Can a rise in income inequality improve welfare?*

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Abstract

Since consumers are not thought to derive "intrinsic" utility from the consumption of status goods, the common vision among economists insists that relative concerns make everyone unhappy. Using a signaling-type model, I show that conspicuous consumption is a natural and efficient response of people to the absence of certain markets, especially if income is not interesting by itself. This implies that reducing inequality may be inefficient. Therefore I test this conjecture based on panel data for 10,000 respondents in Russia for 2000-2002, exploiting two identification strategies. The following results emerge: i. Regional expenditures inequality increases the marginal utility derived from consumption; ii. Aesthetic inequality distaste has been considerably underestimated by the literature; iii. The model is consistent with a utility function first concave and then convex; iv. The results remain unchanged after controlling for the income equivalence scale elasticity and a wide range of recent theories on Economics of Happiness.

JEL Codes : D01, D31, D69, H00, I31.
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1. Introduction

Economic condition was extremely important in the early stages of economic development, when the fulfillment of basic needs was in the centre of every discussion. Nowadays, the role of income in life satisfaction is more frequently related to factors such as conspicuous consumption and social comparisons. This paper tries to re-examine the welfare discussion on income inequality taking into account the growing preponderance of relative concerns.

The economists' immediate reaction in the first works studying models on conspicuous consumption was clearly negative. Since people are not thought not to derive intrinsic utility from status goods, this perspective argues that relative concerns take individuals to a high level of social competition and then to an unnecessary waste on status goods. As a result, the conspicuous behavior leads to a considerable loss in welfare.

However, conspicuous consumption may have a second (indirect) effect (Postlewaite, 1998). I claim that people care about relative standings not just because of their greediness but, at least to some extent, because relative standings indirectly affect the goods and services ultimately consumed by them. The implications of the latter explanation may be diametrically different.

I introduce a particular definition for conspicuous goods (throughout this paper, interchangeable with status goods): those observable goods (and services) with prices above how much the consumer would have paid if the consumption had not been observable (besides esthetic or functional features; further details in Section 2). It is not difficult to think that there are lots of status goods in that sense. A $20,000 gold watch, luxurious cars and expensive cell phones might sound to you as typical examples.

The usual explanation for the existence of such goods sustains that the gap between the price and the "isolated" valuation is just mirroring the pleasure derived from the envy of others. What I claim is that the gap is also reflecting, to some extent, the signaling of income, which increases the probability of getting a different good (or service) "not on sale".

As stated by Cole et al. (1992a, 1992b, 1998), a substantial part of the goods and services that people consume cannot be purchased through standard markets. For instance, some goods (in a broad sense) can not be traded in a formal market without receiving a social (and even legal) reprimand (e.g. friendship, sex). Those non-market goods and services must be allocated through some kind of matching mechanism, which has to select among a set of candidates (demanders) with some relevant characteristics "to pay in exchange". For instance, people have time to spend with others, and in exchange they prefer to "be paid" with chats about topics of their same interest.

The mechanism has to overcome an obvious problem of asymmetric information: the aspirants have non-observable characteristics, and they might not reveal truthfully their type. I claim that conspicuous consumption can be a valid allocation mechanism for non-market goods and services. Something marvelous about formal markets is that they synthesize all the information needed in a single vector of relative prices. In the same spirit, the prices of status goods will be proposed as a vector of implicit prices for non-market goods.

Income (in a broad sense) is one of the most salient of the unobservable characteristics in which the fictitious auctioneer will be interested. But individuals' income does not have to be a relevant characteristic *per se*. The selection of rich individuals just because they are rich (somewhat related to envy and greediness) is not the most powerful insight of this paper. Through conspicuous consumption any desirable characteristic of the candidates can be signaled, as long as the attribute

is (conditionally on observables) correlated with income with a definite sign. This subtle perception is the foundation of the main departures from the usual results.

Take as an example a situation where this mechanism could be in motion: the pricing of graduate programs in business (e.g. an MBA). One of the most valuables benefits of attending an MBA is undoubtedly the possibility of getting in contact with other businessmen to deal in the future, or just to share experiences and knowledge with. Thus, the most talented managers will want to be in the same MBA.

Conditional on the characteristics reliably observed by the admission committee, the best managers will want to deter bad managers from entering the MBA. In the world of business, income is probably an excellent indicator of individual's relevant talents, since the main goal of a businessman is making money. If the benefits from the program for bad managers given that everyone else is good were enough high, a very expensive entrance would be necessary to ensure an efficient allocation through a separating equilibria.[1]

In order to study this phenomenon profoundly, I join together tools from the theoretical literature on conspicuous consumption and from the empirical literature on Economics of Happiness. The main theoretical finding is that income inequality is a necessary condition for an abundant allocation of non-market goods. Consequently, income inequality should increase the marginal utility from consumption. Additionally, this paper also demystifies the traditional linkage between status goods and diamonds. Conspicuous consumption is expected to be more important not in the richest reference groups, but in the most heterogeneous-in-income (present in both tails of the income distribution). This would rationalize the consumption of "luxury" goods by the "prosperous" poor.

Two empirical identification strategies are proposed. First, expenditures inequality within the geographical area is proposed as a multiplicative-augmenter for the effect of expenditures (as a proxy for consumption) on life satisfaction. Then, in order to exploit more information on the expenditures distribution, a nonparametric estimate of the regional expenditures density distribution is proposed as a better proxy for measuring inequality within the reference group.

The results indicate that regional expenditures inequality indeed increases the marginal utility derived from consumption. The indirect effect is observed only for the expenditures-related variables (observable), and not for the income-related variables (unobservable), which can be seen as a very credible robustness exercise. I also show that the results can account for a utility function initially concave and then convex. In this sense this paper is intended to provide a subtle support to the idea of a "natural rate of inequality" (a.k.a. "manufactured inequality").

The paper is arranged as follows. In Section 2 a signaling-type model is presented, along with a theoretical discussion. The specification of the econometric model and a succinct description of the data can be found in Section 3. The estimation results are shown in Section 4. Section 5 concludes.

[1] Of course, many facts can cloud the line of reasoning: graduate programs also involve education and the signaling of skills in the labor market, and (most importantly) the relation between business talents and income may not be so clear (because of inheritances, frictions in the credit markets, etc.).

1.1. Literature on income distribution and happiness

This paper studies the impact of income inequality on individual happiness. There have been some efforts to understand qualitatively and quantitatively that relationship.[2] The first contribution is attributed to Morawetz et al. (1977), who focused on the identification of a direct "aesthetic" effect. Another group of papers are concentrated on effects of indirect nature: inequality as an indicator of social mobility (Di Tella et al., 2004), the formation of an informational tunnel effect (Ravallion et al., 2000; Senik, 2004), and an inequality-augmented impact of income on life satisfaction through conspicuous consumption (Pérez Truglia, 2006).

Many papers have focused indirectly on the relationship between income inequality and well being (Tomes, 1986; Ball, 2001; Clark, 2003; Schwarze et al., 2003; Blanchflower et al., 2004; Luttmer, 2005; Graham et al., 2005; Schwarze et al., 2006). Moreover, a number of authors have published several papers that investigate that relationship on theoretical grounds.[3]

As well, status concerns has been long recognized by economists (for some early contributions see Veblen, 1934; and Duesenberry, 1949), sociologists (Weber, 1978), and even in bio-sciences (Mazur et al., 1980). However, just a few of the theoretical works on income distribution and happiness have mentioned a connection with status concerns. This paper proposes conspicuous consumption as an allocation mechanism for non-market goods.

2. Theoretical Model

There are many examples of signaling within the theoretical literature. Workers can signal their ability to employers through status consumption (Frank, 1985a, 1985b) or social culture (Fang 2001). People can also spend money on fashions to signal skills in a dating game (Pesendorfer 1995), or they can signal wealth just to match wealthier mates (Cole et al., 1992a). In the same vein as Hopkins (2006b), my model marries aspects of both Spence's (job market signaling) and Becker's (marriage matching) models (Spence, 1973; and Becker, 1973).

Maybe the most motivating examples of non-market "services" are personal, emotional and professional relationships among people. Human beings continuously have to pick a small number of individuals from a wide set of candidates: people looking for a job or a particular position inside a corporation, businessmen in search of business partners, teenagers in search of new friends, etc. Seldom decision-makers can observe every relevant aspect to make the right choices, and then they might want to rely on signaling mechanisms.

The following model exploits that idea. Nevertheless, it is not suggested that mating is neither the only nor the most important subject regarding relative concerns. The walrasian auctioneer is for traditional markets what Price Charming will be in the following lines for the non-market allocation mechanism. In fact, this game is not thought to take place explicitly in the real

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[2] Essentially, I focus on economic literature which uses large-scale survey data on subjective well-being. Notwithstanding, there are other interesting ways to study empirically this relationship. For example, Camacho-Cuena et al. (2002) provided a comparative experimental study of risky prospects and income distributions, and Carlsson et al. (2001) measured preferences for risk and inequality through experimental choices between hypothetical societies and lotteries.

[3] To cite some examples: Veblen (1899), Friedman et al. (1948), Duesenberry (1949), Friedman (1953), Thurow (1971), Pollak (1976), Frank (1985b), Cole et al. (1992a, 1992b), Bagwell et al. (1996), Glazer et al. (1996), Postlewaite (1998), Corneo et al. (1998), Ireland (1994, 2001), Cooper et al. (2001), Becker et al. (2003), Hopkings et al. (2004, 2006a, 2006b).

world but in a subtler way in many activities regarding human actions. This subtleness is probably the main reason why this matching mechanism has been systematically ignored in the literature. At the end of the section some evolutionist explanations are provided for the upsurge of such behaviors.

2.1. Prince Charming's Model

The first agent can be of two types: poor or rich (subscripts l and h respectively), differentiated by their income ($M_h > M_l > 0$). The fraction of rich agents is λ. There are two varieties of goods, referred to as standard good and conspicuous good. Let $x_i \geq 0$ be the quantity consumed of the standard good by agent i, which has a constant price normalized to 1. Let z_i be the quantity purchased of the conspicuous good, and suppose it is binary (agent consume one unit or nothing).[4] Let $p > 0$ be the price of one unit of z.

Just for the sake of simplicity, suppose that only the standard good enters into the utility function: $U(\cdot)$, with $U'(\cdot) > 0$ and $U''(\cdot) < 0$, identical for both types. Consider a second individual (e.g. Prince Charming) who wants to share an activity with the richer of the two types (e.g. marry her). The reason is not pertinent yet: he may like to be with the richest partner because she is rich, or he may believe that there is a desirable attribute positively correlated with income.

Consider the simplest framework: Prince Charming prefers strictly performing the activity with the rich type over any other outcome, and he prefers strictly not performing the activity over carrying out the activity with the poor type with positive probability. The last condition is a very straightforward way of discarding pooling equilibria, and a key element of this analysis. If Prince Charming cared directly about the income of his partner, in a homogeneous-in-income society the random allocation of the non-market good without conspicuous spending would make sense. Later I will show that, on the other hand, if Prince Charming cared about the skills needed to earn the income, pooling equilibria would not be interesting any more.[5]

Obviously, Prince Charming can only perform a single activity and with a single individual at most. He can only observe the quantity of the conspicuous consumed by the agent (z), because neither the quantity consumed of the standard good (x) nor her income are publicly observable. Henceforth, only conspicuous consumption can potentially serve as a signal of wealth.[6]

The utility of being selected to perform the activity enters linearly into the utility function of the first agent: it is $U(x_i) + \theta$ if the individual carries out the activity, and merely $U(x_i)$ otherwise, where $\theta > 0$ is larger the more important is the activity under consideration (i.e. the utility associated with marrying Prince Charming is larger than the utility associated with walking along the park with him).

Consider the allocation of a given activity (with a θ associated) through certain status good (with a p associated). In order to sustain a separating equilibria, there are two necessary

[4] It will not be important neither the vector of prices of the conspicuous goods, nor the vector of purchased quantities: what will only matter is simply the total spending on conspicuous goods. Having one conspicuous good with binary consumption is just a simple way to synthesize that information.

[5] Notwithstanding, later it will be explained how to easily remove that assumption without modifying the interesting implications. For instance, a cardinal utility could be chosen for Prince Charming, and all the above analysis would be valid for subsets of the parameters where pooling equilibria does not hold.

[6] Observability is expected to be one salient feature of conspicuous goods. The only survey evidence I am aware of, Carlsson et al. (2003), sustains that belief: an automobile (highly observable) was found to be a positional good, while leisure and car safety (highly unobservable) were found non-positional.

conditions: the rich agent must consume one unit of z, and the poor individual must not have incentives to purchase it. Given that agents choose to consume their entire income (since the utility function is strictly increasing), the two conditions can be expressed in the following way:

$$U(M_l - p) + \theta \leq U(M_l) \qquad (1)$$

$$U(M_h - p) + \theta \geq U(M_h) \qquad (2)$$

Rearranging:

$$\theta \leq U(M_l) - U(M_l - p) = \omega_u \qquad (1a)$$

$$\theta \geq U(M_h) - U(M_h - p) = \omega_b \qquad (2a)$$

Where Jensen's inequality guarantees that $\omega_u > \omega_b$ (i.e. a concave utility function implies that if the incentive compatibility condition of the poor holds then the incentive compatibility condition of the rich must also hold for a given θ and p). For a price of the conspicuous good $p < M_h$ and a pair of incomes $(M_l; M_h)$, there is a range of activities with a $\theta \in [\omega_b, \omega_u]$ associated that comprises a perfect Bayesian separating equilibria in pure-strategies: only the rich type buys the status good, and Prince Charming performs the activity if he sees the consumption of z. In sharp contrast to the literature, this innovative formulation of conspicuous consumption highlights the joy of marrying Prince Charming, θ.

For each conspicuous good priced p, there is a range of activities that can be achieved in equilibrium: keeping up the romantic atmosphere, from going out with Prince Charming ($\theta = \omega_b$) to marrying him ($\theta = \omega_u$). Observe that $d\omega_u / dp > 0$ and $d\omega_b / dp > 0$. More expensive conspicuous goods can rationalize activities with larger θ's associated, but at the same time it is also true that smaller θ's are being ruled out (e.g. the purchase of diamonds can rationalize marrying, but they cannot rationalize going to the cinema). The other way around is also valid (e.g. the purchase of bijouterie can rationalize going the cinema, but definitively it cannot rationalize getting married).

Notice also (using Jensen's inequality) that $d\omega_u / dM_l < 0$ and $d\omega_b / dM_h < 0$: as income disparity grows up the θ's upper boundary goes up while the lower boundary goes down. Hence, higher inequality allows for the allocation of both larger and smaller θ's (e.g. make achievable both, something worse than going to the cinema and something better than marrying).

Consider a benthamian aggregation of individual welfares (the possibility of a paretian improvement will be considered further). If there is a separating equilibria, then expected social welfare can be expressed as follows: $SW = (1-\lambda)U_l + \lambda U_h + \lambda\theta_h^*$, where U_l is the utility reached by the poor type, U_h is the utility reached by the rich type and θ_h^* is the value of a specific $\theta \in [\omega_b, \omega_u]$ enjoyed by the rich type. The last term has been consistently ignored by the literature.

One the one hand, by rising inequality (e.g. decreasing M_l and increasing M_h by the same amount) there is an obvious loss related to the diminishing marginal utility, since a social planner would prefer a more egalitarian scenario.

On the other hand, there is a gain related to conspicuous consumption, as the rich type can achieve both smaller and larger θ's, because ω_u is going up while ω_b is going down[7] (a similar

[7] In the equilibriums described below, the θ's are always the largest possible, and the conspicuous expenditures are always the least possible. However, if the level of available activities and/or the prices of conspicuous goods were fixed and exogenous, the achievability of smaller θ's could be a welfare-improving channel as well.

result will state that after a rise in income inequality the rich type can achieve a fixed θ with a low spending in the conspicuous good). I want to emphasize that this effect may be very important. So, I will show that under weak conditions the second (positive) effect may even prevail over the first (negative).

Nevertheless, if both θ and p were fixed there would be no way to exploit the greater achievable welfare due to a rise in ω_u (or a fall in ω_b) or the decrease in p. Agents will seek to extract the highest possible surplus through the selection of the endogenous parameter.[8] Two scenarios will be taken into consideration: fixed p with endogenous θ, and fixed θ with endogenous p. There is a third scenario allowing endogeneity for both p and θ, but it will not be considered.[9]

Different situations correspond to each one of the first two scenarios. For instance, the fee of a graduate program in business is fixed (p), and the rich type knows what is the maximum business proposal that she can offer (θ) consistent with a separating equilibria. Conversely, when competing for a client with price rigidities, its valuation (θ) is fixed for every type of provider, and the rich type knows what is the minimum expense in conspicuous goods (p) that can make her get the client. As they are two equivalent problems, the following analysis is provided for both scenarios.

2.1.1. Fixed p

In a first stage individuals of both types must offer to Prince Charming an activity to perform with him (characterized by θ_h and θ_l for each type). For having a separating equilibrium, Prince Charming in the second stage should choose to perform the activity only if the θ_i declared by the individual corresponds to the lowest both types offered in the first stage.

The strategy for an individual of the rich type in the first stage will be to choose the highest θ that comprises a separating equilibria in the original game, $\theta_h^* = \omega_u(p)$, since she will want to get as much pleasure as possible from the (fixed) incurred expense (p). Thus, Prince Charming chooses to perform the activity if the conspicuous good is purchased, the poor type chooses $\theta_l^* \geq \omega_u(p)$, and only the rich individual buys the status good and offer the lowest activity that makes binding the incentive compatibility restriction, $\theta_h^* = \omega_u(p)$.

Let SW be the expected utility of the candidate chosen by nature from the population of individuals of poor and rich types. Just for the sake of simplicity consider the case of $\lambda = 1/2$ (rich and poor types are equally important). The expected change in total surplus can be expressed by differentiating:

$$2 \cdot dSW = dU(M_l) + dU(M_h - p) + d\omega_u(M_l, p)$$

Provided a symmetric redistribution ($dM_h = -dM_l$), and assuming $U'''(\cdot) > 0$, a sufficient condition for a welfare improvement is: $p > (M_h - M_l)/2$ (Proof 1, in the Appendix). That is, if the p initially offered by Prince Charming was greater than half the spread of incomes, then social welfare will grow as a result of an increase in income inequality. Once again, the reason is the expected gain in utility for the rich type because a greater spread of incomes allows the rich agent to achieve a larger θ.

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[8] Nevertheless, if the values of θ and/or p were exogenous but chosen at random, it would be possible to shown a weaker result in expected value.

[9] Some uninteresting technical details emerge (e.g. it would be necessary to introduce an upper bound for θ).

FIGURE Ia

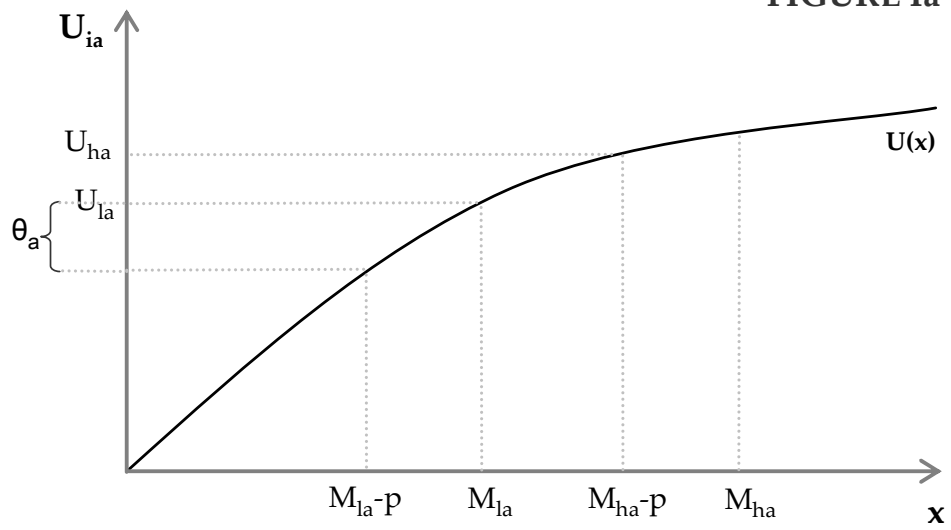


Figure Ia and Figure Ib illustrate the result. The intrinsic utilities reached before the exogenous redistribution by both types and the θ reached by the rich agent, $\theta = U(M_l) - U(M_l - p)$, are displayed in Figure Ia. When redistributing from the poor to the rich (Figure Ib) the rich type gains b, while the poor loses a. The concavity of the utility function guarantees that $b - a < 0$. However, since the spread of incomes has been increased, the rich individual can get a higher θ, which grows in $d - c$ (positive also because of the concavity of the utility function).

The condition $p > (M_h - M_l)/2$ seems now pretty obvious. Following Figure Ib, the concavity of the utility function ensures that both $d - c$ and $b - a$ are increasing in p. On the other hand, $b - a$ is decreasing in $(M_h - M_l)$, and d is decreasing in M_l. Then, for a price of the conspicuous good large enough relatively to the income spread it follows that a rise in income inequality will improve the expected total welfare.

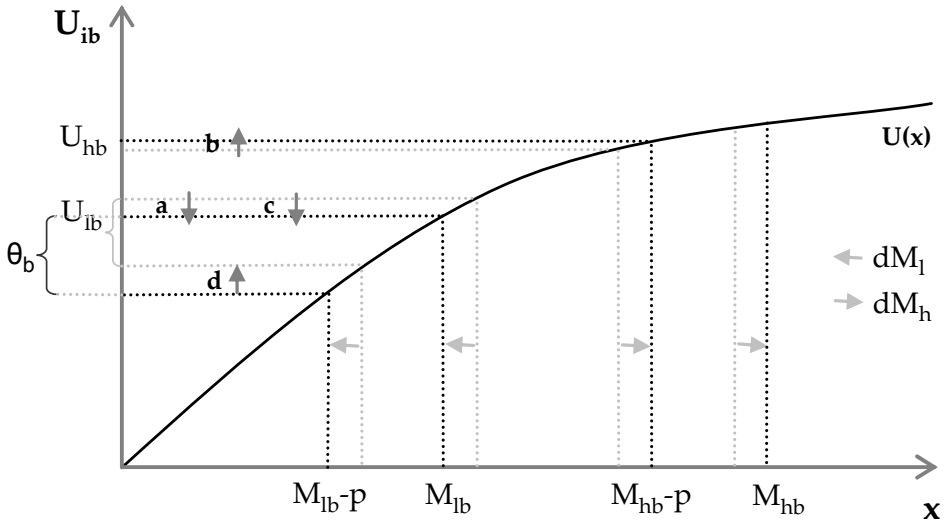
Moreover, the analysis can be extended to a population of numerous types. Suppose that for a number of times two types, i and j, are randomly chosen to play the game (with replacement) from a sample of types (characterizing by different incomes). The expected gain from a particular game realization for individual i before the change in the income distribution is:

$$G(M_i) = P(M_i < M_j)U(M_i) + P(M_i > M_j)\left[U(M_i - p) + \omega_u(M_j, p)\right]$$

Suppose income inequality is increased, but the rank of every single type in the income distribution is preserved: the probabilities in the previous expression remain unchanged. Thus, the new problem equals that of two-types and the welfare implications are also identical. If the distribution of happiness is dispersed, the relatively rich types, even though they now win with the same probability than before, can reach higher utilities when they win (they can reach superior activities).

Since adding utilities may be unpersuasive, I will show that a Pareto improvement can be reached as well by a particular collusion among agents. Suppose that in previous stage the individuals of rich type can sell to the individuals of poor type a discount coupon to pay in advance for a fixed quantity (C) of units of good x. As the poor type knows that in the future she will not be able to perform the activity with Prince Charming, she will accept to buy the coupon for

FIGURE Ib



nonnegative discounts. Notice that this acquisition raises the spread of incomes disposable for status consumption, even when the spread of realized consumption of good x will be even reduced (for positive discounts).

Just for the sake of simplicity suppose that the discount is zero. If a coupon for $C > M_l - p$ units of good x were sold, in the second period the poor individual would not be able to buy the conspicuous good and thus the rich individual would be able to reach a θ as large as possible. That would undoubtedly imply a Pareto improvement, as the rich type is much better without harming the poor type (who would be even better if the discount was positive).[10]

2.1.2. Fixed θ

It seems natural to suppose, at least in the short term, that there is a fixed and exogenous continuum of values for p to choose from.[11] In a similar fashion, each type must show to Prince Charming in a first stage what conspicuous good she wants to propose (with a p associated). Since an individual of rich type wants to spend as less as possible in conspicuous consumption to reach the separating equilibria (with a fixed θ), she will find optimal to make the compatibility restriction of the poor type binding: she chooses p_h^* as to have $\omega_u(p_h^*) = \theta$.

In the second stage Prince Charming will choose to perform the activity only if the p_i declared by the individual was the highest he was offered during the first stage. In addition, the poor type chooses $p_l^* \leq p_h^*$, Prince Charming chooses to perform the activity if the conspicuous good promised during the first stage is purchased, only the rich type buys the status good, and she offers the conspicuous good with the highest price that makes the incentive compatibility restriction of the poor type binding, $\omega_u(p_h^*) = \theta$.

For $\lambda = 1/2$, the change in expected total surplus can be expressed by differentiating:

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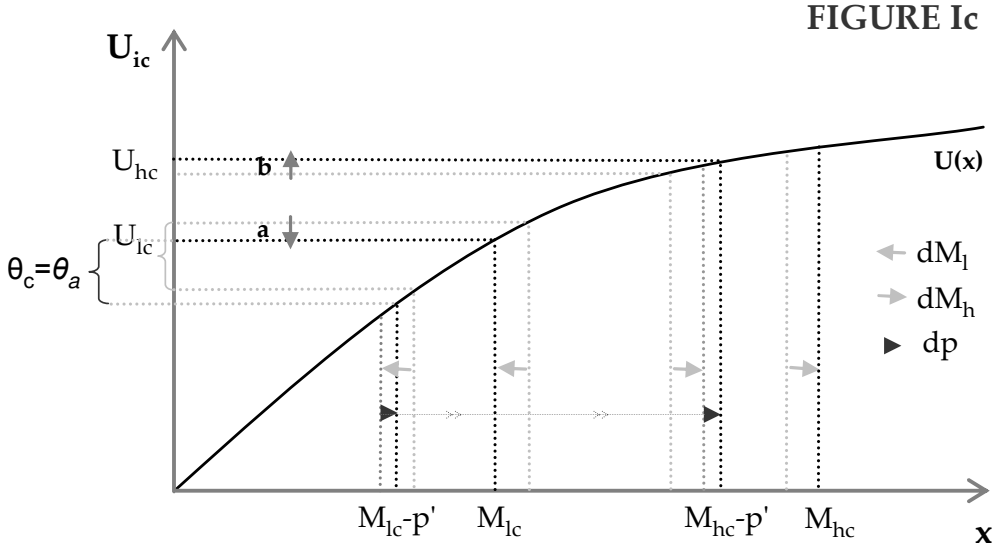
[10] Obviously, the collusion proposed above is ridiculous and has been exposed only to show theoretically that conspicuous behavior is indeed efficient.

[11] In fact, when a monopoly solves the vertical differentiation problem, it is guaranteeing the existence of status goods. Monopolies do not subtract the θ as profits because of the inter-market competition: every vertical differentiated good can be used as a conspicuous good. Gold watches compete as signaling device with fancy cars and a huge quantity of other premium merchandises, and thus neither of them takes the θ away.

FIGURE Ic



$$2 \cdot dSW = U'(M_l)dM_l + U'(M_h - p)(-dM_l - dp)$$

The positive effect on social welfare will arise because with a larger spread of incomes the rich type can move to a conspicuous good of lower price (dp) to get the θ initially fixed. Without assuming $U'''(\cdot) > 0$, a sufficient condition for having a welfare improvement is: $p > (M_h - M_l)$ (Proof 2, in the Appendix). Figure Ic shows the dp needed to remain in the fixed θ after the income redistribution. It is then used to find the new level of utility for the rich type (dotted arrow). The utility of the poor type decreases in a, as the utility of the rich type increases in b.

The condition can be rearranged as follows in order to make the interpretation of Figure Ib straightforward: $M_h - M_l < M_l - (M_l - p)$. It is sufficient to have a distance between M_l and $(M_l - p)$ greater than the distance between M_h and M_l. Similar results can be shown for the extension of the problem to a population of numerous types, and for the (paretian) welfare-improving collusion.

2.2. Discussion

A rigorous reader will be probably uncomfortable with Prince Charming preferring not to perform the activity over performing it with the poor type with positive probability (even if, for example, the rich type is very wealthy in absolute terms and the former is only slightly poorer than her). Even though this assumption was introduced to simplify the analysis, it might not be difficult to justify the existence of such rigid mating-rules.

Firstly, the poorest and richest individuals of a population are rarely found confronted in such challenges. As discussed in the empirical section, individuals face each other struggling for resources and compare themselves within what is called a reference group. Inside those clusters it is likely to find people with similar incomes. Then, Prince Charming should be sensitive to relatively small variations in income.

Secondly, behavioral mechanisms behind relative concerns may be mostly hard-wired, the results of both biological and sociological evolution.[12] As long as it worked well, a very rigid mating-rule such as "marry the richest no matters how much richer she is" could have easily aroused among societies and survived until present.

In spite of everything, it could be supposed that Prince Charming has cardinal preferences (instead of ordinal) over the income of his potential partner. If the utility function is strictly increasing in the income of his partner, Prince Charming will have a cut-off point: he will derive positive utility by sharing the activity with every type with an income above that threshold, and he will not want to perform the activity with types with incomes below it. Therefore, the ordinal preferences could be applicable for two types around that cut-off point.

The assumption about cardinal preferences can also help us to include the utility of Prince Charming into the social welfare. As there is no matching in homogeneous populations (pooling equilibria was ruled out), the effect of a rise in income inequality on social welfare would be even more positive (or at least less negative).

The observant reader should have noticed that the leading assumption behind the striking results is the absence of pooling equilibria. For instance, with homogeneous incomes there could be a trivial solution for the social planner: without the possibility of discriminating, Prince Charming could simply choose to perform the activity always regardless of the conspicuous consumption, and both types choose zero conspicuous consumption. Someone is always getting θ and the wasteful expenses in conspicuous consumption are null.[13]

However, there are not poor and rich types when incomes are homogeneous. Prince Charming's preferences are not defined, and thus cardinal preferences must be addressed. To do so, a crucial issue of this model would have to be defined. Up to this point, it was irrelevant if Prince Charming cared directly about the relative income of his potential partner, or if he cared about any other pleasing (non-pleasing) trait positively (negatively) correlated with individuals' income.

As it has been highlighted more than once, the spirit of this paper goes definitively in the second direction. Take as an example Di Tella et al. (2006), who proposed that (generally speaking) societies can be in an equilibrium where firms pay workers' efforts and workers do make efforts (i.e. USA) or, on the contrary, where firms do not pay efforts, and workers shirk (i.e. Europe). If Americans make efforts, then it will be easier to infer their skills from the information provided by their ranks in the income distribution. Thus, the correlation between income and (unobservable) skills should be stronger in more market-oriented countries, and the indirect effect will be greater in the latter as well.[14]

Indeed, Di Tella et al. (2004) found that people in America do not seem to be harmed by income disparities, though there is a clear apathy towards inequality in Europe. As explained in the empirical section, this paper may indeed be seen as a new interpretation for those findings.

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[12] Some evolutionary arguments for relative concerns can be found in Postlewaite (1998) and Samuelson (2004). The theories go from natural selection (Brosnan et al., 2003) to the production of serotonin (Moldovanu et al., 2005).

[13] It would be convenient to think about fixed θ and endogenous p, since the alternative scenario without a restriction on θ makes no sense (both individuals could have chosen a θ arbitrarily big).

[14] If the redistribution of incomes did not preserve the rank of the agents, a further distortion would be introduced. Namely, the correlation between individuals' incomes and desirable or undesirable characteristics falls down in absolute value, and the impact on social welfare will be probably much worse.

Prince Charming happiness depends positively on some trait of the potential partner (e.g. charisma) positively correlated (conditional on observables) with income (e.g. because charismatic businessmen do better). Going back to the existence of a pooling equilibria, a necessary condition is that the expected value for Prince Charming of performing the activity with someone at random should be positive, something not interesting at all from an economic point of view.

Now it can be seen that pooling equilibria is discarded not because it does not exist, but because it has no point to put energy on that case. Hence, the energy must be put on those games where (conditionally on observables) the expected values of skills are low enough to deter Prince Charming to mate someone at random. Since it helps to identify the skilled agent, adding some heterogeneity some mating possibilities may arise, with a consequently gain in welfare.

The easiest way to understand this mechanism is the following: suppose that a project has a density distribution of return with support in $\Re$. The first possibility is to take two independent draws of the same random variable, and then choose among them randomly, which is the same than picking directly one single draw. This is what happens in pooling equilibria. The second possibility is to pick two independent realization of the same random variable, and keep the greater. Definitively the expected value of the second choice is by far greater than the first. This is exactly the kind of situations this model is intended to address.

There is another direction of the endogeneity of θ and p: the model can change dramatically if Prince Charming has strategic influence on the value of those variables. For instance, Prince Charming could choose θ or p (depending on which is fixed in the particular scenario) to maximize his expected utility previously to a particular realization of the game, in a backward-induction fashion. For example, in the admission to graduate programs in business this would be an interesting way to describe the underlying pricing process.

A key underlying assumption is that individuals have a definite belief about the joint distribution of income and unobservable characteristics, conditional on observable attributes. If everything else were equal between two doctors, a patient would prefer to go to the doctor with a Picasso hanging in his lobby. If you had to decide between two people to begin a conversation about business, you would probably (and not necessarily consciously) choose the man wearing the Armani jacket. This mechanism must be particularly well known by every kind of investment counselors, as they have to signal their own financial success in order to convince people about the quality of their counseling.

There are no particular goods and services (always or sometimes, partially or totally) dedicated to conspicuous consumption. This is a more holistic concept: a share of total consumption is what has a signaling purpose. I am not claiming either that individuals relies only on conspicuous consumption to signal skills, as there is probably a portfolio of other signaling instruments for each individual.

As well, there is not a sharp division between status goods and non-status goods: it is a degree matter. A particular good or service will be considered more conspicuous the more it satisfies certain basic properties: i. To be observable; ii. Others individuals should know its price (and preferably it should be distinguished from a fake[15]); iii. Its price must be above what it would

[15] For instance, Mercedes Benz would find convenient to inform to its customers that the rest of the population is being informed about how expensive its cars are.

be if consumption was not observable[16]; iv. It should not be socially condemned (e.g. burning money).

Take as an example a donation to a university: the amount is public (see Glazer et al., 1996), its price is below the intrinsic utility (derived from altruism), and it is socially encouraged. On the other hand, people can see if someone is wearing a gold chain, it is not easy to discern if it is fake, others' aesthetic valuation make its intrinsic utility considerable high, and it is not particularly disapproved by society.

2.3. Empirical Identification

In summary, the main result is that a high income inequality may make place to the distribution of lots of non-market goods and services. This kind of finding is not at odds with the most recent theoretical literature. For instance, in the model introduced in Hopkins et al. (2004, 2006a) an increase in equality rises the degree of social competition, diminishing the utility of the poor. Rege (2007) and Becker et al. (2005) also found that reducing inequality may be inefficient because of the existence of self-generated inequality.[17]

Within the empirical literature, Schwarze et al. (2003) found that income inequality reduction by the state does not increase wellbeing. Camacho-Cuena et al. (2002) found that the "transfer principle" is largely violated. Ravallion et al. (2000) and Senik (2004) retrieved nonnegative effects of inequality on individual welfare. In Luttmer (2005) and Di Tella et al. (2004) various measures of regional inequality did not seem to affect the well being of Americans. Furthermore, in Clark (2003) life satisfaction was found positively correlated with reference group income inequality.

Income dispersion seems to augment the importance of income on individual well being. The usual discussion on income inequality does not account for that positive effect on individual happiness. The objective of the next section is to identify econometrically the existence and magnitude of that indirect effect of consumption on happiness.

3. Econometric Model and Data

3.1. Main Framework

The socio-economic changes that have taken place in Russia during the past decade have caused this country to become an authentic laboratory for the social sciences. A period characterized by deteriorated living conditions and dramatic economic uncertainty began in 1991. Slightly over one third of the population was living below the official poverty line by the end of 1995. Notwithstanding, the financial crisis of 1998 was a turning point. It was followed by a gradual recovery, with real income growing up and unemployment rates steadily falling. A comprehensive analysis of the economic and social spheres of Russia following transition years can be found in Braithwaite et al. (1998).[18]

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[16] Besides the "intrinsic" gains from observability: functionality (e.g. a sign), esthetic valuation, etc.

[17] Glazer et al. (1996) pointed out that people may be interested in making donations (for signaling wealth) only if income is not homogeneous. As a consequence, universities may be motivated to give scholarships to the middle class in order to increase the heterogeneity of its student body and then raise future donations by rich alumni.

[18] The election of the country was of special importance, because an emerging economy like this can guarantee enough variation along the features of interest: life satisfaction and the distribution of income (and expenditures). In

TABLE I

	Life Sat.=1		Life Sat.=2		Life Sat.=3		Life Sat.=4		Life Sat.=5	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Sat. with Economic Condition	1.22383	0.58551	1.80019	0.7237	2.34325	0.90756	2.80732	1.10526	3.28923	1.38868
Comparison Life Satisfaction	-1.17873	0.43706	-0.35117	0.3633	0.50409	0.3612	1.36375	0.41661	2.15638	0.60244
HH Expenditures Real	6195.33	9656.98	7035.58	8182.14	8796.19	11859	10155.7	13183.2	17318.9	31601.4
HH Income Real	4745.92	5372.55	5760.91	5966.77	6903.86	8679.49	7734.13	9841.43	8479.56	9336.33
F(Expenditures)	0.4618	0.28746	0.54164	0.27124	0.59136	0.27219	0.63571	0.26696	0.67893	0.26341
f(Expenditures)	4.118	2.04027	3.8353	2.13934	3.68501	2.32987	3.24251	2.23319	3.79662	2.8151
F(Income)	0.47034	0.2771	0.55382	0.27563	0.59963	0.27675	0.6383	0.27307	0.62714	0.27728
f(Income)	4.34341	2.10945	3.99267	2.1065	3.81389	2.31276	3.43829	2.24885	4.15146	2.73031
Gini(Expenditures)	0.46378	0.06399	0.46151	0.06316	0.45993	0.06027	0.46369	0.06074	0.47087	0.06392
Gini(Income)	0.44358	0.06851	0.43977	0.0677	0.4417	0.06752	0.44468	0.06804	0.44221	0.0617

Notes: Means and standard deviations (at individual level) for the Round 9 observations included in Equation (1), Table II.

I focus on life satisfaction via 3 rounds (9 to 11, covering the period 2000-2002) of the household-level Russian Longitudinal Monitoring Survey (RLMS).[19] The analysis is limited to respondents aged over 18, reaching a sample size of just over 23,500 observations on 9,200 individuals (after discarding missing values). An important feature is that the sample does not suffer from considerable panel attrition, with an average number of observed rounds over 2.5 (out of 3).

The RLMS was designed as a repeated sample of each household dwelling. Consequently, instead of following individuals or households from one year to the next, the interviewers merely returns to the same residences sampled in the previous year. All households who move are automatically lost to follow-up, and the new tenants of the sample dwellings are invited to join the survey.[20]

Just to mention some basic statistics about the sample, at October 2000 the average age was 45, 44% were male, 54% were married, 66% had a high school diploma, 50% were working, 32% received a pension, 29% reported to be in good or very good health, 5% had been hospitalized during the last three months, 32% smoked, and almost 30% (5%) of the respondents had at least one car (personal computer) in their household. The average of the monthly real household income was 8,000 roubles (approximately US$284), with a standard deviation of 12,000 roubles, and the average of the monthly real household expenditures was 6,100 roubles (US$216), with a standard deviation of 7,400 roubles.

The least squares specification is:

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fact, Frijters et al. (2006), based on the same database, found that changes in real household income can explain up to a third of the large swings in life satisfaction within Russia accounted between 1996 and 2000.

[19] Information about the RLMS can be found at the following address: www.epc.unc.edu/projects/rlms. Some details about the project (and an interesting overview of the data) can be found in Mroz et al. (2004).

[20] New entrants are not dropped. As fixed effects estimators demand at least two observations on each individual to be considered into the estimation, the included new entrants are only those who enter the sample during the second round and remain in the third. Without considering missing values, only 1,243 of the 9,074 individuals in the round 9 had left the sample at round 10, and 177 individuals were the new entrants. Only 767 of the 8,008 individuals present at round 10 left the sample before round 11. As usual, I threw away data with missing values. Ferrer-i-Carbonell (2005) recounted that, within the literature, none of the authors that reweigh data reports that reweighting makes a difference.

$$H_{it} = \beta_1 X_{it} + \beta_2 Z_{it} + \Psi_t + \Sigma_i + \varepsilon_{it}$$

Where H_{it} is a measure of life satisfaction, X_{it} is a matrix of individual time-varying control variables, Z_{it} is the vector containing the variables of interest related to income and expenditures, Ψ_t denotes year effects, Σ_i corresponds to individual fixed effects, and ε_{it} corresponds to the remaining error term.

As more than 50% of the variation in individuals' reported well-being might be explained by genetics (Lykken et al., 1996), we can not ignore fixed effects. Fixed effects estimators help us to concentrate on the longitudinal nature of the data, focusing only on the intra-individual variations in happiness. Beyond obvious unchanging characteristics (such as gender, ethnic group or mother tongue), fixed effects are supposed to account for key static variables, such as personal traits, individual aspiration towards life and comparison income.[21]

Following McBride (2001), the "external norm" is to which individuals compare their income when they look at the people in their cohort (of similar age, gender, race, location, etc). On the other hand, the "internal norm" is based on the individual's personal consumption path. For instance, a particular amount of present income will probably make an individual who was raised in a wealthy environment less happy than an individual with a record of poverty.

Suppose that income raises well being as a logarithmic transformation, $\ln(Inc_{it} / Nor_i)$, where Inc_{it} is the income of the individual i at time t and Nor_i is the individual's comparison income (internal, external, or a combination of both). If it was supposed that both norms can be expressed (approximately) as constants across time, we would be able to ignore the comparison income and focus solely on the logarithm of income, as the fixed effects would be controlling for the norms:

$$\ln(Inc_{it} / Nor_i) = \ln(Inc_{it}) - \ln(Nor_i) = \ln(Inc_{it}) + \Sigma_i$$

Income by itself is far from being the only indicator of material standard of living. Headey et al. (2004) used household economic panel data from five countries to find that in the two countries where consumption data were available, non-durable consumption expenditures appeared to be at least as important to happiness as income. As a matter of fact, if only one of the two variables (income or expenditures) was included in each regression of this paper, the remaining coefficient would show a large bias.

It is not very clear what part of material standard of living each variable captures separately, and it is even less clear what part do each one explain when both income and expenditures are included jointly as regressors. Income may be associated with economic security, or assets that indeed generate a real flow of benefits (e.g. having a more comfortable house). Income also enables to borrow money for investment purposes and for coping with bad times (Headey et al., 2004). Maybe more income makes people happier just because they experience a feeling of self-realization (they love the money by itself).

The expenditures variable has been created to measure consumption (in fact, this variable is partially constructed based on questions about consumption). From now on I will refer to

[21] In fact, Frijters et al. (2006) observed that most of the life satisfaction studies involving panel data have tested the appropriateness of the random effects versus fixed-effects specifications, and the former was always rejected. A more detailed methodological discussion on this issue will be developed in the next subsection.

TABLE II

Sites	Geographical Regions
138-141 (1); 238-239 (2); 240-241 (3)	Moscow and St. Petersburg
1-8 (4); 89-91 (5); 105 (6)	Northern and North Western
14-38 (7); 67-69 (8); 72 (9); 135-136 (10); 142-160 (11)	Central and Central Black-Earth
39-45 (12); 48-51 (13); 70 (14); 100-104 (15); 116-128 (16)	Volga-Vaytski and Volga Basin
52-57 (17); 77-83 (18); 129-134 (19); 9 and 137 (20)	North Caucasian
10-13 (21); 46-47 (22); 106-115 (23)	Ural
58-65 (24); 71 (25); 84-88 (26); 161-163 (none)	Western Siberian
73-76 (27); 92-99 (28); 66 (29)	Eastern Siberian and Far Eastern

Geografical units in parentheses. Almost all are cities (32), most of them administrative centres.

expenditures as our proxy for consumption. Since the expenditures variable might be missing some information on consumption, income would be able to capture partially the residual.

A third variable of interest is wealth. In a similar fashion to internal and external norms, fixed effects control for the initial level of wealth. Only changes in wealth are left as an interesting candidate for regressor. Although, I can not think about any source of changes in wealth (capable of clouding the results) other than income and consumption (already included as regressors).

Ravallion et al. (2001) found that household income is a much stronger predictor of life satisfaction than individual income. For the sake of simplicity, I will focus on income and expenditures measures only at the household level, disregarding individual data. Accounting for the household income (expenditures) composition has not been properly addressed in the literature, even though it can be a serious source of bias.

For instance, Bonke et al. (2003) found evidence on the rejection of income pooling, and provided direct evidence that the distribution of income within the household does impact on the within-household distribution of welfare (see also Lundberg et al., 1996; and Phipps et al., 1998). The happiness of the household head may be decreasing in the income of his/her spouse, or at least not as increasing as in his/her own income. Besides controlling for variables about household composition, the income (expenditures) variables are going to be normalized to account for this household composition effect using a particular calculation of the income (expenditures) equivalence scale elasticity.

Another strategy to account for internal and external comparison incomes is to calculate the empirical cumulative income (expenditures) distribution function. For this purpose, each individual must be matched to the group he/she compares to. A reference group has been defined in a number of different ways within the literature. Easterlin (1995) implicitly assumes that individuals compare themselves with all the other citizens of the same country; Persky et al. (1990) assume that all individuals living in the same region are part of the same reference group; McBride (2001) and Firebaugh et al. (1998) use some kind of age cohorts; Van de Stadt et al. (1985) and Ferrer-i-Carbonell (2005) make use of a combination of various criterions (for a detailed discussion see Clark et al., 2006b).

Several papers have taken a geographic approach to the choice of reference groups (for example Luttmer, 2005; Blanchflower et al., 2004). As China is a developing country (not only geographically) close to Russia, I find interesting to consider the work of Knight et al. (2006). They simply asked Chinese people to whom they compare themselves. The cross-sectional information

confirmed that 70% of the sampled population really see their village as their reference group (and a third of that segment said that they compared themselves specifically to their neighbors).

Therefore, I define the reference group as those individuals within the same geographical unit, which is defined as parsimonious agglomeration of sites belonging to the same geographical area (see Table I). One key leading criterion for the election of the level of aggregation was the sample size. As a result, the maximum number of surveyed individuals within a geographical unit at a particular round is 548, and the minimum is 150. The accumulated expenditures, $F(Exp_{it})$, is defined as the percent of the households within the geographical unit with less real household expenditures than individual i at year t (and the same is true for household real income).

The usual functional form for income (expenditures) is the logarithmic transformation (which entails dropping each nonpositive observation, around 50 observations for income and none for expenditures). The correlation between $Ln(Exp_{it})$ and $F(Exp_{it})$ is greater than 0.9 (and the same is true for income). Including both variables (and the interactions with other variables) would involve a problem of high multicollinearity.[22] All specifications will include $F(Exp_{it})$ and the subsequent interactions. Notwithstanding, all the results remain unchanged after replacing $F(Exp_{it})$ and $F(Inc_{it})$ by their logarithmic counterparts.

When the income's mean distance from an individual to poorer individuals increases, the following two theories (or a combination of both) are consistent with a rise in individual happiness: i. Relative concerns: poorer individuals now envy him/her more; ii. Conspicuous consumption: he/she can acquire more non-market goods (or acquire the same, but cheaper) through signaling. The separation of both effects is basically the identification challenge. In the next subsections there is a discussion about the suitability of OLS (compared to ordered logit), followed by the calculation of the income (expenditures) scale elasticity. Then the two identification strategies are finally introduced.

3.2. OLS vs. Ordered Logit

As discussed in Ferrer-i-Carbonell et al. (2005), the choice between least squares and ordered logit can be reduced to the treatment of reported life satisfaction as cardinal (OLS is suitable) or ordinal (ordered logit/probit is appropriate). I suggest that the properness of OLS may be subsequently subdivided into two separated conditions: i. If for the same individual the difference in (reported) happiness between 3 and 4 is the same as the difference between 6 and 7; ii. If for one individual the difference in (reported) happiness between 3 and 4 is the same as the difference between 3 and 4 for another randomly chosen individual.

If the first condition does not hold, OLS can remain suitable if the dependent variable is properly transformed. For instance, if differences near the centre (5, in a 1 to 10 scale) were stronger, it would be enough to apply a U-shaped function on the happiness variable (re-scale it to make the first condition hold). I have carried out several trials and found that there are no major differences if the dependent variable is transformed in such way (though I am supposing that the suitable transformation is approximately the same for every individual).

Regarding the second condition, if the difference between 3 and 4 for one individual and 3 and 4 for another individual were the same than between 4 and 5 for the first individual and 4 and 5

[22] Notwithstanding, in that specification the key coefficient remain always statistically significant. In addition, the high collinearity also implies that if we included the wrong variable, the bias would be minor.

for the second individual, then fixed effects estimators would be suitable (as those differences are captured by individuals' fixed terms).

Besides the conditions exposed above, there are other two advantages commonly associated to the choice of a nonlinear model (not necessarily ordered logit/probit). Firstly, in nonlinear models there are no predictions "out of range" (i.e. if the happiness scale goes from 1 to 10, the model forecasts in that span). I calculated the predicted values for hundreds of specifications (including those reported in this paper), and there was not a single prediction out of the range.

The second advantage is that marginal effects can be variable in nonlinear models. This paper makes intensive use of set of dummies, and the full saturation of the few continuous variables could make OLS almost as good as nonlinear models in this respect. In addition, in OLS marginal effects are fixed in the parameters, and then we use interactive terms to measure variable marginal effects. However, within OLS the marginal effect relative to X_{kit} cannot depend on every X_{jit} with $j \neq k$ (the first subscript denotes each variable in the X matrix).

There are some practical difficulties associated to the ordered model. Estimation of nonlinear models with fixed effects yields inconsistent estimates (see Greene, 2002). Even though Frijters et al. (2006) proposed a suitable model[23], it demands time to be developed (as it is not available in standard software packages). In second place, Ai et al. (2003) became aware of the fact that the interaction effect in nonlinear models does not equal the marginal effect of the interaction term: it can be even of opposite sign, and its statistical significance is not calculated properly by standard software. This brings in an additional direction of complexity.

Finally, the complexity of the interpretation of marginal effects is another source of troubles. As noticed in Boes et al. (2004), marginal probability effects are rarely reported in practice. For instance, in Frijters et al. (2004) marginal effects are arbitrarily calculated at the mean values of the explanatory variables as the change in the probability of reporting high life satisfaction (either 9 or 10) relative to a value of 8 and below (in a 1 to 10 scale). Despite more convincing measures can be considered (for example, the mean of the marginal effects over the entire sample, disaggregated by some outcome points), the introduction of arbitrary interpretations can obscure the results in a very harmful way.[24]

3.3. Elasticity to household size

In the literature it is not usual to account for the income (expenditures) elasticity to household size. I believe that this omission (even if including explanatory variables for household composition) may possibly lead to biased conclusions. I want to test if the results of this paper are robust to the choice of the equivalence scale elasticity, since using household income (expenditures) as explanatory variable is the same than using arbitrarily zero elasticity to household size.

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[23] Another way to deal with this was proposed by Chamberlain (1980) (applied in Winkelmann et al., 1998; and Clark, 2003), which is a sub-case of the latter (when the happiness scale is collapsed into a binary variable). Another proposal was brought by Das et al. (1999). Terza (1985) proposed an ordered probit in which the value of the thresholds is a linear function of the included regressors (presented as Generalized Threshold Model in Boes et al., 2004). The last alternative is a model based on a sequence of binary choice models for the conditional probability of choosing a higher response category, borrowing concepts from the literature on discrete duration models (Sequential Model, in Boes et al., 2004).

[24] Indeed, Boes et al. (2004) suggest that if the income effect can depend on the level of the individual's life satisfaction, the differences in the results are not significantly different.

TABLE III

Dependent Variable:	(1) Economic Rank Ladder		(2) Satisfaction with Life	
	Coef.	S.Err.	Coef.	S.Err.
Ln(Expenditures)	0.301***	(0.014)	0.212***	(0.010)
Ln(Income)	0.147***	(0.015)	0.151***	(0.010)
Ln(No HH Members)	-0.139***	(0.044)	-0.236***	(0.033)
Ln(No HH Members)*No of kids less than 7 years old	0.069***	(0.013)	0.049***	(0.009)
Ln(No HH Members)*No of kids 7-18 years old	0.009	(0.010)	-0.007	(0.007)
Ln(No HH Members)*No of working-age males	-0.023**	(0.012)	-0.023***	(0.008)
Ln(No HH Members)*No of working age females	0.032***	(0.012)	0.018**	(0.009)
Ln(No HH Members)*No of post working age males	0.098***	(0.023)	0.082***	(0.017)
Ln(No HH Members)*No of post working age Females	-0.039**	(0.017)	-0.009	(0.013)

Notes: Robust standard errors in parentheses. Star is significant at 10%; Double-Star is significant at 5%; Triple-Star is significant at 1%. Data definitions in the Appendix. Both regressions include a constant, year dummies and personal controls (respondent age, work status, and the hours in an average workday). Observations: 25074 and 25276 respectively.

With the aim of calculating the value of the elasticity, I implement the method based on individual panel data on income satisfaction suggested by Schwarze (2000). Because the database doesn't include a specific question about the satisfaction with household income, I focus on the economic rank variable: in which step of the 9-step ladder the respondent declares to stand, where the first step corresponds to the poorest people and the ninth corresponds to the wealthiest. The model can be written as:

$$S_{it} = \alpha_1 X_{it} + \alpha_2 \ln\left(\frac{Y_{it}}{h_{it}^{\theta_0 + \sum_k \theta_k h_{it}^k}}\right) + \Psi_t + \eta_{it}$$

Where S_{it} is the self-evaluated economic rank, X_{it} is a matrix of time-varying individual control variables (a constant, respondent age, work status and hours in an average workday), Ψ_t denotes year effects, and η_{it} corresponds to the remaining error term. Y_{it} is the total household income, and the term in parentheses correspond to the scaled income.

The scaling parameter (the exponent of h_{it}, the household size), is compounded by a constant (θ_0), and a linear combination of the number of kids, teenagers, working age males and females, and post working age males and females (each h_{it}^k within the weighted sum $\sum_k \theta_k h_{it}^k$). Rearranging, I have:

$$S_{it} = \alpha_1 X_{it} + \alpha_2 \ln(Y_{it}) - \alpha_2 \theta_0 \ln(h_{it}) - \sum_k \alpha_2 \theta_k h_{it}^k \ln(h_{it}) + \Psi_t + \eta_{it}$$

I regress S_{it} on $\ln(Y_{it})$, $\ln(h_{it})$ and the interactions between $\ln(Y_{it})$ and each h_{it}^k:

$$S_{it} = \beta_1 X_{it} + \beta_2 \ln(Y_{it}) + \beta_3 \ln(h_{it}) + \sum_k \beta_4^k h_{it}^k \ln(h_{it}) + \Psi_t + \eta_{it}$$

Hence, I can recover the linear parameters of the elasticity to household size: $\theta_0 = -\beta_3/\beta_2$, and $\theta_k = -\beta_4^k/\beta_2$. The regression's output is shown in Table III, along with a replication using life satisfaction as the explanatory variable. Both household income and household expenditures were included as regressors. Therefore, β_2 is the sum of the coefficient accompanying the logarithm of income and the coefficient accompanying the logarithm of expenditures.

The coefficient β_3 is negative, as expected. The coefficients β_4^k show that the elasticity scale is decreasing in the number of kids under seven years old (as expected), in the number of working age females, and in the number of post working age males. The scale is increasing in the number of working age males and in the number of post working age females, while the effect of the number of teenagers in the household is not statistically significative.

The scale proposed by the OECD assigns a weight of one to the first adult, 0.5 to further adults and 0.3 for children under 15 years of age, generating equivalence scales, for instance, ranging from 0.53 (2 adults and 2 kids) to 0.66 (4 adults). Schwarze (2000) suggested equivalent scales below that line (0.40 and 0.31 respectively), and below every other standard scale. My calculations imply equivalence scales such as 0.21 for a working age woman with a kid, 0.29 for a working age couple without kids, and 0.38 for a post working age woman with a teenager.

As the focus will be put on the distribution of income (expenditures) variables, the results could be (at least partially) an artifact of household composition. Thus, all the regressions will be reported with and without accounting for the income (expenditures) scale elasticity.[25]

4. Results

4.1. First identification strategy: regional inequality

An immediate implication of the theoretical model is that consumption affects individual happiness through two channels: i. A direct channel, related to the "intrinsic" utility derived from consumption; ii. An indirect channel, related to a higher probability of being chosen by Prince Charming. The second source of happiness is (by construction) null in a perfectly homogeneous-in-consumption society, and grows as consumption heterogeneity rises (Pérez Truglia, 2006).

The econometric specification is:

$$H_{it} = \beta_1 X_{it} + \beta_2 F(Exp_{it}) + \beta_3 F(Exp_{it}) \cdot Gini(Exp_{it}) + \beta_4 Gini(Exp_{it}) + \\ + \beta_5 F(Inc_{it}) + \beta_6 F(Inc_{it}) \cdot Gini(Inc_{it}) + \beta_7 Gini(Inc_{it}) + \Psi_t + \Sigma_i + \varepsilon_{it}$$

Where $Gini(\cdot)$ is the Gini coefficient in the reference group. The more unequal in expenditures is the geographical unit where the individual lives, the larger the effect of expenditures on happiness will be. Thus, the expected sign for β_3 is:

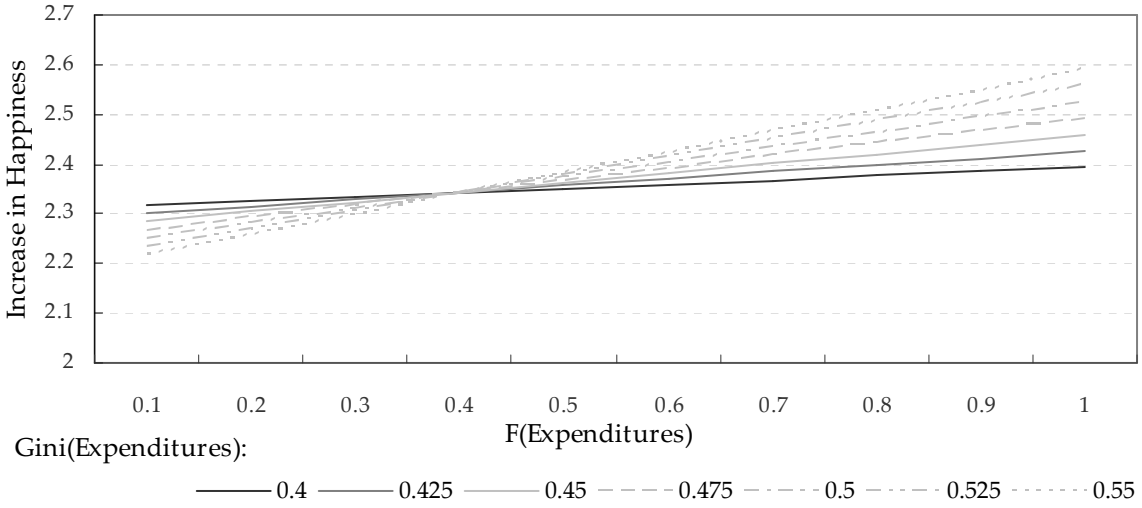
$$\frac{\partial H_{it}}{\partial F(Exp_{it}) \partial Gini(Exp_{it})} = \beta_3 > 0$$

All the analysis began supposing that income is unobservable. If income variables do not capture a residual effect of consumption (controlling for expenditures), the indirect effect should be identified for expenditures-variables and not for income-variables. In that case, β_6 should be zero. This is a key piece for the identification strategy. Indeed, this exercise will be extended to the second identification strategy.

As mean expenditures (income) within the reference group is correlated with regional inequality, it is also included as regressor. Moreover, in some specifications I include the interactions between income (expenditures) and 7 dummies that indicate at which of the seven

[25] Moreover, larger coefficients for income (expenditures) with scale elasticity would reflect that accounting for it might help to solve just a problem of measurement error.

FIGURE II



geographical regions the individual belongs to (the eighth is left as reference). These region-specific $F(\cdot)$'s control for any "interactive" variable constant through time within geographical regions.

Table IV presents various specifications: the interactive terms appear in the second equation, while the first equation will be analyzed at the end in the next subsection. The second pair of equations is equal to the first pair, but using instrumental variables instead of ordinal least squares (as will be explained later). The third two equations are also equal to the first pair, but they account for income (expenditures) scale elasticity.

In equation (2) the coefficient β_3 is positive and statistically different from zero at 1% level of significance. The hypothesis that β_6 is different from zero cannot be rejected at any conventional level of significance. The coefficients on mean expenditures and mean income are negative and significative.

This is consistent with the empirical literature, which shows that individual happiness decreases as the reference group's income raises (Blanchflower et al., 2004; Luttmer, 2005; Ferrer-i-Carbonell, 2005; Clark et al., 2006a). The coefficient on the interaction between mean income (expenditures) and real income (expenditures) is not statistically different from zero. The coefficients β_4 and β_7 will be analyzed in the next subsection.

I propose a set of instruments for income and expenditure inequality in order to reduce any problem related to measurement error and simultaneous causality. The essential idea is to exploit the geographical structure of the data. The happiness of a particular individual, conditional on the income (expenditures) inequality in his own geographical unit, has not to be influenced by the income (expenditures) inequality in any other geographical unit different from his own (and the same is true for the interactive term).

On the other hand, income (expenditures) inequalities in different geographical units are expected to be correlated due to exogenous common shocks on the distribution of incomes (e.g. weather, politics, etc). Therefore, income (expenditures) inequality in other geographical units can serve as instruments for income (expenditures) inequality in given geographical unit.[26]

[26] The set of instrumental variables I discuss here is inspired in the idea of Hausman et al. (1994), applied to Industrial Organization. For the interactive term between income (expenditures) inequality and cumulative income

The IV results are reported in the equation (4) from Table IV. The coefficient β_3 remains positive and statistically different from zero at the 1% level of significance, although its value is slightly smaller. There are no major differences with respect to the OLS specification.

Using the values of coefficients β_2, β_3 and β_4 in equation (4), the total effect of cumulative expenditures on happiness is shown in Figure II. The marginal effect is given by: $\partial H_{it} / \partial F(Exp_{it}) = -0.8 + 2.22 \cdot Gini(Exp_{it})$. The contribution of the interactive term takes values from 0.8 to 1.21, corresponding to the 5th and 95th percentiles of the Gini coefficients in the sample (0.37 and 0.56, respectively). In the most homogeneous-in-expenditures geographical sites ($Gini(Exp_{it}) = 0.4$) going from the poorest 10% to the richest 10% has an effect of 0.1 on happiness. On the other hand, in a very heterogeneous-in-expenditures geographical site ($Gini(Exp_{it}) = 0.4$) the impact on happiness is greater by more than a factor of 4. The augmenting channel is undoubtedly very important.

The indirect effect of inequality on happiness advocates that (holding the ranks constant) a dispersion of expenditure could be associated with greater global happiness, because expenditure disparity increases marginal utility. But this effect should be contrasted to the (negative) direct effect of expenditures inequality on well being.[27]

As shown in Figure II, the poorest two-fifths of the population would be discontented with an increase in expenditure inequality, whilst the richest three-fifths of the population would be considerably better. As $F(\cdot)$ is the cumulative distribution function, the areas between lines in Figure II suggest that there is a gain in total welfare from an increase in expenditures dispersion. Nevertheless, this benthamian welfare improvement would be accompanied by a rise in happiness inequality. The main results do not change neither if income (expenditures) measure is normalized by the elasticity scale, nor if $F(\cdot)$ is replaced by $Ln(\cdot)$ (not reported).

As mentioned at the beginning of the section, the interaction between real expenditures and expenditures inequality might capture just that a person in a more unequal group is in average more distant from his followers in the expenditure distribution. This is known as relative deprivation: the gaps between one individual's income and the incomes of all individuals richer/poorer than him. In fact, the amount of average deprivation in a society can be written as the product of the Gini coefficient and the mean income (see Yitzhaki, 1979).

As well as someone in the unequal group is, in average, more distant from his followers in the expenditure distribution, she is also more distant from those above her. Hence, this would be a problem for the identification strategy if there was any kind of asymmetry between the upward and downward comparisons. For instance, Duesenberry (1949) suggested that only upward comparisons matter.

4.1.1. Inequality aversion revisited

The derivative of happiness with respect to expenditures inequality is composed by two terms: $\partial H_{it} / \partial Gini(Exp_{it}) = \beta_3 F(Exp_{it}) + \beta_4$. The first term, the consumption indirect effect, is always positive. Henceforth, if the interactive term were not included in the regression, a positive

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(expenditures), the instruments are the interactions between the set of instruments for income (expenditures) and the cumulative income (expenditures).

[27] It is more probable to find an omitted variable correlated to expenditures (income) inequality than finding an omitted variable correlated to the interaction between expenditures (income) inequality and real expenditures (income). Then, the following analysis is subject to the validity of the identification of β_4.

coefficient could arise even though the direct effect of expenditures inequality on happiness (β_3) were in fact negative. This can explain why a number of authors have found nonnegative impacts of income inequality on individual well being.[28] Indeed, Ravallion et al. (2000) and Senik (2004) claim to have found such positive coefficients using this same Russian database.

In equation (1) from Table IV I intentionally "forgot" to include the interactive term, and it appeared a positive (but not significant) effect of expenditure inequality on happiness (when in fact the direct effect is negative, as shown in the second equation). The same is valid for the IV estimates.

Up to my knowledge, aside from Pérez Truglia (2006), only Ravallion et al. (2005) have focused on interaction terms with respect to income. They simply noticed that, as income rises, if the effect of some variable (e.g. regional inequality) switches sign, then not including the interaction term (regional inequality by income) will insinuate a positive coefficient for regional inequality (even if it is indeed negative).

4.2. Second identification strategy: more distributional information

The previous empirical strategy exploits only the inter-geographical-unit variation in the distribution of expenditures (and income). All the distributional information within the geographical units is collapsed into a single indicator (the Gini coefficient). All the distributional information available could be exploited. For every reference group (geographical unit), at every single point in time, densities of the household expenditures (incomes) are obtained nonparametrically (using an Epanechnikov kernel with optimal bandwidth).

People continuously interact with people from the same neighborhood, work, educational institution, etc. Those environments are in general much more homogeneous in purchase power than the society as a whole. A great portion of individuals' reference groups are compounded by people with similar positions in the economic ladder. Therefore, someone in a very "populated" step (i.e. with a recurrent income) is likely to have a high proportion of friends with similar economic conditions. On the other hand, someone in a very "unpopulated" step will probably have many friends coming from the neighboring steps.

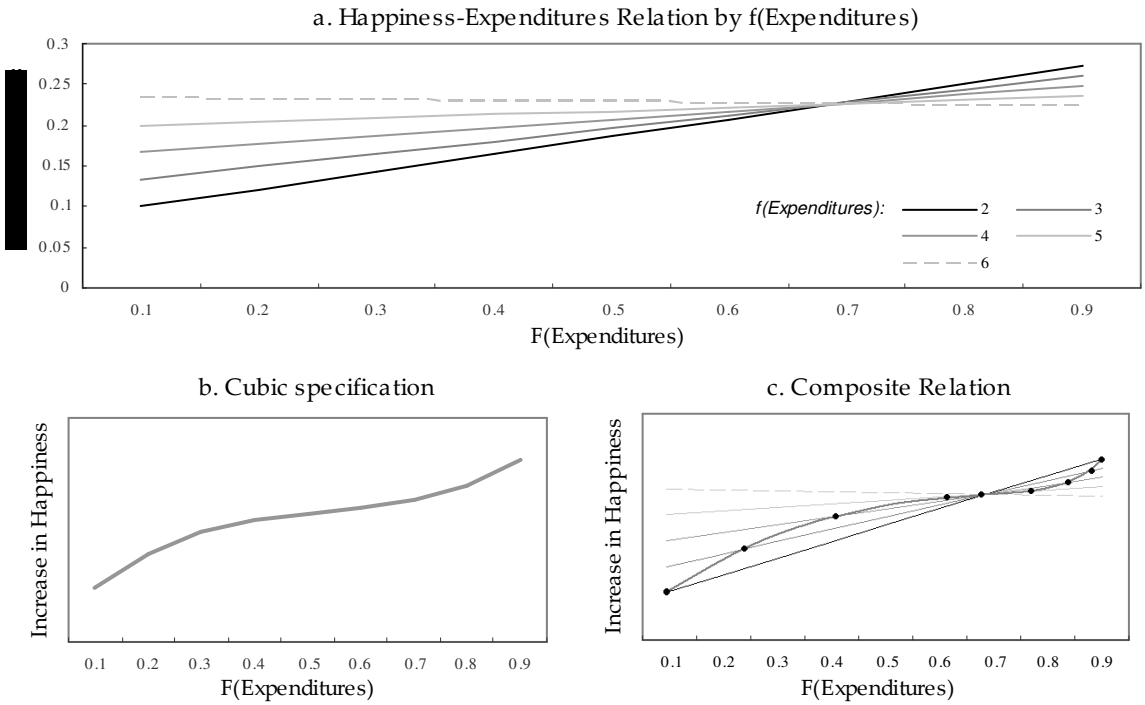
The new identification assumption sustains that the density of income (expenditures) at a particular year is a good indicator of the degree of income (expenditures) heterogeneity within the individual's reference group. Namely, an individual with a "frequent" income (the density of the income distribution evaluated in her income is high) is expected to have a much more homogeneous-in-income reference group than an individual with an "infrequent" income. The same is valid for the expenditures variable.

The consequent OLS specification is:

$$H_{it} = \beta_1 X_{it} + \beta_2 F(Exp_{it}) + \beta_3 F(Exp_{it}) \cdot f(Exp_{it}) + \beta_4 f(Exp_{it}) + \\ + \beta_5 F(Inc_{it}) + \beta_6 F(Inc_{it}) \cdot f(Inc_{it}) + \beta_7 f(Inc_{it}) + \Psi_t + \Sigma_i + \varepsilon_{it}$$

[28] As they do not include expenditures variables, income captures the effect of expenditures to some degree.

FIGURE III



Where $f(Exp_{it})$ is the density of total real expenditures for individual i at year t (and the same is true for income).[29] For an easier quantitative interpretation of the results, $f(\cdot)$ was normalized to take values between 1 and 10. Percentiles 15th, 50th and 85th are respectively 1.43, 3.21 and 5.96 for $f(Inc_{it})$, and 1.15, 3.33 and 5.7 for $f(Exp_{it})$. The impact of expenditures on happiness will be greater the more heterogeneous-in-expenditures is the reference group of the individual:

$$\frac{\partial H_{it}}{\partial F(Exp_{it})\partial f(Exp_{it})} = \beta_3 < 0$$

Since income is not observable, β_6 should be zero (as long as income is not capturing a residual of consumption not addressed by expenditures). The results are reported in Table V. The first equation does not include individual time varying controls. The third equation includes quadratics terms for the $F(\cdot)$'s, and the interactions between the latter and seven dummies for the eighth geographical regions.

For the most complete specification, equation (3), the estimate of β_3 is positive and statistically different from zero at the 1% level of significance, and the estimate of β_6 is far from being statistically different from zero at any conventional level. The estimate of the coefficient on the term $f(\cdot)$ is significant only for expenditures. Furthermore, the outcomes do not suffer any critical alteration if income and expenditures measures are normalized by the elasticity scale, as revealed by equations (1a) to (3a).

[29] Consider the following expression: $\partial H_{it}/\partial Exp_{it} = (\partial H_{it}/\partial F(Exp_{it}))f(Exp_{it})$. If happiness were regressed only on absolute expenditures, the consequent coefficient would be the expected $\partial H_{it}/\partial F(Exp_{it})$ over the entire population of $f(Exp_{it})$'s. This paper proposes a particular partitioning of that weighted average.

Using the coefficients β_2, β_3 and β_4 estimated in equation (2), the total effect of expenditures on life satisfaction is shown in Figure IIIa. The marginal effect can be expressed as: $\partial H_{it} / \partial F(Exp_{it}) = 0.33 - 0.057 \cdot f(Exp_{it})$. The contribution of the interactive term takes values from 0.065 to 0.32, corresponding to the 15th and 85th percentiles of the $f(Exp_{it})$ in the sample (1.15 and 5.7, respectively). In a very homogeneous-in-expenditures reference group ($f(Exp_{it}) = 5$) going from the poorest 10% to the richest 10% has almost no effect on happiness. In contrast, in a very heterogeneous-in-expenditures reference group ($f(Exp_{it}) = 2$) the impact on happiness is almost 0.3. A good measure for the relative importance of the indirect effect is the ratio between the interactive and non-interactive terms, which ranges from 0 to 1.8, corresponding to the extreme expenditures densities 0 and 10. The interactive effect is certainly very important.

One immediate interpretation of the positive sign of coefficient β_4 is that people have some kind of aesthetic valuation for homogeneity in expenditures within their reference group. Since the coefficient β_7 is not statistically different from zero, the aesthetic valuation is not valid for income equality. The introduction of $f(\cdot)$ in the econometric study of happiness is a major contribution of this paper.

Holding the ranks constant, dispersing the expenditures of people above $F(Exp_{it}) = 0.7$ will increase their welfare. The next step is to translate the findings into a more orthodox economic language. It will be shown that the main finding is consistent with the idea of an early group of papers from 50 years ago.

4.2.1. Friedman-Savage utility function

It is a fact that people are voluntarily involved in gambles and lotteries. Friedman et al. (1948) and Friedman (1953) suggested that an important class of reactions to risk can be rationalized by a rather simple extension of orthodox utility analysis. They advocated that utility functions may be initially concave and then convex. For example, Rosen (1997) argued that this behavior is driven by the fact that most of the important decisions that people face are, to some extent, discrete (i.e. a person cannot buy a third of a car, even though she can buy a cheap one).

Using a third degree polynomial for income and expenditures variables, we can not reject that the cubic specification is right for expenditures at the 10% level of significance. When the interactive terms (with respect to densities) are included, the cubic specification is no longer suitable (not reported). In Figure IIIc it is shown how an interactive term (Figure IIIa) can explain the cubic shape (Figure IIIb). The relationship between $F(\cdot)$ and $f(\cdot)$ is inverted-U shaped. As a result, the utility function should be traced beginning on the line corresponding to a low $f(Exp_{it})$. As $F(Exp_{it})$ grows, the curve should be slowly climbing to higher values of $f(Exp_{it})$. When a maximum is reached, the curve should return to low values of $f(Exp_{it})$. As a result, Figure IIIc suggests that a Friedman-Savage utility function can be perfectly explained by the augmenting effect identified in the former subsection.

5. Conclusions

Many of the goods and services which people care about are not allocated through standard markets. Some of them may be assigned through channels similar in nature to that described above. Thus, conspicuous consumption may be seen as a natural and efficient response to the absence of certain markets.

I studied this phenomenon quantitatively based on panel data for 10,000 respondents in Russia for 2000-2002. Two strategies were proposed for identifying the indirect effect of

consumption on life satisfaction. Both strategies gave considerable support to the predictions of the theoretical model: expenditures inequality within the reference group does increase the marginal utility derived from consumption.

As it can be seen in the working paper version, the results remain unchanged after controlling for a wide range of recent theories (such as comparison happiness) and the income (expenditures) equivalence scale elasticity. There is also an early test of happiness dynamics, as proposed by Pérez Truglia (in progress).

Appendix

Tables

TABLE IV

Dep Var: Life Satisfaction	(1) OLS	(2) OLS	(3) IV	(4) IV	(1a) OLS	(2a) OLS
F(Expenditures)	0.159***	-1.098***	0.159***	-0.806***	0.146***	-0.825**
	(0.049)	(0.408)	(0.045)	(0.279)	(0.047)	(0.392)
F(Expenditures)*Gini(Expenditures)		2.431***		2.221***		1.978***
		(0.725)		(0.715)		(0.707)
F(Expenditures)*Mean(Expenditures)		0.008		0.002		0.012
		(0.019)		(0.015)		(0.024)
F(Income)	0.243***	0.041	0.243***	0.352	0.233***	-0.069
	(0.045)	(0.355)	(0.042)	(0.245)	(0.044)	(0.337)
F(Income)*Gini(Income)		-0.343		-0.705		-0.090
		(0.629)		(0.650)		(0.617)
F(Income)*Mean(Income)		0.025		0.033*		0.021
		(0.021)		(0.018)		(0.027)
Gini(Expenditures)	0.283	-1.037**	0.283	-0.904*	0.400	-0.655
	(0.316)	(0.511)	(0.274)	(0.475)	(0.306)	(0.489)
Mean(Expenditures)	-0.022**	-0.025*	-0.022***	-0.022*	-0.034**	-0.039**
	(0.011)	(0.015)	(0.009)	(0.012)	(0.014)	(0.019)
Gini(Income)	0.573**	0.759*	0.573**	0.950**	0.538**	0.589
	(0.239)	(0.419)	(0.225)	(0.424)	(0.232)	(0.404)
Mean(Income)	-0.025**	-0.038**	-0.025**	-0.042***	-0.034**	-0.045**
	(0.011)	(0.016)	(0.011)	(0.015)	(0.015)	(0.021)
Region-Specific F(Exp.) and F(Inc.)	No	Yes	No	Yes	No	Yes
Income equivalence scale elasticity	No	No	No	No	Yes	Yes
Observations	20896	20896	20896	20896	20896	20896
Number of respondents at Round 9	8429	8429	8429	8429	8429	8429

Notes: Robust standard errors in parentheses. Star is significant at 10%; Double-Star is significant at 5%; Triple-Star is significant at 1%. Every specification includes individual fixed effects, time FE and individual time-varying controls (enumerated in the Appendix, with definitions).

TABLE V

Dep Var: Life Satisfaction	(1)	(2)	(3)	(1a)	(2a)	(3a)
F(Expenditures)	0.469***	0.330***	0.820*	0.437***	0.320***	0.767*
	(0.091)	(0.092)	(0.423)	(0.087)	(0.088)	(0.413)
F(Expenditures)^2			-0.432			-0.357
			(0.287)			(0.283)
f(Expenditures)*F(Expenditures)	-0.069***	-0.057**	-0.090***	-0.069***	-0.057**	-0.083***
	(0.024)	(0.025)	(0.032)	(0.022)	(0.023)	(0.030)
f(Expenditures)	0.056***	0.039**	0.040**	0.051***	0.037**	0.038**
	(0.017)	(0.017)	(0.018)	(0.015)	(0.016)	(0.016)
F(Income)	0.324***	0.319***	-0.249	0.303***	0.302***	-0.308
	(0.078)	(0.080)	(0.380)	(0.072)	(0.075)	(0.364)
F(Income)^2			0.418*			0.396
			(0.254)			(0.258)
f(Income)*F(Income)	-0.026	-0.047**	-0.017	-0.024	-0.048**	-0.019
	(0.022)	(0.023)	(0.029)	(0.022)	(0.022)	(0.029)
f(Income)	0.002	0.016	0.019	-0.001	0.014	0.016
	(0.015)	(0.015)	(0.016)	(0.014)	(0.015)	(0.015)
Individual Time-Varying Controls	No	Yes	Yes	No	Yes	Yes
Income equivalence scale elasticity	No	No	No	Yes	Yes	Yes
Region-specific F(Exp.) and F(Inc.)	No	No	Yes	No	No	Yes
Observations	23553	20890	20890	23553	20890	20890
Number of respondents at Round 9	9212	8429	8429	9212	8429	8429

Notes: Robust standard errors in parentheses. Star is significant at 10%; Double-Star is significant at 5%; Triple-Star is significant at 1%. Every specification includes individual fixed effects and time fixed effects. Data Definitions and the enumeration of infividual time-varying controls in the Appendix.

Data Definitions

Satisfaction with Life: the individual responses to the question: "To What extent are you satisfied with your life in general at the present time? [Fully satisfied 5] [Rather satisfied 4] [Both yes and no 3] [Less than satisfied 2] [Not at all satisfied 1]".

Satisfaction with Economic Condition: the individual responses to the question: "Tell me, please, how satisfied are you with your economic conditions at the present time? [Fully satisfied 5] [Rather satisfied 4] [Both yes and no 3] [Less than satisfied 2] [Not at all satisfied 1]".

Comparison Life Satisfaction: (absolute) difference from cells averages for Satisfaction with Life, where the cells are defined by the intersection of the following discrete variables: geographical unit, year, gender, etarian group, education and marital status.

Expenditures: Household Real Expenditures as constructed by the RMLS[30], created with a high level of analytical decomposition (covering food, durable goods, furniture, clothing, housing, rents, transportation, communication, land use, home production, leisure, travel, services, health, insurance, credit repayment, lending, savings and transfers, and so on).

Income: Household Real Income as constructed by the RMLS, including almost all possible sources of income, such as cash and non cash salaries, other paid work, unemployment benefits and pensions, state transfers (children's benefits, stipends, subsidies, etc.), private transfers (from family, relatives, friends, church, etc.), the value of home production of fruits, vegetables, dairy products and meat consumed or given away, net of the expenditure on home production (seed, fertilizers, etc.).

[30] For the imputation procedure (also for income variables), divide all of the monetary expenditure variables by their corresponding inflation index, in order to get June 92 rubles. Then, calculate the median of each real variable by settlement type and family size, and by the entire sample. Going back to the main working data, if the indicator variable for a particular expense indicates that the household incurred that expense, but the actual amount variable is missing, then replace the missing value with the family size and settlement type specific median. If the categorical median is missing as well, then replace the missing amount with the median of the entire sample.

Expenditures pc and Income pc: household size adjustments for expenditures and income, using the equivalence scale elasticity estimated by means of the data on income satisfaction.

F(·): relative real household expenditures or income at the geographical unit level, equal to the ordinal position of the household income (expenditures) among the household incomes (expenditures) within the corresponding geographical unit.

f(·): real household expenditures (or income) density at the geographical unit level, equal to the nonparametric estimated value of the household expenditures (or income) density within the corresponding geographical unit (and re-scaled to take values between 0 and 10).

Gini(·): Gini coefficient for real household expenditures (or income), at the geographical unit level.

Mean(·): mean real household expenditures (or income) in thousand rubles at the geographical unit level.

No HH Members: number of people living in the household, obtained by summing up the six household composition variables detailed below.

Control Variables:

Household Composition variables: six separate variables anchored in the household level questionnaire (Number of kids less than 7 years old living in the household, Number of kids between 7 and 18 years old living in the household, Number of working age males living in the household, Number of working age females living in the household, Number of post working age males living in the household, and Number of post working age females living in the household).

Work Status: a set of two dummies (Leaving Work and Not Working; Working dismissed as reference group) derived from the individual responses to the question: "Tell me, please: Do you now work, are you on paid or unpaid leave, or do you not work? [Working 1] [Maternity or similar leave 2] [Any other paid leave 3] [Unpaid leave 4] [Not working 5]".

Hours in Average Workday: the individual responses to the question: "How many hours on average does your usual workday last?".

Owns a PC: a dummy variable derived from the household-level responses to the question: "Do you have a computer? [No 0] [Yes 1]".

Owns a Car: a dummy variable based on the household-level responses to the question: "Do you have a car? [No 0] [Yes 1]".

HH Lendings to Others: the household-level responses to the question: "How many rubles did your family lend in the last 30 days?"

Recieve a Pension: a dummy variable derived from the individual responses to the question: "Do you now receive a pension? [No 0] [Yes 1]".

Medical Insurance: a dummy variable based on the individual responses to the question: "Do you have compulsory medical insurance, that is, a medical insurance policy? [No 0] [Yes 1]".

Age: the age (in months) derived from the individual responses to the question about the birth dates.

Marital Status: a set of four dummies (Married, Living Together, Divorced and Widowed; Never Married left as the reference group) founded on the individual responses to the question: "What is your marital status? [Never married 1] [In a registered marriage 2] [Just living together 3] [Divorced and not remarried 4] [Widow 5]".

Believer: the individual responses to the question: "In our society in the past there was much said about religion. What is your opinion of religion? [You are a believer 1] [You are more a believing person than a non-believing one 2] [You are more a non-believing person than a believing person 3] [You are a non-believer 4] [You are an atheist 5]".

Orthodoxy: a dummy variable that indicates that the individual considers himself belonging to the orthodoxy religion, based on the individual responses to the question: "Of what religion do you consider yourself?".

Finished High School: dummy variable derived from individual responses to the question: "I would like to ask you a few questions about your education. Do you have a high school diploma? [No 0] [Yes 1]".

Health Self-Evaluation: a set of four dummies (Bad Health, Average Health, Good Health and Very Good Health; Very Bad Health left as reference group) derived from the individual responses to the question: "Tell me, please, how would you evaluate your health? It is: [Very good 1] [Good 2] [Average 3] [Bad 4] [Very bad 5]".

Smokes: a dummy variable derived from the individual responses to the question: "Do you now smoke? [No 0] [Yes 1]".

Has some Chronic Disease: dummy variable derived from the individual responses to the question: "Do you have any kind of chronic illness? [No 0] [Yes 1]".

Hospitalized last 3 months: a dummy variable derived from the individual responses to the question: "Have you been in the hospital in the last three months? [No 0] [Yes 1]".

Drinks Alcohol: dummy variable based on individual responses to the question: "In the last 30 days have you used alcoholic beverages? [No 0] [Yes 1]".

Economic Rank Ladder: a set of seven dummies (the first was kept as reference group, and the top two were merged), indicating the response to the individual question: "Now, please, imagine a 9-step ladder where on the bottom, the first step, stand the poorest people, and on the highest step, the ninth, stand the rich. On which step are you today? [Lowest 1] [2] [3] [4] [5] [6] [7] [8] [Highest 9]".

Power Rank Ladder: a set of seven dummies (the first two were kept as reference group, and the top two were merged), indicating the response to the individual question: " And now, please, imagine a 9-step ladder where on the bottom, the first step, stand people who are completely without rights, and on the highest step, the ninth, stand those who have a lot of power. On which step are you? [Lowest 1] [2] [3] [4] [5] [6] [7] [8] [Highest 9]".

Respect Rank Ladder: a set of seven dummies (the first three were kept as reference group), indicating the response to the individual question: "And now, another 9-step ladder where on the lowest step are people who are absolutely not respected, and on the highest step stand those who are very respected. On which step of this ladder are you? [Lowest 1] [2] [3] [4] [5] [6] [7] [8] [Highest 9]".

Proofs

Proof 1

The first line is obtained by differentiating:

$$2 \cdot dSW = U'(M_l)dM_l + U'(M_h - p)dM_h + U'(M_l)dM_l - U'(M_l - p)dM_l$$

Using $dM_h = -dM_l$ and $dM_l > 0$, the condition $dSW < 0$ equals to:

$$2U'(M_l) - U'(M_h - p) - U'(M_l - p) < 0$$

Rearranging:

$$U'(M_l) < \frac{U'(M_h - p) + U'(M_l - p)}{2}$$

Using that $U'''(\cdot) > 0$ and Jensen's inequality:

$$\frac{U'(M_h - p) + U'(M_l - p)}{2} > U'\left(\frac{M_h + M_l - 2p}{2}\right)$$

So, the following condition is enough (but not necessary) for having a welfare improvement after a spread of incomes:

$$U'(M_l) < U'\left(\frac{M_h - p + M_l - p}{2}\right)$$

Which happens iff $p > (M_h - M_l)/2$.

Proof 2

Facing a change $dM_h = -dM_l$, the rich individual will move its choice of p as to achieve exactly the θ initially fixed:

$$d\theta = 0 = U'(M_l)dM_l - U'(M_l - p)(dM_l - dp)$$

Where $d\theta = 0$, since it is fixed. Differentiating social welfare with respect to each income:

$$2 \cdot dSW = U'(M_l)dM_l + U'(M_h - p)(-dM_l - dp)$$

First dp is replaced by the relationship previously found in the expression $d\theta = 0$. Then, as $dM_l > 0$, the condition for $dSW < 0$ is:

$$2 > \frac{U'(M_l)}{U'(M_h - p)} + \frac{U'(M_l)}{U'(M_l - p)}$$

The assumption $U'''(\cdot) > 0$ will be avoided (and then the resulting condition should be more restrictive). Observe simply that $U'(M_l - p) < U'(M_l - p)$, and then the following is enough (though not necessary) for having an welfare improvement after a rise in income inequality:

$$2 > 2\frac{U'(M_l)}{U'(M_h - p)}$$

Which happens if and only if $p > (M_h - M_l)$.

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