Dress To Impress: Brands as Status Symbols

Aula 07

Rogério Mazali

Economia da Inovação I

06/12/2016

- Veblen (1899) had already ponted out the role of status concerns on the markets of certain goods.

- Veblen (1899) had already ponted out the role of status concerns on the markets of certain goods.
- By status concerns we understand a situation in which agents don't care about the absolute quantity of the good they consume, but instead the positional (ordinal) value it attains in the distribution of the good across society.

- Veblen (1899) had already ponted out the role of status concerns on the markets of certain goods.
- By status concerns we understand a situation in which agents don't care about the absolute quantity of the good they consume, but instead the positional (ordinal) value it attains in the distribution of the good across society.
- In a matching market such as that of Becker (JPE, 1973, 1974) with incomplete information, individuals might purchase goods with the sole purpose of signaling ability to potential matches.

- Veblen (1899) had already ponted out the role of status concerns on the markets of certain goods.
- By status concerns we understand a situation in which agents don't care about the absolute quantity of the good they consume, but instead the positional (ordinal) value it attains in the distribution of the good across society.
- In a matching market such as that of Becker (JPE, 1973, 1974) with incomplete information, individuals might purchase goods with the sole purpose of signaling ability to potential matches.
- These goods are what we call "status goods" or "positional goods".

- In order to obtain the best possible match, what matters is the positional value of the good, in terms of quantity, quality, or sum spend, depending on the model:

- In order to obtain the best possible match, what matters is the positional value of the good, in terms of quantity, quality, or sum spend, depending on the model:
    - Cole, Mailath and Postlewaite (JPE, 1992): savings and economic growth.

- In order to obtain the best possible match, what matters is the positional value of the good, in terms of quantity, quality, or sum spend, depending on the model:
  - Cole, Mailath and Postlewaite (JPE, 1992): savings and economic growth.
  - Hopkins and Kornienko (AER, 2004; WP 2005; WP 2009): income inequality => status good consumption.

- In order to obtain the best possible match, what matters is the positional value of the good, in terms of quantity, quality, or sum spend, depending on the model:
    - Cole, Mailath and Postlewaite (JPE, 1992): savings and economic growth.
    - Hopkins and Kornienko (AER, 2004; WP 2005; WP 2009): income inequality $=>$ status good consumption.
    - Pesendorfer (AER, 1995): fashion design

- In order to obtain the best possible match, what matters is the positional value of the good, in terms of quantity, quality, or sum spend, depending on the model:
  - Cole, Mailath and Postlewaite (JPE, 1992): savings and economic growth.
  - Hopkins and Kornienko (AER, 2004; WP 2005; WP 2009): income inequality $=>$ status good consumption.
  - Pesendorfer (AER, 1995): fashion design
  - Burdett and Coles (QJE, 1997): marriage.

- In order to obtain the best possible match, what matters is the positional value of the good, in terms of quantity, quality, or sum spend, depending on the model:
  - Cole, Mailath and Postlewaite (JPE, 1992): savings and economic growth.
  - Hopkins and Kornienko (AER, 2004; WP 2005; WP 2009): income inequality $=>$ status good consumption.
  - Pesendorfer (AER, 1995): fashion design
  - Burdett and Coles (QJE, 1997): marriage.
  - Rayo (BJTE, 2013): quality.

- In order to obtain the best possible match, what matters is the positional value of the good, in terms of quantity, quality, or sum spend, depending on the model:
  - Cole, Mailath and Postlewaite (JPE, 1992): savings and economic growth.
  - Hopkins and Kornienko (AER, 2004; WP 2005; WP 2009): income inequality => status good consumption.
  - Pesendorfer (AER, 1995): fashion design
  - Burdett and Coles (QJE, 1997): marriage.
  - Rayo (BJTE, 2013): quality.
- In many of these models, firms can create completely customized status goods that consumers can use as signaling devices in the matching models.

- In order to obtain the best possible match, what matters is the positional value of the good, in terms of quantity, quality, or sum spend, depending on the model:
  - Cole, Mailath and Postlewaite (JPE, 1992): savings and economic growth.
  - Hopkins and Kornienko (AER, 2004; WP 2005; WP 2009): income inequality => status good consumption.
  - Pesendorfer (AER, 1995): fashion design
  - Burdett and Coles (QJE, 1997): marriage.
  - Rayo (BJTE, 2013): quality.
- In many of these models, firms can create completely customized status goods that consumers can use as signaling devices in the matching models.
- This market structure is a result of the production technology assumed in the production of status goods: **no fixed costs**.

- Because, like in F1, payoffs fall exponentially as you fall from 1st place to 2nd, 2nd to 3rd, etc., there is incentive to overconsumption of status goods.

- Because, like in F1, payoffs fall exponentially as you fall from 1st place to 2nd, 2nd to 3rd, etc., there is incentive to overconsumption of status goods.
- Overconsumption can be corrected by consumption taxes:

- Because, like in F1, payoffs fall exponentially as you fall from 1st place to 2nd, 2nd to 3rd, etc., there is incentive to overconsumption of status goods.
- Overconsumption can be corrected by consumption taxes:
    - Frank (AER, 1985, 2005); Rege (JEBO, 2008); Ireland (J Pub Econ, 1994, 2001).

- Because, like in F1, payoffs fall exponentially as you fall from 1st place to 2nd, 2nd to 3rd, etc., there is incentive to overconsumption of status goods.
- Overconsumption can be corrected by consumption taxes:
    - Frank (AER, 1985, 2005); Rege (JEBO, 2008); Ireland (J Pub Econ, 1994, 2001).
    - In many models, solution is: Tax as much as possible to reduce or eliminate status consumption.

- We introduce fixed costs to the production of a pure status good.

- We introduce fixed costs to the production of a pure status good.
- Full customization is no longer supported as an equilibrium.

- We introduce fixed costs to the production of a pure status good.
- Full customization is no longer supported as an equilibrium.
- Instead, the most information-revealing equilibrium is **stratified**:

- We introduce fixed costs to the production of a pure status good.
- Full customization is no longer supported as an equilibrium.
- Instead, the most information-revealing equilibrium is **stratified**:
  - Firms offer a finite number of goods of different brands;

- We introduce fixed costs to the production of a pure status good.
- Full customization is no longer supported as an equilibrium.
- Instead, the most information-revealing equilibrium is **stratified**:
  - Firms offer a finite number of goods of different brands;
  - Each social stratum buys one particular brand;

- We introduce fixed costs to the production of a pure status good.
- Full customization is no longer supported as an equilibrium.
- Instead, the most information-revealing equilibrium is **stratified**:
  - Firms offer a finite number of goods of different brands;
  - Each social stratum buys one particular brand;
  - Matching is random within each social stratum, no match occurs between members of different social strata.

- Implications to taxation:

- Implications to taxation:
    - Taxation affects the number of brands offered in equilibrium

- Implications to taxation:
  - Taxation affects the number of brands offered in equilibrium
  - More tax => Less brands;

- Implications to taxation:
  - Taxation affects the number of brands offered in equilibrium
  - More tax => Less brands;
  - Less brands => "noisier", less efficient matchings;

- Implications to taxation:
  - Taxation affects the number of brands offered in equilibrium
  - More tax => Less brands;
  - Less brands => “noisier”, less efficient matchings;
  - It is no longer optimal to tax status goods to the limit;

- Implications to taxation:
  - Taxation affects the number of brands offered in equilibrium
  - More tax $=>$ Less brands;
  - Less brands $=>$ "noisier", less efficient matchings;
  - It is no longer optimal to tax status goods to the limit;
  - Optimal tax balances two effects: reduce overconsumption vs. matching efficiency

Model Setup

Consumers

- Two types of goods: consumption and status.

- Two types of goods: consumption and status.
- Status good gives no direct utility, only status value.

Model Setup
Consumers

- Two types of goods: consumption and status.
- Status good gives no direct utility, only status value.
- Consumers indexed in continuum: Two Populations:

Model Setup

Consumers

- Two types of goods: consumption and status.
- Status good gives no direct utility, only status value.
- Consumers indexed in continuum: Two Populations:
  - Greens: $i \in G = [0, 1]$, where i represents consumers' ability.

Model Setup

Consumers

- Two types of goods: consumption and status.
- Status good gives no direct utility, only status value.
- Consumers indexed in continuum: Two Populations:
  - Greens: $i \in G = [0, 1]$, where i represents consumers' ability.
  - Reds: $j \in R = [0, 1]$, where j represents consumers' ability.

- Two types of goods: consumption and status.
- Status good gives no direct utility, only status value.
- Consumers indexed in continuum: Two Populations:
  - Greens: $i \in G = [0, 1]$, where i represents consumers' ability.
  - Reds: $j \in R = [0, 1]$, where j represents consumers' ability.
- Consumers have income y.

Model Setup
Consumers

- Two types of goods: consumption and status.
- Status good gives no direct utility, only status value.
- Consumers indexed in continuum: Two Populations:
  - Greens: $i \in G = [0, 1]$, where i represents consumers' ability.
  - Reds: $j \in R = [0, 1]$, where j represents consumers' ability.
- Consumers have income y.
- N status goods, indexed by $n \in \{0, 1, \cdots, N\}$.

- Two types of goods: consumption and status.
- Status good gives no direct utility, only status value.
- Consumers indexed in continuum: Two Populations:
  - Greens: $i \in G = [0, 1]$, where i represents consumers' ability.
  - Reds: $j \in R = [0, 1]$, where j represents consumers' ability.
- Consumers have income y.
- N status goods, indexed by $n \in \{0, 1, \cdots, N\}$.
- Consumer buys one status good $n \in \{0, 1, \cdots, N\}$ for p_n.

- Two types of goods: consumption and status.
- Status good gives no direct utility, only status value.
- Consumers indexed in continuum: Two Populations:
  - Greens: $i \in G = [0, 1]$, where i represents consumers' ability.
  - Reds: $j \in R = [0, 1]$, where j represents consumers' ability.
- Consumers have income y.
- N status goods, indexed by $n \in \{0, 1, \cdots, N\}$.
- Consumer buys one status good $n \in \{0, 1, \cdots, N\}$ for p_n.
- If consumer i purchases status good p_n, he/she is assigned status $s(i) = n$.

Model Setup

Consumers

- Two types of goods: consumption and status.
- Status good gives no direct utility, only status value.
- Consumers indexed in continuum: Two Populations:
  - Greens: $i \in G = [0, 1]$, where i represents consumers' ability.
  - Reds: $j \in R = [0, 1]$, where j represents consumers' ability.
- Consumers have income y.
- N status goods, indexed by $n \in \{0, 1, \cdots, N\}$.
- Consumer buys one status good $n \in \{0, 1, \cdots, N\}$ for p_n.
- If consumer i purchases status good p_n, he/she is assigned status $s(i) = n$.
- If consumer does not buy any status good, we say he purchased good 0 at price $p_0 = 0$.

Model Setup

Consumers

- Two types of goods: consumption and status.
- Status good gives no direct utility, only status value.
- Consumers indexed in continuum: Two Populations:
  - Greens: $i \in G = [0, 1]$, where i represents consumers' ability.
  - Reds: $j \in R = [0, 1]$, where j represents consumers' ability.
- Consumers have income y.
- N status goods, indexed by $n \in \{0, 1, \cdots, N\}$.
- Consumer buys one status good $n \in \{0, 1, \cdots, N\}$ for p_n.
- If consumer i purchases status good p_n, he/she is assigned status $s(i) = n$.
- If consumer does not buy any status good, we say he purchased good 0 at price $p_0 = 0$.
- Let i_n be the lowest index consumer purchasing brand n.

Model Setup

Consumers

- If a Green consumer i purchases good of brand n, gets utility:

$$U(x, i, j) = x + z(i, j)$$

where x represents the quantity of the regular consumption good the consumer enjoys, and $z(i, j) = ij$ is the utility from status.

- If a Green consumer i purchases good of brand n, gets utility:

$$U(x, i, j) = x + z(i, j)$$

  where x represents the quantity of the regular consumption good the consumer enjoys, and $z(i, j) = ij$ is the utility from status.
- $z(i, j)$ is the utility obtained from the matching process.

- If a Green consumer i purchases good of brand n, gets utility:

$$U(x, i, j) = x + z(i, j)$$

  where x represents the quantity of the regular consumption good the consumer enjoys, and $z(i, j) = ij$ is the utility from status.
- $z(i, j)$ is the utility obtained from the matching process.
- Red consumer j obtains utility $\phi z(i, j) = ij$, where ϕ is a matching internal distribution parameter.

- Two Market Structures are analyzed:

- Two Market Structures are analyzed:
  - **Monopoly**

- Two Market Structures are analyzed:
  - **Monopoly**
  - **Contestable Market** (Baumol et al., AER 1977; Baumol, 1982).

- Two Market Structures are analyzed:
  - **Monopoly**
  - **Contestable Market** (Baumol et al., AER 1977; Baumol, 1982).
- Firms produce at zero marginal cost, but need to pay fixed cost c to create a new brand.

Model Setup
Status Good Firms

- Two Market Structures are analyzed:
  - **Monopoly**
  - **Contestable Market** (Baumol et al., AER 1977; Baumol, 1982).
- Firms produce at zero marginal cost, but need to pay fixed cost c to create a new brand.
- Firms can choose the tecnology they use to produce the status good.

1. The monopoly decides the number of varieties $N \in \{0, 1, 2, \cdots\}$, and, if $N > 0$, it chooses prices p_n, with $n \in \{1, 2, \cdots, N\}$;

Model Setup

Timeline of the Game: Monopoly

1. The monopoly decides the number of varieties $N \in \{0, 1, 2, \cdots\}$, and, if $N > 0$, it chooses prices p_n, with $n \in \{1, 2, \cdots, N\}$;
2. Each male decides which variety $n \in \{0, 1, \cdots, N\}$ to buy;

1. The monopoly decides the number of varieties $N \in \{0, 1, 2, \cdots\}$, and, if $N > 0$, it chooses prices p_n, with $n \in \{1, 2, \cdots, N\}$;
2. Each male decides which variety $n \in \{0, 1, \cdots, N\}$ to buy;
3. Females observe males' status levels $s_i \in \{0, 1, \cdots, N\}$;

Model Setup

Timeline of the Game: Monopoly

1. The monopoly decides the number of varieties $N \in \{0, 1, 2, \cdots\}$, and, if $N > 0$, it chooses prices p_n, with $n \in \{1, 2, \cdots, N\}$;
2. Each male decides which variety $n \in \{0, 1, \cdots, N\}$ to buy;
3. Females observe males' status levels $s_i \in \{0, 1, \cdots, N\}$;
4. Matches are carried out by a matching process m between males and females;

Model Setup

Timeline of the Game: Monopoly

1. The monopoly decides the number of varieties $N \in \{0, 1, 2, \cdots\}$, and, if $N > 0$, it chooses prices p_n, with $n \in \{1, 2, \cdots, N\}$;
2. Each male decides which variety $n \in \{0, 1, \cdots, N\}$ to buy;
3. Females observe males' status levels $s_i \in \{0, 1, \cdots, N\}$;
4. Matches are carried out by a matching process m between males and females;
5. After all agents are matched, payoffs are realized.

Model Setup

Timeline of the Game: Contestable Markets

1. All firms simultaneously decide whether to enter the market and what price to charge for their products, thus (endogenously) determining the number of brands offered $N^C \in \{0, 1, 2, \cdots\}$, and, if $N^C > 0$, each price p_n, $\forall n \in \{1, \cdots, N^C\}$;

Model Setup

Timeline of the Game: Contestable Markets

1. All firms simultaneously decide whether to enter the market and what price to charge for their products, thus (endogenously) determining the number of brands offered $N^C \in \{0, 1, 2, \cdots\}$, and, if $N^C > 0$, each price p_n, $\forall n \in \{1, \cdots, N^C\}$;
2. Given the number N^C of firms that entered the market and their respective prices $p_1, \cdots, p_{N^C}$, firms outside the market decide simultaneously whether to enter the market, and if they do, the price to charge. If any firm enters, the competition game returns to the beginning of step 2; otherwise, this game ends. Since the number of firms is finite, the competition game eventually ends.

1. All firms simultaneously decide whether to enter the market and what price to charge for their products, thus (endogenously) determining the number of brands offered $N^C \in \{0, 1, 2, \cdots\}$, and, if $N^C > 0$, each price p_n, $\forall n \in \{1, \cdots, N^C\}$;
2. Given the number N^C of firms that entered the market and their respective prices $p_1, \cdots, p_{N^C}$, firms outside the market decide simultaneously whether to enter the market, and if they do, the price to charge. If any firm enters, the competition game returns to the beginning of step 2; otherwise, this game ends. Since the number of firms is finite, the competition game eventually ends.
3. Females observe males' status levels $s_i \in \{0, 1, \cdots, N\}$;

Model Setup

Timeline of the Game: Contestable Markets

1. All firms simultaneously decide whether to enter the market and what price to charge for their products, thus (endogenously) determining the number of brands offered $N^C \in \{0, 1, 2, \cdots\}$, and, if $N^C > 0$, each price p_n, $\forall n \in \{1, \cdots, N^C\}$;
2. Given the number N^C of firms that entered the market and their respective prices $p_1, \cdots, p_{N^C}$, firms outside the market decide simultaneously whether to enter the market, and if they do, the price to charge. If any firm enters, the competition game returns to the beginning of step 2; otherwise, this game ends. Since the number of firms is finite, the competition game eventually ends.
3. Females observe males' status levels $s_i \in \{0, 1, \cdots, N\}$;
4. Matches are carried out by a matching process m between males and females;

Model Setup

Timeline of the Game: Contestable Markets

1. All firms simultaneously decide whether to enter the market and what price to charge for their products, thus (endogenously) determining the number of brands offered $N^C \in \{0, 1, 2, \cdots\}$, and, if $N^C > 0$, each price p_n, $\forall n \in \{1, \cdots, N^C\}$;
2. Given the number N^C of firms that entered the market and their respective prices $p_1, \cdots, p_{N^C}$, firms outside the market decide simultaneously whether to enter the market, and if they do, the price to charge. If any firm enters, the competition game returns to the beginning of step 2; otherwise, this game ends. Since the number of firms is finite, the competition game eventually ends.
3. Females observe males' status levels $s_i \in \{0, 1, \cdots, N\}$;
4. Matches are carried out by a matching process m between males and females;
5. After all agents are matched, payoffs are realized.

- Each Green with ability $i \in G$ solves the problem:

$$\max_{n \in \{0,1,\cdots,N\}} x + E_i \left[im(i) | s(i) = n \right]$$

such that

$$x \leq y + T - p_n \left(1 + \tau_n\right).$$

- Each Green with ability $i \in G$ solves the problem:

$$\max_{n \in \{0,1,\cdots,N\}} x + E_i \left[im(i) | s(i) = n \right]$$

such that

$$x \leq y + T - p_n \left(1 + \tau_n\right).$$

- Consumer i_n must be indifferent between brands n and $n+1$, yielding:

$$2\left(1 + \tau_n\right) p_n = i_n i_{n+1}$$

- Each Green with ability $i \in G$ solves the problem:

$$\max_{n\in\{0,1,\cdots,N\}} x + E_i\left[im(i)|s(i) = n\right]$$

such that

$$x \leq y + T - p_n\left(1 + \tau_n\right).$$

- Consumer i_n must be indifferent between brands n and $n+1$, yielding:

$$2\left(1 + \tau_n\right)p_n = i_n i_{n+1}$$

- The inverse demand must then satisfy:

$$p_n = \frac{i_n i_{n+1}}{2\left(1 + \tau_n\right)}. \quad (1)$$

Welfare

Social Planner's Problem:

- Socially optimal allocations solve the following maximization problem:

$$W^* = \max_{N \in \mathbb{R}_+} \left\{ \max_{i_1 < \cdots < i_N} \sum_{n=0}^{N} \int_{i_n}^{i_{n+1}} y + (1+\phi) E_i \left[im(i) | s(i) \right] di - cN \right\}. \tag{2}$$

Welfare

Social Planner's Problem:

- Socially optimal allocations solve the following maximization problem:

$$W^* = \max_{N \in \mathbb{R}_+} \left\{ \max_{i_1 < \cdots < i_N} \sum_{n=0}^{N} \int_{i_n}^{i_{n+1}} y + (1+\phi) E_i \left[im(i) | s(i) \right] di - cN \right\}. \tag{2}$$

- Two-step solution: first solve for i_n, then for N:

- Socially optimal allocations solve the following maximization problem:

$$W^* = \max_{N \in \mathbb{R}_+} \left\{ \max_{i_1 < \cdots < i_N} \sum_{n=0}^{N} \int_{i_n}^{i_{n+1}} y + (1+\phi) E_i \left[im(i) | s(i) \right] di - cN \right\}. \tag{2}$$

- Two-step solution: first solve for i_n, then for N:
    - The socially optimal strata are of equal length. For every $n \in \{1, 2, \cdots, N+1\}$:

$$i_n^* - i_{n-1}^* = \frac{1}{N+1}.$$

Welfare

Social Planner's Problem:

- Socially optimal allocations solve the following maximization problem:

$$W^* = \max_{N \in \mathbb{R}_+} \left\{ \max_{i_1 < \cdots < i_N} \sum_{n=0}^{N} \int_{i_n}^{i_{n+1}} y + (1+\phi) E_i \left[im(i) | s(i) \right] di - cN \right\}. \tag{2}$$

- Two-step solution: first solve for i_n, then for N:
  - The socially optimal strata are of equal length. For every $n \in \{1, 2, \cdots, N+1\}$:

$$i_n^* - i_{n-1}^* = \frac{1}{N+1}.$$

  - The socially optimal number of brands is given by:

$$N^* = \left(\frac{1+\phi}{6c} \right)^{1/3} - 1. \tag{3}$$

Definition

A stratified equilibrium in a monopolistic status good market is given by a number of brands N^M, a set of strata limit abilities $\left\{i_n^M\right\}_{n=0}^{N^M}$, a set of status good prices $\left\{p_n^M\right\}_{n=0}^{N^M}$, a social norm ranking the different brands $n \in \left\{1, 2, \cdots, N^M\right\}$ of status goods, and a matching $m : G \longrightarrow R$ between Greens and Reds that randomly assigns, for each Green $i \in \left[i_n^M, i_{n+1}^M\right) \subseteq G$, a match $j = m(i) \in \left[i_n^M, i_{n+1}^M\right) \subseteq R$ in the corresponding stratum of the Reds population, such that:

1. The monopolist maximizes its profit, given the equilibrium demand of Greens;

1. The monopolist maximizes its profit, given the equilibrium demand of Greens;
2. Green individuals maximize their expected utility, given the social norm, matching $m(\cdot)$, and the equilibrium values of N^M and $\{p_n^M\}_{n=0}^{N^M}$;

Monopoly

Equilibrium Definition

1. The monopolist maximizes its profit, given the equilibrium demand of Greens;
2. Green individuals maximize their expected utility, given the social norm, matching $m(\cdot)$, and the equilibrium values of N^M and $\left\{p_n^M\right\}_{n=0}^{N^M}$;
3. The market for each brand of status good $n \in \left\{0, 1, \cdots, N^M\right\}$ clears; that is, equation (1) holds for the equilibrium sequences $\left\{i_n^M\right\}_{n=0}^{N^M}$ and $\left\{p_n^M\right\}_{n=0}^{N^M}$.

1. The monopolist maximizes its profit, given the equilibrium demand of Greens;
2. Green individuals maximize their expected utility, given the social norm, matching $m(\cdot)$, and the equilibrium values of N^M and $\left\{p_n^M\right\}_{n=0}^{N^M}$;
3. The market for each brand of status good $n \in \left\{0, 1, \cdots, N^M\right\}$ clears; that is, equation (1) holds for the equilibrium sequences $\left\{i_n^M\right\}_{n=0}^{N^M}$ and $\left\{p_n^M\right\}_{n=0}^{N^M}$.
4. Given the social norm, and the equilibrium values of N^M, $\left\{i_n^M\right\}_{n=0}^{N^M}$ and $\left\{p_n^M\right\}_{n=0}^{N^M}$, then the stratified matching $m(\cdot)$ is weakly stable.

- The monopolist chooses N^M and p^M by solving the problem:

$$\pi^M = \max_{N \in \mathbb{R}_+} \left\{ \max_{p \in \mathbb{R}_+^N} \left\{ \sum_{n=1}^{N} p_n \left(i_{n+1}(p) - i_n(p) \right) - cN \right\} \right\}, \qquad \text{such that:}$$
$$0 < i_n(p) < i_{n+1}(p) \leq 1, \qquad \forall n \in \{0, 1, 2, \cdots, N^M\}, \tag{4}$$

- Two-step solution: first solve for i_n, then for N:

- Two-step solution: first solve for i_n, then for N:
  - The strata limit abilities i_n^M and demand for good n are given, for every $n \in \left\{1, \cdots, N^M\right\}$, by:

$$i_n^M = \frac{n}{N^M + 1}. \tag{5}$$

- Two-step solution: first solve for i_n, then for N:
  - The strata limit abilities i_n^M and demand for good n are given, for every $n \in \left\{1, \cdots, N^M\right\}$, by:

$$i_n^M = \frac{n}{N^M + 1}. \tag{5}$$

  - The demand for each brand is constant. For every $n \in \left\{1, \cdots, N^M\right\}$:

$$i_n^M - i_{n-1}^M = \frac{1}{N^M + 1}. \tag{6}$$

- Two-step solution: first solve for i_n, then for N:
  - The strata limit abilities i_n^M and demand for good n are given, for every $n \in \left\{1, \cdots, N^M\right\}$, by:

$$i_n^M = \frac{n}{N^M + 1}. \tag{5}$$

  - The demand for each brand is constant. For every $n \in \left\{1, \cdots, N^M\right\}$:

$$i_n^M - i_{n-1}^M = \frac{1}{N^M + 1}. \tag{6}$$

  - The optimal number of brands for the monopoly, denoted N^M, is:

$$N^M = \left(\frac{1}{3c\left(1+\tau\right)}\right)^{1/3} - 1. \tag{7}$$

- **Definition**: An **Industry Configuration** (IC) is constituted by the number of incumbent brands N^C and a price vector $p^C = \left(p_1^C, \cdots, p_{N^C}^C\right)$ that is charged by the incumbent firms for each brand $n \in \left\{1, \cdots, N^C\right\}$.

- **Definition**: An **Industry Configuration** (IC) is constituted by the number of incumbent brands N^C and a price vector $p^C = \left(p_1^C, \cdots, p_{N^C}^C\right)$ that is charged by the incumbent firms for each brand $n \in \left\{1, \cdots, N^C\right\}$.
- **Definition**: An Industry Configuration is said to be **feasible** if:

- **Definition**: An **Industry Configuration** (IC) is constituted by the number of incumbent brands N^C and a price vector $p^C = \left(p_1^C, \cdots, p_{N^C}^C\right)$ that is charged by the incumbent firms for each brand $n \in \left\{1, \cdots, N^C\right\}$.
- **Definition**: An Industry Configuration is said to be **feasible** if:
  1. the market clears; that is, equation (1) holds for every $n \in \{1, \cdots, N^C\}$ when $i_n = i_n^C$;

- **Definition**: An **Industry Configuration** (IC) is constituted by the number of incumbent brands N^C and a price vector $p^C = \left(p_1^C, \cdots, p_{N^C}^C\right)$ that is charged by the incumbent firms for each brand $n \in \left\{1, \cdots, N^C\right\}$.
- **Definition**: An Industry Configuration is said to be **feasible** if:
  1. the market clears; that is, equation (1) holds for every $n \in \{1, \cdots, N^C\}$ when $i_n = i_n^C$;
  2. incumbent firms make non-negative profits; that is, for every $n \in \{1, \cdots, N^C\}$, $\pi_n^C \geq 0$, or, equivalently:

$$p_n^C \left(i_{n+1}^C - i_n^C\right) - c \geq 0. \tag{8}$$

- **Definition**: An **Industry Configuration** (IC) is constituted by the number of incumbent brands N^C and a price vector $p^C = \left(p_1^C, \cdots, p_{N^C}^C\right)$ that is charged by the incumbent firms for each brand $n \in \left\{1, \cdots, N^C\right\}$.
- **Definition**: An Industry Configuration is said to be **feasible** if:
  1. the market clears; that is, equation (1) holds for every $n \in \{1, \cdots, N^C\}$ when $i_n = i_n^C$;
  2. incumbent firms make non-negative profits; that is, for every $n \in \{1, \cdots, N^C\}$, $\pi_n^C \geq 0$, or, equivalently:

$$p_n^C\left(i_{n+1}^C - i_n^C\right) - c \geq 0. \tag{8}$$

- **Definition**: An Industry Configuration is said to be **sustainable** if no entrant can obtain positive profit by taking the incumbents' prices as given; that is:

$$p^E\left(\tilde{\imath}_{n+1} - \tilde{\imath}^E\right) - c \leq 0. \tag{9}$$

Definition

A stratified equilibrium in a contestable status good market is given by a social norm ranking the brands of status goods, an industry configuration $\left\{N^C, p^C\right\}$, a set of strata limit abilities $\left\{i_n^C\right\}_{n=1}^{N^C}$ representing the demand for the different brands of status goods, and a matching $m : G \longrightarrow R$ that randomly assigns, for each Green $i \in \left[i_n^C, i_{n+1}^C\right) \subseteq G$, a Red $j = m(i) \in \left[i_n^C, i_{n+1}^C\right) \subseteq R$, such that:

1. Given the social norm, the strata limit abilities $\left\{i_n^C\right\}_{n=1}^{N^C}$, and the matching $m(\cdot)$, then the industry configuration $\left\{N^C, p^C\right\}$ is feasible and sustainable;

1. Given the social norm, the strata limit abilities $\left\{i_n^C\right\}_{n=1}^{N^C}$, and the matching $m(\cdot)$, then the industry configuration $\left\{N^C, p^C\right\}$ is feasible and sustainable;
2. Given the social norm, the strata limit abilities $\left\{i_n^C\right\}_{n=1}^{N^C}$, and the matching $m(\cdot)$, then each Green agent maximizes his expected utility;

1. Given the social norm, the strata limit abilities $\left\{i_n^C\right\}_{n=1}^{N^C}$, and the matching $m(\cdot)$, then the industry configuration $\left\{N^C, p^C\right\}$ is feasible and sustainable;
2. Given the social norm, the strata limit abilities $\left\{i_n^C\right\}_{n=1}^{N^C}$, and the matching $m(\cdot)$, then each Green agent maximizes his expected utility;
3. The market for each brand of status good $n \in \left\{0, 1, \cdots, N^C\right\}$ clears; that is, equation (1) holds for the equilibrium sequences $\left\{i_n^C\right\}_{n=0}^{N^C}$ and $\left\{p_n^C\right\}_{n=0}^{N^C}$.

1. Given the social norm, the strata limit abilities $\left\{i_n^C\right\}_{n=1}^{N^C}$, and the matching $m(\cdot)$, then the industry configuration $\left\{N^C, p^C\right\}$ is feasible and sustainable;
2. Given the social norm, the strata limit abilities $\left\{i_n^C\right\}_{n=1}^{N^C}$, and the matching $m(\cdot)$, then each Green agent maximizes his expected utility;
3. The market for each brand of status good $n \in \left\{0, 1, \cdots, N^C\right\}$ clears; that is, equation (1) holds for the equilibrium sequences $\left\{i_n^C\right\}_{n=0}^{N^C}$ and $\left\{p_n^C\right\}_{n=0}^{N^C}$.
4. Given the social norm, the industry configuration and the strata limit abilities, then the stratified matching $m(\cdot)$ is weakly stable.

- Zero-profit condition:

$$\pi_n^C = p_n^C(i_{n+1}^C - i_n^C) - c = 0$$

- Zero-profit condition:

$$\pi_n^C = p_n^C \left(i_{n+1}^C - i_n^C \right) - c = 0$$

- Substituting the inverse demand and rearranging:

$$-i_{n+1}^C \left(i_n^C \right)^2 + \left(i_{n+1}^C \right)^2 i_n^C - 2 \left(1 + \tau_n \right) c = 0. \tag{10}$$

- Zero-profit condition:

$$\pi_n^C = p_n^C \left(i_{n+1}^C - i_n^C\right) - c = 0$$

- Substituting the inverse demand and rearranging:

$$-i_{n+1}^C \left(i_n^C\right)^2 + \left(i_{n+1}^C\right)^2 i_n^C - 2\left(1+\tau_n\right)c = 0. \tag{10}$$

- Solving i_n as a function of i_{n+1} will give us the iteractive algorithm that solves the problem:

$$i_n^C = \begin{cases} \frac{i_{n+1}^C}{2}\left(1 + \sqrt{1 - \frac{8c(1+\tau_n)}{\left(i_{n+1}^C\right)^3}}\right), & \text{if} \quad i_{n+1}^C \geq 2c^{1/3}\left(1+\tau_n\right)^{1/3}, \\ 0, & \text{otherwise.} \end{cases} \tag{11}$$

Definition

Algorithm: Because we do not know the value of N^C initially, we start the counting process by guessing that $N = -1$. If $1 < 2(c\,(1+\tau_{-1}))^{1/3}$, then no firm produces status goods. Otherwise, Lemma 3 proves that, starting from $n = N = -1$ and $i^C_{N+1} = i^C_{n+1} = i^C_0 = 1$, as n decreases in each iteration by one unit, we recursively pick the largest root of equation (11) and, eventually, in a finite number of steps, there is some integer n_0 such that $i^C_{n_0+1} \geq 2(c\,(1+\tau_{n_0}))^{1/3}$ and $i^C_{n_0} < 2(c\,(1+\tau_{n_0-1}))^{1/3}$. Then, let N^C be the absolute value of this particular index, $N^C = |n_0|$. By adding $N^C + 1$ to all indices of the variables, we re-index them all correctly. Finally, we set $i^C_0 = 0$.

Market Equilibria

Monopoly vs. Contestability

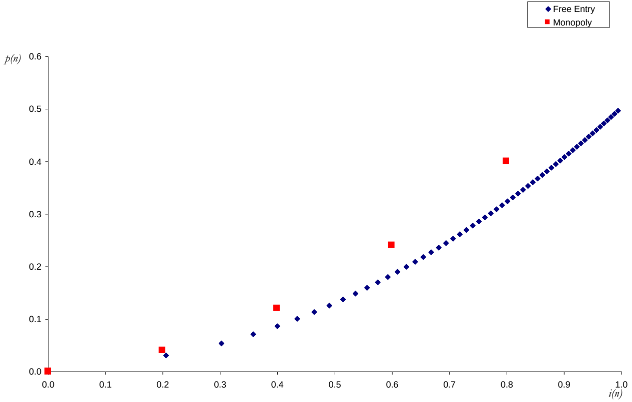

Figure: Market niche borders and prices for $c = 0.003$, $\gamma = 1$, $\phi = 1$ and $\tau = 0$.

- Suppose a benevolent Social Planner wants to implement the social optimum in (3) through consumption taxes.

- Suppose a benevolent Social Planner wants to implement the social optimum in (3) through consumption taxes.
- The monopoly already gives us the social optimal outcome of equally sized social strata.

- Suppose a benevolent Social Planner wants to implement the social optimum in (3) through consumption taxes.
- The monopoly already gives us the social optimal outcome of equally sized social strata.
- Thus, all the Social Planner must do is to fix a constant tax rate $\widehat{\tau}$ such that $N^M = N^*$, that is:

$$\left(\frac{1}{3c\,(1+\tau)}\right)^{1/3} - 1 = \left(\frac{1+\phi}{6c}\right)^{1/3} - 1$$

which gives us:

$$\widehat{\tau} = \frac{1-\phi}{1+\phi}. \tag{12}$$

- Suppose a benevolent Social Planner wants to implement the social optimum in (3) through consumption taxes.
- The monopoly already gives us the social optimal outcome of equally sized social strata.
- Thus, all the Social Planner must do is to fix a constant tax rate $\widehat{\tau}$ such that $N^M = N^*$, that is:

$$\left(\frac{1}{3c\left(1+\tau\right)}\right)^{1/3} - 1 = \left(\frac{1+\phi}{6c}\right)^{1/3} - 1$$

which gives us:

$$\widehat{\tau} = \frac{1-\phi}{1+\phi}. \tag{12}$$

- Optimal tax schedule: flat tax schedule

- Social strata are of different sizes. Social planner needs to apply brand-specific tax rates $\widehat{\widehat{\tau}}$ such that:

$$i_n^C = i_n^* = \frac{n}{N^* + 1}$$

and

$$N^C = N^* = \left(\frac{1 + \phi}{6c} \right)^{1/3} - 1$$

- Social strata are of different sizes. Social planner needs to apply brand-specific tax rates $\widehat{\widehat{\tau}}$ such that:

$$i_n^C = i_n^* = \frac{n}{N^* + 1}$$

and

$$N^C = N^* = \left(\frac{1+\phi}{6c}\right)^{1/3} - 1$$

- Substituting these two equations into the zero-profit condition yields:

$$\widehat{\widehat{\tau}}_n = \frac{3n(n+1)}{1+\phi} - 1. \tag{13}$$

- Social strata are of different sizes. Social planner needs to apply brand-specific tax rates $\widehat{\widehat{\tau}}$ such that:

$$i_n^C = i_n^* = \frac{n}{N^* + 1}$$

and

$$N^C = N^* = \left(\frac{1+\phi}{6c}\right)^{1/3} - 1$$

- Substituting these two equations into the zero-profit condition yields:

$$\widehat{\widehat{\tau}}_n = \frac{3n(n+1)}{1+\phi} - 1. \tag{13}$$

- Optimal tax schedule is progressive and convex.

- Fixed costs are important in determining market structure in status goods markets.

- Fixed costs are important in determining market structure in status goods markets.
- If fixed costs are present, then the most information-revealing equilibrium will be stratified.

- Fixed costs are important in determining market structure in status goods markets.
- If fixed costs are present, then the most information-revealing equilibrium will be stratified.
- Equilibrium characterization will depend on market competition:

Concluding Remarks

Brands as Status Symbols

- Fixed costs are important in determining market structure in status goods markets.
- If fixed costs are present, then the most information-revealing equilibrium will be stratified.
- Equilibrium characterization will depend on market competition:
  - **Monopoly:** strata of equal size; suboptimal number of brands offered;

Concluding Remarks

- Fixed costs are important in determining market structure in status goods markets.
- If fixed costs are present, then the most information-revealing equilibrium will be stratified.
- Equilibrium characterization will depend on market competition:
  - **Monopoly:** strata of equal size; suboptimal number of brands offered;
  - **Contestable Markets:** higher degree of customization in the upper end; suboptimal number of brands and strata size division.

Concluding Remarks
Brands as Status Symbols

- Fixed costs are important in determining market structure in status goods markets.
- If fixed costs are present, then the most information-revealing equilibrium will be stratified.
- Equilibrium characterization will depend on market competition:
  - **Monopoly:** strata of equal size; suboptimal number of brands offered;
  - **Contestable Markets:** higher degree of customization in the upper end; suboptimal number of brands and strata size division.
- Pigouvian taxation: unlike previous work, status good consumption is not just waste; status good consumption enhance matching efficiency.

Concluding Remarks

- Fixed costs are important in determining market structure in status goods markets.
- If fixed costs are present, then the most information-revealing equilibrium will be stratified.
- Equilibrium characterization will depend on market competition:
  - **Monopoly:** strata of equal size; suboptimal number of brands offered;
  - **Contestable Markets:** higher degree of customization in the upper end; suboptimal number of brands and strata size division.
- Pigouvian taxation: unlike previous work, status good consumption is not just waste; status good consumption enhance matching efficiency.
  - Optimal tax rate is no longer the highest possible.

- Fixed costs are important in determining market structure in status goods markets.
- If fixed costs are present, then the most information-revealing equilibrium will be stratified.
- Equilibrium characterization will depend on market competition:
  - **Monopoly:** strata of equal size; suboptimal number of brands offered;
  - **Contestable Markets:** higher degree of customization in the upper end; suboptimal number of brands and strata size division.
- Pigouvian taxation: unlike previous work, status good consumption is not just waste; status good consumption enhance matching efficiency.
  - Optimal tax rate is no longer the highest possible.
  - Optimal tax schedule:

Concluding Remarks

- Fixed costs are important in determining market structure in status goods markets.
- If fixed costs are present, then the most information-revealing equilibrium will be stratified.
- Equilibrium characterization will depend on market competition:
  - **Monopoly:** strata of equal size; suboptimal number of brands offered;
  - **Contestable Markets:** higher degree of customization in the upper end; suboptimal number of brands and strata size division.
- Pigouvian taxation: unlike previous work, status good consumption is not just waste; status good consumption enhance matching efficiency.
  - Optimal tax rate is no longer the highest possible.
  - Optimal tax schedule:
    - **Monopoly:** flat tax rate to make number of brands offered optimal

- Fixed costs are important in determining market structure in status goods markets.
- If fixed costs are present, then the most information-revealing equilibrium will be stratified.
- Equilibrium characterization will depend on market competition:
  - **Monopoly:** strata of equal size; suboptimal number of brands offered;
  - **Contestable Markets:** higher degree of customization in the upper end; suboptimal number of brands and strata size division.
- Pigouvian taxation: unlike previous work, status good consumption is not just waste; status good consumption enhance matching efficiency.
  - Optimal tax rate is no longer the highest possible.
  - Optimal tax schedule:
    - **Monopoly:** flat tax rate to make number of brands offered optimal
    - **Contestable Markets:** progressive tax schedule to adjust both number of brands offered and the market niche each brand will occupy.