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## Questionable luxury taxes: Results from a mating game

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# QUESTIONABLE LUXURY TAXES: RESULTS FROM A MATING GAME

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# QUESTIONABLE LUXURY TAXES: RESULTS FROM A MATING GAME

TOBIAS THOMAS

## Zusammenfassung/ Abstract

This contribution provides a game theoretical derivation of market demand as a function of the level and distribution of income in the considered economy: if (i) the price is low, everyone buys the good; if (ii) the price is high, only the rich buy the good (a status good in a narrow sense). If (iii) the price is located in very high or in middle range, demand collapses. With this, we explain the critical price from which a status good acts as a distinctive signal. In addition, this approach shows the potential welfare-improving impact of conspicuous consumption. Taking these results into account, recommendations by numerous economists to prevent the welfare losses of conspicuous consumption by introducing a luxury tax are highly questionable.

**JEL-Klassifikation/ JEL-Classification:** C70, D11, D82

**Schlagworte/ Keywords:** luxury tax; conspicuous consumption; mating model; signaling game; status good

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## INTRODUCTION

With his wedding on June 14, 2008 sugar daddy Flavio entered safe harbor of marriage and world lost its last real playboy. Over years Joe Public had wondered about the miracle that a grey-haired and, to be friendly, not that athletic man had mated with gorgeous women called Naomi or Heidi.

Whereas one might wonder about the amazing impact of Flavio on the mating market, it is quite straightforward from a Social Psychology perspective. In particular, Evolutionary Social Psychology, which explains human behavior by adopting findings of Evolutionary Biology, provides explanation for such observation. Among the issues of Evolutionary Social Psychology are the principles of sexual selection and with this the selection of and the access to sexual partners: generally, men value beauty and youth as indicators of woman's reproductive health, whereas women focus on status and wealth of a potential partner as "provider and protector of future offspring" [Archer, 2001, 36]. From this perspective Flavio's impact is not miracle at all.

Recognizing these basic mechanisms, from Flavio's perspective another question emerges: if wealth is not observable directly by potential partners, goods of what price should he consume to signal his wealth distinctively on the mating market? In other words: What price makes a good a status good?

Whereas the model presented here in a simplistic way does not differentiate between female and male individuals, some of its main assumptions are based on findings of Evolutionary Social Psychology. Thus, status and wealth are relevant criteria on the mating market. Because individual's wealth is not directly observable, it can be useful to signal one's wealth with the conspicuous consumption of luxuries. However, whether a status good acts as a distinctive signal, depends not least on its price. Depending on the price of the status good, pooling and separating equilibria can emerge on the mating market. The model explains the *critical price* from which the good acts as a distinctive signal and allows the derivation of market demand as a function of the level and distribution of income in the considered society.

Considering conspicuous consumption has a long tradition in economic theory and often implies strong normative statements. From mercantilist perspective conspicuous consumption diminishes capital accumulation, reduces economic growth and is to be seen as immoral and condemnable.

Back then, Mandeville offers a contrary view to the mainstream. In his poem *The Grumbling Hive: or, Knaves Turn'd Honest* published first in 1705 and again in 1714 in his seminal work *The Fable of the Bees: or, Private Vices, Publick Benefits* he states that any selfish economic activity and thus also the ostentative consumption of luxuries generates economic growth and increases welfare. In other words, from Mandeville's perspective status seeking is a socially desirable motive. [Mandeville 1924[1714], 17ff]

By contrast, intellectual authorities of the classical school like Adam Smith [1910(1776), 351ff] and John Rae [1965(1834), 326ff] distinguish between legit-

imate and illegitimate consumption and fear economic and social instability. Consumption behaviour which corresponds to individual rank in society is seen as legitimate whereas consumption which exceeds individual rank in society is to be repudiated.

Conspicuous consumption also plays a central role in the work of institutionalist Thorstein B. Veblen. In his *Theory of the Leisure Class* he describes the consumption behavior of the pecuniary upper class as well as their propensity to avoid useful work and its negative effects on economic and societal development.<sup>1</sup> [Veblen 1899]

A renaissance of this kind of thinking can be found in social and consumption criticism of Galbraith [1958], Hirsch [1976] and Scitovsky [1976] who focus on qualitative aspects of economic progress. Assuming status seeking as a zero sum game Hirsch [1976] even emphasizes the *social limits to growth*.

More recently, status seeking and conspicuous consumption as interpersonal effects are important factors in consumption theory. Two branches of models can be identified:

In the models of Frank [1985], Ireland [1994], Corneo and Jeanne [1997] as well as Hopkins and Kornienko [2004] individuals care about their status, in other words about their ordinal rank in the consumption or income hierarchy of society. While in Frank's model [1985, 103] ordinal rank in the consumption hierarchy enters the utility function directly, in the models of Ireland [1994], Corneo and Jeanne [1997] as well as Hopkins and Kornienko [2004] individuals look after their status in a world of asymmetric information. Individuals usually know their own income quite well, but cannot observe the income of others directly. However, individuals have the option to signal their wealth by the conspicuous consumption of positional (visible) goods. In the signaling equilibrium observers then infer correctly about individuals ranks in the income hierarchy of society, which causes status utility to the individual. All these models have in common that status is a value itself and enters the utility function directly. This implies that the motivation to consume conspicuously can be seen as intrinsic.

Whereas Frank [1985] and Ireland [1994] focus on the amount of the conspicuous good consumed, in the model of Corneo and Jeanne [1997] individuals purchase at most one unit of the status good. With this approach the authors find access to the analysis of the special importance of the price of the status good and succeed in deriving so-called *Veblen Effects* as an increasing willingness to pay for the good with an increasing price. In their contribution the authors already hint on a *critical price* from which the good acts as a distinctive signal but do not derive it [Corneo/Jeanne 1997, 62-63]. More recently, Hopkins and Kornienko [2004] offer another intrinsic approach and analyze effects of exogenous changes in the distribution of income in the society on signaling equilibria, but do not focus on the special importance of the price of the status good.

All of these contributions essentially adhere to Fred Hirsch's way of thinking [1976] and define status seeking as a zero sum game. The authors claim that the

conspicuous consumption of status goods is welfare-decreasing and often recommend the introduction of a *luxury tax* to internalize the negative external effects of conspicuous consumption.<sup>2</sup> These results are hardly surprising, because they follow directly from the assumption: if status seeking is assumed to be a zero sum game, it cannot be welfare-improving.<sup>3</sup>

Within a different branch of models from Bagwell and Bernheim [1996], Cole et al. [1995] and Haucap [2001] demonstrative consumption is seen as a useful signaling device in the initiation of social contacts. Here, status does not enter the utility function directly, i.e. the motivation to consume conspicuously can be seen as extrinsic or instrumental. Again, individuals face asymmetric information. They know their own income quite well, but cannot observe the income of potential partners directly. However, individuals have the option to signal their wealth by the conspicuous consumption of positional (visible) goods with the objective to match with desired partners.

While Cole et al. [1995] focus on distinction by the amount of wealth destroyed by conspicuous consumption, Bagwell and Bernheim [1996] in general analyze options for an individual to defend an existing separating equilibrium by the consumption of a high amount of the conspicuous good, a great variety of conspicuous goods or a conspicuous good which is priced higher than a functionally equivalent good. Both models do not focus on the market demand function and on the *critical price* from which the good acts as a distinctive signal. Welfare effects of conspicuous consumption are not considered. By contrast, Haucap [2001] demonstrates that conspicuous consumption as a signal in social interaction may be welfare-improving. However, in his contribution the market demand function for status goods is not considered.<sup>4</sup>

The model presented here transfers the approach of Corneo and Jeanne [1997] with its special focus on the price of a status good to a mating game. Again, conspicuous consumption acts as a useful signaling device for the initiation of social contacts. Considering both pooling and separating equilibria with respect to the price of the status good allows the derivation of the market demand as a function of the level and distribution of income in the society considered. This approach allows the explanation of the *critical price* from which the good acts as a distinctive signal and can therefore be seen as a status good in a narrow sense. In addition, conditions under which conspicuous consumption can be welfare-increasing are shown.

We proceed as follows: in Section I, a simple mating model without status signaling is developed, which later serves as a benchmark in the analysis of welfare. In Section II, individuals have the option to demonstrate their status by conspicuous consumption. Section III presents the market demand function for status goods before welfare comparison is drawn in Section IV. Section V concludes.

## I. A WORLD WITHOUT STATUS SIGNALING

Consider a economy with two types of individuals  $H$  and  $L$ . The individuals earn

different incomes  $w_i$ , with  $w_H > w_L$ . The population shares of the two types are common knowledge and denoted by  $q_H$  and  $q_L = (1 - q_H)$ , with  $q_H < q_L$ . Each individual knows her own income, but cannot observe the income of the others directly. Hence, the situation is characterised by asymmetric information. Furthermore, individuals do have the option to enter a partnership or to stay alone. If an individual enters a partnership, she obtains fifty percent of the household income. Table 1 presents the payoffs in a partnership.

Table 1: Payoffs in a partnership

	$H$	$L$
$H$	$(\frac{w_H+w_H}{2}, \frac{w_H+w_H}{2})$	$(\frac{w_H+w_L}{2}, \frac{w_L+w_H}{2})$
$L$	$(\frac{w_L+w_H}{2}, \frac{w_H+w_L}{2})$	$(\frac{w_L+w_L}{2}, \frac{w_L+w_L}{2})$

If the individual stays alone, she can dispose of the full amount of her own income. But in this case psychic costs of being alone  $c_A > 0$  emerge which are not threatening individuals life so that  $c_A < w_i$  holds. Otherwise, if an existing partnership is dissolved, psychic costs of separating  $c_T > 0$  emerge. Both kinds of psychic costs are independent of the type of individual.

In a world without status signaling individual  $i$  only consumes the numéraire  $y$ . The price of the numéraire is normalised to 1. The individual spends her whole income to consume  $y$ . So, the very simple resource constraint of the individuals is

$$w_i = y_i. \quad (1)$$

Only the consumption of the numéraire  $y$  enters the utility function, so the utility function for each individual  $i$  is given by:

$$u_i = f(y_i) = y_i^\alpha. \quad (2)$$

The assumption of homogenous preferences holds. Furthermore, the standard assumption of a positive but decreasing marginal utility  $0 < \alpha < 1$  holds;  $\frac{\partial u_i(y_i)}{\partial y_i} > 0$ ,  $\frac{\partial^2 u_i(y_i)}{\partial y_i^2} < 0$ . Substituting (1) into (2) leads to

$$u_i = w_i^\alpha. \quad (3)$$

#### *The Desire for Partnership*

In the present model, the individual desire for partnership results from the comparison between the expected utility in a partnership and the certain utility of being alone. Index  $A$  denotes that individual  $i$  stays alone. Index  $P$  denotes that individual  $i$  enters a partnership. The expected utility from partnership is

$$E(u_{i,P}) = q_H(\frac{w_i + w_H}{2})^\alpha + (1 - q_H)(\frac{w_i + w_L}{2})^\alpha. \quad (4)$$

If an individual stays alone, her certain utility is



$$u_{i,A} = w_i^\alpha - c_A. \quad (5)$$

The individual  $i$  desires a partnership, if

$$E(u_{i,P}) \geq u_{i,A} \quad (6)$$

holds. The assumption that individuals desire a partnership if  $E(u_{i,P}) = u_{i,A}$ , leads to the exact definition of equilibria. The individual  $i$  wants to stay alone, if

$$E(u_{i,P}) < u_{i,A} \quad (7)$$

holds.

Substituting (4) and (5) into (6) as well as algebraic transformation lead to

$$c_A \geq w_i^\alpha - q_H \left( \frac{w_i + w_H}{2} \right)^\alpha - (1 - q_H) \left( \frac{w_i + w_L}{2} \right)^\alpha. \quad (8)$$

Hence, individuals of type  $H$  desire a partnership, if

$$c_A \geq (1 - q_H) \left( w_H^\alpha - \left( \frac{w_H + w_L}{2} \right)^\alpha \right) \quad (9)$$

holds, and individuals of type  $L$  desire a partnership, if

$$c_A \geq q_H \left( w_L^\alpha - \left( \frac{w_L + w_H}{2} \right)^\alpha \right) \quad (10)$$

holds. Note that the right hand side of inequation (10) is negative, because  $w_H > w_L$ . This means that individuals of type  $L$  would desire a partnership even if the psychic costs of being alone are negative, in other words even if they would obtain a payoff from being alone. We exclude this case from our analysis due to the assumption of positive costs of being alone  $c_A > 0$ . In the present model, individuals of type  $L$  desire a partnership at lower psychic costs of being alone than individuals of type  $H$ . This is illustrated by Figure 1.

### *Sequence of Moves*

In a world without status signaling the game unfolds as follows:

- (1) According to the probability distribution  $\{q_H; 1 - q_H\}$  the types of individuals are randomly assigned. Individuals know their own type, but the type is not directly observable by the others. However, the probability distribution  $\{q_H; 1 - q_H\}$  and the levels of income  $\{w_H; w_L\}$  are common knowledge.
- (2) Individuals compare their certain utility from being alone with their expected utility from partnership and decide to initiate a partnership or not.
- (3) If some/all individuals decide to initiate a partnership, according to the matching technology each individual who desires a partnership is randomly matched with a partner who desires a partnership too and each individual who wants to stay alone stays alone.

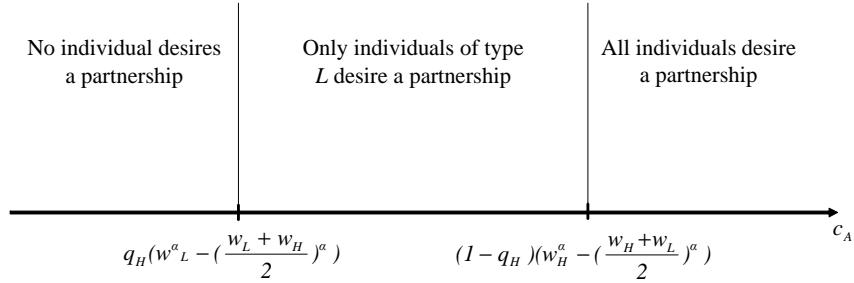


Figure 1: The desire for partnership

(4) Each individual compares the utility obtained in the partnership with the expected utility from dissolving the partnership and restarting the mating game. Then, the individual decides to stay in the partnership or not.

(5) Final Payoffs accrue.

*Equilibria in a World without Status Signaling*

In a world without status signaling, only individuals who desire a partnership mate. After the individual has entered the partnership she compares the certain utility from the partnership with the expected utility from restarting the mating game after separation  $E(u_{i,T})$ . Basically, a gain by restarting the mating game is only possible, if individual  $i$  was matched with an individual of type  $L$  before. Attention should be paid to the fact that at the first stage of the game some individuals  $H$  already meet partners of type  $H$ , are happy and exit the game. Because population shares of the two types are common knowledge, individuals know that some portion of the rich disappear at the end of the first stage and update the weight for the expected portion. Thus individual  $i$  only has an incentive to dissolve the partnership, if

$$\begin{aligned}
 E(u_{i,T}) &= \left(\frac{q_H}{q_H + 1}\right)\left(\frac{w_i + w_H}{2}\right)^\alpha + \left(\frac{1}{q_H + 1}\right)\left(\frac{w_i + w_L}{2}\right)^\alpha - c_T \quad (11) \\
 &> \left(\frac{w_i + w_L}{2}\right)^\alpha = u_{i,P}
 \end{aligned}$$

holds. An equilibrium emerges, if no individual can make herself better off by leaving the equilibrium, in other words by dissolving the partnership. Proposition 1 illustrates equilibria in a world without status signaling.

**Proposition 1** (a) *If, in a world without status signaling, psychic costs of being alone  $c_A$  are low so that  $c_A < (1 - q_H)(w_H^\alpha - (\frac{w_H + w_L}{2})^\alpha)$  holds, an equilibrium emerges in which only individuals of type  $L$  enter a partnership.*

(b) *If psychic costs of being alone  $c_A$  are high so that  $c_A \geq (1 - q_H)(w_H^\alpha - (\frac{w_H + w_L}{2})^\alpha)$  and in addition stability condition  $c_T \geq (\frac{q_H}{q_H + 1})(w_H^\alpha - (\frac{w_H + w_L}{2})^\alpha)$  hold, an equilibrium emerges in which all individuals enter a partnership.*

**Proof.** (a) If costs of being alone are low, only individuals of type  $L$  desire a partnership. Because of the assumption  $c_A > 0$ , type  $L$  individuals always desire a partnership. According to (7) individuals of type  $H$  want to stay alone, if

$$u_{H,A} = w_H^\alpha - c_A > q_H \left( \frac{w_H + w_H}{2} \right)^\alpha + (1 - q_H) \left( \frac{w_H + w_L}{2} \right)^\alpha = E(u_{H,P}) \quad (12)$$

holds. Algebraic transformation of (12) leads to Proposition 1(a).

(b) In this case, individuals of type  $H$  represent the critical type, because they do not desire a partnership at lower costs of being alone  $c_A$  than individuals of type  $L$ . According to (6) individuals of type  $H$  desire a partnership, if

$$u_{H,A} = w_H^\alpha - c_A \leq q_H \left( \frac{w_H + w_H}{2} \right)^\alpha + (1 - q_H) \left( \frac{w_H + w_L}{2} \right)^\alpha = E(u_{H,P}) \quad (13)$$

holds. Algebraic transformation of (13) leads to Proposition 1(b). According to (4) individuals expect a specific utility from partnership. If an individual  $i$  is matched with a partner of type  $L$ , the expectations of  $i$  are not fulfilled and she tends to dissolve the partnership. In this case, individuals of type  $H$  are the critical type, because they dissolve a partnership at lower separation costs  $c_T$  than individuals of type  $L$ .<sup>5</sup> Individuals of type  $H$  have no incentive to dissolve a partnership with an individual of type  $L$ , if

$$\begin{aligned} u_{H,P} &= \left( \frac{w_H + w_L}{2} \right)^\alpha \\ &\geq \left( \frac{q_H}{q_H + 1} \right) \left( \frac{w_H + w_H}{2} \right)^\alpha + \left( \frac{1}{q_H + 1} \right) \left( \frac{w_H + w_L}{2} \right)^\alpha - c_T = E(u_{H,T}) \end{aligned} \quad (14)$$

holds. Algebraic transformation of (14) leads to the stability condition in Proposition 1(b). ■

## II. A WORLD WITH STATUS SIGNALING

In a world with status signaling individuals have the option to demonstrate their income by the conspicuous consumption of status goods. Thus status signaling has an important effect on the mating game: If an individual signals, she is matched with another individual who signals too. If an individual does not signal, despite the option to do so, she expects with a probability of 1 to be matched with an individual of type  $L$ .<sup>6</sup>

In the considered society only one good is established as a status signal. The intuition behind this assumption is that periodically fashions emerge. With these fashions in each period only some and in our case only one good is accepted as a distinctive signal by the population.<sup>7</sup>

The status good only works as a status signal, is without intrinsic value and does not influence the individual's utility directly. Each individual purchases at most one unit of the status good  $x$ , at the price  $p_S \geq 0$ , so that  $x = \{0, 1\}$  holds. If an individual purchases the status good  $x$ , beside this, she only consumes the

numéraire  $y$ . However, if the individual does not purchase the status good, she spends her whole income on the consumption of  $y$ . Only the consumption of the numéraire  $y$  causes utility.<sup>8</sup>

### *Signaling Costs*

In a world with status signaling the budget constraint of the individuals is

$$w_i = p_S + y_i. \quad (15)$$

The utility function (3) is already known:

$$u_i = f(y_i) = y_i^\alpha.$$

Now,  $y_i$  in (3) can be substituted by (15). This leads to

$$u_i = (w_i - p_S \cdot \sigma_i)^\alpha. \quad (16)$$

The dummy variable for conspicuous consumption  $\sigma_i = \{0, 1\}$  becomes 1 if individual  $i$  buys the status good. If an individual signals by means of conspicuous consumption, signaling costs  $c_{S,i}$  arise. These signaling costs  $c_{S,i}$  reflect the opportunity costs in terms of directly utility enhancing consumption. This results in a utility loss  $\Delta u_i$ . The signaling costs  $c_{S,i}$  are given by

$$c_{S,i} = \Delta u_i = w_i^\alpha - (w_i - p_S)^\alpha. \quad (17)$$

As one can see, the signaling costs  $c_{S,i}$  depend on the income  $w_i$  and so, depend on the type of consumer. Because of the assumption of a positive but decreasing marginal utility

$$c_{S,H} < c_{S,L} \quad (18)$$

holds. As a result, the ostentatious display of wealth is cheaper for individuals of type  $H$  than for individuals of type  $L$ . With this, the approach presented here provides a utility theoretical explanation for the validity of the *single crossing property* in the present mating game. See the illustration in Figure 2.<sup>9</sup>

### *Sequence of Moves*

In a world with status signaling the game unfolds as follows:

(1) According to the probability distribution  $\{q_H; 1 - q_H\}$  the types of individuals are randomly assigned. Individuals know their own type, but the type is not directly observable by the others. However, the good which is established as a status good, its price  $p_S$  as well as the probability distribution  $\{q_H; 1 - q_H\}$  and the levels of income  $\{w_H; w_L\}$  are common knowledge.

(2) Individuals compare simultaneously their certain utility from being alone with their certain utility from a partnership with a partner of type  $L$  as well as with their expected utility from partnership after signaling and decide to stay

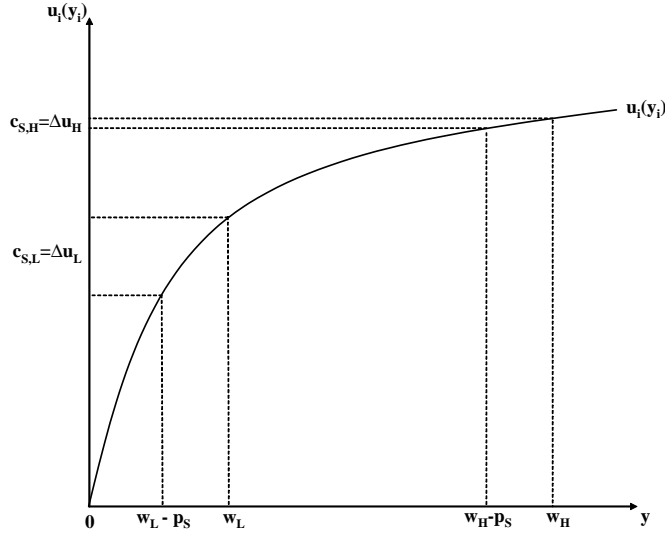


Figure 2: Costs of conspicuous consumption

alone or to initiate a partnership with a partner of type  $L$  or to buy the status good  $\sigma_i = 1$ .

(3) According to the matching technology each individual who signals is randomly matched with a partner who signals too and each individual who does not signal is randomly matched with a partner who does not signal too. In addition each individual who wants to stay alone stays alone.

(4) Each individual who was matched with a partner after buying the status good compares the utility obtained with the expected utility from dissolving the partnership and restarting the mating game. Then, the individual decides to stay in the partnership or not.

(5) Final Payoffs accrue.

#### *Equilibria in a World with Status Signaling*

Depending on the signaling decision of the individuals pooling and separating equilibria can emerge.

In a pooling equilibrium individuals of both types signal. Expecting a pooling equilibrium individuals of type  $i$  have an incentive to signal, if

$$\begin{aligned}
E(u_i^{pool}) &= q_H \left( \frac{w_i + w_H}{2} \right)^\alpha + (1 - q_H) \left( \frac{w_i + w_L}{2} \right)^\alpha - c_{S,i} \\
&\geq \begin{cases} \left( \frac{w_i + w_L}{2} \right)^\alpha = u_{i,L} & \text{if } c_A \geq w_i^\alpha - \left( \frac{w_i + w_L}{2} \right)^\alpha \text{ or} \\ w_i^\alpha - c_A = u_{i,A} & \text{if } c_A < w_i^\alpha - \left( \frac{w_i + w_L}{2} \right)^\alpha \end{cases}
\end{aligned} \tag{19}$$

holds. Note that because of the assumption  $c_A > 0$ , individuals of type  $L$  signal if  $E(u_L^{pool}) \geq u_{L,L}$  holds. For type  $H$  individuals the decision problem differs: if costs of being alone are high  $c_A \geq w_H^\alpha - \left( \frac{w_H + w_L}{2} \right)^\alpha$ , individuals of type  $H$  signal if  $E(u_H^{pool}) \geq u_{H,L}$  holds. However, if costs of being alone are low  $c_A < w_H^\alpha - \left( \frac{w_H + w_L}{2} \right)^\alpha$ , individuals of type  $H$  signal if  $E(u_H^{pool}) \geq u_{H,A}$  holds. If the individual  $i$  is matched with a partner of type  $L$ , her expectations are not fulfilled. Therefore, she tends to dissolve the partnership, restart the mating game and signal again. However, in this case psychic costs of separation  $c_T$  emerge. As above, a gain by restarting the mating game is only possible, if individual  $i$  was matched with an individual of type  $L$  before. Again, individuals know that some individuals of type  $H$  mate rich partners and disappear at the end of the first stage. With this knowledge the weight for the expected utility is updated at the beginning of the second stage. Thus, the individual  $i$  only has an incentive to stay inside the partnership, if

$$\begin{aligned}
u_{i,L}^{pool} &= \left( \frac{w_i + w_L}{2} \right)^\alpha \\
&\geq \left( \frac{q_H}{q_H + 1} \right) \left( \frac{w_i + w_H}{2} \right)^\alpha + \left( \frac{1}{q_H + 1} \right) \left( \frac{w_i + w_L}{2} \right)^\alpha - c_{S,i} - c_T = E(u_{i,T}^{pool})
\end{aligned} \tag{20}$$

holds. Thereby, individuals of type  $H$  are the critical type, because they leave the partnership and so the pooling equilibrium at lower separation costs  $c_T$ , than individuals of type  $L$ .<sup>10</sup> Algebraic transformation of (20) leads to the stability condition for pooling equilibria:

$$c_T(p_S) \geq \left( \frac{q_H}{q_H + 1} \right) \left( w_H^\alpha - \left( \frac{w_H + w_L}{2} \right)^\alpha \right) - \left( w_H^\alpha - (w_H - p_S)^\alpha \right). \tag{21}$$

The separation costs  $c_T$ , which are sufficient for the stability for the pooling equilibrium and thus for the stability for partnerships, is dependent on the price of the status good  $p_S$ . If (19) and (21) hold, an equilibrium emerges in which both the individuals of type  $H$  as well as the individuals of type  $L$  signal. As one can see, positive costs of separating  $c_T$  are the precondition for the existence of a pooling equilibrium. If no costs of separating  $c_T$  would exist, individuals of type  $H$  would dissolve partnership with a type  $L$  individual and restart the mating game as long as they would mate a partner of their own type. As a result, a separating equilibrium would emerge. However, already Lundberg and Pollak hint on the importance of "costs of divorce, including psychic costs" as "divorce bounds" [Lundberg and Pollak 1996, 154].

In the separating equilibrium only individuals of type  $H$  signal and individuals of type  $L$  do not. Expecting a separating equilibrium individuals of type  $H$  have an incentive to signal, if

$$u_H^{sep} = \left(\frac{w_H + w_H}{2}\right)^\alpha - c_{S,H} \geq \begin{cases} \left(\frac{w_H + w_L}{2}\right)^\alpha = u_{H,L} & \text{if } c_A \geq w_H^\alpha - \left(\frac{w_H + w_L}{2}\right)^\alpha \text{ or} \\ w_H^\alpha - c_A = u_{H,A} & \text{if } c_A < w_H^\alpha - \left(\frac{w_H + w_L}{2}\right)^\alpha \end{cases} \quad (22)$$

holds. I.e., the utility of an individual of type  $H$  from a partnership with a partner of type  $L$  or the utility from being alone is not bigger than her utility from a partnership with a partner of type  $H$  minus the type specific signaling costs.

However, individuals of type  $L$  have no incentive to signal, if

$$u_L^{sep} = \left(\frac{w_L + w_H}{2}\right)^\alpha - c_{S,L} < \left(\frac{w_L + w_L}{2}\right)^\alpha = u_{L,L} \quad (23)$$

holds. I.e., the utility of an individual of type  $L$  from a partnership with a partner of type  $L$  is bigger than her utility from a partnership with a partner of type  $H$  minus the type specific signaling costs. (Note that because of the assumption  $c_A > 0$  type  $L$  individuals always desire a partnership.) If (22) and (23) hold, an equilibrium emerges in which only the individuals of type  $H$  signal.

Whether pooling equilibrium oder separating equilibrium emerge depends on the price of the status good. Proposition 2 encapsulates this.

**Proposition 2** (a) *If in a world with status signaling*

$$0 \leq p_S \leq \begin{cases} w_L - \sqrt[\alpha]{w_L^\alpha + q_H(w_L^\alpha - \left(\frac{w_L + w_H}{2}\right)^\alpha)} & \text{if } c_A \text{ are high or} \\ w_H - \sqrt[\alpha]{(2 - q_H)w_H^\alpha - (1 - q_H)\left(\frac{w_L + w_H}{2}\right)^\alpha - c_A} & \text{if } c_A \text{ are low,} \end{cases}$$

*the stability condition*

$$c_T(p_S) \geq \left(\frac{q_H}{q_H + 1}\right)(w_H^\alpha - \left(\frac{w_H + w_L}{2}\right)^\alpha) - (w_H^\alpha - (w_H - p_S)^\alpha), \text{ and the budget condition}$$

$$\alpha \leq \ln\left(\frac{1+q}{q}\right) / \ln\left(\frac{w_H + w_L}{2w_L}\right) \text{ hold,}$$

*a pooling equilibrium emerges in which all individuals purchase the status good.*

(b) *However, if*

$$w_L - \sqrt[\alpha]{2w_L^\alpha - \left(\frac{w_L + w_H}{2}\right)^\alpha} \leq p_S \leq \begin{cases} \left(\frac{w_H - w_L}{2}\right) & \text{if } c_A \geq w_H^\alpha - \left(\frac{w_H + w_L}{2}\right)^\alpha \text{ or} \\ w_H - \sqrt[\alpha]{w_H^\alpha - c_A} & \text{if } c_A < w_H^\alpha - \left(\frac{w_H + w_L}{2}\right)^\alpha \end{cases}$$

*and the budget condition*

$$\alpha \leq \ln(2) / \ln\left(\frac{w_H + w_L}{2w_L}\right) \text{ hold,}$$

*a separating equilibrium emerges in which only individuals of type  $H$  purchase the status good.*

(c) No signaling equilibria emerge, if Proposition 2(a) and (b) do not hold.

**Proof.** (a) If  $c_A$  are high, individuals of type  $L$  are the critical type, because they leave the pooling equilibrium at a lower price of the status good  $p_S$  than individuals of type  $H$ . As shown by (19), individuals of type  $L$  have an incentive to signal, if

$$\begin{aligned} E(u_L^{pool}) &= q_H \left( \frac{w_L + w_H}{2} \right)^\alpha + (1 - q_H) \left( \frac{w_L + w_L}{2} \right)^\alpha - c_{S,L} \\ &\geq \left( \frac{w_L + w_L}{2} \right)^\alpha = u_{L,L} \end{aligned}$$

holds. If on the other hand  $c_A$  are low, individuals of type  $H$  are the critical type, because now they leave the pooling equilibrium at a lower price of the status good  $p_S$  than individuals of type  $L$ . As shown by (19), individuals of type  $H$  have an incentive to signal, if

$$\begin{aligned} E(u_H^{pool}) &= q_H \left( \frac{w_H + w_H}{2} \right)^\alpha + (1 - q_H) \left( \frac{w_H + w_L}{2} \right)^\alpha - c_{S,H} \\ &\geq w_H^\alpha - c_A = u_{H,A} \end{aligned}$$

Substituting (17) into (19) and algebraic transformation lead to Proposition 2(a). Inequation (21) is the stability condition for the equilibrium. The budget condition  $\alpha \leq \ln(\frac{1+q}{q}) / \ln(\frac{w_H + w_L}{2w_L})$  prevents that the willingness to pay of individuals of type  $L$  may exceed their budget in the case of low income  $w_L < w_H(\frac{q}{2+q})$ , so that (15) holds. In parametric constellations  $w_L > w_H(\frac{q}{2+q})$  the condition is already fulfilled by the standard utility assumption  $0 < \alpha < 1$ . Technically the condition prevents that the expression under the root becomes negative.

(b) A separating equilibrium emerges, if individuals of type  $H$  signal and individuals of type  $L$  do not. As shown by (22) individuals of type  $H$  have an incentive to signal, if

$$\begin{aligned} u_H^{sep} &= \left( \frac{w_H + w_H}{2} \right)^\alpha - c_{S,H} \\ &\geq \begin{cases} \left( \frac{w_H + w_L}{2} \right)^\alpha = u_{H,L} & \text{if } c_A \geq w_H^\alpha - \left( \frac{w_H + w_L}{2} \right)^\alpha \text{ or} \\ w_H^\alpha - c_A = u_{H,A} & \text{if } c_A < w_H^\alpha - \left( \frac{w_H + w_L}{2} \right)^\alpha \end{cases} \end{aligned}$$

holds. As shown by (23) individuals of type  $L$  do not have an incentive to signal, if

$$u_L^{sep} = \left( \frac{w_L + w_H}{2} \right)^\alpha - c_{S,L} < \left( \frac{w_L + w_L}{2} \right)^\alpha = u_{L,L}$$

holds. Substituting (17) into (22) and (23) as well as algebraic transformation lead to Proposition 2(b). The budget condition  $\alpha \leq \ln(2) / \ln(\frac{w_H + w_L}{2w_L})$  prevents that the willingness to pay of individuals of type  $L$  may exceed their budget constraint in the case of low income  $w_L < w_H/3$ , so that (15) holds. In parametric constellations  $w_L > \frac{w_H}{3}$  the condition is already fulfilled by the standard utility assumption  $0 < \alpha < 1$ . Technically the condition prevents that the expression under the root becomes negative.

(c) Proposition 2(c) results directly from (a) and (b). ■



### III. MARKET DEMAND FUNCTION FOR STATUS GOODS

In a world with status signaling individuals decide to consume conspicuously depending on the price of the status good. With this decision pooling or separating equilibria emerge what results in the market demand function. The number of the status good purchased is given by the part of the population, which buys just one unit of the status good. Thus in a world with status signaling price ranges of the status good have to be considered in which pooling or separating equilibria emerge. Proposition 3 shows the market demand function for the status good. Figure 3 illustrates the market demand function for the status good for  $w_H = 100000$ ,  $w_L = 50000$ ,  $q_H = 0,3$ ,  $\alpha = 0,90$ , and  $c_A = 8000$ .

**Proposition 3** *The market demand function for the status good  $D(p_S)$  is given by:*

$$D(p_S) = \left\{ \begin{array}{l} 1, \quad \text{in the pooling case.} \\ 0, \quad \text{if } \left. \begin{array}{l} w_L - \sqrt[\alpha]{w_L^\alpha + q_H(w_L^\alpha - (\frac{w_L+w_H}{2})^\alpha)} \\ w_H - \sqrt[\alpha]{(2-q_H)w_H^\alpha - (1-q_H)(\frac{w_L+w_H}{2})^\alpha - c_A} \end{array} \right\} \\ < p_S < w_L - \sqrt[\alpha]{2w_L^\alpha - (\frac{w_L+w_H}{2})^\alpha}. \\ q_H, \quad \text{in the separating case.} \\ 0, \quad \text{if } p_S > \left\{ \begin{array}{l} (\frac{w_H-w_L}{2}) \text{ if } c_A \geq w_H^\alpha - (\frac{w_H+w_L}{2})^\alpha \text{ or} \\ w_H - \sqrt[\alpha]{w_H^\alpha - c_A} \text{ if } c_A < w_H^\alpha - (\frac{w_H+w_L}{2})^\alpha. \end{array} \right. \end{array} \right\} \quad (24)$$

**Proof.** The market demand function for the status good  $D(p_S)$  follows directly from Proposition 2 and its proof. ■

There exist four ranges of the market demand function for the status good  $D(p_S)$  which are determined by the upper and lower price limits of the pooling and separating equilibrium. If the price is low, a pooling equilibrium emerges and everyone in the considered economy buys the good. In this case the good is no status good in a narrow sense, because it does not act as a distinctive signal. If the price is high, a separating equilibrium emerges and only the rich part of the population purchases the good. The lower price limit of the separating case can be seen as the *critical price* from which the good acts as a distinctive signal and therefore can be seen as a status good in a narrow sense. If the price is located in a very high as well as in a middle range, demand collapses. Thus one might see the upper limit of the separating case as critical too.

The *critical price* of the market demand function for the status good might be of special interest with regard to the pricing policy of a monopolist. Well accepted by the Directorate General for Competition of the European Commission as well

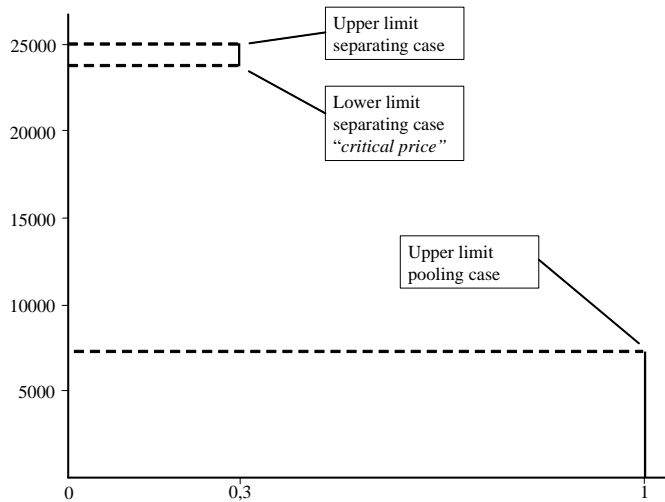


Figure 3: Market demand for status goods

as by the UK Competition Commission, the price itself is a main characteristic of a luxury. If, a monopolist would set the price of the status good to low, demand collapses because the article loses its value as a distinctive signal and in addition is still too expensive for mass market. The model presented here, hints on the danger of a "got stuck in the middle" due to the wrong pricing policy.

#### IV. WELFARE COMPARISON

With the different outcomes depending on the price of the status good different welfare situations emerge which are to be compared. The question if status signaling is welfare-improving or not, depends on the price of the status good as well as on the norms and values of the social environment expressed through the level of costs of being alone.<sup>11</sup>

In our model welfare measure  $W$  is defined by the ratio of the absolute value of the welfare and the number of individuals in the considered economy. Thus  $W$  is the welfare per capita. With respect to the different groups of individuals,  $W_i$  represents the relative welfare contribution of the group of individuals of type  $i \in \{L, H\}$  per capita of the whole population

$$W_i = q_i u_i.$$

The welfare of the whole economy is defined by

$$W = W_H + W_L. \tag{25}$$

In a world without status signaling according to the equilibria shown in Proposition 1 following welfare outcomes can emerge.

If costs of being alone are low and  $c_A < (1 - q_H)(w_H^\alpha - (\frac{w_H + w_L}{2})^\alpha)$  holds, only individuals of type  $L$  desire a partnership. Hence, only they are matched with other individuals of type  $L$  and the welfare per capita is given by

$$W_{H,A;L,P} = q_H w_H^\alpha + (1 - q_H) w_L^\alpha - q_H c_A. \quad (26)$$

If costs of being alone are high and  $c_A \geq (1 - q_H)(w_H^\alpha - (\frac{w_H + w_L}{2})^\alpha)$  holds, all individuals desire a partnership and mate. In this case welfare is given by

$$W_{H,P;L,P} = q_H w_H^\alpha + (1 - q_H) w_L^\alpha. \quad (27)$$

First view on welfare situation in the latter case suggests that the outcome might be the same as it would be in a nirvana with complete information. Taking a closer look this suggestion is correct if you focus on welfare as a whole. Welfare in the full information case and welfare in a world with high costs of being alone are the same. Thus, in a world with high costs of being alone status signaling cannot be welfare-improving.

The intuition is straightforward: If, as already suggested by Sombart [1913, 73], in a society in which love life is free and not determined by strict social norms and rules, cost of being alone are low and the initiation of partnership is encouraged by the ostentative consumption of luxuries. If society is characterized by strict social norms which prohibit for instance extramarital love life, cost of being alone are high and individuals (have to) enter a partnership even without status signaling. As a result, no costs of being alone emerge.

But the suggestion is incorrect if you focus on the welfare situation of both groups of individuals. In a world with complete information each individual can observe the properties of the others directly and initiates a partnership. Thereby, individuals of type  $L$  would prefer to mate rich partners but no rich partner would agree proposal of an individual of type  $L$ . Thus each individual would mate a partner of it's one type to avoid positive costs of being alone.

The situation with asymmetric information and high costs of being alone differs. In such a world all individuals want to mate to avoid the high costs of being alone, but in this situation some individuals of type  $H$  are matched with poor partners. In comparison with the full information case some rich are worse off. Thus in such a society individuals of type  $H$  have a veritable incentive to establish a mechanism to separate the rich from the poor for instance by status signaling.

In a world with status signaling according to Proposition 2 depending on the price of the status good pooling and separating equilibria can emerge. If the price of the status good is low, everyone buys the good and a pooling equilibrium emerges in which each individual mates another. In this case welfare per capita is given by

$$W^{pool} = q_H w_H^\alpha + (1 - q_H) w_L^\alpha - [q_H c_{S,H} + (1 - q_H) c_{S,L}]. \quad (28)$$

In the pooling equilibrium welfare is determined by income as well as by emerging signaling costs in the whole population. Due to positive signaling costs a welfare gain is impossible in comparison with welfare in a world without status signaling and high costs of being alone (27). In addition the comparison between welfare outcome in the pooling equilibrium (28) and (26) is inconsistent. Equation (26) implies relative low costs of being alone which permit individuals of type  $H$  to abstain from partnership, whereas (28) implies high costs of being alone which force individual of type  $H$  to signal in the pooling equilibrium. Comparison of different situations with such diverging cost structure is incorrect.

If the price of the status good is high, only individuals of type  $H$  buy the good and a separating equilibrium emerges in which each individual mates other individuals of their own type. In this case welfare per capita is given by

$$W^{sep} = q_H w_H^\alpha + (1 - q_H) w_L^\alpha - q_H c_{S,H}. \quad (29)$$

In the separating equilibrium welfare is determined by income as well as by emerging signaling costs only in the  $H$ -part of the population. Again, due to positive signaling costs a welfare gain is impossible in comparison with welfare in a world without status signaling and high costs of being alone (27). But comparison between welfare outcome in the separation equilibrium (29) and (26) is consistent and leads to the condition for welfare-improving impact of status signaling. Proposition 4 shows this condition.

**Proposition 4** *Status signaling is welfare improving if costs of being alone are low, a separating equilibrium emerges and in addition  $q_H c_A > q_H c_{S,H}$  holds.*

**Proof.** If, according to Proposition 1(a), in a world without status signaling only individuals of type  $L$  desire a partnership, psychic costs of being alone  $c_A$  only emerge in the type  $H$  part of the population. In addition, according to conditions presented in Proposition 2(b) in a world with status signaling a separating equilibrium emerges in which only individuals of type  $H$  purchase the status good. From comparison between (26) and (29) directly follows, that  $W^{sep} > W_{L,P;H,A}$ , if

$$q_H c_A > q_H c_{S,H} \quad (30)$$

holds. ■

In our model status signaling only can be welfare-improving if in a world without status signaling individuals of type  $H$  decide to stay alone due to the risk of being matched with an unwanted partner of type  $L$ . In this case costs of being alone emerge in the  $H$ -part of society and cause a welfare loss. In a world with status signaling individuals have the option to signal their type. Up from a *critical price* conspicuous consumption separates the rich from the poor, what eliminate the risk of being matched with an unwanted partner. As a result now the rich enter a partnership too and no costs of being alone emerge in society.

If in a world with status signaling signaling costs in the  $H$ -part of society are lower than costs of being alone in the  $H$ -part of society in a world with status

signaling, conspicuous consumption is welfare-improving. The welfare gain is based upon the fact that now rich individuals enter a partnership who had decided to stay alone before. In addition it can be ascertained that the lower the costs of being alone  $c_A$  are, the more likely status signaling is to be welfare improving. Consequentially, in no way can status signaling be seen as *social waste*.

The results of the model are consistent with the suggestion of Rae 1965[1834], 265ff] and more recently Pesendorfer [1995, 785], who state that signaling by the conspicuous consumption of luxuries and fashions is more important in large and anonymous cities than in small villages and rural regions, in which the risk to meet unknown potential partners is low and in addition the costs of being alone might be high.

## V. CONCLUSION

In the current mating game, conspicuous consumption of status goods only serves as a signal at the initiation of partnership in a world of asymmetric information. If an individual purchases the status good, signaling costs as utility loss emerge, because of the lower amount of other goods consumed. This definition of signaling costs allows a utility theoretical explanation for the validity of the *single crossing property* in the present mating game.

Considering both pooling and separating equilibria with respect to the price of the status good allows the derivation of the market demand as a function of level and distribution of income in the considered society. The model explains the *critical price* from which the good acts as a distinctive signal and therefore can be seen as a status good in a narrow sense.

The derived market demand function clearly differs from the standard case: If (1) the price is low, a pooling equilibrium emerges and everyone in the considered economy buys the good. In this case the good is no status good in a narrow sense, because it does not act as a distinctive signal. If (2) the price is high, a separating equilibrium emerges and only the rich part of the population purchases the good. In this case the good is a status good in a narrow sense. If (3) the price is located in a very high as well as in a middle range, demand collapses. This surprising shape of the derived market demand function might be of special interest for the pricing policy of a monopolist. If a producer of a status good would set the price to low, demand collapses because the article loses its value as a distinctive signal and in addition is still too expensive for mass market. With this model presented here, hints on the danger of a "got stuck in the middle" due to the wrong pricing policy.

Interpreting demonstrative consumption as a useful signaling device in the initiation of social contacts in a world of asymmetric information this approach allows conclusions about the potential welfare improving impact of conspicuous consumption. Consequentially, it has to be stated that in no way status signaling can be seen as *social waste*. Taking these results into account, recom-

mendations by numerous economists to prevent the welfare losses of conspicuous consumption by introducing a *luxury tax* are highly questionable.

The present model is for sure quite basic. It only considers two groups of individuals and only one status good. Nevertheless, the basic mechanisms of status driven demand were presented on a market level. With regard to future research the model could be developed into a more sophisticated model with  $n$  types of individuals and  $(n - 1)$  status goods.

Another challenge is the empirical verification of the market demand function for status goods. A starting point could be the contribution of Basmann, Molina and Slottje [1983/1988], Phillips and Slottje [1983] as well as Creedy and Slottje [1991]. The authors show empirically *Veblen Effects* as the positive price dependency of demand for commodities. However, whether this special price dependency refers to interpersonal consumption effects stays ambiguous there.

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## Notes

<sup>1</sup>Today, Veblen's continuing popularity among students stems less from his model of social evolution, but rather from Harvey Leibenstein's article *Bandwagon, Snob, and Veblen Effects in the Theory of Consumers' Demand*. There, "for want of a better term" [Leibenstein 1950, 203], he named the case of a partly upward sloping demand function the *Veblen Effect*, which can be found in almost each microeconomic textbook.

<sup>2</sup>Corneo and Jeanne [1997] state that the prohibition of conspicuous consumption is always welfare-improving, whereas the welfare effects of taxation are ambiguous.

<sup>3</sup>In addition, in their welfare analysis the Frank [1985] and Ireland [1994] compare a world with status signaling and income as private information with a world in which the income rank of each individual is common knowledge. This comparison leads to the result that a world in which the income rank of each individual is common knowledge is welfare-superior, and so status signaling has to be seen as *social waste*. But: it is hardly surprising that conspicuous consumption as a signal makes no sense in a world of complete information which is definitely a part of Nirvana economics.

<sup>4</sup>The present paper is also related to the contributions of Corneo and Jeanne [1998] as well as Van Long and Shimomura [2004] who analyze the intertemporal consumption decision in the framework of life cycle models. Cooper et al. [2001], Corneo and Jeanne [2001] and Rauscher [1997] focus on the impact of conspicuous consumption on economic growth. Haucap [2001] as well as Jaramillo et al. [2001] analyze conspicuous consumption in clubs. Ferrer [2005] presents a signaling game in which education acts as a status signal. Kräbmer [2006] focuses on the connection between advertising and conspicuous consumption.

<sup>5</sup>Individuals of type  $H$  dissolve a partnership at lower separation costs  $c_T$  because of their higher income and the assumption of a positive but decreasing marginal utility. As a result of this, their risk of utility loss with separation and restarting the mating game is lower than the risk of individuals of type  $L$ .

<sup>6</sup>At a first view this assumption might be problematic. A second view discloses that this assumption is straightforward. In the present mating game the only situation in which

some individuals signal and some individuals do not is a separating equilibrium in a world with status signaling. This situation is characterised by individuals of type  $H$  who signal and individuals of type  $L$  who do not. So, if an individual does not signal in the separating equilibrium, the only conclusion can be that she is of type  $L$ . As a result, she has to expect that she will be seen by the others as being poor and with this be matched with an individual of type  $L$  for sure.

<sup>7</sup>For deeper insights in fashion cycles see Pesendorfer [1995].

<sup>8</sup>The set up that individuals purchase at most one unit of the status good is similar to the approach of Corneo and Jeanne [1997, 57]. What differs to their seminal contribution as well to the approaches of Frank [1985, 103], Irland [1994, 93], and more recent Hopkins and Kornienko [2004, 1089] is that in our model neither status nor the consumption of the status good itself enters the utility function. From this perspective in our model conspicuous consumption is instrumental and without intrinsic motivation.

<sup>9</sup>The *single crossing property* is the condition for the possible emergence of separating equilibria in signaling games. It is also well known as *sorting condition*, *constant sign condition* or *Spence-Mirrlees condition* [Fudenberg/Tirole 1991, 259].

<sup>10</sup>As above, individuals of type  $H$  dissolve a partnership at lower separation costs  $c_T$  because of their higher income and the assumption of a positive but decreasing marginal utility. Now, beside their lower risk of utility loss, their signaling costs  $c_{S,H}$  are lower than the signaling costs of  $L$ -type individuals  $c_{S,L}$  too.

<sup>11</sup>In his seminal contribution Haucap [2001] presents a similar welfare analysis. What differs in our contribution is the strict focus on the price-dependency of different welfare outcomes.

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