

Belabed, Christian Alexander; Hake, Mariya

Working Paper

Income inequality and trust in national governments in Central, Eastern and Southeastern Europe

Working Paper, No. 222

Provided in Cooperation with:

Oesterreichische Nationalbank (OeNB), Vienna

Suggested Citation: Belabed, Christian Alexander; Hake, Mariya (2018) : Income inequality and trust in national governments in Central, Eastern and Southeastern Europe, Working Paper, No. 222, Oesterreichische Nationalbank (OeNB), Vienna

This Version is available at:

<https://hdl.handle.net/10419/264814>

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WORKING PAPER 222

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Christian A. Belabed, Mariya Hake

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Publisher and editor Oesterreichische Nationalbank
Otto-Wagner-Platz 3, 1090 Vienna, Austria
PO Box 61, 1011 Vienna, Austria
www.oenb.at
oenb.info@oenb.at
Phone (+43-1) 40420-6666
Fax (+43-1) 40420-046698

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Coordinating editor Martin Summer

Design Communications and Publications Division

DVR 0031577

ISSN 2310-5321 (Print)
ISSN 2310-533X (Online)

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Income inequality and trust in national governments in Central, Eastern and Southeastern Europe

Christian A. Belabed ^{*†}

Mariya Hake ^{*‡}

Abstract

Using unique evidence from the OeNB Euro Survey, this paper sheds light on the correlation between the distribution of income and trust in national governments in ten Central, Eastern and Southeastern European (CESEE) countries between 2009 and 2015. By applying multilevel modeling to account for the hierarchical structure of the data, our main findings indicate that trust in national institutions increases with the individual's position in the regional income distribution but it overall declines with the increase of regional and country income inequality. This result is valid across different measures of income inequality and despite the slight decrease of income inequality over the period. Our analysis shows that perceived high corruption and weak rule of law are key determinants of distrust in national governments, while the negative link between income inequality and trust in national governments is more pronounced in the non-EU countries in our sample.

Keywords: Income inequality, Institutional trust, Multilevel models

JEL Classification: D1, D63, E24, H21, P23

*We would like to thank Elisabeth Beckmann, Anna Katharina Raggl, Helmut Stix, Nicolas Albacete, Peter Lindner, Julia Wörz, Aleksandra Riedl, Pirmin Fessler (all Oesterreichische Nationalbank), Paul Eckerstorfer (Austrian Parliament) and participants at the FIW Seminar in International Economics in December 2016, the ECB Research Seminar in April 2017, the NoeG annual conference in May 2017, the internal OeNB Research Seminar in June 2017 and an anonymous referee for comments on earlier drafts of the paper. We are most grateful to Sabine Schöffmann and Philipp Poyntner for excellent research assistance. The views expressed are strictly those of the authors and do in no way commit the Oesterreichische Nationalbank (OeNB) or the Eurosystem. All remaining errors are ours.

¹OeNB, Foreign Research Division, Otto-Wagner-Platz 3, POB 61, A-1011 Vienna, Tel. +43140420-5229.
christianalexander.belabed@oebn.at

²OeNB, Foreign Research Division, Otto-Wagner-Platz 3, POB 61, A-1011 Vienna, Tel. +43140420-5212.
mariya.hake@oebn.at

Non-Technical Summary

This paper provides evidence on the link between income inequality and trust in national governments. Economic policy, such as the implementation of structural or tax reforms, crucially depends on the compliance and cooperation of the general public. International organizations such as the OECD or the EBRD, have recently published major reports on the importance of trust in institutions for the advancement of reforms and concluded that trust is essential for the working of the economy and economic growth. In particular, trust in national governments is key for investor confidence, consumer confidence or the channeling of finance. It follows that a better understanding of the determinants of trust in national governments are of prime importance. There is, however, little evidence on the effect of income inequality on trust in national governments, in particular for the ten countries in the CESEE region, which comprise our country sample.

This paper fills the gap by using unique data from the Euro Survey, conducted by the Oesterreichische Nationalbank, for the years 2009 until 2015. The data allow us to construct regional- and country-level measures of income inequality for ten EU- and non-EU countries (Bulgaria, Czech Republic, Croatia, Hungary, Poland, Romania, Albania, Bosnia and Herzegovina, FYR Macedonia and Serbia). Thereby, we calculate Gini coefficients as well as top and bottom income shares on an annual basis - a first-time endeavor for some of the countries in our sample.

Employing multilevel models to account for the hierarchical structure of the data, our main findings are: i) regional and country-level income inequality is negatively correlated with trust in national governments, ii) the individual position in the regional income distribution correlates positively with trust in national governments, iii) perceived high corruption and weak rule of law are key determinants of distrust in national governments, iv) the negative correlation between income inequality and trust in national governments is more pronounced in the non-EU countries in our sample. In addition, we show that policies such as the increase of minimum wages as well as the increase of public debt correlate with trust. Interestingly, higher levels of emigration positively relate with trust in governments but the effect declines with higher unemployment in the home country. Our findings are robust across a wealth of measures of income inequality and the inclusion of individual-, regional- and country-level control variables that represent standard controls in the literature.

1 Introduction

This paper provides evidence on the link between income inequality and trust in national governments. Arrow (1972) famously argued that "[v]irtually every commercial transaction has within itself an element of trust, certainly any transaction conducted over a period of time. It can be plausibly argued that much of the economic backwardness in the world can be explained by the lack of mutual confidence (...)." (p. 357). Economic policy, such as the implementation of structural or tax reforms, crucially depends on the compliance and cooperation of the general public.¹ In a very recent contribution the European Bank for Reconstruction and Development (EBRD) outlined the importance of the quality of institutions for middle-income countries and the trust of citizens (EBRD 2017), whereas higher trust enhances financial development (Guiso et al. 2004, 2008). From a macroeconomic perspective, higher levels of trust reduce macroeconomic imbalances (Buetzer et al. 2013), macroeconomic volatility (Sangnier 2013), promote international trade (Guiso et al. 2009), and have a positive effect on economic growth (e.g. Knack and Keefer 1997; Zak and Knack 2001; Algan and Cahuc 2010; Horvath 2013).²

Casting light on income inequality, there is a growing consensus among economists that income inequality matters for socio-economic outcomes (e.g. Piketty 2014, Milanovic 2016 Rajan 2010, Reich 2010, van Treeck 2014 for an excellent survey). In particular, the literature identifies at least several transmission channels through which higher income inequality might affect generalized trust. First, higher income inequality is found to decrease generalized trust (and thus institutional trust) through a stratification channel i.e. it increases distances between social groups and makes the contact less likely and frequent. The reduced social contact makes people from different income groups trust each other less, resulting in overall lower levels of trust (Letki 2008). Second, a more unequal income distribution is found to lower quality of regulatory institutions and property rights (Glaeser et al. 2003, Sonin 2003) and thus undermine trust. Third, through lowering economic

¹The OECD also states that institutional trust is highly relevant for economic policy, for a sufficient degree of confidence of investors and consumers as well as for the smooth working of finance, which is a key economic activity (URL: <http://www.oecd.org/governance/trust-in-government.htm>, dl. 30.6.2016.)

²There are two broad definitions of trust in the literature. First, generalized or social trust relates to trust in others, either individuals or the society as a whole. Second, institutional trust relates to trust in institutions such as national governments, central banks or the police, to name just a few. Our analysis concerns itself with an individual's trust in national governments. Whenever we mention trust or institutional trust we talk about trust in national governments.

growth and/or correlating with higher unemployment (Ostry 2015), high income inequality lowers voters' shares for incumbent governments (Dassonneville and Lewis-Beck 2013). Finally, another possible transmission channel is the weaker perception of fairness, the lower acceptance of decisions or worse compliance with regulations of the population which go hand in hand with higher income inequality (Lind and Arndt 2017).

In spite of the pressing need for policymakers to better understand the determinants of institutional trust also against the background of increasing populist voting and falling support for incumbent institutional structures, only recently studies have turned attention to this topic (e.g. Dustmann et al. 2017, Algan et al. 2017). To this end, the scarce empirical evidence focuses mainly on developments in the OECD member states, EU countries or the USA. Only a few studies analyze the correlation between trust in national governments and income inequality in CESEE and focus even less on the regional dimension of income inequality. The case of the CESEE countries, including both EU member states and non-EU member states, is particularly relevant both from academic but also from policymakers' point of view due to at least three reasons. First, most of the countries in the CESEE region and included in our sample are characterized by lower level of institutional trust (both in national governments and in the EU) than in Western European countries. Second, the strong economic convergence prior the 2008/09 crisis went in lockstep with an increase of income inequality reaching levels well above the OECD average in some CESEE countries. Third, income inequality decreased slightly since 2008/09 in most of the CESEE countries, which did really go hand in hand with an increase of trust in national governments. Overall, these developments are not conclusive to hint to an unequivocal relation between trust in national governments and income inequality.

The rare empirical evidence on the inequality-trust nexus for countries in the CESEE region includes a study by Anderson and Singer (2008), which find a negative correlation between income inequality and trust in public institutions. Including only four CESEE countries in their sample and using LIS (Luxembourg Income Study) data, they differentiate the effects depending on the political ideology of the individual. In short, people on the left tend to react with a steeper decline in trust in public institutions to a rise in income inequality, whereas people on the right show a muted negative impact on trust in public institutions. A more recent study by Medve-Bálint and Boda (2014) also finds a negative link between income inequality and institutional trust for a set of 23 countries in Europe (14 Western European and 9 CESEE countries). However, they find that low levels of

income inequality in the Czech Republic, Hungary, Slovakia and Slovenia correspond to low levels of trust in national governments, which seems puzzling at first. The authors explain that the perception of inequality, owing to the egalitarian attitudes in these countries, is much higher than actual inequality, explaining the low levels of trust. Focusing on Austrian regions, in a recent paper, Knell and Stix (2016) show that socio-demographic characteristics along with perceived income inequality are key determinants of social trust in Austrian regions. The authors develop a theoretical framework, defining reference groups, to study the links between trust, trustworthiness and inequality and model trust as expected trustworthiness which in turn depends on expected relative income differences. Accordingly, the authors use an individual-specific measure of perceived inequality and conclude that this measure shows the expected negative and significant influence on trust. Once these corrections are introduced into the model specifications, income inequality becomes a significant determinant of trust.

In addition, other variables have been found in the empirical literature to be correlated with trust. Alesina and Ferrara (2002) (but also Dustmann et al. 2017; Algan et al. 2017) describe characteristics of the individual such as age, education, race, gender or religious beliefs i.e to some extent moral or cultural features. In addition, institutional characteristics impacting government efficiency such as the level of corruption or the quality of legal institutions are shown to shape trust in national governments as well. Trust may also be influenced through past experience of the individual or the community as individuals and communities with negative past experiences may trust less (Alesina and Ferrara 2002). The literature, however, is somewhat inconclusive whether different types of trust affect each other. Put differently, the question on whether people tend to trust institutions such as governments or central banks, is caused by their level of generalized trust, remains open. Hayo and Neumeier (2017), for instance, do not find a significant influence of generalized trust on trust in central banks if the analysis controls for institutional trust (i.e in national governments), whereas Asadullah (2016) or Fungacova et al. (2016) state that generalized trust does significantly correlate with trust in institutions. Unfortunately, our data do not an investigation of this link as it does not include a question on generalized trust.³

³Note that some surveys, such as the World Values Survey, do include questions on generalized trust but for only two countries of our sample (Poland and Romania), whereas others cover the whole country sample but not the time range we use for our analysis (e.g. European Values Study). To the best of our knowledge, also the Eurobarometer does not include such a question as well. We therefore refrain in our analysis from any further speculation on the link between various types of trust.

Using unique data from comparable household surveys across ten countries, our paper adds to the literature in the following ways. First, we contribute to the analysis on the determinants of trust in national governments in ten CESEE countries for a period of seven years after the onset of the global economic and financial crisis i.e 2009-2015. Second, we calculate measures of regional and country income inequality for these countries using comparable income data among countries and time - the first-time attempt in the case of some of the countries in our sample. Third, we correct the income data by applying state-of-the-art techniques (i.e item-non response, Pareto top income correction, bootstrapping) to receive robust estimates of regional income inequality. Finally, we account for the nested nature of the data (i.e three levels of analysis: country, regional, individual) by employing a multilevel modeling approach.

Our main findings show that both country and regional income inequality are negatively and significantly correlated with the probability to trust national governments in our sample of CESEE countries. This finding is confirmed by using different measures of income inequality such as top income shares and the Gini coefficients. In addition, the higher relative position of the household in the income distribution tends to positively correlate with trust. Furthermore, perceived high corruption and weak rule of law are key determinants of distrust in national governments. Interestingly, income inequality tends to affect distrust in national governments stronger in CESEE non-EU states.

The remainder of the paper is structured as follows. Section 2 explains the data set and the construction of all measures of income inequality. Section 3 presents descriptive evidence on income inequality and institutional trust in the countries and the period of interest. Section 4 elaborates on the empirical strategy, whereas Section 5 presents the baseline results through various specifications and different measures of income inequality as well as the marginal effects. Section 6 expands the analysis to include country-level factors and Section 7 performs robustness checks over different subsamples of countries and individuals. Section 8 concludes.

2 Data and Corrections

2.1 The OeNB Euro Survey

This paper is based on data from the OeNB Euro Survey, which is a household survey performed in ten CESEE countries, commissioned by the Austrian Central Bank (OeNB). The survey was performed bi-annually between 2007 and 2014 and annually since 2015. The survey includes six EU members (Bulgaria, Croatia, Czech Republic, Hungary, Poland and Romania) and four EU (potential) candidate countries (Albania, Bosnia and Herzegovina, Serbia and FYR Macedonia). In each country and per wave, the target population comprises around 1000 interviewees representative of the country's population, who are 14 years or older, selected via a multi-stage stratified random sampling procedure. For the period of analysis of this paper (2009 to 2015) this corresponds to a total number of observations of close to 98000. The survey is based on a representative cross section of respondents for each year, which enables us to perform panel analysis on the country or regional level, but not on the individual level. The survey includes questions on the use of the euro in household's portfolio, both for deposits and loans and the purpose of the latter, but also on different sentiments about the future and experiences from the past as well as questions on wealth and income. It also collects information on socio-demographic characteristics, including age, education and employment status. Going further, the survey delivers information also on a more disaggregated level (i.e regional level roughly corresponding to the NUTS 2 and primary sample units - PSUs). The regional dimension i.e the within-country analysis is key for our paper as it may indicate regional polarization or disintegration, which express structural weaknesses and should be tackled differently by policy makers. In addition, it is in line with recent papers on the determinants of institutional and social trust (e.g. Algan et al. 2017 and Dustmann et al. 2017).⁴

The dependent variable in our study relates to the question about trust in national governments or council of ministers and reads: "Please, tell me if you tend to trust or tend not to trust government/cabinet of ministers. 1 means "I trust completely", 2 means "I

⁴The survey collects data representative on the country level, however the regional representativeness is not warranted. The number of observations on regional level varies between 14 and 921. Hence, as a robustness check, we excluded with less than 100/200/300 regions observations (one at a time) from the estimations. In addition, we run the same regressions with country-level income inequality measures. Our results do not change qualitatively.

somewhat trust", 3 means "I neither trust nor distrust", 4 means "I somewhat distrust" and 5 means "I do not trust at all". For the analysis, we transformed the variable from a categorical to a binary variable by adding up people who at least trust their national government or council of ministers somewhat versus all other responses including those being indifferent ("neither trust nor distrust").⁵

The income inequality measures are based on the survey question on household income: "What is the total monthly income of the household after taxes?". The respondents have been asked to put their income in 20 categories, which have been defined so that at most 10 percent of respondents are in each category (exact amounts were collected in Hungary, Romania and Serbia between 2009 and 2011). Subsequently, the ranges of the categories have been unified over the different countries and over the years and were transformed into euro and in purchasing power units to guarantee cross-country comparability. Furthermore, we applied OECD-standards to calculate weighted household incomes to account for the structure of the household. In the end, the income measure we use is based on equivalized net real household incomes in purchasing power parity units. Following several transformations (see Sections 2.2 and 2.3 for a detailed description), we constructed various income inequality measures on both regional and country level such as the Gini coefficient as well as top and bottom income shares.

2.2 Corrections of the income data

In order to construct the measures of income inequality, we applied some "corrections" to the underlying income data from the survey: (1) imputation of missing values of income due to unit non-response, (2) correction for underestimation of the top income data by assuming a power-law distribution above a certain threshold, and (3) bootstrapping the standard errors of the inequality measures.

First, we apply an imputation technique to correct for the missing data from the income variable. Initially, on average, 20% of respondents did not respond to the income question (highest share of non-response in Bosnia and Herzegovina, Bulgaria and Romania, i.e up to 29% of all respondents and the lowest share - 3% in the Czech Republic). As we

⁵As the share of respondents who "neither trust nor distrust" is the largest and amounts to almost 30%, it might make a difference how we deal with this category. Therefore, we double check the validity of our results by including it in the trusting category, which did not alter the results.

cannot assume that income information is missing completely at random, we opted against dropping these observations to avoid the issue of selection bias. Following Harrell (2001), who suggests to apply a single imputation if the missing observations of a variable are between 5% and 20%, we applied a hotdeck imputation method. Thereby, it is assumed that the unit non-responses would be randomly distributed, i.e missing at random within a group. With respect to our income variable this means that the probability of refusal is related to some socio-economic factors, but within each socio-economic group, the probability of missing values is independent of income. In particular, the hotdeck imputation replaces missing values in the income data with complete lines, i.e observations which are similar from the same stratum, which in this case is the observations in the same region-year pair.⁶

Second, survey data usually do not perform very well in capturing incomes of (very) rich households, leading to an underestimation of their income and subsequently the level of income inequality. Thus, we estimate a Pareto-shaped distribution for the top quintile of the distribution which should yield more realistic values of income and its distribution (see, for instance, Blanchet et al. 2017, Piketty and Saez 2003 or Eckerstorfer et al. 2016). In order to get a Pareto distribution for top incomes we need two parameters: i) the size parameter m and, ii) the shape parameter α (or Pareto's alpha). Size parameter m determines the threshold of income above which the functional form of the distribution follows a power-law. Shape parameter α determines the shape or slope of the distribution function beyond the threshold and may be considered a measure of inequality itself - a lower α indicates a higher level of inequality and vice versa.

To determine the size parameter m , we follow Eckerstorfer et al. (2016) and Atkinson (1975) who model a Pareto-shaped distribution for the top quintile of the distribution. Thereby, we focus on the country-level income distribution. Certainly, the choice of m is crucial for the resulting estimates of income concentration as it determines the part of the distribution which follows a Pareto-type distribution. Choosing a size parameter below the true value includes observations from the non-Pareto part of the distribution, whereas the choice of a higher value may exclude observations from the Pareto part of

⁶We tested the hypothesis that the missing income data might be assigned to the more affluent part of the respondents. A probit estimation on the likelihood of not disclosing income information showed that it is rather young male respondents with university education without children who refuse to reply to this question. At the same time, students and unemployed in the data sample are also more likely to retain information on their income. Thus, these results are not clearly affirmative to the presumption that this group includes only the more affluent part of the sample.

the distribution.⁷ Despite these limitations, we assume that representing the top twenty percent by a Pareto-shaped distribution is rather plausible. However, we double check our Pareto coefficients by following the strategy used by Törmälehto (2017), who estimates Pareto coefficients using multiples (200% to 500%) of the median wage in a given country as the size parameter m .⁸

We find that, on average, the threshold income, expressed in EUR and in PPP, above which a Pareto distribution is assumed, varies among the countries in our sample. For instance, the top 20% threshold is on average the lowest in Albania (475 EUR), while it is the highest in the Czech Republic (1,146 EUR). Comparing these estimates with other surveys (i.e EU SILC) is not really possible due to the different definitions of income. EU-SILC data use disposable income which includes social transfers as well as transfers among households. This is a major difference to data from the OeNB Euro Survey, which is defined as net income (i.e. after taxes and before transfers). In contrast to comparable surveys, a key advantage of our data is that we are able to compute α coefficients for every country and year in our sample. On average for the whole sample, α amounts to 3.2 with the lowest values in Bosnia and Herzegovina (2.1) and the highest in the Czech Republic (4.8). We ran the same regressions using time-invariant but country-specific alphas which did not alter the empirical results. In addition, we assume that time-varying alphas are plausible as they are measures of inequality themselves. Hence, assuming that income inequality stays constant over time is a rather strong assumption.

Third, after computing the income inequality measures from the corrected data, in a final step we performed bootstrapping to improve the precision of the income inequality estimates. Thereby, we have chosen to take 1000 samples from the data with replacement. To visualize the corrections made, Figure 6 (see Appendix) shows a comparison of country-level Gini coefficients based on an unadjusted income data from the survey (red dots) and Gini coefficients after the Pareto adjustment and the bootstrapping procedure (blue dots). Interestingly, the income corrections have broadly induced a level shift of the Gini coefficients in all the countries i.e the dynamics do not change and the pre- and post-adjustment lines run broadly in parallel, thus confirming the plausibility of the adjustments

⁷A possible way to further enhance the estimation of the parameter is to use country-varying thresholds. Although our approach constitutes a certain limitation, it is otherwise well beyond the scope of this paper.

⁸Note, however, that income in the data used by Törmälehto (2017) is defined as household disposable income, whereas data from the OeNB Euro Survey measures after tax income, i.e. without transfers. *Ceteris paribus*, this should lead to lower estimates of α in our calculations.

made (Figure 7 and Figure 8 in the Appendix show the respective values of the bottom and top income shares). Summarizing, all of the aforementioned standard corrections yield much more robust estimates of regional income inequality, which are then used to estimate the impact of an increase of income inequality in individual trust in national governments.

2.3 Income inequality measures

Our study uses the survey's income data to compute the income inequality measures in the following way. The original income data from the survey is gathered in categories in each of the countries. The Gini coefficients used in our paper have been estimated on both regional and country level on the base of the income averages of these categories after the corrections as described in the previous section and after applying OECD weighting method to obtain equivalence income. Thus, in line with Jenkins (1997) and Salverda et al. (2009), the formula for the Gini coefficient is given by

$$G(y) = 1 + (1/N) - [2/(m \cdot N^2)] [\sum (N - i + 1)y_i] \quad (1)$$

with $i = 1, \dots, N$ observations (i.e respondents), arithmetic income m and the rank of respondents in ascending order of y_i , which is the income of household i . In addition, the inequality indices for a subgroup (i.e region) are calculated as if the subgroup were a separate population. Therefore, the country-level indices are slightly different from the average of the regional indices in the same country.

However, aggregate measures of income inequality may come at the cost of not having enough information about which part of the distribution is actually driving the aggregate outcome. For instance, an increase of the Gini coefficient does not tell whether this increase was driven by a decrease of income shares at the bottom of the distribution or by an increase of income shares at the top of the distribution. Furthermore, different distributions may yield the same Gini coefficient, thus it is impossible to judge which distribution would be the preferred one. Finally, due to its construction, the Gini coefficient is particularly sensitive to changes in the middle of the distribution compared to its tails. In other words, a ten percent increase of income going to the 5th decile yields a larger change of the Gini coefficient than a ten percent increase of income going to the top decile.

To account for the aforementioned shortcomings of the Gini coefficient, and to gain a

better understanding of which part of the income distribution is driving overall income inequality, we calculate the income share of the top twenty and ten percent (and top one percent) to capture developments at the (very) top of the income distribution. On the other hand, we calculate the income share of the bottom ten and twenty percent. We re-run the estimations in the paper with all inequality measures both on the regional and the country level.

Finally, the income data from the survey are featured by a change of income categories over time. In particular, some income categories became more narrow over time. For instance, the category 201-300 is applied from 2007-2011, whereas from 2012-2015, the categories 201-250 and 251-300 are used. This change might have an effect on the Gini coefficient, possibly yielding an increase of the Gini coefficient when the income categories are more narrow than otherwise. Therefore, to account for this and to see if this might possibly change the correlation of trust and the Gini coefficients, we unified the income categories i.e they were changed back from e.g. 201-250 and 251-300 to 201-300 for a robustness check. Although comparability across time will improve, we opted against applying this to all estimations as this will result in a loss of information for the years when finer categories are available.

3 Stylized facts on trust and income inequality from the survey

According to recent data from the Eurobarometer, trust in national governments in the EU-28 has increased in recent years and stood on average at 40% in 2017 (European Commission 2017). As for the CESEE region, respondents in Hungary, Romania and the Czech Republic posted the highest trust levels (on average 42%), which are still significantly lower than the average in the EU-15 countries (highest shares, 73% on average, recorded in the Netherlands, Sweden and Luxembourg). Our survey data also show that the share of respondents trusting their national governments varies over countries and increased in half of the countries between 2009 and 2015. In particular, the share of people trusting their government increased strongly in Hungary, Poland and Serbia and to some extent in Croatia in the years up to 2015 to levels close to 50%. At the same time the share was on average the highest in Albania and FYR Macedonia (Figure 1).⁹

⁹The relatively lower levels of trust in CESEE countries compared to Western European countries may bear information on historical dependencies. One potential reason for the fall of the iron curtain may have

Right after the onset of the global economic and financial crisis, in 2009, the share of respondents (somewhat) trusting the government was particularly high in FYR Macedonia and the Czech Republic. By contrast, Hungary, Croatia, Poland, Romania and Serbia experienced a significantly lower share of trust. Interestingly, the picture changes by taking a snapshot view of 2015.¹⁰ Trust increased in Bulgaria, Croatia and Romania (modestly), Serbia and Hungary (strongly), whereas the share of the population trusting the national government decreased in Albania (modestly), Bosnia and Herzegovina, FYR Macedonia and the Czech Republic.

It could be argued that trust is very volatile and varies significantly from year to year and does not allow for a meaningful analysis. Figure 5 in the Appendix shows the swings of trust over time and confirms that in most of the countries there was no erratic change of trust patterns in the period 2009-2015. Hungary deviates from this pattern with large jumps in trust in 2010, 2013 and 2015, perhaps related to major changes of political power and the election of Viktor Orbán and the measures implemented during the increase of immigration in 2015. Figure 1 shows the average trust in all countries between 2009 and 2015 and the average change of trust over the same period. Interestingly, the countries where trust declined (e.g. FYR Macedonia, the Czech Republic and Bosnia and Herzegovina) do not exhibit the lowest levels of trust. For instance, on average the share of trust in 2009-2015 was 30% in FYR Macedonia. At the same time, in 2015 the share of respondents trusting national governments compared to other CESEE-countries was higher in Serbia (42.4%), Poland (40.9%) and Hungary (38%), whereas it is particularly low in Bosnia and Herzegovina (17.4%), the Czech Republic (23.7%) and Romania (24.4%). The average annual change of trust in national governments between 2009 and 2015 was very pronounced in Hungary, Serbia and Poland, where levels of trust increased significantly.

As for income inequality, most CESEE-countries in our sample experienced a decline of income inequality (as measured by the Gini-coefficient) between 2009 and 2015. This development distinguishes the CESEE region from most of the OECD countries since

been a dramatic decline of trust in institutions, particularly in national governments, despite the relatively low levels of income inequality in former communist countries (e.g. Novokmet et al. 2017).

¹⁰Election cycles and other political developments (e.g. the refugee crisis in 2015) might have had a significant influence on the share of people expressing trust in governments. Case in point are developments in Serbia and Hungary. Hence, trust in the national government in Hungary may be causally related to large swings in government composition, despite the increase in regional income inequality in Hungary. We control for the influence of election cycles.

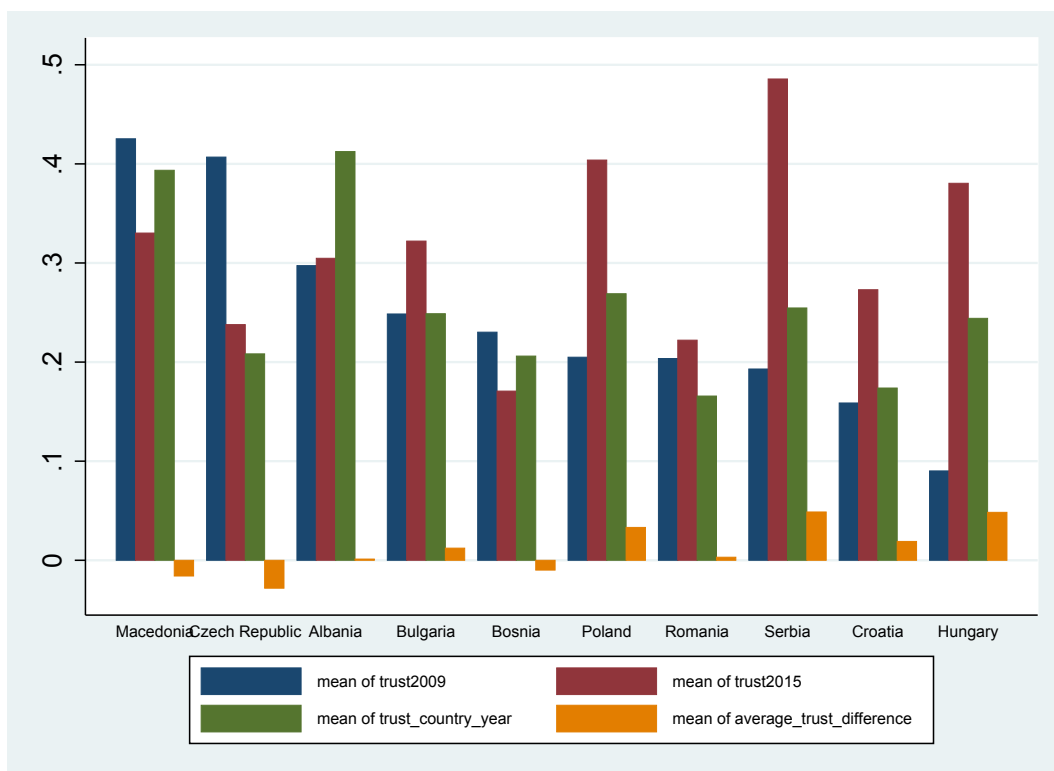


Figure 1: Trust in national governments, 2009 vs 2015 and average annual change.

Source: OeNB Euro Survey, own calculations.

the outbreak of the crisis (see OECD 2015). Figure 2 shows that the Gini coefficient increased in the Czech Republic, Poland and Croatia and was essentially flat in Bosnia and Herzegovina and FYR Macedonia. Overall, these findings are in line with a recent study, which broadly confirms the decrease in income inequality in CESEE since 2009 (Koczan 2016).

The descriptive evidence from our survey also shows that for some CESEE countries the levels of income inequality were higher as compared to OECD countries (see OECD 2015). The highest Gini coefficients are estimated for FYR Macedonia and Bosnia and Herzegovina (on average around 0.50), while the lowest is in the Czech Republic (on average 0.23). For the whole sample of countries, the average Gini coefficient for the period 2009-2015 is around 0.38.

Taking a closer look at the correlation between the level of regional trust in national

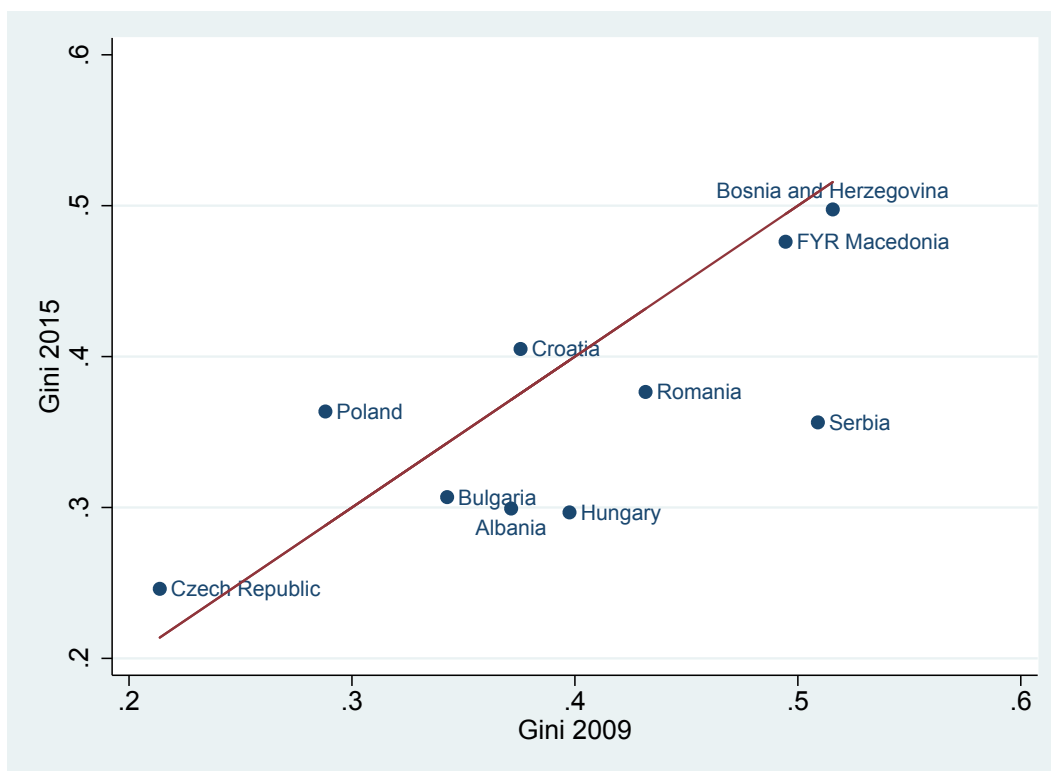


Figure 2: Country-level change of Gini-coefficient 2009 to 2015.

Source: OeNB Euro Survey, own calculations.

governments and the level of regional income inequality hints at a negative correlation. Given the insights from theoretical and empirical studies discussed before, we would expect a relatively clear negative relationship between income inequality and trust in national governments. At the same time, Figure 3 shows that in some regions high average income inequality goes hand in hand with high levels of trust in national governments, implying that there are other factors at play.

Our data allow for computing also other measures of income inequality such as shares of the top or bottom of the income distribution, which deliver additional information on the income distribution.¹¹ Accordingly, Figure 4 shows the correlation between the share of the bottom 10% and the probability to trust and confirms the previous descriptive findings

¹¹The correlation between the regional Gini coefficient and the bottom 10% is -0.87, while it is 0.96 between the regional Gini and the share of top 10%, which points to the fact that aggregate income inequality was driven by changes at both the top and the bottom of the income distribution.

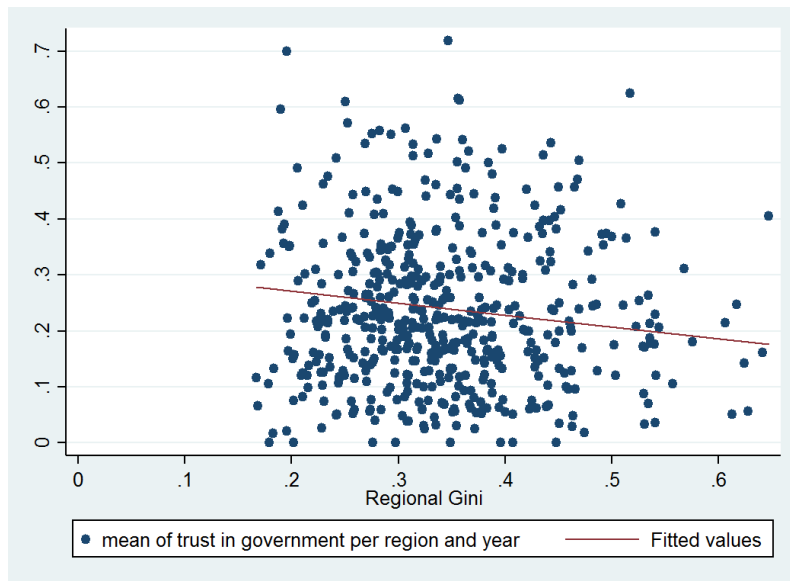


Figure 3: Correlation between trust in government per region and regional Gini coefficients, means for the period 2009-2015.

Source: OeNB Euro Survey, own calculations.

- the higher the income share of the less affluent in our sample, the higher the trust in national governments and vice versa.

4 Empirical framework and methodology

The present study focuses on individual but also regional- and country-level characteristics which may be correlated with trust in national governments. When units are clustered, as it is the case in our analysis, the conventional probit regression analysis might be not appropriate. Households within the same region or country tend to be more similar and interrelated than households in different regions or countries. Accordingly, standard errors will be biased downwards if we do not account for this interdependency. Hence, inferences about the effects of the covariates are not correct and might induce spurious "significant" results. In particular, as of the residual variance in multilevel models, it is partitioned into a between part (i.e between regions in a country and individuals in a region) and a within part (i.e the variance within the observations in the same cluster (i.e region and country)).

Therefore, we apply multilevel models (Rabe-Hesketh and Skrondal 2008), which account

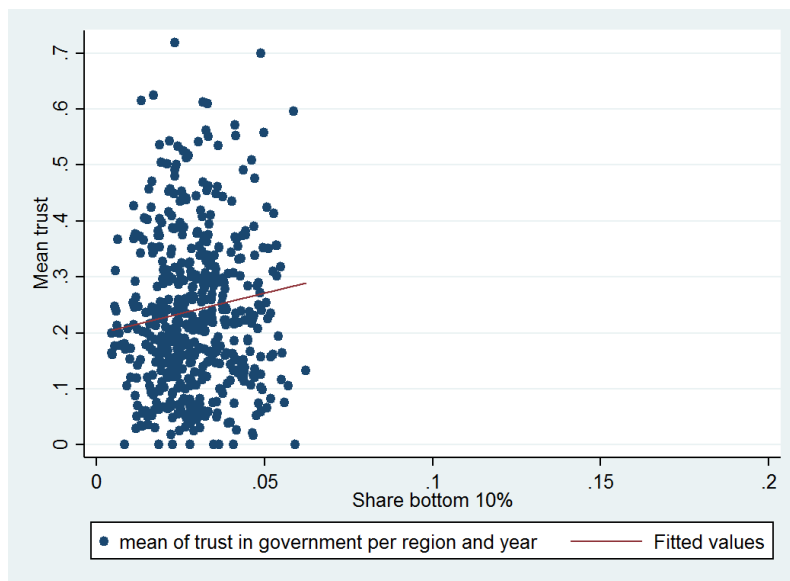


Figure 4: Correlation between trust in government per region and year and regional bottom 10 percent share for all sample countries, means for the period 2009-2015.

Source: OeNB Euro Survey, own calculations.

for the nested nature of the data. There are levels of nested clusters: country, region and individual levels and we assume random effects at the higher levels of clusters. We consider two- and three-level models, where for a series of independent clusters at the country level and conditional on a set of fixed effects x and a set of random effects u , the probability of trusting the national government is given by

$$Pr(y_{ijkt} = 1|x_{ijkt}) = g(\beta_0 + \beta_1 X_{ijkt} + \beta_2 Z_{jkt} + \beta_3 W_{kt} + w_{ijk}) \quad (2)$$

where $k=1,\dots,10$ represents clusters at level three (i.e countries), $j=1,\dots,77$ represents clusters at level two (i.e regions) and $i=1,\dots,n$ representing level one (individual observations). In addition, the time dimension is $t= 2009,\dots,2015$ leaving us with a total number of close to 98000 observations. $Pr(y_{ijkt} = 1|x_{ijkt})$ represents the probability of individuals to trust national governments and takes the value of 1 (in case of at least somewhat trust) or 0 (no trust), hence we focus on the probability to trust instead of the probability to fall into a certain category. Applying the multilevel approach enables us to account for the heterogeneity of the different regions by giving a different coefficient, thus catching

the effect that households within one region are more likely to be influenced by common factors rather than households in different regions. The same line of thinking applies to the regional dimension, where regions within the same country are more likely to be influenced by the same factors, which is less likely the case if applied to regions in different countries. The suitability of the multilevel approach for our data and research question has been confirmed by Bryan and Jenkins (2013), who claim that standard multilevel estimators are consistent only when both the number and the size of the groups are large with a minimum number of groups (i.e. countries in our setting) to be at least 10.

In addition, Equation 2 shows that, apart from the regional or country-level income inequality measures, we control for four different sets of variables, which have been identified as important determinants of individual trust and are on various "hierarchical" levels. First, we include individual socio-demographic characteristics, X_{ijkt} (employment status, age, educational level, etc.). As a part of this group, the relative income position of the household in the regional distribution is included as well. A second set of variables, Z_{jkt} , includes sentiments about past experiences and expectations about future developments of either the household or the country. These control variables have been aggregated to the regional level to avoid reverse causality concerns as higher trust in institutions correlates and causes people to expect an improvement of the economic situation of their country in the coming years. Third, we also account for country-level factors, W_{kt} , such as macro-economic developments (e.g. GDP per capita) as well as country-level variables which relate to government efficiency, rule of law, corruption or EU membership. Finally, wherever possible, we double check the results with the country-level covariates by including indicators, which are based on data from the OeNB Euro Survey. For instance, the indicator on the country level for rule of law as reported by the World Bank Developing Indicators Database is proxied by the regional level of trust in the police as reported in the OeNB Euro Survey. Similarly, the corruption index as reported by Transparency International is also proxied by implied corruption, which is based on questions from the survey.¹² Detailed information on the variables included in the analysis is provided in the Appendix (Table 6).

In the two levels specification (i.e. individual and region effects), the overall error term w_{jt} is decomposed into e_{ijt} and u_{ijt} , where e_{ijt} is the random error term for the i -th

¹²"Trust in the police" is the regional share of people who at least trust somewhat in the police, while "implied corruption" corresponds to the regional share of people confirming that it is common in their country to pay in cash to avoid taxes.

respondent within the j -th region and is assumed to have zero mean and constant variance σ_e^2 . The regional effects are estimated through u_{jt} which is assumed random and again has a zero mean and a constant variance σ_u^2 . The partitioning of the variance in this manner defines a measure to test the suitability of the multilevel modeling i.e the intraclass variance coefficient (ICC or ρ). Accordingly, it measures the strength of 'nesting' with the data hierarchy and is defined as

$$ICC = \rho = \frac{\sigma_u^2}{\sigma_u^2 + \sigma_e^2} \quad (3)$$

Hence, ICC tends to be used as a "goodness of fit" for the use of multilevel models i.e the higher this share (i.e in any case significantly different than zero), the more suitable is the application of multilevel modeling.

5 Results

5.1 Main estimations

The estimations in Table 1 present our baseline results and include information from the OeNB Euro Survey i.e covariates on the individual and regional levels only. The first equation (1) includes only the constant and allows for random effects at the regional level. Accordingly, the regional variation explains 9.1% of the variance (as given by the ICC in column (1)) thus confirming the usefulness of the multi-level modelling. In line with our expectations, the estimations in columns (2)-(6) show that the regional Gini-coefficient is overall negatively and significantly correlated with the probability to trust in national governments. The decrease in regional income inequality (as shown by the descriptive evidence in Section 3) went hand in hand with an increase of the share of respondents, who trust national governments at least to some extent. Most importantly, this result remains valid regardless of the control variables included (e.g. social-demographics, sentiments). Apart from the income distribution measure on the regional level, we include a measure for individual income which is the relative position of individuals in the regional income distribution. A position in a higher decile of the regional income distribution correlates with a higher probability to trust national governments, which may be due to more frequent interactions of richer respondents with domestic institutions (Fungacova et al. 2016). Alternatively, more affluent individuals generally trust more (Guiso et al. 2004),

while economic hardships impact trust negatively and even more so in countries with an under-developed social and welfare system. As the survey data do not include information on the level of social trust, we construct an approximation measure by averaging trust on regional level in banks (domestic and foreign) and police, thus testing the finding of Rothstein and Uslaner (2004) that institutional and social trust are used interchangeably due to their high correlation. The results in column (4) confirm the strong correlation of the level of trust in the region and individual trust in national governments.¹³

We verified also whether it is only the level of income inequality or also its change which impacts trust. The results in column (5) confirm the estimated effect of regional income inequality but discards any significant effect of its change. The redefinition of the dependent variable (including indecisive respondents in the trusting category) does not seem to alter the negative correlation between the regional Gini coefficient and the probability to trust (column (7)). Neither does the application of fixed effects estimation instead of multi-level modeling (column (6)).¹⁴ Finally, we tested the hypothesis whether income inequality would be negatively correlated with trust in governments in all parts of the income distribution and results for the bottom 25% of the distribution of the regional Gini coefficient (i.e below 0.29) are included in column 8. Notably, while we confirm the negative correlation between trust and income inequality, the coefficient points towards a significantly higher coefficient for this part of the distribution. In terms of opportunity costs, one way to understand these results would be that people in CESEE tend to have highly egalitarian attitudes and penalize governments when the increase of income inequality occurs in the lower part of the income distribution (see also Medve-Bálint and Boda 2014).

Table 1 also includes estimations with important socio-demographic variables usually controlled for in the empirical literature (e.g age, education, employment status). As for age, very young respondents (14-18 years) and respondents older than 55 years trust more than the middle-aged, which could be explained through the channel of social trust. For instance, a life-cycle effect could be key as people pile up more experiences and become

¹³Undoubtedly, both the trust index and individual trust in national governments could be influenced by the same factors i.e overestimating the coefficient of the trust index. Although it would not be correct to assume that any omitted variable bias has been removed by the inclusion of the additional controls, we believe that, together with the method in place, we end up with a robust coefficient estimation.

¹⁴According to Goldstein (2011), fixed effects models would remove all variation between higher level units from the parameter estimation. This has the advantage of removing all potential unobserved confounding variables at the higher level from the analysis and thus aids causal inference.

Table 1: Impact of income inequality - Micro-level Analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Income and Distribution								
Regional Gini coef		-1.132*** (0.302)	-0.586** (0.294)	-0.385* (0.218)	-1.137*** (0.302)	-1.179*** (0.088)	-0.668*** (0.202)	-2.533*** (1.309)
Annual change Gini coef					0.587 (0.774)			
Ind position income dist		0.015*** (0.003)	0.015*** (0.003)	0.015*** (0.003)	0.015*** (0.003)	0.015*** (0.003)	0.014*** (0.003)	0.017*** (0.003)
Socio-demographics								
14 to 18 years old		0.148*** (0.030)	0.158*** (0.031)	0.168*** (0.032)	0.149*** (0.030)	0.150*** (0.030)	0.130*** (0.034)	0.26*** (0.007)
19 to 34 years old		-0.011 (0.016)	-0.008 (0.015)	-0.014 (0.014)	0.02 (0.028)	-0.01 (0.011)	0.007 (0.011)	0.002 (0.03)
55+ years old		0.048** (0.019)	0.049** (0.019)	0.051** (0.019)	0.062** (0.017)	0.05*** (0.017)	0.032 (0.020)	0.000 (0.03)
Female		0.016 (0.013)	0.017 (0.013)	0.014 (0.013)	0.017* (0.009)	0.021 (0.009)	0.076*** (0.012)	0.061*** (0.021)
1 person HH		-0.034 (0.024)	-0.032 (0.024)	-0.033 (0.024)	-0.033 (0.024)	-0.028* (0.020)	-0.074 (0.058)	-0.073 (0.058)
2 Person HH		-0.039** (0.018)	-0.037** (0.017)	-0.037** (0.018)	-0.210*** (0.061)	-0.041** (0.014)	-0.021** (0.012)	-0.047 (0.033)
Children		-0.029* (0.019)	-0.029* (0.017)	-0.025 (0.016)	-0.051 (0.004)	-0.03** (0.001)	0.011 (0.001)	-0.051* (0.031)
Head of HH		0.012 (0.017)	0.011 (0.017)	0.002 (0.014)	0.141 (0.083)	0.011 (0.011)	0.091 (0.011)	0.029 (0.023)
Secondary education		-0.005 (0.016)	0.000 (0.016)	0.005 (0.016)	-0.001 (0.041)	0.000 (0.012)	0.000 (0.013)	0.020 (0.031)
Tertiary education		0.098*** (0.028)	0.102*** (0.026)	0.112*** (0.028)	0.107*** (0.028)	0.11*** (0.023)	0.114** (0.048)	0.127*** (0.049)
Retired		0.056** (0.028)	0.054** (0.026)	0.057*** (0.028)	0.048** (0.028)	0.05** (0.023)	0.06* (0.048)	0.104*** (0.049)

Continued on next page

Table 1 – Continued from previous page

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Student		(0.028)	(0.022)	(0.022)	(0.028)	(0.027)	(0.034)	(0.036)
		0.013	0.001	-0.011	.015	0.01	0.01	-0.002
		(0.025)	(0.025)	(0.028)	(0.029)	(0.021)	(0.021)	(0.005)
Unemployed / other		-0.085***	-0.089***	-0.083***	-0.103***	-0.091***	-0.089***	-0.045
		(0.019)	(0.019)	(0.019)	(0.019)	(0.01)	(0.014)	(0.036)
Sentiments								
Restricted access to savings			-0.084			-0.071		-0.341***
			(0.232)			(0.075)		(0.081)
Fut fin sit HH			-0.171			0.218***		-0.604
			(0.228)			(0.066)		(0.347)
Memories infl			-0.014			-0.013		0.660
			(0.222)			(0.061)		(0.426)
Fut econ sit country			2.027***			2.062***		2.985***
			(0.197)			(0.062)		(0.388)
Trust index				3.043***				
				(0.206)				
_cons		-0.768***	-1.041***	-1.617***	-0.842***	-0.911***	-0.695	-0.694
		(0.036)	(0.154)	(0.226)	(0.191)	(0.068)	(0.081)	(0.523)
ICC (regional)	0.091	0.046	0.038	0.029	0.047		0.025	0.069
<i>N</i>	97185	97185	97185	97185	77838	97185	97185	22558

Dependent variable: trust in national governments (dummy variable taking value of one if respondents trust or somewhat trust the national government). Estimation method: (1)-(5)-multi-level estimations, (6)- fixed effects estimation. Column (1) includes only the constant, column (2)- includes sociodemographics, column (3) adds on sentiments averaged on regional level, column (4) includes the trust index, column (5) uses annual change of the regional Gini coefficient, column (6)-applies regional fixed effects and column (7) redefines the dependent variable. Column (8) shows the results when only the bottom 25% of the income distribution included. Country and time fixed effects included. Intraclass correlation coefficient denotes the unexplained correlation on the second regional level. Robust standard errors in parentheses. Variables are defined in the Appendix.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

more trusting. An alternative explanation is the generational effect - today's older adults have experienced times with more fertile seed bed for social trust, which could well be the case before the fall of the Iron curtain for most of the CESEE-countries. At the same time, age seems to have a U-shaped impact on trust as young individuals tend to trust more than their middle-aged counterparts. This might be related to the finding in the literature that young people are overall more trusting in their future or that it is the higher trust in the EU among the young that has positive spillovers on trust in national governments. On a negative note, it might be that populist features of the incumbent governments increasingly attract attention of the youngest.¹⁵ In line with similar studies on institutional trust (Medve-Bálint and Boda 2014), people with higher education tend to have more trust in their national governments. Therefore, in spite of elevated levels of corruption in some of the countries of our sample, we cannot confirm findings in the literature that higher education might have an adverse effect on trust in more corrupt countries, despite the fact that education makes it easier for citizens to acquire and process information about the quality of democratic institutions (Hakhverdian and Mayne 2012). As for the employment categories retired respondents trust more than employed which is the reference category in the estimations. Interestingly, this confirms the effect of age above. Not surprisingly, unemployed trust less than employed, which could be related to the generally underdeveloped social security systems in the region along with low levels of unemployment benefits.

Furthermore, we make use of survey information on households' sentiments about future and past developments, which could impact trust in national governments. To address likely concerns about the endogenous relation between institutional trust and sentiments about the economic situation of the country or the financial situation of the household, we aggregate the sentiment variables on the regional level. Interestingly, only respondents expecting improvement of the economic situation of the country tend to trust their national governments more.¹⁶ Finally, the redefinition of the dependent variable (i.e to include individuals neither trusting nor distrusting into the first category) overall keeps the results qualitatively unchanged.

¹⁵Dustmann et al. (2017) show that there is a strong positive correlation between trust in national governments and voting for populist parties in the EU member states.

¹⁶The rest of the included sentiment variables does not turn out to be significant in neither of the estimations to follow.

Table 2: Impact of income inequality - Alternative income inequality measures

	(1)	(2)	(3)	(4)	(5)	(6)
Income and Distribution						
Top 1% income share	-1.659** (0.733)					
Top 10% income share		-1.011*** (0.356)				
Bottom 10% income share			8.699*** (2.656)			
Bottom 20% income share				2.850*** (1.328)		
Top 20% income share					-1.108*** (0.345)	
Reg gini coef same categories						-0.625* (0.435)
Ind position income dist	0.015*** (0.003)	0.015*** (0.003)	0.015*** (0.003)	0.015*** (0.003)	0.017*** (0.003)	0.017*** (0.003)
_cons	-0.269** (0.101)	-0.086 (0.356)	-0.603*** (0.112)	-0.743*** (0.132)	-0.105 (0.133)	-0.171 (0.138)
ICC (regional)	0.043	0.044	0.046	0.046	0.096	0.042
<i>N</i>	97185	97185	97185	97185	97185	97185

Dependent variable: trust in national governments (dummy variable taking value of one if respondents trust or somewhat trust the national government). Estimation method: (1)-(6)- multi-level modeling. Sociodemographics, country and time fixed effects included in all estimations. Intraclass correlation coefficient denotes the explained portion of the variance by inclusion of the regional (second) level covariates. Robust standard errors in parentheses. Variables are defined in appendix.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In order to get more reliable estimations of the impact of regional income inequality on trust in national governments, we run the same regressions with alternative measures of regional and country-level income inequality i.e top income shares of 1%, 10% and 20% and shares of bottom 10% and 20%. In addition, in column (5) we included the Gini coefficient at country level as well as estimates of Gini coefficients when income categories have been kept the same over the whole period in column (6). Fortunately, and as expected, these variations do not qualitatively change the results presented in Table 1. As reported in Table 2, an increase of the share of total income going to the top one and ten percent has a negative and significant impact on trust. An increase of the share of income going to the bottom ten and twenty percent increases trust in national governments significantly. Trust in national governments also decreases if income inequality is measured by the Gini coefficient on the country level and is highly significant. Summarizing, the results presented

in this section show that - on the micro-level - regional income inequality negatively relates to trust in national governments, as we expected. Estimates are robust across several different measures of income inequality bearing the expected signs.

5.2 Marginal effects

To account for the economic significance of our results, we perform estimations to compute the average marginal effects of the covariates included. Thereby, while the results in Tables 1 and 2 indicate the significance and the sign of impact of the variables measuring income inequality, the coefficients in Table 3 show the magnitude of the impact i.e the effects as percentage points in the change of the probability of trusting in national governments. In the case of dummy variables, the marginal effects relate to the change of one category to the other and for other variables it shows the impact of one standard deviation change.

Table 3: Impact of income inequality - Marginal Effects

	(1)	(2)	(3)	(4)	(5)	(6)
Income and Distribution						
Regional Gini coef	-0.337*** (0.009)					
Top 1%		-0.495** (0.219)				
Top 10%			-0.301 *** (0.106)			
Top 20%				-0.330 *** (0.103)		
Bottom 10%					2.590 *** (0.788)	
Bottom 20%						1.551 *** (0.373)
Ind position income dist	0.004*** (0.001)	0.004 *** (0.001)	0.004** (0.001)	0.004** (0.001)	0.004*** (0.001)	0.004** (0.001)
<i>N</i>	97185	97185	97185	97185	97185	97185

The marginal effect has been estimated as the average marginal effect (partial effects) of the respective income inequality covariates. Detailed results available upon request.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The significance does not change in all the cases. As regards the regional income inequality measure, one standard deviation increase of the regional Gini coefficient, decreases

the probability of people in the CESEE countries to trust on average by 0.3 percentage points. The individual position in the regional income distribution rest of the income variables maintain their significance, however, they seem to impose an economically smaller effect than the regional income inequality.

6 Country-level and institutional factors

Seminal studies have shown that indicators for the economy's position in the business cycle, fiscal imbalances as well as the compliance to the rule of law and the degree of corruption tend to affect trust in national governments and institutions.¹⁷ We take a closer look into how these factors shape trust in the sample of CESEE countries in Table 4. We include GDP per capita (in logarithm) on the country level due to lack of data on regional economic activity for some of the countries, while the unemployment rate, computed from the survey, is on the regional level. We account also for the fact that the majority, if not all, of the countries of our sample are featured by a large flows of emigration. According to Atoyán et al. (2016) by 2012 up to 18% of the population as it was in 1990 have already left the country- especially relevant for the Western Balkan countries. As this is coupled with high levels of unemployment in the home country, we jointly tested for impact of unemployment and emigration on trust in governments.

The first column is estimated only by including the constant and shows that the country level variation (i.e the variation within first-level groups) explains up to 5.7% of the overall variation. Notably, the country Gini coefficient remains negatively and significantly correlated with trust through the array of estimations we have performed. Going further, higher GDP per capita boosts trust in national governments, while higher regional unemployment correlates negatively with trust. Interestingly, the level of emigration increases the likelihood of trust in national governments. This result is in line with Lodigiani (2016), who finds that overall emigration can demand greater accountability and more democratic government. Eventually, this would contribute to strengthening institutions in the home countries and higher trust in national governments. As our estimation in column 3 shows, this effect levels off with increasing levels of unemployment. The level of

¹⁷We included also other indicators measuring macroeconomic stability such as the level and change of inflation and growth of GDP per capita, however, their impact was insignificant. Results are available upon request.

Table 4: Impact of income inequality - Country-level Analysis

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Income and Distribution								
Country Gini coef		-0.785** (0.375)	-2.013*** (0.712)	-1.20*** (0.291)	-0.596** (0.257)	-0.517** (0.265)	-1.039*** (0.325)	-0.759*** (0.289)
Ind position income dist		0.015*** (0.003)	0.021*** (0.003)	0.0145*** (0.003)	0.0152** (0.002)	0.0147*** (0.004)	0.0145*** (0.003)	0.0145*** (0.004)
Macroeconomic and policy variables								
GDP pc PPP (log)		0.516** (1.83)						
Unemployment rate			-1.404*** (0.222)					
Emigration flows, log			1.756*** (0.175)					
Interaction UR*Emigration flows			-0.212*** (0.312)					
Minimum wage				0.221* (0.121)				
Corruption index					-0.043 (-0.069)			
Implied regional corruption					-0.268* (-0.152)			
Trust in police						2.007*** (0.165)		
Rule of law						-0.094 (0.080)		
Public debt							-0.009*** (0.003)	
EU membership								-0.163** (0.086)
Trust in EU								1.471*** (0.169)
_cons	-0.719*** (0.091)	-4.005*** (0.233)	-1.363*** (0.224)	-1.342*** (0.333)	-1.14** (0.371)	-1.54*** (0.160)	-0.731*** (0.431)	-1.821*** (0.430)
ICC	0.061 97185	0.062 46616	0.031 97185	0.041 97185	0.044 77838	0.062 97185	0.043 97185	0.023 97185
N								

Dependent variable: trust in national governments (dummy variable taking value of one if respondents trust or somewhat trust the national government). Estimation method: multi-level model. Column (1) includes only the constant. Socio-demographics and time fixed effects included in all the estimations. Intraclass correlation coefficient (ICC country) denotes the unexplained correlation on the third level. Robust standard errors in parentheses. Detailed results available upon request. Variables are defined in the Appendix.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

minimum wages correlates with higher trust for the national governments but the effect tends to be weak at best. In addition, we did not find a significant effect by the increase of minimum wages¹⁸. As the income inequality measure remains significantly correlated with trust throughout all estimations in this table, we presume that the effect of the increase of minimum wages has been already reflected in the inequality coefficient. Interestingly, the correlation between the country Gini and the minimum wage-level is 0.22 - higher inequality and higher minimum wages go hand in hand.

Going further, fiscal policies and their performance are very likely to impact trust of the population. For instance, the perception of government efficiency is intimately related to the level of corruption, which in our estimations is tested by the inclusion of two measures. On the one hand, we include the corruption perception index (CPI) on the country level, which ranges between 0 and 100 and is higher when less corrupt. On the other hand, we use data from the OeNB Eurosurvey related to the question whether it would be common in one's country to pay in cash to avoid taxes (i.e implied corruption). The country-level corruption perception index turns out to be insignificant, which might have to do with the fact that CPI is based on a survey of firms while our data come from a household survey. On the contrary, implied corruption coming from the survey and aggregated to give a regional share indicates lower probability of trusting the national government. Closely related to this result, in column (6) we test whether a high degree of legal accountability (i.e stronger rule of law) ensures that people rely on their institutions. Again, on the country level, it does not show to have an effect. Therefore, we include information on the average level of regional trust in the police to approximate the rule of law, which measures the execution of legal acts.¹⁹ This turns out to be strongly and significantly correlated with trust.

Additionally, a weak fiscal position could undermine the accountability and credibility

¹⁸All CESEE countries in our sample have introduced minimum wages, which are monthly and apply for the whole economy in most of the countries, before the 2008/2009 crisis. According to available data, policy makers in the CESEE countries raised minimum wages in the period 2009-2015 on average by 3.5 percent (annual average). The average minimum wage over the sample of CESEE countries amounted to 285 EUR.

¹⁹We are aware that trust in the police is not a very fitting proxy for the rule of law but it is the best we have at hand. Unfortunately, the survey does not provide data on trust in the judiciary system. Alternatively, data from the Eurobarometer would cover only half of our country sample and only four out of fourteen waves from 2009 to 2015. The Balkan Opinion Barometer covers more countries but only after 2015.

of policy measures, thus lowering population's trust in their governments. In column (7) we test whether the level of public debt as a percentage of GDP would account for this effect. The result shows that public debt is negatively linked with trusting national governments, thus people are likely to distrust governments which contribute to higher fiscal imbalances. Finally, individuals living in a EU member state tend to trust their governments overall less. One possible explanation is a substitution effect whereby trust in national governments is simply substituted by trust in the EU, perhaps due to the higher perception of corruption of national governments compared to EU bodies. We also include data on the regional share of individuals trusting the EU (also coming from the OeNB Euro Survey). Trust in the EU is positive and highly significantly correlated with trust in national governments thus pointing to complementarity effects.

7 Exploring heterogeneity across countries and groups

We performed several checks to test the robustness of our estimations. We thereby explore the potential heterogeneity of results across country and demographic groups and include several measures of income inequality to verify the results. Similar to a recent study by Algan et al. (2017), we first run two estimations divided by education to test whether lower-skilled respondents react differently to a more unequal income distribution. The results in column (1) in Table 5 show that indeed the negative coefficients of income inequality and top income shares remain for the group of lower-skilled individuals, possibly due to them being strongly affected by the 2008/09 crisis. Second, in column (2) we tested whether differences are discernible according to gender. Interestingly, we confirm our baseline results for women, while the coefficients of the regional Gini remain with the expected sign but are insignificant for the group of male respondents. These results might imply a higher sensitivity of women for social issues (as expressed by the impact of higher income inequality) or that women were more often affected by unemployment following the 2008/2009 crisis. Indeed, our data confirm that in all countries of our sample, female respondents were more likely to be unemployed in the period 2009-2015 by a significant margin.

We also account for the change of the structure of population, which might impact the inequality measure. One reason for a change could be emigration, in particular, skilled

emigration, which is sizable for most of the CESEE countries of our sample.²⁰ As skilled emigration, would potentially reduce the share of the upper tail of the income distribution, *ceteris paribus*, this would lead to a decline of income inequality. To verify whether this effect might influence our results, column (3) reports our estimations only for the group of students, which is broadly unchanged in terms of earnings. We confirm the decline of trust in this group as well. In addition, a T-test did not show significant differences between the coefficients of the two groups.

Overall, the average level of regional income inequality tends to be higher in non-EU countries as compared to EU members (average Gini of 0.41 vs. 0.32, respectively). The results in column (4) show that the coefficient for regions in non-EU countries remains negative and significant, while the Gini coefficient for EU countries is negative but turns insignificant. This might hint to a threshold effect of the significant negative correlation between trust and inequality. In a next step, as the number of income data points vary per year and regions and can bias the precision of the inequality measures despite being bootstrapped, we excluded regions with less than 100, 200 or 300 observations (one at a time) and report the results for the first case in column (5). Our results remain unchanged in terms of sign and significance as compared to the baseline results²¹. Finally, in column (6) we accounted for two distinct patterns in our data. First, we checked whether the somewhat erratic pattern of trust in the case of Hungary (see Figure 5) impacts the overall results. Second, we also dropped Serbia from the sample to check whether the strong downward adjustment in income inequality (see Figure 6) might have impacted our results. Both hypotheses proved to be wrong and the negative correlation between the probability to trust national governments and income inequality remained.²²

²⁰According to Atoyán et al. (2016), cumulative real GDP growth would have been 7 percentage points higher on average in CESEE in the absence of emigration during 1995 and 2012 with Albania, Croatia, Bulgaria and Romania being particularly affected.

²¹An alternative for testing the impact of regional inequality measures would be to bootstrap also the estimations next to bootstrapping the income inequality measures. On the country level the representativeness is warranted by the setup of the survey.

²²We also included an election dummy to test for the impact of the election cycle. However, this proved to be insignificant.

Table 5: Results across sociodemographic and country groups

	(1)		(2)		(3)		(4)		(5)	(6)	
	non skilled	skilled	female	male	students	non-students	EU countries	Non-EU countries	more 100 obs	w/t Serbia	w/t Hungary
Regional Gini	-0.645** (0.296)	-0.121 (0.282)	-0.632** (0.294)	-0.382 (0.271)	-0.498* (0.303)	-0.556** (0.376)	-0.218 (0.535)	-0.610* (0.328)	-0.723** (0.303)	-0.054* (0.461)	-0.578** (0.281)
Top 20%	-0.621* (0.451)	-0.145 (0.316)	-0.594* (0.323)	-0.398 (0.304)	-0.654* (0.400)	-0.517* (0.315)	-0.196 (0.601)	-0.573** (0.339)	-0.741** (0.303)	-0.746* (0.461)	-0.561* (0.281)
Bottom 20%	3.137** (1.321)	0.234 (1.421)	3.236*** (1.311)	1.509 (1.242)	0.924 (1.788)	2.844** (1.264)	0.464 (1.897)	3.328** (1.412)	3.206** (0.303)	1.04** (0.461)	2.749** (1.351)
ICC (regional)	0.077	0.057	0.065	0.076	0.091	0.070	0.034	0.071	0.075	0.071	0.099
ICC (regional)	0.075	0.057	0.063	0.075	0.091	0.071	0.034	0.072	0.074	0.071	0.098
ICC (regional)	0.081	0.057	0.068	0.077	0.092	0.077	0.035	0.071	0.073	0.071	0.099
<i>N</i>	80264	16921	51273	45912	8470	88715	51322	45863	89031	87502	87578

Dependent variable: trust in national governments (dummy variable being one if respondents trust or somewhat trust the national government). Estimation method: multi-level modeling. Column (1) includes all respondents with low or medium education. Column (2) compares female and male respondents, column (3) students and non-students, column (4) non-EU vs. EU countries, column (5) excludes regions with less than 100 observations, column (6) excludes Serbia and Hungary. All estimations include sociodemographics and sentiments control variables. Country, time fixed effects and a constant included. Robust standard errors in parentheses.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

8 Concluding remarks

Against the background of a broadly increasing distrust in national policies, the issue of the determinants of institutional trust in Europe and in the CESEE region, in particular has recently attracted attention from academics and policymakers alike. The issue gained importance also due to the current policy discussion on the new design of systems of direct income taxation in some of the CESEE countries. Therefore, using unique evidence from the OeNB Euro Survey, this paper adds to the discussion and sheds light on the correlation of the distribution of income and trust in national governments in ten CESEE countries between 2009 and 2015. Our study enters uncharted waters in several aspects. First, we are able to construct measures of income inequality, in particular regional income inequality - an endeavor undertaken for the first time for some of the countries in our sample. Second, we analyze the determinants of trust in national governments, which is still an underresearched topic for the CESEE countries. We apply standard techniques such as estimating a Pareto-shaped distribution for top incomes, imputation of missing values to correct for unit non-response and bootstrapping to get more reliable estimates of regional income inequality. Third, our study is one of the first to make use of comparable income data across countries and regions and over a longer period of time, including the 2008/09 crisis. Finally, we apply multi-level methodology in order to exploit the various dimensions of the data (i.e individual, regional, country-level) and tackle potential problems related to endogeneity issues.

Controlling for standard variables (e.g. socio-demographics, macroeconomic developments or sentiments about past events and future developments), our results show that the probability to trust in national governments is negatively related to the level of both country and regional income inequality in the CESEE region. In addition, trust in governments is positively related to an individual's position in the regional income distribution. These results are also robust across several other measures of regional income inequality such as top and bottom income shares. Interestingly, we found that individual trust in national governments is overall lower in EU member states than in EU (potential) candidate countries. At the same time respondents in non-EU member states react stronger to an increase of income inequality.

As for the estimation of the income distribution, we applied Pareto adjustment for the first time for incomes in non-EU member states. We found the Pareto coefficient to

vary among countries and years with the Czech Republic scoring the highest (on average 4.9) and Bosnia and Herzegovina the lowest (on average 2.1), therefore highlighting the importance of the adjustment of top incomes. In addition, we found that income inequality decreased in most CESEE countries between 2009 and 2015, with the notable exceptions of Poland, Czech Republic and Croatia.

Exploring control variables at higher levels (i.e regional-, country-level) significantly contributed to the analysis by explaining up to 15% of the variance, suggesting that the use of multilevel-methods significantly enhances the explanatory power of the estimations. However, standard macroeconomic variables (e.g. GDP or inflation) have at best a weak explanatory power for trust in governments, which hints at a certain decoupling between the macroeconomic performance and trust since the crisis of 2008/2009. At the same time, the degree of economic convergence increases the probability to trust, *ceteris paribus*. Intuitively, when the level of perceived corruption is higher and the adherence to the rule of law is lower, the probability to trust diminishes in the CESEE countries. Regarding regional-level variables, sentiments about past events and future developments are not significant throughout most specifications with the exception of individuals expecting a better economic future for their country. This variable is positively and significantly linked to trust in national governments in all estimations. On the individual-level, our results indicate that the impact of age on trust in national governments reveals a CESEE-specific U-shaped pattern. Older respondents trust most, which might be explained by these individuals' experience from times when social trust was widespread (i.e. before the fall of communism). At the same time, younger respondents also trust more, which might be related to the uprise of populist parties in some of the CESEE countries, which increasingly attracts younger voters (see Algan et al. 2017). In addition, income inequality negatively correlates with trust in national governments especially for lower-skilled individuals and female respondents.

Finally, we want to emphasize that there are a number of open issues that should be dealt with in future research. First, the calculation of a country-specific threshold for the Pareto-adjustment of the top incomes would possibly counteract any under- or overshooting of the income inequality measures. Second, the analysis would benefit from a comparison of the survey data at hand with administrative data on income (e.g. tax records) to have a better idea of our estimates of income inequality. Third, future work should try to elicit information concerning interpersonal trust and trustworthiness, as well as a comparison

to reference groups in order to corroborate and extend the findings. Finally, another possible extension would be analyze the interdependence of trust in national governments and perceived income inequality. Despite these various extensions of the analysis, we are confident that our results unequivocally showed the negative correlation between trust in governments and income inequality for the countries in CESEE.

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Appendix

Table 6: Variable description

Individual level. Source: OeNB Euro Survey	
Trust in national governments	Dummy variable taking value of one if respondents trust or somewhat trust the national government
Position in income decile	Variable ranging between 1 and 10 and expressing in which decile of the regional income distribution the respondent is positioned.
Age	Dummy variables taking value one if respondents were in one of the age ranges (14-18 years old, 19-34 years old, 55+ years old). Omitted category is 35-54 years old.
Female	Dummy variable that takes the value one if the respondent is female.
Size of household (one person,two persons)	Dummy variables that take the value one if the respondents live in a single household or in a household with two people. Omitted category: household with three or more people.
Children	Number of children aged 6 years and younger.
Head of household	Dummy variable that takes the value one
Education (low, medium, high)	Dummy variables, degree of education (university level, medium level and basic education), omitted category: education low.
Employment status	Dummy variable coded as one if respondent belongs to selected occupational category (student, unemployed/other, working, self-employed). Omitted category: retired
Skilled	Dummy variable for respondents with a university level degree of education, zero otherwise.
Regional level. Source: OeNB Euro Survey	
Regional Gini coef	Variable measuring income inequality constructed per region and year.
Top 1% income share	Variable measuring income share of top one percent constructed per region and year.
Top 10% income share	Variable measuring income share of top decile constructed per region and year.
Top 20% income share	Variable measuring income share of top quintile constructed per region and year.
Bottom 10% income share	Variable measuring income share of bottom decile constructed per region and year.
Bottom 20% income share	Variable measuring income share of Bottom quintile constructed per region and year.
LC stable and trustworthy	Dummy variable taking the value of one if the respondent perceives the local currency to be stable and trustworthy in the coming five years.
Memories of restr deposits	Dummy variable taking the value of one if the respondent remember times where the access to deposits was restricted

Continued on next page

Table 6 – *Continued from previous page*

Fin sit of household	Dummy variable taking value of one if respondent expects that the financial situation of his/her household to improve in the coming 12 months.
Econ sit my country improve	Dummy variable taking value of one if respondent expects that the economic situation of the country will improve in the following five years.
Trust index	Index giving the average regional share of respondents trusting either police or banks in a region. Source: OeNB Euro Survey.
Trust in EU	Regional share of people trusting in the EU. Source: OeNB Euro Survey.
Implied corruption	Regional share of people giving an affirmative answer to the question on whether it is widespread in the own country to pay cash to avoid taxes. Source: OeNB Euro Survey.
Trust in police	Dummy variable taking value of one if respondents trust or somewhat trust the police
Regional unemployment	Share of unemployed in total employment defined in the survey as the sum of unemployed and unempoyed respondents.
Country level	
Country Gini coef	Variable measuring income inequality at the country-level per year. Source: OeNB Euro Survey, own estimation.
GDP per capita	GDP in ppp per capita. Source: AMECO database.
Rule of law	Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence, Balance statistics varying between -2.5 (weak) and +2.5 (strong). Source World Governance Indicators (World Bank).
EU membership	Dummy variable being one if the country is a EU member state, zero otherwise.
Corruption index	Index varying between 0 (highly corrupt) and 100 (clean). Source: Transparency International.
Minimum wage	Monthly minimum wages are in euro converted from national currencies using the irrevocably fixed rate for all years) and Purchasing Power Standards (PPS). Source: Eurostat, national statistical institutes.
Emigration	The share of long-term emigrants leaving during a reference year into total population of the home country. Data available only for EU member states in our sample. Source: Eurostat.

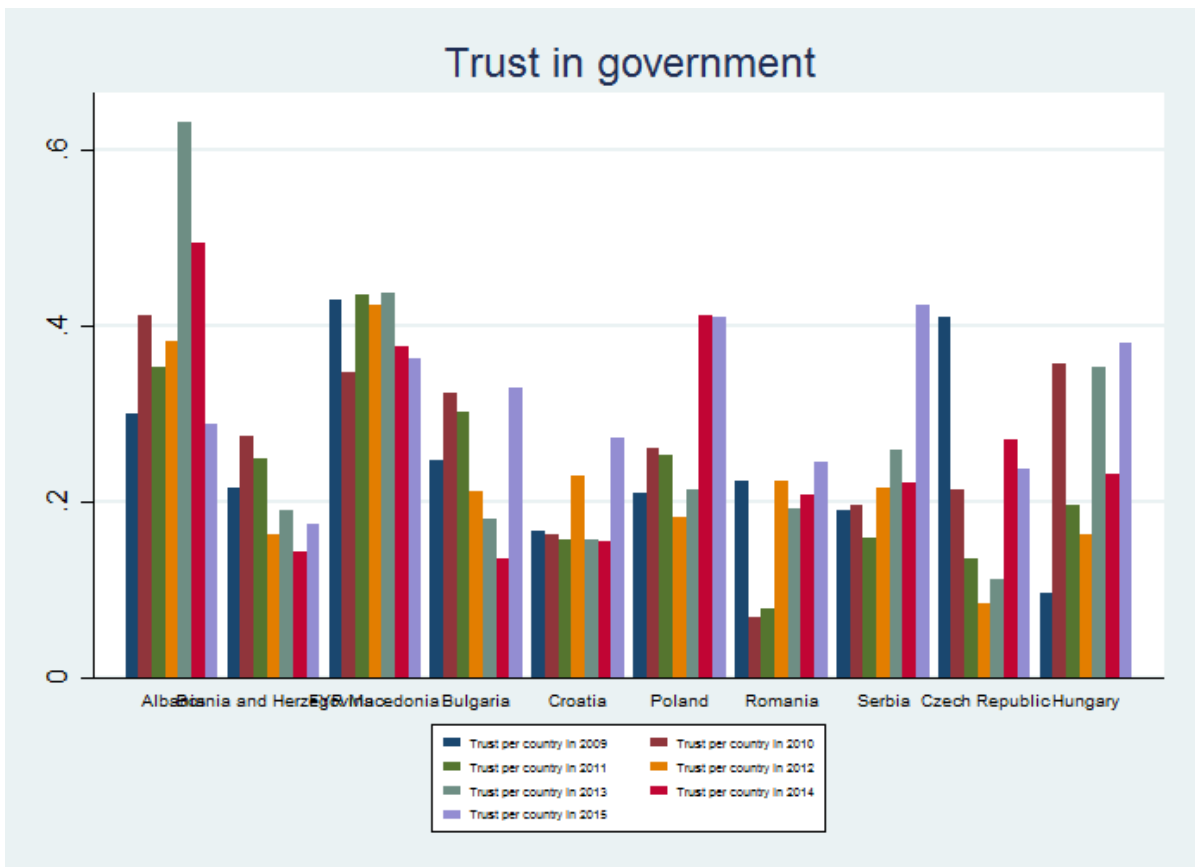


Figure 5: Trust in national governments, 2009-2015

Source: OeNB Euro Survey, own calculations.

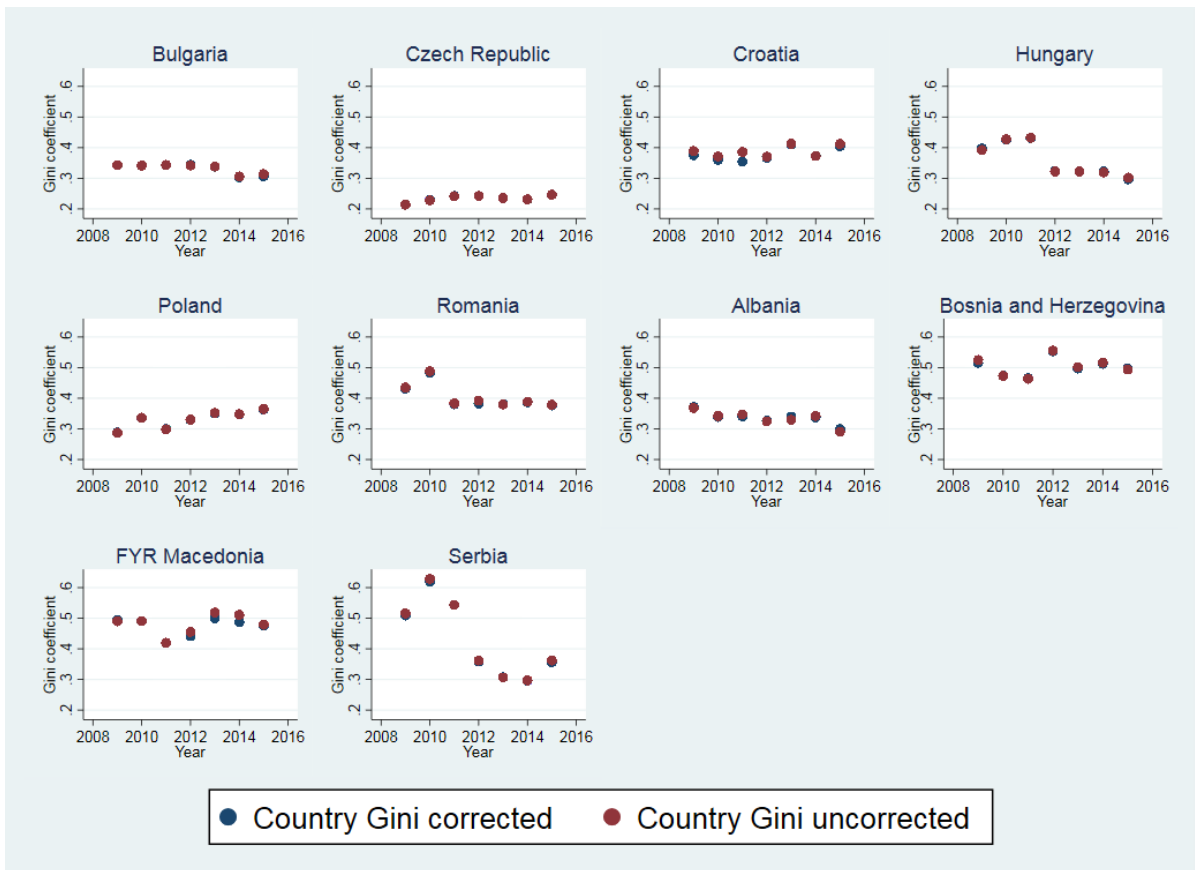


Figure 6: Gini coefficients with and without bootstrapping
 Source: OeNB Euro Survey, own calculations.

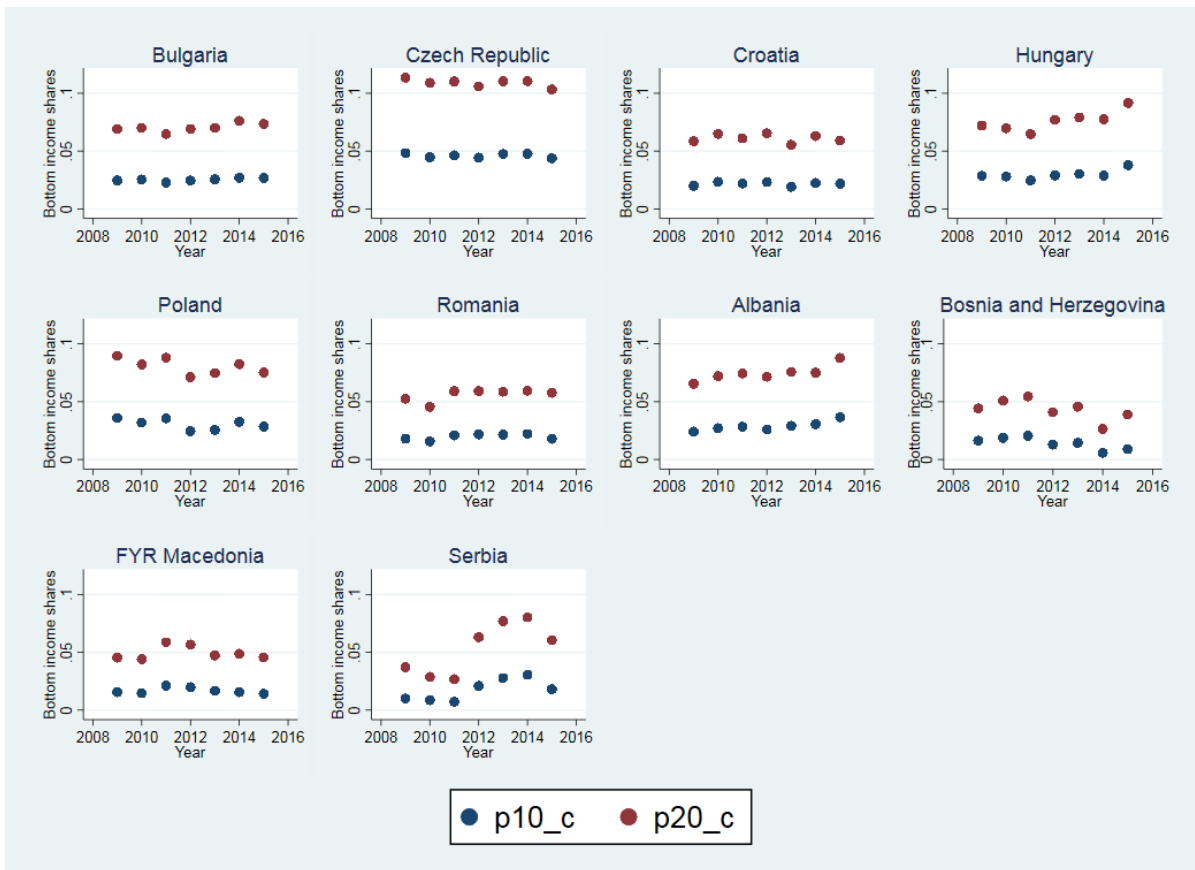


Figure 7: Bottom shares of income in CESEE
 Source: OeNB Euro Survey, own calculations.

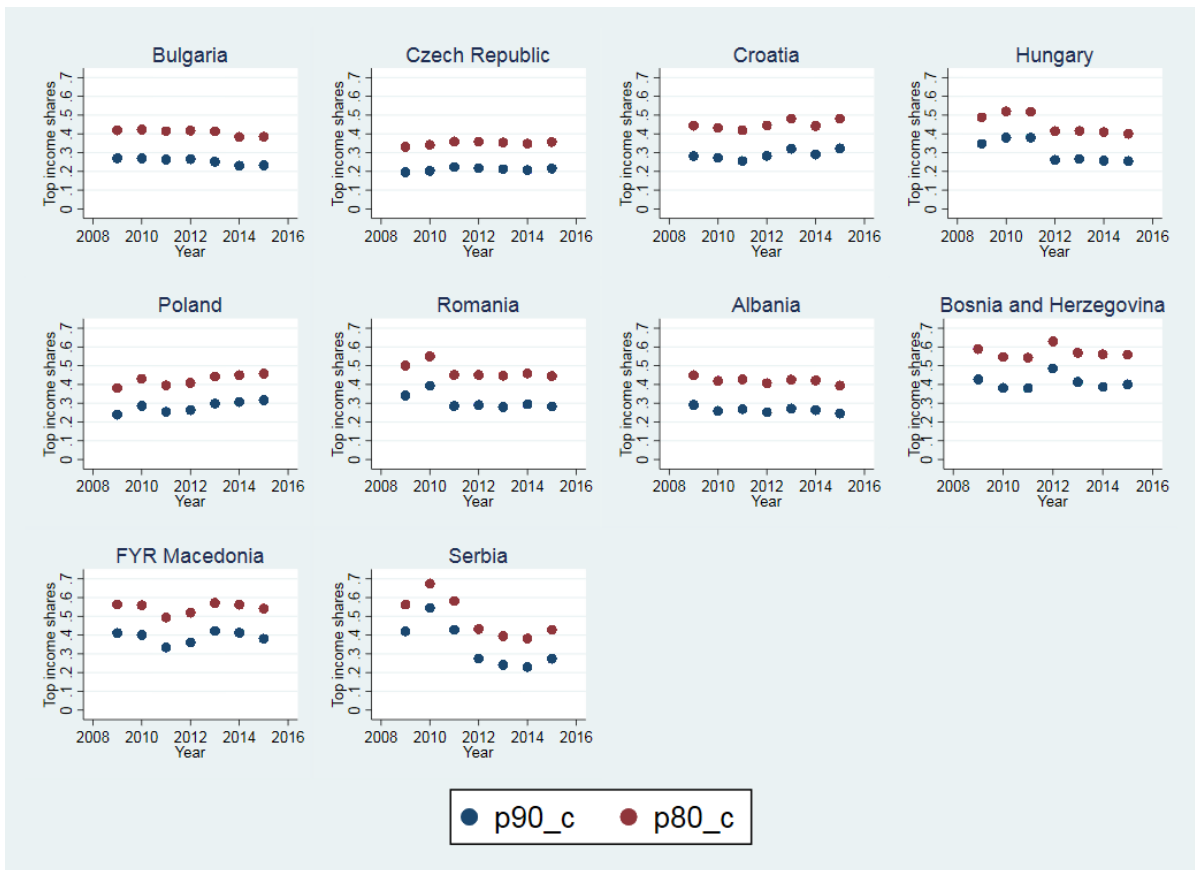


Figure 8: Top shares of income in CESEE
Source: OeNB Euro Survey, own calculations.

Table 7: Trust in national government by socio-demographic groups (averaged over 2009 to 2015), in %

	Albania	Bosnia	Macedonia	Bulgaria	Croatia	Poland	Romania	Serbia	Czech Republic	Hungary
Average	38.92	22.25	40.28	25.99	17.70	26.52	15.69	21.92	22.17	24.19
Age										
14 to 34 years	39.31	22.39	40.13	26.39	17.75	26.13	15.52	21.88	22.39	23.68
35 to 53 years	38.75	22.31	40.41	26.21	17.72	26.27	15.36	21.65	22.13	24.56
55 years and older	38.65	22.12	40.22	25.43	17.71	27.54	16.02	22.19	21.95	24.17
Net household income										
Low income	38.64	22.00	40.65	25.93	17.74	26.49	16.00	20.85	22.49	24.11
Medium Income	39.38	22.33	39.54	26.47	17.84	26.57	15.59	22.30	22.00	24.16
High Income	38.69	22.43	40.51	25.47	17.51	26.48	15.46	23.20	21.96	24.36
Employment status										
Retired	38.68	22.13	40.28	25.09	17.62	27.43	16.10	22.07	23.29	23.81
Student	39.23	22.50	40.42	26.55	17.43	25.17	15.82	22.52	22.04	22.02
Unemployed/other	38.76	21.58	40.18	26.47	17.96	26.33	14.66	22.17	22.17	22.42
Employed	38.52	22.92	40.26	26.34	17.70	26.42	15.62	21.74	22.11	24.95
Self-employed	40.12	22.97	41.88	19.21	19.44	24.12	17.47	21.21	22.38	25.19
Education										
Low	39.31	21.63	18.89	43.51	17.39	17.15	22.31	8.54	19.25	25.08
Medium	38.85	21.03	40.46	25.62	18.38	28.61	15.98	23.57	23.39	23.65
High	38.64	22.86	40.22	25.99	17.43	25.86	15.49	21.03	22.31	24.11

Source: OeNB Euro Survey, own calculations.

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