The Effect of Income on Trust: the Evidence from 2009 Crisis in Russia

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December 2014

Abstract

This paper draws on a natural experiment to identify the relationship between income and trust. We use a unique panel dataset on Russia where GDP experienced an 8 percent drop in 2009. The effect of the crisis had been very uneven among Russian regions because of their differences in industrial structure inherited from the Soviet times. We find that the regions that specialize in producing capital goods, as well as those depending on oil and gas, had a more substantial income decline during the crisis. The variation in the industrial structure allows creating an instrument for the change in income. After instrumenting average regional income, we find that the effect of income on generalized social trust (the share of respondents saying that most people can be trusted) is statistically and economically significant. Controlling for conventional determinants of trust, we show that 10 percent decrease in income is associated with 5 percentage point decrease in trust. Given that the average level of trust in Russia is 25%, this magnitude is substantial. We also find that post-crisis economic recovery did not restore pre-crisis trust level. Trust recovered only in those regions where the 2009 decline in trust was small. In the regions with the large decline in trust during the crisis, trust in 2014 was still 10 percentage points below its pre-crisis level.

*Ananyev: Department of Political Science, UCLA. Guriev: Department of Economics, Sciences Po, Paris, and CEPR. We thank Paul Dower, Sergei Izmalkov, Vasily Korovkin, Natalia Lamberova, Paasha Mahdavi, Tatiana Mikhailova, Michael Poyker, Anton Sobolev, Alexei Zakharov, Ekaterina Zhuravskaya and seminar participants at UCLA, Frankfurt, Paris School of Economics, ECARES, Princeton, Sciences Po, Tilburg, New Economic School, EBRD, THEMA and conference participants at ISNIE Florence for helpful comments. We are grateful to the Public Opinion Foundation (*Fond Obschestvennoe Mnenie*), especially to Aleksey Churikov, Alexander Oslon, and Elena Petrenko for sharing survey data and excellent insights. We gratefully acknowledge the support of the Center for the Study of Diversity and Social Interactions at the New Economic School and the Ministry of Education and Science of the Russian Federation, Grant No. 14.U04.31.0002.

1 Introduction

In 1958, American sociologist Edward C. Banfield identified a set of norms and beliefs that allegedly held back the Southern Italian village of "Montegrano"(Banfield (1967)). According to Banfield, Montegrano residents were so deeply suspicious towards each other that any collective project became impossible and any attempt to foster civic life would be futile. In short, the economic and social development of Montegrano was impeded by the lack of what modern scholars call "social capital".

Since then, social capital has become one of the most important concepts in social science. Scholars argue that the social capital plays a key role in the production of human capital and public goods (Coleman (1988)), good governance (Putnam et al. (1994)), financial development (Guiso et al. (2004)), political participation (DiPasquale and Glaeser (1999), Berman (1997), Satyanath et al. (2013)), efficiency of the judiciary system (La Porta et al. (1997)), political accountability (Nannicini et al. (2010)), labor market institutions (Algan and Cahuc (2009)). Economists have always tried to understand, whether through these or other channels, the social capital has an impact on growth and development. Using country-level and state-level data, Knack and Keefer (1997), Zak and Knack (2001), Knack (2003), Dincer and Uslaner (2010), Algan and Cahuc (2010), Bjørnskov (2012), Algan and Cahuc (2013) studied the correlation between social capital and economic growth (or income per capita) generally finding that the social capital (in most cases quantified as generalized trust, or the propensity to trust others) is positively correlated with economic growth.

Given the substantial contribution of social capital to development and growth, it is important to understand what determines the level of social capital in the first place. Banfield's original work offered several explanations of the lack of social capital in Montegrano, but his first choice was the low standard of living. Montegrano was a poor village where 80 percent of households lived off subsistence farming. A threat of hunger was imminent. Banfield argued that the constant focus on survival led to what he called "amoral familism", or the lack of willingness to cooperate with other villagers outside the nuclear family. Banfield named poverty as the first determinant of the lack of social capital: "The dreadful poverty of the region and the degraded status of those who do manual labor ... are surely of very great importance in forming it [amoral familism]" (Banfield (1967), p. 139).[1]

There are at least two reasons to believe that income can affect social capital. First, higher incomes may lead to higher trust because better-off individuals feel more secure economically and are less averse

[1]Banfield then discussed three other factors contributing to the 'amoral familism': likely premature death, inefficient land tenure institutions, and the underdeveloped institution of the extended family. However, in the beginning of the Chapter 8 "Origins of the Ethos" he emphasized that the discussion of three other elements "is not to depreciate the importance" of the poverty and the degraded status.

to risk. Since trusting other people may bring both positive and negative returns depending on how the counterpart reciprocates, lower risk aversion may contribute to higher propensity to trust others. Second, higher incomes may lead to higher trust because individuals use income as an observable statistic to infer the degree of fairness of the world around them (and therefore the returns to trusting others).[2] Suppose that an individual's income depends on both her own contribution and on that of the rest of the world; and that the individual cannot directly observe her own productivity. Then individuals who observe higher income attach a higher probability to the scenario that the others are fair towards them.

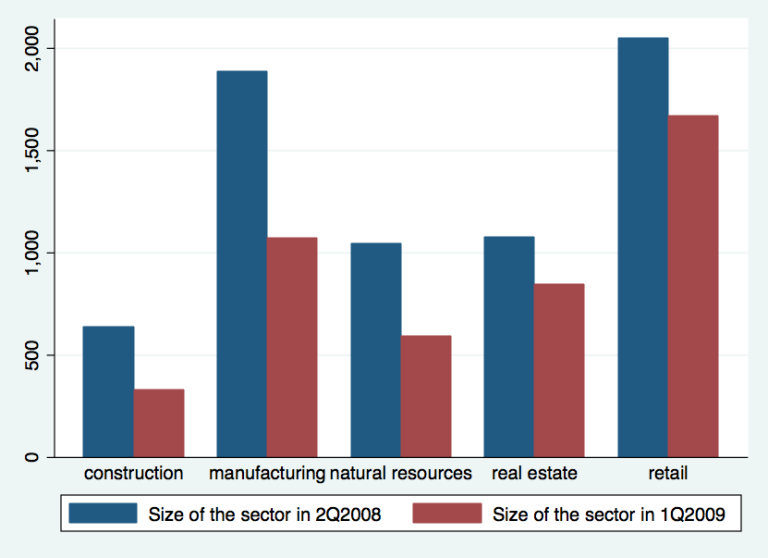
The cross-sectional evidence from the literature suggests that at both the individual level and at the state level trust is indeed associated with higher income (see, among others, Alesina and La Ferrara (2002) and Algan and Cahuc (2013)). However, establishing a causal relationship between income and trust is difficult as this requires identifying an episode where both income and trust change substantially and where the change in income can be instrumented by a factor that does not affect trust directly.

In this paper, we consider such a natural experiment. We use a large regionally representative survey administered to 34 000 Russians in the second quarter of 2008 and in the first quarter of 2009, before and after the main shock of the 2008-09 crisis. During this crisis, Russia experienced an acute drop in income; in 2009, Russian GDP contracted by 8% – the largest decline among G20 countries. The fall in GDP in the fourth quarter of 2008 and the first quarter of 2009 was 19% and 17% in annual terms (constant prices, seasonally adjusted). The Russian stock market peaked exactly in the second quarter of 2008 (the dollar-denominated RTS Index reached the all-time high 2488 on May 19, 2008; this record has never been broken afterwards). Respectively, in the first quarter of 2009 Russian market bottomed out: on Jan 23, 2009 RTS traded at only 498 — just at 20% of its value at the peak. The average value of the RTS index in the second quarter of 2008 was 2277, the average value in the first quarter of 2009 was only 592, or 74% lower.

Most importantly, the effect of the crisis was very uneven across Russia. If we ranked Russian regions by their real GDP per capita growth in 2009, the top quartile would grow by 1 percent, while the bottom quartile would decline by 20 percents. The heterogeneity of the response to the crisis was at least partially explained by the different compositions of the regional economies. As in every recession, the decrease in investment is substantially larger than that in consumption, hence the regions that were more dependent on capital-goods-producing industries, and manufacturing in general, suffered the most. At the same time, the regions specializing in consumer goods and services experienced only a moderate GDP fall or even continued to grow.

[2] A similar assumption is used in the seminal paper by Piketty (1995) who studies the effect of the learning from past income experiences on the preferences for redistribution and therefore social mobility in equilibrium.

Figure 1: Output of the Largest Sectors of the Russian Economy in the Second Quarter of 2008 and in the First Quarter of 2009.



Source: Rosstat, Bank of Russia, billions of 2008 rubles. Average exchange rate in this period was 26 rubles per U.S. dollar

Figure 1 shows the output decline in the five largest sectors of Russian economy (i.e., retail, construction, natural resources, manufacturing, and real estate) between the second quarter of 2008 (the last pre-crisis quarter) and the first quarter of 2009 (the lowest point of the cycle). The largest decline took place in manufacturing and in natural resources with both shrinking by more than 40% from the second quarter of 2008 to the first quarter of 2009. The 2008-09 crisis was accompanied by a deep fall in the world prices for natural resources; in particular, the price for oil, the main Russian export commodity, went down by a factor of three from peak (also, in the second quarter of 2008) to trough (in the first quarter of 2009).

Russia's regions vary greatly in terms of the composition of the regional GDP: in 9 out of 66 regions in our sample the share of manufacturing in GDP is below 10 per cent, while in two regions the share of manufacturing is more than 50 per cent. The variation is inherited from Soviet industrialization and is plausibly exogenous to the events of 2008-09. This allows constructing an instrument for the potential impact of crisis on income. We use the data on the composition of the Soviet economy compiled by Brown et al. (1993) from the last Soviet industrial census of 1989. For each region of Russia, we use the share of employment in 1989 in (i) production of industrial machinery and equipment (SIC code 35), (ii) metal products (SIC code 33), and (iii) oil and gas (SIC code 13). High share of employment in the first two sectors in 1989 is a good predictor of the share of manufacturing and capital goods producing industries in

2008. Similarly, the share of employment in oil and gas in 1989 is a good predictor of oil and gas output in 2008. The Soviet industrial structure turns out to be a strong instrument for the change in income between the middle of 2008 and the beginning of 2009: the first-stage F-statistic is above 10, and the bias of 2SLS is safely below 15% of OLS estimation, according to Stock-Yogo critical values for weak identification (Stock and Yogo (2002))[3].

After instrumenting the change in regional income with the Soviet employment in manufacturing and oil and gas, we find that the effect of change in income on change in trust is statistically significant and large in magnitude. Controlling for other conventional determinants of trust, we show that 10 percent decrease in income is associated with 5 percentage point decrease in the share of respondents who say that most people can be trusted. For Russia, it is a large effect: indeed, the average level of trust in our data is 34 per cent in 2008 and 19 per cent in 2009.

In order to understand the persistence of the destruction of the social capital during the 2009 crisis, we commissioned another survey of the same sample of regions in April 2014. By that time, Russian economy recovered after 2009 shock; Russia's GDP even exceeded the pre-crisis level. We found that in the regions where trust declined moderately during the 2009 crisis, trust did reach and even exceeded the pre-crisis levels (by 1.5 percentage points). However, in the regions where the 2009 shock resulted in the large decline in trust, the impact of the shock still persisted in 2014. In the latter regions, trust in 2014 was 10 percentage points below the pre-crisis levels. Our evidence therefore suggests that large shocks to trust may have long-lasting effects.

In this sense, our paper contributes to the literature on the long-run impact of recessions on employment (Røed (1996), Røed (1997), Blanchard and Summers (1986)). In particular, our paper provides evidence on a channel through which this effect might operate: recessions destroy social capital that is needed for productive cooperation. Our results are consistent with Giuliano and Spilimbergo (2014) who show that people facing recessions and macroeconomic disasters in their formative years have distinctly different beliefs — supporting government redistribution and voting for left-wing parties. Our results are also consistent with Fisman et al. (2013) who show in a laboratory setting that people who experience losses are more likely to behave selfishly.

In sum, we demonstrate that trust can change quickly in response to economic shocks, and that the implications of those shocks are persistent. This conclusion is new since most of the scholarship on this topic emphasizes deep historical roots of social capital. Following Putnam et al. (1994), who famously attributed

[3]All estimations have been done in ®Stata using *ivreg2* package (Baum et al. (2007)).

low levels of social capital in the Southern Italy to the legacy of late-medieval autocratic Norman regime, authors demonstrate that norms and values today are influenced by the legacies of colonial era (Nunn and Wantchekon (2011)), Black Death in Europe (Voigtländer and Voth (2011)), Pale of Settlement in Imperial Russia (Grosfeld et al. (2012)), communism in Eastern Europe (Pop-Eleches and Tucker (2011)), Hindu caste system (Hoff et al. (2011)).

These studies have rather pessimistic policy implications. If social capital is determined by long-term history, then the government's capacity to build social capital is limited. While we do not disagree with those results, our analysis suggests that social capital does have a substantial malleable component that can be influenced by economic policies. For example, if during economic crisis government undertakes generous counter-cyclical fiscal policy, it can prevent the destruction of social capital and thus preclude the long-lasting negative effects of economic shocks.

Our paper therefore contributes to the debate between "Putnam I" and "Putnam II". As discussed in Algan and Cahuc (2013), "Putnam I" (following Putnam et al. (1994)) states that trust is very stable over time, and is to a large extent determined by history, while "Putnam II" (after Putnam (2001)) argues that trust can change substantially in a shorter period of time. While these views do not need to contradict each other, our study can be interpreted as an attempt to quantify the magnitude of "Putnam II", as we show that trust does respond to economic shocks very quickly and estimate this effect.[4] On the other hand, in line with "Putnam I", we also find that large negative shocks to trust may be persistent with trust remaining lower even after income recovers after the crisis.

We also make a methodological contribution to the research on the relationship between social capital and growth. Most of this literature is based on cross-sectional OLS regressions and therefore cannot overcome the issue of causality. As both growth and social capital depend on a multitude of social and political characteristics, it is very hard to come up with a convincing instrument.[5] One notable exception in this literature is Algan and Cahuc (2010) who use the data on the origin of immigrants coming to the United States and timing of their families' arrival to the US. Similarly to the previous studies (e.g. Rice and Feldman (1997), Putnam (2001), Guiso et al. (2006)), Algan and Cahuc (2010) find that the social capital of the US immigrants is correlated with the social capital in their home countries and therefore can be used

[4]Stevenson and Wolfers (2011) also find a relationship between social capital, namely trust in government and financial institutions, and economic shocks during the recent crisis and show that state-level economic shocks do result in lower trust in institutions. Our analysis is different as we study generalized social trust rather than trust in institutions, and that we examine an economy where economic shocks were significantly larger and more heterogeneous. Also, we use an instrument for economic shocks.

[5]See Durlauf (2002), Durlauf and Fafchamps (2005), and Blume et al. (2010) on the methodological challenges in the econometric research on social capital.

as an instrument for the inherited trust in their countries of origin. They show that inherited trust explains a large part of variation in economic performance in 48 countries. Our paper also uses the instrumental variable approach but we consider the opposite question — whether economic growth influences trust.

We should make two caveats. First, social capital is a broad concept; in this paper we study a very specific and well-defined aspect of social capital – "generalized social trust", the answer of survey respondents to the question *"Do you think most people can be trusted or one cannot be too careful dealing with other people?"* There are other dimensions and measurements of social capital (e.g., membership in formal and informal clubs and associations) (Putnam (2001), Skocpol and Fiorina (1999), Skocpol (2003)). Guiso et al. (2010) suggest to introduce a narrower definition – that of the "civic capital" or the set of beliefs that promote cooperation and help overcome free-riding problem. Aghion et al. (2010) understand civic behaviour in a similar way and show that it can be a substitute for regulation. Both Guiso et al. (2010) and Aghion et al. (2010) suggest that one way to measure civic capital is indeed to administer surveys on generalized trust.

Our second caveat is that our quasi-experimental setting only allows to study the *determinants* of change in trust and not its *implications*. As crises and recessions have many negative social implications, our data do not allow separating the impact of the fall in trust and direct effect of income shocks. In this paper, we only identify the effect of income on trust; we rely on the large body of research discussed above that shows that trust is important for the political, economic and social development.

The rest of the paper is structured as follows. Section 2 provides a brief background on the Russian crisis of 2008-09 that motivates our choice of the instruments. In Section 3 we discuss hypotheses, econometric specifications and data. In Section 4 we report the main results. In Section 5 we carry out placebo tests and robustness checks. Futhermore, we provide evidence that the exclusion restriction holds. We also show that large changes in income and trust during the crisis are also observed in other countries. We find that the cross-sectional evidence from the Life in Transition Survey (covering 35 East and West European countries) is consistent with our results. We also estimate cross-sectional regressions and show that the results are comparable to those in Alesina and La Ferrara (2002) who use similar data on the US. In Section 6 we study the evolution of trust in Russian regions after the crisis and analyze the evolution of trust after the crisis. Section 7 concludes.

2 The Spatial Dimension of the 2008-09 Crisis in Russia

In this paper, we view the global economic crisis of 2008 and 2009 as a "natural experiment" that helps us identify the effect of income on trust. While there are many explanations of the crisis' causes, for the purpose of this study we only need to assume that the crisis was global, and that the crisis has not originated in Russia.

During the crisis, GDP of the advanced economies declined by 3 percent in 2009; according to the International Monetary Fund's World Economic Outlook Database, this was the only year since 1980 when advanced economies had a negative GDP growth. Major stock market indices plummeted nearly by half from peak to trough.

In Russia, the problems were much more acute than in the other large economies. Annual GDP went down by 8 percent in 2009, constituting the largest decline in G20. The shock was not only huge, but sudden: Russian authorities, public, and the business community were caught by surprise. Treisman (2012) reports that, according to the Renaissance Capital (then second largest Russian investment bank), in August 2008 "Moscow was flooded with international bankers competing to provide money to Russian entities". In October, "the only financiers visiting were those trying to get their money back". According to the World Bank, net inflow of foreign direct investment in Russia fell by a factor of two: from $75 billion in 2008 to $36.5 billion in 2009.[6] The dollar-denominated RTS index of the Russian stock market fell by 80% (peak to trough).

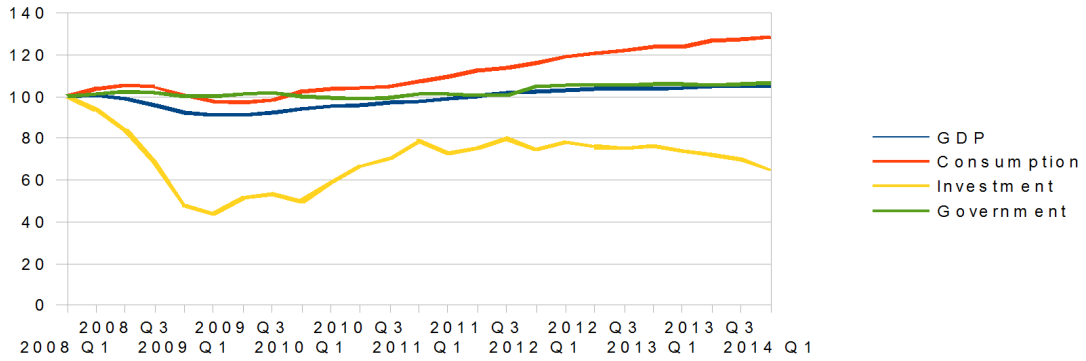
The fact that Russia was caught by surprise explains why the shock of the crisis was not initially mitigated by policy response. The first anti-crisis plan was adopted by the Government of Russia only on April 9, 2009.

The large, unexpected,and unmitigated collapse of the Russian economy creates a quasi-experimental setting for the analysis of impact of income on trust. Our data on generalized trust come from two surveys administered right at the pre-crisis peak of the second quarter of 2008 and at the bottom of the crisis in the first quarter of 2009 (see Figure 2).

The basic macroeconomics of the business cycle implies that recessions hurt investment more than consumption. Investment is typically pro-cyclical and the most volatile part of GDP. Figure 2 shows that the aggregate consumption dropped by 3% in the first quarter of 2009 compared to the second quarter of 2008, while aggregate investment dropped by 50% during the same period (both in constant prices, seasonally adjusted).

[6] http://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD

Figure 2: Russia's GDP, Consumption, Investment, and Government Spending in 2008-2014.



Note: Constant prices, seasonally adjusted, normalized to 100 in the first quarter of 2008. Source: Official data (Rosstat).

In addition to the fall of demand for investment, the global crisis brought down the global price of oil. According to the US Department of Energy, the average oil price in Europe in the second quarter of 2008 was 121 US dollars per barrel (this maximum has never been observed neither before nor after). The oil price then fell to 44 dollars per barrel in the first quarter of 2009 (its lowest level in 2005-2014) and recovered afterwards.

The crisis therefore had a very different impact on different Russian regions hurting especially strongly those dependent on capital goods and oil. In Russia, industries are heavily concentrated. In more than 20 Russian regions a single industry accounts for more than 40 percent of industrial production.[7] For example, ferrous metallurgy constitutes 70 percent of manufacturing of Lipetskaya Oblast (region in Western Russia with 1.5 million people), 65 percent of Chelyabinkaya Oblast (region in the Urals with nearly 4 million people). Overall, in an average Russian region the share of the top industry in the total industrial output is 29.3 percent.

The geographical concentration of industry is inherited from the Soviet times. The location of the main Russian industrial assets still reflects the decisions made by Soviet leadership many decades ago. For example, Lipetskaya Oblast is dependent on the production of steel making because of the Novolipetsk Steel – the third largest steel plant in Russia. This plant was built in 1934. One of the main industrial assets of Chelyabinskaya Oblast is Magnitogorsk Iron and Steel Works which was founded in 1926.

[7]Natalya Zubarevich, "Evaluation of Impact of Crisis on Russian Regions", Independent Institute of Social Policy, February 2009. http://www.cscp.ru/content/16/10944/

Path dependence of economic activity is a widely recognized phenomenon: Krugman (1991) points out that today's concentration of manufacturing in the United States reflects early colonial agricultural settlements in the Northeast. As for the Soviet regional development, Mikhailova (2012) shows that Stalin's industrial policy had long-lasting impact on the growth of Russian cities. Cities that had labor camps established by GULAG (Stalin's Main Administration of Corrective Labor Camps and Labor Settlements) within 50 kilometer distance, grew faster than the cities with the similar observable characteristics. The difference in population persists until 2010, and the effect is larger for the GULAG camps that specialized in building industrial infrastructure, than for the camps that specialized in agriculture and forestry. This evidence strongly suggests that the geographical structure of Russian economy is to a large extent pre-determined by the Soviet heritage and is exogenous to the change in trust between 2008 and 2009. This exogeneity allows us to identify the causal effects of income on trust.

Our instrument is based on the data on the composition of industrial employment in 1989 (see Brown et al. (1993)). These data come from the 1989 Census of Soviet Manufacturers, the last enterprise census carried out in the command economy before the transition began. This Census has two important advantages. First, the existing institutions of central planning still provided high reliability of the data. Second, the Census pre-dated transition to market and disintegration of Eastern Bloc and Soviet Union hence being exogenous to market forces. Following Brown et al. (1993), we do not rely on Soviet prices; we use the data on employment structure rather than on composition of ruble sales.

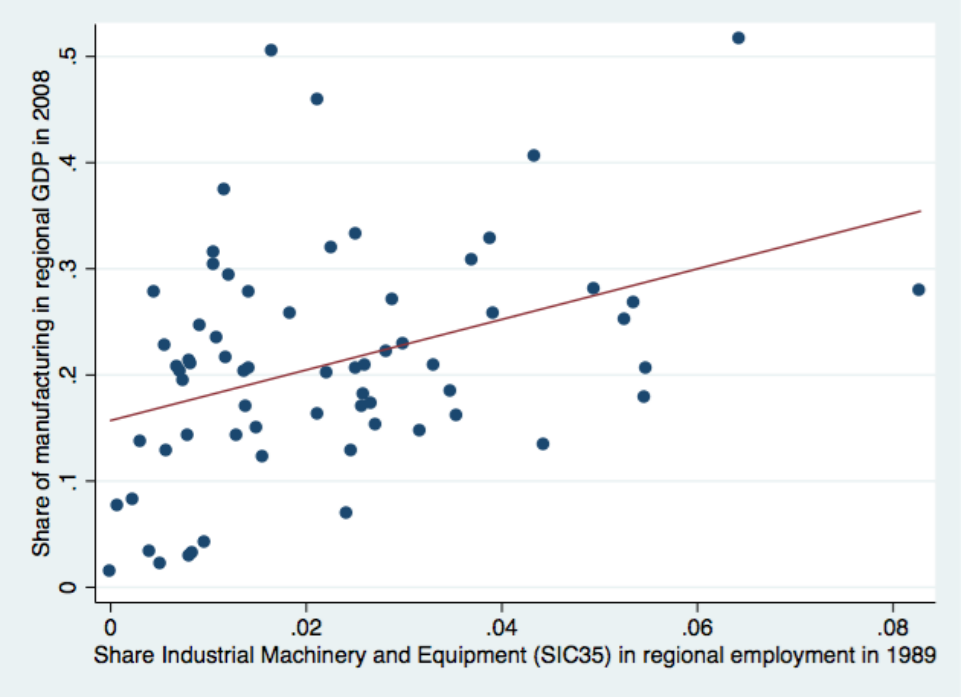
Using the 1989 survey of industrial enterprises for each region of Russia, we calculate Soviet Capital Goods Employment as this region's shares of employment in industries with Standard Industrial Classification 13, 33 and 35 ("oil&gas", "primary metal industries" and "industrial machinery and equipment", respectively) in 1989.[8]

Soviet-time employment shares turn out to be a strong predictor of today's economic structure. In particular, the relationship between employment in the Industrial Machinery and Equipment in 1989 and the share of manufacturing in regional GDP in 2008 is positive and statistically and economically significant (see Figure 3). One percentage point change in the employment in the Industrial Machinery and Equipment in 1989 corresponds to 2.4 percentage points in the share of manufacturing in regional GDP in 2008.

Following the logic above, Soviet industrial employment is also correlated with the *change* in income during the crisis. For example, Figure 4 shows the plot of change in the regional per capita GDP between 2008 and 2009 and the employment in Industrial Machinery and Equipment in 1989. One percentage point

[8] In Section 5 we also run regressions using just two out of the three instruments.

Figure 3: Employment Share in Industrial Machinery and Equipment in 1989 and the Share of Manufacturing in Regional GDP in 2008.



Source: 1989 Soviet Industrial Census, Rosstat

deviation in the share of employment in Machinery and Equipment corresponds to 1.3 percent of decrease in income during the crisis; for the Primary Metal Products the respective number is 2.6 percent; for Oil and Gas – 4 percent.

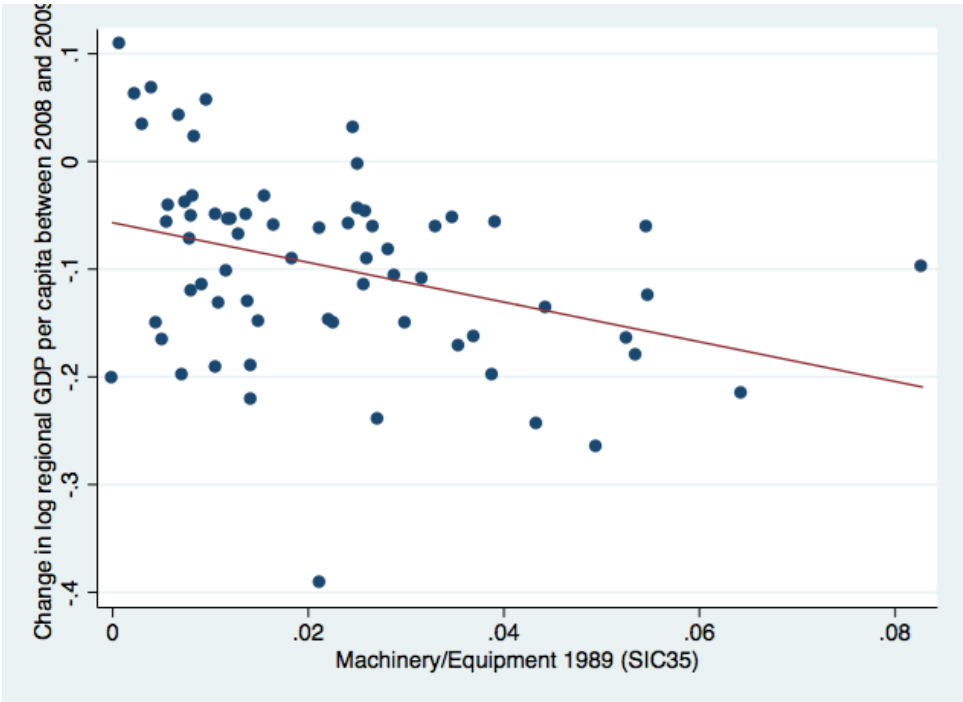
3 Hypotheses, Econometric Specification, and Data

3.1 Hypotheses and Specification

Our identification strategy is designed to test a causal notion that more people in a society start to distrust each other as their incomes go down. If this claim is true, the data should reject the null hypothesis about the absence of any statistical association between income and trust:

H0: Change in trust from 2008 to 2009 does not differ between the regions with different predicted change in income.

Figure 4: Machinery and Equipment in 1989 and Change in Regional Per Capita GDP from 2008 to 2009.



Source: 1989 Soviet Industrial Census, Rosstat

In order to test the hypothesis we need to estimate the following specification:

$$\Delta Trust_i = \alpha + \beta \Delta Income_i + \sum_k \gamma_k \Delta X_{ki} + \epsilon_i$$

Here, $Trust$ is an average level of trust in the region i at period t, $\Delta Trust_i$ is the change in $Trust$ from the second quarter of 2008 to the first quarter of 2009, $\Delta Income_i$ is the respective change in log regional income between 2008 and 2009, ΔX_{ki} are the changes (between 2008 and 2009) in the other correlates of trust established in the literature: average age (Mishler and Rose (2001)), public goods, higher education (Kumlin and Rothstein (2005)), inequality (Knack and Keefer (1997)). To reject *H0*, the coefficient at $\Delta Income$ must be large in magnitude and significantly different from zero.

As $Income$ is an endogenous variable, we use the 2SLS procedure with the first stage as follows:

$$\Delta Income_i = \kappa + \lambda SovietIndustrialStructure_i + \sum_k \mu_k \Delta X_{ki} + u_i$$

Here $SovietIndustrialStructure_i$ are the values of the instruments introduced in Section 2.

3.2 Data

Our data come from two sources: the Public Opinion Foundation (Fond Obschestvennogo Mneniya, or FOM) and the Russian State Statistics Agency (Rosstat). FOM conducts large regionally representatives GeoRating Surveys repeated quarterly since 2003. Nearly 34 000 randomly selected Russian households in 66 regions (where 90 percent of Russian population lives) are surveyed about their economic conditions and expectations, political positions, opinions on current events, and demographic characteristics.

FOM selects respondents using a three-step stratified sample. In the first step, districts are selected to ensure geographical representation (for example, the shares of urban and rural population in the sample are chosen to match the population). In the second step, the settlements are selected randomly with the probability of each settlement to be selected equal to the share of population living there. In the third step, households are selected using random walk procedure. A respondent within a household is selected using gender, age, and educational quotas calculated from the National Census.

Trust is measured by the response to the question *"Do you think that most people can be trusted or one cannot be too careful in dealing with people?"* This question was asked twice: the first time in the second quarter of 2008, and the second time in the first quarter of 2009. So, our time dimension includes just two periods. While the regions of the survey were the same both times, the households were different. So, for every region we divide respondents between into 3 locations: regional center (for example, Lipetsk in Lipetsk region), non-center urban area (for example, all the cities and towns in Lipetsk region except for Lipetsk itself), and rural area (all the villages). For each of these locations we calculate average values of the variables of interest from the individual responses. Income is measured by the regional Gross Domestic Product per capita deflated by the regional consumer price index.[9] In the robustness checks we also use nominal GDP per capita and real GDP deflated by GDP deflators; the results are similar.

Since our instrument and the income variable are measured at the regional level, we always cluster standard errors at the regional level as well.

Data on the respondents' age and level of education also come from FOM surveys. Data on inequality and homicide rates come from Rosstat (and are also therefore also at the regional level). Table 15 in the Appendix presents the descriptive statistics of the variables for both years.

[9]The survey includes a question about personal income as well: *"Declare, please, at least approximately, your income in last month per family member."* The respondents are instructed to report their income in one of 15 pre-defined intervals. These intervals are however very broad: the average difference between lower and upper bounds of the intervals is 26%. These data are therefore not suited for measuring change of income over time. In Section 5.5 we use them for cross-sectional regressions.

4 Results

4.1 Main Results

We first present the OLS results. We regress the difference in trust between 2008 and 2009 on the difference in log GDP per capita and an array for controls (Table 1). The point estimate varies from 0.12 to 0.24, and is not statistically different from zero in most specifications.

While OLS results cannot reject the absence of the effect of income on trust, these estimations cannot be interpreted causally for two main reasons that can attenuate the real effect. Firstly, there can be endogeneity, since the difference in GDP per capita and the difference in trust can be jointly determined by a change in an omitted variable. Secondly, as it is usual for difference-in-difference estimation, measurement error can be a serious problem, because GDP is persistent, especially between the two adjacent years, and the measure is imperfect, the noise can attenuate the effect.[10]

Both of these problems can be addressed through the instrumental variable approach. It alleviates the measurement error, and since the Soviet industrial structure is measured before the crisis of 2009, it is plausibly exogenous to the change in trust between 2008 and 2009.

Table 2 shows the results of the first stage of the 2SLS procedure. In all the specifications, the Soviet-time composition of employment does predict the change in income. The instruments are statistically significant and economically relevant predictors of the extent of the crisis in a region. One standard deviation (1.7 percentage point) increase in the employment share in SIC33 in 1989 implies a 4% decline in the regional income in 2009. One standard deviation (1.7 percentage point) change in the SIC35 employment share in 1989 adds another 2% change in regional income. Finally, one standard deviation (half a percentage point) change in the SIC13 employment share in 1989 adds another 2% change in regional income.

Table 3 and Figure 5 present the second stage results, where the levels of trust are regressed on predicted levels of income and a set of controls. The coefficient at the change in real GDP per capita are statistically significant in all the specifications. They are also economically significant varying from 0.48 to 0.63. This implies that a 10 percentage point fall in income (this is by how much Russian GDP contracted in real terms between the second quarter of 2008 and the first quarter of 2009) corresponds on average to about 5-6 percentage points decrease in trust. The effect is substantial given that the average level of trust in Russia is relatively low: in 2009, only 19% of FOM respondents told interviewers that most people can be trusted.[11]

[10] In order to mitigate the problem of the measurement error, we also run OLS and 2SLS regressions where we use quartiles of change in GDP instead of continuous GDP changes (see Section 5.2).

[11] Figures 8 and 9 in the Appendix present the cross-national scatter plot of trust and GDP per capita. Trust in Russia is 25 percentage points, roughly the same as the world average (25%) and very close to the cross-country trend both in 2005-08 and

Table 1: Change in Trust and Real GDP Per Capita: OLS Estimates.

	(1)	(2)	(3)	(4)	(5)	(6)
Real GDP per Capita Change	0.148	0.131	0.121	0.124	0.132	0.243*
	(0.108)	(0.104)	(0.108)	(0.106)	(0.119)	(0.134)
Homicide Change		0.00120	0.00102	0.000983	0.000654	0.000261
		(0.00176)	(0.00172)	(0.00165)	(0.00175)	(0.00170)
Gini Change			1.683	1.754	1.379	2.247
			(1.443)	(1.444)	(1.587)	(1.471)
Education Change				-0.188	-0.0769	-0.148
				(0.223)	(0.290)	(0.295)
Age Change					0.0603	0.0983
					(0.142)	(0.143)
Age Squared Change					-0.000416	-0.000809
					(0.00159)	(0.00159)
Constant	-0.132***	-0.128***	-0.127***	-0.126***	-0.128***	-0.120***
	(0.0141)	(0.0155)	(0.0151)	(0.0147)	(0.0147)	(0.0167)
Observations	198	195	195	195	195	189
R-squared	0.012	0.010	0.017	0.020	0.085	0.111

Note: The dependent variable is the change in the share of people who answered that "most people can be trusted" in a particular location between 2008 and 2009. The change in the log regional GDP per capita is taken from Russian State Statistics Agency (Rosstat). Changes in Gini and changes in homicide rate are also taken from Rosstat. Individual characteristics (Education, Age, and Age squared) are calculated using the survey responses averaged out at the level of location: regional center, non-center urban area, and rural area in a region. *Education* is a share of people with at least unfinished college degree. *Homicide rate* is the number of murders and assaults per 100 000 people in a year calculated at the regional level. In column (6), we exclude the faster growing and the fastest falling regions (Sakhalin and Vologda, respectively). Robust standard errors (clustered by 66 regions) in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 2: First Stage Estimates: Determinants of the Change in Real GDP per capita.

	(1)	(2)	(3)	(4)	(5)	(6)
Primary Metals 1989	-2.55***	-2.52***	-2.63***	-2.66***	-2.69***	-2.03***
(SIC33)	(0.67)	(0.68)	(0.66)	(0.66)	(0.66)	(0.38)
Machinery&Equipment 1989	-1.30**	-1.52**	-1.36**	-1.32**	-1.32**	-1.37**
(SIC35)	(0.61)	(0.58)	(0.57)	(0.58)	(0.59)	(0.56)
Oil&Gas 1989	-4.10***	-4.27***	-4.03***	-4.07***	-4.06***	-3.89***
(SIC13)	(1.27)	(1.26)	(1.24)	(1.24)	(1.21)	(1.16)
Homicide Change		-0.0016	-0.0018	-0.0017	-0.0019	-0.0013
		(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0014)
Gini Change			0.0038***	0.0039***	0.0039***	0.0036***
			(0.00049)	(0.00050)	(0.00051)	(0.00041)
Education Change				0.14	0.11	0.095
				(0.20)	(0.21)	(0.23)
Age Change					0.090	0.066
					(0.082)	(0.083)
Age Squared Change					-0.0010	-0.00080
					(0.00090)	(0.00091)
Observations	198	195	195	195	195	189
R^2	0.380	0.429	0.466	0.469	0.474	0.428

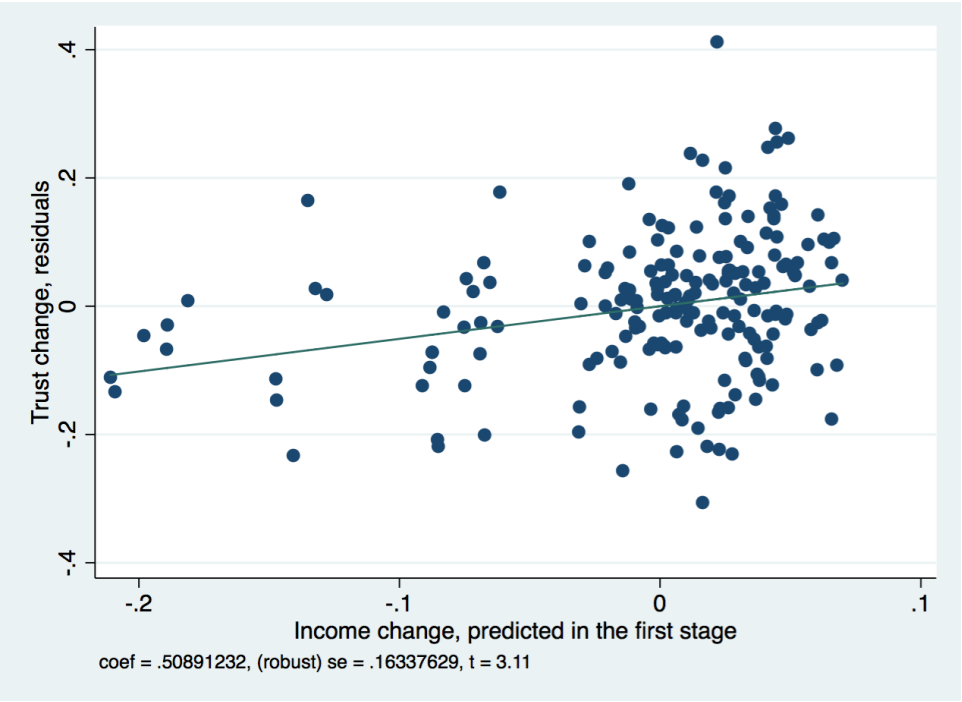
Note: The dependent variable is the change in the log regional real GDP per capita between 2008 and 2009. All explanatory variables are calculated using two repeated cross-sections of 66 Russian regions. Individual characteristics (Education, Age, and Age squared) are averaged out at the level of location: regional center, non-center urban area, and rural area in a region. *Education* is a share of people with at least unfinished college degree. *Gini* is the regional Gini coefficient. *Homicide rate* is the number of murders and assaults per 100 000 people in a year calculated on a regional level. In column (6), we exclude the faster growing and the fastest falling regions (Sakhalin and Vologda, respectively). Robust standard errors (clustered by 66 regions) in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3: Second Stage Estimates: Determinants of Change in Trust.

	(1)	(2)	(3)	(4)	(5)	(6)
Real GDP Per Capita Change	0.48**	0.53***	0.53***	0.53***	0.51**	0.71***
	(0.20)	(0.20)	(0.20)	(0.20)	(0.21)	(0.21)
Homicide Change		0.0025	0.0027	0.0027	0.0022	0.0017
		(0.0019)	(0.0019)	(0.0019)	(0.0018)	(0.0018)
Gini Change			-0.0031***	-0.0031***	-0.0029***	-0.0036***
			(0.00086)	(0.00085)	(0.00081)	(0.00087)
Education Change				-0.22	-0.11	-0.18
				(0.26)	(0.33)	(0.37)
Age Change					0.047	0.088
					(0.14)	(0.14)
Age Squared Change					-0.00026	-0.00066
					(0.0015)	(0.0016)
Observations	198	195	195	195	195	189
F-statistic (excluded instruments)	10.9	12.2	11.8	12.1	12.5	22.4

*Note:*All variables are calculated using two repeated cross-sections of 66 Russian regions. Individual characteristics (Trust, Education, Age, and Age squared) are averaged out at the level of location: regional center, non-center urban area, rural area in a region. *Education* is a share of people with at least unfinished college degree. *Gini* is the regional Gini coefficient. *Homicide rate* is the number of murders and assaults per 100 000 people per year calculated at the regional level. In column (6), we exclude the faster growing and the fastest falling regions (Sakhalin and Vologda, respectively). In all specifications, Hansen J test of overidentification never rejects the null hypothesis. Robust standard errors (clustered by 66 regions) in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Figure 5: Second Stage Results: Specification (5) from Table 3, Residuals of Trust Change and the Predicted Income Change (Instrumented by 1989 Employment Shares of SIC33, SIC35 and SIC13).



4.2 Channels of Impact of Income on Trust

Income can affect trust through at least two mechanisms that we described in Introduction. First, as risk aversion usually decreases with income, a lower income may make individuals more risk-averse and therefore less prone to trust others. Second, a decrease in income may result in individuals' updating of their beliefs about the fairness of the world hence reducing their willingness to trust others.

In order to distinguish between the two stories, we estimate the differences in the effect of change in income on change in trust for different categories of individuals. In particular, we test whether the effect is stronger for subsamples stratified by age, education and personal income.

The second mechanism (related to learning/inference of the fairness of the world) should be more pronounced for younger individuals (who are early on in the process of forming their beliefs about the outside world) and less important for the educated individuals (who may have other signals about the outside world rather than just their own income).

The predictions regarding the first mechanism (related to risk-aversion) are less clear and depend on the

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functional form of the utility function. Indeed, given the income, the older and the poorer individuals are more risk-averse. However, the effect of age on the marginal change of risk-aversion to change in income depends on the utility function's third derivative. For a standard utility function with a constant relative risk aversion the first mechanism should be more salient for the older individuals (they should be more risk-averse) and for the poorer individuals.

The results for the subsamples are presented in the Table 4. Each column presents the second stage estimates where the first stage is the same as in the Table 1, specification (5). The dependent variable is the average level of trust within the subregion for the individuals with a specific characteristic (low, medium, high income, young, middle-aged, senior, and with and without higher education). In the case of income and age, we divide the sample into three equal terciles, while in the case of education we just separate those with and without tertiary education.

Table 4: Results for the Subsamples: Second Stage IV Estimates.

	Income			Age, years			Education	
	Low	Medium	High	18-34	35-53	54+	Low	High
Real GDP	0.67*	0.36	1.05**	0.83*	0.82**	0.53	0.72**	0.91
Change	(0.35)	(0.36)	(0.46)	(0.44)	(0.36)	(0.35)	(0.34)	(0.56)
Homicide	0.0027*	0.00066	0.0012	0.0020	0.0013	0.00058	0.0015	0.0012
Change	(0.0015)	(0.0026)	(0.0023)	(0.0020)	(0.0020)	(0.0023)	(0.0016)	(0.0029)
Gini	-0.18**	-0.062	-0.61***	-0.25**	-0.18*	-0.36***	-0.28***	-0.10
Change, x100	(0.086)	(0.096)	(0.12)	(0.11)	(0.094)	(0.090)	(0.086)	(0.14)
Education	0.096	-0.034	-0.79	-0.52	-0.26	0.051	-0.27	-0.55
Change	(0.29)	(0.35)	(0.56)	(0.54)	(0.39)	(0.28)	(0.36)	(0.49)
Age	0.084	0.14	0.010	-0.021	0.011	0.14	0.032	0.041
Change	(0.18)	(0.26)	(0.25)	(0.20)	(0.15)	(0.17)	(0.14)	(0.32)
Age Squared	-0.063	-0.12	0.015	0.055	0.015	-0.14	-0.0092	-0.024
Change, x100	(0.20)	(0.30)	(0.28)	(0.22)	(0.16)	(0.19)	(0.16)	(0.36)
N	195	193	195	195	195	195	195	195

Note: All specifications, independent variables and sources of data are the same as in Table 3. The dependent variables is the change of trust for the subsample of individuals from the bottom tercile, the medium tercile and the top tercile of income, respectively, for young, middle-aged and senior, and for the subsamples with and without higher education. Robust standard errors (clustered by 66 regions) in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

We find that the effect of income on trust holds for the individuals with higher income, lower education, and for those of younger age. The second and the third results are consistent with the inference mechanism. The first and the third result are in contradiction with the risk aversion mechanism. Overall, the results

presented in the Table 4 are in support of the "inference" explanation.

Our results on the effect of age should be treated with caution. Since we only have one historical episode we cannot distinguish between the age effect and the cohort effect. Older Russian may have had very different life experiences from those of the younger Russians. Unfortunately, measuring the effect of differential life experiences is impossible without a long-term panel of data on trust.

5 Additional Evidence

5.1 Placebo Tests

In this section we test whether our result (the correlation between decline in income and decline in trust) is not an artefact of correlation between trends in these two variables. To check this, we use yet another GeoRating survey by FOM. In the third quarter of 2007 the survey included a question on trust although it allowed for fewer response categories (this is why we do not use it in the main regression).

If our results are driven by the trends in income and trust that are unrelated to the effect of income on trust, we should find a correlation between the change in income instrumented by the structure of the regional economy and the change in trust between 3Q2007 and 2Q2008.

We estimate an instrumental variables specification where the change in income is still instrumented by the 1989 industrial structure, but in the second stage we study the impact of the change in income on the change in trust between 2007 and 2008. Effectively, we test whether our results would still hold for the period between 3Q2007 and 2Q2008. If we found significant positive coefficients in the second stage, it would imply that the relationship between income and trust is due to unobserved factors unrelated to the crisis. Indeed, in Russia the period between 3Q2007 and 2Q2008 was still a period of growth rather than that of recesssion. According to official data, Russian GDP in 2Q2008 was 7% higher than in 3Q2007 (in constant prices, seasonally adjusted).

The second stage results are presented in Table 5. The coefficients are negative and insignificant. This shows that our results presented in Table 3 are not due to pre-existing trends but are indeed related to the shock of crisis that took place between the second quarter of 2008 and the first quarter of 2009.

Table 5: Placebo Tests, Second Stage Estimates.

	Dependent Variable: Change in Trust in 2007-08					
	(1)	(2)	(3)	(4)	(5)	(6)
Real GDP Change	-2.70	-3.33	-7.25	-6.63	-6.85	-4.83
	(5.66)	(6.35)	(24.4)	(21.5)	(23.6)	(11.4)
Homicide Change		-0.0063	-0.030	-0.027	-0.028	-0.020
		(0.022)	(0.11)	(0.098)	(0.11)	(0.055)
Gini Change			15.2	14.3	14.6	9.97
			(48.7)	(43.5)	(47.3)	(22.0)
Education Change				0.53	0.52	0.54
				(1.23)	(1.25)	(0.86)
Age Change					-0.27	-0.26
					(1.02)	(0.64)
Age Squared Change					0.0029	0.0028
					(0.011)	(0.0069)
Observations	198	195	195	195	195	189

Note: All specifications, independent variables and sources of data are the same as in Table 3. Standard errors in parentheses are clustered at the regional level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

5.2 Regressions with a Discrete Measure of Recession

In order to make sure that the results are unlikely to be driven by the measurement error (as is always a risk with difference-in-difference estimation), we re-estimate the main OLS and 2SLS specifications using a discrete measure of recession. Instead of using a continuous value of change in real GDP per capita, we use a categorical variable with 4 values: 1 – for the bottom quartile of change in GDP between 2008 and 2009 (fall in real GDP per capita between 39% and 15%), 2 – for the second-from-the-bottom quartile (fall between 15% and 9%), 3 – for the third-from-the-bottom quartile (fall between 9% and 5%), 4 – for the top quartile (GDP change from -5% to +10%).

The results of the OLS regressions are presented in Table 6. In our preferred specifications, the coefficient on a quartile of change is around 0.02 implying that one quartile change is associated with 2 percentage point of change in trust. So, the change from the bottom to top quartile is associated with 4 percentage point change in trust, while the change from minimal level of GDP change to the maximum level of GDP change is associated with 8 percentage point of change in trust.

Table 7 presents the results of 2SLS estimations where the quartile of change in GDP is instrumented by the Soviet-era industrial structure. As in the previous estimations, we find a statistically significant and

Table 6: Trust and Quartiles of GDP Change: OLS estimates.

	(1)	(2)	(3)	(4)	(5)	(6)
Quartile	0.0160*	0.0150	0.0149	0.0153*	0.0185*	0.0213**
	(0.00918)	(0.00930)	(0.00926)	(0.00912)	(0.00944)	(0.00978)
Homicide Change		0.00152	0.00136	0.00132	0.00113	0.000671
		(0.00180)	(0.00175)	(0.00167)	(0.00173)	(0.00169)
Gini Change			1.800	1.882	1.483	2.237
			(1.385)	(1.380)	(1.534)	(1.453)
Education Change				-0.209	-0.0943	-0.162
				(0.215)	(0.287)	(0.284)
Age Change					0.0491	0.0869
					(0.139)	(0.141)
Age Squared Change					-0.000274	-0.000670
					(0.00156)	(0.00157)
Constant	-0.185***	-0.176***	-0.174***	-0.175***	-0.185***	-0.193***
	(0.0255)	(0.0256)	(0.0259)	(0.0257)	(0.0264)	(0.0270)
Observations	198	195	195	195	195	189
R-squared	0.024	0.021	0.029	0.033	0.106	0.125

Note: The dependent variable is the change in the share of people who answered that "most people can be trusted" in a particular location between 2008 and 2009. *Quartile* is a quartile of change in log regional GDP per capita. The change in the log regional GDP per capita is taken from Russian State Statistics Agency (Rosstat). Changes in Gini and changes in homicide rate are also taken from Rosstat. Individual characteristics (Education, Age, and Age squared) are calculated using the survey responses averaged out at the level of location: regional center, non-center urban area, and rural area in a region. *Education* is a share of people with at least unfinished college degree. *Homicide rate* is the number of murders and assaults per 100 000 people in a year calculated at the regional level. In column (6), we exclude the faster growing and the fastest falling regions (Sakhalin and Vologda, respectively). Robust standard errors (clustered by 66 regions) in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

large effect of change in GDP on the change in trust. In our preferred specification, an increase in GDP change by a quartile is associated with 4 percentage points of increase in the change in trust. Therefore a two-quartile change (from the region with 15 percent fall in GDP to 5 percent fall in GDP) is associated with 8 percentage point fall in trust; this is similar to our 2SLS estimates with a continuous measure of change in GDP (where a 10 percent change in GDP is a associated with 5-6 percentage point change in trust.

Table 7: Trust and Quartiles of GDP Change: 2SLS Estimates, Second Stage.

	(1)	(2)	(3)	(4)	(5)	(6)
Quartile	0.0404***	0.0443***	0.0410***	0.0410***	0.0400***	0.0470***
	(0.0141)	(0.0140)	(0.0146)	(0.0143)	(0.0135)	(0.0138)
Homicide Change		0.00298	0.00267	0.00260	0.00221	0.00174
		(0.00208)	(0.00200)	(0.00189)	(0.00179)	(0.00176)
Gini Change			1.700	1.804	1.381	2.437
			(1.555)	(1.544)	(1.634)	(1.561)
Education Change				-0.261	-0.125	-0.205
				(0.229)	(0.304)	(0.308)
Age Change					0.0314	0.0708
					(0.138)	(0.140)
Age Squared Change					-5.37e-05	-0.000455
					(0.00154)	(0.00157)
Constant	-0.244***	-0.244***	-0.235***	-0.234***	-0.234***	-0.253***
	(0.0348)	(0.0332)	(0.0349)	(0.0339)	(0.0335)	(0.0329)
Observations	198	195	195	195	195	189
First Stage F-stat	15.62	16.16	13.26	14.3	16.08	15.18

Note: The dependent variable is the change in the share of people who answered that "most people can be trusted" in a particular location between 2008 and 2009. *Quartile* is a quartile of change in log regional GDP per capita. The change in the log regional GDP per capita is taken from Russian State Statistics Agency (Rosstat). Changes in Gini and changes in homicide rate are also taken from Rosstat. Individual characteristics (Education, Age, and Age squared) are calculated using the survey responses averaged out at the level of location: regional center, non-center urban area, and rural area in a region. *Education* is a share of people with at least unfinished college degree. *Homicide rate* is the number of murders and assaults per 100 000 people in a year calculated at the regional level. In column (6), we exclude the faster growing and the fastest falling regions (Sakhalin and Vologda, respectively). Robust standard errors (clustered by 66 regions) in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

5.3 Robustness Checks and Alternative Explanations

In order to test the robustness of our results, we perform a number of additional tests. First, we try to understand whether any of our three instruments is critical for our results. We remove one instrument at a time and re-estimate regressions with just two remaining instruments. The results are presented in the first three columns of the Tables 8 (the first stage) and 9 (the second stage). The first specification (using

the metal products and machinery and equipment only) is especially important as the allocation of oil and gas production may be driven by geographical characteristics that may affect change in trust through other channels.

Table 8: Robustness Checks, First Stage Estimates.

	(1)	(2)	(3)	(4)	(5)
	Dependent variable: Change in real GRP per capita				
Primary Metals 1989 (SIC33)	-2.58***	-3.11***		-2.59***	-2.73***
	(0.65)	(0.52)		(0.68)	(0.68)
Machinery&Equipment 1989 (SIC35)	-1.12*		-2.21***	-1.50**	-1.24**
	(0.59)		(0.63)	(0.61)	(0.54)
Oil&Gas 1989 (SIC13)		-3.35***	-3.26**	-4.32***	-4.05***
		(1.19)	(1.30)	(1.23)	(1.17)
Homicide Change	-0.0025	-0.0016	-0.0033	-0.0017	-0.0014
	(0.0016)	(0.0016)	(0.0020)	(0.0015)	(0.0014)
Gini Change	0.0041***	0.0046***	0.0028***	0.060	0.0037***
	(0.00049)	(0.00029)	(0.00050)	(0.14)	(0.00052)
Education Change	0.095	0.18	0.013	0.085	0.12
	(0.20)	(0.23)	(0.22)	(0.20)	(0.20)
Age Change	0.089	0.085	0.047	0.088	0.048
	(0.088)	(0.090)	(0.090)	(0.080)	(0.066)
Age Squared Change	-0.0010	-0.00098	-0.00054	-0.0010	-0.00058
	(0.00096)	(0.00098)	(0.00099)	(0.00087)	(0.00072)
Trust in 2007					0.21**
					(0.10)
Observations	195	195	195	195	195
F-statistic (excluded instruments)	15.8	22.4	7.0	12.9	12.4

Note: All specifications, independent variables and sources of data are the same as in Table 2. Standard errors in parentheses are clustered at the regional level. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

In all three cases, the effect of income on trust is significant; its magnitude does not change. In one of the specifications, the F statistic falls to 7 (this is when we only use shares of SIC38 and SIC13 sectors but drop SIC33). In the first specification where we do not use the share of employment in oil and gas, the F statistic actually increases to 15.

In the fourth column, we reproduce our results with an alternative measure of inequality, the Gini coefficient based on the self-reported income categories (see Section 5.5 for a detailed description of these

Table 9: Robustness Checks, Second Stage Estimates.

	(1)	(2)	(3)	(4)	(5)
Real GDP Change	0.48**	0.51**	0.51**	0.45**	0.51**
	(0.23)	(0.25)	(0.25)	(0.19)	(0.22)
Trust in 2007					-0.24
					(0.18)
Homicide Change	0.0021	0.0022	0.0022	0.0022	0.0017
	(0.0018)	(0.0019)	(0.0020)	(0.0016)	(0.0017)
Gini Change	-0.0028***	-0.0029***	-0.0029***	-0.79***	-0.0027***
	(0.00090)	(0.00098)	(0.0010)	(0.28)	(0.00077)
Education Change	-0.10	-0.11	-0.11	-0.018	-0.11
	(0.33)	(0.33)	(0.33)	(0.25)	(0.32)
Age Change	0.048	0.047	0.047	0.073	0.095
	(0.14)	(0.14)	(0.14)	(0.14)	(0.14)
Age Squared Change	-0.00027	-0.00026	-0.00026	-0.00059	-0.00079
	(0.0015)	(0.0015)	(0.0015)	(0.0015)	(0.0015)
Observations	195	195	195	195	195

Note: All specifications, independent variables and sources of data are the same as in Table 3. Standard errors in parentheses are clustered at the regional level. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

data). We find that the change in this Gini coefficient is negatively correlated with change in trust but its use does not affect the magnitude or the statistical significance of the impact of change in income on change in trust.

The main *alternative explanation* for our results is that the Soviet industrial structure affects change in trust during the crisis through channels different from change in income. It is entirely plausible that regions that have inherited industries specializing in capital goods production and in oil and gas differ from other regions in many respects, including the social fabric and the level of social capital. However, it is not clear why these differences should affect the *change* in trust during the crisis. If anything, these regions should have become more—rather than—less resilient to economic volatility. In order to check whether the *level* of trust matters for our estimations of the effects of change in income on trust, we carried out several tests. First, we checked whether the level of trust is correlated with our instruments. We ran a regression of the level of trust in 2007, 2008 and in 2009 on our instruments and found that the three instruments together explain less than 3% of variation in the level of trust in either year. We also found that neither of three instruments is correlated with the level of trust, except for a positive correlation between the level of trust in 2008 and the share of employment in the Primary Metals in 1989 (with F statistics equal to 5).

Our second test of this alternative explanation involved controlling for the level of trust in our main regression. The results are presented in the column (5) in Tables 8 and 9. We include the level of trust in 2007 and find that the impact of change in income on change in trust remains the same in both statistical and economic significance. The level of trust in 2007 positively affects the change in income during the crisis (i.e. the locations with higher trust had lower decrease in income during the crisis). In the second stage, the coefficient at the level of trust is not significant. This implies that controlling for the change in income the initial level of trust in 2007 has no impact on the change of trust between 2008 and 2009; nor controlling for the initial level in trust has an effect on the magnitude and the significance of the effect of change in income on change in trust.

We also checked (regressions available on request) whether the relationship between trust and income is non-linear. We ran specifications with squared change in income as well as used a semi-parametric estimation for regressions in Table Table 3. We found no non-linearities. The coefficient at squared income change is not significant, and the non-parametric relationship between change in trust and change in income (Table 3 and Figure 5) is virtually linear.

5.4 International Evidence

The results above provide evidence on the relationship between income and trust within one country. In order to understand whether these results are driven by unique features of Russia, in this section we study data from the Life in Transition Survey (LITS) run by the European Bank for Reconstruction and Development and the World Bank in 2006 and 2010. We will try to see, first, to what extent a large change in the level of trust observed in Russia in 2009 is unusual, and, second, whether the decrease in income due to the crisis has a similar effect on trust in other countries, not just in Russia.

In 2006, LITS covered 29 transition countries (including Mongolia and Turkey). In 2010, it was expanded to 35 countries adding France, Germany, Italy, Kosovo, Sweden, and the UK. In each country, the survey was administered on a representative sample of about 1000 respondents in rural and urban primary sample units (PUs) with 20 respondents per PSU (with about 2000 PSUs). Figure 6 shows the change in average level of trust in countries that participated in both 2006 and 2010 surveys along with the average annual growth rate of GDP between the two surveys. We see that large changes of trust during this period were quite common.[12] Also, except for few outliers (Slovakia plus the war-torn Georgia, Armenia, and Azerbaijan), there is a positive correlation between GDP growth and change in trust. The slope of this relationship is about 0.24 percentage point change in trust for one per cent change in GDP.

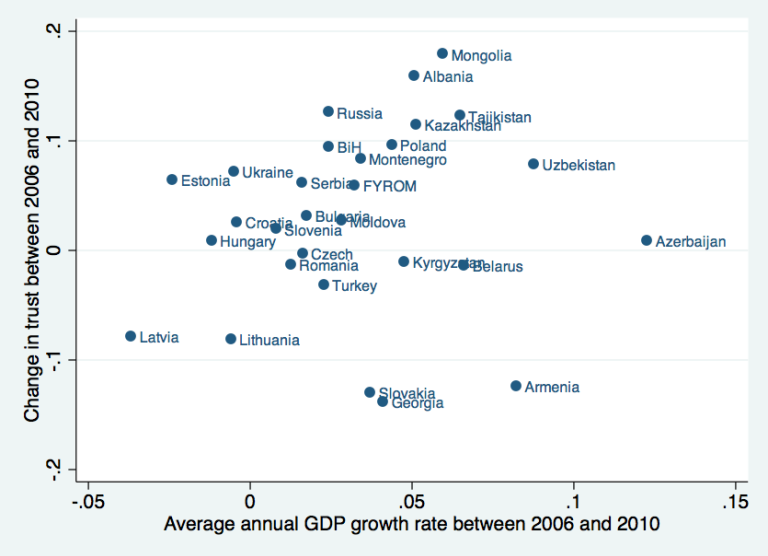
In 2006 and 2010, LITS was undertaken in different locations. Therefore we cannot carry out a difference-in-differences exercise similar to the one we did for Russia in Section 4. Also, the sample was not representative at the PSU level. Therefore the evidence in this section can only be viewed as illustrative. Yet, it is interesting to see whether the relationships between effect of the crisis, income, and trust still hold in the international data, at least in cross-sectional correlations.

We use 2010 individual data to calculate vulnerability to crisis. Following Grosjean and Ricka (2013), we use their "synthetic consumption response index" as a proxy for the effect of the crisis: we add up positive responses to the questions about whether individual had to reduce consumption of staple food, limit tobacco smoking, delay medical appointments, postpone buying necessary medications, and accumulated arrears on utility bills.

The results are presented in the Table 10. In Column 1 we regress the individual level of trust on the "synthetic consumption response" controlling for individual characteristics and country dummies. We find a negative and significant coefficient at the consumption response variable. This effect does not change

[12] See also Grosjean and Ricka (2013), who use LITS data to show that crisis also resulted in large changes in attitudes to market and to democracy.

Figure 6: GDP growth and change in Trust between 2006 and 2010



Sources: Life in Transition Survey, World Development Indicators.

magnitude and remains significant even when we control for the average consumption response within the PSU. The effect of average consumption response itself, however, is small and not significant.

In Columns 3 and 4 we investigate the relationship between crisis impact, trust, and income. LITS does not include questions on income per se, yet the respondents provide their relative rank in income distribution within a country. Therefore, once we control for country dummies, we can use this variable as a measure of household income. We find that income is indeed lower in households who report a higher consumption response (Column 3). We also find that income and trust are positively correlated even if control for consumption response (Column 4). Moreover, once we include income, the consumption response becomes insignificant. This is consistent with a conjecture that crisis impacts trust through income.

Figure 10 in the Appendix presents a scatter plot of the predicted probability of trust (from the linear probability model of Column 1) and the consumption response.

Table 10: Individual-level OLS regressions based on the Life in Transition Survey.

	(1) Trust	(2) Trust	(3) Income	(4) Trust
Consumption Response	-0.0154***	-0.0149***	-0.265***	-0.00793
	(0.00378)	(0.00303)	(0.0208)	(0.00573)
Average Consumption Response		-0.00213		
		(0.0120)		
Income				0.3080***
				(0.0039)
Female	-0.0162***	-0.0162***	-0.0820**	-0.0223**
	(0.00563)	(0.00563)	(0.0339)	(0.00994)
Education	0.0682***	0.0682***	0.482***	0.0490***
	(0.00733)	(0.00733)	(0.0377)	(0.0114)
Age	0.000457	0.000448	-0.0132**	0.00111
	(0.00103)	(0.00102)	(0.00601)	(0.00186)
Age Squared	-1.12e-06	-1.04e-06	3.08e-05	-1.35e-05
	(9.57e-06)	(9.54e-06)	(5.79e-05)	(1.72e-05)
Country Fixed Effects	Yes	Yes	Yes	Yes
Observations	38,864	38,864	13,967	13,967
R-squared	0.067	0.067	0.142	0.066

Note: Consumption Response is a measure of reduction of basic consumption items (stable food etc.) constructed by a procedure of Grosjean and Ricka (2013). *Income* is the self-reported decile of within-country income distribution. Source: Life in Transition Survey 2010.

5.5 Individual Level Regressions: Cross-Sectional Evidence

In this section, we use the FOM data on Russia to estimate cross-sectional individual-level relationship between income and trust. The cross-sectional regressions cannot resolve the endogeneity problem. For example, if a person has high income and high level of trust, it may mean that her level of trust is high because of high income. But the causality may also go in opposite direction: a person has high income because social capital helps to advance her career. Nevertheless, the results of such estimations might be viewed as a suggestive evidence.

Moreover, these results are important for checking whether behaviour of generalised social trust in Russia is similar to the one in other countries. We compare the results to the individual level regressions in Alesina and La Ferrara (2002) (who use the General Social Survey in the US). We find that signs and even magnitudes of coefficients of respondents of the FOM survey in Russia are generally similar to those found by Alesina and La Ferrara (2002). This further suggests that our data on trust are comparable to those in other countries and that our results are not likely to be driven by certain Russia-specific factors.

We estimate probit regressions separately for 2008 and 2009 cross-sections. The dependent variable is 1 if the respondent says that "most people can be trusted" and is 0 if they say that "one cannot be too careful dealing with other people". We also include age, age squared, gender, income, and education. For income, we use self-reported income data. The survey asks whether the household's per capita monthly income is in one of 16 broad categories.[13]

The 2009 survey also included questions on the respondents' employment status and occupation (if employed). The descriptive statistics of the employment status and occupational dummies are reported in Table 16. In order to make 2009 results comparable to those of 2008, we run the estimations for 2009 both with and without employment status and occupational dummies.

The results are presented in Table 11. We report marginal effects. In regressions (1), (3), (5) we include regional dummies and control for the type of the subregion (rural, urban or regional center, with the latter being the omitted category).[14] In regressions (2), (4), (6) we include subregional dummies.

In all specifications trust is positively correlated with personal income. 10% increase in personal income is associated with 0.8 percentage points increase in a probability of a person trusting others in 2009 survey. In 2008 survey, the effect is twice is large. In Alesina and La Ferrara (2002) the coefficient is similar in

[13]The respondents are asked whether their income is below or above the following fifteen thresholds: 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 15, 20, 25, 30, 45 thousand rubles. In 2008-2009, a thousand rubles was about 30 US dollars. These categories are too broad to use these data for change in income over time so we only use these data for the cross-sectional analysis.

[14]We have also run the estimations with median income, median income squared and Gini index calculated at the subregional level. The coefficients at the individual characteristics did not change.

Table 11: Individual cross-section regressions, probit.

	Dependent variable=1 if the respondent trusts others					
	Year 2008		Year 2009		Year 2009	
Log personal income	0.17***	0.16***	0.085***	0.079***	0.079***	0.073***
	(0.014)	(0.014)	(0.016)	(0.017)	(0.016)	(0.018)
Female	0.059***	0.058***	0.016	0.0099	0.015	0.0088
	(0.017)	(0.017)	(0.018)	(0.019)	(0.018)	(0.019)
Age, x100	0.43	0.43	0.87***	1.04***	0.88***	1.09***
	(0.27)	(0.28)	(0.30)	(0.33)	(0.31)	(0.34)
Age Squared, x10000	-0.38	-0.38	-0.46	-0.45	-0.46	-0.48
	(0.28)	(0.28)	(0.31)	(0.35)	(0.31)	(0.36)
Education	0.13***	0.14***	0.15***	0.14***	0.16***	0.14***
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.023)
Housewife				0.022		0.021
				(0.063)		(0.064)
Unemployed				0.017		0.0096
				(0.045)		(0.046)
Student				0.25***		0.25***
				(0.064)		(0.065)
Retired				-0.035		-0.041
				(0.044)		(0.045)
Rural	-0.0035		0.10***	0.098***		
	(0.034)		(0.033)	(0.033)		
Urban	-0.066*		0.070**	0.067**		
	(0.036)		(0.033)	(0.033)		
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes
Subregional dummies	No	Yes	No	No	Yes	Yes
Occupational dummies	No	No	No	Yes	No	Yes
Observations	29102	29102	28991	28991	28991	28991

Marginal effects are reported. Education equals 1 if the respondent has higher education. Coefficients at Age and Age Squared are multiplied by 100 and 10000, respectively. *Source:* FOM.
Robust standard errors (clustered by 198 subregions) in parentheses: *** p<0.01, ** p<0.05, * p<0.1

magnitude to the one we find in 2009 data: in their regressions a 10% change in income is associated with 0.6 percentage points increase in trust.

We also find a positive correlation between trust and education. Higher education is associated with 13-16 percentage point increase in trust. This effect is also similar to the one found in Alesina and La Ferrara (2002): there having less than 12 years of education is associated with 13 percentage point lower trust and having more than 16 years of education is associated with 18 percentage point higher trust than for having 12-16 years of education. In Russia, having more than 16 years of education is equivalent to having post-masters degrees and is therefore very rare; thus the main comparison in our sample is between those having less than 12 years (secondary but no higher education) and having 12-16 years (higher education but no post-graduate degrees).

5.6 Crisis and Trust in Government

Economic performance can have implications not only for the generalized social trust but also for the trust in public institutions (Stevenson and Wolfers (2011)). Unfortunately, GeoRating lacks consistent questions about the trust in public institutions and it also lacks questions where the word "trust" and any of government officials appear in the same sentence. The closest question to the trust in government is the question about approval of Russian then-prime minister Vladimir Putin. We find no connection in regional variation in the changes of Putin's approval rating and economic crisis. This may seem puzzling since other authors document significant correlation between incumbent's popularity and economic conditions both in hybrid regimes and democracies (Monroe (1978), Colton and Hale (2009), Treisman (2011)).

One potential explanation for this effect would be related to the effectiveness of the anti-crisis policies that mitigated the impact of the crisis on government's popularity.[15] However, in our case, the relief efforts started after the first quarter of 2009 (when our survey on trust was administered). A more plausible explanation is that during the crisis, the government stepped up propaganda efforts to convince the Russian households that the crisis was driven by external factors and has nothing to do with the government's performance. We leave a more systematic analysis of this phenomenon to future research.

[15] Lazarev et al. (2014) find that in the Russian villages that suffered from 2010 forest fires the support for the government *increased* substantially. They explain this increased support as the perception of the effectiveness of the government's relief efforts.

6 Persistence of the Decline in Trust

We have shown that Russian regions exposed to the the crisis of 2008-2009 had a larger decrease in trust than the regions with the smaller exposure. Is the effect persistent? Does trust go up again when economy recovers or does it remain stuck at the low level? In this section, we offer evidence that suggests the effect is persistent at least in some regions; trust does not always improve even when the income is restored.

In 2014, we asked the Public Opinion Foundation (FOM) to include once again the question about generalized trust in their GeoRating survey. The survey was conducted in April 2014 using the same methodology and same locations as the surveys in 2008 and 2009.

As shown in Figure 2, by 2014 Russian GDP did recover from the 2009 crisis and exceeded its pre-crisis level. In the second quarter of 2014, Russian GDP was 5% higher (in constant prices, seasonally adjusted) than in the second quarter of 2008.

On average, the level of trust did increase after the fall in 2008: it was 34 percent in 2008, 19 percent in 2009, and 29 percent in 2014. However, this improvement has not been uniform: trust has recovered in the regions where it had not gone down significantly in the first place. In those regions, where trust decreased significantly in 2009, it remained far below its pre-crisis levels even in 2014.

To demonstrate this, we divide the sample into two halves based on the median change in the level of trust between 2008 and 2009 and compare the subsequent changes in trust between 2009 and 2014. If the initial decrease in trust was larger than the median (15 percentage points), we call such a decrease "large"; if it was smaller than the median, we call it "small".

Table 12 shows the evolution of trust since 2008 in the full sample of Russian regions, in the regions with the large 2009 decrease in trust, and in the regions with the small 2009 decrease in trust. In the full sample, between 2008 and 2009 trust decreased by 15 percentage points, and then increased by 10 percentage points between 2009 and 2014. The areas with the small initial decrease in trust have recovered to the initial level (and even slightly exceeded it), but the areas with large initial drop in trust have not. Between 2009 and 2014 trust in those areas went up by 14 percentage points; trust remained about 10 percentage points lower than its pre-crisis level.

The differences in the changes in trust between regions with large and small drops are economically important and statistically significant. Table 13 shows results of the following simple estimation:

$$TrustChange0814_i = \alpha + \beta LargeDecrease_i + \epsilon_i$$

where $TrustChange0814_i$ is a change in trust between 2008 and 2014 in a subregion i, and $LargeDecrease_i$ is an indicator variable for a decline in trust between 2008 and 2009 being larger than the median (larger than 15 percentage points).

These results imply that in the regions where the impact of the crisis (the change in 2008-2009) was large, the long-term (2008-2014) decrease was also 11.5 percentage points larger. In the other regions, the difference between 2008 and 2014 levels of trust was positive and small (+1.5 percentage points) and not significantly different from zero.

Table 12: Evolution of Trust in Russian Regions in 2008-2014.

	Level in year 2008	Change between 2008 and 2009	Change between 2009 and 2014
Full Sample	0.34	-0.15	+0.10
Subsample: "Large Decrease"	0.39	-0.23	+0.14
Subsample: "Small Decrease"	0.28	-0.06	+0.08

Table 13: Long-Term Change in Trust.

	Change in Trust Between 2008 and 2014
Large Decrease in Trust	-0.115***
	(0.0240)
Constant	0.0154
	(0.0198)
Observations	195
R-squared	0.125

Robust standard errors (in parentheses) are clustered at the regional level.
*** p<0.01, ** p<0.05, * p<0.1

To show that the trust was more likely to recover in places, where the initial drop was not small, we estimate the following regression for the two subsamples:

$$\begin{aligned} TrustChange0914_i &= \alpha + \beta_1 TrustChange0809_i + \beta_2 GDPpcChange_i + \\ &+ \beta_3 EducationChange_i + \beta_4 GiniChange_i + \epsilon_i \end{aligned}$$

where $TrustChange0914_i$ is the change in the level of trust in subregion i between 2009 and 2014. $GDPpcChange$ is the change in Gross Regional Product per capita between 2009 and 2012.[16] $EducationChange_i$ is a change

[16]We use data on year 2012 because regional GDP data on 2013 and 2014 are not available. However, given that Russian GDP only grew at 1.3% in 2013 and at 0% in the first quarter of 2014, the 2009-12 recovery is likely to be representative of the whole 2009-14 period. By the end of 2012, Russia's GDP was 4% higher its 2008 level.

Table 14: Changes in Trust Between 2009 and 2014.

	Subsample: large decrease		Subsample: small decrease		Full sample	
Trust change in 2008-2009	0.0281	0.00173	-0.573***	-0.637***	-0.301***	-0.270**
	(0.145)	(0.157)	(0.191)	(0.203)	(0.111)	(0.106)
Per capita GDP change	0.106***	0.134***	0.684***	0.441*	0.140**	0.153***
	(0.0255)	(0.0294)	(0.248)	(0.239)	(0.060)	(0.048)
Education change		-0.0263		0.718***		0.355**
		(0.160)		(0.207)		(0.152)
Gini change		-0.376		0.0684		-0.309
		(0.316)		(0.267)		(0.242)
Observations	97	97	98	98	195	195
R-squared	0.041	0.067	0.179	0.300	0.099	0.164

Robust standard errors (in parentheses) are clustered at the regional level.
*** p<0.01, ** p<0.05, * p<0.1

in the proportion of people with at least incomplete higher education between 2009 and 2014, $GiniChange_i$ is change in Gini coefficients between 2009 and 2014.

If trust recovers after the crisis, we expect β_1 to be negative and large in absolute value: the larger is the decline during the crisis, the faster the subsequent recovery.

Table 14 presents the results. We find that the coefficient β_1 is negative and large only in the sample with the small 2009 decline. In the sample with the large 2009 decline, the subsequent evolution of trust is not related to the fall of trust during the crisis.[17]

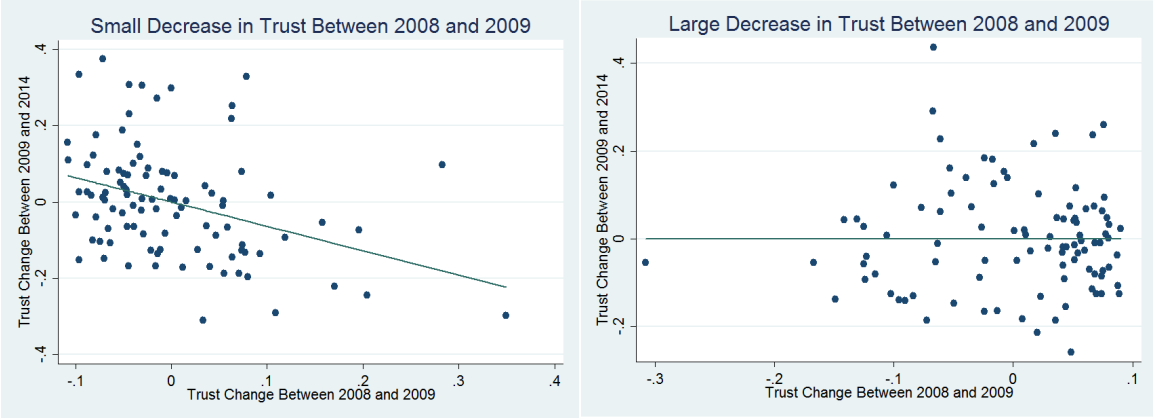
If the decrease is small, then 10 percentage points of the decrease in trust in 2008-09 are associated with 6 percentage points of the post-crisis recovery. If the decrease is large, then subsequent trajectory is not related to the initial decrease.

The results are presented in a graphical form in Figure 7. The left panel shows residual plot for the subsample with the small decrease during the crisis, and the right panel shows the residual plot for the subsample with the large decrease. While the regression line in the plot with the small drop has a negative slope signifying that the recovery of trust between 2009 and 2014 was proportional to its decrease during the crisis, the fitted line in the sample with the large drop is flat showing no relationship between the initial drop in trust and subsequent recovery.

This evidence is consistent with the hypothesis that if the income shocks result in a substantial decrease in trust then the effect may persist even after incomes bounces back to the initial level.

[17] We have also tried to divide the sample into the areas with large vs. small decrease of trust using the *predicted* (rather than actual) change in trust during the crisis. The results (available on request) are the same.

Figure 7: Post-2009 Recovery of Trust in the Subsamples with Small and Large Decreases in Trust in 2008-09 (Residuals).



7 Concluding remarks

In this paper, we study the relationship between changes in income and changes in trust. In order to identify the causal effect, we use the sharp—and spatially uneven—decline in Russian GDP in the end of 2008 and the beginning of 2009. We find that the regions, whose economy historically relied on the production of capital goods and oil and gas, were more vulnerable to the global crisis and therefore experienced a larger decline in trust than other regions.

We interpret this result as evidence in favor of the effect of income on trust. Alternative explanations of our results would have to argue that regional economies specialising in capital goods may have developed special social institutions. While it is entirely plausible to assume that such institutions affect the *level* of social capital in these regions, it is difficult to understand why these institutions should have an impact on the *changes* in trust over a very short period of time. And even if such a relationship between industrial specialisation and resilience of trust to crisis existed, it would be likely to work in the opposite direction: regions vulnerable to crisis should have been more—rather than less—resilient in the challenging times. This is why we believe that our results imply that inherited industrial structure affects trust through income.

Our results cannot distinguish between different explanations of the relationship between income and trust — whether it is driven by risk aversion or by inference based on income (or other potential explanations). But whatever the origin of the effect of income on trust, its magnitude is substantial: on average, 10 percent decline in income is associated with 5 percentage points decrease in trust. Given the low average level of trust in Russia (25%, according to the World Values Survey), this is a substantial effect.

We also study the post-crisis evolution of trust in Russian regions to understand whether the impact

of crisis on trust had a persistent or transitory effect. After the deep recession in 2009 Russian GDP has recovered back to the pre-crises levels and even exceeded them in 2012-14. Trust also rose but did not return to its pre-crisis levels. We find that the change in trust after the crisis was very heterogeneous. In the regions where the decline in trust was small, trust fully recovered to the pre-crisis level. However, in those regions where the shock of crisis on trust was strong, the impact of crisis was persistent: in 2014, trust in those regions was still 10 percentage points below the respective 2008 levels. These findings shed a new light on our understanding of the social costs of recessions and have very clear policy implications. Governments should respond quickly and decisively to crises with countercyclical social policies in order to prevent the recession's strong impact on trust — as the latter may have implications for social capital even after the recession is over.

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Appendix

Table 15: Descriptive Statistics

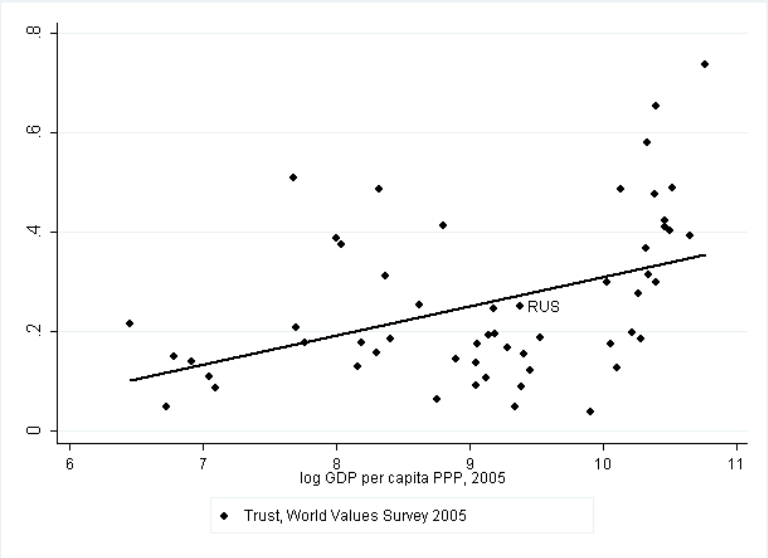
	Year 2008		Year 2009	
	mean	std.dev.	mean	std.dev.
GDP per capita, thousand 2008 rubles per year	190	129	171	122
Trust	0.34	0.10	0.19	0.08
Education	0.151	0.08	0.152	0.08
Homicide Rate (per 100 000 citizens)	24.76	12.7	21.77	10.61
Gini	0.39	0.03	0.39	0.02
Age	44.95	2.00	44.87	1.98

Note: All variables are calculated using two repeated observations on cross-section of 66 Russian regions. Individual responses are averaged on the level of location: regional center, urban area, and rural area in a region, therefore there are three observations on Trust and Education in each region. *Trust* is a share of people respond in that most people can be trusted. Education is a share of people with at least unfinished college degree. *Gini* is regional Gini coefficient from official data. *Homicide rate* is number of murders per 1000 people per year. It is calculated on the regional level. *GDP per capita* is nominal annual GDP deflated by regional consumer price index. *Sources:* FOM, Rosstat.

Table 16: Gender and employment of respondents of the FOM survey

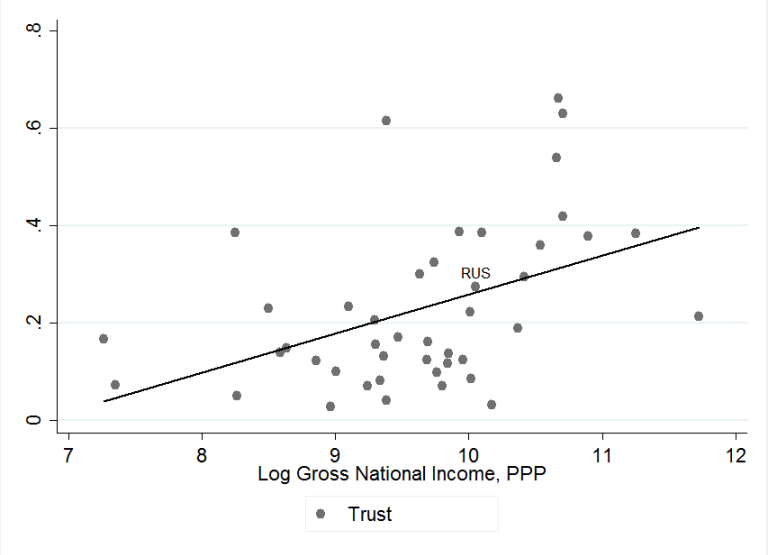
	Year 2008	Year 2009
Gender		
Female	0.566	0.561
Out of the labor force		
Unemployed	0.068	0.109
Retired	0.292	0.281
Housewife	0.038	0.036
Student	0.040	0.032
Sectors of employment		
Manufacturing	0.094	0.087
Agriculture	0.037	0.036
Construction	0.041	0.050
Services	0.065	0.087
Catering	0.014	0.013
Utilities	0.022	0.023
Research	0.010	0.004
Education	0.045	0.045
Healthcare	0.036	0.037
Media	0.021	0.010
Government	0.022	0.015
Military	0.020	0.006
Police	0.029	0.017
Retail	0.040	0.038
Consulting	0.002	0.003
Finance	0.004	0.005
Observations	27960	28991

Figure 8: Trust and Income: Cross-National Comparison in 2005



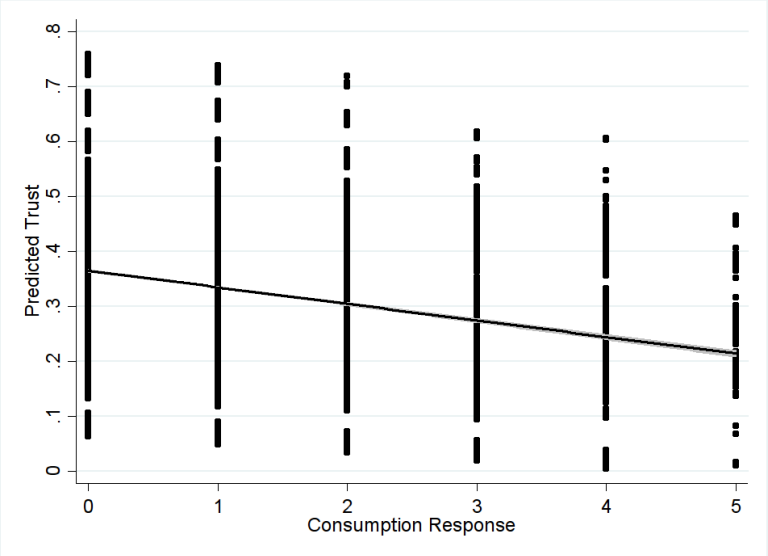
Source: World Values Survey Wave 5, World Bank; GDP per capita for year 2005

Figure 9: Trust and Income: Cross-National Comparison in 2013



Source: World Values Survey Wave 6, World Bank; GNI per capita for year 2013

Figure 10: Predicted Trust and Consumption Response



Source: Life in Transition Survey 2010.