacy and Legitimation. *Annual Review of*

Psychology, *57*(1), 375–400. https://doi.org/10.1146/annurev.psych.57.102904.190038

Tyler, T. R. (2006b). *Why People Obey the Law*. Princeton: Princeton University Press.

Van de Walle, S. (2007). *Confidence in the civil service: An international comparison.* (K. Schedler & I.

Proeller, Eds.). Ansterdam: Elsevier.

Van de Walle, S. (2017). Trust in public administration and public services. In European Commission

Directorate-General for Research and Innovation (Ed.), *Trust at risk? Implications for EU policies*

and institutions. (pp. 118–128). Brussels: European Commission.

https://doi.org/10.2777/364327

Van de Walle, S. (2018). Explaining Citizen Satisfaction and Dissatisfaction with Public Services. *The*

Palgrave Handbook of Public Administration and Management in Europe, 227–241.

https://doi.org/10.1057/978-1-137-55269-3

Van de Walle, S., Van Roosbroek, S., & Bouckaert, G. (2008). Trust in the public sector: is there any

evidence for a long-term decline? *International Review of Administrative Sciences*, *74*(1), 47–

64. https://doi.org/10.1177/0020852307085733

van der Meer, T., & Hakhverdian, A. (2017). Political Trust as the Evaluation of Process and

Performance: A Cross-National Study of 42 European Countries. *Political Studies*, *65*(1), 81–102.

https://doi.org/10.1177/0032321715607514

Van Ryzin, G. G. (2011). Outcomes, process, and trust of civil servants. *Journal of Public*

Administration Research and Theory, *21*(4), 745–760. https://doi.org/10.1093/jopart/muq092

Van Ryzin, G. G. (2015). Service Quality, Administrative Process, and Citizens' Evaluation of Local

Government in the US. *Public Management Review*, *17*(3), 425–442.

https://doi.org/10.1080/14719037.2013.841456

Vigoda-Gadot, E., & Yuval, F. (2004). The State of Bureaucracy: Public Opinion about the

Performance of Government Agencies in Israel. *International Journal of Public Opinion*

Research, *16*(1), 63–80. https://doi.org/10.1093/ijpor/16.1.63

Vigoda-Gadot, Eran. (2006). Citizens' Perceptions of Politics and Ethics in Public Administration: A

Five-Year National Study of Their Relationship to Satisfaction with Services, Trust in

Governance, and Voice Orientations. *Journal of Public Administration Research and Theory*,

17(2), 285–305. https://doi.org/10.1093/jopart/muj018

Yackee, S. W., & Lowery, D. (2005). Understanding public support for the US federal bureaucracy.

Public Management Review, *7*(4), 515–536. https://doi.org/10.1080/14719030500362389

Appendix 1

NUTS 1 aggregates were used for: Belgium, Germany, Greece, Ireland, the Netherlands, Sweden, and the United Kingdom. NUTS 2 aggregates were used for: Austria, Bulgaria, Denmark, Spain, France, Finland, Croatia, Hungary, Italy, Poland, Romania, and Slovakia. Finally, for a group of countries no NUTS level aggregates are compiled. For these countries, the country aggregates are used as group aggregates. These countries are: Cyprus, Estonia, Lithuania, Luxembourg, Latvia, Malta, and Slovenia.

Second, a number of regions were excluded from the analysis, either because we choose not to include the overseas areas and exclaves in the analysis, or because there is no data on them. We chose not to include Ceuta (ES), Melilla (ES), Balearic Islands (ES), Guadeloupe (FR), Martinique (FR), Guyana (FR), La Reunion (FR), Mayotte (FR), Azores (PT), and Madeira (PT) in the analysis. Furthermore, some regions remained unsampled in the Eurobarometer. These regions were: La Rioja (ES), Åland (FI), Corsica (FR), North Aegean (EL), South Aegean (EL), Ionian Islands (EL), Provincia Autonoma di Bolzano/Bozen (IT), and Provincia Autonoma di Trento (IT).

Third, some Italian regions were merged before sampling: Piemonte and Valle d'Aoste, Abruzzo and Molise, and Puglia and Basilicata. These regions were disaggregated for the descriptive analysis alone.

Fourth, with the adoption of the NUTS 2016 classification, some regional designations and territorial units changed. First, the Hungarian region Közép-Magyarország (HU10) was split in two a regional and a capital region (Budapest (HU11) and Buda (HU10)). Both new regions were assigned their original NUTS 2013 scores (HU10). Second, in Poland the region designation of five regions changed (PL11=PL71, PL33=PL72 & PL82, PL31 = PL81, and PL34 = PL84) and a new capital region was created (PL12=PL91 & PL92). Third, the NUTS 2010 classification was recoded into the NUTS 2016 classification. Fourth, though Lithuania was split in two NUTS 2 regions, we kept the original one NUTS 2 designation. And finally, all France's regions changed name, though no substantive changes were made.

Appendix 2

The quality of public services

- How would you rate the quality of public education in your area ('1' extremely poor quality – '10' extremely high quality)
- How would you rate the quality of the public health care system in your area ('1' extremely poor quality – '10' extremely high quality)
- How would you rate the quality of the police force in your area ('1' extremely poor quality – '10' extremely high quality)

The impartiality of public services

- Certain people are given special advantages in the public education system in my area ('1' strongly disagree – '10; strongly agree)
- Certain people are given special advantages in the public health care system in my area ('1' strongly disagree – '10; strongly agree)
- The police force gives special advantages to certain people in my area ('1' strongly disagree – '10; strongly agree)
- All citizens are treated equally in the public education system in my area ('1' Agree, '2' Rather agree, '3' Rather disagree', '4' Disagree)
- All citizens are treated equally in the public health system in my area ('1' Agree, '2' Rather agree, '3' Rather disagree', '4' Disagree)
- All citizens are treated equally by the police force in my area ('1' Agree, '2' Rather agree, '3' Rather disagree', '4' Disagree)
- The tax authorities in my area treat all people equally ('1' strongly disagree – '10; strongly agree)

The level of corruption in public services

- Corruption is prevalent in my area's local public school system ('1' strongly disagree – '10; strongly agree)
- Corruption is prevalent in the public health system in my area ('1' strongly disagree – '10; strongly agree)
- Corruption is prevalent in the police force in my area ('1' strongly disagree – '10; strongly agree)
- People in my area must use some form of corruption to just get some basic public services ('1' strongly disagree – '10; strongly agree)
- Corruption in my area is used to get access to special unfair privileges and wealth ('1' strongly disagree – '10; strongly agree)
- In the last 12 months, have you or anyone in your family been asked by a public official to give an informal gift or bribe in: (a): Education services? (b): Health or medical services? (c): Police? d) aby other public service (Yes = '1', No = '0')
- 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) aby other public service (Yes = '1', No = '0')
- Elections in my area are clean from corruption ('1' strongly disagree – '10; strongly agree)

Appendix 3

	Deviance	Δ dev to model 5	Δ df. to Model 5	Critical value χ^2 at p.005
Model 5	131,302.6			
Model 2	131,388.4	35.8	2	10.8276
Model 3	131,356.8	54.2	2	10.8276
Model 4	131,315.4	12.8	2	10.8276