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Abstract:

There is much still to learn about the relationship between income and well-being, and in particular how this may depend on the economic and social context. We use Russian data to estimate individual Welfare Functions of Income, and examine two potentially context-dependent concepts: self-assessed income needs and welfare sensitivity to income (how well-being changes with income). The considerable geographical diversity in Russia provides within-country variation in GDP, inequality, population density, and unemployment. We first show that income needs exceed actual income on average in Russia, and that these needs are less sensitive to changes in income than in other countries. Second, income needs vary by individual characteristics, while welfare sensitivity does not. Welfare sensitivity is however related to the regional context. Last, our estimated contextual results help us to understand why the existing literature has produced such a wide range of results.

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Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could influence or appear to influence the work reported in this paper.

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1 Introduction

The relationship between income and well-being is central to both the understanding of individual behaviour and the determination of societal welfare. There are a variety of ways to establish the strength of this relationship: revealed preferences, hypothetical preferences, subjective well-being measures, and direct questions to individuals. We consider the last of these, where individuals provide income figures that correspond to a variety of verbal well-being labels. This method has the advantage of direct elicitation, but has produced a notably wide range of estimates.

Any attempt to estimate the link between income and well-being should consider that there may not be only one such relationship but rather many, and that these may depend on both individual characteristics and the economic and social context. The existing direct-elicitation results come from a patchwork of different datasets, methods, periods and cultures, making direct comparisons between them complicated. We will in the first instance add evidence from Russia to this existing set of results. However, our main contribution is to take advantage of the vast geographical and cultural variability in Russia that allows us to address the role of local context in the income-well-being relationship when applying one single method to one single dataset.

Following the literature initiated by van Praag (1968), we use the amounts of money individuals say they would need to attain different verbal levels of well-being to estimate individual welfare functions of income (IWFI). Each individual's IWFI has two parameters: (a) the income level that person requires to attain a certain level of well-being, which is called *income needs*, and (b) how much the individual's well-being changes as her own income changes, which is the *welfare sensitivity to income*. We then ask whether these two individual-level parameters are related to the regional context, as measured by GDP, income inequality, population density, and unemployment.

Existing work on income needs has covered a variety of countries and years,[1] finding that these needs are systematically correlated with individual characteristics such as income, education, and marital status. Evidence on the systematic correlates of the welfare sensitivity of income is however much sparser (see, e.g., van Herwaarden *et al*., 1977; van Praag, 1971;

[1] Colosanto *et al.* (1984) use 1981 US data; Flik and van Praag (1991) 1983 Dutch data; Kant *et al.* (2020) 2017 Canadian data; Kapteyn *et al*. (2009) 2001-2007 Dutch data; Schwarze (2008) 1992 German data; van Herwaarden *et al*. (1977) 1969, 1970 and 1973 Belgian data, and 1971, 1974 and 1975 Dutch data; van Praag (1971) 1969 Belgian data; van Praag and Kapteyn (1973) 1971 Dutch data; and van Praag *et al.* (1982) 1979 Belgian, British, Danish, Dutch, French, German, Irish and Italian data.

van Praag and Kapteyn, 1973). There are clear differences between countries, but these have not, to the best of our knowledge, been analysed in depth. Theoretical explanations of why these concepts may vary between individuals appear in Arie Kapteyn's PhD Thesis (1977) and subsequent research (for example, Kapteyn and Wansbeek, 1985, and Van de Stadt *et al.*, 1985). These propose that the IWFI corresponds to the individual's *perceived income distribution*, so that their income needs and welfare sensitivity mirror their perception of the distribution of income. We may well then, in turn, imagine that this perception reflects, partially or wholly, the context within which the individual lives, so that the perceived income and well-being of people individuals encounter affect their IWFI. We here directly estimate the role of the social and economic context to see whether these do indeed help explain the range of empirical results regarding the IWFI parameters, both within Russia and across the research findings from a variety of countries in the existing literature.

The research we present here has three aims. First, to establish whether the main results found in the existing literature continue to hold in recent Russian data. Second, to exploit the considerable geographical variation in Russian data to see whether the regional context affects the individual-level relationship between income and well-being: the regional context here will cover the regional income distribution (via the Gini coefficient), income (Gross Regional Product, GRP, per capita), population density (population per km^2), and unemployment (the regional unemployment rate). Last, to return to the (wide variety of) results in the existing literature and ask whether these can be better understood in the light of the contextual variables that turn out to be important in the Russian data.

Understanding the relationship between income and well-being is not only interesting from a theoretical point of view but can also provide important insights about societal welfare in terms of income distribution and redistribution, which many economic policies address. Considering how individuals' income preferences are affected by the context in which they live can thus shed light on how these policies may affect people's well-being.

We have three main results. First, the average Russian requires more income than they currently receive to attain average welfare, and their income needs are less sensitive to changes in income than is found in other countries. Second, income needs depend on individual characteristics (such as gender, income, education, and marital status), while welfare sensitivity does not but is instead related to the regional context (and in particular income inequality). Last, this contextual pattern (which cannot be identified from the analysis of data from only one homogenous country or region) also appears when re-examining the previous findings in the IWFI literature: an extra Dollar buys less welfare in countries with higher income inequality than in those with lower income inequality. Redistributing income from wealthier individuals to those with lower incomes can therefore enhance societal well-being by narrowing the income gap between different welfare levels. This not only raises overall welfare but also has a secondary benefit – reduced income inequality makes individuals more responsive to changes in income.

2 Data

The data we use mainly come from the 25th wave of the Russian Longitudinal Monitoring Survey - Higher School of Economics (RLMS-HSE), carried out in 2016, which in some cases is matched to income information from previous waves. Our main variables of interest come from the answers to the income evaluation question (IEQ).[2] The IEQ only appears in the 2016 survey wave, and is worded as follows:

What monthly income do you feel your family need for you to consider your living...

… rich?	_____ Rubles
… average?	_____ Rubles
… poor?	_____ Rubles

The 25th RLMS wave includes individual- and household-level information on 18,756 respondents in 7,000 households. We drop observations with missing values for the analysis variables and restrict the sample to respondents who are age 18 or over. To avoid any undue influence of extreme values, we further drop all observations that appear in the top or bottom

[2] The IEQ first appeared in van Praag (1971), in which IWFIs were estimated using data from a 1969 Belgian survey where respondents stated how much income they required to be at nine different verbal welfare levels, from very bad to excellent. Similar questions have appeared in a number of surveys, with the number of verbal welfare labels varying from three to nine. These answers are used to determine each individual's IWFI. The simplest version of the IEQ is the often-used Minimum Income Question (MIQ), where respondents state the minimum income they or their household would need to make ends meet (see, for example, the European Union Statistics on Income and Living Conditions survey (EU-SILC)). The RLMS's version of the IEQ varies from the wording of the original IEQ, as it asks respondents to consider living poor or rich, as opposed to evaluating an income level that is bad, sufficient, good, e.g. Nevertheless, we argue that the RLMS version is a similar welfare judgment since it also asks the respondent to value income at higher or lower well-being levels. As with all self-reported data, the use of this subjective measure of income needs has potential issues. The most prominent critique of questions such as the IEQ is that individuals might understand the question and the welfare levels differently. This has been shown to be the case with the MIQ (Steiger *et al.*, 1997). We cannot be sure that everyone understands "living to be average", for example, in the same way, which makes direct comparisons between people somewhat harder. It is, however, the case that this measurement error applies to the dependent variable in our estimations, so that the estimated OLS regression coefficients are consistent (see, for example, Wooldridge, 2016: pp. 287-288).

1% of the household income distribution in the 2016 survey and that of previous income,[3] as well as the top and bottom 1% of the distribution of each of the IEQ answers. Appendix Table A1 describes the selection process leading from the original to the final sample (and that for two alternatives appears in Appendix Table A3). Our final estimation sample covers 9,646 respondents in 5,178 households. We convert the income and IEQ variables (both of which are measured at the household level) to reflect household economies of scale by dividing them by the square root of the number of household members.[4] The summary statistics for all of the variables in the analysis (apart from the regional dummies) appear in Table 1 (for comparison, the analogous statistics for the original sample are listed in Appendix Table A2). We convert all income amounts to US Dollars.[5]

[Table 1 around here]

It has been argued that the IWFI reflects the perceived income distribution (Kapteyn, 1997; Kapteyn and Wansbeek, 1985). We provide some empirical evidence along these lines by seeing whether the relationship between income and well-being depends on the regional context. We consider the Gini coefficient, per capita Gross Regional Product (GRP), population density and the regional unemployment rate; all of these are aggregate variables that can affect both the perceived and actual income distributions. The regional Gini coefficient is calculated from the same sample data as in the main analysis.[6] The data on the GRP, population density, and unemployment come from the Federal State Statistics Service (2010, 2017, 2023). Appendix Table A4 lists the Russian regions and the values of these regional contextual variables.

[3] Previous income refers to that in 2012. We aim to strike a balance between avoiding an excessively-distant past (Di Tella *et al*., 2007, for instance, show that four years after an income increase, the impact on happiness is reduced by 65 percent) and ensuring that the chosen period remains representative of previous income. At the same time, we wish to retain a satisfactory sample size. When the respondent's 2012 income is unavailable, we substitute income information from 2011, 2013, 2010 and 2014 in turn (taking first the 2011 value, if available, and if not the values from 2013, 2010 and 2014 in turn) in order to keep as many observations as possible.

[4] In robustness tests we also consider the unequivalised income and IEQ income levels, as well as equivalised income from the commonly-used modified OECD equivalence scale.

[5] The conversion from Russian Rubles to mid-year 2016 US Dollars was carried out using information from the Central Bank of the Russian Federation (2023*a*, 2023*b*), with the Consumer Price Index from the World Bank (2023*a*) being used to correct for inflation.

[6] We analyse a trimmed sample, as the top and bottom one percent of income observations may be unreliable at the individual level. As such, they should also be considered to be unreliable when used to calculate the regional Gini coefficients. Although dropping the top and bottom one percent renders the income distribution more equal, we have no reason to believe that this attenuation differs systematically between regions.

Once we have established the role of the regional context in the Russian data, we ask whether the same contextual variables (now at the country level) can help to explain the pattern of findings from other countries in the existing literature. We carry out this exercise mostly using country-level Gini information from the Luxembourg Income Study Database (LIS Cross-National Data Center in Luxembourg, 2023), either for the same year as the analysis data in question, or a little earlier or later if the exact year is not available. The 1979 Italian Gini coefficient, as well as the coefficient for 1971 and 1979 in the Netherlands come from The Chartbook of Economic Inequality (Atkinson *et al.*, 2017*a*, 2017*b*). We were not able to identify reliable Gini coefficients for Belgium in 1969, 1970, 1973 and 1979, Denmark in 1979, Ireland in 1979, and the Netherlands in 1974. We use GDP per capita and country-level population-density data from The World Bank (2023*b* and 2023*c*). Population density for Wisconsin comes from The United States Census Bureau (1996, 2012), and we assign the US Gini coefficient to the Wisconsin analysis. Last, information on unemployment for the US comes from Bednarzik *et al*. (1982) and for the Netherlands in 1971 from Dreihus (1986). The other unemployment data all come The World Bank (2023*d*). Appendix Table A5 lists the values of the country-level variables used in the empirical analysis.

3 Methods

3.1 The Individual Welfare Function of Income

In 1968, Bernard van Praag argued that individuals could assign cardinal, and not only ordinal, values to different income levels. This allowed him to develop a direct method to estimate what he called the individual welfare function of income (IWFI), using the values that individuals supplied for the different welfare levels listed in the IEQ above (van Praag, 1971). These values allow two welfare parameters to be estimated for each respondent, capturing the relationship between individual income and well-being. The first is *income needs*, often called the want-parameter (μ): higher values of μ correspond to individuals who need more income to attain the medium welfare level. The second is *welfare sensitivity* (σ): this refers to the size of the reported income changes that are required to move from one welfare level to another.

These two parameters are estimated from individual-level regressions that rely on two key assumptions: (1) the shape of the welfare function can be approximated by a lognormal distribution function, which is the same for all individuals; and (2) each verbal description (such as being poor or having insufficient income) corresponds to the same numerical value on the scale from zero to one for all individuals and, further, these values are distributed equidistantly. For example, the values corresponding to three welfare levels (poor, average and rich) on a zero to one scale, are 0.25, 0.5 and 0.75 for all individuals (Buyze, 1982; van Herwaarden *et al.*, 1977; van Praag, 1971).

The utility of income y, $U(y)$, is then approximated by $\Lambda(y;\ \mu;\ \sigma^2)$, where Λ is a lognormal distribution function. This function is generally called the individual welfare function of income (IWFI: van Praag, 1968). Each individual i has their own particular values of μ and σ, estimated from the individual's IEQ responses.

In the RLMS data, there are three income amounts for each individual, $y_{i,c}$, corresponding to the three welfare levels $U_c(y_{i,c})$ at which the respondent would consider their family to be poor, average, and rich. Each individual, i, therefore has three points $\{(y_{i,c}, U_c(y_{i,c}))\}^3_{c=1}$, where $y_{i,c}$ is the income they assign to the verbal welfare level c (poor, average, or rich) and $U_c(y_{i,c})$ is the corresponding number on the [0,1] interval: here 0.25, 0.5 and 0.75 on the welfare curve. As such, the three verbal welfare levels are the same for all individuals and are equidistant from each other.

The normal distribution function is:

$$\Phi(\mathrm{x}) = \int_{-\infty}^{\mathrm{x}} \mathrm{e}^{-\frac{\mathrm{x}^2}{2}} \mathrm{dx} \qquad (1)$$

Standardising produces the standard normal distribution where income is in natural logs:

$$\left(ln\left(y_{i,c}\right) - \mu_i\right)/\sigma_i = \Phi^{-1}(U_c) \qquad (2)$$

The coefficients μ_i and σ_i then become parameters in the following regression model:

$$ln\left(y_{i,c}\right) = \mu_i + \sigma_i \Phi^{-1}(U_c) + \varepsilon_{i,c} \qquad (3)$$

Following the assumption above that the three points U_1, U_2 and U_3 lie at equal intervals[7] and are the same for all individuals, and letting $x_c = \Phi^{-1}(U_c)$:

$$U_c = \begin{bmatrix} 0.25 \\ 0.5 \\ 0.75 \end{bmatrix} \Rightarrow x_i = \begin{bmatrix} \Phi^{-1}(0.25) \\ \Phi^{-1}(0.5) \\ \Phi^{-1}(0.75) \end{bmatrix} \approx \begin{bmatrix} -0.67449 \\ 0 \\ 0.67449 \end{bmatrix} \qquad (4)$$

We can then estimate σ_i and μ_i in Equation (3) for each individual via OLS using the following coefficient equations (note that $\bar{x}$ = 0).[8]

[7] Buyze (1982) tested this assumption by estimating the intervals using Dutch data with nine levels of welfare, and concluded that it holds. We assume there that this equidistance assumption also holds with our three welfare levels, but we do not have explicit proof that it does. However, as a sensitivity analysis we present results in Appendix B in which this assumption is relaxed, with the verbal welfare level "rich" being assumed to be different from 0.75.

[8] $\bar{x} = \frac{x_1+x_2+x_3}{3} = \frac{\Phi^{-1}(0.25)+\Phi^{-1}(0.5)+\Phi^{-1}(0.75)}{3} = \frac{-0.67449+0+0.67449}{3} = 0.$

$$\sigma_i = \frac{\sum(x_{i,c} - \bar{x}) ln(y_{i,c})}{\sum(x_{i,c} - \bar{x})^2} = \frac{\sum x_{i,c}\, ln(y_{i,c})}{\sum x_{i,c}^2}$$
$$= \frac{-0.67449 ln(y_{i,1}) + 0 ln(y_{i,2}) + 0.67449 ln(y_{i,3})}{(-0.67449)^2 + 0^2 + 0.67449^2}$$
$$= \frac{0.67449\left(ln(y_{i,3}) - ln(y_{i,1})\right)}{2(0.67449)^2} = \frac{1}{1.34898} ln\left(\frac{y_{i,3}}{y_{i,1}}\right) \quad (5)$$

$$\mu_i = \overline{ln(y_i)} - \sigma_i \bar{x} = \overline{ln(y_i)} = \frac{1}{C}\sum ln(y_{i,c}) = \frac{1}{3}\sum ln(y_{i,c}) \quad (6)$$

With μ_i being the income needs, e^{μ_i} tells us how much income the individual requires to be at the medium welfare level of U = 0.5 (van Herwaarden *et al*., 1977; van Praag, 1971). An individual with a higher value of μ_i needs more income than someone with a lower μ_i to attain this welfare level. The *welfare sensitivity* parameter, σ_i, determines the slope of the welfare function around the value μ_i. Higher values of σ_i indicate that the individual requires larger changes in income to move from one welfare level to the next: as such, lower values of σ_i correspond to a higher value of the individual marginal utility of income. Note that the evaluation of the IWFI with either equivalised or unequivalised IEQ produces the same estimated value of σ_i, as σ_i indicates the standard deviation of a log.

[Figure 1 around here]

Figure 1 depicts this calculation for four different IWFIs: these are not actual values from the estimation sample, but rather more-extreme examples for illustrative purposes. Both the red and yellow curves have the same μ_i value of 8 (corresponding to a required annual income of 2,980 USD to attain the medium welfare level of U = 0.5), while for the blue and green curves μ_i is 12 (corresponding to a figure of 162,755 USD to attain the same welfare level). The value of σ_i is 1.5 for the red and blue curves, and 3 in the yellow and green curves. We thus have four combinations of income needs and welfare sensitivity to income. Higher income has an identical effect on welfare for those with the same value of σ_i. For example, a rise in *ln*(*income*) of 1 point for the yellow and green individuals in Figure 1, starting from welfare level U = 0.5, moves them both to U = 0.625; however, the same higher income moves red and blue individuals to U = 0.75, as their parameter for welfare sensitivity is lower (*i.e.* they are more sensitive to changes in their income). Those with lower values of σ_i benefit more from a rise in income, but at the same time have a higher income threshold for being poor (U

= 0.25): reading across from U = 0.25 in Figure 1, the blue curve is to the right of the green curve, and the red curve to the right of the yellow curve.

3.2 The Determinants of μ and σ

Given the importance of income needs and welfare sensitivity, μ and σ, for individual welfare, we wish to understand how they are determined.[9] Following existing work, the main explanatory variables in our first regression Model (1) are the natural log of the individual's family size, *ln*(*fs*), and the natural log of their household income, *ln*(*y*) (see, e.g., van Herwaarden *et al.*, 1977; van Praag, 1971). Models (2)−(5) then add age, marital status, education, whether working, and urbanisation. In addition, Model (3) includes region dummies, Models (4) and (5) the regional contextual variables (the Gini coefficient, Gross Regional Product, population density and unemployment), and Model (5) the log of the individual's past income (to examine adaptation to income). We consider the estimated determinants of μ for both equivalised income (μ_{ES}) and non-equivalised income (μ_{noES}). The estimation equations are as follows:

$$\mu_i = \beta_0 + \beta_1\, ln(fs_i) + \beta_2\, ln(y_i) + \sum_{n=1}^{p} \gamma_n\, X_{n,i} + \varepsilon_i \tag{7}$$

$$\sigma_i^2 = \theta_0 + \theta_1\, ln(fs_i) + \theta_2\, ln(y_i) + \sum_{n=1}^{p} \phi_n\, X_{n,i} + \zeta_i \tag{8}$$

where the exact variables in the X vector depend on the different estimation models. The standard errors in all estimations are clustered at the household level, and in Models (4) and (5) are also clustered at the regional level.

The existing literature always finds a positive estimated relationship between the log of family size and μ (*i.e.* the β_1 coefficient): this is called the *family elasticity*. As the IEQ refers to household income, we naturally expect family size to increase income needs when the IEQ is not corrected via equivalence scales. With an appropriate correction to produce equivalised income, β_1 should be (close to) zero: if family size is adequately taken into account in the IEQ responses via an equivalence scale, then it should not be correlated with the estimated value of μ. While we will mainly use the square root of family size to equivalise income, we also in Appendix C estimate μ_{OECD} using the modified OECD equivalence scale.

[9] From now on we will generally use μ and σ instead of μ_i and σ_i to refer to the two parameters at the individual level.

The relationship between μ and income, β_2, is called *preference drift* and is also consistently positive in the literature. Individuals with higher income require greater income to attain a given verbal level of welfare. We can interpret μ here as individual aspirations.[10] The term "preference drift" suggests causality running from individual income to income needs. However, the reverse causality is also possible: individuals who need more money to do well may put more effort into earning it. If so, then it is not high income that *causes* higher μ here, but rather greater μ determines behaviour in earning income. Both causal relationships are possible. The role of the regional context as a determinant of μ is not clear from the literature.

Existing work is divided about the relationships between σ and family size, income, and other socioeconomic characteristics (see, e.g., van Herwaarden *et al.*, 1977; van Praag, 1971; van Praag and Kapteyn, 1973). We will estimate these relationships, but again add to the existing literature by considering the regional context. For example, we might expect income inequality to increase σ, *i.e.* make individuals less sensitive to changes in income, if individuals are rank-sensitive, as larger rises in income will be needed to climb the income ranking in more-unequal regions. In addition, if the IWFI reflects the perceived income distribution (Kapteyn and Wansbeek, 1985), the actual income distribution in individuals' context should directly affect their σ. The effect of the Gross Regional Product on σ could be either negative or positive. Richer regions have better infrastructure, which might yield a greater sensitivity to changes in income (a lower σ) as each additional Ruble can buy more. However, richer regions may also have higher prices, making an additional Ruble worth less and producing a higher value of σ. There is considerable variation in population density across Russian regions. We will examine the role of population density while holding the individual's own urbanisation status constant. Those in more densely-populated regions may have better access to markets, making additional income more valuable (in terms of increasing welfare), regardless of whether the individual themself lives in a rural or urban area. In addition, economic mobility is higher in urban areas in Russia (Nassanov, 2017), and this mobility could produce a lower σ if movement between welfare levels consequently appears more feasible. Last, greater regional unemployment may make individuals more worried about losing their source of income and more sensitive to the income distribution.[11]

[10] Stutzer (2004), for example, uses the IEQ from Swiss survey data to estimate the relationship between income aspirations and well-being, finding that higher aspirations are associated with lower well-being.

[11] Eggers *et al*. (2006) found a slight positive relationship between well-being and the unemployment rate in Russia, contrary to the results from other European countries and the US. They argue that in troubled economic times individuals may lower their economic standards.

One of our aims is to see whether our results across Russian regions can help explain the variety of findings regarding the size of μ and σ in the existing literature. To do so, we first relate the average values of μ and σ at the region level in the Russian data ($\overline{\mu_r}$ and $\overline{\sigma_r}$) to a number of regional characteristics:

$$\overline{\mu_r} = \beta_0 + \beta_1 \mathrm{gini_r} + \beta_2 \mathrm{grp_r} + \beta_3 \mathrm{pop.dens_r} + \beta_4 \mathrm{unempl.rate_r} + \varepsilon_r \quad (9)$$

$$\overline{\sigma_r^2} = \theta_0 + \theta_1 \mathrm{gini_r} + \theta_2 \mathrm{grp_r} + \theta_3 \mathrm{pop.dens_r} + \theta_4 \mathrm{unempl.rate_r} + \zeta_r \quad (10)$$

The explanatory variables are regional inequality, income, population density and unemployment ($gini_r$, grp_r, $pop.dens_r$, and $unempl.rate_r$).

We then ask whether the pattern of estimated coefficients in Equations (9) and (10) can help us to understand the pattern of μ and σ found in other countries. We thus re-estimate Equations (9) and (10) using the estimated values of μ and σ in the existing literature ($\overline{\mu_s}$ and $\bar{\sigma}_s$, where the 's' subscript refers to existing surveys), matching in the appropriate $gini_s$, gdp_s, $pop.dens_s$, and $unempl.rate_s$ information from the different countries at the time of data collection. In this last analysis, we will also consider differences across surveys in the number of verbal labels for which income is elicited, as these may affect the estimated μ and σ coefficients.

4 Results

4.1 The Individual Welfare Function of Income

Table 2 lists the average of the individual values of μ_{ES}, μ_{noES} and σ, first over the whole sample and then by a number of different subgroups.[12] This table also shows the average income level needed to reach the medium welfare level of U = 0.5, $\overline{e^{\mu}}$ (note that $\overline{e^{\mu}} \neq e^{\overline{\mu}}$), which has been called the *natural unit* (van Herwaarden *et al.*, 1977). In the first panel of Table 2, using equivalised income levels in the IEQ, $\overline{\mu_{ES}}$ is 9.004 and the average $e^{\mu_{ES}}$ figure required for the middle family welfare level of U = 0.5, $\overline{e^{\mu_{ES}}}$, is $7,654 per annum (58,119 Rubles per

[12] Appendix Table A6 shows that these results continue to apply in samples with alternative income-trimming criteria. We may also wonder about the reliability of the answers to the IEQ. One way of addressing noise in the self-reported income levels corresponding to different levels of welfare is to restrict the sample to respondents who have been in the panel for longer (as these individuals may both have more trust in the interviewers and be more careful in answering the questions). The last row of Table A6 is estimated on a sample of individuals who appeared in the RLMS at least five times: this additional restriction makes barely any difference to the estimated results.

month). Given the average sample annual income of $5,071 (30,185 Rubles per month), the income that Russians perceive to be necessary for average welfare then substantially exceeds what they actually receive:[13] the average sample individual would require $2,583 (or 50%) higher income to attain the medium welfare level. Although this income gap is quite large, it does not automatically follow that individuals' perceptions are wrong. Average welfare in Russia may indeed be low.

[Table 2 around here]

The 2016 RLMS also includes a Cantril Ladder question, as follows: "[P]lease imagine a nine-step ladder where on the bottom, the first step, stand the poorest people, and on the highest step, the ninth, stand the richest. On which step of the nine steps are you personally standing today?" The average sample Cantril-ladder score is 3.66, again corresponding to below-average economic welfare. The gap to the mid-point of 5 on the Cantril scale is similar to the gap in the IWFI between 0.391 and medium welfare of 0.5. The IWFI does thus seem to capture individuals' views of their economic situation.

The estimate using unequivalised IEQ responses, which are mechanically larger as they are not divided by (the square root of) the number of household members, produces an annual household income figure of $17,141 (102,030 Russian Rubles per month) for an average family standard of living. With there being an average of 3.3 people in a household, it is not surprising that this amount is larger than the $\overline{\mu_{ES}}$, which has been equivalised for one individual.

The average estimated value of $\bar{\sigma}$ is large, so that substantial movements in income are needed to switch from one welfare level to another. The natural logs of the income amounts corresponding to being poor (U = 0.25) and rich (U = 0.75) are 7.879 and 10.129 respectively, for annual income levels of $2,641 and $25,061.

[Figure 2 around here]

The remainder of Table 2 reveals the differences in these figures between groups. Men have higher values of both $\bar{\mu}$ and $\bar{\sigma}$: this gender gap is illustrated in Figure 2, which shows the curves for the whole sample, and then men and women separately. Although the curves for

[13] In terms of welfare, the average individual is below average welfare with a score of 0.391 on the 0 to 1 welfare curve. This figure is calculated by inserting average income, $\overline{\mu_{ES}}$ and $\bar{\sigma}$ into Equation (2) and solving for u.

men and women are fairly close, especially at lower income levels, they are not identical. They intersect at *U* = 0.129 and *ln*(*income*) = *ln(*1,202*)* = 7.092: to the left of this point, a given rise in income produces a greater rise in welfare for men than for women, while the reverse holds to the right of this point.

Table 2 also shows that $\bar{\mu}$ is higher for workers, the educated, and those living in urban areas, while $\bar{\sigma}$ is also higher for workers but not for the educated and is lower in urban areas. Last, both $\bar{\mu}$ and $\bar{\sigma}$ fall with age (although the difference between the youngest age group, aged 18 to 30, and those aged 31-50 is only small).

4.2 The Determinants of μ and σ

We now ask what factors lie behind the estimated values of μ_{ES}: Which kind of people require more income to attain a given level of welfare? Table 3 presents a multivariate analysis of the determinants of μ_{ES}, with the columns corresponding to Models (1) to (5) of Equation (7), as discussed in Section 3.2.

[Table 3 around here]

In the first row of Table 3, family size attracts a negative and significant coefficient across all versions of the μ_{ES} regression. As the equivalence scale is meant to correct for the economies of scale associated with different family sizes, we would expect an adequate correction to produce a family elasticity coefficient that is close zero. The consistently-negative coefficient instead indicates that the equivalence scale that we apply here (the square root of the number of household members) actually over-corrects for household size.[14]

The bottom panel of Table 3 lists the estimated coefficients on the log of family size when the dependent variable is rather the uncorrected μ_{noES}. This is the only explanatory variable that is affected by the equivalising of the IEQ values (income and previous income are equivalised identically on the right-hand side in the regressions with μ_{ES} and μ_{noES}): see Appendix D for the algebraic proof. The estimated family-size coefficient in the μ_{noES} regression is unsurprisingly positive: larger families need more money to attain a given level of welfare, as found in previous research (see the first from last column in Table 4).

[14] In Appendix Table C3 the family-size coefficient is even more negative (in Models (2)-(5)) with the OECD equivalence scale, so that the OECD scale over-corrects even more than does the square root of family size.

[Table 4 around here]

Second, the estimated income coefficient is positive, in line with existing work on preference drift (listed in the last column of Table 4) and as predicted by the theory of preference formation (Kapteyn, 1977; Kapteyn and Wansbeek, 1985). In the most-parsimonious model in column (1) of Table 3 this coefficient is 0.462, which figure falls as additional controls are introduced and ends up at 0.315 in column (5).[15] In column (3), which includes all of the controls except for previous income and the regional variables (Gini, GRP, population density and the unemployment rate) but does include the regional dummies, this coefficient is 0.326. As such, a 10% higher income is associated with a value of μ that is 0.033 higher. For example, the value of μ for a single, working 30-year-old woman with higher education whose annual income rises from \$6,500 to \$7,150 is estimated to rise from 9.886 to 9.917 (corresponding to an increase in e^{μ} of \$19,656 to \$20,276). In Model (5), both current and past income are associated with higher μ, which is consistent with adaptation. A sudden income jump today is associated with a rise in income needs, and this latter rise will become larger over time if this higher level of income persists. This is consistent with the finding that, controlling for current income, past income is negatively correlated with current life satisfaction (Clark, 2016, summarises some of the research in this area).

The estimated coefficients on the other individual control variables show that the income-need parameter μ is higher for men, the educated, workers, and those in urban areas, as in the raw data in Table 2. The estimated quadratic age coefficients indicate that μ is the highest for those in their early 30s.

Adding regional dummies in column 3 increases the explanatory power. However, replacing these dummies with the four regional variables in Models (4) and (5), the Gini coefficient, GRP, population density and the unemployment rate, reduces the adjusted-R^2 figure, so that these are not the only regional variables that matter for income needs. The Gini coefficient and GRP are positively correlated with μ, whereas the correlations with population density and the unemployment rate are negative and significant.[16]

Column 3 of Table 3 reveals substantial regional differences in the value of μ, even when controlling for the composition effects of age, sex, urbanisation and so on. Table 5 then shows how the estimated coefficients on the 38 regional dummies, $\overline{\mu_r}$, are related to the four

[15] Adding the control variables one by one, we find that urbanisation is the most responsible for this fall in the income coefficient.
[16] The regression results when the regional variables are introduced one at a time appear in Appendix Table A7.

observable regional characteristics, as set out in Equation (9). This two-stage procedure (as opposed to introducing the regional characteristics directly, as in column 4 of Table 3) allows us to compare the results directly to those in the existing literature that are summarised in Table 4.

[Table 5 around here]

The results for the Russian regions that we analyse appear in the first two columns of Table 5, where the regional average μ_{ES} is regressed on the regional Gini coefficient, GRP per capita (in logs), population density and unemployment rate. There is a strong association between GRP and the regional $\bar{\mu}$, with more income being required to reach a given welfare level in richer regions. Neither the estimated Gini coefficient nor unemployment are statistically significant in the left-hand side of Table 5. Last, as in Table 3, the estimated coefficient on regional population density is negative (but not significant in Table 5).

The three right-hand columns of Table 5 carry out the same exercise, where each observation no longer refers to a Russian region but rather to a result in the existing literature (generally at the country level). There is considerable variation in the analyses that produced these observations, in terms of the IEQ used (the number of verbal welfare levels), the estimation techniques, and so on. This data is therefore much noisier than that from the RLMS, potentially making significant relationships even more difficult to detect; there are also far fewer observations. It is however still useful to carry out this exercise to evaluate the potential external validity of the Russian regional results. The estimated coefficients on all of the aggregate variables in specification (1) in the right panel are of the same sign as in the Russian regional data when population density is included in the analysis. Excluding population density in specifications (2) and (3) on the right-hand side causes the coefficient on GRP to change sign, while the coefficient on Gini is reduced. This, in addition to the large population-density coefficient (as compared to that in Russian regions), suggests the presence of multicollinearity.[17] The unemployment rate attracts a consistent negative coefficient in the analysis of the existing literature, which is statistically significant in specifications (2) and (3). Specification (3) includes the number of IEQ welfare points in the survey, but this does not attract a significant estimated coefficient.[18]

[17] The correlation matrix for the variables can be seen in Appendix Table A8.

[18] Appendix E describes the correlations between the regional average μ coefficients and the regional variables in Russia, and the analogous figures in the existing literature. Neither of the bivariate correlations with the Gini

Table 6 shows the regression results for the individual welfare-sensitivity parameter, σ. Family size is positively correlated with σ in Model (1) but switches signs once the individual controls are included. This reflects the correlation between family size and the other characteristics.[19] There is a positive correlation between income and σ: the richer require a larger percentage rise in income (as income appears in logs) to change welfare level. This is also the case for men and those living outside of cities. We should nonetheless note that the regression with individual controls in column 2 only produces an Adjusted R^2 value of 0.032, as opposed to 0.188 in the analogous regression for μ in Table 3. As in the existing literature then, σ depends only weakly on individual characteristics (van Herwaarden *et al*., 1977; van Praag, 1971; van Praag and Kapteyn, 1973).

[Table 6 around here]

Although the individual-level correlations are not strong, van Herwaarden *et al*. (1977) do find a clear difference between the estimated values of σ in Belgium and the Netherlands. They speculate that this may reflect linguistic differences but could also reflect other regional differences. Van Praag *et al.* (1982) also report country differences in σ, but do not discuss their possible causes. Adding regional dummies in column 3 of Table 6 produces a notable rise in the R^2 to 0.124. There are then substantial regional differences in how much income is required to change welfare levels, which are not linguistic in our case.

We add our four observable regional variables in columns 4 and 5. All but the unemployment rate attract significant coefficients. The positive relationship with the Gini coefficient shows that individuals require more income to change welfare levels where there is greater income inequality, in line with a utility function where rank in the income distribution matters.[20] On the contrary, the coefficient on GRP per capita is negative, so that an extra Ruble buys more welfare in richer regions. Last, population density is positively associated with σ.[21]

Table 7 shows the results when we regress the estimated coefficients, σ_r, on the four regional variables. Only the Gini coefficient attracts a statistically-significant coefficient here,

coefficient is significant, but the findings are consistent with the regression results in Table 5. Last, there is no bivariate relationship between population density and μ in Russia, while that in the existing literature is positive and significant.

[19] When the controls are added one by one into the regression model, it is age that lies behind this switch from a positive to a negative estimated coefficient.

[20] There is empirical evidence that income rank affects individuals' reported satisfaction scores, controlling for the level of own income. Two examples are Boyce *et al*. (2010) and Clark *et al*. (2009).

[21] The regression results when the regional variables are introduced one at a time appear in Appendix Table A9.

which is positive (as in Table 6). The coefficient on GRP hovers around zero. Population density changes signs when compared to the individual-level regressions and is no longer significant. As with the individual-level regression, the unemployment rate does not attract a statistically-significant coefficient at the regional level.

[Table 7 around here]

The last three columns of Table 7 carry out the same exercise at the country level for the estimated values of σ in the existing literature. The results here are similar to those for Russian regions: a positive and significant relationship between the Gini coefficient and σ, and insignificant estimates on GRP and population density. The unemployment rate is negatively associated with σ, although only statistically-significantly so in Models (1) and (2). The same relationships are apparent in the bivariate correlations (See Appendix E).

5 Discussion

We set out to estimate the relationship between income and well-being using 2016 Russian data. The two key parameters in this relationship are income needs and welfare sensitivity, and we relate both to individual and regional characteristics. The advantage of the Russian data is that it allows the analysis of substantial geographical variation within a single dataset.

Our adjustment of the IEQ responses via an equivalence scale is rare in the existing literature, and the comparison of our unequivalised income needs ($\overline{\mu_{noES}}$) to those in previous work (CPI-adjusted US$) is more instructive. Our estimated income-needs figure, $\overline{\mu_{noES}}$ = 9.536 is at the bottom of the range of 9.379−10.438 in the literature. To put these different income amounts into perspective, Table 4 also shows the $e^{\overline{\mu}}$ as a percentage of GDP per capita (World Bank, 2023*b*). As Russia is poorer than most of the countries that appear in the existing literature, the relatively low Russian income-needs figure ($\overline{\mu_{noES}}$) still turns out to be higher than the Russian GDP per capita figure.

The relationship between income needs (μ_{ES} and μ_{noES}) and current income (preference drift) is positive and similar in size to that estimated by Ferrer-i-Carbonell and van Praag (2001) using 1997 and 1998 Russian data. Either causality is possible here: greater income needs as income rises, or that those with more income needs seek higher income. There is also a positive relationship with previous income, which is consistent with adaptation (Easterlin, 1974, 1995, 2017; Easterlin *et al*., 2010).

The relationship between family size and income needs is larger in Russia than in other countries. Our coefficient of 0.396 (in the bottom panel of Table 3) is similar to what Ferrer-i-Carbonell and van Praag find in Russia (0.422 and 0.365 in 1997 and 1998 respectively), but considerably larger than those in the other existing work (0.059-0.204 in Table 4). These coefficient sizes refer to the additional number of total Dollars the household needs as family size rises (μ_{noES}); however, when we consider equivalised income, this relationship turns negative. This reversal indicates that the equivalence scale has over-corrected for economies of scale within households. This conclusion applies to both the square root and OECD equivalence scales.[22]

Controlling for individual characteristics, there is a clear regional pattern in income needs (μ): these are higher in richer regions. This may reflect regional prices, or comparisons to others within the region (as surveyed in Clark *et al*., 2008). In the latter case, utility is not absolute but relative: the more others earn, the more I need to earn to consider myself to be at a given welfare level.

Our estimated welfare-sensitivity value (σ) of 1.69 is much higher than in previous work (0.34−0.57). Russians, therefore, require larger changes in income to move between welfare levels. As in the existing literature, individual characteristics contribute little to the understanding of this welfare sensitivity; however, regional variables do play a role. In particular, the welfare-sensitivity parameter rises with the regional Gini coefficient. In other words, higher income inequality is associated with a lower sensitivity to changes in income. This may again reflect comparisons to others, where larger changes in income are needed to improve rank in the income distribution when the latter is more unequal. The same positive relationship between income inequality and income needs is also apparent in the previous literature. The current examination of contextual variables indicates that circumstances surrounding the individual matter. As such, identifying other regional/country characteristics that can help to explain the pattern of income needs (μ) and welfare sensitivity (σ), and therefore the determination of individual welfare, is a worthwhile avenue for future research.

These results underline the potential role of income redistribution in the determination of societal welfare. As the elasticity of income needs to income is far below one, and the income gap between welfare levels is smaller for those with lower incomes, redistributing from the richer to the poorer will raise welfare. There is also a double dividend from this redistribution,

[22] Although it falls outside the scope of this paper, the estimated coefficient on family size in the IWFI regressions can be used to directly estimate equivalence scales (see Kapteyn and Van Praag, 1978; Kapteyn, 1994).

as the resulting lower aggregate income inequality will reduce the value of the welfare-sensitivity parameter resulting in the individuals being *more sensitive* to changes in their income, so that each additional Dollar now buys more welfare. As such, fewer people would describe themselves as poor under a more-equal distribution of income. As our examination of a variety of results from different countries has underlined, this conclusion is not confined to Russia but rather seems to be universal.

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Tables

Table 1: Summary Statistics for the Final Sample

Statistic	Mean	St. Dev	Min	Max
Income: Equivalised				
Household income ($ per year)	5,071	2,696	1,048	19,488
Previous household income*	5,325	3,280	717	22,139
Income: Unequivalised				
Household income ($ per year)	9,174	5,884	1,058	48,871
Previous household income*	9,398	6,444	813	58,436
Income evaluation question: Equivalised income levels				
Monthly income to consider your family living as...				
... poor:	2,867	2,011	252	12,124
... average:	13,651	11,562	2,425	83,156
... rich:	30,881	27,759	4,250	193,990
Income evaluation question: Unequivalised income levels				
Monthly income to consider your family living as...				
... poor:	5,039	3,834	336	33,600
... average:	23,697	20,967	2,520	168,000
... rich:	54,010	49,364	4,704	504,000
Individual Characteristics				
Male	0.414	0.493	0	1
Age	46.61	17.12	18	93
Number of children	1.391	0.989	0	8
Number of household members	3.287	1.692	1	16
Working	0.576	0.494	0	1
Marital status				
Single	0.128	0.334	0	1
Married**	0.670	0.470	0	1
Divorced	0.085	0.278	0	1
Widowed	0.117	0.321	0	1
Education				
Primary education	0.141	0.348	0	1
Secondary education	0.298	0.457	0	1
Vocational school	0.272	0.445	0	1
Higher education	0.289	0.453	0	1
Urbanisation				
City	0.426	0.495	0	1
Town	0.291	0.454	0	1
Rural	0.282	0.450	0	1

Observations = 9,646
* The fact that income is lower in 2016 than previous income reflects the 2014-2015 Russian financial crisis.
** Married includes those who are living together and those in a domestic relationship.

Table 2: Average IWFI Parameters from the Estimation of Equation (3)

	N	$\overline{\mu_{ES}}$	Std.Err	$\overline{\sigma}$	Std.Err	$\overline{e^{\mu_{ES}}}$	$\overline{\mu_{noES}}$	$\overline{e^{\mu_{noES}}}$
Whole sample	9,646	9.004	0.208	1.688	0.377	9,764	9.536	17,141
		[0.597]	[0.168]	[0.647]	[0.305]	[6,366]	[0.653]	[11,899]
Gender:								
Men	3,997	9.063	0.215	1.741	0.391	10,352	9.632	18,519
		[0.600]	[0.175]	[0.665]	[0.318]	[6,650]	[0.626]	[12,192]
Women	5,649	8.963	0.202	1.651	0.368	9,349	9.335	16,166
		[0.591]	[0.163]	[0.632]	[0.295]	[6,124]	[0.664]	[11,590]
Education:								
Primary	1,363	8.815	0.210	1.669	0.381	8,162	9.335	14,343
		[0.598]	[0.172]	[0.673]	[0.312]	[5,746]	[0.674]	[11,069]
Secondary	2,871	8.942	0.216	1.693	0.314	9,217	9.486	16,275
		[0.598]	[0.173]	[0.654]	[0.314]	[6,242]	[0.644]	[11,479]
Vocational	2,621	9.019	0.209	1.692	0.380	9,865	9.535	17,157
		[0.590]	[0.168]	[0.652]	[0.305]	[6,377]	[0.656]	[12,012]
Higher	2,791	9.147	0.197	1.689	0.358	11,017	9.688	19,384
		[0.566]	[0.161]	[0.622]	[0.292]	[6,526]	[0.614]	[12,206]
Employment:								
Working	5,555	9.099	0.214	1.736	0.387	10,613	9.670	19,033
		[0.584]	[0.172]	[0.649]	[0.312]	[6,541]	[0.609]	[12,124]
Not working	4,091	8.876	0.200	1.623	0.363	8,613	9.355	14,572
		[0.590]	[0.162]	[0.639]	[0.295]	[5,930]	[0.668]	[11,083]
Urbanisation:								
City	4,113	9.113	0.190	1.604	0.344	10,865	9.569	19,052
		[0.565]	[0.155]	[0.613]	[0.281]	[6,531]	[0.635]	[12,349]
Town	2,810	8.980	0.207	1.716	0.376	9,532	9.494	16,484
		[0.590]	[0.169]	[0.643]	[0.306]	[6,404]	[0.650]	[11,812]
Rural	2,723	8.836	0.236	1.787	0.428	8,343	9.394	14,933
		[0.605]	[0.182]	[0.683]	[0.331]	[5,740]	[0.650]	[10,795]
Age groups:								
18-30	1,988	9.073	0.214	1.754	0.388	10,489	9.700	19,678
		[0.611]	[0.174]	[0.658]	[0.316]	[6,733]	[0.616]	[12,744]
31-50	3,740	9.059	0.215	1.734	0.390	10,267	9.673	19,077
		[0.598]	[0.175]	[0.659]	[0.318]	[6,446]	[0.609]	[12,039]
51-70	2,994	8.957	0.203	1.654	0.368	9,325	9.392	14,946
		[0.590]	[0.160]	[0.627]	[0.290]	[6,304]	[0.649]	[11,078]
71+	924	8.792	0.183	1.471	0.332	7,598	9.100	10,962
		[0.518]	[0.148]	[0.583]	[0.268]	[4,607]	[0.617]	[7,872]

Notes: Standard deviations are in square brackets.
* $\overline{\mu_{ES}}$ is estimated using the equivalised IEQ income figures and $\overline{\mu_{noES}}$ from the unequivalised income figures. The standard errors of $\overline{\mu_{ES}}$ and $\overline{\mu_{noES}}$ are identical.
** The $\overline{e^{\mu_{ES}}}$ and $\overline{e^{\mu_{noES}}}$ values are calculated as the average of the exponential for each individual, rather than being the exponential of the average $\overline{\mu_{ES}}$ and $\overline{\mu_{noES}}$ figures. Both of these exponential figures are listed in annual US Dollars.

Table 3: The Determinants of Income Needs (μ_{ES}) from the Estimation of Equation (7)

	Dependent variable:				
	μ_{ES}				
	(1)	(2)	(3)	(4)	(5)
Ln Family Size	-0.104***	-0.160***	-0.146***	-0.148***	-0.142***
	(0.011)	(0.013)	(0.013)	(0.013)	(0.013)
Ln $Income_t$	0.462***	0.391***	0.326***	0.356***	0.315***
	(0.012)	(0.013)	(0.013)	(0.013)	(0.015)
Ln $Income_{t-4}$					0.082***
					(0.011)
Male		0.083***	0.085***	0.085***	0.083***
		(0.012)	(0.012)	(0.012)	(0.012)
Age		0.007***	0.008***	0.006***	0.005**
		(0.002)	(0.002)	(0.002)	(0.002)
$Age^2/100$		-0.011***	-0.012***	-0.010***	-0.009***
		(0.002)	(0.002)	(0.002)	(0.002)
Single		0.039*	0.040**	0.039*	0.039*
		(0.020)	(0.019)	(0.020)	(0.020)
Divorced		0.036*	0.015	0.028	0.031
		(0.021)	(0.021)	(0.021)	(0.021)
Widowed		-0.036*	-0.039*	-0.044**	-0.042**
		(0.021)	(0.021)	(0.021)	(0.020)
Primary education		-0.110***	-0.124***	-0.113***	-0.099***
		(0.019)	(0.019)	(0.019)	(0.019)
Secondary education		-0.082***	-0.086***	-0.083***	-0.074***
		(0.015)	(0.014)	(0.015)	(0.015)
Vocational school		-0.030***	-0.044***	-0.032**	-0.025*
		(0.015)	(0.014)	(0.015)	(0.015)
Working		0.034***	0.035***	0.038***	0.041***
		(0.014)	(0.014)	(0.014)	(0.014)
Town		-0.094***	-0.527***	-0.068***	-0.066***
		(0.013)	(0.047)	(0.014)	(0.014)
Rural		-0.157***	-0.537***	-0.122***	-0.120***
		(0.014)	(0.042)	(0.015)	(0.015)
Gini				0.954***	0.878***
				(0.270)	(0.269)
Ln GRP				0.052***	0.040**
				(0.020)	(0.020)
Pop. density/100,000				-1.299**	-1.413**
				(0.562)	(0.560)
Unemployment rate				-0.034***	-0.034***
				(0.005)	(0.005)
Constant	5.233***	5.895***	6.492***	6.006***	5.719***
	(0.095)	(0.118)	(0.127)	(0.131)	(0.133)
Regional dummies‡	No	No	Yes	No	No
Adjusted R^2	0.144	0.188	0.257	0.199	0.203
	μ_{noES}†				
Ln Family Size	0.396***	0.340***	0.354***	0.352***	0.358***
	(0.011)	(0.013)	(0.013)	(0.013)	(0.013)
Adjusted R^2	0.286	0.323	0.380	0.332	0.335

Notes: Observations = 9,646 * p<0.1; **p<0.05; ***p<0.01

Standard errors clustered at the household level, and additionally at the regional level in Models (4) and (5), appear in parentheses.

† The only difference between the models where μ is estimated with and without equivalised IEQ is the coefficient on family size. See Appendix D for the proof.

‡ See Appendix Table A4 for the list of regions and the regional variables; Moscow is the omitted category here.

Table 4: The Results in Previous Research

Paper	*Country*	*Year*	*N*	*μ*	*conv. μ*	e^{μ}	*% of GDP per cap.†*	*σ*	*Family elasticity*	*Preference drift*
Colasanto *et al*. (1984)*	Wisconsin, USA	1981	1,372	8.67	9.657	15,628	49%	0.49	0.204	0.445
Ferrer-i-Carbonell and van Praag (2001)	Russia	1997	2,000	*NA*				*NA*	0.422	0.370
	Russia	1998	1,510	*NA*				*NA*	0.365	0.392
Flik and van Praag (1991)**	Netherlands	1983	6,313	9.597	9.531	13,786	52%	0.36	0.084	0.711
Kant *et al*. (2020)***	Canada	2017	315	10.217	9.934	20,623	46%	0.51	0.22	0.51
Kapteyn *et al*. (2009)	Netherlands	2001-2007	9,293	10.023	10.283	29,237	66%	0.40	NA	NA
Schwarze (2008)	Germany	1992	3,813	8.03	10.325	30,478	97%	0.34	0.097	0.585
van den Bosch (1996)	Belgium	1985	3,846	*NA*				*NA*	0.158	0.395
	Belgium	1988	1,931	*NA*				*NA*	0.159	0.468
van Herwaarden *et al*. (1977)	Belgium	1969	2,522	3.01	10.329	30,620	179%	0.56	0.14	0.68
	Belgium	1970	2,268	3.12	10.401	32,878	182%	0.57	0.13	0.66
	Belgium	1973	2,179	3.1	10.218	27,400	131%	0.57	0.14	0.61
	Netherlands	1971	2,952	9.55	10.264	28,690	129%	0.51	0.14	0.6
	Netherlands	1974	919	9.78	10.252	28,342	116%	0.43	0.13	0.66
	Netherlands	1975	1,748	9.75	10.125	24,964	103%	0.40	0.11	0.53
van Praag (1971)	Belgium	1969	2,789	3.025	10.345	31,095	181%	0.52	0.13	0.19
van Praag and Kapteyn (1973)	Netherlands	1971	3,010	9.55	10.264	28,690	129%	0.54	0.30	0.64
van Praag *et al*. (1982)	Belgium	1979	1,272	8.937	9.958	21,130	89%	0.41	0.097	0.433
	Denmark	1979	1,972	8.91	10.084	23,961	73%	0.33	0.075	0.631
	France	1979	2,052	9.167	10.299	29,705	126%	0.44	0.059	0.505
	West Germany	1979	1,574	8.602	9.379	11,840	50%	0.40	0.112	0.583
	Great Britain	1979	1,183	8.748	10.117	24,772	100%	0.45	0.115	0.364
	Ireland	1979	1,733	8.484	9.932	20,587	125%	0.41	0.169	0.455
	Italy	1979	1,911	8.673	10.438	34,117	160%	0.55	0.156	0.381
	Netherlands	1979	1,933	8.883	9.716	16,577	62%	0.35	0.1	0.537
Our results with ES (μ)	Russia	2016	9,646	9.004	9.004	8,136	86%	1.69	-0.104	0.462
Our results without ES (μ_{noES})	Russia	2016	9,646	9.536	9.536	13,846	147%	1.69	0.396	0.462

Notes: *μ* is the figure reported in the original study, and conv *μ* is that figure converted to annual US$ (2016 prices). All figures are CPI-adjusted using information from the World Bank (2021*a*). The currencies used before the adoption of the Euro are converted to Euros using the exchange rate that was fixed at the time of the change. Information from each country's Central Bank was used to convert to US$ (Bank of Canada (2023), Bank of England (2023), Danmarks Nationalbank (2023), European Central Bank (2023), European Commission (2023*a*, 2023*b*, 2023*c*, 2023*d*, 2023*e*, 2023*f*). *Family elasticity* and *Preference drift* are the coefficients from the regression estimating the determinants of *μ* (note that the other controls differ between the different contributions in the existing literature).

* Based on the poverty line at U=0.5 for a family of 1. ** Based on the poverty line of U=0.5. *** First Nations Canadians: these are household, not individual, welfare functions. **** This is simply the exponential of *μ*, not the average e^{μ} over the whole sample

† This column should be interpreted with some caution, due to potential differences in the treatment of the income variables used to estimate the IWFI across surveys. Some surveys measure income before tax, and others after-tax income. In addition, not all of the surveys included in this analysis are necessarily representative of the entire national population (for example, van Herwaarden *et al*., 1977, explicitly state that their respondents are volunteers).

Table 5: The Regional μ and the Regional Variables from the Estimation of Equation (9)

	Dependent variable				
	$\overline{\mu_{ES}}$		$\bar{\mu}$ *in the literature*		
	(1)	(2)	(1)	(2)	(3)
Gini	2.169	2.174	9.034*	4.301	4.937
	(1.648)	(1.621)	(4.656)	(2.979)	(2.897)
Ln GRP/GDP per cap.	0.246**	0.244**	0.225	-0.005	-0.623
	(0.118)	(0.112)	(0.385)	(0.354)	(0.576)
Pop. density/100,000	-0.219		147.834		
	(4.166)		(114.455)		
Unemployment	-0.035	-0.035	-0.055	-0.069*	-0.091**
	(0.030)	(0.028)	(0.033)	(0.032)	(0.035)
IEQ					-0.129
					(0.097)
Constant	6.433***	6.443***	6.707**	9.238***	12.249***
	(1.060)	(1.025)	(2.438)	(1.504)	(2.687)
N	38	38	13	13	13
R^2	0.399	0.399	0.532	0.435	0.537
Adjusted R^2	0.327	0.346	0.299	0.247	0.306

Note: *p<0.1; **p<0.05; ***p<0.01.

Table 6: The Determinants of the Welfare Sensitivity to Income (σ^2) from the Estimation of Equation (8)

	Dependent variable:				
	σ^2				
	(1)	(2)	(3)	(4)	(5)
Ln Family Size	0.152***	-0.205***	-0.149**	-0.104*	-0.103*
	(0.050)	(0.058)	(0.058)	(0.059)	(0.059)
Ln $Income_t$	0.080	0.223***	0.304***	0.130**	0.128**
	(0.054)	(0.059)	(0.062)	(0.060)	(0.065)
Ln $Income_{t-4}$					0.005
					(0.051)
Male		0.237***	0.237***	0.252***	0.252***
		(0.057)	(0.054)	(0.056)	(0.056)
Age		0.019*	0.017*	0.017*	0.017*
		(0.010)	(0.009)	(0.010)	(0.010)
$Age^2/100$		-0.035***	-0.032***	-0.032***	-0.032***
		(0.010)	(0.009)	(0.010)	(0.010)
Single		0.062	0.120	0.086	0.086
		(0.098)	(0.093)	(0.097)	(0.097)
Divorced		0.049	0.073	0.048	0.048
		(0.094)	(0.091)	(0.094)	(0.094)
Widowed		-0.131	-0.063	-0.105	-0.105
		(0.087)	(0.084)	(0.086)	(0.086)
Primary education		0.067	-0.037	0.022	0.023
		(0.089)	(0.085)	(0.088)	(0.088)
Secondary education		-0.029	-0.045	-0.086	-0.086
		(0.069)	(0.067)	(0.068)	(0.069)
Vocational school		0.031	-0.034	0.012	0.013
		(0.068)	(0.066)	(0.067)	(0.067)
Working		0.054	0.057	0.096	0.096
		(0.065)	(0.063)	(0.064)	(0.064)
Town		0.402***	1.115***	0.454***	0.455***
		(0.061)	(0.216)	(0.063)	(0.063)
Rural		0.768***	0.874***	0.746***	0.746***
		(0.066)	(0.196)	(0.068)	(0.068)
Gini				17.588***	17.584***
				(1.176)	(1.180)
Ln GRP				-0.355**	-0.356***
				(0.097)	(0.096)
Pop. density/100,000				15.569***	15.561***
				(2.610)	(2.610)
Unemployment rate				-0.036	-0.036
				(0.023)	(0.023)
Constant	2.437***	1.119**	0.711	-1.743***	-1.762***
	(0.439)	(0.534)	(0.576)	(0.584)	(0.614)
Regional dummies†	No	No	Yes	No	No
Adjusted R^2	0.001	0.032	0.114	0.055	0.055

Notes: Observations = 9,646 * p<0.1; **p<0.05; ***p<0.01
Standard errors clustered at the household level, and additionally at the regional level in Models (4) and (5), appear in parentheses.
† See Appendix Table A4 for the list of regions and the regional variables; Moscow is the omitted category here.

Table 7: The Regional σ and the Regional Variables from the Estimation of Equation (10)

	Dependent variable				
	$\bar{\sigma}^2$		$\bar{\sigma}^2$ *in the literature*		
	(1)	(2)	(1)	(2)	(3)
Gini	14.803**	14.668**	1.963**	1.724***	1.717***
	(5.703)	(5.811)	(0.608)	(0.360)	(0.386)
Ln GRP/GPD per cap.	-0.346	-0.332	-0.011	-0.022	-0.015
	(0.407)	(0.417)	(0.050)	(0.043)	(0.077)
Pop. density/100,000	-0.543		7.486		
	(14.413)		(14.957)		
Unemployment	-0.118	-0.114	-0.008*	-0.009**	-0.009
	(0.103)	(0.105)	(0.004)	(0.004)	(0.005)
IEQ					0.001
					(0.013)
Constant	2.834	2.735	-0.290	0.162	-0.196
	(3.667)	(3.741)	(0.319)	(0.182)	(0.358)
N	38	38	13	13	13
R^2	0.173	0.144	0.774	0.767	0.767
Adjusted R^2	0.073	0.045	0.661	0.689	0.651

Note: *p<0.1; **p<0.05; ***p<0.001.

Figures

Figure 1: Examples of Four Different Welfare Functions of Income

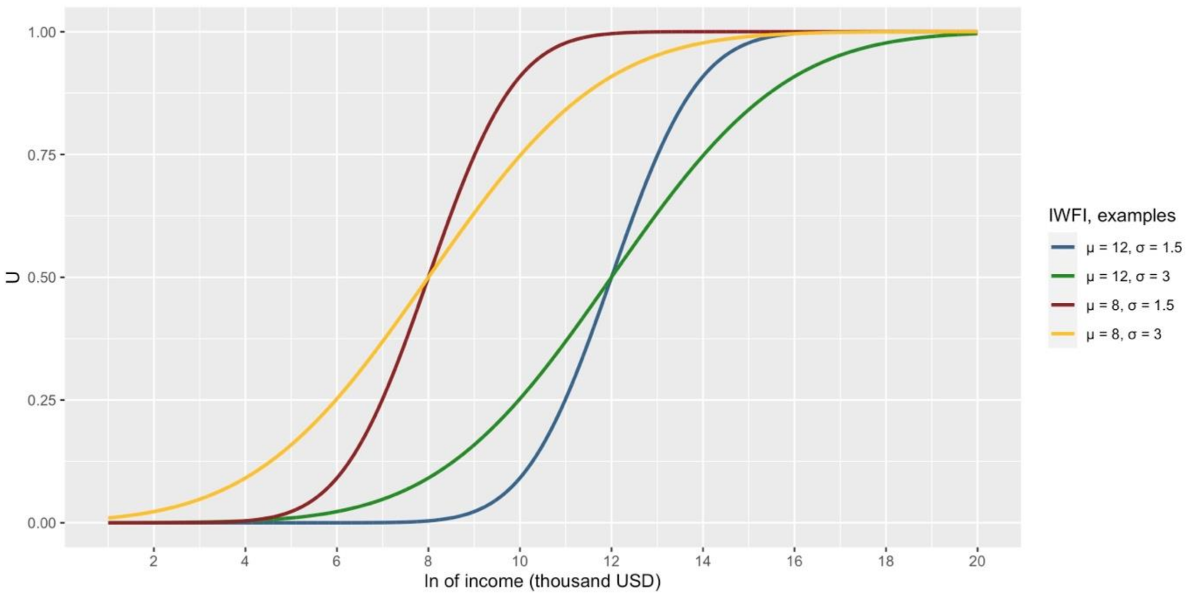
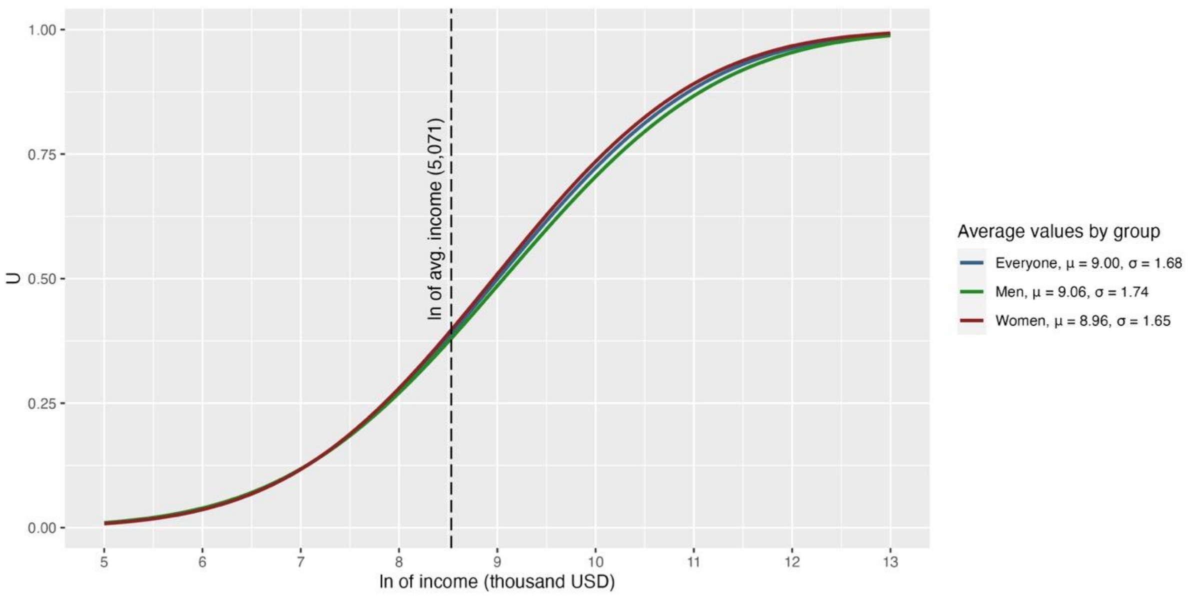


Figure 2: The Welfare Function of Income: Average Values for the Whole Sample, Men, and Women



Appendices: Where Does Money Matter More?

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A Additional Tables

Table A1: The Selection Criteria Used to Produce the Final Sample

	Observations dropped			Observations		
Cause of sample restriction	All	Men	Women	All	Men	Women
Original sample				18756	8214	10542
Dropping missing values:						
Income	774	362	412	17982	7852	10130
Previous income	886	378	508	17096	7474	9622
IEQ - rich	5789	2706	3083	11307	4768	6539
IEQ - average	94	37	57	11213	4731	6482
IEQ - poor	182	85	97	11031	4646	6385
Marital status	12	3	9	11019	4643	6376
Education	19	11	8	11000	4632	6368
Employment	2	1	1	10998	4631	6367
Age	498	254	244	10500	4377	6123
1% top and bottom dropped						
Income	210	83	127	10290	4294	5996
Previous income	179	85	94	10111	4209	5902
IEQ - rich	190	75	115	9921	4134	5787
IEQ - average	101	45	56	9820	4089	5731
IEQ - poor	174	92	82	**9646**	**3997**	**5649**

Notes: The bold numbers refer to the final estimation sample. A larger number of respondents with zero incomes produces trimming of over 1% in some cases. The top and bottom 1% refer to the observations after dropping but before any further trimming.

Table A2: Summary Statistics for the Original Sample

Statistic	N	Mean	St. Dev	Min	Max
Income: Equivalised					
Household income (US$ per year)	17,982	5,328	5,985	0	267,997
Previous household income*	17,671	5,500	6,175	0	301,709
Income: Unequivalised					
Household income (US$ per year)	17,982	9,917	10,789	0	464,184
Previous household income*	17,671	10,051	10,940	0	522,575
Income evaluation question: Equivalised income levels					
Monthly income to consider your family living as...					
... poor:	12,389	3,042	3,679	0	201,600
... average:	12,911	105,185	9,421,832	168	1,069,145,453
... rich:	12,153	185,406	10,416,988	1,503	1,069,145,453
Income evaluation question: Unequivalised income levels					
Monthly income to consider your family living as...					
... poor:	12,389	5,368	6,879	0	403,200
... average:	12,911	155,436	13,331,287	504	1,512,000,000
... rich:	12,153	295,691	15,796,746	1,680	1,512,000,000
Individual Characteristics					
Male	18,756	0.438	0.496	0	1
Age	18,756	38.185	22.702	0	102
Number of children	18,756	1.065	1.077	0	9
Number of household members	18,756	3.588	1.815	1	16
Working	18,756	0.519	0.5	0	1
Marital status					
Single	15,289	0.181	0.385	0	1
Married**	15,289	0.504	0.5	0	1
Divorced	15,289	0.082	0.274	0	1
Widowed	15,289	0.119	0.323	0	1
Education					
Primary education	15,279	0.192	0.394	0	1
Secondary education	15,279	0.29	0.454	0	1
Vocational school	15,279	0.253	0.435	0	1
Higher education	15,279	0.265	0.442	0	1
Urbanisation					
City	18,756	0.412	0.492	0	1
Town	18,756	0.273	0.446	0	1
Rural	18,756	0.315	0.465	0	1

Total observations = 18,576.
* The fact that income is lower in 2016 than previous income is due to the 2014-2015 Russian financial crisis.
** Married includes those who are living together and those in a domestic relationship.

Table A3: Selection Criteria to Produce Alternative Samples

	Observations dropped			Observations		
Cause of sample restriction	All	Men	Women	All	Men	Women
Original sample				18756	8214	10542
Dropping missing values:						
Income	774	362	412	17982	7852	10130
Previous income	886	378	508	17096	7474	9622
IEQ - rich	5789	2706	3083	11307	4768	6539
IEQ - average	94	37	57	11213	4731	6482
IEQ - poor	182	85	97	11031	4646	6385
Marital status	12	3	9	11019	4643	6376
Education	19	11	8	11000	4632	6368
Employment	2	1	1	10998	4631	6367
Age	498	254	244	10500	4377	6123
Dropping zeros						
IEQ - rich	0	0	0	10500	4377	6123
IEQ - average	0	0	0	10500	4377	6123
IEQ - poor	59	36	23	**10441**	**4341**	**6100**
0.5% top and bottom dropped (1% in total)						
Income	108	47	61	10333	4294	6039
Previous income	101	46	55	10232	4248	5984
IEQ - rich	92	42	50	10140	4206	5934
IEQ - average	53	26	27	10087	4180	5907
IEQ - poor	108	49	59	**9979**	**4131**	**5848**
1% top and bottom dropped (2% in total)						
Income	101	47	54	9899	4105	5794
Previous income	87	44	43	9812	4061	5751
IEQ - rich	77	22	55	9735	4039	5696
IEQ - average	58	25	33	9677	4014	5663
IEQ - poor	31	17	14	**9646**	**3997**	**5649**
Restricting sample to respondents who have taken part in the survey five or more times						
Number of waves	550	266	284	**9096**	**3731**	**5365**

Note: The bold numbers refer to the final estimation sample following the successive sample restrictions.

Table A4: List of Russian Regions and Regional Variables

	Region	Obs.	Gini*	GRP**	Pop. dens.***	Unempl.****
1	St. Petersburg City	258	0.246	12.40	3719.20	1.60
2	Moscow City	676	0.243	22.06	4980.67	1.40
3	Moscow Oblast	488	0.252	8.83	169.38	3.20
4	Syktyvkar, Komi Republic	205	0.274	12.65	2.02	3.20
5	Usinsk City and District, Komi Republic	185	0.274	12.65	2.02	3.20
6	Volosovsky District, Leningrad Oblast	227	0.252	9.57	21.47	4.60
7	Smolensk City and District	174	0.268	5.25	19.01	5.70
8	Rzhev City and District, Tver Oblast	188	0.257	7.33	15.27	4.50
9	Tula, Tulskaya Oblast	168	0.248	6.80	58.05	3.90
10	Kuybyshevsky District, Kaluga Oblast	107	0.225	7.32	33.96	4.00
11	Nizhny Novgorod, Nizhegorodkaya Oblast	370	0.221	6.73	42.06	4.20
12	Shumerlya City and District, Chuvashia Republic	255	0.263	3.85	67.27	5.10
13	Zemetschinsky District, Penza Oblast	137	0.224	4.80	30.83	4.50
14	Lipetsk City and District, Lipetsk Oblast	411	0.193	8.03	47.73	3.90
15	Uvarovo City and District, Tambov Oblast	261	0.265	5.14	30.13	4.40
16	Kazan City, Tatar Republic	377	0.242	10.06	57.27	3.50
17	Saratov City and District, Saratov Oblast	216	0.250	4.61	24.58	4.80
18	Volsk Town and District, Saratov Oblast	264	0.254	4.61	24.58	4.80
19	Rudnyansky District, Volgograd Oblast	197	0.213	5.38	22.14	5.70
20	Zolsky District, Kabardino-Balkaria	91	0.240	2.67	69.27	10.40
21	Bataysk, Rostov Oblast	291	0.220	5.45	41.87	5.60
22	Krasnodar City and District, Krasnodar Krai	187	0.245	6.62	73.73	5.70
23	Georgiyevsk City and District, Savropol Krai	299	0.224	4.06	42.12	4.60
24	Kushchyovsky District, Krasnodarsky Krai	400	0.253	6.62	41.87	5.70
25	Chelyabinsk City, Chelyabinsk Oblast	226	0.250	6.71	39.74	6.60
26	Kurgan City, Kurgan Oblast	231	0.285	4.03	119.09	9.10
27	Glazov Town, Udmurt Republic	216	0.237	6.63	35.94	4.80
28	Orsk City, Orenburg Oblast	222	0.226	8.06	15.95	4.50
29	Solikamsk City and District, Perm Krai	351	0.224	8.00	17.56	6.00
30	Krasnoarmeysky District, Chelyabinsk Oblast	220	0.242	6.71	39.74	6.60
31	Tomsk City, Tomsk Oblast	222	0.265	8.53	3.4	6.30
32	Berdsk City and District; Novosibirsk Oblast	237	0.279	7.12	15.65	6.00
33	Biysk City and District, Altai Krai	215	0.225	3.73	13.9	6.90
34	Kuryinsky District, Altai Krai	250	0.277	3.73	13.9	6.90
35	Krasnoyarsk City, Krasnoyarsk Krai	233	0.272	12.59	1.23	5.70
36	Vladivostok City, Primorsky Krai	159	0.280	6.94	11.53	5.40
37	Nazarovo City and District, Krasnoyarsk Krai	250	0.290	12.59	1.23	5.70
38	Tambovsky District, Amurskaya Oblast	182	0.266	6.00	2.2	5.90

* Gini coefficient calculated using the RLMS sample.
** Gross regional product per capita in $1000.
*** Population density: People per km^2.
**** Unemployment rate of the population aged over 15 in 2017.

Table A5: Country-level data

Country	*Year*	μ	σ	*Gini year*	*Gini*	*Population density*	*GDP per capita*	*IEQ levels**	*Unempt*
Wisconsin, USA	1981	9.657	0.49	1979	0.309	27.6	32,048	7	8.8
Netherlands	1983	9.531	0.36	1983	0.252	345.2	26,305	6	11.8
Canada	2019	9.934	0.51	2017	0.313	3.7	44,896	6	5.7
Netherlands	2001-2007	10.283	0.40	avg. 99, 04, 07	0.257	388.2	44,154	6	4.0**
Germany	1992	10.325	0.34	1991	0.268	223.2	31,522	5	6.3
Netherlands	1971	10.264	0.51	1970	0.287	315.8	22,305	9	1.5
Netherlands	1975	10.252	0.40	1977	0.258	327.4	24,536	9	6
Netherlands	1971	10.264	0.54	1970	0.287	315.8	22,305	9	1.5
France	1979	10.299	0.44	1978	0.313	85.3	23,609	9	6
W. Germany	1979	9.379	0.40	1978	0.263	247.2	23,787	9	6.5 (1983)
Great Britain	1979	10.117	0.45	1979	0.267	231.8	24,820	9	5.3
Italy	1979	10.438	0.55	1979	0.346	186.7	21,388	9	7.6
Netherlands	1979	9.716	0.35	1977	0.258	336.8	26,561	9	6.2

* This refers to the number of welfare levels that appear in the IEQ; in the RLMS there are only three.

*** Average rate for the years 2001-2007.*

Table A6: Average Estimated IWFI Parameters in the Alternative Samples

Statistic	N	$\overline{\mu_{ES}}$	Std.Err	$\overline{\sigma}$	Std.Err	$\overline{e^{\mu_{ES}}}$	$\overline{\mu_{noES}}$	$\overline{e^{\mu_{noES}}}$
No trim	10,441	9.026	0.215	1.713	0.390	11,278	9.558	19,617
(Drop missing and zeros)		[0.684]	[0.183]	[0.710]	[0.331]	[29,777]	[0.731]	[45,529]
1% trim	9,979	9.008	0.209	1.691	0.380	9,953	9.540	17,476
(0.5% top/bottom)		[0.619]	[0.170]	[0.657]	[0.309]	[6,862]	[0.676]	[7,886]
2% trim (Main Results in Table 2)	9,646	9.004	0.208	1.688	0.377	9,764	9.536	17,141
(1% top/bottom)		[0.597]	[0.168]	[0.647]	[0.305]	[6,366]	[0.653]	[11,899]
Number of waves	9,096	9.001	0.208	1.685	0.377	9,721	9.531	17,065
(1% top/bottom)		[0.595]	[0.168]	[0.645]	[0.304]	[6,312]	[0.654]	[11,844]

Note: Standard deviations in square brackets.
* $\overline{\mu_{ES}}$ is estimated using the equivalised IEQ income scores, and $\overline{\mu_{noES}}$ the unequivalised income figures. The standard errors of $\overline{\mu_{ES}}$ and $\overline{\mu_{noES}}$ are identical.
** The $\overline{e^{\mu_{ES}}}$ and $\overline{e^{\mu_{noES}}}$ values are calculated as the average exponential for each individual, rather than being the exponential of the average $\overline{\mu_{ES}}$ and $\overline{\mu_{noES}}$ figures. Both of these exponential figures are listed in annual US Dollars.

Table A7: The Determinants of μ with the Regional Variables Included One at a Time

	Dependent variable			
	μ_{ES}			
	(1)	(2)	(3)	(4)
Ln Family Size	-0.156***	-0.152***	-0.160***	-0.158***
	(0.013)	(0.013)	(0.013)	(0.013)
Ln Income_t	0.389***	0.359***	0.381***	0.369***
	(0.013)	(0.013)	(0.013)	(0.013)
Male	0.083***	0.084***	0.083***	0.083***
	(0.012)	(0.012)	(0.012)	(0.012)
Age	0.007***	0.006***	0.007***	0.006***
	(0.002)	(0.002)	(0.002)	(0.002)
$\text{Age}^2/100$	-0.011***	-0.010***	-0.011***	-0.010***
	(0.002)	(0.002)	(0.002)	(0.002)
Single	0.040**	0.037*	0.036*	0.036*
	(0.020)	(0.020)	(0.020)	(0.020)
Divorced	0.037*	0.028	0.030	0.027
	(0.021)	(0.021)	(0.021)	(0.021)
Widowed	-0.035*	-0.041*	-0.038*	-0.044*
	(0.021)	(0.021)	(0.021)	(0.021)
Primary education	-0.113***	-0.115***	-0.109***	-0.106***
	(0.019)	(0.019)	(0.019)	(0.019)
Secondary education	-0.084***	-0.083***	-0.082***	-0.079***
	(0.015)	(0.015)	(0.015)	(0.015)
Vocational school	-0.031**	-0.032**	-0.029*	-0.029*
	(0.015)	(0.015)	(0.015)	(0.015)
Working	0.035***	0.040***	0.038***	0.036**
	(0.014)	(0.014)	(0.014)	(0.014)
Town	-0.094***	-0.057***	-0.073***	-0.072***
	(0.014)	(0.014)	(0.014)	(0.013)
Rural	-0.159***	-0.117***	-0.137***	-0.123***
	(0.014)	(0.015)	(0.015)	(0.014)
Gini	0.535***			
	(0.251)			
Ln of GRP		0.120***		
		(0.013)		
Pop. density/100,000			2.239***	
			(0.417)	
Unemployment rate				-0.034***
				(0.003)
Constant	5.783***	5.906***	5.966***	6.243***
	(0.128)	(0.117)	(0.119)	(0.122)
Regional dummies‡	No	No	No	No
Adjusted R^2	0.189	0.195	0.191	0.197

Notes: Observations = 9,646 * p<0.1; **p<0.05; ***p<0.01

Standard errors clustered at the household and regional levels appear in parentheses.

Table A8: Correlation Matrix of Variables in Regression Equations (9) and (10)

	Regional				Country			
	Gini	*GRP per cap.*	*Pop. density*	*Unempl. rate*	*Gini*	*GDP per cap.*	*Pop. density*	*Unempl. rate*
Gini	1.000				1.000			
GDP/GRP per cap.	0.668	1.000			-0.249	1.000		
Pop. density	0.148	-0.057	1.000		-0.050	-0.715	1.000	
Unempl. rate	-0.625	-0.500	0.173	1.000	0.023	-0.233	-0.008	1.000

Table A9: The Determinants of σ with the Regional Variables Included One at a Time

	Dependent variable			
	σ^2			
	(1)	(2)	(3)	(4)
Ln Family Size	-0.094	-0.199***	-0.204***	-0.205***
	(0.059)	(0.058)	(0.058)	(0.058)
Ln $Income_t$	0.140**	0.198***	0.178***	0.224***
	(0.059)	(0.061)	(0.060)	(0.060)
Male	0.254***	0.239***	0.238 ***	0.237***
	(0.056)	(0.057)	(0.056)	(0.057)
Age	0.018*	0.018*	0.018*	0.019*
	(0.010)	(0.010)	(0.010)	(0.010)
$Age^2/100$	-0.032***	-0.034***	-0.034***	-0.035***
	(0.010)	(0.010)	(0.010)	(0.010)
Single	0.103	0.060	0.048	0.062
	(0.098)	(0.098)	(0.098)	(0.098)
Divorced	0.072	0.043	0.023	0.050
	(0.094)	(0.094)	(0.094)	(0.094)
Widowed	-0.103	-0.135	-0.138	-0.130
	(0.087)	(0.087)	(0.087)	(0.087)
Primary education	-0.0003	0.064	0.074	0.067
	(0.088)	(0.089)	(0.088)	(0.089)
Secondary education	-0.087	-0.030	-0.029	-0.029
	(0.069)	(0.069)	(0.069)	(0.069)
Vocational school	-0.0003	0.029	0.036	0.030
	(0.067)	(0.068)	(0.068)	(0.068)
Working	0.082	0.059	0.071	0.054
	(0.064)	(0.065)	(0.065)	(0.065)
Town	0.393***	0.430***	0.492***	0.400***
	(0.060)	(0.063)	(0.063)	(0.062)
Rural	0.696***	0.798***	0.853***	0.766***
	(0.066)	(0.068)	(0.068)	(0.067)
Gini	16.075***			
	(1.081)			
Ln of GRP		0.092		
		(0.063)		
Pop.density/100,000			9.580***	
			(1.979)	
Unemployment rate				0.002
				(0.016)
Constant	-2.254***	1.127**	1.421***	1.095*
	(0.561)	(0.533)	(0.538)	(0.135)
Regional dummies †	No	No	No	No
Adjusted R^2	0.051	0.032	0.034	0.032

Notes: Observations = 9,646 * p<0.1; **p<0.05; ***p<0.01

Standard errors clustered at the household and regional levels appear in parentheses.

B Results Relaxing the Equidistance Assumption

In our main analysis each individual, *i*, has three points $\{(y_{i,c}, U_c(y_{i,c}))\}^3_{c=1}$, where $y_{i,c}$ is the income they assign to the verbal welfare level *c* (poor, average, or rich) and $U_c(y_{i,c})$ is the corresponding number on the [0,1] interval. We assume that these latter are 0.25, 0.5 and 0.75 on the welfare curve: in other words, that the verbal welfare levels are equidistant from each other. It is not clear that this holds with three levels.

Here, we report the results when the verbal qualification corresponding to rich (U_3) refers to different points on the welfare curve (in the main analysis we assume that it corresponds to 0.75), while the other points stay the same. By doing so, we assume that the welfare levels when rich or poor are not symmetric around the mid-level welfare of 0.5.

We consider five alternative scenarios. In two of these the "rich" point is closer to the mid-point (0.65 and 0.70), so that being rich corresponds to a welfare level that is closer to the mid-level than that corresponding to being poor. In the other three scenarios, the rich point is further from the mid-point (0.80, 0.85 and 0.90) than the distance between poor and the mid-point.

As might be expected, the estimated values of μ and σ differ under these various scenarios. Nevertheless, the regression results where the different μ's are the dependent variable produce very similar results (expect for the point estimate for the Gini coefficient). However, since σ refers to the slope of the curve, moving the "rich" point mechanically produces different values, and the point estimates (in Appendix Table B4) are different in size, although they do seem to tell the same story as our main results.

Table B1: Average Estimated IWFI Parameters when the Equidistance Assumption is Relaxed

Statistic	N	$\overline{\mu_{ES}}$	Std.Err	$\overline{\sigma}$	Std.Err	$\overline{e^{\mu_{ES}}}$	$\overline{\mu_{noES}}$	$\overline{e^{\mu_{noES}}}$
U_{rich}=0.65	9,646	9.213	0.132	2.161	0.302	12.234	9.745	21.468
		[0.623]	[0.118]	[0.840]	[0.269]	[8,372]	[0.679]	[15,491]
U_{rich} =0.70	9,646	9.100	0.165	1.916	0.336	10,822	9.632	18,994
		[0.608]	[0.141]	[0.739]	[0.287]	[7,194]	[0.664]	[13,387]
U_{rich} =0.75	9,646	9.004	0.208	1.688	0.377	9,764	9.536	17,141
(Main results from Table 2)		[0.597]	[0.168]	[0.647]	[0.305]	[6,366]	[0.653]	[11,899]
U_{rich} =0.80	9,646	8.992	0.254	1.477	0.409	8,951	9.454	15,716
		[0.589]	[0.191]	[0.564]	[0.307]	[5,760]	[0.646]	[10.805]
U_{rich} =0.85	9,646	8.850	0.300	1.280	0.426	8.302	9.382	14,577
		[0.584]	[0.209]	[0.487]	[0.297]	[5,297]	[0.642]	[9,963]
U_{rich} =0.90	9,646	8.784	0.346	1.089	0.426	7,756	9.316	13,620
		[0.580]	[0.225]	[0.413]	[0.278]	[4,921]	[0.637]	[9,277]

Note: Standard deviations in square brackets.
* $\overline{\mu_{ES}}$ is estimated using the equivalised IEQ income scores, and $\overline{\mu_{noES}}$ the unequivalised income figures. The standard errors of $\overline{\mu_{ES}}$and $\overline{\mu_{noES}}$ are identical.
** The $\overline{e^{\mu_{ES}}}$ and $\overline{e^{\mu_{noES}}}$ values are calculated as the average exponential for each individual, rather than being the exponential of the average $\overline{\mu_{ES}}$and $\overline{\mu_{noES}}$ figures. Both of these exponential figures are listed in annual US Dollars.

Table B2: The Determinants of the Different Income Needs from Table B1 above (μ_{ES}) from the Estimation of Equation (7)

	Dependent variable:					
	μ_{ES}					
	U_{rich}=0.65	**U_{rich}=0.70**	**U_{rich}=0.75**	**U_{rich}=0.80**	**U_{rich}=0.85**	**U_{rich}=0.90**
Ln Family Size	-0.144***	-0.143***	**-0.142*** **	-0.140***	-0.139***	-0.138***
	(0.014)	(0.013)	**(0.013)**	(0.013)	(0.013)	(0.012)
Ln Income$_t$	0.319***	0.317***	**0.315*** **	0.313***	0.311***	0.309***
	(0.015)	(0.015)	**(0.015)**	(0.014)	(0.014)	(0.014)
Ln Income$_{t-4}$	0.081***	0.081***	**0.082*** **	0.082***	0.082***	0.082***
	(0.011)	(0.011)	**(0.011)**	(0.011)	(0.011)	(0.011)
Male	0.091***	0.087***	**0.083*** **	0.080***	0.077***	0.074***
	(0.012)	(0.012)	**(0.012)**	(0.012)	(0.012)	(0.012)
Age	0.006**	0.005**	**0.005** **	0.005**	0.005**	0.004**
	(0.002)	(0.002)	**(0.002)**	(0.002)	(0.002)	(0.002)
Age^2/100	-0.010***	-0.009***	**-0.009*** **	-0.008***	-0.008***	-0.008***
	(0.002)	(0.002)	**(0.002)**	(0.002)	(0.002)	(0.002)
Single	0.041**	0.040*	**0.039* **	0.038*	0.038*	0.038*
	(0.021)	(0.020)	**(0.020)**	(0.02)	(0.020)	(0.019)
Divorced	0.034	0.033	**0.031**	0.030	0.029	0.028
	(0.022)	(0.022)	**(0.021)**	(0.021)	(0.021)	(0.021)
Widowed	-0.044**	-0.043**	**-0.042** **	-0.041**	-0.040**	-0.039**
	(0.022)	(0.021)	**(0.020)**	(0.020)	(0.020)	(0.020)
Primary education	-0.099***	-0.099***	**-0.099*** **	-0.098***	-0.098***	-0.097***
	(0.020)	(0.020)	**(0.019)**	(0.019)	(0.019)	(0.019)
Secondary education	-0.077***	-0.076***	**-0.074*** **	-0.072***	-0.071***	-0.069***
	(0.015)	(0.015)	**(0.015)**	(0.014)	(0.014)	(0.014)
Vocational school	-0.026*	-0.026*	**-0.025* **	-0.025*	-0.025*	-0.024*
	(0.015)	(0.014)	**(0.015)**	(0.014)	(0.014)	(0.014)
Working	0.045***	0.043***	**0.041*** **	0.040***	0.039***	0.038***
	(0.015)	(0.014)	**(0.014)**	(0.014)	(0.014)	(0.014)
Town	-0.049***	-0.058***	**-0.066*** **	-0.072***	-0.077***	-0.082***
	(0.015)	(0.014)	**(0.014)**	(0.014)	(0.014)	(0.014)
Rural	-0.094***	-0.108***	**-0.120*** **	-0.120***	-0.120***	-0.120***
	(0.015)	(0.015)	**(0.015)**	(0.014)	(0.014)	(0.014)
Gini	1.461***	1.141***	**0.878*** **	0.658**	0.472*	0.307
	(0.280)	(0.273)	**(0.269)**	(0.267)	(0.265)	(0.265)
Ln GRP	0.030	0.036*	**0.040** **	0.043**	0.046**	0.048**
	(0.020)	(0.021)	**(0.020)**	(0.020)	(0.020)	(0.020)
Pop. density/100,000	-0.947	-1.209**	**-1.413** **	-1.575**	-1.704**	-1.811**
	(0.592)	(0.573)	**(0.560)**	(0.551)	(0.545)	(0.541)
Unemployment rate	-0.035***	-0.035***	**-0.034*** **	-0.033***	-0.032***	-0.032***
	(0.005)	(0.005)	**(0.005)**	(0.005)	(0.005)	(0.005)
Constant	5.756***	5.737***	**5.719*** **	5.702***	5.685***	5.667***
	(0.139)	(0.135)	**(0.133)**	(0.131)	(0.130)	(0.130)
Regional dummies‡	No	No	**No**	No	No	No
Adjusted R^2	0.193	0.199	**0.203**	0.208	0.209	0.210
	μ_{noES}†					
Ln Family Size	0.356***	0.357***	**0.358*** **	0.360***	0.361***	0.362***
	(0.011)	(0.013)	**(0.013)**	(0.013)	(0.013)	(0.012)
Adjusted R^2	0.321	0.329	**0.335**	0.340	0.342	0.343

Notes: Observations = 9,646 * p<0.1; **p<0.05; ***p<0.01

Standard errors clustered at the household and regional level appear in parentheses.

† The only difference between the models where μ is estimated with and without equivalised IEQ is the coefficient on family size. See Appendix C for the proof.

‡ See Appendix Table A4 for the list of regions and the regional variables; Moscow is the omitted category here.

Table B3: The Regional $\overline{\mu_{ES}}$ and Regional Variables from the Estimation of Equation (10)

	Dependent variable					
	μ_{ES}					
	U_{rich}=0.65	**U_{rich}=0.70**	**U_{rich}=0.75**	**U_{rich}=0.80**	**U_{rich}=0.85**	**U_{rich}=0.90**
Gini	2.717	2.416	2.169	1.964	1.792	1.640
	(1.670)	(1.655)	(1.648)	(1.647)	(1.648)	(1.650)
Ln GRP per cap.	0.243*	0.241*	0.246*	0.250*	0.253*	0.256*
	(0.119)	(0.118)	(0.118)	(0.118)	(0.118)	(0.118)
Pop. density/100,000	-0.282	-0.253	-0.219	-0.184	-0.2147	-0.109
	(4.221)	(4.183)	(4.166)	(4.161)	(4.164)	(4.171)
Unemployment rate	-0.040	-0.038	-0.035	-0.033	-0.032	-0.030
	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
Constant	6.637***	6.525***	6.433***	6.335***	6.289***	6.230***
	(1.074)	(1.064)	(1.060)	(1.059)	(1.059)	(1.061)
N	38	38	38	38	38	38
R^2	0.410	0.405	0.399	0.393	0.387	0.381
Adjusted R^2	0.338	0.333	0.327	0.320	0.313	0.307

Note: *p<0.1; **p<0.05; ***p<0.01.

Table B4: The Determinants of the Different Welfare Sensitivity from Table 1 above (σ^2) from the Estimation of Equation (7)

	Dependent variable: σ^2					
	U_{rich}=0.65	**U_{rich}=0.70**	**U_{rich}=0.75**	**U_{rich}=0.80**	**U_{rich}=0.85**	**U_{rich}=0.90**
Ln Family Size	-0.131	-0.119	-0.103*	-0.087*	-0.071**	-0.055**
	(0.098)	(0.076)	(0.059)	(0.045)	(0.34)	(0.059)
Ln $Income_t$	0.194*	0.159*	0.128**	0.101**	0.78**	0.058**
	(0.109)	(0.084)	(0.065)	(0.050)	(0.037)	(0.027)
Ln $Income_{t-4}$	0.010	0.007	0.005	0.004	0.003	0.002
	(0.084)	(0.066)	(0.051)	(0.039)	(0.029)	(0.021)
Male	0.410***	0.324***	0.252***	0.194***	0.146***	0.106***
	(0.093)	(0.072)	(0.056)	(0.043)	(0.032)	(0.023)
Age	0.030*	0.023*	0.017*	0.013*	0.009*	0.006
	(0.016)	(0.013)	(0.010)	(0.007)	(0.006)	(0.004)
$Age^2/100$	-0.054***	-0.042***	-0.032***	-0.024***	-0.018***	-0.013***
	(0.016)	(0.013)	(0.010)	(0.007)	(0.006)	(0.004)
Single	0.180	0.125	0.086	0.058	0.038	0.023
	(0.162)	(0.125)	(0.097)	(0.073)	(0.055)	(0.040)
Divorced	0.062	0.055	0.048	0.040	0.033	0.026
	(0.156)	(0.121)	(0.094)	(0.072)	(0.054)	(0.039)
Widowed	-0.173	-0.136	-0.105	-0.081	-0.061	-0.044
	(0.144)	(0.112)	(0.086)	(0.066)	(0.049)	(0.036)
Primary education	0.055	0.036	0.023	0.015	0.009	0.005
	(0.147)	(0.114)	(0.088)	(0.067)	(0.050)	(0.037)
Secondary education	-0.111	-0.099	-0.086	-0.071	-0.058	-0.045
	(0.114)	(0.089)	(0.069)	(0.052)	(0.039)	(0.028)
Vocational school	0.038	0.023	0.013	0.007	0.003	0.0003
	(0.112)	(0.087)	(0.067)	(0.051)	(0.038)	(0.028)
Working	0.180*	0.132	0.096	0.069	0.049	0.033
	(0.107)	(0.083)	(0.064)	(0.049)	(0.037)	(0.027)
Town	0.768***	0.594***	0.455***	0.344***	0.255***	0.182***
	(0.105)	(0.083)	(0.063)	(0.048)	(0.036)	(0.026)
Rural	1.280***	0.982***	0.746***	0.561***	0.413***	0.293***
	(0.113)	(0.088)	(0.068)	(0.052)	(0.039)	(0.028)
Gini	30.067***	23.109***	17.584***	13.230***	9.769***	6.946***
	(1.987)	(1.538)	(1.180)	(0.896)	(0.669)	(0.481)
Ln GRP	-0.640***	-0.479***	-0.356***	-0.262***	-0.189***	-0.131***
	(0.163)	(0.126)	(0.096)	(0.073)	(0.055)	(0.039)
Pop. density/100,000	27.826***	20.897***	15.561***	11.469***	8.297***	5.775***
	(4.321)	(3.374)	(2.610)	(1.998)	(1.502)	(1.090)
Unemployment rate	-0.053	-0.044	-0.036	-0.029*	-0.023*	-0.017*
	(0.039)	(0.030)	(0.023)	(0.018)	(0.013)	(0.010)
Constant	-3.149***	-2.365***	-1.762***	-1.300***	-0.941***	-0.656***
	(1.029)	(0.799)	(0.614)	(0.467)	(0.349)	(0.252)
Regional dummies	No	No	No	No	No	No
Adjusted R^2	0.056	0.056	0.055	0.054	0.053	0.052

Notes: Observations = 9,646 — * p<0.1; ** p<0.05; *** p<0.01

Standard errors clustered at the household and regional level appear in parentheses.

Table B5: The Regional σ^2 and the Regional Variables from the Estimation of Equation (10)

	Dependent variable					
	σ^2					
	U_{rich}=0.65	**U_{rich}=0.70**	**U_{rich}=0.75**	**U_{rich}=0.80**	**U_{rich}=0.85**	**U_{rich}=0.90**
Gini	25.396**	19.488**	14.803**	11.116**	8.190**	5.809**
	(9.789)	(7.509)	(5.703)	(4.283)	(3.157)	(2.241)
Ln GRP per cap.	-0.632	-0.469	-0.346	-0.252	-0.180	-0.124
	(0.699)	(0.536)	(0.407)	(0.306)	(0.225)	(0.160)
Pop. density/100,000	0.011	-0.369	-0.543	-0.595	-0.574	-0.507
	(24.738)	(18.977)	(14.413)	(10.825)	(7.979)	(5.663)
Unemployment rate	-0.198	-0.154	-0.118	-0.090	-0.067	-0.048
	(0.176)	(0.135)	(0.103)	(0.077)	(0.057)	(0.040)
Constant	4.971	3.771	2.834	2.107	1.537	1.079
	(6.293)	(4.828)	(3.667)	(2.754)	(2.030)	(1.441)
N	38	38	38	38	38	38
R^2	0.172	0.172	0.173	0.173	0.174	0.175
Adjusted R^2	0.071	0.072	0.073	0.073	0.074	0.075

Note: *p<0.1; **p<0.05; ***p<0.01.

C Results Using the OECD Equivalence Scale

The equivalence scale (ES) used to account for household economies of scale in the main analyses is the square root of the number of household members. An alternative is the OECD equivalence scale, where different individuals within the household are assigned different weights as follows:

$$equivalised\ income = \frac{income}{[first\ adult] + 0.5 * [num.\ of\ other\ adults] + 0.3 * [num.\ of\ children]} \tag{C.1}$$

Table C1 shows that the OECD ES produces lower values of equivalised income than does the square root of family size. It is therefore unsurprising that the value of $\overline{\mu_{OECD}}$ in Table C2, 8.840, is lower than that in our main results, 9.004.

Table C3 presents the regression results for the determinants of $\overline{\mu_{OECD}}$ using the same specifications as in Table 4. The results with the different equivalence scales are similar: higher income is associated with a higher μ_{OECD}, as are male, higher education, living in a city, and working. One difference between the two is that the family elasticity coefficient is more negative when we correct income levels via the OECD equivalence scale than in the main results in Table 3 (at least in Models (2) to (5)). The OECD equivalence scale thus overcorrects even more than does the square-root scale used in the main analysis.

Table C1: Summary Statistics for the Income Variables using the OECD Equivalence Scale

Statistic	Mean	St. Dev	Min	Max
Income				
Household income ($ per year)	4,338	2,383	706	18,560
Previous household income	4,326	2,382	706	18,560
Income evaluation question, equivalised income levels				
Monthly income to consider your family living...				
... poor:	2,467	1,802	202	12,923
... average:	11,801	10,337	1,551	78,400
... rich	26,751	24,822	2,860	193,846

Table C2: Average IWFI Parameters Using the OECD Equivalence Scale

	N	$\overline{\mu_{OECD}}$	Std.Err	$\overline{\sigma}$	Std.Err	$\overline{e^{\mu_{OECD}}}$
Whole sample	9,646	8.840	0.208	1.688	0.377	8,432
		[0.627]	[0.168]	[0.647]	[0.305]	[5,752]
Gender:						
Men	3,997	8.908	0.215	1.741	0.391	8,994
		[0.625]	[0.175]	[0.665]	[0.318]	[6,019]
Women	5,649	8.792	0.202	1.651	0.368	8,034
		[0.624]	[0.163]	[0.632]	[0.295]	[5,522]
Education:						
Primary	1,363	8.611	0.210	1.669	0.381	6,801
		[0.630]	[0.172]	[0.673]	[0.312]	[5,119]
Secondary	2,871	8.781	0.216	1.693	0.391	7,967
		[0.623]	[0.173]	[0.654]	[0.314]	[5,610]
Vocational	2,621	8.853	0.209	1.692	0.380	8,496
		[0.619]	[0.168]	[0.652]	[0.305]	[5,726]
Higher	2,791	9.000	0.197	1.689	0.358	9,647
		[0.593]	[0.161]	[0.622]	[0.292]	[5,952]
Employment:						
Working	5,555	8.975	0.213	1.736	0.387	9,442
		[0.596]	[0.172]	[0.649]	[0.312]	[5,973]
Not working	4,091	8.657	0.200	1.623	0.363	7,060
		[0.622]	[0.162]	[0.639]	[0.295]	[5,130]
Urbanisation:						
City	4,113	8.970	0.190	1.604	0.344	9,382
		[0.595]	[0.155]	[0.613]	[0.281]	[5,913]
Town	2,810	8.827	0.207	1.716	0.376	8,318
		[0.617]	[0.169]	[0.643]	[0.306]	[5,807]
Rural	2,723	8.657	0.236	1.787	0.428	7,115
		[0.637]	[0.182]	[0.683]	[0.331]	[5,150]
Age groups:						
18-30	1,988	8.936	0.214	1.754	0.388	9,216
		[0.624]	[0.174]	[0.658]	[0.316]	[6,042]
31-50	3,740	8.958	0.215	1.734	0.390	9,339
		[0.607]	[0.175]	[0.659]	[0.318]	[5,987]
51-70	2,994	8.738	0.203	1.654	0.368	7,628
		[0.620]	[0.160]	[0.627]	[0.290]	[5,404]
71+	924	8.487	0.183	1.471	0.332	5,679
		[0.543]	[0.148]	[0.583]	[0.268]	[3,594]

Notes: Standard deviations are in square brackets.
** The $\overline{e^{\mu_{OECD}}}$ value is calculated as the average exponential for each individual, rather than being the exponential of the average $\overline{\mu_{OECD}}$. The exponential figure is listed in annual US Dollars.

Table C3: The Determinants of μ_{OECD}

	Dependent variable:				
			μ_{OECD}		
	(1)	(2)	(3)	(4)	(5)
Ln Family Size	-0.081***	-0.199***	-0.175***	-0.185***	-0.179***
	(0.013)	(0.014)	(0.014)	(0.014)	(0.014)
Ln $Income_t$	0.457***	0.371***	0.303***	0.331***	0.293***
	(0.012)	(0.013)	(0.014)	(0.013)	(0.015)
Ln $Income_{t-4}$					0.075***
					(0.012)
Male		0.082***	0.084***	0.084***	0.082***
		(0.012)	(0.012)	(0.012)	(0.012)
Age		0.011***	0.012***	0.010***	0.009***
		(0.002)	(0.002)	(0.002)	(0.002)
$Age^2/100$		-0.019***	-0.020***	-0.018***	-0.017***
		(0.002)	(0.002)	(0.002)	(0.002)
Single		0.004	0.008	0.005	0.005
		(0.021)	(0.020)	(0.020)	(0.020)
Divorced		0.048**	0.030	0.040*	0.042*
		(0.022)	(0.022)	(0.022)	(0.022)
Widowed		-0.035	-0.035*	-0.043**	-0.042*
		(0.022)	(0.021)	(0.022)	(0.022)
Primary education		-0.117***	-0.133***	-0.121***	-0.108***
		(0.020)	(0.019)	(0.020)	(0.020)
Secondary education		-0.089***	-0.094***	-0.091***	-0.082***
		(0.015)	(0.015)	(0.015)	(0.015)
Vocational school		-0.039***	-0.054***	-0.042***	-0.036***
		(0.015)	(0.015)	(0.015)	(0.015)
Working		0.067***	0.067***	0.071***	0.074***
		(0.014)	(0.014)	(0.014)	(0.014)
Town		-0.098***	-0.533***	-0.070***	-0.067***
		(0.014)	(0.049)	(0.014)	(0.014)
Rural		-0.178***	-0.542***	-0.140***	-0.138***
		(0.015)	(0.044)	(0.015)	(0.015)
Gini				1.149**	1.079***
				(0.278)	(0.277)
Ln GRP				0.064***	0.053**
				(0.021)	(0.021)
Pop. density/100,000				-1.428**	-1.533**
				(0.585)	(0.584)
Unemployment rate				-0.035***	-0.035***
				(0.005)	(0.005)
Constant	5.090***	5.958***	6.567***	5.846***	5.580***
	(0.101)	(0.121)	(0.131)	(0.132)	(0.135)
Regional dummies†	No	No	Yes	No	No
Adjusted R^2	0.128	0.220	0.285	0.228	0.231

Notes: * p<0.1; **p<0.05; ***p<0.01

Observations = 9,646

Standard errors, clustered at the household level, and additionally at the regional level in Models (4) and (5), appear in parentheses.

† See Appendix Table A4 for the list of regions and the regional variables; Moscow is the omitted category here.

D Proof

D.1 Why are all the coefficients except for that on *ln*(*fs*) identical?

In Equation (7) we estimate:

$$\mu_i = \beta_0 + \beta_1\, ln(fs_i) + \beta_2\, ln(y_i) + \sum_{n=1}^{p} \gamma_n X_{n,i} + \varepsilon_i \tag{D.1}$$

With $y_{i,c}$ being equivalised by the square root of family size, Equation (6) is:

$$\mu_i = \frac{1}{C}\sum ln(y_{i,c}) = \frac{1}{C}\sum ln\left(\frac{y^*_{i,c}}{\sqrt{fs_i}}\right) \tag{D.2}$$

Where $y_{i,c}^*$ is the value of nominal unequivalised household income. If we instead use these unequivalised income values, $y_{i,c}^*$, we have:

$$\mu^*_i = \frac{1}{C}\sum ln(y^*_{i,c}) \tag{D.3}$$

In our data $C = 3$, and rearranging Equation (D.2) yields:

$$\mu_i = \frac{1}{3}\sum ln\left(\frac{y^*_{i,c}}{\sqrt{fs_i}}\right) = \frac{1}{3}\left(lny^*_{i,1} + lny^*_{i,2} + lny^*_{i,3} - 3ln\left(\sqrt{fs_i}\right)\right)$$

$$= \frac{1}{3}\sum ln(y^*_{i,c}) - ln\left(\sqrt{fs_i}\right) = \mu^*_i - ln\left(\sqrt{fs_i}\right) \tag{D.4}$$

Combining Equations (D.1) and (D.4):

$$\mu_i = \mu^*_i - ln\left(\sqrt{fs_i}\right) = \beta_0 + \beta_1\, ln(fs_i) + \beta_2\, ln(y_i) + \sum_{n=1}^{p} \gamma_n X_{n,i} + \varepsilon_i$$

$$\Rightarrow \mu^*_i = \beta_0 + \beta_1\, ln(fs_i) + ln\left(\sqrt{fs_i}\right) + \beta_2\, ln(y_i) + \sum_{n=1}^{p} \gamma_n X_{n,i} + \varepsilon_i$$

$$\Rightarrow \mu^*_i = \beta_0 + \beta_1\, ln\left(\sqrt{fs_i} * \sqrt{fs_i}\right) + ln\left(\sqrt{fs_i}\right) + \beta_2\, ln(y_i) + \sum_{n=1}^{p} \gamma_n X_{n,i} + \varepsilon_i$$

$$\Rightarrow \mu^*_i = \beta_0 + (2\beta_1 + 1) ln\left(\sqrt{fs_i}\right) + \beta_2\, ln(y_i) + \sum_{n=1}^{p} \gamma_n X_{n,i} + \varepsilon_i$$

$$\Rightarrow \mu^*_i = \beta_0 + \beta^*_1 ln\left(\sqrt{fs_i}\right) + \beta_2\, ln(y_i) + \sum_{n=1}^{p} \gamma_n X_{n,i} + \varepsilon_i \tag{D.5}$$

E Bivariate Correlations Between μ, σ and the Regional Variables

We below list the Spearman correlation coefficients, ρ, for the relationship between the four regional variables (the Gini coefficient, GRP, population density and the unemployment rate) and the regional values of $\overline{\mu}$ and $\overline{\sigma}$. We also illustrate this relationship with scatter plots. We last consider the results from previous work in the same way, using country-specific data when applicable, to address the external validity of the results found in the Russian data. There are more observations in the country-level bivariate correlations with GDP and population density than in the regressions in Table 5, as the latter is restricted by the number of existing analyses to which we can match reliable inequality information.

E.1 Regional Variables and μ

E.1.1 The Gini Coefficient and μ

The regional μ values are plotted against the regional Gini coefficients in Figure E1. The correlation coefficient, ρ, is 0.225, so that greater income inequality is associated with higher income needs. The same analysis for the existing literature in Figure E2 produces a stronger positive correlation (ρ = 0.420). However, neither correlation is significant at conventional levels.

E.1.2 Gross Domestic Product and μ

Regional μ is plotted against the GRP (in natural logs) in Figure E3, producing a positive significant relationship with a correlation coefficient of 0.538: income needs are higher in richer regions. This relationship is negative (ρ = -0.439) in the literature. As we have adjusted the μ values in the existing literature by the CPI, the Russian results may be considered to reflect higher prices in richer regions.

E.1.3 Population Density and μ

Figure E5 plots regional μ against population density, producing no clear relationship when looking at the Russian data. The same is found in the existing literature.

E.1.4 Unemployment and μ

Figure E7 plots regional μ against the unemployment rate, producing a negative relationship when considering the Russian data; the same negative correlation appears in the existing literature (Figure E8).

E.2 Regional Variables and σ

E.2.1 The Gini Coefficient and σ

The regional σ is plotted against the regional Gini coefficient in Figure E9. The correlation coefficient is 0.223, and the slope in the figure is positive and significant: individuals in regions with greater income inequality need larger rises in income to move between welfare levels. The same significant relationship is found between the σ's in the literature and the corresponding country-year Gini coefficients in Figure E10.

E.2.2 Gross Domestic Product and σ

Figure E11 plots the regional σ against regional GRP, producing no clear relationship. The correlation coefficient between σ and GDP in the existing literature is negative in Figure E12.

E.2.3 Population Density and σ

The regional σ is plotted against population density in Figure E13 for 36 regions: we exclude St. Petersburg and Moscow city, as these are the only survey regions that are cities and therefore do not include individuals living at all different levels of urbanisation. The correlation coefficient is -0.306 excluding St. Petersburg and Moscow city, and -0.244 when they are included. It may be thought that the economic activity in more-populous regions results in individuals being more sensitive to changes in income, but this is not borne out by the zero correlation with regional output per capita in Figure E9.

The same analysis in the existing literature produces insignificant correlations (see Figure E14). Overall, we have only mixed evidence that population density matters for the amount of income required to move between welfare levels.

E.2.2 Unemployment and σ

Figure E15 plots the regional σ against the regional unemployment rate, showing a slight negative relationship. The correlation coefficient between σ and the country unemployment rate in the existing literature is also negative and stronger in Figure E16.

D Figures

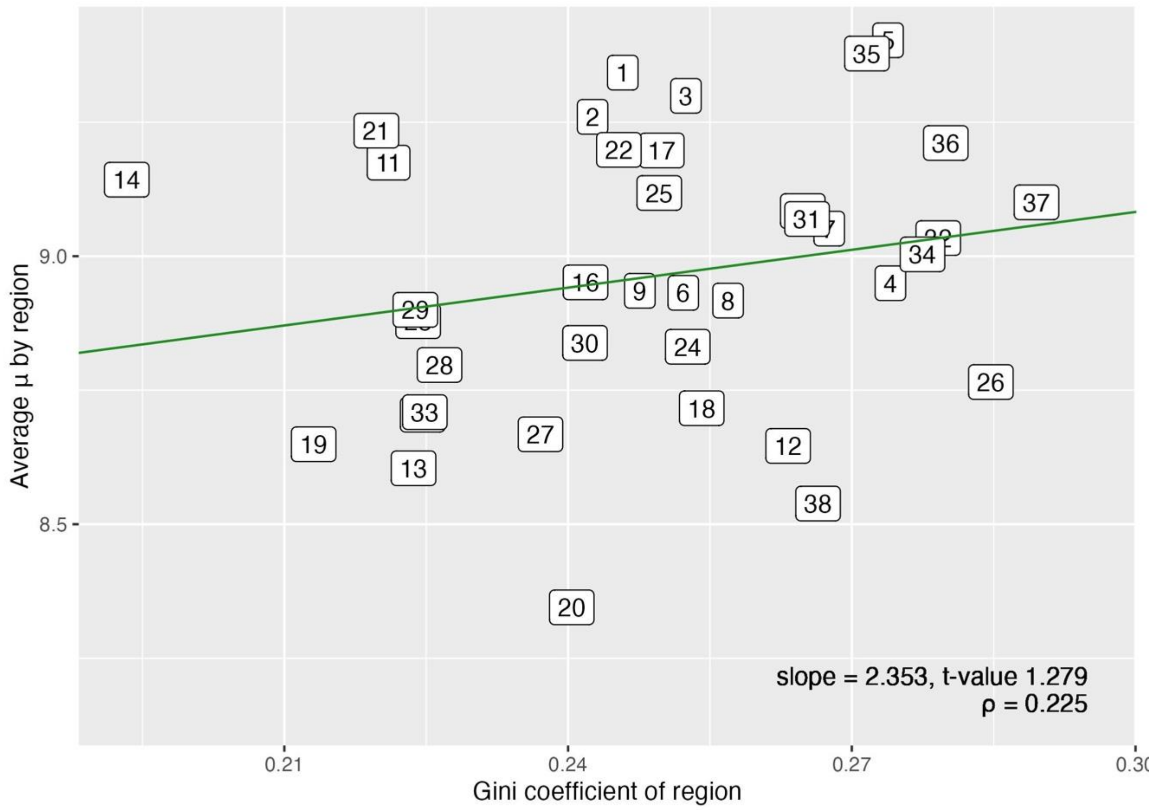

Figure E1: The Gini coefficient and μ by Russian Region

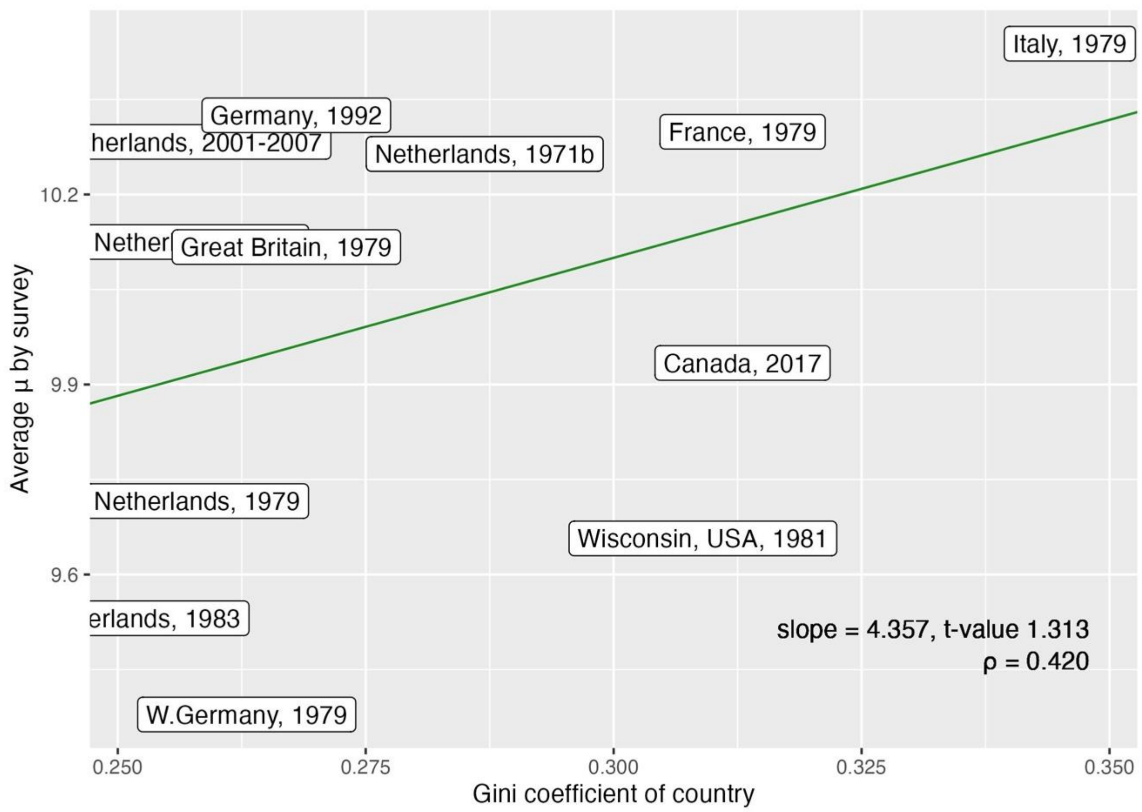

Figure E2: The Gini coefficient and μ by Study

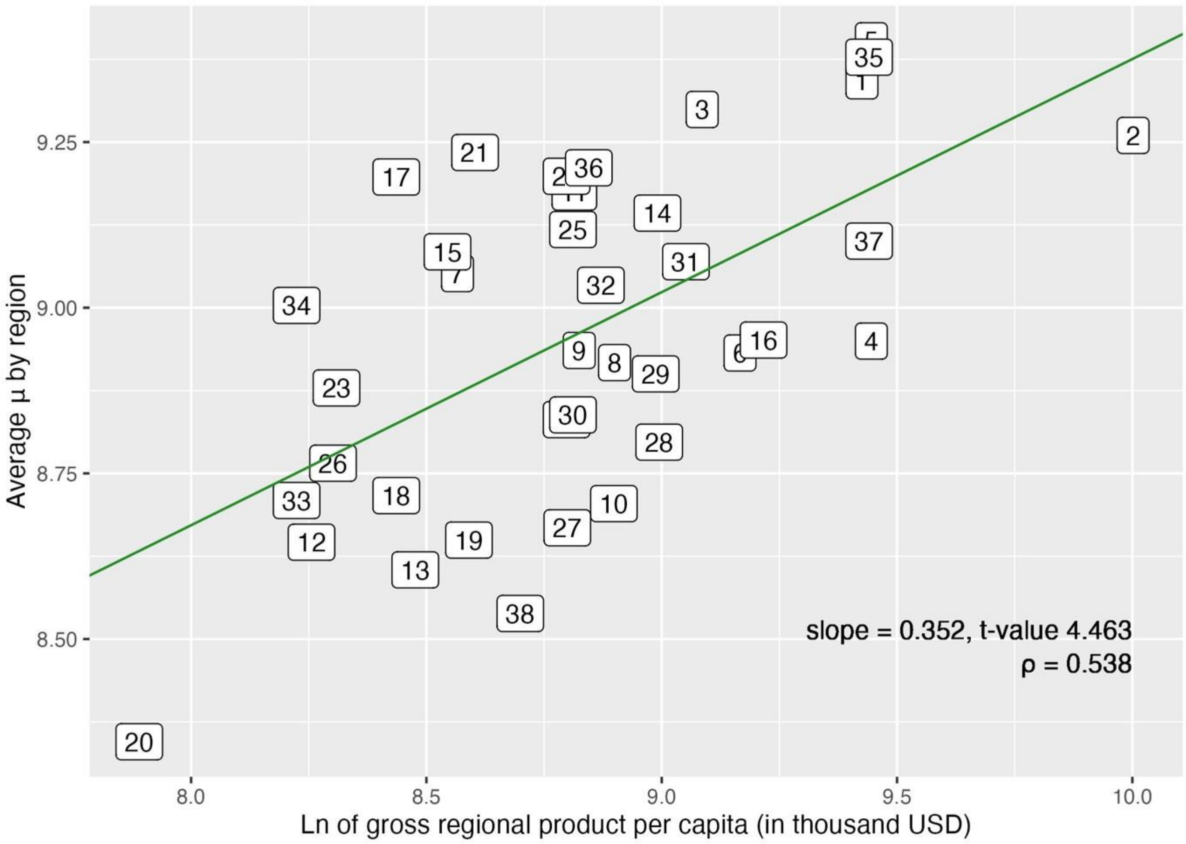

Figure E3: GRP and μ by Russian Region

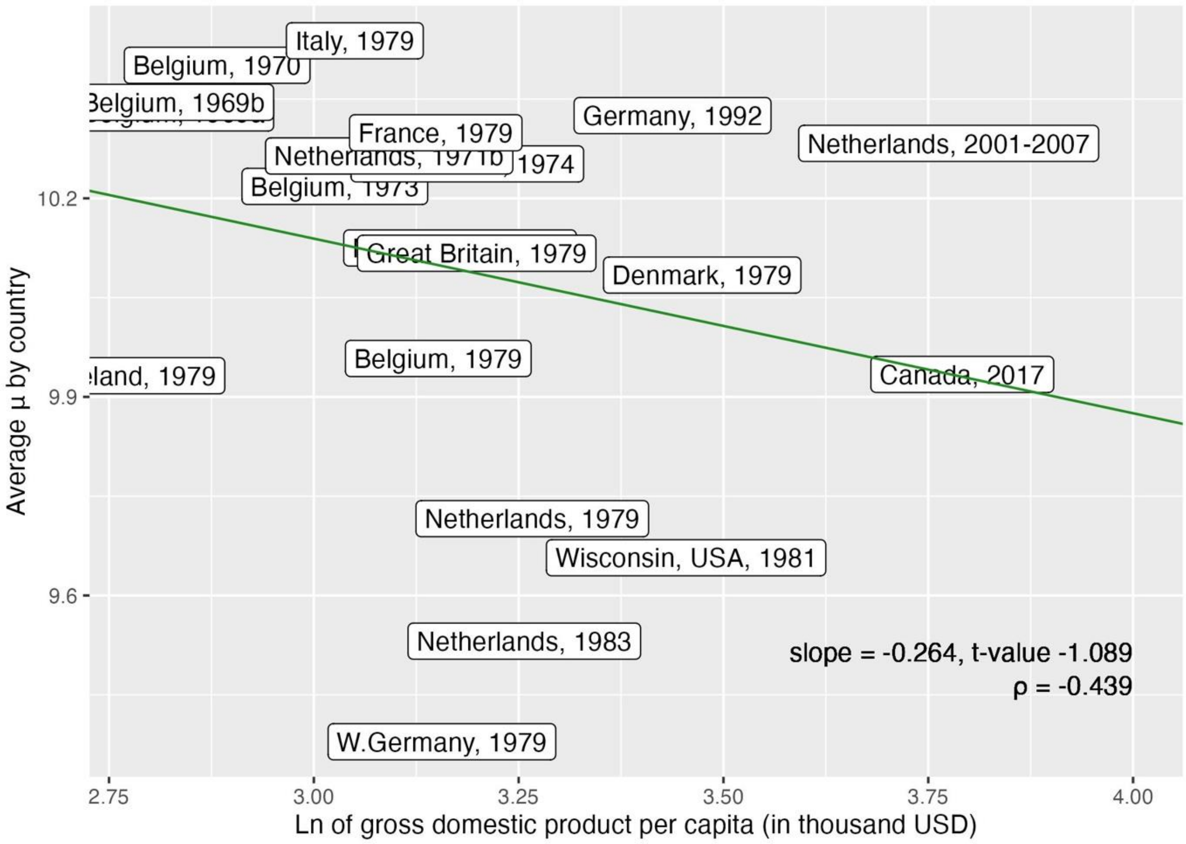

Figure E4: GDP and μ by Study

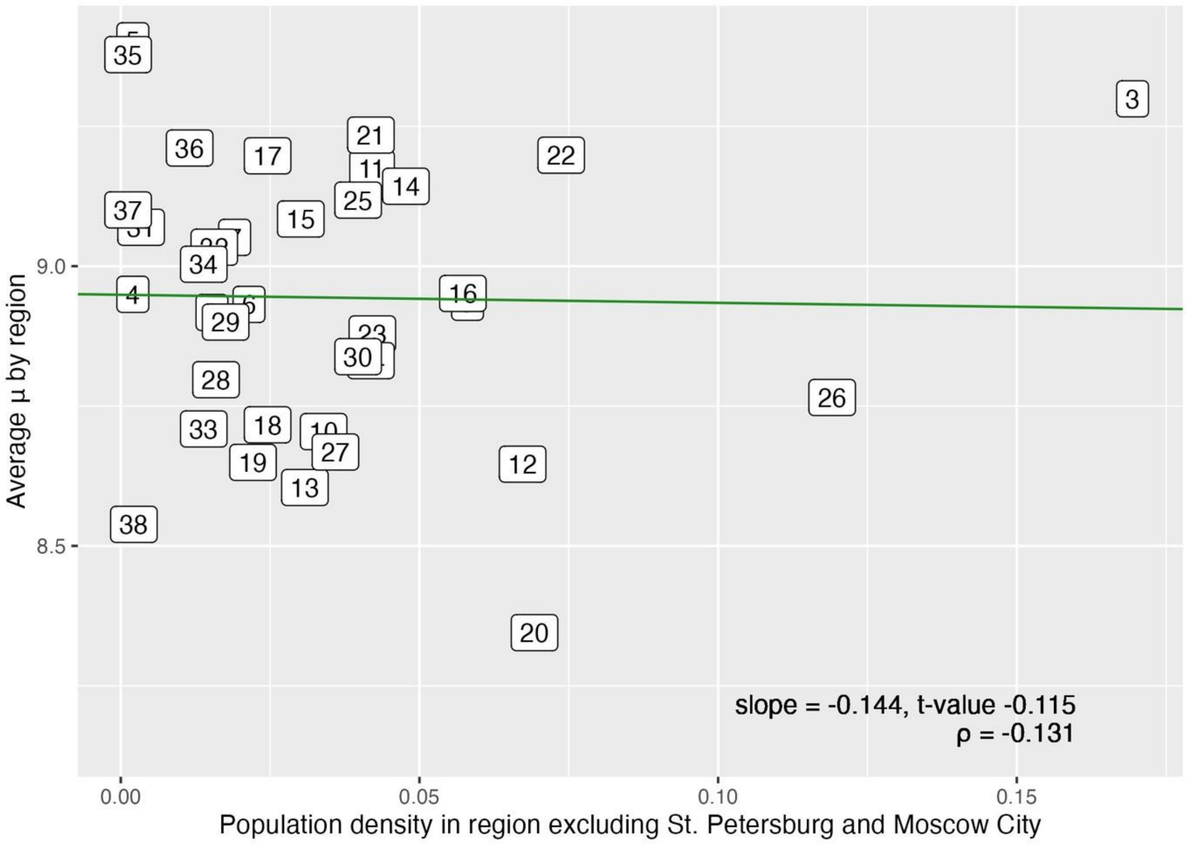

Figure E5: Population density and μ by Russian Region

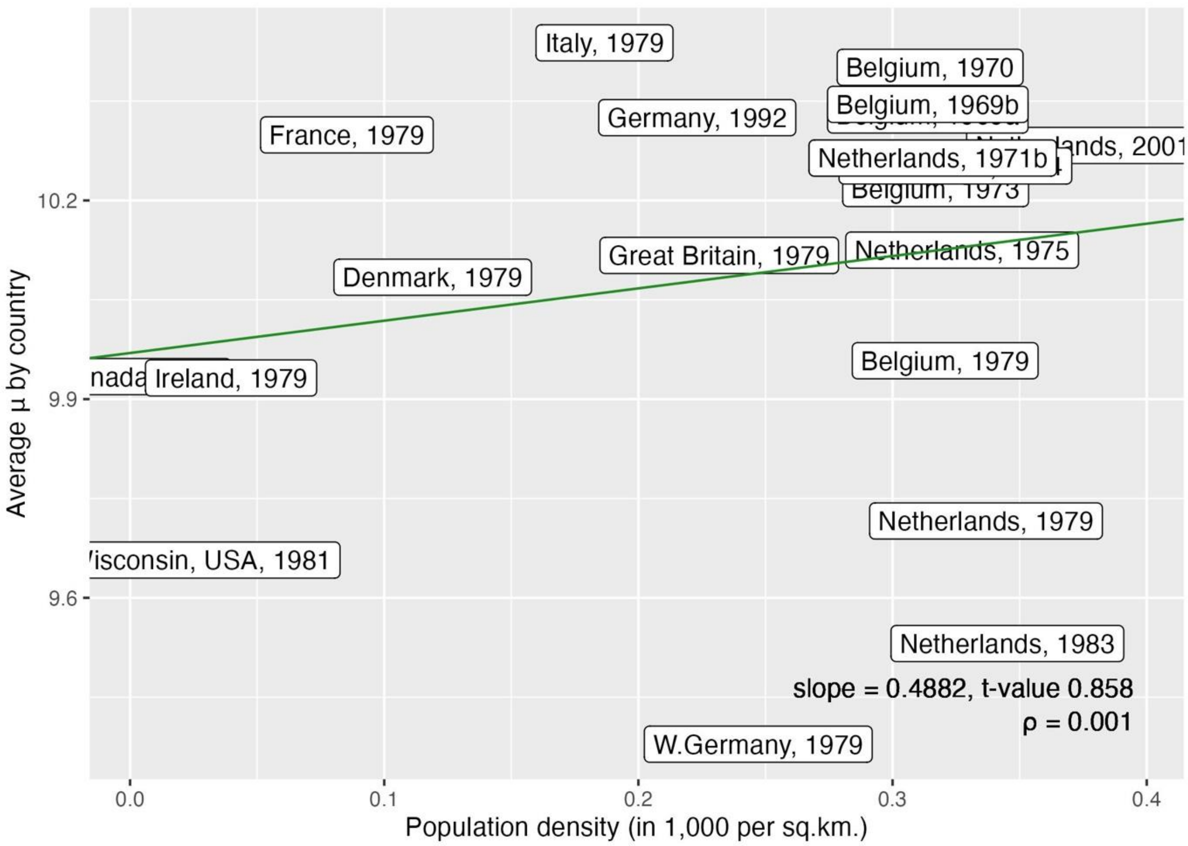

Figure E6: Population density and μ by Study

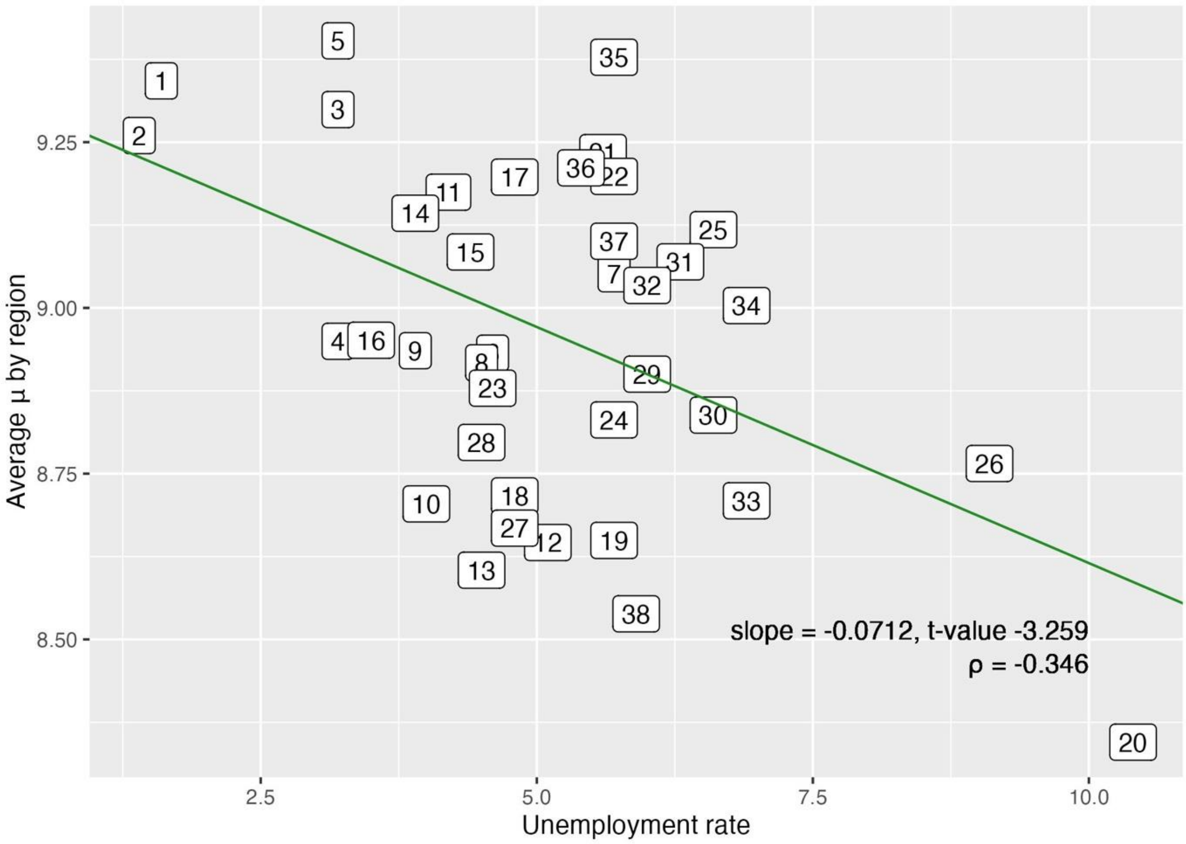

Figure E7: The unemployment rate and μ by Russian Region

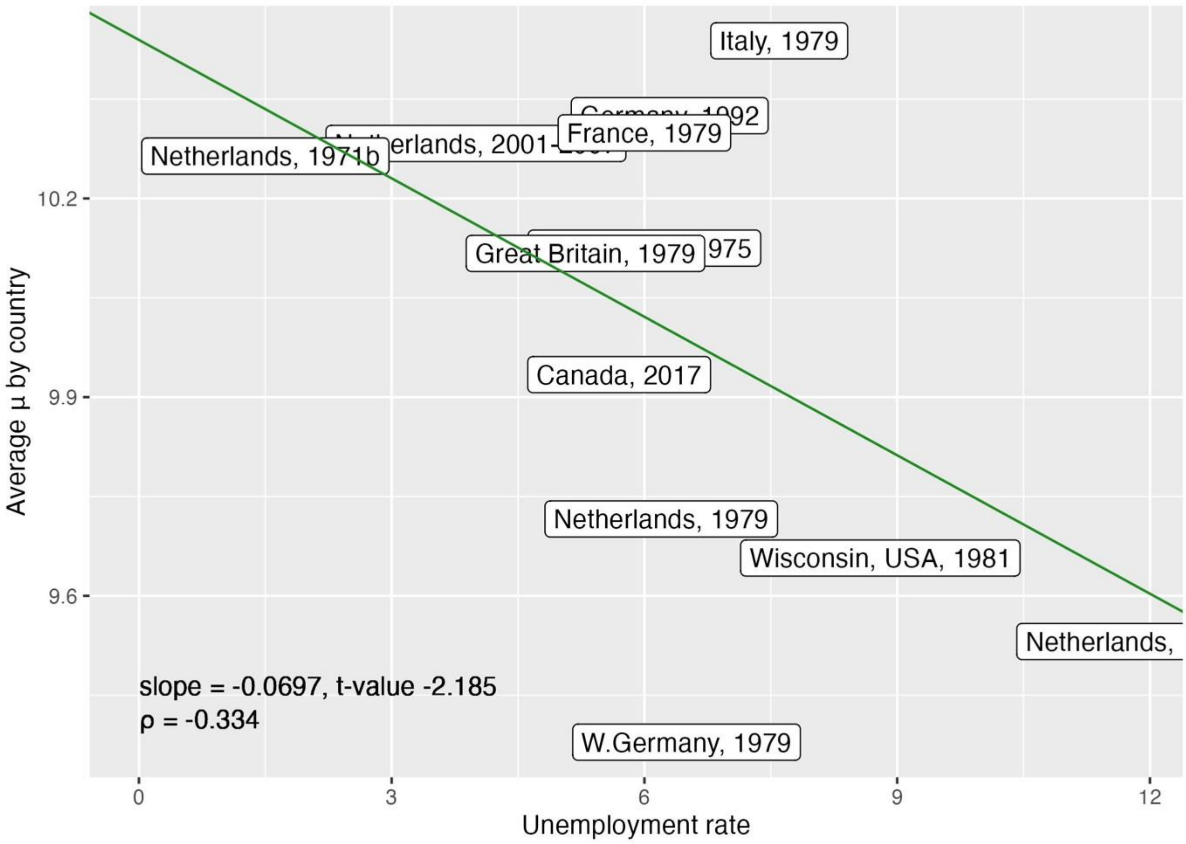

Figure E8: The unemployment rate and μ by Study

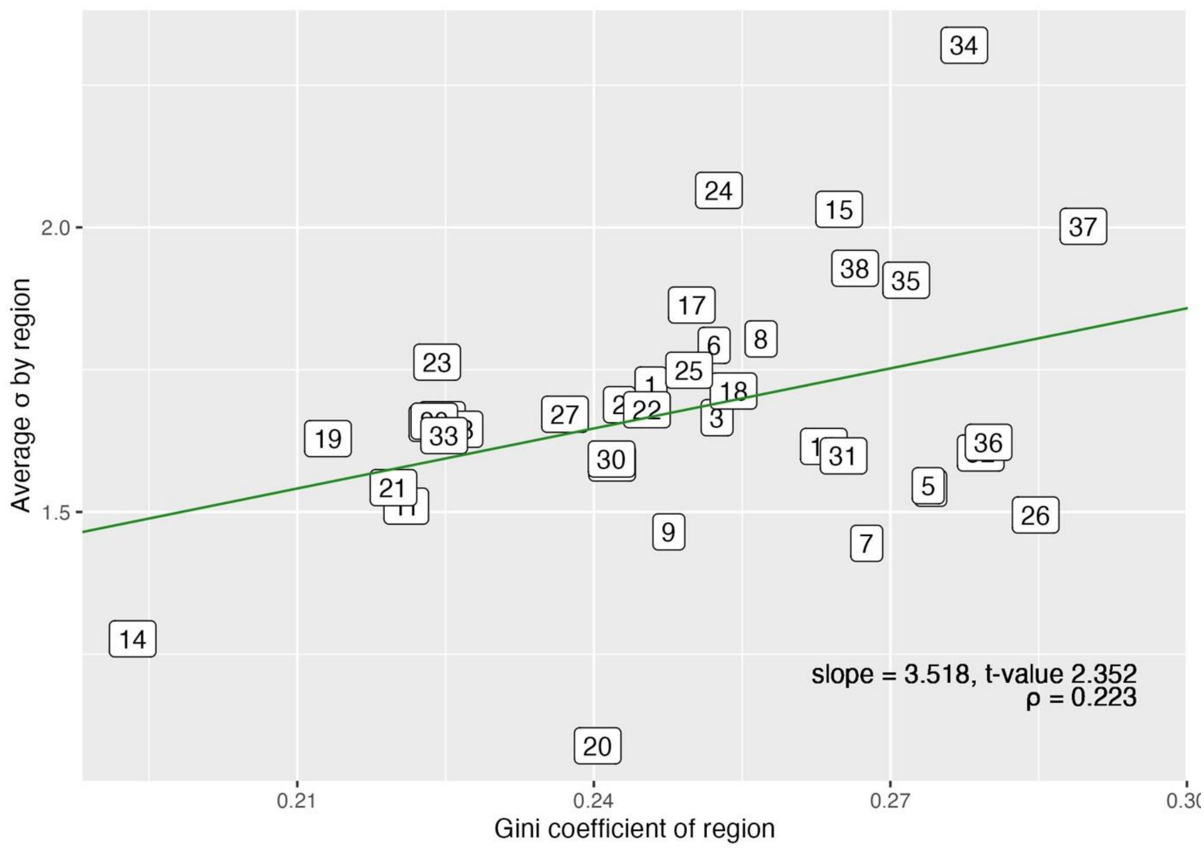

Figure E9: The Gini coefficient and σ by Russian Region

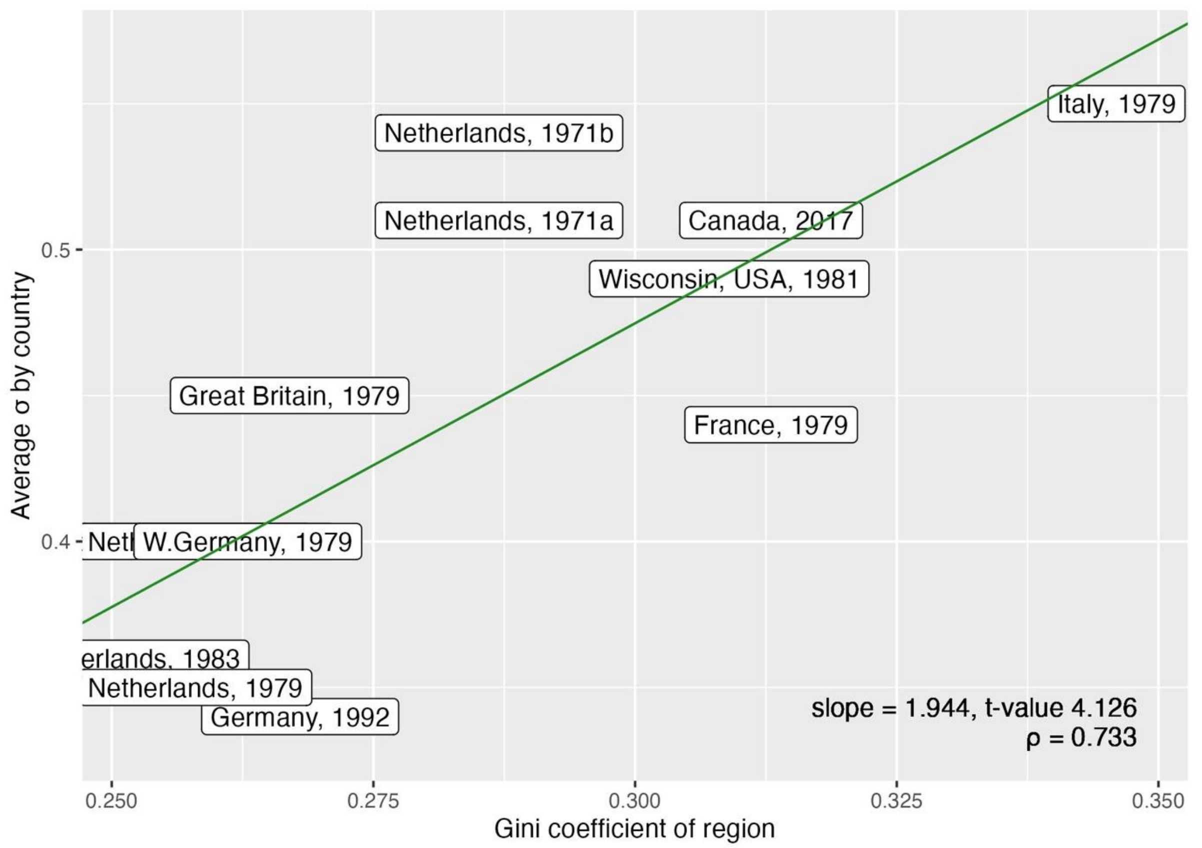

Figure E10: The Gini coefficient and σ by Study

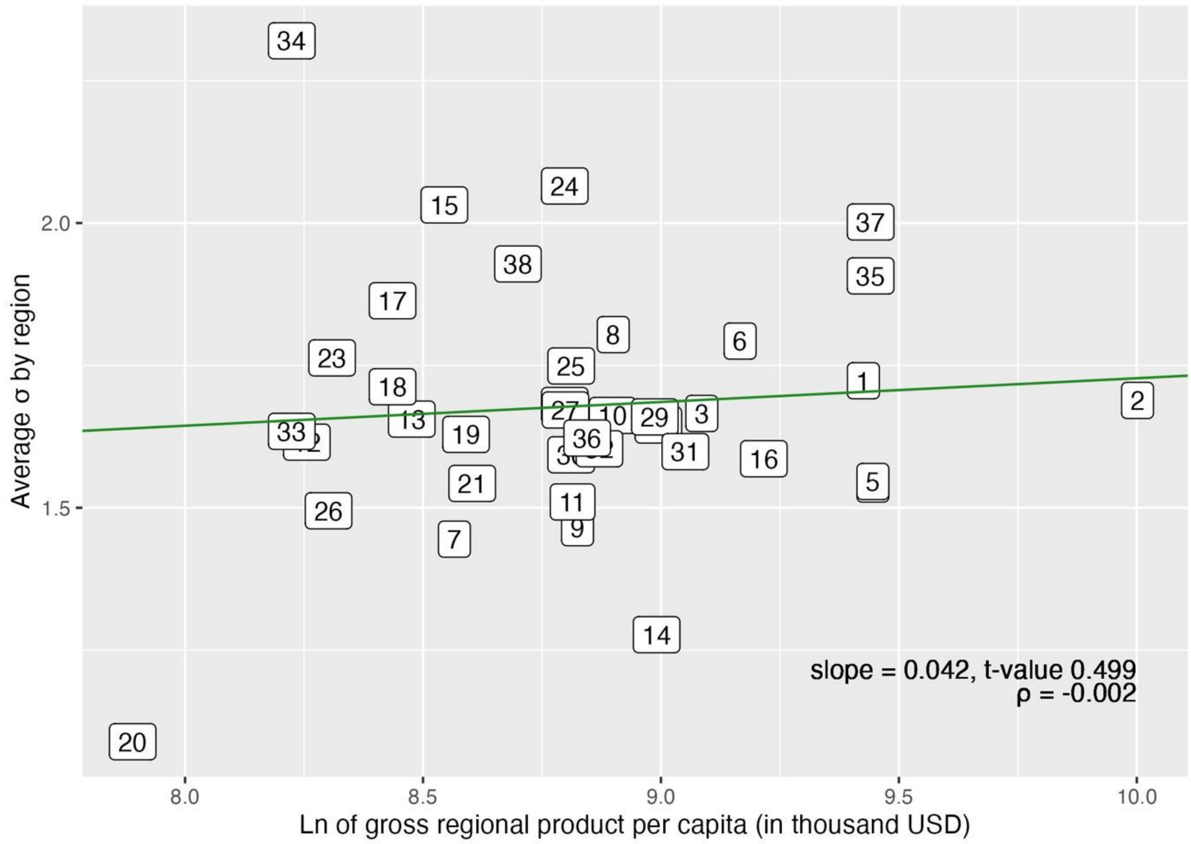

Figure E11: GRP and σ by Russian Region

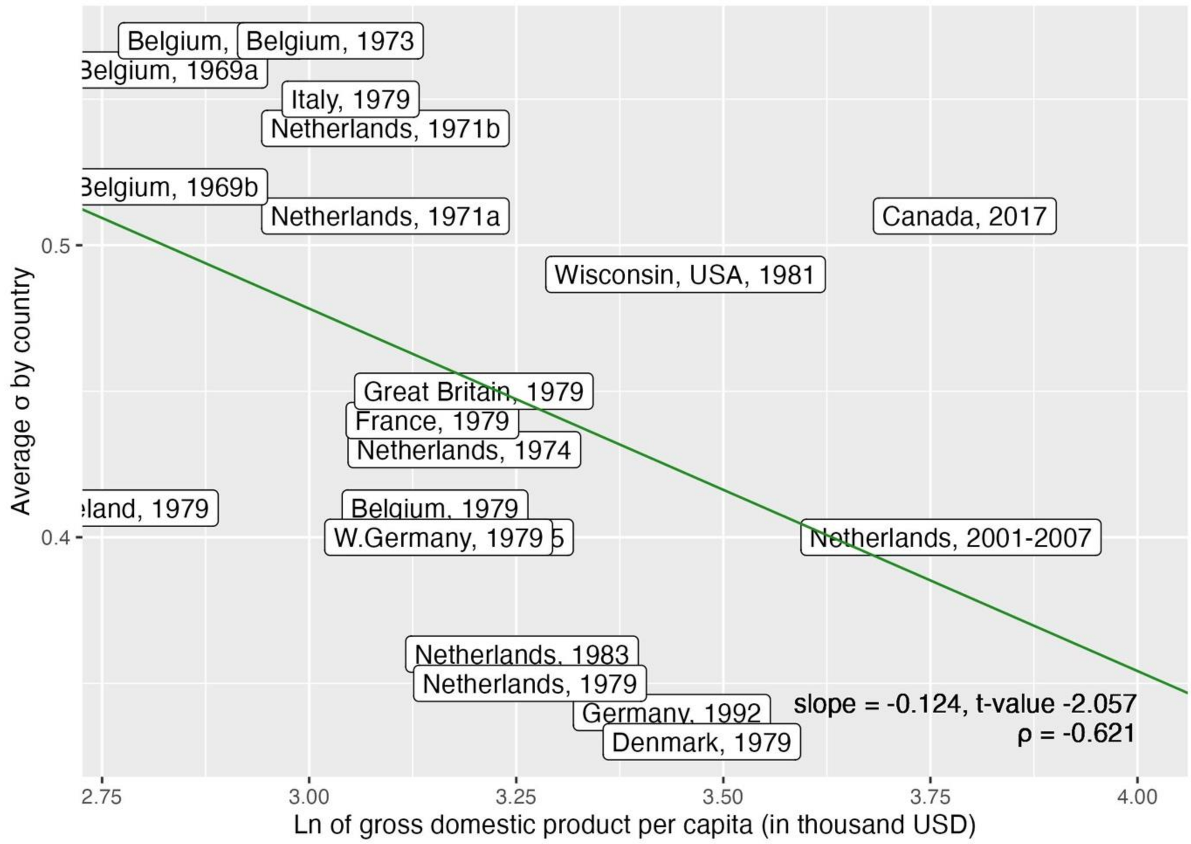

Figure E12: GDP and σ by Study

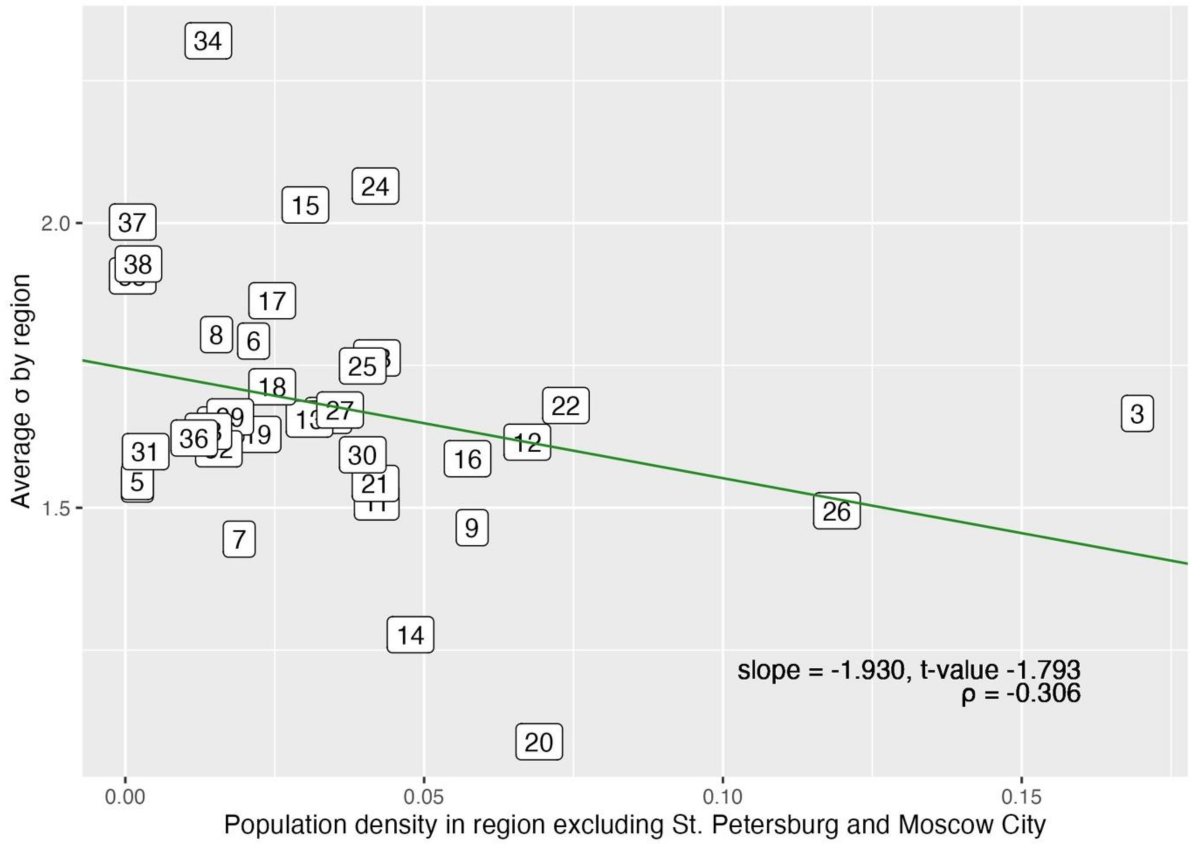

Figure E13: Population density and σ by Russian Region

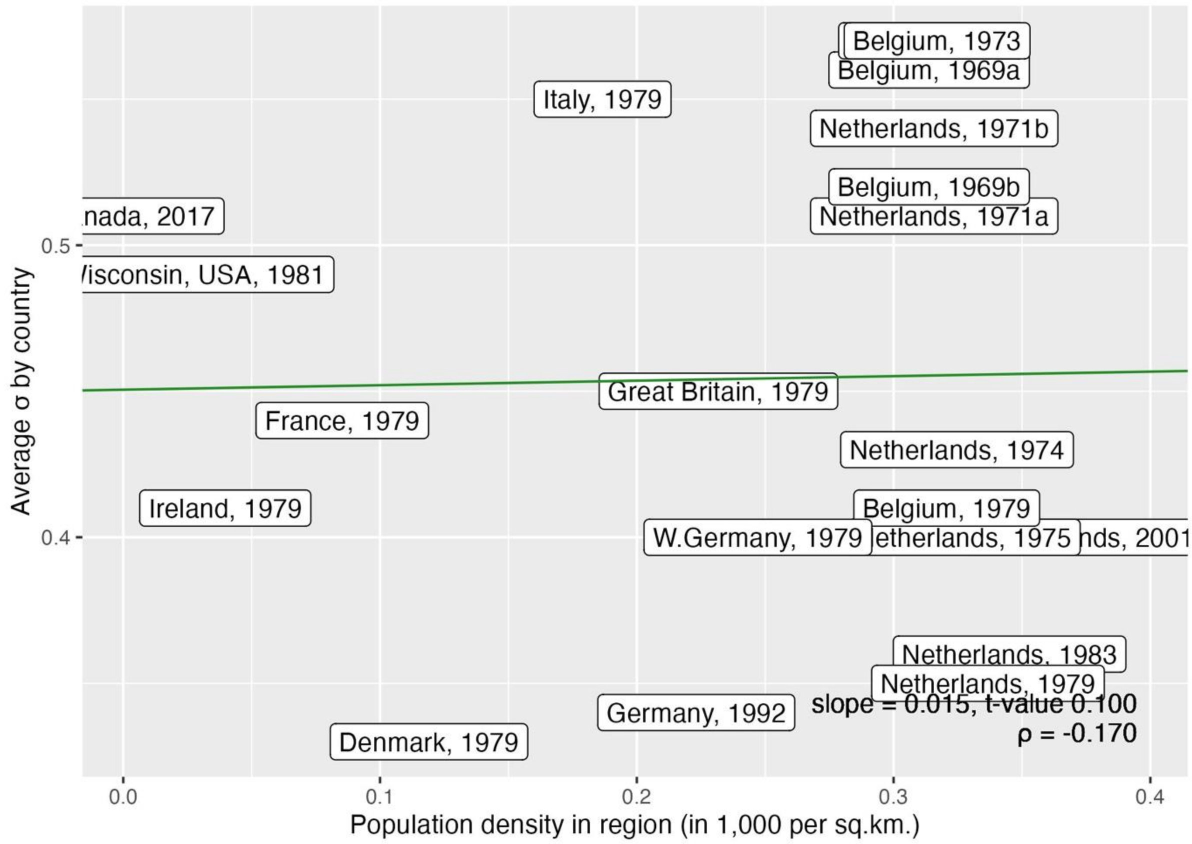

Figure E14: Population density and σ by Study

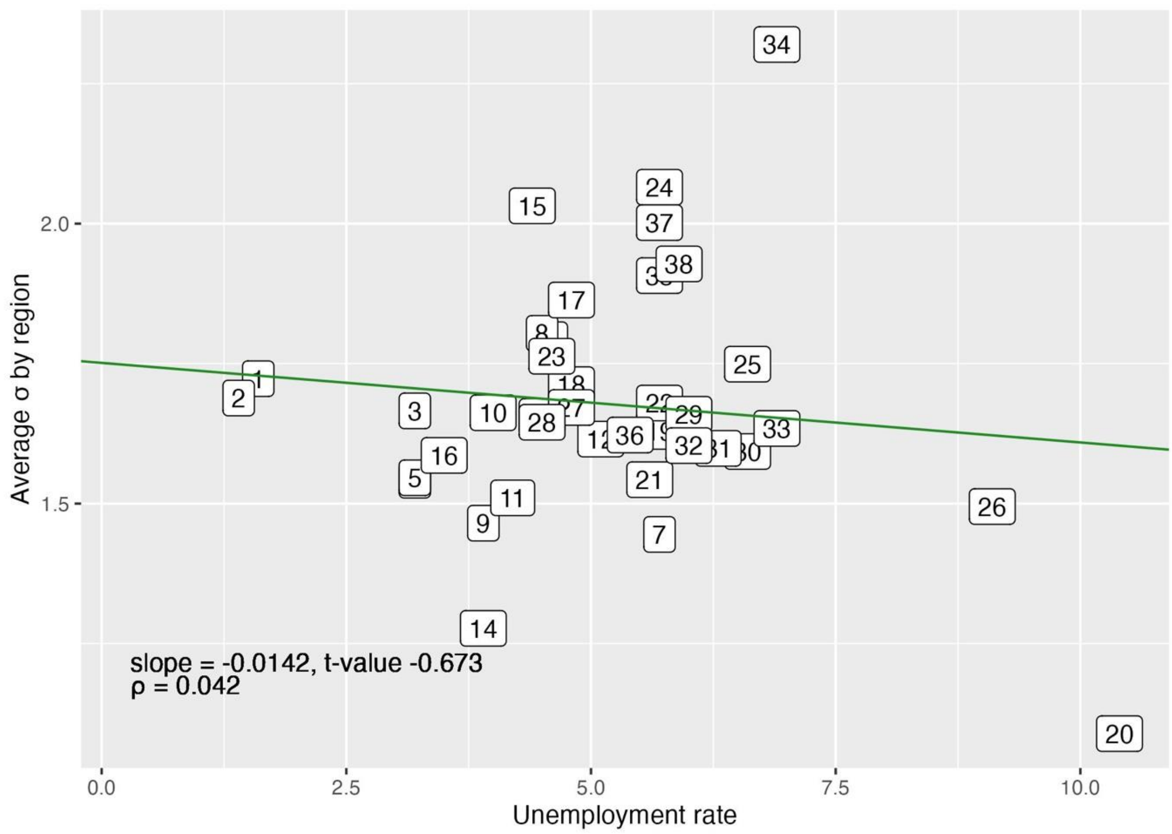

Figure E15: The unemployment rate and σ by region

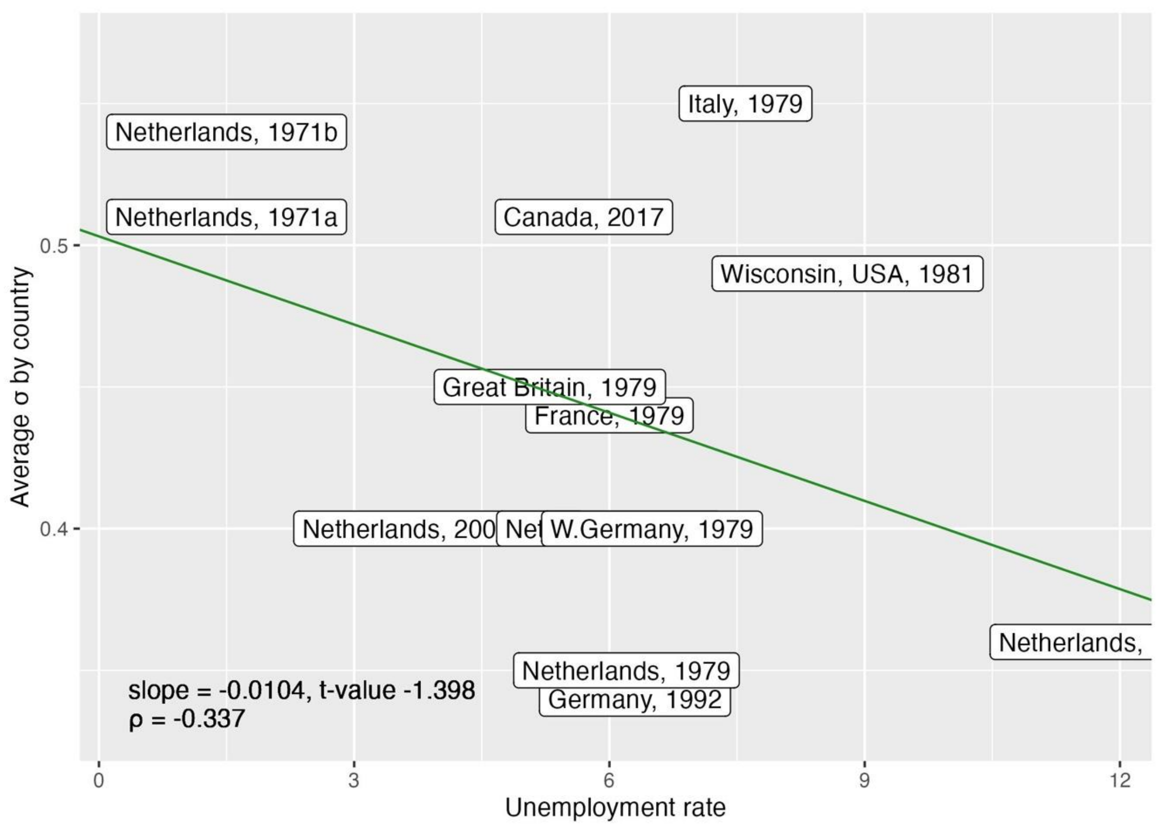

Figure E16: The unemployment rate and σ by study