Conspicuous consumption in the land of Prince Charming

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CONSPICUOUS CONSUMPTION
IN THE LAND OF PRINCE CHARming

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Abstract. Conspicuous consumption is a signaling device used to allocate non-market goods
(i.e., goods that cannot be traded in markets). In sharp contrast to the existing literature, in
our model people do not want to signal wealth but some unobservable traits that, conditional
on other observable information, are correlated with wealth. For instance, in order to get
non-markets goods like respect, esteem and admiration, people want to signal the talents
that generated the wealth, and not the wealth itself. Both the nature of the equilibrium
and the policy implications depart dramatically from the literature. More and more papers
argue that, because of relative concerns, the government should redistribute heavily. Our
model shows that, once taken in a general-equilibrium context, those arguments break down.
Furthermore, our model offers explanations beyond the current reach of the literature, like a
theory of the natural rate of inequality.

Keywords: Conspicuous consumption, signaling, non-market goods.

JEL Codes: D49, D31, D83, H21, P16.

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1. Introduction

Status concerns have been long recognized not only by economists, but also by sociologists
(e.g. Weber, 1922), philosophers, psychologists, and recently extended to other fields such as
sociobiology (e.g. Zahavi, 1975). Among the economists, the first contributor was Adam Smith,
who dedicated a great deal of his Theory of Moral Sentiments to the study of admiration,
estee, etc. (Smith, 1759). Other classical economists like Marshall (1890) and Pigou (1903)
contributed to the discussion. But it was Veblen’s Theory of the Leisure Class (Veblen, 1898)
that coined the term conspicuous consumption, used to refer to expenditure in goods that signal
the consumer’s position in society.

Veblen’s arguments were not taken further until 50 years later, when Duesenberry (1949)
insisted with the importance of relative standings in determining consumption and savings
patterns over time. During the following decades there were some isolated contributions on the
subject: e.g. Leibenstein (1950), Galbraith (1958), Hirsch (1976), Pollack (1976), Boskin and

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Sheshinski (1978) and Frank (1985). However, the last couple of decades have witnessed a wave of papers on conspicuous consumption and related subjects.¹

The first explanations for the existence of conspicuous goods were based on envy, arrogance, greediness and similar moral sentiments, leading most economists to conclude that conspicuous consumption is just a waste of resources (i.e. a "rat race"). However, a recent literature recognized that conspicuous consumption may have secondary, indirect effects: people may incur in conspicuous consumption as a way to get some non-market goods (Cole et al., 1992, 1995; see also Postlewaite, 1998).

As opposed to Cole et al. (1992, 1995) and the rest of the literature, in our model people do not want to signal wealth but some unobservable traits that, conditional on other observable information, are correlated with wealth. For instance, when the non-markets goods are respect, esteem and admiration, people work hard and buy conspicuous goods in order to signal personal traits like talent, trustworthiness and discipline.

Since the relationship between types and incomes is endogenous, the nature of the equilibrium is completely different than in the rest of the literature. More importantly, the policy experiments in our model depart dramatically from the usual results. For instance, the prevalent view is that status concern lead to over-consumption of positional goods in order to "keep up with the Joneses" (e.g. Frank, 1985). On the contrary, our model suggests that conspicuous consumption is welfare enhancing (a result only shared by Rege, 2008).

Furthermore, the model incorporates issues that were beyond the current reach of the literature on conspicuous consumption. We let individuals use lotteries, which has never been contemplated by a signaling model. We also incorporate exogenous randomness in the income generating process. Those elements generate a semi-separating equilibrium that is much more intuitive and realistic than the usual pure-separating equilibria studied in the literature (e.g. Bagwell and Bernheim, 1996). We can then explain the disconnection between the micro and macro estimates on risk aversion, and give a theory on the natural rate of inequality.

In the literature there are so many functional forms for status concerns that as a group they could generate literally any policy conclusion. More importantly, we can always add a twist to the utility functions as to rationalize new observable evidence. In our model relative concerns arise endogenously as the result of a signaling allocation of non-market goods. As a consequence, we can generate testable implications, there is much less ambiguity in the welfare predictions, and we can propose estimation exercises to reduce the remaining ambiguity.

One of the main practical objectives of the paper is to provide a new framework to analyze the effects of income redistribution in a general-equilibrium context. In Section 2 we provide a very simple version of Prince Charming’s Model, where the intuitions are very easy to grasp. In Section 3 we consider a more rigorous model where we incorporate randomness in the income

¹We will compare our results to many of the papers in the literature. For a review see Weiss and Fershtman (1998). For an extensive analysis of the history of economic thought on conspicuous consumption see Mason (1999).
generating process and we allow individuals to buy lotteries. Among other results, we get a novel explanation for the natural rate of inequality.

More importantly, the model shows that the societal benefits from taxation are heavily constrained by the stochastic and endogenous nature of the link between income and personal traits. In other words, this paper provides a clean and sound theoretical argument for a usual claim that has never been micro-founded: income inequality is not a intrinsically bad property of an economy. On the contrary, "some" income inequality is a signal of an efficient provision of non-market goods.

Section 4 introduces some extensions and empirical tests of the model. We desmitify the link between conspicuous goods and diamonds. We argue that the correlation between traits and wealth is very strong in the lower and middle classes, which explains recent evidence on why poor people in developed and developing countries spend so much in conspicuous goods. And we discuss the widespread confusion between relative concerns and hedonic adaptation, among many other issues.

2. Prince Charming’s Model

The conspicuous consumption literature forms part of a more general theme on relative concerns. The difference between the two is that in the former people cannot directly observe each other’s incomes, so they need to consume observable goods to signal their incomes. Such a difference is radical when incomes are taken as given. However, as we will show later, the models are much closer once we let income be endogenous.

There are many variations of models on relative concerns. Let \( y_i \) and \( U_i \) denote respectively the income and utility of individual \( i \), and let \( F(\cdot) \) be the income cumulative distribution in the reference group (e.g. county, country). For instance, people could care about their own decile in the income distribution: e.g. \( U(\cdot, F(y_i)) \). People could care about income differences: e.g. \( U(\cdot, \int (y_i - y) dF(y)) \). They could compare their happiness with the hypothetical happiness of other people, either in a cardinal or ordinal sense: e.g. \( U(\cdot, \int U(y_i) - U(y)dF(y)) \). An so on and so forth.

When you take a reduced-form approach, there are many other crucial normalizations to make.\(^2\) Probably the main problem in the relative concerns literature is that all the implications of the models depend sensibly on the functional form assumptions: e.g. the welfare effects of income taxations (e.g. Hopkins, 2008).

Furthermore, we can always add a twist to the utility function in order to explain new behavioral evidence. As Cole et al. (1992) pointed out, if allowing agents to care about status can explain everything, it has explained nothing. Indeed, this may be a key reason why Veblen’s idea did not gain much relevance in modern economic analysis. As we mentioned before, the classical

\(^2\)Consider the case of income comparisons with respect to the average income: \( U = U_1(y_i) + U_2(y_i - \bar{y}) \). People below the mean could be better off if the relative concerns did not exist: e.g. \( U_2(0) = 0 \) (envy). Or maybe everybody would be worse off in absence of relative concerns: e.g. \( U_2(\cdot) > 0 \) (pride).
economists were well aware of both the importance of relative concerns and the methodological challenges that they faced in the classical economics framework (e.g. Pigou, 1903).

On the contrary, Cole et al. (1992) noted that the status externality can be endogenously determined in a model where agents only care about their own consumption. That idea was later incorporated to micro-found conspicuous consumption: people are willing to "burn money" because that serves a signaling role to get non-market goods (Cole et al., 1995; Postlewaite, 1998). Our paper shares the methodological motivation in Cole et al. (1992, 1995), but departs from them in almost every other aspect, both in economic content and methodology.

Non-market goods and services (in a wide sense) are goods and services that people consume but cannot purchase through standard markets. Non-market goods are a very important source of happiness (Scitovsky, 1976). In spite of this, they have a relatively low standing in modern economic analysis.

There are many reasons why some goods cannot be traded in markets. Some transactions may face moral and legal restrictions. Roth (2007) gives many examples of repugnance as a constraint on markets: human organs, indentured servitude, abortion, adoption, surrogate mothers, sex, life insurance, short selling, interest on loans, drugs and alcohol, simony, vote selling, etc. Some other non-market goods cannot be traded in markets because of their intrinsic nature, like the case of esteem, respect and admiration: the very fact that someone tried to buy your admiration would make it impossible for you to admire her.

In the Prince Charming’s Model (PCM) conspicuous consumption is micro-founded, in the sense that it serves the instrumental role of signaling personal traits (e.g. talent) for the allocation of non-market goods. We insist that one of the most important family of non-market goods is that of respect, admiration, esteem, etc. However, the setup extends to other non-market goods in which people are not mainly interested in recognizing wealthy people as they are interested in recognizing people who are talented, trustworthy, etc.: e.g. friends, marital and business partners, political and civil leaders, authority, representatives in the private and public sector, role models, etc.

In a nutshell, the model relies on the following assumptions:

**Assumption 1:** Some individual traits are not perfectly observable to all the other individuals.

For instance, firms dedicate an enormous amount of resources to spot talented workers. Undergraduate and graduate programs find it very difficult to select the best students. However, the assumption is much deeper than it seems. There are some talents that cannot be revealed unless we actually go out and do something. People do not know whether they could be brilliant

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3In the first place, Cole et al. (1992, 1995) focused on non-market goods like country club memberships, charity board invitations, assigned seats in churches and synagogues, etc. According to our model those goods are themselves intermediate steps to obtain the ultimate non-market goods: respect, esteem and admiration. More importantly, they do not acknowledge that people care about personal traits, and not directly about income.

4For instance, recent empirical evidence shows that relational goods are a major source of life satisfaction (e.g. Becchetti, 2007).
conspicuous consumption

chefs or physicists until they actually open a restaurant or write a great paper. Moreover, many personal traits are unobservable even to ourselves.

**Assumption 2:** Conditional on all the observable characteristics of one individual, wealth is in some contexts positively (negatively) correlated to good (bad) unobservable traits.

People in general feel uncomfortable with assuming a positive correlation between income and talent. After all, most of our life heroes were not rich at all. However, we are referring to conditional correlations, where the conditioning variables may be anything that we observe in each particular occasion: e.g. age, occupation, social origin, memories from previous interactions, etc.

Consider the case of admiration for productivity. People know for a fact that in some occupations workers can extract a higher proportion of their marginal productivity than in others: e.g. a clown can extract a great deal of the social product he generates, but some mathematicians can only enjoy a minuscule share of the value they generate for the society. Our model does not predict that a clown earning $100,000 a year would be more admired than a mathematician earning only $80,000. But it certainly predicts that a given clown will be more respected the higher his income.

The conditional correlation between income and traits depends heavily on the social class. For instance, in lower and middle classes the income transferences from parents (if even positive) are relatively low with respect to total earnings. Opportunities and information while growing up are very scarce relatively to their wealthier counterparts. As a consequence, income becomes a strong signal of discipline, talent and hard work. You do not even need direct information about social origin. Driving a Ferrari is a very different signal if it comes from a bank clerk than from an Internet entrepreneur: you can conclude that the latter is much more likely to have earned the money.5

Assumption 2 is actually a very weak. Since people can (usually) choose whether to display or not observable goods (i.e. a golden watch), they could choose not to display them in occasions where income (conditional on other observables) is negatively correlated to goods traits. That is to say, income could be (conditional on observables) negatively correlated with good traits in the average situation and the assumption would still be safe.

Under those simple conditions, conspicuous consumption will serve as a powerful signal of good and (the lack of) bad traits. With respect to the demand of conspicuous goods, people must be interested in signaling those unobservable traits:

**Assumption 3:** People care (directly or indirectly) about what other people think of them.

As we anticipated, people may care about other person’s traits in an indirect way: to hire that person for a job, trust, do business with, go on a date, vote, imitate, try initiating a friendship, 5People's perceptions would go like this: "conditional on his age, social origin, profession, some conversations I have had with him and other available information, if someone earned twice as much then my (probabilistic) belief about her talents would go up considerably."

etc. However, we insist that people care to a great extent in a direct manner: most people enjoy a great deal from being seen as productive, intelligent, hard-working members of society.

We know this is a great source of happiness, if not the most important, not only by introspection but also from revealed-preference evidence. People are willing to die for the sake of their image in society. Some people are willing to work practically all the time and even give up having a family for the sake of revealing their inner talents to the rest of the world. We are a honor-hungry species, and we simply cannot leave the quest for respect out of our analysis of human action.

Assumption 3 may be the most controversial of the above conditions for most economists, but it is not the case in other fields, and certainly was not the case for the classical economists. A great deal of Adam Smith's *Theory of Moral Sentiments* is dedicated to respect, admiration and esteem:

"To what purpose is all the toil and bustle of this world? ... To be observed, to be recognized, to be taken notice of with sympathy are all the advantages which we can propose to derive from it. It is vanity, not pleasure, which really interests us... It is not wealth that men desire, but the consideration and good opinion that wait upon riches." (Smith, 1759)

Smith also insisted with this many times in *Wealth of Nations*: "Nature, when she formed man for society, (...) rendered their approbation most flattering and most agreeable to him for its own sake; and their disapprobation most mortifying and most offensive" (Smith, 1982). Among the other classical economists, Marshall (1890) wrote: "The desire to earn the approval, or to avoid the contempt, of those around us is a stimulus to action which often works with some uniformity in any class of persons at a given time and place." And Bentham talked about the "pleasures of self-recommendation" (see Loewenstein, 1999).

Philosophers from Cicero to Kant, Marx and Locke gave esteem, admiration and respect a key role in pulling the strings of the world. Psychologists have been always discussing the role of recognition in human motivation. For instance, Lukes (1973) argues that western culture "celebrates the virtues of hard work and sacrifice. It equates idleness with sin." Coleman (1990) assures that recognition from others has long been regarded by psychologists as a primary source of happiness. Tangney (2002) claims that pride is an emotional barometer, providing immediate and salient feedback on our social and moral acceptability and our worth as human beings. See also Campbell (1981), among many others.

In their extensive analysis of esteem Brenan and Pettit (2004) make a brilliant synthesis: "It is almost as if there were a conspiracy in social sciences not to register or document the fact that we are, and always have been, an honour-hungry species." In particular, economists have rarely incorporated admiration and respect into economic models. Among the exceptions we have Becker and Murphy (2000, p. 124): "Great scientists and outstanding entrepreneurs receive

\[6\]Brennan and Pettit (2004) offer great quotations from all times: Kant, Tucker, Burke, Hume, Voltaire, Hobbes, etc. For instance: "The principal spring from which the actions of men take their rise, the rule they conduct them by, and the end to which they direct them, seems to be credit and reputation" (Locke, 1678).
enormous prestige and status precisely in order to encourage scientific and startup activities." Frey (1997) introduced a broader economic theory of personal motivation. And Piketty (1998) used social mobility as a signal of intelligence.\footnote{His model was later extended by Cowan and Jonard (2005) and Cervellati et al. (2009).}

Almost in every society people seek respect and admiration. Professional in sports, academia and other activities have a formal, centralized and public allocation mechanism for that sake. For instance, in some countries people within academia may use publications and other indicators to form beliefs about talent. Many sport professionals have national and international rankings. There are formal and informal institutions (e.g. sports associations, journals) dedicated to make those rankings public and credible.

But those matching mechanisms are limited to a very small share of the population, and even for people in those groups they have several limitations (e.g. they do not rank individuals across professions). Conspicuous consumption makes admiration possible between complete strangers. Since the conspicuous goods are sold in free markets, they extend some of the advantages of markets to non-market goods. That is a genuine and sizable source of happiness, and as economists we should give it the relevance it deserves.

There is a final and less important assumption:

Assumption 4: The income of one individual is not perfectly observable to all the other individuals.

Once we let income be endogenous, the main results of the model would be qualitatively similar even if we assumed that income was perfectly observable by all. We provide the formal argument later in the paper. As we anticipated, this is the line separating the literature on conspicuous consumption from the more general theme of relative concerns.

Even though income is observed with some probability, consumption is undoubtedly much more observable. In fact, even if they were equally observable, consumption would still be much more reliable than income: it may be easy to deceive other people about your paycheck, but just try deceiving other people with your imaginery Ferrari. In particular, among all the consumption goods some are more observable than others. Those relatively more observable goods will be used to signal income, which in turn signals some unobservable traits.\footnote{There are a few exceptions for the very rich: e.g. some magazines, like Forbes, release rankings of the wealthiest people in the country or the world.}

Some people (your family and close friends) may have very precise information about your income, and may even observe many of your traits. Also, such information could be available for everybody at some cost: for instance, if we wanted to know about your income and personal traits, we could ask your contacts, look into public information, and even hire a private investigator.\footnote{This is important for non-market goods like business or marital partners: since both parties are interested in making a good match, they are willing to pay a substantial cost for monitoring.}

However, that does not apply for respect and similar non-market goods. If individual A thinks that B is talented, the former does not "gain" from holding such beliefs. That gives a
radically new interpretation to conspicuous consumption: individual B is willing to pay for a rudimentary monitoring cost on behalf of individual A by means of "burning money."

The subtlety of conspicuous consumption is even deeper. Assume individual B tells individual A that he finds driving a Ferrari a very inefficient way to signal talent, and then he prefers to send A a notarized copy of his paycheck (and he may even offer A some money in exchange of simply looking at the document). Such an offer would automatically make individual B no longer worthy of A's admiration and respect.\(^\text{10}\)

The social stigma varies widely between different income-revelation mechanisms. Sending a notarized copy of your bank statement to your friends is subject to a sizable stigma, just like lighting a cigar with a $100 bill. But for some reason if you light a $1,000 cigar with a match it is acceptable in most social circles, even though in both cases the objective is clearly to signal wealth. Indeed, some firms finds useful to create conspicuous goods with mottos related to environmentalism, organic food and charity (e.g. Glazer and Konrad, 1996).\(^\text{11}\)

This is not irrational, because preferences are not rational or irrational. You simply feel good or bad when you observe the consumption of some goods and services. At most you can say that they are weird preferences. But denying them because they are weird would be a shame, since it would deprive us from very rich aspects of the real-world economy.

The above assumptions hold in different degrees for different conspicuous goods and in different situations. For instance, imagine three broad groups of people that can infer something about your personal traits: complete strangers,\(^\text{12}\) close friends (including coworkers and family) and people in-between.

For close friends conspicuous consumption may play a marginal informational role, since over the years your social circle gather a lot of information on both your income and your personal traits. For complete strangers, the conditional correlation between income and talents is weaker, since they can condition the signal on few observables. Even though individually you care much less about strangers, as a group you may value their non-market goods even much more than that of all of your close friends taken together. Also, for complete strangers conspicuous consumption is in most cases the only available information about talents, so the marginal informational role of conspicuous consumption may still be important.

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\(^{10}\)In words of Brennan and Pettit (2004): "Although we are suppliers of esteem to one another, we are parametric suppliers who cannot help what we do and cannot seek strategic advantage from it. If I notice someone doing something or revealing themselves to be a certain sort of person, then I will more or less inevitably think well or badly of them" (see also McAdams, 1997).

\(^{11}\)Burning money may also deteriorate the self-image. Consider the following though experiment: in a very exclusive New York restaurant, a client reads this paper and realizes that he is paying an astronomical price not because he likes the place or the food, but simply because of the signal it sends to other people. Some people may dislike this fact, and they may even want to deceive themselves about the intrinsic utility of some conspicuous goods. In any case, the psychological and sociological details may be very intricate, but the signaling equilibria would still be a good approximation.

\(^{12}\)Munger and Harris (1989) offer a creative piece of evidence on whether we care about what complete strangers may think about us. They show that in New York public washrooms only 35% of women wash their hands after using the toilet when there is no one else present in the washroom, yet nearly 80% do so when there is someone else there.
For people in-between the trade-off is similar: closeness strengthens the conditional correlation between income and talent, but at the same time decreases its informational value. The trade-off is illustrated in Figure 1. Because of those opposed forces, we cannot tell a priori whether conspicuous consumption is more valuable for non-market goods provided in close or distant interactions. Of course, there are additional sources of heterogeneity.\footnote{For instance, the quantity and quality of non-market goods may be increasing or decreasing in closeness. We do not discuss this dimension of the problem because it varies considerably across non-market goods and circumstances. For example, if the non-market good is a business partner then most potential business partners (including the best ones) are not part of your close friends. On the contrary, even though there are billions of strangers whose respect you can obtain (e.g. being famous), its value may be outweighed by being respected just by your daughter.}

We will continue to discuss some the above assumptions, specially in Section 4.

2.1. The Model. We will start with a very stylized model with two-agents and two-types. We take the relationship between income and talent as deterministic and given. Later in the Section we will let income be endogenous. In the following Section we incorporate randomness in the income generating process, and we consider a continuum of agents and a continuum of types.

The first agent, the maiden,\footnote{In the very first version of the model (Perez Truglia, 2006) we threw a coin to decide the gender of the sender and the receiver.} is chosen randomly by Nature from a population of two possible types: poor and rich (subscripts $l$ and $h$, respectively), differentiated by their incomes ($y_h > y_l > 0$). The fraction of rich type maidens in the population is $\lambda$.

There are two varieties of goods that a maiden can consume, referred to as standard good and conspicuous good. Let $x \geq 0$ be the quantity consumed of the standard good, which has a constant price normalized to 1. Let $z \in \{0, 1\}$ indicate whether the maiden purchased of the conspicuous good, and let $p > 0$ be its price. The actual object of interest is the total expenditure on conspicuous goods, regardless of what combination of conspicuous goods was chosen.\footnote{However, there are small practical concerns that may favor some goods over others, and even encourage the appearance of some social norms. We will discuss those issues in Section 4.}
binary good is a simple way to synthesize that information. Sometimes we will refer to \( p \) as the price of the conspicuous good, but actually we mean total conspicuous expenditure.

Only the standard good gives intrinsic utility to the maiden: \( U(x) \), with \( U'(\cdot) > 0 \) and \( U''(\cdot) < 0 \), identical for both types. The conspicuous good is then equivalent to "burning money," but without the social stigma. The assumption about \( z \) not giving intrinsic utility is only brought to simplify the algebra. Later we will show the more general case.

The second agent is Prince Charming (hereon, PC), who has to choose whether to give or not perform an activity with the maiden (e.g. admire her, marry her, do business with her). Performing the activity is the non-market good. PC can only observe the conspicuous consumption of the maiden (\( z \)), because neither her income nor her standard consumption (\( x \)) are publicly observable.

For PC the utility from performing the activity with the rich (poor) type is \( V_h \) (\( V_l \)), and the utility from not performing the activity is \( V_0 \). Preferences are such as PC likes being with the rich type more than with the poor type, and more than being alone: \( V_h > V_l \) and \( V_h > V_0 \). PC likes being with the richest partner not merely because she is rich, but because there is a desirable attribute positively correlated with her wealth. We assume that rich (poor) people have good (bad) unobservable attributes.

As we anticipated, later that link will be stochastic and endogenous. Also, PC does not like to waste time with the poor type: \( V_l < V_0 \). For instance, think about PC as representing social admiration (marriage). People would like to admire (marry) the talented, and they would prefer not to admire (marry) anyone rather than admiring (marrying) someone untalented.

The utility of getting the non-market good from PC enters additively into the utility function of the maiden: \( U(x) + \theta \) if performing the activity, and \( U(x) \) otherwise. The \( \theta > 0 \) is larger the more important is the non-market good under consideration (e.g. marriage versus going to the cinema). Even though we mention particular examples, \( \theta \) is actually meant to represent all the non-market goods altogether.

In this simple signaling game we have three possible Perfect Bayesian Equilibria in pure strategies. If \( \lambda V_h + (1 - \lambda)V_l \leq V_0 \) (i.e. PC prefers not to perform the activity rather than performing it with a random type), there is a "negative" pooling equilibria where there is no matching: neither maiden buys the conspicuous good and PC does not perform the activity regardless of the conspicuous consumption. If \( \lambda V_h + (1 - \lambda)V_l > V_0 \) there is a "positive" pooling equilibria: neither maiden buys the conspicuous good yet PC perform the activity regardless of the conspicuous consumption.\(^{16}\)

Finally, there is always a separating equilibria where the maiden of the rich type buys the conspicuous good and PC performs the activity iff the maiden bought the conspicuous good. The separating equilibria pareto-dominates the "negative" pooling equilibria: that is to say, signaling through conspicuous consumption makes room for matching, which makes both PC and the rich type better off without harming the poor type. However, the "positive" pooling

\(^{16}\)There is also a pooling equilibria where both types buy the conspicuous good and PC performs the activity iff the maiden buys the conspicuous good.
equilibria and the separating equilibria are not pareto-ranked: PC is better off, but the maidens of both types are worse.\textsuperscript{17}

Just like in the rest of the literature, we will focus only on the separating equilibria (e.g. Bagwell and Bernheim, 1996; Rege, 2008). For most signaling games the separating equilibria is justified by means of similar arguments. The first is the Intuitive Criterion (Cho and Kreps, 1987), which imposes restrictions on the off-the-equilibrium-path beliefs. The motivation behind the Intuitive Criterion underlies other refinements such as the Perfect Sequential Equilibrium (Grossman and Perry, 1986) and Undefeated Equilibrium (Mailath et al., 1993). The other argument involves the Riley (1979) equilibrium (or reactive equilibrium), which happens to be separating and equivalent to the equilibrium of the screening version of the game. Indeed, the Intuitive Criterion selects the Riley outcome in the basic signalling model.

In Section 3 we take into account endogenous and exogenous sources of income randomness and we show that the pure-separating equilibrium breaks down and has to be replaced by a semi-separating equilibria. This is the first paper to acknowledge this. Indeed, to our knowledge there is no paper allowing for lotteries in any signaling game. This more realistic setup not only offers more intuitive results, but it also provides a theory of the natural rate of inequality.\textsuperscript{18}

Consider the allocation of a non-market good $\theta$ through a conspicuous good with price $p$. Since the utility function is strictly increasing, every type choose to consume their entire income. In order to sustain a separating equilibria, given that PC will perform the activity if he observes conspicuous consumption, the poor type must not want to buy the conspicuous good yet the rich type must do so:

\begin{align*}
\text{(IC)} & \quad U(y_l - p) + \theta \leq U(y_l) \\
\text{(IR)} & \quad U(y_h - p) + \theta \geq U(y_h)
\end{align*}

In the mechanism design jargon they are called the Incentive Compatibility (IC) and Individual Rationality (IR) constraints, respectively. First, take $p$ as given. For a pair of incomes $(y_l, y_h)$ we can re-write the conditions as:

\begin{align*}
\theta & \leq \bar{\theta} \equiv U(y_l) - U(y_l - p) \\
\theta & \geq \underline{\theta} \equiv U(y_h) - U(y_h - p)
\end{align*}

The concavity of the utility function guarantees that $\bar{\theta} > \underline{\theta}$ (see A1 in the Appendix). For a pair of incomes $(y_l, y_h)$ and a price of the conspicuous good $p < y_l$ there is a range of non-market

\textsuperscript{17}If we wanted to compare total welfare, we would have to decide how to weight the utilities of PC and the maidens, which would be very inconvenient.

\textsuperscript{18}Not allowing for lotteries is actually a serious omission of this Section’s model. However, the qualitative results and the intuitions regarding taxation are remarkably similar than those of the rigorous version in Section 3.
goods $\theta \in [\underline{\theta}, \overline{\theta}]$ that comprise a perfect Bayesian separating equilibria in pure strategies. Notice that $\partial \tilde{\theta} / \partial p > 0$ and $\partial \theta / \partial p > 0$: more expensive conspicuous goods can rationalize activities with larger $\theta$'s, although at the same time smaller $\theta$'s are being ruled out (e.g. the purchase of diamonds can rationalize getting married, but it cannot rationalize going to the cinema). Notice as well that $\partial \tilde{\theta} / \partial y_l < 0$ and $\partial \theta / \partial y_h < 0$: e.g. increasing income inequality makes achievable both something worse than going to the cinema and something better than getting married (A8).

Now fix $\theta$. For a pair of incomes $(y_l, y_h)$ we have:

\[
\begin{align*}
p &\geq \bar{p} \equiv y_l - U^{-1}(U(y_l) - \theta) \\
p &\leq \underline{p} \equiv y_h - U^{-1}(U(y_h) - \theta)
\end{align*}
\]

Once again, the concavity of the utility function guarantees that $\bar{p} > \underline{p}$ (A2). For a given $\theta$ and a pair of incomes $(y_l, y_h)$ there is a set of prices $p \in [\underline{p}, \bar{p}]$ that comprise a separating equilibria. If the value of the non-market good increases then the set of prices that sustains the separating equilibria moves to the right: $\partial \bar{p} / \partial \theta > 0$ and $\partial \underline{p} / \partial \theta > 0$. Also, since $\partial \bar{p} / \partial y_h > 0$ and $\partial \underline{p} / \partial y_l > 0$, an increase in income inequality expands in both directions the set of prices that sustain a separating equilibria (A3). In order to get the non-market good the rich type is willing to spend up to $\bar{p}$, but she would prefer to pay $\underline{p}$. Therefore, $\bar{p} - \underline{p}$ is the maximum consumer gain from conspicuous consumption (in units of the standard good).

2.1.1. A disgression: conspicuous goods with intrinsic utility. To represent this case, we can think of the conspicuous good as a damaged good: each unit of observable good $z$ has the same price than the standard good, but in utility terms it only provides a proportion $2 \in [0, 1)$ of the benefits of the standard good. Then the IC constraint becomes:

\[
U(y_l - z(1 - \gamma)) + \theta \leq U(y_l)
\]

If we replace $p = z(1 - \gamma)$, this is the same condition than the one we had before. However, if the PC sees $z \geq y_l$ it would be enough to spot the rich agent. PC’s cutoff rule is then: $z \geq z^* \equiv \min \left\{ \frac{\bar{p} - y_l}{1 - \gamma}, y_l \right\}$. The min $\{\cdot\}$ is not binding iff $\gamma < \exp(-\theta)$. In that case, it does not matter whether the conspicuous good gives some intrinsic utility or not. The only important object is the total waste in observable goods, $p = z(1 - \gamma)$.

2.2. Can an increase in income inequality improve welfare? Let’s make some assumptions to simplify the notation. First, assume maidens have unit measure and both types are

19For each particular problem at hand there is probably a technological upper bound to $\theta$, denote it $\tilde{\theta}$, so $\tilde{\theta} = \min \left\{ U(y_l) - U(y_l - p), \frac{\theta}{\gamma} \right\}$.

20The restriction $\gamma < \exp(-\theta)$ can be even less restrictive when lotteries are available and/or when income is endogenous.
equally likely. Secondly, PC withdraws maidens without replacement, so each maiden is chosen at most once. Define $SW$ as the sum of individual expected utilities. Individuals always play the separating equilibrium, so:

$$SW = U(y_l) + U(y_h - p) + \theta$$

We do not include the utility of PC because in the separating equilibrium he always gets the same expected utility. On the one hand, by rising inequality (e.g. decreasing $y_l$ and increasing $y_h$ by the same amount) there is an obvious welfare loss due to diminishing marginal utility. On the other hand, there are some gains from the conspicuous consumption channel. If $p$ was fixed, the rich type would be able to achieve a larger $\theta$, since $\bar{\theta}$ would increase. If $\theta$ was fixed, the rich type would be able to spend less in conspicuous goods, since $p$ would decrease. We will show that under weak conditions the second (positive) effect can prevail over the first (negative).

2.2.1. Fixed $p$. For the simple comparative statics we need to define how $\theta$ is determined for a given $p$. Intuitively, the rich maiden would like the highest $\theta$ that comprises a separating equilibria in the original game, $\theta = \bar{\theta}$, as to get as much pleasure as possible from the (fixed) expense $p$ (A7).21

It is only in very specific short-run games that $p$ can be treated as fixed, and in the rest of the paper we will focus exclusively on the case where $\theta$ is fixed. As an example, consider rich people using a club membership to meet other rich people to do business with. In the short run the entrance fee ($p$) is fixed. Once a member, the sender can make business proposals where he gets a slice ($\theta$). The benefits for the receiver are zero if the proposal is rejected, positive if the proposal is accepted and the sender is rich, and negative otherwise. If the expected benefits for the sender were too high, $\theta > \bar{\theta}$, poor people would like to enter the club. Therefore, we expect in equilibrium $\theta = \bar{\theta}$.22

The indirect utility from expenditure $p$ in conspicuous goods is: $V(p) = U(y_l) - U(y_l - p)$, with $V'(p) > 0$ and $V''(p) > 0$. Notice that indirect utility functions for standard goods are concave, not convex (i.e. if your budget is twice as high, your utility will be less than twice as high).23

The utilitarian Social Welfare is:

$$SW = U(y_l) + U(y_h - p) + \theta$$

Where $\theta = U(y_l) - U(y_l - p)$. Let’s introduce a regressive and symmetric redistribution of income ($dy_h = -dy_l > 0$):

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21 We implicitly assumed that PC does not care about $\theta$. For most non-market goods, like respect and admiration, this is the case. But even if PC cared about $\theta$, we would expect him to be benefited by it, so the result would be the same.

22 Notice that members can act as both PC and maidens. Also, we would expect a higher $\theta$ to be beneficial for both parties (e.g. the sender and the receiver), which we could easily incorporate and it would not change the qualitative results.

23 It is exactly because of the convexity in the expenditure function that maidens would like to use lotteries, as shown later.
The first term represents the usual redistributive arithmetics: since \( U''(\cdot) < 0 \), you are transferring from an individual with high marginal utility to an individual with low marginal utility, so \( SW \) decreases. The second term indicates that a greater income spread would allow the rich maiden to increase the size of the attainable non-market good:

\[
d\theta = dy_l [U'(y_l) - U'(y_l - p)]
\]

Where \( d\theta > 0 \) because of \( U''(\cdot) < 0 \). Notice that the RHS is strictly increasing in \( p \). If \( p \) is high enough then \( d\theta \) is so high that more than compensates the loss from the first term, so expected total welfare increases with a regressive redistribution (A4).

The standard consumption for both types before redistribution are displayed in Figure 2, along with the non-market good obtained by the rich (\( \theta \)). After the redistribution the rich type gains \( b \) in utility from standard consumption, while the poor loses \( a \). The concavity of the utility function guarantees that \( b - a < 0 \). On the other hand, because of the higher income spread the rich type can now get a higher \( \theta' > \theta \), which increases her utility in \( \theta' - \theta = d - c \) (positive also because of the concavity assumption). The total change in welfare is \( b - a + d - c \), which is positive for \( p \) high enough.

Notice that income redistribution is not subject to moral hazard, since we are taking incomes as given. We can dispense of the functional form for the Social Welfare and obtain the utility-possibility frontier (UPF) instead. The utility of the high (low) type will be in the \( y(\cdot) \) axis. In the absence of non-market goods the UPF is given by the following set:

\[
\{(U(x_l), U(y_l + y_h - x_l)) : \forall x_l \in [0, y_l + y_h]\}
\]
An example is given in the left panel of Figure 3. The UPF is both symmetric and strictly convex, so any social preference that is symmetric and efficient will select perfect income equalization. This is shown by the social indifference curves (in grey) in the left panel of Figure 3.

When we include conspicuous consumption the UPF becomes:

$$\left\{U(y_l + y_h - x_l - p) + U(x_l) - U(x_l - p), U(x_l)\right\} \forall x_l \in \left[0, \frac{y_l + y_h}{2}\right]$$

For $x_l \in \left[\frac{y_l + y_h}{2}, y_l + y_h\right]$ it is the same UPF than without the non-market good. Let’s assume a natural upper boundary for the non-market good: $\theta \leq \hat{\theta}$. An example is given in the right panel of Figure 3. The kink in the UPF is given by $\theta$. Now the UPF is not symmetric nor convex. As shown in the Figure, only a Social Planner with Leontief preferences (or close) would choose complete income equalization. In the Figure the utilitarian Social Planner allows for enough inequality so the rich type can attain the boundary $\theta$ (i.e. the kink).

The accumulation of capital has an informational role: signaling the industrial virtue of people. The redistribution of income clouds the distinction between talented and untalented people in the same way than the redistribution of scientific achievements between scholars (if they were fungible and transferable) would cloud the distinction between clever and inept researchers.

2.2.2. Fixed $\theta$. For many non-market goods it seems natural to think of $\theta$ as being fixed even in the long run. For instance, when the non-market good is admiration. Because admiration is a universal feeling, just like being a fan of an sport team or feeling pity for the disadvantaged. The pleasure from being respected is probably determined to a great extent by deep evolutionary

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24PC would like to perform the activity with the rich type, even if after the redistribution she ends up with less disposable income than the poor type.

25The utilitarian choice can be to the right of the kink (A5).
roots. The same argument applies for many other non-market goods: e.g. having a role model, enjoying being friends or partners with a talented person.\footnote{A case where we clearly need to let \( \theta \) be endogenous is the case of business proposals: i.e. if everybody works harder we expect more and better business proposals to appear.}

For the simple comparative statics we need to define how \( p \) is determined for a given \( \theta \). Individuals of the rich type prefer to spend as least as possible in conspicuous consumption, so we will take \( p = p \). The conspicuous good is just an intermediate step to acquire the non-market good, so \( p \) is the shadow price of the non-market good. The corresponding non-market expenditure function (i.e. how much a high-type has to spend to attain a non-market utility \( \theta \)) is: \( \pi(\theta) = y_l - U^{-1}(U(y_l) - \theta) \), with \( \pi'(\theta) > 0 \) and \( \pi''(\theta) < 0 \). Notice that expenditure functions for standard goods are convex, not concave (i.e. to achieve a utility twice as high you would need a budget more than twice as high).\footnote{Intuitively, \( U(y_l) - U(y_l - p) \) is a concave function of \( p \), so the higher \( p \) the cheaper it is to "buy" a marginal increase in \( \theta \).}

Notice that high prices are meant to yield advantageous selection (the opposite of adverse selection), generating an upward-sloping demand.\footnote{To illustrate this, assume that PC is organizing the annual gala. Maidens enjoy \( \theta \) utils when being complimented by PC. PC would strictly prefer to compliment only rich maidens. The entire kingdom is going to the gala, but each maiden can choose whether to rent an expensive limousine or take a cab, which is observed by PC. For simplicity, cabs are exactly as comfortable as limousines. The demand for limousines in the kingdom will be initially upward-sloping: demand is zero for \( p < p \), every rich maiden wants a limousine if \( p \in [p, p] \), and demand drops to zero if \( p > p \).}

Recall the utilitarian Social Welfare:

\[
SW = U(y_l) + U(y_h - p) + \theta
\]

With \( p = y_l - U^{-1}(U(y_l) - \theta) \). Let’s introduce again a symmetric and regressive redistribution of income (i.e. \( dy_h = -dy_l > 0 \)):

\[
dSW = [U'(y_l) - U'(y_h - p)] dy_l - U'(y_h - p) \frac{dp}{dy_l} dy_l
\]

The first term is negative, due to the decreasing marginal utility. The second term is positive, since the rich type can now achieve the same non-market good with a lower conspicuous expenditure:

\[
dp = \frac{U'(y_l - p) - U'(y_l)}{U'(y_l - p)} dy_l < 0
\]

The benefits from a regressive redistribution, \( -U'(y_h - p) dp \), are increasing in \( \theta \). If \( \theta \) is high enough (i.e. if non-market goods are an important source of happiness) then utilitarian welfare will increase after a regressive redistribution (A6).

Figure 4 illustrates the result. After the redistribution the rich type gains \( b \) from the standard consumption, while the poor loses \( a \). The concavity of the utility function guarantees that \( b - a < 0 \). Notice that by construction the curve \( U(x-p) + \theta \) crosses \( U(x) \) at \( x = y_l \). When we reduce \( y_l \) then \( p \) goes down and the curve \( U(x-p) + \theta \) moves to the left. The difference between the new and the old curve at \( x = y_h \) gives the utility gain for the high type from savings in
conspicuous consumption: c. If \( \theta \) is high enough then \( c > a - b \), so the net welfare impact from the regressive redistribution is positive.

The utility-possibility frontier (UPF) in the absence of non-market goods is identical to the one obtained before, which you can find in the left panel of Figure 5. Every social preference that is symmetric and efficient will indicate perfect income equalization. But when we introduce non-market goods the UPF becomes:

\[
\left\{ \left( U(x_l), U(y_l + y_h - 2x_l + U^{-1}(U(x_l) - \theta)) + \theta \right) \mid x_l \in \left[ 0, \frac{y_l + y_h}{2} \right] \right\}
\]

An example is given in the right panel of Figure 5. The UPF is not symmetric nor convex, and the utilitarian optimal redistribution departs from complete income equalization. Indeed, other papers that studied status concerns and took income exogenously found similar effects. For example, Hopkins and Kornienko (2004, 2007) show that income equality increases wasteful consumption by fostering social competition for status.

However, there are two important drawbacks. First of all, when incomes are endogenous taxes can actually relax the IC constraint. That is, instead of reducing the desire for redistribution, non-market goods may increase it. Secondly, in Section 3 we will reconsider the signaling equilibria in a way that is consistent with both exogenous and endogenous sources of income randomness.

2.3. **Endogenous Income.** We took as given that good traits are positively correlated with income. In a model where income is endogenous we can close the model. There are two types: high productivity \( (\mu_h) \) and low productivity \( (\mu_l < \mu_h) \). If maiden \( i \) exerts effort \( e_i \) then her income will be \( y_i = \mu_i \cdot e_i \), and her disutility from working will be \( c(e_i) = e_i \). Intrinsic utility from the standard good is logarithmic, \( U(x_i) = \ln(x_i) \), and the conspicuous good gives no
intrinsic utility. For the sake of simplicity, maidens will make effort and consumption choices simultaneously (if the decisions were sequential, the PBNE below survives\(^{29}\)).

PC likes productive partners: i.e. he wants to perform the activity only with people of the high type. In the case of the non-market good being respect or admiration, think about PC as representing social approval. People are exposed to such approval of disapproval all the time, and then \(\theta\) would represent the expected utility from enjoying public recognition during your entire life. Just like before, PC faces one maiden at a time, and he observes her conspicuous expenditure \((p_i)\) before deciding whether to perform the activity or not.

PC prefers not to perform the action rather than performing it with a maiden of the low type (his preferences are ordinal, since PC does not care whether \(\mu_h - \mu_l\) is large or small). If you like, you can think about people with "above median" \((\mu_h)\) and "below median" \((\mu_l)\) productivities. As long as types are stable over time, PC’s preferences over types are equivalent if they are ordinal or cardinal. We will take \(\theta\) as given: i.e. the pleasure from being respected or admired is exogenous.

We are looking for the separating Perfect Bayesian Equilibrium. Let’s begin with the optimization problem for an individual of low type. Since in equilibrium they will not get the non-market good, they will choose conspicuous expenditure \(p_l^* = 0\) and effort:

\[
\max_{e_l} \ln(\mu_l \cdot e_l) - e_l
\]

From the FOC: \(e_l^* = 1\). This does not depend on \(\mu_l\) because of the well-know property of the logarithmic utility function that income and substitution effects cancel each other out. Notice that if there was no market for respect, then the high type would work one unit as well.

\(^{29}\)However, some refinements may be in conflict with the off-the-equilibrium beliefs. Intuitively, if the low-type made a low effort in the first period, the high-type would try to make a lower conspicuous consumption in the second period. If PC sees such \(p\), he should conclude that it is coming from a high type (i.e. in that subgame the signal is dominated for the low type). The problem clearly appears because of the discreetness in the type space. Indeed, it disappears in the more general version of the model given in Section 3.
Individuals of the high type want to get $\theta$, so they incur in the conspicuous consumption that makes the Incentive Compatibility condition binding. Given $p$, if a low-type maiden would like to get $\theta$, she would choose an effort:

$$\max_{e_l} \ln(\mu_l \cdot e_l - p) + \theta - e_l$$

From the FOC: $\hat{e}_l = 1 + \frac{p}{\mu_l}$. The conspicuous expenditure has to be such as no individual of the low-type wants to deviate:

$$\ln \left( \mu_l \cdot \left( 1 + \frac{p^*}{\mu_l} \right) - p^* \right) + \theta - \left( 1 + \frac{p^*}{\mu_l} \right) = \ln(\mu_l) - 1$$

So: $p^* = \theta \mu_l$. This is very intuitive: if $\theta$ is greater then the low-type maidens have higher incentives to buy the conspicuous good, so $p$ should increase to deter them from doing so. Similarly, a higher $\mu_l$ would imply a lower cost of imitating the high-type, so $p$ has to increased for deterrence.

We can finally write down the optimization problem of an individual of high-type:

$$\max_{e_h} \ln(\mu_h \cdot e_h - \theta \mu_l) + \theta - e_h$$

From the FOC:

$$e_h^* = 1 + \frac{\theta \mu_l}{\mu_h} > 1$$

The effort of the high-type above 1 $(\theta \mu_h)$ is entirely destined to buy the non-market good. Both $\theta$ and $\mu_l$ increases the need for conspicuous expenditure, which translates in a higher effort by the high type. The consumption of standard goods are: $x_l^* = \mu_l$ and $x_h^* = \mu_h$.

### 2.4. A disgression: observable income.

If income was observable or, equivalently, all the consumption goods were observable, then the model would still be the same. Instead of using a cutoff rule based on $p$, PC would simply use a cutoff rule based on $x$. People would not burn money, but they would still work and consume much more than in absence of the non-market good, which is also a kind of waste. Instead of "burning money" in $z$ and "enjoying money" in $x$, maidens would have a mix of those roles in $x$. One of the advantages of the setup we chose is that it let us differentiate clearly among those two roles.

Imagine $x^*$ is the cutoff rule used by PC. If a low-type maiden wanted to deviate in order to get $\theta$, she would choose $\hat{e}_l = \frac{x^*}{\mu_l}$. Then the Incentive Compatibility constraint becomes:

$$x \geq x^* \equiv \min \{ \exp(\mathcal{W}(-1, -\exp(-\theta - 1)) - \theta - 1) \mu_l, \mu_h \}$$

Where $\mathcal{W}$ is the Lambert $W$ function. The high-type would attain a utility:

$$\ln(x^*) + \theta - \frac{x^*}{\mu_h}$$
As expected, this utility is higher than that attained by using $z$. That is to say, if all consumption goods were observable, then maidens would not want to use $z$ as signaling device. Nonetheless, the utility losses can be actually very small, and the qualitative results of the model are very similar.

However, the model where all consumption goods are observable does not seem even remotely plausible. The version where observable goods are damaged goods (i.e. they provide some intrinsic utility) is probably the most realistic way to go. And we already showed that the model without intrinsic utility is a very close approximation.

This formulation highlight the fact that conspicuous consumption arises just because some conspicuous goods are not observable. But the model is actually about conspicuous production: people work more than they would in absence of non-market goods to signal their talent.

Many authors have documented a growing "inequality" in leisure (e.g. Aguiar and Hurst, 2007). In this simple model leisure inequality is given by $\theta \frac{\mu_h}{\mu_l}$ One explanation would be that non-market goods ($\theta$) have increased. This seems reasonable because standard goods are increasing over time and some non-market goods (e.g. business proposals, leadership) may depend upon them. Also, the decrease in communication may have increased the "market" for respect, admiration, etc. Finally, inequality of talents, $\frac{\mu_h}{\mu_l}$, may have decreased as well.

2.5. Some Rawlsian arithmetics. The usual problem for the government is that efforts and types are not observable. And even if they were observable, if taxes cannot be conditioned on them redistribution would still be distortive. Let’s assume for a second that the government can achieve the first best through a social planner. We will solve the problem for a non-market good $\theta$, and then we will represent the absence of such goods by letting $\theta = 0$.

Once again, assume that maidens have unit measure and high and low types are in equal proportions. Let $\tau_l$ be a transference from the rich to the poor. The social planner maximizes utilitarian welfare:

$$SW = \ln(y_h - \tau_l - p) + \ln(y_l + \tau_l) + \theta - e_l - e_h$$

Because of the concavity in intrinsic utility, we can focus directly on $\tau_l \leq \frac{\mu_h + \mu_l}{2}$. Since the cost function is linear, the planner will force the high-type to make all the effort: $e_l = 0$.30 The maximization problem is then:

$$\max \left\{ e_h \geq 0, \tau_l \leq \frac{\mu_h + \mu_l}{2} \right\} \ln(\mu_h \cdot e_h - \tau_l(2 - \exp(-\theta))) + \ln(\tau_l) - e_h$$

We will get a FOC for optimal consumption smoothing and a FOC for optimal effort. Respectively:

$$\tau_l = \frac{\mu_h e_h}{2 (2 - \exp(-\theta))}$$

30 This property does not affect the results below. For instance, if the cost function was convex, the low-type would work something.
We combine the conditions to get $\hat{e}_h = 2$ and $\hat{\tau}_l = \frac{\mu_h}{2(2 - \exp(-\theta))}$. Because $\hat{e}_h = 2$ the allocation of effort is not distorted by the presence of conspicuous consumption. As a consequence, output can be treated as given and then the implications for redistribution would be exactly the same than those presented when income was treated as exogenous.

To analyze the tax structure, we need to express it in a more intuitive way. Define $\rho$ as the proportion of total income that goes to the high type:

$$\rho = 1 - \frac{1}{2(2 - \exp(-\theta))} \geq \frac{1}{2}$$

In absence of non-market goods $\rho = \frac{1}{2}$ (i.e. perfect income smoothing). The more important the non-market good ($\theta$), the less heavily the government is going to redistribute: $\frac{\partial \rho}{\partial \theta} < 0$. Note that $\rho \leq \frac{3}{4}$, due to the log-utility assumption. Intuitively, if $\rho = \frac{3}{4}$ the income of the high-type is two times the income of the low-type, so the high-type can make the conspicuous expenditure (almost) equal to the disposable income of the low type and then achieve a separating equilibrium with $\theta$ as high as desired. This particular property disappears when lotteries are available.

According to the basic economic models, if redistribution did not distort efforts then governments should prefer complete income smoothing. However, the attention has always been limited to market goods. The efficiency in non-market goods depends directly upon the after-tax income distribution. As a result, even if redistribution did not distort effort, the government would not choose full income equalization. The more important source of happiness the non-market goods are, the more willing the government is to let room for income inequality in the economy.

Consider now the case of optimal redistribution under the usual proportional income tax $0 \leq \tau \leq 1$, which distorts effort choices. As before, we represent the absence of non-market goods by letting $\theta = 0$. In equilibrium the low-type will choose zero conspicuous expenditure and the following effort:

$$\max_{e_l \geq 0} \ln((1 - \tau)\mu_l \cdot e_l + \frac{\tau}{2} \mu_l \cdot e_l^* + \frac{\tau}{2} \mu_h \cdot e_h^*) - e_l$$

FOC: $e_l = 1 - \frac{1}{2} \frac{\tau}{1 - \tau} e_l^* - \frac{1}{2} \frac{\tau}{1 - \tau} \frac{\mu_h}{\mu_l} e_h^*$

Assume that the equilibrium is symmetric:

$$e_l^* = \max \{\hat{e}_l, 0\}, \hat{e}_l = \frac{1}{2} \frac{1 - \tau}{2 - \tau} - \frac{\tau}{2 - \tau} \frac{\mu_h}{\mu_l} e_h^*$$

\[^{31}\text{For instance, in the complete-equalization case the high type has to spend so much in conspicuous consumption that in net terms she does not gain any utility at all from the non-market good.}\]
Individuals of the high type want to get $\theta$, so they incur in the conspicuous consumption that makes the IC constraint binding. Given $p$, if a low-type maiden wanted to deviate to get $\theta$, she would choose an effort:

$$\max_{e_l \geq 0} \ln((1 - \tau)\mu_l e_l + \frac{\tau}{2} \mu_l e_l^* + \frac{\tau}{2} \mu_h e_h^* - p) + \theta - e_l$$

From the FOC:

$$\tilde{e}_l = \begin{cases} 
 e_l^* + \frac{p}{(1 - \tau)\mu_l} & \text{if } e_l^* > 0 \\
 \max\{\tilde{e}_l^*, 0\} & \text{if } e_l^* = 0
\end{cases}$$

$$\tilde{e}_l^* = \frac{(1 - \tau)\mu_l - \frac{\tau}{2} \mu_h e_h^* + p}{(1 - \tau)\mu_l}$$

Notice that if $e_l^* > 0$ then $\tilde{e}_l > 0$. The conspicuous expenditure has to be such as no individual of the low-type wants to deviate:

$$\ln((1 - \tau)\mu_l \tilde{e}_l + \frac{\tau}{2} \mu_l e_l^* + \frac{\tau}{2} \mu_h e_h^* - p) + \theta - \tilde{e}_l$$

$$= \ln((1 - \tau)\mu_l e_l^* + \frac{\tau}{2} \mu_l e_l^* + \frac{\tau}{2} \mu_h e_h^*)$$

If $e_l^* > 0$ (so $\tilde{e}_l > 0$), then:

$$p^* = \theta(1 - \tau)\mu_l$$

Progressive redistribution decreases the cost of conspicuous consumption: $\frac{\partial p^*}{\partial \tau} < 0$. Intuitively, if a low-type wants to deviate, then she can only use a share $(1 - \tau)$ of the additional income she gets from working harder ($\tilde{e}_l$). As a consequence, the IC constraint is relaxed and conspicuous expenditure can be lowered. Since conspicuous expenditure is a "waste" of money, society benefits from taxation through this channel.

In the other extreme case $e_l^* = 0$ and $\tilde{e}_l^* \leq 0$:

$$p^* = \frac{\tau}{2} \mu_h e_h^* (1 - \exp(-\theta))$$

Here taxation increases conspicuous expenditure (for a given $e_h$). Since the low type do not work, not even if they wanted to buy the conspicuous good, they rely completely on the redistribution from the high type to imitate them. By increasing $\tau$ the IC constraint is tightened, not relaxed. Taxation is harmful to society through the conspicuous consumption channel, just like in the case of exogenous income.

If $\tilde{e}_l < 0$ and $\tilde{e}_l^* > 0$:

$$p^* = \left\{-\ln \left( \frac{e_h^* \frac{\tau}{2} \mu_h}{1 - \tau \mu_l} \right) + \theta - 1 \right\} (1 - \tau)\mu_l + \frac{\tau}{2} \mu_h e_h^*$$

In this intermediate case there is a combination of the effects from the two previous cases, so the net effect of taxation on conspicuous expenditure (holding $e_h$ fixed) is ambiguous.
We can finally write down the optimization problem of the high type:

$$\max_{e_h \geq 0} \ln((1 - \tau)\mu_h \cdot e_h + \frac{\tau}{2} \mu_l \cdot e_l^* + \frac{\tau}{2} \mu_h \cdot e_h^* - p^*) + \theta - e_h$$

From the FOC, and assuming symmetric equilibria:

$$e_h^* = \frac{1 - \tau}{2 - \tau} - \frac{\tau}{2} \frac{\mu_l}{\mu_h} e_l^* + \frac{1}{2} \frac{2}{\mu_h} p^*$$

If $e_l > 0$:

$$e_h^* = \frac{2 - \tau}{2} - \frac{\tau}{2} \frac{\mu_l}{\mu_h} + \frac{2 - \tau}{2} \frac{\mu_l}{\mu_h} \theta(1 - \tau)\mu_l$$

$$e_l^* = \frac{2 - \tau}{2} - \frac{\tau}{2} \frac{\mu_l}{\mu_l} - \frac{\tau}{2} \theta(1 - \tau)\mu_l$$

It follows immediately that $e_h^* > 0$. To check that $e_l > 0$ in the first place:

$$\tau < \tau_1 \equiv \frac{\mu_l + \theta \mu_l^2 + \mu_l - \sqrt{\mu_l^2 + 2\theta \mu_h \mu_l^2 + 2\mu_h \mu_l + \theta^2 \mu_l^4 - 6\theta \mu_l^3 + \mu_l^2}}{2\theta \mu_l^2}$$

Now assume $e_l < 0$ and $e_l' > 0$:

$$e_h^* = 1 + \frac{\mu_l}{\mu_h} \left\{- \ln \left( e_h^* \frac{1}{2 - \tau} \frac{\mu_l}{\mu_l} \right) + \theta - 1 \right\}$$

We cannot solve explicitly for $e_h^*$, but it is still straightforward to check $e_h^* > 0$. Finally, if $e_l' < 0$:

$$e_h^* = \frac{1 - \tau}{2 - 2\tau + \tau \exp(-\theta)}$$

Where $e_h^* > 0$. To see when we have $e_l' < 0$ to begin with:

$$\tau \geq \tau_2 \equiv \frac{2}{\left( \frac{\mu_l}{\mu_l} - 1 \right) \exp(-\theta) + 2}$$

Up to know we assumed that the high type finds it better to get the conspicuous good. That might not be true, in which case we must jump to another equilibrium. You can find the results in A9.

Figure 6 shows the results for $\theta = 0$ (left) and $\theta = 1.5$ (right), with $\mu_l = 1$ and $\mu_h = 2$ (the qualitative results are the same for other parameter choices). Notice that $\theta = 1.5$ is a relatively large value: individuals of the high type are spending about half of their disposable income in conspicuous goods. Secondly, even though the utilitarian optimal tax rate is zero when $\theta = 0$, when non-market goods are present the optimal tax rate is positive.

We already saw the reason: an increase in the tax rate can relax the IC constraint and then achieve substantial savings in conspicuous consumption. Indeed, for large values of $\theta$ this effect is so strong that some taxes can be pareto-improving. The mirror image of the savings in
conspicuous consumption is the decrease in effort by the high type, who were working too much because of the competition for the non-market goods.

In Figure 7 we show the optimal taxes for \( \theta \in [0, 2] \), with \( \mu_l = 1 \) and \( \mu_h = 2 \). The left panel shows the tax rate that maximizes \( U_h \) (lighter), \( U_l \), \( U_h + \frac{3}{4} U_l \), \( \frac{1}{2} U_h + \frac{1}{4} U_l \), \( \frac{1}{4} U_h + \frac{3}{4} U_l \) and \( U_l \) (darker). Notice that the optimal tax rates are increasing in \( \theta \) (i.e. because they bring about decreased competition for non-market goods). For \( \theta > 1 \) the preferred tax rates by the high-type are positive, which means that such taxes are welfare-improving. This is a usual result in the literature (e.g. Ireland, 1994, 1998, 2001), except that in our model it arises with endogenous relative concerns.

Looking at how \( \tau^* \) changes with \( \theta \) is not very informative about the after-tax distribution of incomes, since efforts (and then output) respond to \( \tau \). The right panel in Figure 7 shows the disposable income of the high type as a share of total income, \( \rho \). The optimal income inequality is increasing in \( \theta \) for all the welfare criteria: i.e. the more important the non-market good the more willing a social planner (even a Rawlsian one) is to allow for income inequality in the economy (recall that this result applied also for the case of exogenous income).

The bottom line is that taxation seems an attractive policy because of its capability of relaxing the IC constraint and then reducing the social waste in conspicuous consumption. However, taxation is a two-edged knife, since it may make the separating equilibrium collapse. Conspicuous goods are informational goods: they have value as long as they contain information about talents. In the next Section we will incorporate exogenous and endogenous randomness.

\[ 32 \text{ Note that } \frac{1}{4} U_h + \frac{1}{4} U_l \text{ corresponds to the utilitarian case, and } U_l \text{ to the Rawlsian case.} \]
in the income generating process. Under those (much more realistic) conditions, the welfare implications from income taxation are very different.

This model is overly simple, but it is still useful to understand some basic results. In the first place, imagine that there were public goods whose utility was separable. This is a very strong assumption that applies only partially to a handful of cases (e.g. national defense). If some of the redistribution goes to the public good, then less of the tax revenues from income taxes go to the poor individuals and the IC constraint is relaxed. That is to say, public goods increase the desirability of taxation in the model.\textsuperscript{33}

Secondly, there may be substantial incentives to introduce non-linear taxes. Intuitively, in the model without non-market goods the social planner chooses the tax scheme (one parameter in the linear case, $\tau$) that influence two endogenous variables, $e_l^*$ and $e_h^*$. In presence of non-market goods the planner has an extra reason to benefit from a richer tax scheme, since it also affects the low-type best deviation, $\hat{e}_l$, which in turn determines $p^*$. Indeed, we explore quadratic taxes in the richer model of Perez Truglia (2010).

Notice that income taxes and a consumption taxes are equivalent in this model. However, a specific tax on conspicuous goods could be very beneficial. In the extreme case, we could tax conspicuous goods at a 100\% rate, so the conspicuous good becomes a "certificate" from the government. The conspicuous expenditures, instead of getting burned, gets transferred to the poor and then there is no waste. However, there are plenty of practical reasons that seriously limits the benefits from such taxes. We will discuss them extensively in Section 4.

3. Incorporating lotteries and luck

"Get Rich or Die Tryin'" 50 Cent (American rapper)

Friedman (1953) and Friedman and Savage (1948) first introduced the idea of a concave-convex-concave utility function. They suggested that the convexity could be explained by discontinuities in the choice set, which was later developed by Rosen (1997). Few papers have

\textsuperscript{33}For most public goods in the real-world there is at least some crowding-out (e.g. more public education decreases private education), so this result would wear off.
explored this line of research. Robson (1992) is one notable exception, who elaborated on the assumption that utility is concave in money but convex in income rank (e.g. being first rather than second is more satisfying than being second rather than third). Becker et al. (2005) took a similar approach by assuming that higher status raises the marginal utility from income.

However, in all those papers the source of the convexity is assumed in a reduced-form fashion. Instead, our theory of persistent inequality has an endogenous motive: the allocation of non-market goods. In our signaling game the very concavity of the intrinsic-utility function will end up generating the convexity in the value function (through the IC constraint).

There is substantial anecdotal and statistical evidence on risk-loving behavior. The typical example is that of raffles. However, there are much more important choices regarding risk, like that of career choice. For instance, Moskowitz and Vissing-Jorgensen (2002) studied the so-called Private Equity Premium Puzzle. They estimated the return to entrepreneurial investment using data from the Survey of Consumer Finances and the Flow of Funds Accounts and National Income and Product Accounts. They found that the average return to all private equity is similar to that of the public market equity index, despite the private equity of being much riskier.

In a similar spirit, Hamilton (2000) uses data from Survey of Income and Program Participation. He estimates that earnings of the self-employed are substantially smaller than earnings of workers (the median earning differential in 10 years is 35%), yet they have a higher variance. The modes does not only provide a clear explanation for such risk aversion, but it also explains the empirical discrepancy between moderate-stake and large-stake risk aversion.

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34 Even the most conservative life choices are subject to substantial randomness. Even if individuals were risk-lovers it would not necessarily follow that they would buy lotteries: they could simply not buy as much insurance as they could.

35 This is not a minor puzzle: they report that the total value of private equity is similar in magnitude to the public equity market.
See Figure 8, which shows the \( p \) that makes the IC constraint binding: i.e. the unique price such as the curve \( U(x - p) + \theta \) crosses \( U(x) \) at \( x = y_l \). Notice that the implied value function is given by the upper envelope: \( V(y) = \max \{ U(y - p) + \theta, U(y) \} \). The value function is by construction convex around \( y_l \), so the poor type would like very much to buy risk. Let \( y_1 \) denote the point where the value function becomes concave again (see Figure 8). If \( y_h < y_1 \) then the rich type will also like to buy risk.

If either the rich or the poor type buys a lottery, then PC would like to revise his strategy. Otherwise, he would end up performing the action with some maidens of the low type with positive probability, and performing the action with maidens of the high type with probability less than one.

Therefore, we must abandon the pure-separating equilibrium and replace it by a semi-separating one. Take \( \theta \) as given, and assume PC will perform the activity for conspicuous expenditures equal or greater than \( p \). Now maidens must decide whether to participate in a lottery and whether to buy the conspicuous good (contingent on the outcome of the lottery). The value function for the maidens would be linear in the region \( [y_0, y_l] \) (i.e. the dotted line in Figure 8). A maiden with \( y \in [y_0, y_1] \) would buy the following fair\(^{36} \) lottery:

\[
\begin{align*}
&\begin{cases}
y_1 & \text{with probability } q = \frac{y - y_0}{y_1 - y_0} \\
y_0 & \text{with probability } 1 - q
\end{cases} \\
&\text{if } y < y_0 \\
&\text{if } y_0 \leq y \leq y_1 \\
&\text{if } y > y_1
\end{align*}
\]

Which gives rise to the after-lottery value function:

\[
V_a(y) = \begin{cases}
U(y) & \text{if } y < y_0 \\
(1 - q)U(y_0 - p) + q[U(y_1 - p) + \theta] & \text{if } y_0 \leq y \leq y_1 \\
U(y - p) + \theta & \text{if } y > y_1
\end{cases}
\]

See Figure 8. We can compute \( y_0 \) and \( y_1 \). Notice that by construction the slopes of the value function at \( y_0 \) and \( y_1 \) must be the same. That means \( y_1 - y_0 = p \). Also by construction:

\[
U(y_0) + U'(y_0)[y_1 - y_0] = U(y_1 - p) + \theta
\]

Combining both conditions:

\[
y_0 = U\left( \frac{\theta}{p} \right) ; \quad y_1 = U\left( \frac{\theta}{p} \right) + p
\]

A maiden with income \( y \) will buy the conspicuous good with probability:

\[
q(y; p) = \begin{cases}
0 & \text{if } y < y_0 \\
\frac{y - U'(\frac{\theta}{p})}{p} & \text{if } y_0 \leq y \leq y_1 \\
1 & \text{if } y > y_1
\end{cases}
\]

Conditional on observing the conspicuous consumption \( p \), PC must infer that the probability of coming from a high type is:

\(^{36}\) The analysis is very similar if lotteries are unfair.
\[ P(p) = \frac{q(y_h; p)}{q(y_h; p) + q(y_l; p)} \]

Assume PC's utility has the von Neumann-Morgenstern form, so we can normalize the utility from not performing the activity to zero, and denote \( \kappa_H > 0 \) and \( \kappa_L < 0 \) to the utilities from performing the activity with a maiden of high and low type, respectively. Recall that we are interested in the case \( \kappa_L < -\kappa_H \): i.e. PC would prefer not to perform the activity rather than performing it with a random individual.

We have a continuum of semi-separating PBE indexed by \( p^* \), where:

I. The maiden of type \( j \) buys the conspicuous good \( p^* \) with probability \( q(y_j; p^*) \).

II. If PC observes \( p \geq p^* \) his belief that the maiden is of the high type is \( P(p) \), and zero otherwise.

III. PC performs the activity iff \( p \geq p^* \), and \( p^* \) is such \( P(p^*) \cdot \kappa_H + (1 - P(p^*)) \cdot \kappa_L \geq 0 \).

There is not a pareto-best equilibrium anymore, since there is a trade-off between utils of PC and utils of the maidens. We will choose \( p^* \) to be the one that corresponds to the solution of the screening version of the game. The strict theoretical reason is that it is the one equilibrium that is "equivalent" to the pure-separating equilibrium without lotteries we studied before.\(^{37}\)

The screening equilibrium is the one that maximizes PC's expected welfare:

\[ p^* = \arg \max_P q(y_h; P) \kappa_H + q(y_l; P) \kappa_L \]

Where is straightforward to show that \( p^* \) is unique. We cannot discuss the economic reasons in depth because those vary across different non-market goods. Since this model is meant to aggregate over all of the non-market goods, we would need to pin down the "average" argument. Intuitively, this equilibrium choice gives all the bargaining power to PC.

On the other hand, we call "equalizing" equilibrium to the case where maidens have all the bargaining power:

\[ p^* : q(y_h; p^*) \kappa_H + q(y_l; p^*) \kappa_L = 0 \]

It is easy to show that \( p^* \) is unique. In practice it does not matter that much whether we make one of the extreme assumptions or anything in-between. We will introduce a more realistic setup with exogenous income randomness and taxation, which makes the correlation between income and talent becomes weaker and then reduces the set of \( p* \) that give PC positive expected utility. Thus, the \( p^* \) of the screening and equalizing equilibriums (and so do all the intermediate cases) converge to each other. In other words, the more realistic assumptions will end up making the equilibrium choice a less relevant issue.

Let’s incorporate the richer assumptions. Firstly, there are only two types but a continuum of incomes distributed \( g(y) \) in the interval \([y_l, y]\). Secondly, the mapping between types and

\(^{37}\)For instance, the equalizing equilibrium we present below appeared as a semi-separating equilibrium in the game without lotteries. Nonetheless, not all the refinements for signaling games (e.g. Intuitive Criterion) suggest the same equilibrium for this game.
incomes is stochastic: the probability of being of the high type conditional on income $y$ is $f(y)$, where we only assume $f'(\cdot) > 0$.

Then $p^*$ would be given by:

$$\max_p \kappa_H \int_0^y q(y; p) f(y) g(y) dy + \kappa_L \int_0^y q(y; p) (1 - f(y)) g(y) dy$$

For the sake of simplicity, let intrinsic utility will be logarithmic:

$$q(y; p) = \begin{cases} 
0 & \text{if } y < \frac{p}{\theta} \\
\frac{y}{p} - \frac{1}{\theta} & \text{if } \frac{p}{\theta} \leq y \leq \frac{p + 1}{\theta} \\
1 & \text{if } y > \frac{p + 1}{\theta}
\end{cases}$$

Maidens with $y \in [\frac{p}{\theta}, \frac{p + 1}{\theta}]$ will make bets to each other, so the market for risk clears. The inequality due to those bets is "self-generated." Finally, assume $\kappa_L = -\kappa_H = \kappa$:

$$\max_p \kappa \left[ \int_{\min\{\frac{p + 1}{\theta}, \bar{y}\}}^{\min\{\frac{p + 1}{\theta}, y\}} \left( \frac{y}{p} - \frac{1}{\theta} \right) (2f(y) - 1) g(y) dy + \int_{\min\{\frac{p + 1}{\theta}, \bar{y}\}}^{\bar{y}} (2f(y) - 1) g(y) dy \right]$$

Assume $y$ is uniformly distributed on $[0, 1]$. And let $f(y) = a + by$, where $0 < a < \frac{1}{2}$ and $0 < b < 1 - a$, so $f(y) \in (0, 1)$. The interesting case is when $a + \frac{b}{2} < \frac{1}{2}$, so PC would prefer not to perform the action rather than performing it with a random individual. We also need $a + b > \frac{1}{2}$, otherwise PC would not like to perform the activity even with the richest individual. We will show the results for $a = 0$, with $b \in \left(\frac{1}{2}, 1\right)$, simply because of the notational simplicity.

For all $p > \theta$ not even the richest maiden will buy the conspicuous good, so PC attains zero expected utility. We have two cases left. First:

$$\max_{p \in [0, \frac{1}{\theta + 1}]} b - 1 + p \frac{\theta + 2}{\theta} - p^* \frac{b}{\theta^2} \left( 1 + \theta + \frac{1}{3} \theta^2 \right)$$

From the FOC:

$$p^* = \frac{1}{4b} \frac{\theta^2 + 2\theta}{1 + \theta + \frac{\theta^2}{3}}$$

We need to see if $p < \frac{\theta}{\theta + 1}$ in the first place. That happens whenever $\theta < \bar{\theta}$, where:

$$\bar{\theta} = \begin{cases} 
-\frac{12b - 9 + \sqrt{144b^2 + 24b + 9}}{-6 + 6b} & \text{if } b < \frac{3}{4} \\
\infty & \text{if } b \geq \frac{3}{4}
\end{cases}$$

The case left is:

$$\max_{p \in \left[\frac{1}{\theta + 1}, \theta\right]} \frac{1}{\bar{\theta}} \left( 1 - \frac{p}{\bar{\theta}} \right) - \left( \frac{1}{2p} + \frac{b}{\bar{\theta}} \right) \left( 1 - \frac{p^2}{\bar{\theta}^2} \right) + \frac{2b}{3p} \left( 1 - \frac{p^3}{\bar{\theta}^3} \right)$$

From the FOC we obtain:
Figure 9. Equilibrium for $\theta \in [0, 2]$, with $b = 0.65$.

$$p^* = -\theta \frac{-3 + 4b - \sqrt{9 + 24b - 48b^2}}{8b}$$

Where it is straightforward to obtain the conditions for $p^* \in \left[\frac{\theta}{c_T}, \theta\right]$. From both cases you can see that $p^*$ is decreasing in $b$ and increasing in $\theta$, as expected. The greater $b$ the greater the proportion of individuals that are talented, so PC will want to reach a higher share of the population by reducing the required conspicuous consumption. The greater $\theta$ the more incentives for the low-type to buy the conspicuous good, so $p^*$ must increase to maintain deterrence.

The share of individuals of high type buying the conspicuous good is given by:

$$c_h = \frac{b}{3p} \left( \min \left\{ p\frac{\theta + 1}{\theta}, 1 \right\}^3 - \frac{p^3}{\theta^3} \right) + \frac{b}{2\theta} \left( \frac{p^2}{\theta^2} + \theta - (\theta + 1) \min \left\{ p\frac{\theta + 1}{\theta}, 1 \right\}^2 \right)$$

We are also interested in the share of individuals buying risk, which is given by $p^*$ if $\theta < \hat{\theta}$ and by $\frac{\theta - p^*}{\theta}$ otherwise. As before, we want a behavioral measure of how large $\theta$ is. We do so by measuring $\bar{p}$, which is the average income share spent in conspicuous goods (for those who buy some):

$$\bar{p} = \frac{\theta}{\theta + 1} \frac{q}{\theta} - p \ln(\min \left\{ p\frac{\theta + 1}{\theta}, 1 \right\})$$

The results are illustrated by Figure 9, where we fix $b = 0.65$ and $\theta \in [0, 2]$.

Notice that a higher $\theta$ decreases PC’s utility. Intuitively, the IC constraint becomes tighter and then it becomes more difficult for PC to match maidens of high type. Both types benefit from a higher $\theta$. However, utility only increases a fraction of $\theta$, since there is a waste in conspicuous
goods. Indeed, there is an endogenous upper limit to how much \( \theta \) can benefit maidens (in Section we had to introduce a limit exogenously). In other words, endogenous and exogenous randomness make the IC constraint so tight that it leaves a limited scope to enjoy non-markets good.

We also calculated income inequality as the variance of the final income distribution (the mean is always the same, so we do not need to normalize). The greater \( \theta \) the greater share of the population that trades risk. As a direct result, income inequality goes up with \( \theta \), which we call self-generated inequality.

3.1. Rawlsian arithmetics. Let’s introduce a proportional income tax, \( \tau \). The problem is exactly the same, except that incomes will now be uniformly distributed between \( \tau \) and \( 1 - \tau \). You can find the calculations in A10.

The resulting UPF is depicted in Figure 10. Notice that we did not include regressive taxes (\( \tau < 0 \)), which explains why the UPF on the right is a vertical line. The qualitative result is the same than in the model of Section 2. The social planner would choose complete income equalization in absence of the non-market good, but it prefers to allow for a substantial deal of inequality when non-market goods are present. The reason is simple: the extent to which the high type can profit from non-market goods depends directly upon the degree of income inequality.

You can see another version of the same fact in the left panel of Figure 11. In the right panel we show the (after-tax) income inequality. Inequality is always greater with than without non-market goods, as expected. Since income is exogenous, the extra inequality is "self-generated." Also, in absence of non-market goods inequality is strictly decreasing in the tax rate. But in presence of non-markets goods maidens trade risk to counteract the equalizing effects of
taxation. Indeed, this effect is so large that it generates a U-shape relationship between tax rate and inequality.\footnote{Nonetheless, later we show that when income is endogenous risk-trading counteracts the equalizing effects of taxation, but rarely as strongly as to revert its sign.}

3.2. Continuous case. One key implication of the model is that the rich are buying risk but the poor are not. This is actually a poor prediction due to the overly simple model we are using. In the model of next section there is a continuum of types, so people with "middle-incomes" will be the ones willing to buy risk. But we need a much richer model.

However, you may want to think of the model as taking place within a certain reference group (e.g. a geographical or societal slice of the economy). In that case people with "middle-incomes" in each reference group would buy risk (who in absolute terms can be very rich or poor). Yet choosing reference groups is actually part of conspicuous consumption (e.g. living in an expensive neighborhood). We need a more realistic model to provide more accurate predictions about attitudes towards risk.

The problem with the above model is basically that part of the demand for risk is coming from the discreetness of PC’s action space. We focused on such stylized model because of its tractability and easiness to interpret. In another paper we have more general versions of the results (Perez Truglia, 2010). As an intermediate step, in this subsection we will show that the demand for risk does not rely on the discrete nature of the type space, nor in the discrete nature of PC’s action space. The most important result is the following: the SOC of the individual maximization problem can be satisfied and still the value function be very convex.

There is a continuum of non-market goods. Instead of facing one PC with certain probability, the maidens have a density distribution over a continuum of Princes Charming (PCs), one for each non-market good. When facing a maiden, each PC must take a (continuous) action $a_j \in A_j$. The action can be conditioned on the only observable information: total conspicuous consumption by the maiden ($p$).
CONSPICUOUS CONSUMPTION

There are two things that differentiate PCs from each other. On the one hand, different PCs may have different preferences over the types of maidens they want to perform the activity with: the utility of PC $j$ from performing activity $a$ with a maiden of type $t$ is $G(a, t)$. Let $y = g(t)$ represent the deterministic mapping between income and types. Let $p = f^{-1}(y)$ be the equilibrium conspicuous expenditure of the maidens as a function of income. We can then obtain the optimal action as a function of conspicuous consumption: $a_j^*(p) = \arg \max_a G(a, g^{-1}(f^{-1}(p)))$.

The second dimension that may differentiate PCs from each other is how valuable their non-market goods are. The utility for the maiden from performing activity $a$ with PC $j$ is: $R(a, v_j)$, where $v_j$ is a PC-specific parameter. We expect $R'_a > 0$ and $R'_v > 0$. If PCs are expecting the maidens to act according to: $p = f^{-1}(y)$, then the expected utility from non-market goods for a maiden with income $y$ is: $\theta(p) = E[R(a_j^*(p), v_j)]$, where the expectation is over $j$. The function $\theta(p)$ is the indirect utility from conspicuous expenditure.\footnote{Note that in the first model $\theta(p)$ was a step-function: $\theta$ if $p \geq p_b$ and 0 otherwise.}

With this formulation we can highlight how misleading it is to make reduce-form assumptions about $\theta(p)$, since its shape depends heavily on endogenous variables: e.g. effort choices (which determine $g(\cdot)$) and consumption choices (which determine $f(\cdot)$). Also, the curvature of $\theta(p)$ does not depend exclusively on the preferences of PC (e.g. the curvature of $G(\cdot)$), but it also depends to a great extent on the curvature of $U(\cdot)$ (i.e. through $f(\cdot)$).

We want to keep this as a stylized example, so we will not provide an explicit model for PC’s problem. Let $\theta(p)$ be a candidate for a separating equilibrium. The problem of a maiden with income $y$ is:

$$\max_p U(y - p) + \theta(p)$$

From the FOC: $y = f(p) = U'^{-1}(\theta(p)) + p$. Denote the value function:

$$V(y) = U(y - f^{-1}(y)) + \theta(f^{-1}(y))$$

Take the second derivative:

$$V''(y) = U''(y - f^{-1}(y)) \left(1 - f^{-1}(y)\right)^2 - f^{-1}(y)U'(y - f^{-1}(y)) + \theta''(f^{-1}(y))f^{-1}(y) + \theta'(f^{-1}(y))f^{-1}(y)$$

The SOC of the maximization problem can be satisfied and still $V(y)$ can be very convex. We will prove this by providing a simple counter-example. Consider logarithmic intrinsic utility and $y \in [1, 1.25]$.\footnote{This and other very particular normalizations serve the only purpose of making the notation as concise as possible.} If incomes were public information, then the actions of the PCs would generate the following expected utility from non-market goods:

$$\Psi(y) = \frac{1}{8} \left(1 + y + \sqrt{3 + 2y + y^2}\right)^2$$
Notice that $\Psi(\cdot)$ is monotonically increasing and strictly concave. Since incomes are not observable, maidens must incur in conspicuous consumption as a signaling device. Let $p = f^{-1}(y)$ be the optimal conspicuous consumption as a function of income. Then the PCs will use $y = f(p)$ as a revelation mechanism, resulting in:

$$\theta(p) = \Psi(f(p))$$

The consumption problem for a maiden with income $y$ is:

$$\max_p \ln(y - p) + \Psi(f(p))$$

FOC: $y = \frac{1}{\Psi'(f(p))} + p$.

Since this must be true for every $y$:

$$f(p) = \frac{1}{\Psi'(f(p))} + p$$

Since 1 is the minimum income, we should have $f(0) = 1$. It is straightforward to verify that $f(p) = \frac{1}{1 + p} + p$ is a solution to this differential equation. It is also straightforward to check that the SOC of the maximization problem is satisfied. Finally, we can compute the value function:

$$V(y) = \ln(y - f^{-1}(y)) + \Psi(y)$$

Which is a convex function of $y$, as we anticipated. This means that the above cannot be a separating equilibrium: if the PCs were to keep the $a^*_j(p)$ that led to $\theta(p)$, all maidens would invest their entire incomes in lotteries giving the extreme outcomes 1 and 2.5, so the joint distribution of talents and incomes would change dramatically and $a^*_j(p)$ would not be a best response.

We hope it is now clear that the continuous model is much less tractable, the intuitions are harder to grasp, and we are restricted to functional form assumptions that have to do with the system of differential equations being solvable and not with the economic nature of the problem. Nonetheless, in Perez Truglia (2010) we incorporate these and other realistic assumptions with both analytic results and numerical methods.

3.2.1. Interpreting risk aversion. The key result above is that the value function can be much less concave than the intrinsic utility function, and even convex. This can explain the discrepancy between moderate-stake and large-stake risk aversion.

In the spirit of Chetty and Sziefal (2007), it is very difficult and costly to make temporary adjustments in the consumption of conspicuous goods (e.g. gold watches and Ferraris). As a consequence, when people face a small-stake lottery, they know they are going to spend (cut spending) the winnings (looses) in standard consumption. The measured risk aversion will then correspond to their intrinsic utility, which can be very high. On the contrary, when stakes are

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41In the discrete model $\Psi(\cdot)$ was a step function (and then convex).
large they adjust both standard and conspicuous consumption, so the risk aversion is that of the value function: much lower and even negative.\(^{42}\)

3.3. **Endogenous income.** There is a continuum of individuals with types \(\mu_i\) uniformly distributed in \([\mu_1, \mu_h]\). Intrinsic utility is logarithmic. An individual that makes an effort \(e_i\) pays a utility cost \(-\theta e_i\) and gets a random income uniformly distributed in \([0, e_i\mu_i]\). The maiden gets an extra \(\theta\) if he performs the activity with PC. PC’s utility is normalized to zero if he does not perform the activity, and he gets \(\kappa (\mu - \mu)\) if performing the activity with a maiden of type \(\mu\), where \(\mu \in [\mu_1, \mu_h]\).

On the one hand, PC will choose the threshold \(p^*\): i.e. he performs the activity with a given maiden if he observes \(p \geq p^*\). On the other hand, in the symmetric equilibrium an individual of type \(\mu\) will choose an effort \(e(\mu)\), a fair lottery, and whether to buy the conspicuous good \(p\) or not (conditional on the outcome of the lottery).

Begin by taking \(p\) as given, and recall \(q(y)\) from before. Now let \(\phi_1 = \min \{ \frac{p}{\theta}, e_i\mu_i \} \), \(\phi_2 = \max \{ \frac{p^{\theta + 1}}{\theta}, e_i\mu_i \} \) and \(\phi_3 = \max \{ p^{\theta + 1}, e_i\mu_i \} \). The problem for maiden \(i\) is:

\[
\max_{e_i \geq 0} \int \frac{\phi_2}{\theta} \ln \left( \frac{y}{\theta} \right) \left( 1 - \frac{y}{\theta} + \frac{1}{\theta} \right) + \left( \ln \left( \frac{p^{\theta + 1}}{\theta} - p \right) + \theta \right) \left( \frac{y}{\theta} - \frac{1}{\theta} \right) dy +
\int \int_{\phi_1}^{\phi_2} \frac{\ln (y)}{e_i\mu_i} dy + \int_{\phi_2}^{\phi_3} \frac{\ln \left( y - p + \theta \right)}{e_i\mu_i} dy
\]

The problem can be decomposed into three different sub-problems. The first sub-problem:

\[
\max_{e_i \in \left[ 0, \frac{1}{\mu_i} \right]} \int_{0}^{\phi_1} \frac{\ln (y)}{e_i\mu_i} dy - e_i
\]

From the FOC: \(e_i^* = 1\). The second sub-problem:

\[
\max_{e_i \in \left[ \frac{1}{\mu_i}, \frac{p^{\theta + 1}}{\mu_i} \right]} \frac{p^2 - \theta^2 e_i^2 \mu_i^2 - e_i\mu_i 2\theta p \ln \left( \frac{p}{\theta} \right) - 1 + 2 \theta e_i^2 \mu_i p}{2p\theta e_i\mu_i}
\]

Which also has an explicit solution. For the third sub-problem, \(e_i > \frac{1}{\mu_i} p^{\theta + 1}\), we cannot provide an explicit solution but we can show the solution exists and is unique. In summary, we will have:

\[
e_i = \begin{cases} 
1 & \text{if } \mu_i \leq \hat{\mu}(p) \\
e(\mu_i) & \text{if } \mu_i > \hat{\mu}(p)
\end{cases}
\]

Recall that we chose the signaling equilibrium to be the one corresponding to the screening equilibrium. Let \(\hat{\mu}(p) = \max \{ \hat{\mu}(p), \mu_i \} \). PC will solve:

\(^{42}\)An equivalent argument would be that there are cognitive cost from maximizing, so people want to maximize locally (i.e. revise standard consumption) when stakes are not very high, but move over the envelope (i.e. revise also conspicuous consumption) when stakes are high.
Figure 12. Equilibrium for $\theta \in [0, 2]$, with $\mu_l = 1$, $\mu_h = 2$ and $\bar{\pi} = 1.65$.

$$\max_p \frac{\kappa}{\mu_h - \mu_l} \int_{\mu_l(p)}^{\mu_h} (\mu - \bar{\pi}) \int_{\bar{\pi}}^{e(\mu)\mu} \frac{g(y)}{e(\mu)\mu} dy d\mu$$

Where $g(\cdot)$ is given by the usual formula. If we wanted the other equilibrium notion, we would need to find the minimum $p$ that makes the above objective function equal to zero.

The objective function is continuous and globally concave in $p$, so it has a unique global maximum. In Figure 12 we show the results for $\theta \in [0, 2]$, with $\mu_l = 1$, $\mu_h = 2$ and $\bar{\pi} = 1.65$. The intuitions are the same than the ones we saw for the model with endogenous income in Section 2.\footnote{There is only one significative difference. In the former model maidens of the low type never got the non-market good, so they could not benefit from an increase in $\theta$ (unless there was taxation). On the contrary, in this model some $\mu_i < \bar{\pi}$ get the non-market good with positive probability.}

Moreover, if we repeat the exercise but replacing the screening by the equalizing equilibrium we get an extremely similar picture.

3.4. Further Rawlsian arithmetics. Now we have to repeat the procedure, but incorporating a proportional income tax: $0 \leq \tau \leq 1$. Let $\bar{y}$ be the (expected) mean income. Denote:

$$\phi_1 = \max \left\{ \min \left\{ \frac{p}{\theta} - \tau \bar{y}, e_i \mu_i (1 - \tau) \right\}, 0 \right\}$$

$$\phi_2 = \max \left\{ \frac{p}{\theta} - \tau \bar{y}, \min \left\{ \frac{\theta + 1}{\theta} - \tau \bar{y}, e_i \mu_i (1 - \tau) \right\}, 0 \right\}$$

$$\phi_3 = \max \left\{ \frac{\theta + 1}{\theta} - \tau \bar{y}, e_i \mu_i (1 - \tau), 0 \right\}$$

The problem for maiden $i$ is:
Figure 13. Equilibrium for $\theta \in \{0, 2\}$ and $\tau \in [0, 0.95]$, with $\mu_l = 1$, $\mu_h = 2$ and $\bar{\mu} = 1.65$.

We can split up this problem into sub-problems, as we did before. Denote $e(\mu, \bar{\mu})$ to the solution. A symmetric equilibrium is defined by the following fixed point:

$$
\max_{e_i \geq 0} \int_{\bar{\mu} - \tau \bar{\mu}}^{\phi_2} \ln \left( \frac{\bar{\mu}}{\mu} \right) \left( 1 - \frac{\mu + \tau \bar{\mu}}{e_i} + \frac{1}{\tau} \right) + \left( \ln \left( p \frac{\theta + 1}{\bar{\mu}} - p \right) + \theta \right) \left( \frac{\mu + \tau \bar{\mu}}{e_i} - \frac{1}{\tau} \right) \, dy +
\int_{0}^{\phi_1} \ln \left( \frac{\tau \bar{\mu} - e_i \mu_h (1 - \tau)}{e_i \mu_h (1 - \tau)} \right) \, dy + \int_{\frac{\mu + \tau \bar{\mu}}{e_i} - \tau \bar{\mu}}^{\phi_3} \ln \left( \frac{\mu + \tau \bar{\mu} - p}{e_i \mu_h (1 - \tau)} + \theta \right) \, dy
$$

We can split up this problem into sub-problems, as we did before. Denote $e(\mu, \bar{\mu})$ to the solution. A symmetric equilibrium is defined by the following fixed point:

$$
\bar{\mu} = \int_{\mu_l}^{\mu_h} \frac{\mu e(\mu, \bar{\mu})}{\mu_h - \mu_l} \, d\mu
$$

Which is straightforward to compute, since $e(\cdot)$ is monotonically increasing in its second argument. In general the addition of more realistic assumptions makes a model more difficult to deal with. This is the opposite case: contrary to the model in Section 2, now the equilibrium is a "smooth" function of $\tau$.

In Figure 13 we show the results for $\theta \in \{0, 2\}$ and $\tau \in [0, 0.95]$ (with $\mu_l = 1$, $\mu_h = 2$ and $\bar{\mu} = 1.65$). We reproduce the results for the equalizing (instead of the screening) equilibrium in Figure 14. As you can see, the qualitative results are very similar.
Notice that redistribution increases utilitarian welfare even when $\theta = 0$, since it provides social insurance. When $\theta > 0$ the tax rate that maximizes utilitarian welfare is even greater. Just like in Section 2, the extra gains from taxation come from relaxing the IC constraint. Intuitively, in absence of taxation the high type were working too much because of the competition for non-market goods. By introducing taxes that competition is relaxed.

However, if the tax rate is too high the after-tax incomes are so close that the IC constraint actually becomes tighter. Indeed, you can see from Figures 13 and 14 that the provision of non-market goods collapses when $\tau$ becomes very high. As we already anticipated, this is the first paper to acknowledge that the conspicuous market is fragile: if income inequality is not high enough, non-market goods will not be provided in equilibrium, which is bad for both maidens and PC. This is in sharp contrast to the pure-separating equilibrium considered in the literature (hopefully, up to now).

Among the applications for this new framework, we focus particularly on the time-old debate about the extent to which governments must rely on income redistribution. In 1960 the composition of the public sector in OECD countries was 8% of GDP in social spending versus 16% of

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44 As expected, the collapse starts at a higher tax rate in Figure 14 than in Figure 13.
45 This result is unchanged if we consider the equalizing rather than the screening equilibrium, since just like the supremum of PC’s utility goes to zero, the set of prices that give him positive utility also shrinks.
GDP in public goods. Today the composition is 16% versus 17% (Alesina et al., 2004), so the growth of the public sector is due mainly to the growth of income redistribution.

There have been many attempts to explain the disparities between the US- and France-like equilibriums. Some of the attempts have relied on assuming fairness and altruistic concerns (e.g. Alesina and Angeletos, 2005), or deviations from rational expectations (e.g. Piketty, 1998). By applying the median-voter theorem (e.g. Meltzer and Richard, 1981) it is straightforward to see that the tax rate is monotonically increasing in the size of the non-market goods. By letting the supply of non-market goods be endogenous, we will be able to provide an explanation for the disparities in the redistributive schemes.

The most attractive property of the model is that non-market goods are allocated indirectly through markets. Thus, we can use that information as to test predictions of the model, estimate an structural model, and perform calibration exercises.

More importantly, we would like to know whether a particular economy could benefit as a whole from decreasing or increasing taxes substantially. The optimal tax, from utilitarian to Rawlsian, will depend upon the strength of the "pre-tax" link between income and talents. In the particular calibration of the model given above the link is relatively strong, so the optimal tax rate is very high. In the real world there are many confounding factors, like bequests, non-pecuniary occupational benefits, etc. On the other hand, people can condition the conspicuous signal on other observable information, and even combine more than one signaling strategy. The optimal tax rate will depend on the balance between those opposed factors, in addition to the size of the non-market goods.

In particular, a great number of papers on relative concerns have argued that countries should rely heavily on taxation, and they even recommended extreme measures like limiting the number of hours people are allowed to work. For instance, they take the correlation between relative income and happiness scores as a measure of relative concerns. But that correlation is endogenous: e.g. the correlation would change if we were to change the tax rate. since the correlation between income and talents would vary. Therefore, our model shows that those arguments break down once we take them in a general-equilibrium context.

3.5. Some remarks. Notice that we did not take into account PC’s utility, basically because we do not know a priori how to compare utils of maidens with utils of PC. Nevertheless, as you can see from Figure 15, PC’s utility peaks at about the same tax rate than maidens’ utility. Beyond the peak, what is important is that PC’s utility falls dramatically for high τ (i.e. when the conspicuous market collapses). This is an additional reason, of first-order importance, why the benefits from taxation are limited.

One important assumption is that i is greater than the median μ. More generally, the implied assumption is that a great deal of the conspicuous goods would not be provided if the matching

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46 We do know that people play the role of both maiden and PC. However, we do not know: i. How much more (or less) frequently people act as PC than as maidens; ii. The magnitude of κ.

47 In the equalizing equilibrium, by construction, PC’s utility is always zero.
mechanism was random or close to random. This seems to be the case, in different degrees, for many of the examples of non-market goods we have given so far: e.g. if people could not distinguish talented from untalented people, they would not admire or marry at random. But the limits for redistribution would apply even if $\bar{\mu} = \mu$, the only difference being that PC would face all the efficiency losses from the misallocation of non-market goods.

4. Extensions and empirical tests

We will suggest some extensions of the model, and we will provide empirical evidence on both the assumptions and the implications of the model. As we already mentioned, in Pérez-Truglia (2010) we have a more general version of the model with (among other features) a continuum of non-market goods and a continuous action set for PC. That is particularly important to get more precise predictions about the attitudes towards risk and the equilibrium distribution of income.

We already pointed out that the object that matters is not the consumption of a particular conspicuous good, but the total expenditure in observable goods. In principle, different societies could use very different conspicuous goods. In practice some goods seem to be particularly good at being noticed, so they very popular across societies: e.g. clothes, clothing accessories, housing, cars.

Recall the characterization of a conspicuous good as a damaged good. The signal from a visible good is stronger the less the intrinsic utility derived from the good. As a general rule, to see how conspicuous a good is you should ask the following question: if the consumption was not observable, how much of the good would the individual consume? For instance, if burning money (forget about the social stigma) was not observable, then nobody would ever want to burn money. We can confidently conclude that burning money counts entirely as conspicuous expenditure.

On the other hand, if we gave you a spell that makes your car invisible for the rest of the population, you would still want to spend a substantial amount of money in your car (e.g.

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48 Actually, they would not allocate them at random, but using the second best allocation mechanism.
transportation, safety). Thus, your conspicuous expenditure equals the difference between how much you would spend if the car was visible rather than invisible.\footnote{Note that observability is sometimes part of the intrinsic utility: e.g. a sign. Also, there may be heterogeneity in the intrinsic utility derived from a particular observable good. For instance, some people may like cars more, so the "signal" from their expenditure in cars should be weaker. If there are many possible conspicuous goods then we can re-define the equilibrium to let PC account for this.}

But being visible is not a sufficient condition to qualify as a conspicuous good. Ideally, the price should be either public or easy to estimate. Since PC also acts as a maiden, he should know the prices of the conspicuous goods used in his community. Some goods may be particularly good in this respect: e.g. for diamonds the price is approximately proportional to its size.

There is plenty of evidence on that respect. For instance, Cartier has one person in Paris whose sole responsibility is to keep tabs on its watches once they leave the workshop (Bagwell and Bernheim, 1996). Also, luxury brands restrict sales outside their own stores to prevent discounts in secondary markets. Among some examples, Christian Dior sued supermarkets for carrying its products, and luxury goods manufacturers are advised not to sell their products over the Internet (Amaldoss and Jain, 2005).

Another consequence is that luxury brands should find it convenient to inform non-customers about the (exorbitant) prices of their products: e.g. by means of advertisement to non-consumers. Even though offering a product cheaper than the competition would send the wrong signal,\footnote{The following manager, cited by Bagwell and Bernheim (1996), illustrates the point: "Our customers do not want to pay less. If we halved the price of all our products, we would double our sales for six months and then we would sell nothing."} the marketing team of one jewelry firm found the way around: "Only Cardow knows you paid less."

Recognizing prices implicitly means that individual should be able to spot fake copies. Firms invest a significant amount of money in developing authenticity marks. The examples include certificates of authenticity for clothes, Louis Vuitton’s bags with tags that do not come off, and the use of rare and expensive clothing materials. We have an interesting anecdote about fakes. In the poor areas of Argentina there are big "street shoppings" to buy fake copies of high-brow clothes and clothing accessories. Faking authenticity marks is very costly to the forfeiters, because they involve sophisticated technology and also change very frequently. When purchasing deliberately fake cloths of well-known brands, people are willing to pay up to 50% extra for falsified authenticity marks.

Social norms may kick in again regarding fakes. Ng (1987) notices that a carat of diamond can be worth thousands of dollars, while imitation diamonds look virtually the same (i.e. it takes experts with fine instruments to tell the difference) but cost only a few dollars. In spite of this, people seem to restrain from wearing fake diamonds (at least when interacting with people from their own social circle), which indicates the presence of a harsh social norm against the use of fake products. In the end, wearing a fake diamond to get an unearned non-market good is a form of stealing.
People usually relate conspicuous goods with snobism. This is not surprising, because snob goods have the advantage that consumers invest time and effort in identifying them (e.g. spotting fakes) and learning their prices. As we said before, in practice every maiden is also a PC. Using snob goods introduces a non-pecuniary cost: even if you had the money to buy the conspicuous good, you would not know which one to buy. Snobism is then a finer mechanism to work with the IC constraint that incorporates transaction and information costs to the relevant price of the conspicuous good.

Different people observe different visible goods in different situations. For instance, only your close friends and neighbors may visit your home (even though other people may hear about where you live). And some conspicuous goods, like a formal dress, only get seen a couple of times and by a reduced group of people. That explains why there is a demand for variety of conspicuous goods, so nobody focus all conspicuous expenditures on a single item (e.g. housing).

Some conspicuous goods are more popular exactly because they are more visible: e.g. clothing accessories. People do not direct 100% of their conspicuous expenditures towards them because of practical concerns: e.g. the probability of getting robbed may be convex in its price, the social stigma may be convex in its price, the cost of making a fake may be concave in its price (i.e. faking a $5,000 watch costs $500, but faking a $100,000 watch may cost only $1,000). For instance, if people wanted to spend their entire conspicuous budget in a single good (e.g. gold watch), people should be able to tell the difference between a $5,000 and a $100,000 watch.\(^5\)

However, there are practical reasons why people would like to "coordinate" to buy particular conspicuous goods. For instance, cognitive limitations: e.g. you cannot keep track of all the goods consumed by all your friends, so you just focus on some items (e.g. car, housing, clothing). Similarly, there are monitoring costs: e.g. even if you could memorize the entire consumption matrix, you would find it very costly to gather all that information.

Cognitive limitations are not the only potential sources of social norms. For instance, American women seem to learn a lot about diamond engagement rings ever since they are teenagers. There is an informal rule that a man should spend two to three months’ of salary for the engagement ring. If people above the rule are punished (e.g. their friends think that they tried to appear to be richer than they are), then the engagement-ring norm would be a nice income-revelation mechanism (within a narrow reference group).

Coordinating in a single conspicuous good may only be reasonable in small communities. However, there is an historic event which can be accounted as an (eventually failed) attempt to create a unique conspicuous goods: the Tulip Mania during the Dutch Golden Age, better known as the first recorded financial bubble (see MacKay, 1980). The tulip arrived to Europe in the 16th century and became very popular in the United Provinces. The flower rapidly became a status symbol, and it could cost more than 10 times the annual income of a skilled craftsman. The tulips seem to satisfy many desirable conditions for a conspicuous good: intrinsic utility is homogeneous and close to zero, trading was widespread so prices were public information and

\(^5\) We mentioned that intrinsic utility may be heterogenous (e.g. some people may like cars more than other). If that is the case, using many conspicuous goods will "average out" the heterogeneity.
fake tulips were not a viable option, people should simply monitor the tulips and not many different status items, etc.

Even though they represent a huge share of the economy in both developed and developing countries, there have only been some isolated empirical papers on conspicuous goods. Our favorite piece of evidence comes from Glazer and Konrad (2006), who studied charitable donations as conspicuous goods. First of all, they show that a minority of personal donations are anonymous. More importantly, they show that for donation records of institutions that report the names of donators in donation categories (e.g. $1000-$1999, $2000-$2999), donations within each category are very close to the lower bound.\(^{52}\)

Another piece of evidence comes from Mandel (2009), who shows that long-term average returns for art are lower than for equity and, in several cases, the mean real return of "risk-free" government bonds. Art is particularly observable: it gives a practical excuse to let your friends know about your expenditures. Unless the intrinsic utility from contemplating the artwork is very high, art expenditures are conspicuous expenditures.\(^{53}\)

Some papers measure the "positionality" of particular goods by asking individuals hypothetical questions regarding their choice among alternative states or outcomes: e.g. which society would you prefer, a society in which everybody has a $100,000 Ferrari, or a society in which you have a $20,000 car but everybody else has a $10,000 car? According to the conspicuous consumption theory, only observable goods should appear as positional. Indeed, Carlsson et al. (2003) showed that automobiles (highly observable) were found to be positional goods, while leisure and car safety (highly unobservable) were found non-positional.

Jao et al. (1998) chose a group of products with similar use and function, but which vary on the dimension of social visibility. Then they ranked the products by the social visibility dimension through an informal survey. They found that the correlation between price and intrinsic quality is lower with products highly observable. Also, Heffetz (2007) conducts a nationally-representative survey among US households to rank the visibility of 31 consumption categories. He shows that, on average, higher-income households spend larger shares of their budgets on more visible categories.

We do not claim that brain or hormonal activity (e.g. pleasure, happiness) is not increased when the individual is consuming a conspicuous good, like a staring at a painting or driving a Ferrari. Apart from the intrinsic utility, they experiment the instantaneous pleasure from some non-market goods such as the pride from being respected and admired. Moreover, they will feel that way even if they are staring at the picture alone or driving on an empty route, since they

\(^{52}\)Personal contributions are not a minor issue. In 1991 US universities alone received $10.2 billion in voluntary support, of which $2.3 billion was from alumni.

\(^{53}\)If you think that the intrinsic utility is very high, then you should be able explain why the individual does not spend the money instead in visiting museums around the world (and then contemplating a wider variety of artworks).
will savor the prospect of all the non-market goods that they will get because of the conspicuous good.\footnote{The difference with the rest of the literature is that such pleasure is taken exogenously, while we let it be endogenous.}

Finally, if the conspicuous good is durable you should be careful about the definition of its price. Imagine that you have a one-shot signaling game. Since you can use a gold watch and sell it the day after, the actual price of the conspicuous good would be the opportunity cost of the one-night interest losse, the one-night insurance, the losses in the buy-and-sell transaction and the (pecuniary and non-pecuniary) transaction costs.\footnote{Indeed, there are websites where you can rent clothes and clothing accessories from the top brands. Also, "wardrobing" (the return of used clothing) is a widespread problem in the US: according to the National Retail Federation its cost was around $16 billion during 2002 (Speights and Hilinski, 2005).}

In our model $p(\theta)$ represented conspicuous expenditures (non-market goods) over an entire lifetime. One could argue that the conspicuous expenditure in housing should not be the actual price of the property, but the opportunity cost of the capital to the time of death. However, people do not consume their entire assets (not even if they know their due date) because they want to leave bequests. But bequests are just a particular form of consumption. Therefore, the observable goods that are transferred post-mortem should count as conspicuous consumption when living.

There are many details about conspicuous consumption we could incorporate into the model. For instance, when lotteries are observable (e.g. betting $100,000 in a Casino) they may be great conspicuous goods. The same if one conspicuous good is complementary to standard consumption. The non-market goods may also be complementary to the maiden’s type, etc. Since we meant to study conspicuous consumption in general, we will not develop them here. Nonetheless, you can find some extension in Perez Truglia (2010).

4.1. Talent vs wealth. The great departure from the rest of literature rests on the sole assumption that people do not want to allocate non-market goods according to wealth directly, but according to some personal traits that, conditionally on other information, are correlated with wealth.\footnote{Smith (1759) seemed to agree with our perspective: "He must acquire superior knowledge in his profession, and superior industry in the exercise of it. He must be patient in labour, resolute in danger, and firm in distress. These talents he must bring into public view, by the difficulty, importance, and, at the same time, good judgement of his undertakings, and by the severe and unrelenting application with which he pursues them... We desire both to be respectable and to be respected. We dread both to be contemnible and to be contemned... To deserve, to acquire, and to enjoy the respect and admiration of mankind, are the great objects of ambition and emulation."}

Fortunately, there is a sharp testable prediction. According to the former theory:

"... the utility of both (conspicuous leisure and conspicuous consumption) alike for the purposes of reputability lies in the waste that is common to both. In the one case it is a waste of time and effort, in the other it is a waste of goods. Both are methods of demonstrating the possession of wealth, and the two are conventionally accepted as equivalents." Veblen (1899)

If people cared directly about wealth, then conspicuous leisure would send the right signal: i.e. the individual is so wealthy that he does not need to work. But if wealth only mattered indirectly,
leisure would send the wrong signal: for example, it would signal a higher likelihood that your wealth was inherited, which is not the best indicator about your innate talents.\textsuperscript{57}

Consistently with our theory, the evidence suggests that rich and talented people work harder. For instance, a number of papers have documented that rich people work more and moreover that leisure inequality has grown over time (e.g. Aguiar and Hurst, 2007). Clark et al. (2007) found that income rank is a better predictor of work effort than average income. And Anger (2008) shows that overtime work is a signal of productivity. Not only people do not use leisure conspicuously, on the contrary, people talk extensively about how much they work and how little they get to see their family (i.e. about the opportunity cost of their time).

Once people achieved some basic needs, being respected and admired are some of the most important sources of happiness. For instance, Rosenberg (1957) asked people to what extent a job or career would have to satisfy each of ten requirements in order to be considered ideal (e.g. make a great deal of money, exercise leadership). The most highly ranked career value was "provide an opportunity to use my special abilities or aptitudes," rated as highly important by 78\% of respondents. This is evidence that people do not care directly about being wealthy, but they care primarily about being recognized as productive members of society (and wealth is just one of the ways to achieve that).\textsuperscript{58}

A thought experiment that is useful to elucidate whether people care about wealth directly or indirectly is to think what would happen in a world where the link between income and wealth disappeared. The perfect example is Babylon (Borges, 1998), a nation where everybody’s destiny is entirely determined by a public lottery. If people used conspicuous consumption substantially in such a place, we would reject our assumption.

Unfortunately, no matter how much we would like to, we cannot visit Babylon. But we can exploit variation across existing societies. The US is probably on one extreme, where people seem to clearly recognize wealth as a signal of value. In fact, Ayn Rand argued that the expression "to make money" was invented by Americans.\textsuperscript{59} There are many pieces of anecdotal evidence. Just to mention one, when some US newspapers mentioned a famous businessman they used to put his total wealth in parentheses next to his name.

The image is very different in some developing countries, which are closer to Babylon. In Latin America, for example, people believe that a significant proportion of rich people got their wealth by "stealing" from their communities (stealing has a colloquial meaning, referring to corruption in the private and public sector). Indeed, that alone can explain the widespread leftist rhetoric in the developing world (Di Tella and MacCulloch, 2009). As a result, the

\textsuperscript{57}That is, even if someone inherited all his wealth, he may want to "look like" he is working hard. Nonetheless, having wealthy parents may still be informative by its own, as discussed later.

\textsuperscript{58}We do not claim that people do not care directly about each others’ incomes. The signaling equilibria is a steady state of a more general learning game where people could seem to care directly about income, but simply because they unconsciously acknowledge the positive conditional correlation between income and talent. Just like heuristics may let people solve complex consumption problems, they may sustain our signaling equilibrium.

\textsuperscript{59}Ayn Rand (1957): "No other language or nation had ever used these words before; men had always thought of wealth as a static quantity - to be seized, begged, inherited, shared, looted or obtained as a favor. Americans were the first to understand that wealth has to be created."
unconditional correlation between income and bad traits may be positive. For example, in Argentina people with expensive cars cannot park them on some streets because pedestrians would scratch the paint out using a key.

Indeed, Perez Truglia (in progress) asked people whether they think that rich people are rich because they "stole," worked hard, were born in rich families, or were just lucky. The survey of 1,100 households is representative of the greater Buenos Aires area, which hosts about one third of the national population. Over 20% of the respondents claimed that rich people were rich because they "stole money." To be more precise, 25% (15%) among the poor (rich). Furthermore, believing that the poor stole money is one of the most important variables for explaining respondents' political ideology, preferences for redistribution and happiness.

The fact that the unconditional correlation between wealth and good traits is weak does not necessarily imply that the conditional correlation is also weak. Far from that, it can be higher than in the developed world, since many confounding factors (e.g. bequests) are less important. That is, once that people knows that someone is a doctor (as opposed to a lawyer or a politician), her conspicuous consumption will signal many respectable traits.

4.2. Bequests. One of the objectives of conspicuous consumption is to inform complete strangers about your underlying talents. As we discussed before, the correlation between income and skills may be of a different nature if it is unconditional or conditional on some observables. That is, whether you are trying to impress a close friend, an stranger, or someone in the middle. Adam Smith noted that the unconditional correlation could be very weak in the higher classes:

"In the middling and inferior stations of life, the road to virtue and that to fortune (…) are, happily in most cases, very nearly the same. In all the middling and inferior professions, real and solid professional abilities, joined to prudent, just, firm, and temperate conduct, can very seldom fail of success. (…) In the superior stations of life the case is unhappily not always the same" (Smith, 1759)

This is completely captured by the randomness in the income generating process: some people have high probability of ending with high income even though their innate skills are low. On the one hand, this is not a major concern if people can condition (directly or indirectly) on social origin. In terms of our model, PC can use the conspicuous consumption to "back up" the "labor" wealth of the maiden. If PC has a (probabilistic) estimate of the maiden's "bequest" (i.e. income coming from her family), then he can simply subtract the estimated bequest from the estimated wealth.

60For instance, Piketty (1998) offers a model of the theory of reference group comparisons developed by Merton (1953) and Boudon (1973). That is, people evaluate their economic performance by comparing it to the reference group which they come from, so that agents with lower-class origins are more easily satisfied with their performance.
However, it is not obvious at all that bequests must be completely disregarded. People do not only inherit wealth, but also cultural and genetic traits. And for the wealth inherited, people may perceived it as "accumulated effort" or as a signal of the traits of your entire infinitely-lived "dynasty."

Ever since Veblen economists have been looking for conspicuous goods in luxury items from the middle and higher class. Our theory demystifies such link. On the contrary, it suggests that conspicuous consumption may be even stronger among poor reference groups. Poor people like and seek respect and admiration at least as hard as people from the higher classes. And among that group many of the confounding factors people want to condition on (e.g. bequests) are of minor importance.

Indeed, there is plenty of evidence that conspicuous consumption (in relative terms) is strongest among poor communities. Charles et al. (2009) use data from the Consumer Expenditure Survey in the US during 1986-2002, and show that, controlling for differences in permanent incomes, Blacks and Hispanics spend about 30% more on conspicuous consumption than Whites. Bloch et al. (2004) studied weddings as conspicuous consumption in rural India, where poor families spend on average four months of family income in the wedding.

4.3. Luxury taxes. Many papers have suggested to use specific taxes on luxury goods, but without a formal argument: e.g. Ng (1989), Bagwell and Bernheim (1996), Frank (1999); Rege (2008). They argue that since expenditures in luxury goods is "burning money," then taxing it would reduce conspicuous consumption. Firstly, even if income was exogenously given, that is a partial-equilibrium prediction: since the money is being redistributed to poorer people, then the incentive compatibility constraint becomes tighter and conspicuous consumption must increase.

Secondly, we should formalize the argument in a model where income is endogenous, which is not the main objective of this paper. Besides the theoretical concerns, there are many practical issues that have to be taken into account. For instance, we must take into account that conspicuous goods give some intrinsic utility, and the production of those goods may bring positive spillovers to the rest of the population (more on this later).

Also, taxes should be public information (i.e. form part of the "perceived" price by the population), which may be true for some old luxury taxes but might not be true if we add more and more specific taxes. Taxes will also introduce additional noise. For instance, people may think that dishonest people have access to the black market, which ends up deteriorating the informational value of carrying the good.

Also, there is heterogeneity in conspicuous goods. From a theoretical point of view we should tax all observable goods equally. And even though demand for luxury goods seem very inelastic

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61 We strongly believe that talents are homogeneously distributed across the population. Unfortunately, the fostering of those talents (e.g. nutrition, training, emotional support) is much less homogeneous.

62 Liebow offers a great insight: "The desire to be a person in his own right, to be noticed in the world he lives in, is shared by each of the men on the streetcorner. Whether they articulate this desire . . . or not, one can see them position themselves to catch the attention of their fellows in much the same way as plants bend to catch the sunlight." (Liebow, 1967, pp. 60-61; quoted by Oxoby, 2004).
in the short run, they may be extremely elastic in the longer run when people have time to "coordinate" new ways into which communicate economic success. 

If you think of conspicuous consumption as throwing money to a bonfire, luxury taxation may have some benefits, at least in the short run. But conspicuous goods are more like an informational service. For instance, companies that produce clothes with exorbitant prices spend a great deal of that money in building identity and advertisement, so the rest of the population can "recognize" the conspicuous expenditure. If you tax some conspicuous goods heavily, they will stop being viable as informational services, and people will switch to alternative conspicuous goods outside those referred by the law. Since those goods were not consumed before the law was passed, they will probably be less efficient for the economy as a whole. 

4.4. Positive externalities. According to the welfare calculations, high taxes may be optimal because people would otherwise work too much in the struggle for the non-market goods. Nevertheless, the production of conspicuous goods may not be a complete waste of resources. Consider the case of conspicuous production in academia: if scholars are working a lot because of the competition for non-market goods, in the process they generate social benefits that probably more than compensate the welfare losses from workaholism. 

If conspicuous consumption meant literally burning $100 bills, then it would not be wasteful at all (and hence its social stigma is ironic). On the other hand, if conspicuous goods require many valuable resources that do not generate positive spillovers to the rest of the economy (e.g. mining for diamonds), they are mostly waste. Most conspicuous goods are somewhere in the middle. For instance, when BMW pays expensive advertisements for the Super Bowl, it is actually financing the game for the spectators (a genuine source of happiness) in exchange of being informed about the exorbitant prices of its cars. 

Indeed, technologic goods are ideal for conspicuous consumption. If someone is wearing a $10,000 shirt you might not tell the difference from a $10 shirt without knowledge about fashion. But if someone shows up in a flying car, you will be very confident that she is extremely rich. If conspicuous expenditures go to technological R&D, then they imply major positive spillovers for future generations. In other words, the engineering of the best BMW today will eventually end up affecting the comfort and price of the cheapest cars 10 years from now. 

If the spillovers from conspicuous consumption are sizable, then you may want to think twice about taxing heavily. The quest for respect and admiration has played a crucial role in capitalism. It made the great entrepreneurs keep working harder and harder, even when they already accumulated a fortune. And their hard work, sooner or later, directly or indirectly, will benefit the poor. 

\footnote{Indeed, Frank (1999, page 203) gives an extensive list of practical explanations for the historic failure of luxury taxes.} 

\footnote{Notice that the expectators could simply not pay attention to the advertisements, which are actually fun to watch.}
5. Conclusions

Our new framework provides a clean and sound theoretical argument for a usual claim that had never been micro-founded: income inequality is not an intrinsically bad property of an economy. On the contrary, some income inequality is a signal of an efficient provision of non-market goods. The model gives new perspectives for many theoretical and practical applications. For instance, it gives an explanation for the disconnection between risk aversion from small- and large-stakes, and it provides the first steps towards a more general understanding of the equilibrium distribution of income (Perez Truglia, 2010).

Regarding policy implications, we learned two important lessons about optimal taxation. Firstly, the presence of non-market goods increases the utilitarian optimal tax rate, because higher taxation relaxes the IC constraint and then reduces wasteful consumption. This is a familiar result in the literature on relative concerns. However, we provided it in a model where relative concerns are endogenous.

Secondly, once we incorporate the endogenous and stochastic nature of the link between incomes and talents, the benefits from taxation are considerably limited. That is, taxes are efficient only up to the point where the savings in conspicuous consumption are counterbalanced by the allocative inefficiencies in non-market goods brought by the erosion of the link between incomes and talents.

A number of the papers on relative concerns have argued that countries should rely heavily on taxation, and they have even recommended extreme measures like limiting the number of hours people are allowed to work. Our model shows that, once taken in a general-equilibrium context, those arguments break down.

References


CONSPICUOUS CONSUMPTION

6. Appendix

**A1.** Since $U''(\cdot) < 0$:

$$U(y_h - p) - U(y_l - p) > U(y_h) - U(y_l)$$

Then, the difference $(\bar{\theta} - \theta)$ equals:

$$U(y_l) - U(y_l - p) + U(y_h - p) - U(y_h) > U(y_l) - U(y_h) = 0$$

**A2.** Note that $U^{-1}(\cdot) > 0$ and $U^{-1''}(\cdot) > 0$. Thus:

$$U^{-1}(U(y_l) - \theta) - U^{-1}(U(y_h) - \theta) > U^{-1}(U(y_l)) - U^{-1}(U(y_h)) = y_l - y_h$$

Then:

$$\bar{p} - p = y_h - U^{-1}(U(y_h) - \theta) - y_l + U^{-1}(U(y_l) - \theta)$$

$$> y_h - y_l + y_l - y_h = 0$$

**A3.** Differentiate:

$$U'(y_h - p)(dy_h - d\bar{p}) = U'(y_h)dy_h$$

Rearranging and using $U''(\cdot) < 0$:

$$\frac{d\bar{p}}{dy_h} = \frac{U'(y_h - p) - U'(y_h)}{U''(y_h - p)} > 0$$

The same procedure yields $d\bar{p}/dy_l$.

**A4.** Differentiate:
\[ dSW = U'(y_l)dy_l + U'(y_h - p)dy_h + U'(y_l)dy_l - U'(y_l - p)dy_l \]

Replace \( dy_h = -dy_l \). Since \( dy_l > 0 \), the condition \( dSW < 0 \) equals to:

\[ 2U'(y_l) - U'(y_h - p) - U'(y_l - p) < 0 \]

Rearranging:

\[ U'(y_l) < \frac{U'(y_h - p) + U'(y_l - p)}{2} \]

Recall \( p \) is fixed. First note that the RHS is strictly increasing in \( p \). Notice that when \( p = 0 \) the condition is not satisfied because of \( U''(\cdot) < 0 \):

\[ U'(y_l) > \frac{U'(y_h) + U'(y_l)}{2} \]

Also because of \( U''(\cdot) > 0 \), the condition is satisfied when \( p = y_h - y_l \):

\[ U'(y_l) < \frac{U'(y_l) + U'(y_l - (y_h - y_l))}{2} \]

Therefore, the condition is satisfied only for \( p > p^* \), where \( y_h - y_l > p^* > 0 \) is defined as:

\[ U'(y_l) = \frac{U'(y_h - p^*) + U'(y_l - p^*)}{2} \]

The intuition is simple: if \( p \) is too small then there are no gains from signaling and therefore a regressive transference cannot be welfare-improving.

**A5.** We know the utilitarian social planner would not choose \( x_l \) below the one that let the rich type attain the maximum non-market good: \( x_l \geq x_l^{\text{min}} \), where \( U(x_l^{\text{min}}) - U(x_l^{\text{min}} - p) = \hat{\theta} \).

The utilitarian social planner solves:

\[ \max_{x_l \geq x_l^{\text{min}}} U(y_l + y_h - x_l - p) + U(x_l) - U(x_l - p) + U(x_l) \]

\[ \frac{\partial SW}{\partial x_l} = U'(x_l) - U'(y_l + y_h - x_l - p) + U'(x_l) - U'(x_l - p) \]

The problem is not globally concave. Note that if \( x_l > \frac{1}{2}(y_l + y_h - p) \) then \( \frac{\partial SW}{\partial x_l} < 0 \). If \( x_l^{\text{min}} \geq \frac{1}{2}(y_l + y_h - p) \):

\[ U\left(\frac{1}{2}(y_l + y_h - p)\right) - U\left(\frac{1}{2}(y_l + y_h - 3p)\right) < \hat{\theta} \]

Then the social planner will choose the corner solution \( x_l^* = x_l^{\text{min}} \). Otherwise, the solution will be interior: \( x_l^* \in \left[x_l^{\text{min}}, \frac{1}{2}(y_l + y_h - p)\right] \).

**A6.** The effect on social welfare will be positive if and only if:

\[ [U'(y_l) - U'(y_h - p)] dy_l - dpU'(y_h - p) > 0 \]

Just replace \( dp \):
\[
\frac{\frac{1}{U'(y_h-p)} + \frac{1}{U'(y_l-p)}}{2} < \frac{1}{U'(y_l)}
\]

First, notice that the LHS in strictly decreasing in \(p\). When \(p = 0\) the condition above is not satisfied:

\[
\frac{\frac{1}{U'(y_h)} + \frac{1}{U'(y_l)}}{2} > \frac{1}{U'(y_l)}
\]

When \(p = y_h - y_l\) it is satisfied:

\[
\frac{\frac{1}{U'(y_h-y_l)} + \frac{1}{U'(y_l-y_l)}}{2} < \frac{1}{U'(y_l)}
\]

Therefore, the condition is satisfied only for \(p > p^*\), where \(y_h - y_l > p^* > 0\) is defined as:

\[
\frac{\frac{1}{U'(y_h-p)} + \frac{1}{U'(y_l-p)}}{2} = \frac{1}{U'(y_l)}
\]

Notice that in this exercise \(p\) is endogenous and \(\theta\) is fixed. Then we have to write the condition as a function of \(\theta\) instead:

\[
\theta^* \equiv U(y_l) - U(y_l - p^*) > 0
\]

So the welfare improvement exists if \(\theta > \theta^*\).

A7. We want to check that, given \(p\), the rich maiden would like to have a \(\theta\) as high as possible. Her welfare as a function of \(\theta\) is:

\[
U \left( y_h - y_l + U^{-1}(U(y_l) - \theta) \right) + \theta
\]

Let \(G(\theta)\) be its first derivative. Then we need to prove:

\[
G(\theta) = 1 - U' \left( y_h - y_l + U^{-1}(U(y_l) - \theta) \right) U^{-1}(U(y_l) - \theta) > 0
\]

Notice that \(G(\theta)\) is strictly increasing in \(y_h\). Then it is sufficient to prove that \(G(\theta) \geq 0\) when \(y_h = y_l\):

\[
1 - U' \left( U^{-1}(U(y_l) - \theta) \right) U^{-1}(U(y_l) - \theta) = 0
\]

And we are done.

A8. Differentiate:

\[
U'(y_l)dy_l - U'(y_l - p)dy_l = d\bar{\theta}
\]

Rearranging and using \(U''(\cdot) < 0\):

\[
\frac{d\bar{\theta}}{dy_l} = U'(y_l) - U'(y_l - p) < 0
\]
The same procedure yields $d\bar{\mu}/dy_h$.

**A9.** To spot when that condition is violated, let’s calculate the best candidate for deviation:

$$e^d_h = \max \left\{ 1 - \frac{1}{2} \frac{\tau}{1 - \tau} \frac{\mu_l}{\mu_h} e^*_l - \frac{1}{2} \frac{\tau}{1 - \tau} e^*_h, 0 \right\}$$

For instance, if $e^d_h > 0$ the high type would attain a utility:

$$U^d_h = \ln((1 - \tau)\mu_h) - 1 + \frac{1}{2} \frac{\tau}{1 - \tau} \left( \frac{\mu_l}{\mu_h} e^*_l + e^*_h \right)$$

For some parameter values there is a set of $\tau$ such as by getting the conspicuous good the high type cannot attain the reservation utility $U^d_h$, so the above would not be an equilibrium. That is to say, the high-type are better off as a group in the separating equilibrium, but they have individual incentives to work less, don’t buy the conspicuous good and still enjoy the net redistribution coming from rest of the hard-working high-type maidens.

If that is the case, we can jump to any point in a continuum of equilibria indexed by $q$, the proportion of high type individuals working hard (where $q = 1$ is the separating Pareto-best and $q = 0$ corresponds to a pooling equilibria). Nevertheless, this is a result of the discretness of the income and type spaces, which dissapears in the more general model of Section 3.

The pooling equilibria is given by:

$$\left\{ \begin{array}{l}
e^p_h = \frac{2 - \tau}{2} - \frac{\tau}{2} \frac{\mu_l}{\mu_h}; \quad e^p_l = \frac{2 - \tau}{2} - \frac{\tau}{2} \frac{\mu_l}{\mu_h} \text{ if } \tau \leq \frac{2}{1 + \frac{\tau}{2} q} \\
e^p_h = \frac{2 - \tau}{2 - \tau} ; \quad e^p_l = 0 \text{ if } \tau > \frac{2}{1 + \frac{\tau}{2} q} \end{array} \right.$$  

For the separating equilibria, we need rich people to be indifferent between making two different effort choices: $e^1_h$ (proportion $q$) and $e^2_h > e^1_h$, where only the latter will buy the conspicuous good. For the sake of simplicity, we will show the case $q = 1$. For the indifference condition to hold:

$$\{ p^* = \theta (1 - \tau) \mu_h, \ e^I_h = e^I_l + \theta \}$$

The problem for the high-type that works hard:

$$\max_{e_h} \ln((1 - \tau)\mu_h \cdot e_h + \frac{\tau}{2} \mu_l \cdot e^*_l + \frac{\tau}{2} \mu_h \cdot e^*_h) + \theta - e_h$$

$$e^{II}_h = \frac{2 - \tau}{2 - \tau} + \frac{2}{2 - \tau} \theta - \frac{\tau}{2 - \tau} \frac{\mu_l}{\mu_h} e^*_l$$

If $e^*_l = 0$:

$$e^{II}_h = \frac{2 - \tau}{2 - \tau} + \frac{2}{2 - \tau} \theta$$

We can check when $e^*_l = 0$:  

If \( \tau < \tau_3 \) then \( e_i^* > 0 \) and:

\[
e_{h}^{II} = \frac{2 - \tau}{2}(1 + \theta) - \frac{\tau}{2} \mu_h
\]

There are extra details to look at. First, if \( e_{h}^{II} < \theta \) then we could potentially find an equilibrium for a lower \( p \). Secondly, if \( \bar{e}_i < 0 \) then the low type may have incentives to buy the conspicuous good, in which case the separating equilibrium would break down. This is clearly a "coordination equilibrium": all the high-type maidens are from an individual point of view indifferent between making a high effort or not, but they benefit each other greatly by coordinating \( q \) as large as possible.

In fact, this \( q \)-equilibria exists for all values of \( \tau \). We did not consider them at first because they were eliminated by the refinements (e.g. Cho and Kreps). In any case, these issues disappear once we consider the richer setup of Section 3.

A10. The problem is:

\[
\max_p \frac{1}{1 - \tau} \left[ \int_{\min\{\frac{\theta}{b}, 1 - \frac{\tau}{2}\}}^{\min\{\frac{\theta}{b}, 1 - \frac{\tau}{2}\}} \left( \frac{y}{p} - 1 \frac{1 - \tau}{\theta} \right) \left( 2b y - \frac{\tau}{1 - \tau} - 1 \right) dy + \int_{\min\{\frac{\theta}{b}, 1 - \frac{\tau}{2}\}}^{1 - \frac{\tau}{2}} \left( 2b y - \frac{\tau}{1 - \tau} - 1 \right) dy \right]
\]

Let’s solve it case-by-case. If \( \frac{\theta}{b} \leq 1 - \frac{\tau}{2} \) and \( \frac{\theta}{b} \geq \frac{\tau}{2} \):

\[
p^* = \frac{3}{4} \theta \frac{b \tau + 2 b r + \theta + 2 - \tau \theta - 42 \tau}{b (b^2 + 3 \theta + 3)}
\]

If \( \frac{\theta}{b} \leq 1 - \frac{\tau}{2} \) and \( \frac{\theta}{b} \leq \frac{\tau}{2} \):

\[
p^* = \theta \frac{2b r - 6 \theta + 3 + \sqrt{36 b^2 \tau^2 - 120 b r^2 + 60 b r + 36 \tau^2 - 36 \tau + 9}}{8b (\theta + 1)}
\]

Finally, if \( \frac{\theta}{b} \geq 1 - \frac{\tau}{2} \) and \( \frac{\theta}{b} \geq \frac{\tau}{2} \):

\[
p^* = \theta \frac{-3 \tau + 5b r + 3 - 4 b + \sqrt{-15 b^2 \tau^2 - 18 b r - 8 b r^2 + 72 b^2 \tau + 9 - 18 \tau + 24 b + 9 \tau^2 - 48 b^2}}{8b}
\]