A Theory of Fashion Based on Segmented Communication*

by

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Abstract

Fashion is a popular style of behavior at a given time or place. In this paper we model fashion as a dynamic phenomenon, characterized by fragility of mass behavior and life cycles. Conformity of behavior is generated by a consumption externality, while the typical intertemporal aspects of fashions are the outcome of segmented communication: knowledge about available actions is imperfect and there exists social segregation in the way knowledge is generated and transmitted. The proposed approach is consistent with views of sociologists and marketing experts about fashion.

1 Introduction

Fashions are popular patterns of behavior adopted by individuals for a particular time and situation. The nature of the behavior may be very diverse: wearing special clothes, going to particular restaurants, travelling to certain holiday places, living in given neighborhoods. Indeed fashion-oriented behavior has even been identified with intellectual pursuits of science, literature, arts, and education. Germane to fashion are transience and the impression of arbitrariness that it leaves upon observers. As a peculiar form of collective behavior, fashions are thought to display two main ingredients [Coleman (1990)]. Firstly, fashions are *fragile* in the sense that small shocks can lead to large shifts in aggregate behavior. Therefore fashions constantly succeed each other. Secondly, fashions exhibit distinct *life cycles*. Usually, four main stages of fashion cycles are pointed out: introduction, emulation, mass conformity, and decline. The goal of this paper is to offer an explanation for collective behavior that presents both these characteristics.

By its capricious nature, the phenomenon of fashion has long puzzled social scientists. [1] In order to rationalize the conformity of individual behavior that characterizes fashions, economists have invoked various kinds of consumption externalities, ranging from status-seeking behavior and quality signaling, to snob and bandwagon effects [Frank (1985), Leibenstein (1950), Pigou (1913), Stigler and Becker (1977)]. The main focus of the recent economic literature on fashion has been on the *intertemporal* mechanisms that, coupled with those externalities, can give rise to the dynamic aspects of fashions. Thus, Coelho and McClure (1993) have stressed the potential role of consumers' expectations for generating fashion cycles. They posit that a fashion good is used to signal status and that as a consequence the market demand curve varies inversely with the estimated contemporaneous stock of the good. If consumers form their expectations adaptively, the dynamics of demand may turn to entail explosive oscillations. In an evolutionary framework, Matsuyama (1992) has shown

[1] Among the early contributors, Rae (1905), Simmel (1904) and Veblen (1924) deserve special mentioning. They stressed that processes of imitation and differentiation between social classes are a central element of fashions.

that the presence of two types of individuals, with conformist and with anticonformist preferences respectively, can give rise to limit cycles, in which nonconformists behave as fashion leaders and conformists as fashion followers. Karni and Schmeidler (1990) have pointed out that equilibrium selection in a dynamic game of complete information with overlapping generations of players divided into different classes can also lead to cyclical demand variations. In contrast, Bikhchandani *et al.* (1992) have shown that incomplete information about the quality of the product can imply fashion dynamics. They consider a sequence of individuals, each deciding to adopt or reject some specific behavior. Each individual in the queue observes both a private signal about the gain to adopting, and the decisions of those ahead of him. In equilibrium, "informational cascades" may occur, i.e. individuals choose to follow the behavior of the preceding individual without regard to their own information, and the arrival of a little new information can shatter the cascade.[2] Corneo and Jeanne (1994) and Pesendorfer (1993) have instead explored the potential role of the supply side of the market for generating fashion dynamics. In these models, a monopoly sells a good which is used by consumers as a signaling device. When the monopolist appropriately takes the intertemporal signaling effects into account, its optimal strategy may entail a cyclic supply.

In the present study a different intertemporal mechanism capable of generating fashions is proposed. The basic idea that we want to develop is that the structure of communication channels within a community may be the crucial ingredient for generating fashion dynamics. In particular, we aim at showing that fashions arise naturally if consumption externalities are accompanied by social segregation in the way knowledge about consumption opportunities is generated and transmitted. We argue that if the probability of being informed about existing alternatives is systematically different for people who belong to groups that make different contributions to the aggregate externality, phenomena such as fragility of mass behavior and product life cycle may easily be rationalized.

Consider, for the sake of illustration, the frequentation of *cafés* in towns that

[2] Banerjee (1992) offers a closely related model of herd behavior.

attract mass tourism. Tourists are delighted to seat in typical cafés, where natives display their true soul, uncorrupted by foreign presence. Similarly, natives dislike the fastidious presence of curious tourists. Hence, when too many tourists visit a typical café, some natives with strong distaste for tourists have an incentive to move to a less known café. If the information about the location of the new café spreads in the first place to other natives, the new café actually becomes the new typical café of the town. But then, some foreigner will come to know in which café natives spend their time, so that the number of tourists visiting it will grow and the cycle will start again with respect to a new café.

We believe that interactions with this kind of formal structure are quite common in phenomena of fashion. Indeed, marketers devote great attention to how the information concerning new products propagates, and marketing textbooks discuss at length the impact of personal communication channels on the fate of fashionable products and suggest which steps companies should take to stimulate influence channels to work on their behalf [e.g. Kotler (1988, ch.20)]. The fact that alternative new styles gain public exposure through communication by fashion conscious consumers within their social networks is a widely accepted principle among marketing scholars [Sproles (1981)].

In this paper we model communication channels as a random matching process that occurs in society as a whole, but in which individuals belonging to the same social group have a comparatively larger probability to exchange information. The special consumption externality that we posit can be viewed as a local public good, to which individuals differently contribute according to their type. Thus it is natural to interpret our formal setting as a model of fashionable places or communities. However, mechanisms of uneven propagation of knowledge, coupled with various kinds of external effects in consumption, may provide a rationale for the dynamic aspects of a much broader class of fashion phenomena.

The remainder of the paper is structured as follows. In Section 2 the main assumptions of the model concerning both the form taken by the consumption externality and the mechanism of information transmission are presented. Section 3 determines the equilibrium dynamics and derives conditions under which it exhibits the typical features of a fashion. Section 4 provides some concluding remarks.

2 The model

2.1 The consumption externality

We consider a continuous-time economy populated by two types of individuals, type A and type B. Type A denotes the "desirable type" and type B the "undesirable type"; respectively, natives and tourists in our previous example. The mass of the population is normalized to unity, with α individuals of type A and $1-\alpha$ individuals of type B. Each of these individuals may choose between one of two possible actions, denoted 0 and 1. An action may be interpreted as a choice of location. The utility of being in a particular location depends on the proportion of desirable individuals present there. We may think of this proportion as a measure of the amount of consumption of a *local public good*. Formally, individual $i \in]0,1]$ has an instantaneous utility function given by:

$$u_i = y_i + (1-l_i)(\frac{\pi_0}{i\theta} - c_0) + l_i(\frac{\pi_1}{i\theta} - c_1) \tag{1}$$

where y_i is the individual's income expressed in units of a numéraire good, π_j is the proportion of type-A individuals in location $j \in \{0,1\}$, θ is a strictly positive coefficient, c_j is the cost in terms of the numéraire good of going to location j,[3] and l_i is the location choice of the individual, a dummy variable which takes the value 0 if the individual goes to location 0 and value 1 if he chooses location 1. Each individual goes to one of these two locations, and only one.

Some remarks on how to interpret the utility function (1) are in order. This formulation captures the idea that the gain to adopting some behavior increases with the proportion of desirable individuals that actually adopt that behavior. Taking again our example, the amount of the public good provided in the café, e.g. its

[3] This may be viewed as a transportation cost, or an entry fee.

"atmosphere", is given by the number of clients who are natives divided by the total number of clients. Thus, natives induce a positive externality on their surroundings whereas tourists exert a negative externality.[4]

One may think of a number of situations in the real world in which the externality described in (1) is present. Relevant examples are the residential choice within a city and the selection of holiday places, in both of which the quality of people taking the same decision has a major impact on the individuals' utility. Similar effects may be found in sport clubs and research centers, where unskilled players, resp. researchers, try to match with skilled ones in order to improve their own ability. This externality may also be present in market places, where the probability to make a good deal increases with the proportion of traders who have a wide range of high-quality goods.

The externality in (1) may also be ascribed to signaling effects. If third parties, e.g. firms, can observe the overall repartition of types across locations but cannot observe the type of each individual, π_j gives the probability that an individual in location j is the desirable type. In turn, a reputation for belonging to the desirable group might be valuable either *per se* or because it improves the trade opportunities of the individual [Akerlof (1980), Spence (1974)].

Notice that in (1) we assume preferences to be heterogeneous across individuals but homogeneous across classes. The lower is the index of the individual, the more sensitive he is with respect to the provision of the local public good. However, the distribution of the rate of substitution between the private and the public good, $i\theta$, is the same for both types.

Equation (1) defines the utility of an individual if he goes to a location that is already frequented by someone. The utility in the case of an individual being alone in a location is still to be defined. Denote $\overline{\pi}$ the amount of public good that is consumed in that case. The former interpretations of (1) suggest some plausible restrictions on

[4]Becker (1991) and Karni and Levin (1994) study the effect of social interactions on restaurant pricing in a static framework. Karni and Levin (1994) explicitly formulate this effect as a local externality; however, in their model the externality merely depends on the total number of individuals who go to the restaurant and not on their identity.

the possible values of $\overline{\pi}$. According to the signaling interpretation, $\overline{\pi}$ represent the beliefs held out of a pooling equilibrium. If these take the form of passive conjectures, we have that $\overline{\pi} = \alpha$. According to the local externality interpretation, being alone means that benefits from social interaction are foregone, so that $\overline{\pi} = 0$ seems a natural assumption. Hereafter we merely suppose $\overline{\pi} \leq \alpha$.

2.2 The propagation of information

We assume that knowledge about available locations is imperfect. While all individuals are familiar with location 0, only a certain fraction of the population, the *initiates*, knows where location 1 is. Hence, initiates have the option to go to location 1, the *new* location, while non-initiates have no choice but going to the old location 0.

Knowledge is assumed to diffuse continuously over time, denoted $t \in \mathbb{R}_+$. It propagates through a process of random matching, similarly to Banerjee's (1993) model of rumours. A non-initiate learns the location of the new site by matching with an initiate. One may think of this as the initiates giving the "address" of the location to the people they meet.[5]

The matching process may take place in families, neighbourhoods, working places or clubs, or any other places in which individuals socialize. It formalizes what marketers call *word-of-mouth influence*. Notice that under our assumptions, the matching process through which the information is transmitted does not take place in location 0 or 1. It might be interesting, in a more general version of the model, to allow for a role of locations 0 and 1 in the transmission of information, but we abstract from this possibility for the sake of simplicity.[6]

We allow the matching process to be asymmetric across types, i.e. desirable types

[5]We do not consider the incentives of initiates to give their information. Notice that the initiates give the address of the new location even if they do not frequent it themselves. Alternatively, we might assume that the address is transmitted only by initiates who frequent location 1. This alternative assumption does not change the essential properties of the model.

[6]Clearly, at least some information transmission must take place outside locations 0 and 1. If the matching was confined to these locations, individuals in the old location could never learn where the new location is.

may match relatively more often with desirable types than undesirable ones. This feature, which is important for our results, can be interpreted as the existence of social segregation in the way information is transmitted. It reflects the idea that socialization occurs in a segmented manner, with individuals being formed mainly by those who belong to the same social group. Thus, desirable-type individuals may enjoy better information about desirable behavior because their social environment counts a higher proportion of desirable types.

Formally, we assume that in each of his matchings an individual of type A has a probability $\mu < 1$, to meet another type A, which may be larger than the probability α which would prevail if the matching were symmetric: $\mu \geq \alpha$. It follows that the probability for type A to meet type B is $1-\mu$, so that the probability for a type B to meet type A is $\frac{\alpha}{1-\alpha}(1-\mu)$. The following table summarizes the matching probabilities between types. It gives the probability for the rank type to match with the column type.

.	A	B
A	μ	$1-\mu$
B	$\frac{\alpha}{1-\alpha}(1-\mu)$	$1-\frac{\alpha}{1-\alpha}(1-\mu)$

This table allows us to deduce the dynamics of the number of initiates in the two groups. Denote N_A and N_B the fractions of desirable type individuals and undesirable type individuals respectively who are initiates. During an infinitesimal time interval $[t, t+dt]$, the number of type-A initiates increases by the number of type-A non-initiates who meet initiates of both types. Similarly, the number of type-B initiates increases by the number of type-B non-initiates who meet initiates. Given the individual matching rate ρ, which is assumed to be the same for both groups, this implies:

$$N_A(t+dt) - N_A(t) = \rho dt(1-N_A(t))[\mu N_A(t) + (1-\mu)N_B(t)] \tag{2}$$

$$N_B(t+dt) - N_B(t) = \rho dt(1-N_B(t))[\frac{\alpha}{1-\alpha}(1-\mu)N_A(t) +$$

$$+(1-\frac{\alpha}{1-\alpha}(1-\mu))N_B(t)] \qquad (3)$$

Simplifying these expressions and taking the limit for $dt = 0$, one obtains the two following differential equations:

$$(\mathbf{S}) \begin{cases} \dot{N}_A = \rho(1-N_A)[N_B+\mu(N_A-N_B)] \\ \dot{N}_B = \rho(1-N_B)[N_B+\frac{\alpha}{1-\alpha}(1-\mu)(N_A-N_B)] \end{cases}$$

This system summarizes how the knowledge about the new location propagates through personal communication within the two groups. It may be analysed by means of a phase-diagram in the space (N_B, N_A), as depicted on Figure 1. Starting from an initial point $(N_B(0), N_A(0)) \in [0,1] \times [0,1]$, system (S) determines one unique path, that we shall denote (T).

It is easy to see that the two stable points of the system are $(N_B, N_A) = (0,0)$, where nobody is informed, and $(N_B, N_A) = (1,1)$, where everybody is informed. The equilibrium in which nobody is informed is unstable, in the sense that starting from any other point, the economy will converge towards the equilibrium where everybody is informed. In other terms, provided that the initial number of initiates is initially not nil, all individuals will know the new location sooner or later.

The path (T) has some useful geometrical properties, which are proved in the Appendix. In particular, if the matching process is symmetric ($\mu = \alpha$), (T) is simply the line joining the initial point $(N_B(0), N_A(0))$ to $(1,1)$. Introducing some asymmetry in the transmission of information ($\mu > \alpha$) skews (T) upwards. This skewdness simply reflects the fact that type A individuals get informed more quickly than type B ones.

3 The dynamics of social location

3.1 Determination of the equilibrium

We are now interested in examining the equilibrium dynamics of the economy so far considered. This requires to examine how the dynamics of information influences the dynamics of location. For this purpose, we shall consider economies which are always in a state of equilibrium of the Nash location game, i.e. in which no individual can ever strictly increase his utility by moving alone.

Let us denote by n_A and n_B the fractions of type-A and type-B individuals in the new location. We are going to show that, under some conditions, n_A and n_B are uniquely determined by the allocation of initiates across types, N_A and N_B. This result relies on the following circularity in the determination of the number of initiates and the number of individuals who go to the new location. On one hand, n_A and n_B determine the proportions of desirable and undesirable types in both locations, and whence the attractivity of going to the new location relatively to the old one. On the other hand, given this attractivity and the total number of initiates, $N = \alpha N_A + (1-\alpha) N_B$, the total number of individuals who frequent the new location, $n = \alpha n_A + (1-\alpha) n_B$, results from the maximization of the utility by each individual.

Firstly, consider the location choice of an initiate. Let $\Delta\pi \equiv \pi_1 - \pi_0$ and $\Delta c \equiv c_1 - c_0$ denote respectively the benefit and the cost of being in location 1 rather than in location 0. It directly follows from the maximization of (1) that an initiate i will choose location 1 if and only if:[7]

$$i \leq \parallel \frac{\Delta\pi}{\theta\Delta c} \parallel \tag{4}$$

where the operator $\parallel \cdot \parallel$ is defined by $\parallel x \parallel = \sup(\inf(x,1),0)$. Using the law of large numbers, the fractions of desirable and undesirable populations who frequent the new location are given by:

$$n_A = \parallel \frac{\Delta\pi}{\theta\Delta c} \parallel N_A \tag{5}$$

$$n_B = \parallel \frac{\Delta\pi}{\theta\Delta c} \parallel N_B \tag{6}$$

It directly follows that the total number of individuals in location 1 is related to the total number of initiates through:

[7] Note that we may write this condition because all individuals know $\Delta\pi$. Recall that the imperfection of the information concerns the way to go to location 1, not the allocation of types (n_A, n_B), which is observable at all times by individuals in the location where they are. Whence both initiates and non-initiates may derive $\Delta\pi$ from their observations.

$$n = \| \frac{\Delta\pi}{\theta\Delta c} \| N \tag{7}$$

In order to close the model, we write the benefit of going to location 1, $\Delta\pi$, as a function of the distribution of individuals across the two locations. If $n \in (0,1)$, the benefit can be written as:

$$\Delta\pi = \frac{\alpha n_A}{n} - \frac{\alpha(1-n_A)}{1-n} = \frac{\alpha(1-\alpha)}{n(1-n)}(n_A - n_B) \tag{8}$$

Using equations (5) and (6) to substitute out n_A and n_B, the last equation may be rewritten as:

$$\Delta\pi = \frac{\alpha(1-\alpha)}{n(1-n)} \| \frac{\Delta\pi}{\theta\Delta c} \| (N_A - N_B) \tag{9}$$

For a given information structure described by (N_B, N_A), an instantaneous Nash equilibrium in which both locations are frequented is a pair $(n, \Delta\pi)$ satisfying $0 < n < 1, -1 < \Delta\pi < 1$, and the two equations (7) and (9). Using (4), an instantaneous Nash equilibrium in which only the old location is frequented must simply satisfy the condition:

$$i > \| \frac{\overline{\pi} - \alpha}{\theta\Delta c} \| \tag{10}$$

for all i. [8]

Proposition 1 . *Assume $\Delta c > 0$ and $\theta\Delta c > 2$. For all $(N_B, N_A) \in [0,1) \times [0,1)$, the following holds:*

if $N_B \geq N_A$, then $n = 0$ is the unique Nash equilibrium;

if $N_B < N_A$, there exists a unique Nash equilibrium with $n > 0$, in which:

$$n = \frac{1}{2} - \sqrt{\frac{1}{4} - \frac{\alpha(1-\alpha)}{\theta\Delta c}(N_A - N_B)}. \tag{11}$$

[8] Proofs of all propositions are contained in the Appendix.

Proposition 1 says that if the desirable population is relatively more informed than the undesirable population, the new location may be frequented by some individuals, even though it is more costly to visit than the old location. The reason is that, since the desirable-type individuals are (relatively) more numerous among the initiates, the proportion of desirable types is higher in the new location than in the old one, which in turn makes the new location attractive. Unsurprisingly, the number of individuals who go to the new location decreases with the relative cost to go there, Δc. However, this number remains strictly positive even for arbitrarily high cost. This is because no matter how high the cost, there remain initiates with low enough i who are ready to bear this cost in order to mix with desirable types. On the other hand, if undesirable individuals are relatively more informed, nobody will frequent the new location, no matter how large the number of initiates is.

Proposition 1 holds under two conditions on the parameters, that we suppose verified throughout the rest of the paper. The inequality $\theta\Delta c > 2$ is simply a technical condition which ensures the uniqueness of the equilibrium with both locations. The condition $\Delta c > 0$ allows us to state the existence result in a simple way, but Proposition 1 may easily be extended to the case of a negative Δc. If the new location is less costly, and desirable type individuals are more informed ($N_A \geq N_B$), all initiates go to the new location, i.e. $n = N$. This ceases to be true if desirable types are *less* informed than undesirable types, so that the lower cost of the new location is counterbalanced by the negative externality created by the individuals who go there. Thus if $\Delta c < 0$ and $N_B > N_A$, n may be lower than N, and will be given by a formula very similar to (11).

Now we turn to the dynamic properties of the equilibrium and show that it exhibits the prominent features of fashion phenomena.

3.2 Fragility of mass behavior

A striking aspect of fashions is that the conformity of collective behavior can be scattered by seemingly innocuous changes of the environment. Consider a situation in which the entire population frequents location 0 and nobody knows the possibility of choosing location 1. Let us assume that the following shock occurs: an arbitrarily small group of individuals belonging to the desirable group comes to know the opportunity of frequenting location 1. If this informational shock induces a non-infinitesimal fraction of the whole population to change their location, we say that mass behavior is fragile.

Proposition 2 *.(Fragility of mass behavior). Suppose $N_B(0) = 0$ and $N_A(0) > 0$, arbitrarily small. If $\mu > \alpha$, $n(t)$ is strictly positive and reaches a non-infinitesimal level. Furthermore, $\partial n(t)/\partial \mu > 0$.*

The intuition is as follows. If initially only individuals of the desirable group know the new behavior, some of them, those with the lowest marginal rate of substitution between the private and the public good, will choose to adopt it notwithstanding its higher costs. Given the structure of communication, the initial difference with respect to information within the two groups will never be completely eroded. Hence, the amount of public good provided in the new location will always be larger than in the old location, so that the new location will ever be frequented despite its higher costs. In this model, small causes produce large effects.

Moreover, given the population structure, the lower is the probability that a desirable type communicates with an undesirable type, the larger is the proportion of informed desirable types relative to the proportion of informed undesirable types. Thus the more segmented are the communication channels, the larger is the total number of people that adopts the new behavior at each point in time.

Notice the importance of initial conditions, i.e. the way in which knowledge is generated: if $N_B(0) > N_A(0) \geq 0$, the first part of Proposition 1 applies, and $n(t) = 0$. In this sense, desirable individuals may be viewed as natural "fashion leaders" and undesirable individuals as natural " fashion followers".

3.3 Fashion life cycle

A distinctive component of fashion is what marketing textbooks call its life cycle. This means that the temporal pattern of fashion adoption in society takes the form of a bell, neatly showing a phase of growth and a phase of decay. The following stages of the fashion cycle are distinguished in marketing textbooks. First, a given style of behavior is introduced by a small group of fashion leaders. Successively, other individuals take an interest in the behavior out of the desire to emulate the fashion leaders. At a certain point, the proportion of individuals adopting the new behavior reaches a peak. Finally, individuals start moving toward alternative styles and the fashion declines [Kotler (1988), Sproles (1981)]. This temporal pattern of fashions can be explained by the segmentation of communication channels within society.

Proposition 3 *(Fashion cycle). Suppose* $N_B(0) = 0$ *and* $0 < N_A(0) < \frac{\mu-\alpha}{(1-\alpha)\mu}$. *Then,* $n(t)$ *is first strictly increasing and then strictly decreasing. It reaches its maximum when* $(N_A(t), N_B(t))$ *is on the line defined by:*

$$\mu(1 - N_A) = N_B + \frac{\alpha}{1-\alpha}(1-\mu)(1-N_B). \tag{12}$$

In order to understand this result, notice that the frequentation of location 1 is maximum when $N_A(t) - N_B(t)$ is maximum. This is so since whereas the cost differential remains constant, the differential provision of public good in the two locations changes according to the way knowledge propagates within society. In particular, the incentive to move to the new location is related to the amount of information in the two groups. The larger the probability for a desirable individual to be informed as compared to the probability for an undesirable individual to be informed, the larger is the number of those who actually choose to adopt the new behavior.

Notice the importance of the communication structure for establishing the fashion cycle. The assumption of asymmetric matching ($\mu > \alpha$) is necessary to obtain the phase of growth. It is precisely because desirable individuals communicate more intensively among themselves than with undesirable individuals that the new behavior can have a stage of take-off and conqueer an increasing part of the population.

If strong segregation prevails ($\mu \approx 1$), social dynamics tends to be a sequence of group dynamics. First, almost all desirable individuals move; after that, the undesirable individuals join them. However, when the undesirable individuals come, desirable individuals leave. In the long run, frequenting location 1 ceases to be a signal that the individual is desirable; rather it signals his vanity (the rate of substitution between the numéraire good and the local public good is low).

This feature of the equilibrium is reminiscent of the socalled "upper class theory of fashion" which was developed by social scientists at the turn of the century. This theory has two main elements. The first one is that standards of behavior adopted by the upper class - the desirable population in our model - tend to trickle down to lower classes. Thus, it is stated that "In modern civilized communities the lines of demarcation between social classes have grown vague and transient, and whenever this happens the norm of reputability imposed by the upper class extends its coercive influence with but slight hindrance down through the social structure to the lowest strata. The result is that the members of each stratum accept as their ideal of decency the scheme of life in vogue in the next higher stratum, and bend their energies to live up to that ideal." [Veblen (1924, p.84)]. The second element of the theory is that the upper class itself desires to set apart from the "common herd", so that collective behavior is intrinsically unstable. This aspect of the theory is eloquently stated by German social philosopher Simmel (1904): "Just as soon as the lower classes begin to copy their style, thereby crossing the line of demarcation the upper classes have drawn and destroying the uniformity of their coherence, the upper classes turn away from this style and adopt a new one, which in its own turn differentiates them from the masses; and thus the game goes merrily on." Our model suggests that a strongly segmented communication structure may effectively induce processes of imitation and differentiation between social classes as those described by the upper class theory.

4 Conclusion

Fashions are transient collective phenomena characterized by distinctive life cycles. Both these features can be ascribed to many different mechanisms, e.g. they could be the result of strategic behavior by the fashion industry. In this paper we have focused on a special but probably important mechanism that generates fashions: the structure of information propagation in society. The experience of marketers is that communication channels are germane to the fate of fashionable products. In particular, personal communication, in form of word-of-mouth influence, occurring between individuals interacting in similar social circles is often seen as a key determinant of the diffusion of new styles of behavior. The analysis in this paper provides a simple formal framework for studying the impact of communication channels on collective behavior and relates the structure of communication to the characteristics of fashion. The main conclusion is that if the probability of being informed about new behaviors is systematically different for individuals who belong to groups that make different contributions to the consumption externality, fashions easily obtain. Moreover, the feature concerning which people are informed can be readily interpreted in terms of segmented communication channels, according to the individuals' class or group affiliation. There is little doubt that this is precisely the way in which socialization and mutual influence typically occur in the real world.

Our formalization of segmented communication is based on an asymmetric random matching process in which individuals tell what they know to those with whom they socialize. Clearly, this is a rather primitive description of how information is really transmitted, and it may be useful to extend the model to incorporate more sophisticated communication settings.

Thus, it has just been assumed that individuals have an incentive to release information. Making this an endogenous choice opens new possibilities: on the one hand, initiates might try to restrict information diffusion in order to avoid "polluting" their location with undesirable individuals; on the other hand, the willingness to communicate may depend on the ability of receivers to "pay" for it, for example by showing deference to the sender.

Another natural extension of the model would make the communication structure partially endogenous by allowing individuals to invest in obtaining information. In our model, individuals value communication, especially communication with desirable types. Hence, they would be willing to pay for increasing their individual matching rate and/or for improving the quality of their matchings.

Finally, a generalization of the model would incorporate mass communication together with personal communication channels. According to the present approach, the impact of mass communication on the fashion cycle would crucially depend on the *quality* of the mass media. If those who receive the information from the media form the general public, the presence of mass communication is likely to accelerate both the phase of growth and the phase of decline of the fashion, and hence reduce the length of the life cycle. However, if the media are area-specific, so that their messages are coded in the "language" of a particular social group, their presence may increase the segmentation of information flows, thereby making fashions more likely to occur.

APPENDIX

Properties of the trajectory (T)

Let us first consider the case with symmetric matching $\mu = \alpha$. The differential system (S) then implies:

$$\frac{dN_A}{1-N_A} = \frac{dN_B}{1-N_B} \tag{13}$$

which may be integrated into:

$$\frac{1-N_A}{1-N_B} = \text{constant} \tag{14}$$

Thus, the trajectory reduces to the line joining the initial point $(N_B(0), N_A(0))$ to the point $(1,1)$ (see Figure 1).

Next, let us consider the opposite polar case, where different types do not match with each other ($\mu = 1$). In this case, the differential system (S) implies:

$$\frac{dN_A}{N_A(1-N_A)} = \frac{dN_B}{N_B(1-N_B)} \tag{15}$$

which may be integrated into:

$$\frac{N_A}{1-N_A} = \text{constant}\frac{N_B}{1-N_B} \tag{16}$$

which is depicted on Figure 1.

In general, the slope of curve (T) in point (N_B, N_A) is given by:

$$\frac{dN_A}{dN_B} = \frac{1-N_A}{1-N_B}\,\frac{N_B + \mu(N_A - N_B)}{N_B + \frac{\alpha}{1-\alpha}(1-\mu)(N_A - N_B)} \tag{17}$$

This slope is increasing with μ. Thus, starting from a given point $(N_B(0), N_A(0))$ the trajectory will be between the line corresponding to $\mu = \alpha$ and the curve corresponding to $\mu = 1$, and the closer to the second one the larger μ (see Figure 1).

Proof of Proposition 1

Since $\overline{\pi} \leq \alpha$, condition (10) is met for all i, which implies that $n = 0$ is a Nash equilibrium.

If $N_B < N_A$ and $n > 0$, plugging equation (7) into equation (9) gives:

$$\Delta\pi(1-n) = \alpha(1-\alpha)\frac{N_A - N_B}{N} \tag{18}$$

and using again (7) to substitute out n provides the following equation in $\Delta\pi$:

$$\Delta\pi\left(1 - \parallel \frac{\Delta\pi}{\theta\Delta c} \parallel N\right) = \alpha(1-\alpha)\frac{N_A - N_B}{N} \tag{19}$$

If $\theta\Delta c > 2$, then $\theta\Delta c/2N > 1$, which implies that the quadratic function in $\Delta\pi$ on the l.h.s. of equation (19) is increasing for $\Delta\pi \in [0, 1]$. Thus the solution of equation (19), if it exists, is unique. For a solution to exist, it is sufficient that the l.h.s. is higher than the r.h.s. for $\Delta\pi = 1$, i.e.:

$$1 - \frac{N}{\theta\Delta c} \geq \alpha(1-\alpha)\frac{N_A - N_B}{N} \tag{20}$$

This inequality is true for all (N_A, N_B) since $1 - \dfrac{N}{\theta\Delta c} \geq \dfrac{1}{2}$, $\alpha(1-\alpha) \leq \dfrac{1}{4}$, and $\dfrac{N_A - N_B}{N} \leq 1$. Moreover, $\theta\Delta c > 2$ implies that $\dfrac{\Delta\pi}{\theta\Delta c}$ is smaller than one, so that equation (7) reduces to $\Delta\pi = \theta\Delta c\dfrac{n}{N}$, and equation (19) may be rewritten:

$$n(1-n) = \frac{\alpha(1-\alpha)}{\theta\Delta c}(N_A - N_B) \tag{21}$$

which has one unique root $n \in [0, 1]$, given by equation (11).

Proof of Proposition 2

By the properties of trajectory (T), if $N_A(0) > 0$ and $N_B(0) = 0$, $N_A(t) > N_B(t)$ for all t. Using (11), this implies $n(t) > 0$ for all t. By (18), $dN_A(t)/dN_B(t)$ is strictly increasing with μ. Hence $N_A(t) - N_B(t)$ is strictly increasing with μ, and $\partial n(t)/\partial\mu > 0$ by (11).

The number of adopters $n(t)$ reaches a non-infinitesimal level for the following reason. When $N_A(0)$ goes to 0, $\dfrac{dN_A}{dN_B}$ goes to $\dfrac{(1-\alpha)\mu}{\alpha(1-\mu)}$ (see equation (17)), which is larger than 1 if $\alpha < \mu$. Thus (T) converges toward a limiting curve which is different from the 45^0 line.

Proof of Proposition 3

By (11), $n(t)$ is maximum when $N_A(t) - N_B(t)$ is maximum. Along a given path, $N_A(t) - N_B(t)$ reaches its maximum when $\dot{N}_A = \dot{N}_B$, i.e. using (S), when $(N_A(t), N_B(t))$ is on the line defined by (12). This is depicted in Figure 2. Provided that $(N_A(0), N_B(0))$ belongs to region 1, $n(t)$ is first strictly increasing (path in region 1) and then strictly decreasing (path in region 2).

Figure 1. Trajectory (T).

Figure 2. The fashion cycle.

REFERENCES

Akerlof, G., 1980, A Theory of Social Custom, of Which Unemployment May Be One Consequence, *Quarterly Journal of Economics* 94, 749-775.

Banerjee, A.V., 1993, The Economics of Rumours, *Review of Economic Studies* 60, 309-337.

Banerjee, A.V., 1992, A Simple Model of Herd Behavior, *Quarterly Journal of Economics*, 107, 797-817.

Becker, G., 1991, A Note on Restaurant Pricing and Other Examples of Social Influences on Price, *Journal of Political Economy*, 99, 1109-1116.

Bikhchandani, S., Hirshleifer, D., and I. Welch, 1992, A Theory of Fads, Fashion, Custom, and Cultural Change as Informational Cascades, *Journal of Political Economy*, 100, 992-1026.

Coelho, P.R.P., and J.E. McClure, 1993, Toward an Economic Theory of Fashion, *Economic Inquiry*, 31, 595-608.

Coleman, J., 1990, *Foundations of Social Theory*, Cambridge: Harvard University Press.

Corneo, G., and O. Jeanne, 1994, The Economics of Signaling Goods Industries, mimeo, University of Bonn.

Frank, R.,H., 1985, The Demand for Unobservable and Other Nonpositional Goods, *American Economic Review*, 75, 101-116.

Karni, E. and D. Levin, 1994, Social Attributes and Strategic Equilibrium: A Restaurant Pricing Game, *Journal of Political Economy*, 102, 822-840.

Karni, E. and D. Schmeidler, 1990, Fixed Preferences and Changing Tastes, *American Economic Review*, 80, 262-267.

Kotler, Ph., 1988, *Marketing Management* (Sixth Edition), Englewood Cliffs: Prentice-Hall International.

Leibenstein, H., 1950, Bandwagon, Snob, and Veblen Effects in the Theory of Consumer Demand, *Quarterly Journal of Economics*, 64, 183-207.

Matsuyama, K., 1992, Custom versus Fashion: Path-Dependence and Limit Cycles in a Random Matching Game, Working paper E-92-11, Stanford University.

Pesendorfer, W., 1993, Design Innovation and Fashion Cycles, mimeo, Northwestern University.

Pigou, A.C., 1913, The Interdependence of Different Sources of Demand and Supply in a Market, *Economic Journal*, 23, 18-24.

Rae, J., 1905, *The Sociological Theory of Capital*, London: MacMillan.

Simmel, G., 1904, Fashion, *International Quarterly*, 10, 130-155.

Spence, A.M., 1974, *Market Signaling, Information Transfer in Hiring and Related Processes*, Cambridge: Harvard University Press.

Sproles, G., 1981, Analyzing Fashion Life Cycles - Principles and Perspectives, *Journal of Marketing*, 45, 116-124.

Stigler, G. and G., Becker, 1977, De Gustibus Non Est Disputandum, *American Economic Review*, 67, 76-90.

Veblen, T., 1924 (first published 1899), *The Theory of the Leisure Class. An Economic Study of Institutions*, London: George Allen & Unwin ltd.