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When information dominates comparison Learning from Russian subjective panel data

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Abstract

We propose a micro-econometric evaluation of the relation between life satisfaction and income distribution, using a balanced panel survey of the Russian population, Russian longitudinal monitoring survey (RLMS), running from 1994 to 2000, covering 4685 individuals. We show that in the context of the very volatile Russian environment, Hirschman's [Q. J. Econ. 87 (1973) 544] "tunnel effect" conjecture seems to be confirmed: variables reflecting income distribution do not influence satisfaction through social comparisons; individuals rather seem to use their informational content in order to form their expectations. The reference group's income thereby exerts a positive influence on individual satisfaction, which contrasts with other studies on the subject. Inequality indices do not affect individual welfare.

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1. Introduction

How does income distribution affect individual utility? In a seminal paper, Hirschman (1973) suggested that individuals could derive positive flows of utility from observing other people's faster progression if they interpret this evolution as a sign that their turn will come soon (for instance if the other lane of cars starts

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progressing towards the exit while their lane is still immobile during a traffic jam inside a tunnel). Dubbed the "tunnel effect" after the metaphor used by the author, this suggests that rising inequality may increase welfare, even for the poor, if it is interpreted as a positive signal with respect to likely future outcomes. This is at odds with the vision of Thurow (1971) who indicated that people may dislike inequality as such because they have quasi-aesthetic preferences for more equal distributions of wealth.

The same opposition exists regarding the interpretation of the income of one's reference group, which can be defined as the set of "relevant others" (e.g. peers, neighbors, colleagues, former schoolmates, etc.). On the one hand, the notion that utility is relative dates back to Veblen (1909) and Duesenberry (1949) and implies that individual utility depends on comparison to a reference level. This comparison effect has been documented empirically since then, e.g. van de Stadt et al. (1985) and Clark and Oswald (1996); a consequence is that reference group income should affect individual utility negatively. On the other hand, Hirschman's conjecture suggests that an individual can use the observation of his reference group's income as a source of information about his own perspectives (see also Levy-Garboua and Montmarquette, 2001), and hence derive positive utility from it. In summary, income distribution may affect subjective welfare in at least two ways: either as a direct argument in individual utility, or as a piece of information used to form expectations about future variables[1]. Our purpose is to try to disentangle these two aspects, focusing on the notion of the reference level of income. We analyze life satisfaction, using five rounds (1994–2000) of the representative household-level Russian longitudinal monitoring survey (RLMS). We concentrate on the longitudinal nature of the data in order to analyze intra-individual variations in satisfaction.

Our interpretation considers transition in Russia as a natural experiment characterized by an unusually high variance in absolute and relative incomes. Transition countries have effectively witnessed large movements in the distribution of wealth, income and labor market status, since the early 1990s, due to the transformation of the coordination system, the productive structure and relative prices in the economy. These evolutions have been associated with a high degree of uncertainty both at the individual level (employment and income perspectives) and at the aggregate level (macroeconomic and regulatory environment). Rising income inequality has been an important part of this evolution[2]. In the particular case of Russia, the presence of mineral and energy resources, and their privatization through the 1995 "loans for share" program, has led to a sharp increase in the income gap. Swings in macroeconomic policy have also hit the population's income, from the years of high inflation

[1] This implies that agents are forward looking and that their satisfaction depends not only on their current income, but also on their expected schedule of future income flows. A formulation of this assumption is the theory of anticipatory feelings (Caplin and Leahy, 2001).

[2] In the late 1980s, the Gini coefficient for socialist economies averaged about 23 points, whereas Western countries' coefficients were about six points higher. With transition, these coefficients have increased, sometimes dramatically, to above 50 in Russia (see Brainard, 1998; Ferreira, 1999; Commander et al., 1999).

1992–1995, through a period of monetary austerity and exchange rate stability, until the 1998 devaluation and the following resumption of growth (see Lokshin and Ravallion, 2000). Russia is thus an ideal case to test Hirschman's conjecture, as it enshrines all the necessary ingredients: uncertainty, growing inequality and prospects for development.

Ravallion and Lokshin (2000) have already advocated the presence of such a ''tunnel effect'' in Russia, based on the analysis of the demand for income redistribution in 1996. Analyzing the answers to the question ''do you agree that the government should restrict the income of the rich?'', they show that individuals who agree are not necessarily those who are poorer, but rather those whose perspectives are more uncertain. This is consistent with the conjecture that it is not inequality per se that affects individual utility. We pursue the exploration of this issue, concentrating on the notion of the reference level of income. We show that in the very volatile Russian environment, individuals react favorably to a rise in their reference group's income, suggesting that the informational effect dominates the comparison effect.

As an illustration, consider the fate of the agriculture and government administration workers across five rounds of the RLMS (Table 1). It is striking that their individual satisfaction moves with the average income of their professional group rather than with their individual income.

Table 1
The evolution of individual satisfaction and branch income

	Average income in the industry	Average happiness score in the industry	
		Increasing individual income	Decreasing individual income
Agriculture and forestry			
1994	483		
1995	267	2.09	1.99
1996	192	2.03	1.87
1998	186	1.85	1.87
2000	367	2.35	2.20
Government administration			
1994	1200		
1995	839	2.23	2.39
1996	923	2.40	2.42
1998	637	2.05	2.00
2000	732	2.60	2.56

Average income is in constant 1992 prices (thousands of rubles). From 1995 to 1996, the average income in agriculture fell from 267 to 192 thousand rubles and the average satisfaction score fell both for individuals with increasing income (from 2.09 to 2.03) and for those whose personal income decreased. In the same time, the average satisfaction in the government administration sector went up from 2.23 to 2.4 for individuals whose personal income was decreasing, a well as for those whose individual income decreased, as the average income in the sector increased from 839 to 923 thousand rubles.

Table 2
The evolution of life satisfaction in Russia 1994–2000

Percentage	Round 1994	Round 1995	Round 1996	Round 1998	Round 2000
Not satisfied	23	28	31	37	24
Rather not	44	39	38	35	39
Yes and no	21	21	20	18	22
Satisfied (fully and rather)	13	12	10	10	15
Total	100	100	100	100	100

To what extent are you satisfied with your life in general at the present time?

The remainder of this paper explores this finding more systematically, i.e. controlling for the other determinants of life satisfaction. The next section presents the empirical strategy, while Section 3 discusses the results and Section 4 concludes.

2. Empirical strategy

We use rounds 5–9 of the RLMS representative household survey, running from December 1994 to October 2000[3]. As the survey is based on a stratified sample of dwelling units, attrition is due to households or individuals who move (in addition to non-response). Among the 11 129 individuals of the survey, 4685 (42%) remain in the sample at all rounds, while 6444 are absent at some round. Attrition essentially consists in the loss of urban older individuals, especially from the Moscow and St. Petersburg regions. It affects men more than women. In order to correct for the fact that attrition may not be a random process, we estimate the probability for an individual to remain in the sample during the whole period, and we use the inverse of the predicted probability to weight all the estimations presented in the paper.

We analyze the answers to the Life Satisfaction Question contained in the adult questionnaire. The question is: "to what extent are you satisfied with your life in general at the present time?". Respondents tick one of the following answers: fully satisfied, rather satisfied, both yes and no, less than satisfied, not at all satisfied. We interpret this ordinal, discrete variable as a proxy for the flow of utility derived by individuals, assuming a latent continuous utility function. Due to the smallish proportion of people choosing the fully satisfied answer, we aggregate the fully and rather satisfied categories. Obviously (Table 2), the distribution of the population into satisfaction categories varies during the period considered, with a general movement of decreasing satisfaction until 1998 followed by a rise in satisfaction from 1998 to 2000 (which can be associated with the resumption of domestic activity after the 1998 devaluation of the ruble). Looking at transition matrices reveals a substantial mobility of individuals across the different satisfaction categories. On

[3] Information about the RLMS, including the data itself, is available on the internet at the address http://www.epc.unc.edu/projects/rlms. See Mroz et al. (2001) for a description of the project. Descriptive statistics are presented in the working paper version of this paper (Senik, 2002).

average, only about 40% of the population remains in the same category from one round to the other. Up to 50% of the not satisfied at all remain in that class throughout the study; the other categories are much less stable (Senik, 2002).

Using satisfaction judgements requires some explanation as these variables are sometimes regarded with suspicion by economists who are more attached to action-revealed preferences[4], even though the stock of economic studies based on subjective data is both vivid and varied[5]. This reluctance to use subjective data is motivated by a multifaceted doubt about the psychological mechanisms that underlie individual declarations: social and cultural constraints on self image, interaction with the surveyor, questionable lucidity and memory of the surveyed person, formulation and questions order effects, answers to irrelevant questions, cognitive dissonance, "mood effects"[6] (see Bertrand and Mullainathan, 2001) and difficulty of interpreting the answers. This last point is the most delicate, whereas the others result in classical measurement errors which can be benign if they are not correlated with explanatory variables. The specific difficulty with subjective variables is the link between the latent variable (actual satisfaction) and its expression (satisfaction judgements). The main issue is whether different individuals apply the same labels to the same satisfaction level; if not, then interpersonal comparisons of responses are meaningless. Dealing with this "anchoring effect" (Winkelmann and Winkelmann, 1998) implies assuming inter-personal ordinal comparability of satisfaction judgements, following the Leyden school (see van Praag, 1991), and focusing on variations in individual satisfaction, a strong argument in favor of panel data analysis (see also Ferrer-i-Carbonnell and Frijters, 2002).

Another difficulty is to implement panel data analysis in order to deal with individual heterogeneity, while respecting the ordinal nature of the satisfaction variable[7] since there is no accepted general method for panel analysis allowing ordered probit or logit with fixed effects. Our choice is to explore many routes and check that the results are robust to the method. More precisely, we run maximum-likelihood ordered probit estimations with variants in which a Mundlak transformation of the exogenous variables reproduces the between (X_i) and within ($X_{it} - X_i$) effects. We apply this treatment to all variables for which there are reasons to suspect individual heterogeneity (e.g. income and expenditure

[4] A distinction is often made between decision utility, which reflects preferences, and experienced utility, a more Benthamian notion, which can diverge from the former (see for example Frey and Stutzer, 2002). We refer to the second notion.

[5] A stream of recent research on political values, demand for redistribution and votes, hinges on subjective attitudinal questions including life satisfaction, e.g. Alesina et al. (2000),Corneo and Grüner (2000, 2002),Di Tella et al. (2001) and Ravallion and Lokshin (2000).

[6] According to Diener et al. (1999), however, empirical studies reveal that the stable component of satisfaction is dominant in the satisfaction answers. Ravallion and Lokshin (2001) note that even though mood variability may reduce the statistical fit with the regressors related to long term determinants of welfare, it is not an obvious source of bias.

[7] The last objective can be met using an ordered logit or probit statistical model. Concerning unobserved heterogeneity, the most usual route is to assume that it takes the form of an additive individual (fixed or random) effect which is explicitly included in the individual welfare function. One can then deal with the fixed effect by taking the first difference or the difference to the time mean of relevant variables (see Mundlak, 1978). However, it would make no sense to calculate such a difference for the satisfaction variable which is ordinal.

categories). The tables presented in the text are produced with this method[8]. We refer to the working paper version of this paper (Senik, 2002) in which estimations based on other statistical models are presented in Appendix A: treating life satisfaction as a continuous variable, we used linear fixed effects regressions as well as standard dynamic panel techniques. We also collapsed the life satisfaction variable into two categories (satisfied/dissatisfied) and ran standard conditional fixed effects logit estimations. We verified that all our results are robust across these methods.

The individual welfare function we estimate depends on current real individual income ($\log Y_{it}$), income expectations formed in $t-1$ (E_{it-1}), the individual reference group's income ($\log Y_{\text{reference},it}$), socio-demographic characteristics (X_{it}), and time and regional dummies, as well as inequality measures in some specifications:

$$U_{it} = V[\log Y_{it},\ E_{it-1},\ \log Y_{\text{reference},it},\ U_{it-1},\ X_{it},\ I_t] \tag{1}$$

Hence, with the ordered probit model:

$$P(U_{it} = u_k) = P(\mu_{k-1} < F(\varepsilon_{it},\ \log Y_{it},\ E_{it-1},\ \log Y_{\text{reference},it-1},\ U_{it-1},\ X_{it},\ I_t,\ \theta) < \mu_k \tag{2}$$

with $k=$ l, 4 and $t=1$, 5, where, F is a linear satisfaction function depending on a vector of characteristics X_{it}, a parameter vector θ, a random variable ε_{it} that follows a normal distribution, and a set of cut-points μ_k.

In Eq. (2), the influence of the real income variable is obvious; ceteris paribus higher income should be synonymous with higher satisfaction. We use two categories of income: individual real income and household real income[9]. As our main interest lies with the influence of reference income, it is important to control for actual individual income, in order to separate the effect of both variables on satisfaction. However, a classical worry is that income is likely to be endogenous to satisfaction for two possible reasons. The first reason is unobserved individual heterogeneity, say "personality". A happy, for instance extraverted, personality will generate both more productive behavior and more satisfaction, hence a spurious correlation between say wage and satisfaction. We deal with this problem by introducing the Mundlak distinction on exogenous variables (Table 5) and by introducing individual fixed effects in Senik (2002). The second risk is collinearity, as income and satisfaction may vary together, following some external cause. In order to deal with this issue, we introduce year and region dummies, which should capture much of the business cycle, and in addition, we include lagged individual income instead of current

[8] The variance–covariance matrix of estimators, but not the coefficient, is adjusted for the fact that observations relating to the same individuals are not independent; we use Stata's cluster option, which automatically estimates the "robust" Huber/White/sandwich estimator of variance instead of the traditional one.

[9] In the data, individual income includes cash and non cash salaries, other paid work and income, unemployment benefits and pensions. Household income includes all possible kinds of income, including work payment, state transfers (children's benefits, stipends, subsidies, etc.), private transfers (from family, relatives, friends, church, etc.), the value of the home production of fruits, vegetables, meat and dairy products consumed or given away, net of the expenditure on home production (e.g. seed, fertilizers, feed), i.e. the largest possible notion of household general net income.

income. Because of measurement errors and risks of under-declaration of income, we also add real household income or real household expenditure[10], following the idea that measurement errors are smaller regarding the latter variable (see Ravallion and Lokshin, 2001, for example). All these financial categories are deflated using regional consumer price indices[11]. As is often the case, we use the natural logarithm of the income and expenditure categories: in the particular case of our model, this reflects the assumption that utility is a concave function of income.

The role of information and expectations is central to our discussion of satisfaction and reference income. Expectations may also influence satisfaction by raising the aspiration level. We thus control for lagged income expectations in some specifications, using what we see as an indicator of individual income expectations: "do you think that in the next 12 months you and your family will live better than today, or worse?" (five proposed answers). In Eq. (2), X_{it} is a vector of socio-demographic individual characteristics that influence life satisfaction (age, marital status, household size, mother tongue, religion, gender, health). Regional dummies capture the influence of unexplained location effects such as local public goods, local job market or good market externalities, or other local externalities. Lastly, I_t is a set of year dummies that capture the effect of cyclical macroeconomic fluctuations on individual satisfaction. Eventually, we include variables related to the perception of income distribution, such as the reference group's income, Gini indices and Stark indices of income overhang, which are described in the following subsections.

2.1. Constructing the reference group income

Following Clark and Oswald (1996), we estimate, round by round, in a first-stage regression, the logarithm of the typical real income of an individual, based on his education, years of experience, region, branch, age, sex, and primary occupation code (International Standard Classification of Occupations). We then include the post-estimation predicted individual income in the second stage estimation of life satisfaction, as a proxy for the individual's reference group income. The rationale is that this constructed variable is the average pay-off associated with the productive characteristics of a given

[10] Household expenditure data is constructed with the same degree of analytical decomposition as household income, distinguishing the volume and cost of each element of expenditure (on food, durable goods, furniture, clothing, housing, rents, transportation, communication, land use, home production, leisure, travel, services, health, insurance, credit repayment, lending, savings and transfers).

[11] Price indices are constructed at the level of PSUs. We build these deflators based on two sources of information. First, the Consumer Price Indices published by the Russian statistical organ *Russian Economic Trends*, available on their web site http://www.recep.org/ret/, and second, the ratio of regional to national poverty lines of RLMS. The formula of our deflator is then: $\text{Deflator}_{jt} = \text{National Consumer Price Index}_t$. $[\Sigma_{(i?j)}(\text{regional poverty line}_{it})/(\text{all-Russian poverty line}_{it})]$. Where $j = 1, 38$ stands for the Primary Sample Units of RLMS, $i = 1, 9000$ stands for the households, $t = 5$, nine stands for the rounds of the RLMS survey. Regional and national poverty lines are defined as the regional or national cost of a representative subsistence food basket, adjusted for each demographic group. Taking the ratio of these two indicators suppresses the influence of the adjustment for the demographic group. In a former version (Senik, 2002), we used national consumer price indices, which yielded the same results.

individual. We believe that it has a substantial informational content. In a context where the association between skills and pay-offs is changing rapidly[12] and somewhat unpredictably, the observation of the typical income of people sharing the same skills and the same position is a good indicator of what an individual can expect for himself.

We estimate reference income on the whole sample of individuals[13]. However, there are people with no source of income at all. Note that the problem is mitigated by the fact that the notion of income in the RLMS is unusually extensive as it includes official as well as unofficial wages from primary, secondary and tertiary jobs, in cash or in kind, as well as transfer payments such as unemployment benefits and pensions; this should minimize the bias resulting from the selection of active people. Nonetheless, in order to correct for the participation bias, we use the Heckman (1979) maximum likelihood estimator selection model where the following main regression is:

$$\begin{aligned}&\log\ \text{individual income}\\&= F[\text{years of education},\ \text{years of experience}, \text{ISCO}\\&\qquad \text{occupation code},\ \text{industrial branch},\ \text{gender},\ \text{region}]\end{aligned} \tag{3}$$

and the selection equation states that log individual income is observed if[14]:

$$\gamma_0 \text{age} + \gamma_1 \text{gender} + \gamma_3(\text{presence of a child under 7}) + u_{2j} > 0 \tag{4}$$

Table A.1 in the Appendix shows the results of the estimation of reference income at each round. As the predicted reference income is going to be included together with other explanatory variables in the estimation of life satisfaction, one should be careful about the risk of multicollinearity. Here, we exclude all the right hand side variables of the first stage estimation of the reference income from the second stage life satisfaction estimation, except gender (which has an obvious influence on both variables but partly for different reasons), as well as regional dummies, as these capture the influence of certain local externalities which are not necessarily related to level of wages. Note that the variables used in the estimation of reference income are not (or only weakly) significant

[12] This is due to the industrial restructuring of the country which implies the contraction of certain activities (machine-building, metal-working) and the expansion of new ones (services), the changing demand for the various skills (e.g. lower demand for administrative skills, higher demand for qualified workers), the rise of new professions (entrepreneurs), of a new private sector, etc.

[13] People with no current profession have 0 as their ISCO code; people with no industry code have a 0 code instead of a missing value. Avoiding missing values ensures that everybody remains in the sample, except individuals with a missing value for income. There are two reasons why we prefer to estimate reference income on the whole sample. Firstly, many individuals are active at one round and inactive at the next round (e.g. many inactive people in rounds 6 and 7 are active at round 9), our impression is that it is preferable to keep them in the sample. Secondly, although the rationale of the paper is that people are forming expectations on the basis of their productive characteristics, which are mostly relevant for the working population, people can also form expectations concerning the transfer payments that they are likely to obtain.

[14] We have checked, using different specifications of the selection equation, that age, gender and the presence of a child under 7 years in the household are indeed the most relevant variables for the selection effect. Note that we have checked that life satisfaction was not a significant determinant of participation in the labor market: participation does not seem to be endogenous to life satisfaction.

determinants of life satisfaction. This is particularly true of industry and experience (Table A.2 in the Appendix)[15]. Hence, one can admit that the productive characteristics that are on the right hand side of the first-stage estimation only influence life satisfaction through the channel of the reference income category that they serve to generate.

As the reference income is a prediction from a first-stage estimation, this makes the conventional standard errors (S.E.s) of the second-stage estimation unreliable. We, thus, thereafter, systematically report bootstrapped S.E.s, based on 1000 replications.

2.2. Inequality indices

We use Stark indices of income overhang STARKH (resp. STARKL) which measure the average difference between individual *i*'s income and those of richer (resp. poorer) people, normalized by individual *i*'s income. We also include GINI indices of real income for each round. We construct these variables at three geographical levels: Russia, the eight regions described in Table A.1, and Primary Sample Units. (The RLMS divides Russia into 2029 PSUs(LC), of which about 100 are retained in the sample and include about 42 households each).

3. Results

We first present the general socio-demographic correlates of life satisfaction, we then discuss the role of reference group income; lastly, we turn to the influence of inequality.

3.1. The usual correlates of satisfaction

We check that the data generate the usual pattern of socio-demographic correlates of life satisfaction, which have been shown to be quite stable across countries (Oswald, 1997; Di Tella et al., 2001; Diener and Suh, 1997; Diener et al., 1999). As expected (Table A.2 in the Appendix), satisfaction is U shaped in age, increases with subjective health and years of education, is positively correlated with religious belief, with being married rather than divorced or widowed, and with being a male (the gender effect is specific to Russia). Further, we find that life satisfaction is higher for those living in Moscow or St. Petersburg metropolis and whose mother tongue is not Russian. Satisfaction decreases from round 5 to 8 and then increases at round 9 (in 2000). Unsurprisingly, satisfaction is higher in more prestigious professions such as legislators, senior managers and officials, as well as for technicians who are in excess demand on the Russian labor market (see Grosfeld et al., 2001), although the significance of the coefficients is exaggerated by the fact that the reference category is unemployed. As already noted by Ravallion and Lokshin (2001), household income (column 4) or expenditure (column 2) are better predictors of satisfaction than individual income (column 3).

[15] The influence of certain occupations is exaggerated by the fact that the reference category is "unemployed".

3.2. The influence of reference group income

We now include reference group income, constructed as indicated in Section 2. We also include alternatively lagged individual income and "residual income", i.e. the difference between the individual's income and his reference income. In order to check for robustness, we also control, in alternative specifications, for the level of real household income or expenditure. This latter should help correct for possible measurement errors, in particular the under-declaration of income.

We find that reference income exerts a positive and significant effect on individual satisfaction (Table 3). This positive sign is systematic, whether we consider the specification with residual income (columns 1–3) or with lagged individual income (columns 4 and 5), whether we control for household income (column 3) or household expenditure (columns 1 and 4), and whether expectations are included or not. As expected, the coefficients on residual individual income, lagged individual income, household income and household expenditure are also positive and significant.

Note that the estimation of reference income yields: $y_i = z_i + \varepsilon_i$, where y_i is individual income, z_i is estimated reference income and ε_i is the residual from the estimation. Neglecting the other variables, the estimated welfare function is: $U_i = \alpha y_i + \beta z_i + \mu_i$, which is equivalent to $U_i = \alpha(z_i + \varepsilon_i) + \beta z_i + \mu_i$, i.e. $U_i = \alpha\varepsilon_i + (\alpha + \beta)\, z_i + \mu_i$, where ε_i is the residual income, and z_i is the reference income. Hence, in order to test of the significance of the reference income, one needs to check whether $\beta > 0$, i.e. whether the coefficient on the reference income z_i is greater than the coefficient on the residual income ε_i. The last rows in Table 3 (columns 1–3) show that this is indeed the case, and χ^2 tests confirm that the difference is significant.

We check that these results hold for two restrictions on the sample. Firstly, following the idea that the notion of reference income is more relevant for active people who actually do valorize their productive characteristics, we run the same regression keeping only employed people with a strictly positive individual income. This yields about 8000 observations, covering approximately 1800 individuals per round. Secondly, as men and women generally face different working conditions, the role of reference income may differ by sex, hence we isolate the sub-sample of working males, on the one hand, and working women on the other hand (about 4000 observations for each sub-sample). The same result as in the general regression presented in Table 3 is found in each sub-sample: reference income systematically exerts a positive and significant influence on life satisfaction[16].

What is the order of magnitude of this effect? Computing marginal effects and calculating substitution ratios between the various income categories shows that the influence of reference income on life satisfaction is far from negligible. Marginal effects are calculated as the effect of a one standard deviation (S.D.) increase in the

[16] The regression coefficient of reference income is 0.235 (0.042) for active people, 0.266 (0.063) for active males, and 0.212 (0.068) for active females, controlling for lagged individual income. Introducing other controls does not modify the order of magnitude of the coefficient.

Table 3
The positive influence of the reference income, ordered probit estimates of life satisfaction

	(1)	(2)	(3)	(4)	(5)
Log reference income	0.331*** (0.027)	0.239*** (0.028)	0.229*** (0.029)	0.262*** (0.033)	0.191*** (0.033)
Lagged individual income				0.131*** (0.017)	0.092*** (0.016)
Residual individual income	0.156*** (0.017)	0.105*** (0.016)	0.072*** (0.018)		
Log household expenditure	0.237*** (0.019)			0.272*** (0.020)	
Log household income			0.239*** (0.019)		
cut1	0.700 (0.233)	2.201 (0.259)	2.126 (0.257)	1.359 (0.251)	2.903 (0.267)
cut2	1.834 (0.233)	3.350 (0.259)	3.274 (0.256)	2.448 (0.252)	4.012 (0.269)
cut3	2.600 (0.233)	4.127 (0.260)	4.050 (0.257)	3.213 (0.252)	4.791 (0.269)
Nd. Observations	13 462	13 462	13 434	10 401	10 399
Pseudo R^2	0.04	0.05	0.05	0.04	0.06
Log likelihood	− 16 854	− 16 698	− 16 682	− 12 984	− 12 819
Test $\beta > 0$	24.59	14.01	19.78		
Prob > χ^2	0.0000	0.0002	0.0000		

Controls: age, marital status, household size, mother tongue, believer, gender, region, round, health. The variance–covariance matrix of estimators is adjusted for the fact that observations relating to the same individuals are not independent. Robust S.E.s in brackets. Weighted estimates using the inverse of the probability of remaining in the sample at all rounds. Bootstrapped S.E.s with 1000 iterations. *, significant at 10%; **, significant at 5%; ***, significant at 1%. Prob>Wald $\chi^2 = 0.0000$ for all specifications.

Table 4
Substitution ratios based on marginal effects of income categories

Ratios of [marginal effects × S.D.] of the variables (%)	
Reference income/household expenditure	57
Reference income/household income	66
Reference income/individual income	69
Reference income/lagged individual income	123
Reference income/individual residual income	145
Individual income/household expenditure	55
Household expenditure/household income	121
Individual income/household income	40

Calculated after Table 3 regressions. Marginal effects are calculated as the effect of a one standard deviation increase in the independent variable on the probability of choosing the "satisfied" answer to the life satisfaction question.

independent variable on the probability of choosing the satisfied answer to the life satisfaction question. It turns out (Table 4) that the marginal effect of reference income amounts to about 70% of the effect of an increase in actual individual income and about 50% of the effect of an increase in real household expenditure or income. The effect of reference income is more important than that of residual individual income and of lagged individual income. These observations are consistent with the fact that household financial categories have more influence on life satisfaction than does individual income.

We now introduce the Mundlak distinction between intra versus inter-individual effects. Both effects are positive (Table 5). As before, tests show that the coefficient of reference income is significantly higher than that on residual income (both on average and in variation). In terms of magnitude, we find that the intra-individual marginal effect of a one standard deviation in reference income is now equivalent to about 90% of a one standard deviation in household income or expenditure (Table 6). The effect is again larger than an increase in residual income. For inter-individual effects, the order of magnitude is half as large. This observation is consistent with the idea that it is the news conveyed by reference income that affect individual satisfaction, as there is clearly more information in the variation of the reference income than there is in its average level.

These results are unusual. Studies in relative income typically find a negative relation between reference income and satisfaction, suggesting that only relative income matters. Clark and Oswald (1996) for instance, use a similar earnings equation to estimate the reference income of an individual, based on his productive characteristics (age, qualification, occupation, region, sex), using the 1991 wave of the British Household Panel Survey (5195 wage earners). They find that job satisfaction depends negatively on what they call "comparison income". The same is true of the "satisfaction with pay". Moreover, the coefficients of individual income and reference income, although of opposite sign, are not significantly different in absolute value, suggesting that job satisfaction is purely relative. As Clark and Oswald (1996) use a cross section estimator, we verify that our result also holds in cross section by running the regression for each

Table 5
Distinguishing inter and intra-individual effects, ordered probit estimates of life satisfaction

	(1)	(2)	(3)	(4)
Intra-individual effects				
Reference income	0.294*** (0.057)	0.245*** (0.055)	0.225*** (0.059)	0.224*** (0.061)
Lagged individual income				0.006 (0.020)
Residual individual income	0.111*** (0.019)	0.092*** (0.019)	0.071*** (0.021)	
Household expenditure		0.141*** (0.021)		
Household income			0.122*** (0.022)	
Inter-individual effects				
Reference income	0.338*** (0.031)	0.194*** (0.032)	0.185*** (0.0.33)	0.187*** (0.041)
Lagged individual income				0.215*** (0.027)
Residual individual income	0.192*** (0.026)	0.102*** (0.026)	0.066** (0.027)	
Household expenditure		0.328*** (0.029)		
Household income			0.360*** (0.027)	
Number of observations	13 462	13 462	13 434	10 401
Pseudo R^2	0.04	0.05	0.05	0.05
Log likelihood	– 16 848	– 16 668	– 16 630	– 12 954

Controls: age, marital status, household size, mother tongue, believer, gender, region, round, health. The variance–covariance matrix of estimators is adjusted for the fact that observations relating to the same individuals are not independent. Robust S.E.s in brackets. Weighted estimates using the inverse of the probability of remaining in the sample at all rounds. Bootstrapped S.E.s with 1000 iterations. *, significant at 10%; **, significant at 5%; ***, significant at 1%. Prob>Wald $\chi^2 = 0.0000$ for all specifications.

round[17]. Note that Clark and Oswald's results relate to job and wage satisfaction whereas we deal with life satisfaction[18].

Other studies find a negative effect of the comparison income on life satisfaction[19]. Ferrer-i-Carbonnell (2002) uses the GSOEP survey's (1992–1997) "satisfaction with life in general" evaluated by individuals on a ten-rung ladder. She finds that the average income of the reference group, defined by individuals of the same age group, education group and region (East vs. West Germany) exerts a negative influence on individual satisfaction. For West-Germans, the effect is asymmetric: it is significant only for those individuals whose own income is less than that of their reference group. Using the 1994 American *General Social Survey*, McBride (2001) shows that life satisfaction decreases with one's cohort average income, as well as with the comparison to one's parents' income at the same age. These comparison effects are stronger for high income persons. Following the Leyden school methodology, van de Stadt et al. (1985) use panel data from the Netherlands (1980 and 1981) and show that the reference group's income (defined by the education level, employment status and age) increases the comparison norm which itself μ_i, reduces the utility of income[20]. Ravallion and Lokshin (2001, Table 6) obtain a different conclusion, more consistent with ours. They regress the RLMS "economic satisfaction" variable whereby individuals rank themselves on a nine-rung ladder in terms of economic rank. They interpret the coefficient of the base year income as reflecting the influence of the relative income (change in the reference income with time). Their results do not validate the relative income assumption, as the base year variables are not significant.

We interpret our result as a sign that in the context of the Russian transition, reference group categories play a predominantly informational role, whereas in more stable environments, they are more likely to act as norms of comparison. In other words, in a very rapidly changing context, social comparisons per se lose significance as relative positions are highly unstable. Rather, agents try to use as much information as possible in order to form their expectations concerning future variables. This implies that the effect should be stronger among the young, as they have the most to gain from information, and they have more time left to seize their job opportunities. Indeed (Table 7), the effect is stronger for people under 40-years-old: controlling for reference income and age, the coefficient on the interaction term young × reference income is positive and significant (column 1). This means that the positive slope of the curve relating satisfaction and reference income is higher for younger people than it is on average. Symmetrically

[17] The coefficient on the reference income is 0.320 (0.062) for round 5, 0.408 (0.068) for round 6, 0.298 (0.065) for round 7, 0.348 (0.073) for round 8 and 0.361 (0.049) for round 9.

[18] It is not farfetched to imagine that the reference income can both decrease job satisfaction and increase life satisfaction; for instance, this could be the case if job satisfaction reflects a judgement on the agent's current position whereas life satisfaction also includes a notion of expected future improvement.

[19] Clark and Oswald (1994) also show that the disutility of unemployment is relative: the unemployment of the relevant others is positively correlated with an unemployed person's GHQ-12 index of mental well-being.

[20] μ_i is a parameter of the Welfare Function of Income: $W_i = N(\log y_i, \mu_i, \sigma_i)$ and represents the median value of the distribution of income imagined by individual *i*.

Table 6
Substitution ratios between income categories, distinguishing between and within effects

Ratios of marginal effects × S.D. of the variables (%)	
Reference income/other categories of income, inter-individual effects	
Reference income/residual individual income	135
Reference income/household expenditure	38
Reference income/household income	41
Reference income/individual income	46
Reference income/lagged individual income	52
Reference income/other categories of income, intra-individual effects	
Reference income/individual residual income	161
Reference income/household expenditure	86
Reference income/household income	93
Reference income/individual income	84
Reference income/lagged individual income	2221
Comparison of income categories	
Individual income/household expenditure, inter-individual effect	45
Individual income/household expenditure, intra-individual effect	73
Individual income/household income, inter-individual effect	32
Individual income/household income, intra-individual effect	59
Household expenditure/household income, inter-individual effect	106
Household expenditure/household income, intra-individual effect	106
Ratio of intra/inter-individual effects	
Reference income	57
Individual residual income	48
Individual income	41
Lagged individual income	2
Household expenditure	36
Household income	34

Calculated after Table 5 regressions. Marginal effects are calculated as the effect of a one standard deviation increase in the independent variable on the probability of choosing the "satisfied" answer to the life satisfaction question.

Table 7
The higher influence of reference income on younger individuals

	(1)	(2)
Reference income × young	0.019** (0.009)	
Reference income × old		− 0.016** (0.008)
Number of observations	8675	8645
Pseudo R^2	0.028	0.028
Log likelihood	− 11 031	− 10 995

Controls: lagged individual income, reference income, age, marital status, household size, mother tongue, believer, gender, region, round. The variance–covariance matrix of estimators is adjusted for the fact that observations relating to the same individuals are not independent. Robust S.E.s in brackets. Weighted estimates using the inverse of the probability of remaining in the sample at all rounds. *, significant at 10%; **, significant at 5%; ***, significant at 1%. Prob>Wald $\chi^2 = 0.0000$ for both specifications.

(column 2), the coefficient on the interaction term old × reference income is negative and significant.

We now present a series of complementary robustness tests that are meant to reinforce the informational conjecture and rule out alternative interpretations of our result.

3.3. Controlling for the direction of mobility

A skeptical view could be that the favorable influence of the reference income is driven by individuals who are upwardly mobile, or alternatively by the general wave of discontent and impoverishment that is overwhelming Russia. In order to test these ideas, we separate the population in two groups: those whose real income has increased (or remained the same) as compared with the previous round, and those whose real income has decreased. As the division between the two populations could be endogenous to life satisfaction, we instrument the variation in income by computing the probability that income has increased from $t-1$ to t (using a probit model); we then divide the population in two groups, depending on whether the probability that their income has increased is superior or inferior to 0.5. Eventually, we run two separate regressions on the two groups. We find (Table 8, columns 1 and 2) that the coefficient of reference income is positive and significant in both groups. Hence, it seems that for ascending, as well as for descending people, the progression of their peers is interpreted as a good news. We also check (Table 8, columns 3 and 4) that the effect holds whether the individual's reference income has increased of decreased compared with the previous period.

This symmetry of the "tunnel effect" is certainly related to the uncertainty of the Russian environment. Most individuals are unsure about their future prospects and the valuation of their specific skills, because of rapid economic change. Hence, for currently descending people, the progression of their peers is taken as a promise of future improvement, while for ascending people, it is interpreted as a sign that the favorable evolution of their situation is based on objective grounds. Ravallion and Lokshin (2000)

Table 8
The symmetry of the tunnel effect, ordered probit estimates of life satisfaction

	Individual income:		Reference income:	
	Up (1)	Down (2)	Up (3)	Down (4)
Log reference income	0.337*** (0.029)	0.363*** (0.046)	0.425*** (0.046)	0.331*** (0.045)
Number of observations	7666	5796	4676	6090
Pseudo R^2	0.04	0.05	0.05	0.05
Log likelihood	− 9621	− 7185	− 5840	− 7608

Column (1) (resp. (2)) presents the regression of life satisfaction on the sub-sample of people whose probability that their income has increased compared with the last period is greater than (resp. less than) 0.5. Column (3) (resp. (4)) presents the regression of life satisfaction on the sub-sample of individuals whose reference income has increased (resp. decreased) compared with the last period. Controls: age, marital status, household size, mother tongue, believer, gender, region, round, health, residual income. The variance–covariance matrix of estimators is adjusted for the fact that observations relating to the same individuals are not independent. Robust S.E.s in brackets. Weighted estimates using the inverse of the probability of remaining in the sample at all rounds. Bootstrapped S.E.s with 1000 iterations. *, significant at 10%; **, significant at 5%; ***, significant at 1%. Prob>Wald $\chi^2 = 0.0000$ for all specifications.

Table 9
Reference income is not just an instrument for individual income

	(1)	(2)	(2)	(3)
Individual income	Up	Up	Down	Down
Reference income	Up	Down	Up	Down
Log reference income	0.415*** (0.057)	0.402*** (0.085)	0.546*** (0.081)	0.305*** (0.060)
Number of observations	3141	1829	1535	4261
Pseudo R^2	0.05	0.05	0.07	0.04
Log likelihood	− 3941	− 2289	− 1871	− 5295

Column (1) presents the regression of life satisfaction on the sub-sample of people whose individual income has increased with a probability>0.5 compared with the last period and whose reference income has gone up. Controls: age, marital status, household size, mother tongue, believer, gender, region, round, health, residual income. The variance–covariance matrix of estimators is adjusted for the fact that observations relating to the same individuals are not independent. Robust S.E.s in brackets. Weighted estimates using the inverse of the probability of remaining in the sample at all rounds. Bootstrapped S.E.s with 1000 iterations. *, significant at 10%; **, significant at 5%; ***, significant at 1%. Prob>Wald $\chi^2 = 0.0000$ for all specifications.

show that up to 63% of persons belonging to the upper consumption decile in 1996 were in favor of restricting the income of the rich; the same was true of 44% of the subjectively richest persons. This is because they expected their welfare to deteriorate in the next 12 months. Our own calculations show that on average, from 1994 to 2000, about 28% of the persons who belonged to the upper real income decile expected their situation to become worse or much worse in the next 12 months. Uncertainty is thus present both at the top of the income ladder as well as at the bottom.

Another interpretation, somewhat similar to the former, could be that the positive influence of reference income merely reflects the influence of individual income because both variables change in the same direction. In order to test this, we check that the effect of reference income is maintained whatever the relative situation of the individual, i.e. whether the change in his own income and his reference income coincide or not (Table 9). This rules out the suspicion that relative income is just an instrument for individual income.

Another alternative interpretation of our result is that reference income influences individual satisfaction not because of its informational content but because of the feeling of social domination that it is associated with. Belonging to the elite or to a rising social group is nicer than belonging to a low or declining social group because of "social rivalry". This is tantamount to a group-wise comparison effect whereby individuals do not compare themselves to other individuals, but compare their social group to other groups. In order to explore this conjecture, we successively include in the regression of life satisfaction, the subjective self-evaluation in terms of economic rank, power rank and respect rank (on nine-step ladders), as well as the objective income decile of individuals. All specifications show that the positive and significant effect of the reference income is maintained[21]. Thus, the effect of the reference income cannot be identified as a "social rivalry effect".

[21] The coefficient on reference income is respectively 0.209 (0.024), 0.257 (0.023), 0.255 (0.025), 0.198 (0.024) and 0.136 (0.040) when we include successively, in separate regressions, the subjective economic rank, the objective individual income decile, the objective household income decile, the subjective respect rank, and the subjective power rank.

11. Some further tests of the role of uncertainty

In order to assess the cognitive role of reference income, we now include variables that capture the volatility and uncertainty that individuals are confronted with. First, we compute the S.D. of individual real income across rounds; we divide the working population in two groups depending on whether their income variability is higher or lower than the average. We then run the usual regression on the two groups. We find (Table 10) that the coefficient of reference income is significant only for people who experience high income volatility, hence whose income is less predictable (columns 1 and 2). This is consistent with the view that the reference income is used as a basis to form expectations about future income. We verify that the substitutability between reference income and expectations is greater for higher volatility groups.

As another proxy for uncertainty, we now use the answer to the following question: How concerned are you about the possibility that you might not be able to provide yourself with the bare essentials in the next 12 months? Again, we divide the population in two groups, depending on whether they answer that they are concerned or not (we aggregate the multiple answer categories in order to obtain a dichotomic variable). We find (Table 10, columns 3 and 4) that reference income plays the usual positive role for people who say they are anxious, but not for the others, a strong result in favor of the cognitive interpretation of the reference income. Lastly, we divide the population in two groups, depending on whether they are concerned that they might lose their job. Again, the effect of reference income is maintained for those who are concerned (column 5 in Table 10), but not for the others (column 6 in Table 10).

All these results suggest that the reference level of income is used predominantly as an informational tool. We have checked that income expectations are actually increasing in reference income[22]. We have also checked that the result holds for the sub-population of individuals who correctly anticipated whether their income would increase or decrease. Lastly, we checked that introducing current income expectations in the regression reduces the explanatory power of reference income, suggesting that the two variables are partly substitutes, which confirms the informational role played by the latter. The analysis of the role of inequality indices further reinforces this cognitive conjecture.

3.5. Inequality indices

When introducing inequality measures, whether Gini or Stark indices calculated at the national level, in life satisfaction regressions, we find that these are generally insignificant, whatever the specification and the controls used. This could be attributed to ignorance, i.e. people do not correctly perceive the distribution of income, hence it does not influence their satisfaction. To explore this idea, we include Stark and Gini indices calculated at the regional level (with eight regions, as defined in Table A.1), assuming that people may have a better perception of the distribution of income in their

[22] When regressing the expectation variable (five modalities) using an ordered probit, with the usual controls and precautions, the coefficient of reference income is 0.081, with a bootstrapped S.E. of 0.027 which corresponds to a level of confidence of 0.002.

Table 10
The reference income and the volatility of individual income, ordered probit estimates of life satisfaction

	Income volatility		Concerned about getting the bare essentials?		Concerned that you might loose your job?	
	Low (1)	High (2)	No (3)	Yes (4)	No (5)	Yes (6)
Log reference income	0.094 (0.057)	0.176*** (0.064)	0.150 (0.112)	0.127** (0.048)	0.083 (0.055)	0.298*** (0.071)
Number of observations	3002	2798	1119	4665	3637	2125
Pseudo R^2	0.06	0.07	0.04	0.06	0.07	0.05
Log likelihood	− 3707	− 3423	− 1379	− 5588	− 4365	− 2688

Column (1) presents the regression for individuals whose S.D. of individual income across rounds is higher than the average. Column (2) is for people whose income variability is lower than average. Controls: lagged individual income, age, marital status, household size, mother tongue, believer, gender, region, round, health. The variance–covariance matrix of estimators is adjusted for the fact that observations relating to the same individuals are not independent. Robust S.E.s in brackets. Weighted estimates using the inverse of the probability of remaining in the sample at all rounds. Bootstrapped S.E.s with 1000 iterations. *, significant at 10%; **, significant at 5%; ***, significant at 1%. Prob>Wald $\chi^2 = 0.0000$ for all specifications.

Table 11
Inequality indices do not affect life satisfaction, ordered probit estimates of life satisfaction

	(1)	(2)	(3)	(4)
GINI	0.069 (0.240)			
STARKH		0.000 (0.000)		
STARKL			0.003*** (0.001)	0.002* (0.001)
Number of observations	10 439	10 439	10 439	10 294
Pseudo R^2	0.06	0.06	0.06	0.1
Log likelihood	− 12 883	− 12 883	− 12 876	− 12 081

Gini and Stark indices are calculated at the PSU level on the basis of household real income. The same results hold when controlling for lagged income expectations and other income categories. In column (4) subjective economic rank included. Controls: age, marital status, household size, mother tongue, believer, gender, region, round, health, lagged individual income, household income. Weighted estimates using the inverse of the probability of remaining in the sample. Bootstrapped S.E.s with 1000 iterations. Robust S.E.s in brackets. *, significant at 10%; **, significant at 5%; *** significant at 1%. Prob>Wald $\chi^2 = 0.0000$ for all specifications.

region rather than in the whole country. It turns out that regional inequality indices are insignificant as well (Senik, 2002). Eventually, we re-calculate the Gini and Stark indices at the Primary Sample Units level, which could be a more relevant scale of local perception. This does not alter the results concerning the non-influence of the Gini indices on satisfaction (Table 11). The same is true of the STARKH indices. Only the STARKL indices, which measure the distance of individual *i*'s income to those poorer than him, attract a positive and significant coefficient. This variable is statistically a substitute for the subjective economic rank of the individuals (column 4).

Yet, we can check that people do perceive their relative position with respect to the national or regional distribution of income. When asked about their subjective relative economic rank (on a nine-step ladder), their answer is significantly correlated with their actual position in the distribution of income, as represented by the STARKH index or their decile of real individual income (see Senik, 2002). Thus, while inequality has no statistical influence on life satisfaction, it is not because individuals are unaware of it.

Hirschman's conjecture that the revenues of other people affect me through the information they convey can again be used to interpret this result. In a society where income distribution is perceived to change rapidly, the observed static distribution of income does not contain much informational value. This could explain why it does not affect individual subjective satisfaction. The same general framework can be applied to explain the low aversion for inequality in the United States that Alesina et al. (2000) have revealed[23]. Introducing Gini indices in the estimation of life satisfaction, they show that inequality indices play an exceptionally weak role in the satisfaction of Americans, as compared with Europeans. Their interpretation is that when (perceived) expected mobility is high, the perception of static inequality is dominated by the prospect for mobility.

[23] Corneo and Grüner (2002), using demand for redistribution data, also observe a particularly low aversion for inequality in the United States.

4. Conclusion

This study has revealed unusual findings. Although basic socio-demographic variables are correlated in a quite standard way with individual satisfaction, social comparison indicators are not. Reference group income exerts a positive influence on individual satisfaction, which contrasts with other studies on the subject. This is particularly true of categories of the population who experience high income volatility and feelings of uncertainty. Inequality indices do not seem to matter although people are aware of their place in the distribution of income.

We interpret these unusual results, especially the positive sign of the reference income, as a sign of a Hirschman type "tunnel effect" whereby agents use income variables (the income of other people) in a cognitive manner rather than for comparison purposes. This may be due to the very rapidly changing context, in which social comparisons per se lose significance as relative positions are highly unstable. Rather, agents try to use as much information as possible in order to form their expectations concerning future variables. In other words, a rapidly changing environment gives a particularly high value to information as an input for expectations. In this context, inequality indices, which reflect the static income distribution, do not affect individual satisfaction because of their weak informational content. By contrast, an increase in the income of one's reference group (people with the same productive characteristics) is an encouraging promise of future income gains.

A brighter version, close to Hirschman's intuition, would be that Russians are optimistic about their chance to gain from the transformation process, which makes them neutral to the perception of immediate inequality. Whatever the preferred version, the general conclusion is that it is not always the case that people engage into social comparisons based on frustration or domination schemes. Transition could well be a case in which people go back to "fundamentals" and care only about their own outcomes, including the information necessary to predict them.

Beyond the case of transition economies, how general is the conjecture that other people's revenues affect me essentially through their informational content? And how much does the respective role of information versus comparison depend on the features of the environment such as the degree of uncertainty and the prospect for mobility? This question has obvious policy implications, in particular in the field of redistribution policy[24]. We believe that there is room for further empirical research in this direction.

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[24] For example, one application is the definition of the relevant synthetic measure of perceived income distribution: should one use static or dynamic measures of inequality (income distribution vs. the distribution of expected income gains)?

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Appendix

Table A.1. Estimation of the reference group income

	Round 9		Round 8		Round 7		Round 6		Round 5	
	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
Years education	0.024	0.003	0.029	0.004	0.027	0.009	0.025	0.004	0.017	0.004
Male	0.118	0.029	0.141	0.033	0.279	0.073	0.238	0.033	0.275	0.034
Years experience	0.017	0.001	0.014	0.001	0.007	0.010	0.011	0.001	0.015	0.001
Profession										
Legislators, senior managers	1.404	0.240	1.174	0.311	1.059	0.449	0.870	0.266	1.049	0.363
Professionals	1.192	0.221	1.223	0.268	0.931	0.383	0.736	0.260	0.807	0.293
Technicians	1.027	0.226	0.995	0.266	0.817	0.397	0.679	0.252	0.644	0.288
Clerks	0.711	0.237	0.836	0.266	0.717	0.388	0.470	0.263	0.407	0.291
Services workers	0.638	0.236	0.847	0.276	0.735	0.396	0.677	0.257	0.676	0.296
Skilled agr. and fish.	1.325	0.416	0.689	0.347	0.765	0.461	1.404	1.003	0.688	0.370
Craft and related	0.933	0.230	0.888	0.267	0.730	0.395	0.577	0.252	0.585	0.286
Operators and assemblers	1.029	0.226	1.029	0.266	0.809	0.392	0.580	0.254	0.714	0.283
Elementary unskilled occup.	0.495	0.232	0.760	0.266	0.520	0.393	0.395	0.247	0.312	0.286
Army	1.379	0.270	1.235	0.401	0.538	0.505	0.964	0.303	1.358	0.344
Industry										
Energy	0.464	0.257	0.068	0.292	0.290	0.398	0.409	0.273	0.682	0.311
Heavy industry	− 0.154	0.223	− 0.436	0.268	− 0.207	0.387	− 0.040	0.250	− 0.013	0.289
Light industry	− 0.262	0.231	− 0.552	0.267	− 0.070	0.394	0.044	0.253	− 0.048	0.290
Agriculture	− 1.047	0.242	− 1.127	0.278	− 0.937	0.401	− 0.589	0.253	− 0.579	0.290
Traditional services	0.020	0.225	− 0.245	0.267	− 0.053	0.383	0.131	0.254	0.124	0.289
Modern services	0.114	0.223	− 0.180	0.267	0.205	0.387	0.273	0.254	0.344	0.291
Public sector	− 0.595	0.218	− 0.800	0.262	− 0.437	0.383	− 0.238	0.250	− 0.135	0.287
Government and security	− 0.127	0.229	− 0.272	0.274	0.024	0.387	0.159	0.257	0.141	0.299
Region										
Northern and North Western	− 0.130	0.086	− 0.010	0.091	− 0.103	0.104	0.003	0.095	− 0.011	0.105
Central and Central Black-Earth	− 0.328	0.062	− 0.305	0.074	− 0.298	0.077	− 0.222	0.083	− 0.318	0.091
Volga – Vaytski and Volga Basin	− 0.440	0.061	− 0.314	0.072	− 0.491	0.081	− 0.393	0.083	− 0.450	0.092
North Caucasian	− 0.327	0.071	− 0.234	0.082	− 0.301	0.096	− 0.295	0.089	− 0.381	0.097
Ural	− 0.356	0.064	− 0.216	0.074	− 0.241	0.081	− 0.140	0.084	− 0.240	0.093
Western Siberia	− 0.128	0.073	− 0.173	0.094	− 0.203	0.110	− 0.181	0.101	− 0.269	0.105
Eastern Siberia and Far Eastern	− 0.554	0.084	− 0.405	0.090	− 0.623	0.104	− 0.371	0.094	− 0.347	0.107
Constant	5.101	0.082	5.047	0.087	5.880	0.620	5.385	0.102	5.648	0.110
Number of observations	3988		3978		3982		3833		3963	
Censored observations	740		1252		1592		1059		1108	
Uncensored observations	3248		2726		2390		2774		2855	
Log likelihood	− 5313		− 5303		− 5291		− 4916		− 5080	
Selection										
Age	0.037	0.002	0.027	0.001	0.021	0.004	0.042	0.002	0.046	0.002
Male	− 0.056	0.049	− 0.043	0.042	− 0.062	0.056	− 0.111	0.044	− 0.194	0.045
Number of children < 7-years-old	0.091	0.075	− 0.015	0.068	0.084	0.057	0.134	0.062	0.186	0.059
Constant	− 0.645	0.078	− 0.676	0.070	− 0.631	0.150	− 1.022	0.066	− 1.107	0.063
Rho	− 0.157	0.018	− 0.162	0.031	− 0.495	0.921	− 0.107	0.023	− 0.102	0.022
Sigma	0.762	0.015	0.754	0.018	0.835	0.242	0.750	0.015	0.767	0.015
Lambda	− 0.119	0.015	− 0.122	0.024	− 0.414	0.889	− 0.080	0.017	− 0.079	0.017

Heckman maximum likelihood estimator selection model. The estimated S.E.s and variance covariance matrix of estimators are corrected for the fact that many individuals of the same household are observed. Robust S.E.s. The estimations are weighted using the inverse of the probability of remaining in the panel sample at all rounds. The reference categories are Moscow and St. Petersburg for region, Round 5 for rounds, ''unemployed'' for ISCO code. *, significant at 10%; **, significant at 5%; ***, significant at 1%. The simple OLS regressions of reference income have a R^2 of about 30%.

Table A.2. Basic regressions of life satisfaction, ordered probit

	(1)	(2)	(3)	(4)
Demographic categories				
Age	− 0.054*** (0.006)	− 0.050*** (0.006)	− 0.057*** (0.006)	− 0.052*** (0.006)
Age square	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
Male	0.058** (0.029)	0.056* (0.029)	0.045 (0.029)	0.057** (0.029)
Household size	− 0.024*** (0.009)	− 0.071*** (0.009)	− 0.023** (0.009)	− 0.052*** (0.009)
Russian mother tongue	− 0.221*** (0.034)	− 0.208*** (0.034)	− 0.229*** (0.035)	− 0.219*** (0.034)
Believer	0.141*** (0.029)	0.125*** (0.028)	0.130*** (0.028)	0.133*** (0.028)
Marital status				
Married	− 0.014 (0.046)	− 0.04 (0.045)	− 0.01 (0.045)	− 0.014 (0.045)
Divorced	− 0.253*** (0.064)	− 0.205*** (0.064)	− 0.256*** (0.063)	− 0.224*** (0.064)
Widower	− 0.194*** (0.059)	− 0.155*** (0.058)	− 0.198*** (0.058)	− 0.162*** (0.058)
Productive characteristics				
Years education	0.015*** (0.004)	0.007* (0.004)	0.013*** (0.004)	0.011*** (0.004)
Years experience	0.004 (0.002)	0.002 (0.002)	0.004 (0.002)	0.003 (0.002)
Occupation				
Legislators, senior managers, officials	0.654*** (0.214)	0.576*** (0.219)	0.546** (0.255)	0.635*** (0.215)
Professionals	0.538*** (0.207)	0.499** (0.210)	0.438* (0.249)	0.515** (0.206)
Technicians	0.451** (0.204)	0.422** (0.208)	0.35 (0.247)	0.439** (0.204)
Clerks	0.275 (0.222)	0.279 (0.227)	0.162 (0.264)	0.271 (0.222)
Services workers	0.343 (0.211)	0.329 (0.215)	0.229 (0.253)	0.326 (0.211)
Skilled agriculture and fish.	0.558** (0.280)	0.557** (0.277)	0.464 (0.311)	0.530* (0.274)
Craft and related	0.319 (0.205)	0.335 (0.209)	0.239 (0.247)	0.321 (0.205)
Operators and assemblers	0.334 (0.206)	0.322 (0.210)	0.246 (0.247)	0.333 (0.206)
Elementary unskilled occupation	0.24 (0.204)	0.283 (0.208)	0.148 (0.246)	0.248 (0.204)
Branch				
Army	0.186 (0.288)	0.137 (0.290)	0.021 (0.319)	0.191 (0.277)
Energy	0.16 (0.211)	0.047 (0.215)	0.176 (0.252)	0.072 (0.211)
Heavy industry	− 0.234 (0.206)	− 0.278 (0.209)	− 0.2 (0.246)	− 0.263 (0.205)
Light industry	− 0.195 (0.208)	− 0.222 (0.211)	− 0.168 (0.249)	− 0.226 (0.208)
Agriculture	− 0.329 (0.205)	− 0.316 (0.208)	− 0.236 (0.247)	− 0.346* (0.205)
Traditional services	− 0.129 (0.208)	− 0.174 (0.212)	− 0.101 (0.250)	− 0.151 (0.208)
Modern services	− 0.076 (0.208)	− 0.144 (0.211)	− 0.041 (0.250)	− 0.105 (0.208)
Public sector	− 0.271 (0.204)	− 0.28 (0.207)	− 0.219 (0.246)	− 0.283 (0.203)
Government and security	− 0.055 (0.214)	− 0.1 (0.219)	− 0.019 (0.255)	− 0.076 (0.215)
Region				
Northern and North Western	− 0.187*** (0.072)	− 0.136* (0.072)	− 0.170** (0.071)	− 0.157** (0.071)
Central and Central Black-Earth	− 0.165*** (0.060)	− 0.053 (0.061)	− 0.139** (0.059)	− 0.112* (0.060)
Volga – Vaytski and Volga Basin	− 0.217*** (0.061)	− 0.083 (0.062)	− 0.178*** (0.059)	− 0.156** (0.061)
North Caucasian	− 0.222*** (0.063)	− 0.140** (0.064)	− 0.168*** (0.062)	− 0.145** (0.063)
Ural	− 0.279*** (0.061)	− 0.163*** (0.061)	− 0.254*** (0.059)	− 0.226*** (0.060)
Western Siberia	− 0.302*** (0.067)	− 0.247*** (0.067)	− 0.261*** (0.065)	− 0.257*** (0.067)
Eastern Siberia and Far Eastern	− 0.174** (0.069)	− 0.149** (0.068)	− 0.150** (0.068)	− 0.167** (0.068)

Round				
Round 6	− 0.082*** (0.024)	− 0.033 (0.024)	− 0.079*** (0.024)	− 0.043* (0.024)
Round 7	0.150*** (0.026)	− 0.066** (0.026)	− 0.122*** (0.026)	− 0.088*** (0.026)
Round 8	− 0.311*** (0.027)	− 0.149*** (0.029)	− 0.183*** (0.031)	− 0.231*** (0.028)
Round 9	0.028 (0.026)	0.146*** (0.028)	0.136*** (0.029)	0.073*** (0.027)
Subjective health				
Bad health	0.381*** (0.072)	0.362*** (0.073)	0.374*** (0.072)	0.371*** (0.073)
Average heath	0.765*** (0.073)	0.743*** (0.074)	0.763*** (0.073)	0.745*** (0.074)
Good health	0.907*** (0.077)	0.891*** (0.078)	0.907*** (0.078)	0.891*** (0.078)
Very good health	0.823*** (0.117)	0.831*** (0.118)	0.818*** (0.116)	0.850*** (0.118)
Financial categories				
Real household expenditure (log)		0.274*** (0.015)		
Real individual income (log)			0.025*** (0.003)	
Real household income (log)				0.134*** (0.012)
Number of observations	17 897	17 897	17 553	17 897
Pseudo R^2	0.04	0.05	0.04	0.05
Log likelihood	− 22 612	− 22 300	− 22 077	− 22 445
Wald χ^2	1086	1361	1170	1207
Prob>χ^2	0.000	0.000	0.000	0.000
cut1	− 1.119 (0.150)	1.204 (0.198)	− 1.032 (0.146)	− 0.057 (0.178)
cut2	− 0.044 (0.149)	2.300 (0.198)	0.052 (0.146)	1.030 (0.178)
cut3	0.713 (0.149)	3.072 (0.199)	0.814 (0.146)	1.795 (0.179)

We control for the auto-correlations of the residuals of observations relating to the same individual. Robust S.E.s. The estimations are weighted using the inverse of the probability of remaining in the panel sample. The reference categories are: ''very bad health'' for subjective health, Moscow and St. Petersburg for region, Round 5 for rounds, ''unemployed'' for ISCO code, ''single'' for marital status. *, significant at 10%; **, significant at 5%; ***, significant at 1%.

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