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

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**Abstract**

In this paper, we use a natural experiment to identify a causal relationship between income and trust. We use a panel dataset on Russia where GDP experienced a 8% drop in 2009 (the largest decline in G20). The effect of the crisis had been very uneven among Russian regions because of their different industrial structure inherited from the Soviet economy. We find that the regions that specialize in producing capital goods, had a more substantial income decline during the crisis. The variation in the industrial structure therefore allows us create an instrument for the change in income. After instrumenting average regional income we find that the effect of income on trust is statistically and economically significant. Controlling for other conventional determinants of trust, we show that 10 percent decrease in income is associated with 2.6 percentage point decrease in the level of trust (the share of respondents saying that most people can be trusted). Given that the average level of trust in Russia is only 18 per cent, this magnitude is substantial.

PRELIMINARY AND INCOMPLETE. PLEASE DO NOT CIRCULATE

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# 1 Introduction

Social capital is one of the most important concepts in modern social science. Social scientists argue that the social capital has key role in production of human capital and public goods (starting with Coleman (1988)), development of political institutions (Putnam et al. (1994)), financial development (Guiso et al. (2000)), political participation (DiPasquale and Glaeser (1999)), efficiency of the judiciary system (La Porta et al. (1996)), political accountability (Nannicini et al. (2010)). 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) studied the correlation between social capital and economic growth generally finding that the social capital (mostly quantified as the propensity to trust others) is positively correlated with growth controlling for other conventional determinants of growth. Most of this research 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.[1] 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 arrival to the US. Similarly to the previous studies (e.g. Rice and Feldman (1997), Putnam (2001), Guiso et al. (2006)), Algan and Cahuc find that the social capital of the US immigrants is correlated with the social capital in their home countries and therefore can be used 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.

Even though the effect of inherited trust on growth is established, the agenda of the empirical study of the relationship between trust and income is still wide open. First, trust changes over time (even though there is clearly a substantial persistent component). Second, there may also be a reverse causality – from income to trust. There are many reasons to believe that change in income may result in a change in trust. For example, a person that experiences a drop in income may attribute his or her losses to the unfairness of the society and therefore reduce his/her willingness to trust others and to cooperate with others. Another explanation can be that higher income individuals are more trusted and therefore may be happier to trust others as well.

The cross-sectional evidence suggests that at both individual- and state-level trust is indeed associated

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

with higher income (see Alesina and La Ferrara (2002), as well as Aghion et al. (2010)). Stevenson and Wolfers (2011) show correlation of trust in institutions and state-specific shocks to the economy. 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 of 34 thousand Russians administered in September 2007 and March 2009, before and after the main shock of the 2008-09 crisis. Russia experienced an acute drop in income; in 2009, Russian GDP contracted by 8% – the largest decline among G20 countries. The effect of the crisis had been very uneven among the regions. If we sort regions by the change in per capita gross regional product in 2009, the top quartile grew by 4 percent, while the bottom quartile declined by 28 percent.

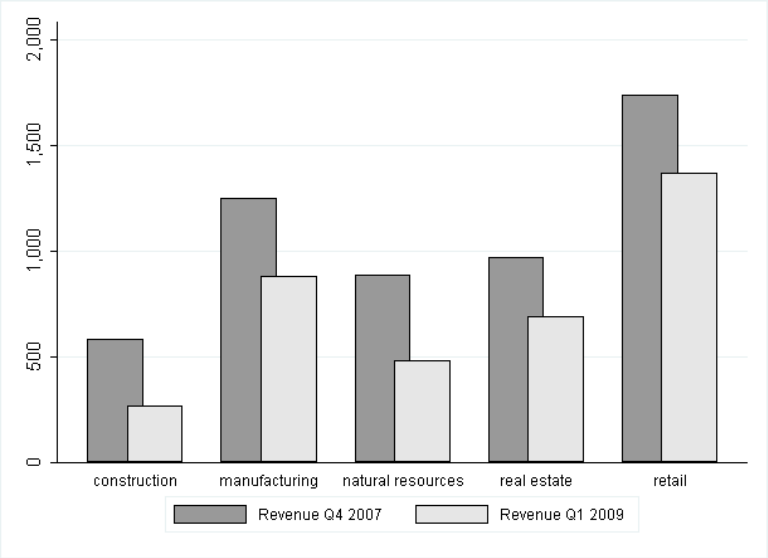
The heterogeneity of the response to the crisis was at least partially explained by the different compositions of the regional economies. As in every business cycle, the decrease in investment is substantially larger than that in consumption, hence the regions that were more dependent on capital goods producing industries (and manufacturing in general) suffered the most while regions specializing in consumer goods and services suffered very little.

Figure 1 shows relative declines of five largest sectors of Russian economy (retail, construction, natural resources, manufacturing, and real estate).

Manufacturing is the second largest sector in the Russian economy in Russian economy. It shrunk by 30% from the last quarter of 2007 to the fist quarter of 2009.[2] Another important feature of manufacturing sector in Russia is its geographical concentration (due to the legacy fo Soviet industrialization). Using the variation in the share of manufacturing sector in the regional economies allows us to construct a measure of the potential impact of crisis on income: if a share of manufacturing in the regional economy is high, then the region is more dependent on the demand for capital goods. To capture this notion we calculate the "imputed revenue from manufacturing" multiplying the share of manufacturing to gross regional product in every region by the value of S&P100 Index in September 2007 and in March 2009 (the dates of the surveys). This measure is a good proxy for the exogenous vulnerability of the regional economy to the crisis: the S&P100 Index captures the state of the global economy and therefore demand for the investment goods. The share of manufacturing in the regional economy shows to what extent the regional economy is dependent

[2]Another sector, Natural Resources, contracted in 2009 even to a larger extent, it lost 45%. However, this sector (especially oil and gas) is heavily taxed. So, the changes in commodities price, the main driver of the sector's revenue dynamics, influences not only regions with large natural resources, but other regions as well – through the federal redistribution of natural resource rents.

Figure 1: **Largest Sectors of Russian Economy**




Source: Rosstat, Bank of Russia, volumes are in billions of 2007 rubles. Average exchange rate in this persiod was 26.2 Russian rubles per U.S. dollar

on the state of the global economy.

We argue that change in imputed revenue serves a good instrument for the drop in income: it is exogenous, since its time dimension depends only on global markets and does not depend on how the crises unfolded in every single region (S&P100 does not include Russian companies), and it is strong (the first-stage R-squared is more than 0.5, and the bias of 2SLS is safely less than 15% of OLS estimation, according to Stock-Yogo weak ID critical values). This measure is robust to changing the proxy for the demand for capital goods (instead of S&P100 one can also use Russian GDP, Russian stock market index etc.).

After instrumenting average regional income with the imputed revenue we find that the effect of income on trust is statistically significant and large in magnitude. Controlling for other conventional determinants of trust and regional fixed effects, we show that 10 percent decrease in income is associated with 2.6 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 18 per cent in 2007 and 19 per cent in 2009.

Our results not only capture the effect of income on trust but raise an important question. We show that social capital may change very quickly in response to a short-term income shock driven by a business cycle. Our data do not provide any evidence whether the recession shock affects the temporary or permanent component of social capital – but these cases have very different policy implications. In the former case, the policymakers do not need to worry about this effect as the recovery will automatically restore the pre-

crisis level fo social capital. The latter case has very different policy implications: the policymakers should provide robust and generous safety nets can alleviate the destruction of social capital in recessions. A lot of papers document long-run impact of recessions on employment (Røed (1996), Røed (1997), Blanchard and Summers (1986)). This study provides evidence about one of the channels by which this effect might operate: recessions destroy social capital that is needed for productive cooperation.

We must make an important caveat. Social capital is a broad concept; in this paper we study a very specific and well-defined aspect of social capital – "social trust" (or generalized trust), the answer of survey respondent 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. and Aghion et al. suggest that one way to measure civic capital is indeed to administer surveys on generalized trust.

The rest of the paper is structured as follows. Section 2 provides brief background on Russian crisis of 2008-09 that motivates our choice of the instrument. In Section 3 we discuss hypotheses, econometric specifications and data. In Section 4 we report the main results. In Section 5, we provide additional evidence and carry out robustness checks. Section 6 concludes.

## 2 Geography and Crisis of 2008-09 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. Scholars of macroeconomics and finance offer competing explanations of the crisis' causes, but for the purpose of this study we only need to know the following: the crisis was global, and the crisis has not originated in Russia. GDP of the advanced economies declined by 2.7 percent in 2009 as compared to 2007.[3] Financial panic swept the markets and dried the credit. Major market indices plummeted nearly by half from peak to trough.

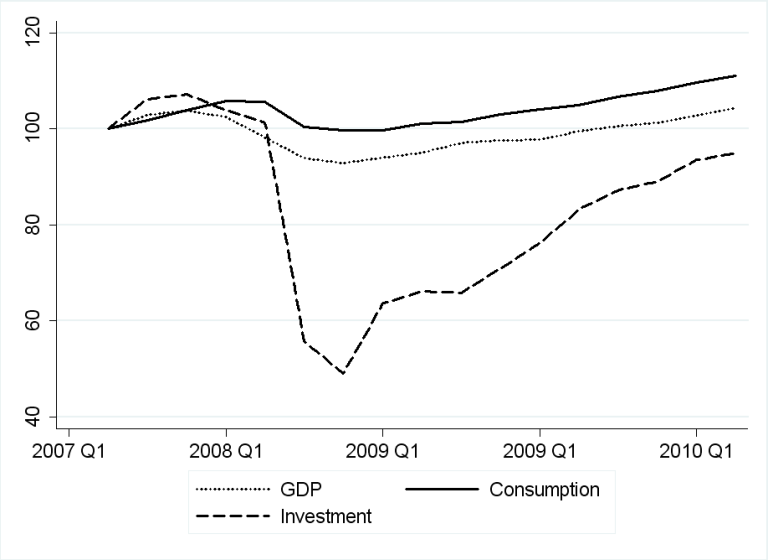
In Russia, the problems were even more acute than in other countries. GDP went down by 8 percent, constituting the largest decline in G20. The shock was not only huge, but sudden: Russian authorities, public, and the business community were caught by surprise. Treisman (2012) reports that, according to the

[3]IMF World Outlook, October 2010, http://www.imf.org/external/pubs/ft/weo/2010/02/

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 Word Bank[4], net inflow of foreign direct investment in Russia plummeted more than twice: from $75 billion in 2008 to $36.5 billion in 2009. The dollar-denominated RTS index of the Russian stock market fel by 80% (peak to trough).

One of the textbook facts on the business cycle is that investment is typically pro-cyclical, leading, and the most volatile part of GDP. Figure 2 shows time series of Russian GDP, consumption and investment since 2003. According to official data, aggregate consumption dropped by 5% in the first quarter of 2009 compared to the last quarter of 2008, and aggregate investment dropped by 45% during the same period.

Figure 2: **GDP, Consumption, and Investment in Russia**




The values of the variables are normalized to 100 in 4Q2007. Source: Rosstat

If firms decide to invest less during a recession, then producers of capital goods would face a decline in demand for their products. For example, if a plan to build a new plant is delayed, then producers of equipment will be more likely to reduce wages and lay off workers.

In Russia, industries are heavily concentrated in geographical terms. In more than 20 (out of 83) Russian regions a single industry accounts for more than 40 percent of industrial production.[5] For example, ferrous metallurgy constitutes 70 percent of manufacturing of Lipetskaya Oblast (region in Western Russia with 1.5

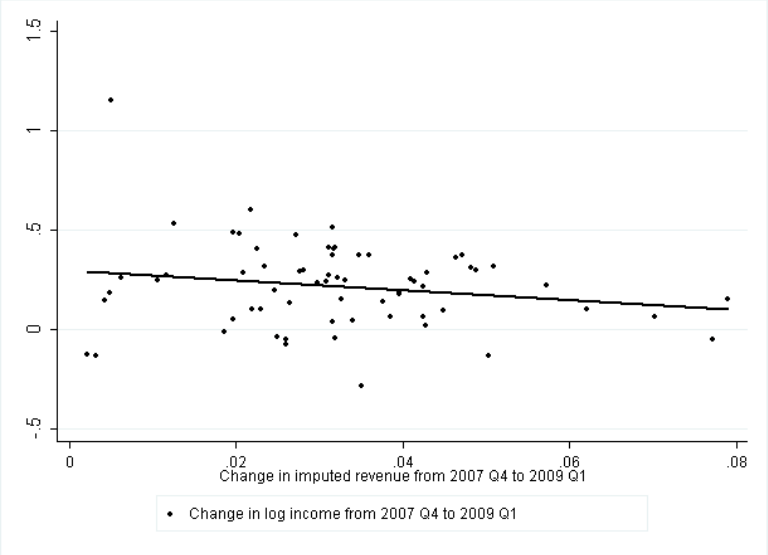
[4]http://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD

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

million people), 65 percent of Chelyabinkaya Oblast (region on the Southern Urals with nearly 4 million people). Overall, average share of top industry among other industries in a Russian region is 29.3 percent.

Figure 3 shows the plot of change in income from the share of manufacturing in the economy before the crisis. The relationship is negative and is significantly different from zero: 10 percent increase in the share of manufacturing corresponds to 1 percent of decrease in income from September 2007 to March 2009.

Figure 3: **Imputed Revenue and Change in Income**




For industrial structure to help identify the effect of change in income on trust, it should be exogenous to the change in trust. We use industrial structure in 2007, so it is exogenous to all later developments. Moreover, we can make an even stronger assumption: the structure of the regional economy in 2007 is exogenous to the crisis of 2008-09, it is likely to be exogenous to market economy. Indeed, 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 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 ans Steel Works which was founded in 1926.

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 GULAG camps 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, then 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 predetermined by the Soviet heritage and is exogenous to the change in trust between 2007 and 2009. This exogeneity allows us to identify the effect of income on trust.

The identification of this causal relationship is a challenging task. When income correlates with trust in panel data, the effect consists of two components: cross-sectional effect and time effect. Cross-sectional effect captures the difference between units of observations which is not stable, and time effect captures the difference within a unit. In both cases causality can run both ways. For example, economic decline in some regions could have been triggered by the deterioration of trust exogenous to the economy. This is why we need an instrument for income must capture the variation in demand for capital goods that is exogenous to domestic developments. We use S&P Global 100 index as such a proxy. We assume that this index is not influenced by the economic dynamics of any particular Russian region, but is a proxy for the state of the global economy beyond the influence of Russian regional economies.

The intuition for using a stock market index as a proxy for the global demand for capital goods comes from the standard understanding of asset prices as the present value of future returns:[6] the higher the stock price, the greater the number of profitable projects that require investment. If stock prices go down, the firms are less likely to have productive projects and are less likely to invest.

Imputed revenue from manufacturing is calculated as follows:

$$ImpRev_{it} = Man\_Revenue\_2007 \times Share\_Man_i \times SP_t \tag{1}$$

where $i$ indexes regions or subregions, $t$ is year 2007 or year 2009. $Man\_Revenue\_2007$ is a constant multiplier, the total Russian revenue from manufacturing in 2007 (1253 billion rubles), $Share\_Man_i$ is a share of manufacturing in GDP of region $i$ in 2007 (that is, before the crisis). $SP_t$ is a S&P Global 100 index at period $t$. For year 2007, S&P Global 100 is 694.38 (September 15, 2007), and for the year 2009, S&P Global 100 value is 359.58 (March 15, 2009).[7]. The survey itself takes place for several weeks within a month. We do not know the date of each interview, so we take index value of a middle of a month when survey took place. Nothing changes if we use another dates or another index.

[6]Strictly speaking, this is only true for risk-neutral investors, and Grossman and Shiller (1981) show that the changes in the stream of dividends can not explain price movement. However, for the purpose of this paper, what matters is not the value of the index, but the fact, that they are different in different time periods. Risk-neutral prices will also be different.

[7]The values of S&P Global 100 index come from finance.google.com

Here, S&P Global 100 varies in time, and pre-crisis share of manufacturing varies across space. Both variations are arguably exogenous to the economic dynamics in Russian regions between the last quarter of 2007 and first quarter of 2009.

As we only have two time periods, 2007 and 2009, nothing would change in the results of our 2SLS estimations if we just replaced the S&P100 Index with time dummy or any time-dependent variable. This choice affects the first stage coefficients, but does not influence predicted values, and therefore – does not have any impact on the second stage estimates. We choose the stock market index to differentiate between periods (and not, say, value of 1 for September 2007 and value of 2 for March 2009), because it allows economically substantive interpretation.

# 3 Hypotheses, Econometric Specification, and Data

## 3.1 Hypotheses

Our identification strategy is based on the notion that more people in a society start to distrust each other as their incomes go down. If this claim is true, the null hypothesis about the absence of any link between income and trust should be rejected by data. Since the instrument is used for the endogenous variable, we test that the instrument predicts the real decline in income (i. e. it is not weak, and the 2SLS procedure is not likely to produce inconsistent estimates):

*H0 First Stage: The regions where imputed revenue from manufacturing went down had on average the same change in income as the regions where imputed revenue did not decline.*

If imputed revenue is not a weak instrument, then *H0 First Stage* should be rejected. Literature often uses F-statistic cutoff of 10 to detect weak instrument. We follow this rule of thumb, but also use Cragg-Donals F-statistic with simulated Stock-Yogo critical values.

Second stage null hypothesis captures the substance of our causal claim:

*H0 Second Stage: Trust does not differ between the regions where predicted income declined and regions where predicted income did not decline*

If our causal notion is correct, *H0 Second Stage* should be rejected by the data.

### 3.2 Econometric Specification

In order to test the hypotheses we estimate the following specification with 2SLS procedure:

$$\begin{cases} Trust_{it} = \alpha + \beta_1 Income_{it} + \sum_{k=2}^{5} \beta_k C_{kit} + \mu_i + \epsilon_{it} \\ Income_{it} = \kappa + \gamma_i ImpRev_{it} + \sum_{k=2}^{5} \gamma_k C_{it} + \psi_i + \delta_{it} \end{cases} \tag{2}$$

$Trust_{it}$ is an average level of trust in the region $i$ at period $t$, $Income_{it}$ is log average income, $C_{kit}$ are the values of other correlates of trust established in the literature: age, crime rate, higher education, log population, inequality. $ImpRev$ is the value of the instrument calculated by equation (1), $\mu_i$ and $\psi_i$ are fixed effects.

To reject *H0 First Stage*, the hypothesis that all coefficient of first stage equation are equal to zero, must be rejected. To reject *H0 Second Stage* coefficient on $Income$ must be large in magnitude and significantly different from zero.

### 3.3 Data

Our data come from two sources: the Public Opinion Foundation (Fond Obschestvennogo Mneniya, or FOM) and Russian State Statistics Agency (Rosstat). FOM conducts large regionally representatives Geo-Rating Surveys repeated quarterly since 2003. Nearly 34 000 randomly selected Russians 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 (mostly, the shares of urban and rural population). In the second step, locations are selected randomly with the probability of each location to be selected equal to the share of population of a location. In the third step, households are selected using random walk. A respondent within a household is selected using gender, age, and educational quotas calculated from the National Census.

The question on the level of trust was asked twice: the first time in September, 2007, and the second time in March, 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 regions we divide respondents between into 3 meta-locations: regional center (for example, Lipetsk in Lipetskaya Oblast), non-center urban area (for example, all the cities and towns in Lipetsk oblast, that are not Lipetsk), and rural area (all the villages). For each of these meta-locations we calculate average values of the variables of interest from the individual

responses. Because rural areas depend on agricultural income and not manufacturing even if they are located in manufacturing regions, they are not used in 2SLS estimations.[8] For all inferential procedures, standard errors are clustered at the regional level.

Trust is measured by the response to the question *"Do you think that most people can be trusted or you cannot be too careful in dealing with people?"*

Income is measured by the response to the question: *"Declare, please, at least approximately, your income in last month per family member"* Interviewers were instructed to explain respondents how to add all incomes of all household members and divide the resulting value by the number of household members. In 2007, a respondent could tell an exact number. In 2009, a responded had to name one of the 17 pre-determined ranges. In order to make values of incomes comparable, we recode each value to the bottom of corresponding 2009 range (see Table 1 for the classification).

Data on age and on level of education also come from FOM surveys. Data on population and homicide rates come from Rosstat. Table 3 (in Appendix) shows the descriptive statistics of all the variables for both years.

# 4 Results

Table 1 shows the results of the first stage of 2SLS procedure. *H0 First Stage* is rejected in all the specifications with F-statistic varying from 28 to 84. So, the imputed revenue does predict the level of income.

[8] As a robustness check, we did re-run our estimations including the rural observations. Our results remained significant although were weaker in terms of both statistical and economic significance.

Table 1: Determinants of Generalized Trust: First Stage Estimates

| . | Log Income | | | |
|---|---|---|---|---|
| Imputed Revenue | -2.661*** | -2.645*** | -1.192*** | -1.145** |
| | (0.301) | (0.301) | (0.432) | (0.438) |
| Population | | -0.126* | -0.100 | -0.102 |
| | | (0.0673) | (0.0935) | (0.101) |
| Education | | | 0.766 | 0.618 |
| | | | (0.524) | (0.536) |
| Homicide Rate | | | -3.605*** | -3.566*** |
| | | | (0.827) | (0.841) |
| Gini | | | -0.445 | -0.536 |
| | | | (0.497) | (0.501) |
| Age | | | | 0.0671 |
| | | | | (0.304) |
| Age squared_sq | | | | -0.00107 |
| | | | | (0.00349) |
| Constant | 8.742*** | 9.521*** | 9.756*** | 8.932 |
| | (0.0335) | (0.417) | (0.643) | (6.787) |
| Observations | 264 | 264 | 264 | 264 |
| R-squared | 0.412 | 0.418 | 0.580 | 0.590 |
| F-statistic | 84.99 | 45.10 | 36.37 | 28.38 |
| Number of settl_id | 132 | 132 | 132 | 132 |

All variables are calculated using two repeated observations on cross-section of 68 Russian regions. The first period is September 2007. The second period is March 2009. Individual responses are averaged on the level of meta-setllement: regional center, and non-center urban area in a region. Imputed revenue is calculated for every region and every period by formula(1): *Education*is a share of people with at least unfinished college degree. *Gini* is Gini coefficient calculated from individual incomes for every meta-settlement for both periods. *Homicide rate* is number of murders per 1000 people per year. It is calculated on the regional level. Values of other variables are calculated on meta-settlement level. Fixed effects are on meta-settlement level. *Sources:* "Public Opinion" Foundation, Russian State Statistics Committee. Robust standard errors (clustered by 68 regions) in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 2 presents the second stage results, where the levels of trust are regressed on predicted levels of income and a set of controls.

Table 2: Determinants of Trust: Second Stage IV Estimates

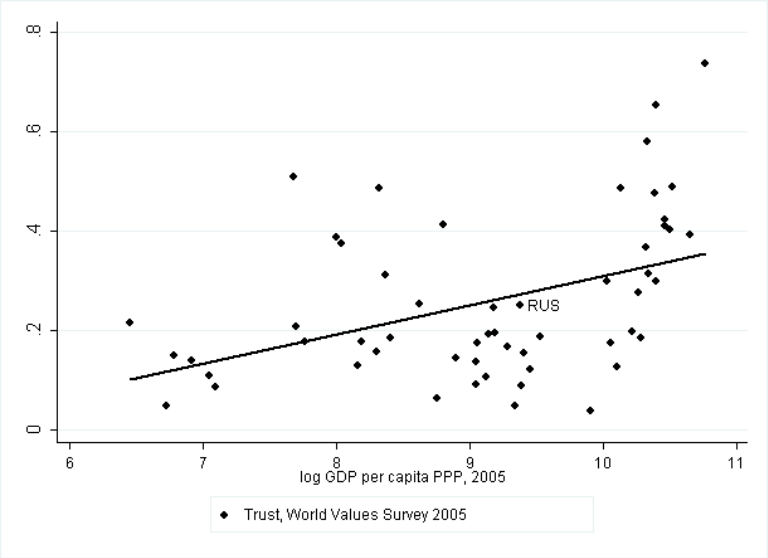
| . | | **Trust** | | |
|---|---|---|---|---|
| . | (1) | (2) | (4) | (4) |
| Log Income | 0.0435 | 0.0517* | 0.261** | 0.264** |
| | (0.0316) | (0.0312) | (0.119) | (0.121) |
| Log Population | - | 0.177** | 0.177*** | 0.174*** |
| | | (0.0752) | (0.0365) | (0.0352) |
| Education | - | - | -0.488** | -0.472** |
| | | | (0.243) | (0.235) |
| Homicide Rate | - | - | 1.423** | 1.410** |
| | | | (0.636) | (0.632) |
| Gini | - | - | 0.136 | 0.157 |
| | | | (0.227) | (0.236) |
| Age | - | - | - | -0.110 |
| | | | | (0.114) |
| Age Squared | - | - | - | 0.00130 |
| | | | | (0.00131) |
| Observations | 264 | 264 | 264 | 264 |
| Meta-Settlements | 132 | 132 | 132 | 132 |
| Years | 2 | 2 | 2 | 2 |
| Cragg-Donald F-statistic | 78.52 | 90.82 | 13.36 | 12.34 |

*Note:* All variables are calculated using two repeated observations on cross-section of 66 Russian regions. The first period is September 2007. The second period is March 2009. Individual responses are averaged on the level of meta-setllement: regional center, and non-center urban area in a region. Imputed revenue is calculated for every region and every period by formula (1). *Education*is a share of people with at least unfinished college degree. *Gini* is Gini coefficient calculated from individual incomes for every meta-settlement for both periods. *Homicide rate* is number of murders per 1000 people per year. It is calculated on the regional level. Fixed effects are on meta-settlement level. Values of Cragg-Donald F-statistic is always higher than 15 percent simulated Stock-Yogo critical values. *Sources:* FOM, Rosstat. Robust standard errors (clustered by 66 regions) in parentheses: *** p<0.01, ** p<0.05, * p<0.1

In a bivariate relation (column (1)) the coefficient on predicted income is not statistically different from zero, but when we control for other determinants of trust (education, homicide rate, age, inequality), the coefficient on trust becomes statistically significant, and its magnitude goes up. In equations (2) and (3) the coefficient is 0.26, signifying that 10% increase in income is associated with 2.6 percentage point increase of generalized trust. This is quite substantial given that the level of trust in Russia is relatively low[9]: on average 18% of FOM respondents tell interviewers that most people can be trusted.

[9]Figure 4 shows cross-national scatter plot of trust and GDP per capita (according to World Values Survey and World Bank. Trust in Russia is 25.03 percentage points: slightly less than world average (25.6))

Figure 4: **Trust and GDP: Cross-National Comparison**




Source: World Values Survey, World Bank. Both trust and GDP per capita are for year 2005

Table 2 also shows us that average level of education (controlling for income) is negatively associated with trust: 10% increase in a number of people with college degrees is linked to 1.8 percentage point decrease in trust. This result is also important because it seemingly contradicts Helliwell and Putnam (1999) and Coleman (1988). As we show in individual level regressions, the contradiction might be resolved if we interpret this result as environmental: while getting enrolled in the institution of higher education boosts one's level of social capital, people might dislike having a lot of college-educated counterparts around. This result may also reflect the rise of low-quality (and in many cases corrupt and fraudulent) institutions of higher education. As such institutions do not produce human capital and do not contribute to productivity and income (for which we control), nominal quantity of higher education may undermine rather reinforce trust.

Another counterintuitive result is the positive coefficient at the homicide rate (which is the most reliable proxy for crime in Russia). This is different from the literature which documents positive correlation between rule of law and the social capital. In this sample, on the contrary, one additional case of homicide per 1000 people per year is associated with 1.4 percentage point *increase* in the number of people who report that most people can be trusted. This result may suggest that social capital may emerge as an informal reaction to the inefficiency and corruption in the formal law enforcement system – people may be more likely to trust each other when they cannot rely on the formal mechanisms.

It can be argued however, that respondents could be not completely sincere answering a question about income or just make mistakes due to imperfect recall. The measurement error on the left hand side of the second stage equation can therefore be high biasing the coefficient towards zero. For this reason, it is instructive to explore the result of reduced form estimation, where level of trust is directly predicted by the level of imputed revenue:

$$Trust_{it} = \alpha + \widehat{\beta}_1 ImpRev_{it} + \sum_{k=2}^{5} \beta_k C_{kit} + \mu_i + \epsilon_{it} \tag{3}$$

The notation here follows equation (2). If income is positively associated with trust, $\widehat{\beta}_1$ should be statistically significant and negative (indeed, the imputed revenue from manufacturing implies a larger *decline* in income which results in a larger decline in trust).

Table 5 (in Appendix) shows the reduced form estimation of the equation. The coefficient on imputed revenue is significantly different from zero and negative. Moreover, the coefficient $\widehat{\beta}_1$ is equal to the product of the coefficients $\beta_1$ and $\gamma_1$from (2). For example, in the last specification the coefficient in the reduced form estimation (effect of imputed revenue on trust) is -0.302 while in the 2SLS the effect of imputed revenue on income is -1.145 and effect of income on trust is 0.264.

# 5 Additional Evidence and Robustness Checks

## 5.1 Individual Level Regressions

The analysis presented so far shows that the decline of the average level of trust can be triggered by a decline in income. It does not however tell much about the mechanism through which income influences trust. It would be a mistake to conclude from these estimations alone, that, for example, if a person becomes better-off, her trust goes up. The effect may be explained by the change in *average* level of income, while there is no relationship at the individual level. This section outlines several hypotheses about mechanisms and uses individual-level regressions to distinguish between them.

Income can influence trust through the following channels:

1. Higher personal income leads to higher personal trust, because people who earn more feel more secure financially and are less afraid to taking risks. 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.

2. Higher personal income leads to higher personal trust because individuals overestimate their personal productivity. When they start to earn more, they think that others treat them fairly, and when they start to earn less, they think that world treats them unfairly.

3. Decrease in personal income leads to lower trust because it is typically associated with the events that are negatively charged emotionally (layoffs, decreases in salary, wage arrears).

4. Increase in average income is associated with higher personal trust because better-off individuals seem to have fewer incentives to cheat at thus are perceived more trustworthy.

We estimate the following regression using linear probability model and probit specifications:

$$Trust_i = \alpha + \sum_{k=1}^{K} \beta_k P_{ik} + \sum_{u=1}^{U} \gamma_u S_u + \sum_{r=1}^{R} \kappa_r d_r + \sum_{t=1}^{3} \gamma_t T_t + \epsilon_i \tag{4}$$

Where $Trust_i$ equals 1 if individual $i$ responds that other people can be trusted, 0 – otherwise. $P_{ik}$ is a vector of individual characteristics: age, gender, income, education, ethnicity, and whether a respondent belongs to ethnic minority; $S_u$ is a vector of characteristics of a settlement: average age, average income, average education, population, ethnic diversity, inequality, shares of all major ethnicities.

With these data, we cannot resolve the endogeneity problem. For example, if a person has high income and high level of trust, it might mean that her level of trust is high because of the level of financial security that high income provides, 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 for or against some of the hypotheses.

The results of individual level regressions are shown in Table 6 (linear probability model) and Table 7 (probit). The most important result is the non-trivial statistical significance of personal income: 10% increase in personal income is associated with 0.07 percent increase in a probability of a person trusting others. This result is robust to different specifications and methods of estimation, and it is consistent with Alesina and La Ferrara (2002), which finds in GSS survey the individuals are more likely to be trusting if their income is higher.

This result can be cautiously interpreted as evidence that negative economic shocks decrease individual level of trust by decreasing personal incomes and not by decreasing incomes of others. So, the effect is individual and not "environmental".

Trust and education exhibit different results on individual and aggregate levels: individual trust is positively associated with personal education. This result is consistent with the literature that underlines

importance of higher education for building the stock of social capital. It also suggests that even if education builds social capital of the individual students, poor reputation of colleges can harm aggregate social capital.

These results are consistent with Alesina and La Ferrara (2002), that finds positive links between personal income, personal eduction and trust. Females are less trusting in Alesina and La Ferrara (2002) and in our sample. One of the notable differences between Alesina and La Ferrara (2002) and our results is that we find positive correlation with trust and being ethnic minority in Russia, while they establish a negative link between being Black and trust in U.S. The mechanism behind both results may be the same: Alesina and La Ferrara (2002) explain this result by the history of discrimination against black people in the U.S. In Soviet Union, ethnic networks prospered in Communist Party leadership especially at the regional level. Martin (2001) notes, that government responded to nationalist sentiments by "promoting national consciousness of its ethnic minorities and establishing for them many characteristic institutional form of a nation-state". It was (and still is) common to appoint a representative of the locally- dominant ethnicity as a governor of an ethnic region (while this ethnicity would be a minority in Russia as a total).

The effect of average income is significantly different from zero and negative in linear probabllity model, but not in the probit model. We interpret it as evidence against "environmental" hypothesis, since there is no positive link between individual trust and and the aggregate income; the link is negative, if any.

## 5.2 Robustness checks

A measure of imputed revenue from manufacturing based on the pre-existing industrial structure can be constructed in different ways. For example, instead of looking at the share of manufacturing one might use the share of capital goods producing industries. Also, it is possible to consider the industrial structure several years ago rather than immediately before the crisis.

The earliest year for each detailed and reliable information on industrial structure is available is 2000. To calculate the share of capital goods for every region, we take sum of the shares of ferrous metallurgy, non-ferrous metallurgy, chemical industry, machinery construction and metal works, timber industry, and the production of construction materials.

Imputed revenue can be calculated from the share capital goods:

$$ImpRev_{it} = ShareCapGoods_i \times SP_t \tag{5}$$

$ShareCapGoods_i$ is a share of capital goods in manufacturing in 2000, $i$ denotes region. $SP_t$ is the value of

S&P index in September 2007 and in March 2009.

Table 8 shows the results of 2SLS when income is instrumented by the imputed revenue from capital goods. When controlled for other covariates of trust, coefficient on income is significant and positive: once again, 10 percent increase in income implies a 2 percentage points increase in trust.

One of the alternative explanations for the positive link between income and trust may be the change in the quality of government services. For example, if in the regions vulnerable to crisis the tax base went down during the crisis, so local governments could not sustain the level of government services (law enforcement healthcare, etc.) and this lead to negative changes in trust.

This hypothesis can be tested using the measure of quality of public goods. We already control for the efficiency of law enforcement (Table 9, columns 4 and 5). We can also add a proxy for a quality of healthcare: infant mortality (number of children who die in their first year). Another option is to use self-reported subjective satisfaction with government services. We choose not to do so, because self-reported satisfaction closely resembles the level of trust, and is suspiciously distant from the objective measures. For example, in a cross-section of Russian regions, share of people who are dissatisfied with the quality of healthcare is strongly negatively correlates with with the level of trust. The correlation with infant mortality is not significantly different from zero Russians do not see doctors often: 37 percent of respondents say that they have not visited a doctor in at least a year (the source is the FOM survey administered in 2006 which was the latest year when this question was asked). Among those who had been visiting a doctor, 64 percent had been doing it "seldom".

Table 9 shows the results of 2SLS estimation with the set of controls including infant mortality rate. The coefficient for income remains significantly different from zero, and point estimate goes up to 0.34. Surprisingly, the coefficient for infant mortality is small but positive: 0.1 percentage point increase in infant mortality is associated with 0.01 percentage point increase in the share of those who say that most people can be trusted. Probably, in those regions where people can not get quality services from government, they rely on community more, which results in stronger social capital and trust.

# 6 Concluding remarks

In this paper, we ask a question if a change in income can cause a change in trust. We use sharp decline in Russian national income in in the end of 2008 and beginning of 2009 to identify the effect. We find that regions, where the economy relies on the production of capital goods (and therefore was more vulnerable to

the global crisis) experienced a larger decline in trust, than other regions. On average, 10 percent decline in income is associated with 2.6 percentage points decrease in trust. Given the average level of trust in Russia (18%), this is a substantial effect.

The finding that recession-driven income shocks cause a decline in trust certainly provides a scope for further research. First, the effect is not necessarily direction-symmetric: the fact that income decline decreases trust does not have to imply that an increase in income must increase trust. Second, it is not clear whether the effect is permanent or transitory. If the effect of income on trust is transitory, policy-makers should not worry too much as the recovery would bring trust back to pre-recession levels. If the decline in trust is permanent (and we do know that trust is very persistent) then this finding strengthen the case for countercyclical social policies.

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# Appendix

Table 3: Income Ranges

| **income range** | **coded in the dataset as:** |
|---:|---|
| ≤2000 | 1000 |
| 2001–3000 | 2000 |
| 3001–4000 | 3000 |
| 4001–5000 | 4000 |
| 5001–6000 | 5000 |
| 6001–7000 | 6000 |
| 7001–8000 | 7000 |
| 8001–9000 | 8000 |
| 9001–10000 | 9000 |
| 10001–12000 | 10000 |
| 12001–15000 | 12000 |
| 15001–20000 | 15000 |
| 20001–25000 | 20000 |
| 25001–30000 | 25000 |
| 30001–45000 | 30000 |
| 45001–60000 | 45000 |
| ≥60001 | 60000 |

*Note:* All values are in Russian rubles.

Table 4: Descriptive Statistics

| | Year 2007 | | Year 2009 | |
|---|---|---|---|---|
| | mean | sd | mean | sd |
| Trust | 0.18 | 0.06 | 0.19 | 0.08 |
| Income | 3856.29 | 1399.39 | 5048.58 | 1935.91 |
| Education | 0.16 | 0.08 | 0.15 | 0.08 |
| Population | 676.87 | 947.77 | 675.83 | 945.04 |
| Homicide Rate | 0.17 | 0.06 | 0.14 | 0.06 |
| Gini | 0.35 | 0.05 | 0.32 | 0.05 |
| Age | 44.95 | 2.00 | 44.87 | 1.98 |
| *N* | 198 | | 198 | |

*Note:* All variables are calculated using two repeated observations on cross-section of 66 Russian regions. The first period is September, 2007. The second period is March, 2009. Individual responses are averaged on the level of meta-setllement: regional center, urban area, and rural area in a 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 Gini coefficient calculated from individual incomes for every meta-settlement for both periods. *Homicide rate* is number of murders per 1000 people per year. It is calculated on the regional level. *Population* is in thousands. *Sources:* FOM, Rosstat.

Table 5: Reduced Form Estimates

| . | | **Trust** | | |
|---|---|---|---|---|
| . | (1) | (2) | (4) | (4) |
| Imputed Revenue | -0.116 | -0.137 | -0.311*** | -0.302*** |
| | (0.0850) | (0.0839) | (0.103) | (0.102) |
| Log Population | | 0.170** | 0.151*** | 0.147*** |
| | | (0.0752) | (0.0475) | (0.0488) |
| Higher Education | | | -0.289* | -0.309* |
| | | | (0.164) | (0.164) |
| Homicide Rate | | | 0.483** | 0.470* |
| | | | (0.234) | (0.241) |
| Gini | | | 0.0202 | 0.0155 |
| | | | (0.116) | (0.121) |
| Age | | | | -0.0924 |
| | | | | (0.102) |
| Age Squared | | | | 0.00101 |
| | | | | (0.00117) |
| Constant | 0.196*** | -0.860* | -0.748** | 1.380 |
| | (0.00947) | (0.465) | (0.295) | (2.214) |
| Observations | 264 | 264 | 264 | 264 |
| R-squared | 0.012 | 0.173 | 0.244 | 0.249 |
| Number of settl_id | 132 | 132 | 132 | 132 |

*Note:* All variables are calculated using two repeated observations on cross-section of 66 Russian regions. The first period is September 2007. The second period is March 2009. Individual responses are averaged on the level of meta-setllement: regional center, and non-center urban area in a region. Imputed revenue is calculated for every region and every period by formula (1). *Education*is a share of people with at least unfinished college degree. *Gini* is Gini coefficient calculated from individual incomes for every meta-settlement for both periods. *Homicide rate* is number of murders per 1000 people per year. It is calculated on the regional level. Fixed effects are on meta-settlement level. *Sources:* FOM, Rosstat. Robust standard errors (clustered by 66 regions) in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 6: Generalized Trust: Individual Linear Probability Estimates

| . | **Generalized Trust** | | | |
|---|---|---|---|---|
| . | (1) | (2) | (3) | (4) |
| Log Income | 0.00859*** | 0.00729*** | 0.00714*** | 0.00692** |
| | (0.00308) | (0.00269) | (0.00267) | (0.00263) |
| Female | | -0.0144*** | -0.0145*** | -0.0143*** |
| | | (0.00422) | (0.00424) | (0.00430) |
| Education | | 0.0673*** | 0.0681*** | 0.0682*** |
| | | (0.00779) | (0.00779) | (0.00786) |
| Age | | 0.000241 | 0.000230 | 0.000205 |
| | | (0.00109) | (0.00110) | (0.00110) |
| Age Squared | | -1.55e-06 | -1.28e-06 | -1.03e-06 |
| | | (1.07e-05) | (1.07e-05) | (1.07e-05) |
| Minority | | 0.0468*** | 0.0458*** | 0.0474*** |
| | | (0.0102) | (0.00984) | (0.0104) |
| Average income | -0.0643 | -0.0651 | -0.0647 | -0.0316** |
| | (0.0423) | (0.0429) | (0.0452) | (0.0148) |
| Ethnic Diversity | | | -0.00242 | 0.0364 |
| | | | (0.190) | (0.0548) |
| Average Education | | | -0.189 | -0.0967* |
| | | | (0.149) | (0.0537) |
| Average Age | | | 0.0716 | 0.0259 |
| | | | (0.0811) | (0.0252) |
| Average Age Squared | | | -0.000840 | -0.000286 |
| | | | (0.000884) | (0.000268) |
| Homicide Rate | | | -0.0393 | -0.0103 |
| | | | (0.0493) | (0.0125) |
| Average Trust | | | | 1.007*** |
| | | | | (0.0395) |
| Observations | 25,617 | 25,617 | 25,617 | 25,617 |
| R-squared | 0.017 | 0.021 | 0.021 | 0.028 |

*Note:* All variables are calculated with FOM survey of September 2007. Individual responses are averaged on the level of meta-setllement: regional center, and non-center urban area in a region. Each regressions contains variables for the share of all major ethnicities in a stllement as well as dummies for the respondent's ethnicity. *Education*is a share of people with at least unfinished college degree. *Gini* is Gini coefficient calculated from individual incomes for every meta-settlement for both periods. *Homicide rate* is number of murders per 1000 people per year. It is calculated on the regional level. Minority equals 1 if respondent's ethnicity is the majority in a settlement, 0 – otherwise. Other regressors are: the shares of all ethnicities and indicator variables for all major ethnicities. Fixed effects are on meta-settlement level. *Sources:* FOM, Rosstat. Robust standard errors (clustered by 66 regions) in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 7: Generalized Trust: Probit Estimates

| . | **Generalized Trust** | | | |
|---|---|---|---|---|
| . | (1) | (2) | (3) | (4) |
| Log Income | 0.0311** | 0.0263** | 0.0256** | 0.0249** |
| | (0.0121) | (0.0105) | (0.0104) | (0.0103) |
| Female | | -0.0577*** | -0.0580*** | -0.0576*** |
| | | (0.0163) | (0.0164) | (0.0168) |
| Education | | 0.240*** | 0.244*** | 0.246*** |
| | | (0.0262) | (0.0263) | (0.0267) |
| Age | | 0.000976 | 0.000921 | 0.000765 |
| | | (0.00410) | (0.00413) | (0.00418) |
| Age Squared | | -6.16e-06 | -5.02e-06 | -3.21e-06 |
| | | (4.03e-05) | (4.05e-05) | (4.09e-05) |
| Minority | | 0.179*** | 0.174*** | 0.185*** |
| | | (0.0347) | (0.0335) | (0.0358) |
| Log Average Income | -0.225 | -0.234 | -0.233 | -0.0818 |
| | (0.149) | (0.151) | (0.157) | (0.0680) |
| Ethnic Diversity | | | 0.0682 | 0.243 |
| | | | (0.713) | (0.244) |
| Average Education | | | -0.719 | -0.469** |
| | | | (0.542) | (0.216) |
| Average Age | | | 0.269 | 0.0779 |
| | | | (0.275) | (0.115) |
| Average Age Squared | | | -0.00313 | -0.000820 |
| | | | (0.00300) | (0.00119) |
| Homicide Rate | | | -0.0981 | 0.0448 |
| | | | (0.162) | (0.0395) |
| Average Trust | | | | 3.688*** |
| | | | | (0.208) |
| Observations | 25,617 | 25,617 | 25,617 | 25,617 |

*Note:* All variables are calculated with FOM survey of September 2007. Individual responses are averaged on the level of meta-setllement: regional center, and non-center urban area in a region. Each regressions contains variables for the share of all major ethnicities in a stllement as well as dummies for the respondent's ethnicity. *Education*is a share of people with at least unfinished college degree. *Gini* is Gini coefficient calculated from individual incomes for every meta-settlement for both periods. *Homicide rate* is number of murders per 1000 people per year. It is calculated on the regional level. Minority equals 1 if respondent's ethnicity is the majority in a settlement, 0 – otherwise. Other regressors are: the shares of all ethnicities and indicator variables for all major ethnicities. Fixed effects are on meta-settlement level. *Sources:* FOM, Rosstat. Robust standard errors (clustered by 66 regions) in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 8: IV Estimates with Share of Capital Goods in Manufacturing

| . | | **Trust** | | |
|---|---|---|---|---|
| . | (1) | (2) | (3) | (4) |
| Log Income | 0.0437 | 0.0561 | 0.217* | 0.212* |
| | (0.0338) | (0.0346) | (0.121) | (0.121) |
| Log Population | | 0.177** | 0.171*** | 0.167*** |
| | | (0.0752) | (0.0367) | (0.0364) |
| Education | | | -0.456** | -0.444** |
| | | | (0.232) | (0.222) |
| Homicide Rate | | | 1.206* | 1.164* |
| | | | (0.669) | (0.661) |
| Gini | | | 0.107 | 0.118 |
| | | | (0.197) | (0.200) |
| Age | | | | -0.108 |
| | | | | (0.108) |
| Age Squared | | | | 0.00126 |
| | | | | (0.00124) |
| Observations | 264 | 264 | 264 | 264 |
| First stage R-squared | 0.357 | 0.361 | 0.579 | 0.586 |
| First stage F-stat | 59.31 | 25.11 | 19.09 | 14.31 |
| Number of meta-settlements | 132 | 132 | 132 | 132 |
| Years | 2 | 2 | 2 | 2 |

*Note:* All variables are calculated using two repeated observations on cross-section of 66 Russian regions. The first period is September 2007. The second period is March 2009. Individual responses are averaged on the level of meta-setllement: regional center, and non-center urban area in a region. Imputed revenue is calculated for every region and every period by formula 5. *Education*is a share of people with at least unfinished college degree. *Gini* is Gini coefficient calculated from individual incomes for every meta-settlement for both periods. *Homicide rate* is number of murders per 1000 people per year. It is calculated on the regional level. Fixed effects are on meta-settlement level. *Sources:* FOM, Rosstat. Robust standard errors (clustered by 66 regions) in parentheses: *** p<0.01, ** p<0.05, * p<0.1

Table 9: Determinants of Generalized Trust: Robustness Checks

| . | **Generalized Trust** |
|---|---|
| Log Income | 0.350** |
| | (0.157) |
| Log Population | 0.186*** |
| | (0.0346) |
| Higher Education | -0.543** |
| | (0.262) |
| Homicide Rate | 1.827** |
| | (0.830) |
| Gini | 0.164 |
| | (0.266) |
| Age | -0.0945 |
| | (0.127) |
| Age Squared | 0.00115 |
| | (0.00146) |
| Infant Mortality | 0.0159** |
| | (0.00705) |
| Observations | 264 |
| Number of settl_id | 132 |

All variables are calculated using two repeated observations on cross-section of 68 Russian regions. The first period is September, 2007. The second period is March, 2009. Individual responses are averaged on the level of meta-setllement: regional center, urban area, and rural area in a region. *Generalized 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 Gini coefficient calculated from individual incomes for every meta-settlement for both periods. *Homicide rate* is number of murders per 1000 people per year. It is calculated on the regional level. Values of other variables are calculated on meta-settlement level. Fixed effects are on meta-settlement level. *Sources:* "Public Opinion" Foundation, Russian State Statistics Committee. Robust standard errors (clustered by 68 regions) in parentheses: *** p<0.01, ** p<0.05, * p<0.1