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# Modeling Luxury Consumption: An Inter-income Classes Study of Demand Dynamics and Social Behaviors

Abstract

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**JEL classification:** B52, D01, D11.

## 1 Motivations and related literature

The study of luxury consumption is relatively rare in economic analysis. Actually, the standard economic theory of demand, based on the simplified concept of homothetic preferences, does not allow for such a study. The purpose of this article is to fill this gap by building a structure of preferences based on sociological and psychological factors, such as the need for social distinction. Especially, the paper investigates whether a specialization of consumption by income classes emerges from simple social behaviors such as imitation, differentiation and innovation. Our purpose is to build an agent-based model of luxury consumption, which could easily be included in macro-models in order to study the impact of demand for luxury at an aggregate level.

In 1899, Thorstein Veblen analyzed consumption as a class-phenomenon, devoting part of his study to the concept of *conspicuous consumption*. Then, Pierre Bourdieu investigated the links between consumption and social status, emphasizing that "the world of luxury goods [...] seems predisposed to express social differences" (Bourdieu 1979, p.249). The 1857's empirical analysis of Ernst Engel about the way people allocate their budget shares among different categories of

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expenditures with respect to their socioeconomic class, and the subsequent concept of hierarchic preferences both revealed links between income level, wants and consumption. Finally, Aversi et al. (1999) investigated the main features of socially based individual preferences using the agent-based computational economics methodology. In that sense our model may be seen as a simplification of this latter. Indeed, our model requires less parameters and for this reason, it is easier to deal with, to replicate and to include in a macro-model. However, it may also be seen as a deepening of the Aversi et al. (1999) model because of its focus on the analysis of preference for luxury.

## 2 Methodology

We build an agent-based model of luxury consumption. In the model  $n$  agents are distributed among different income classes, denoted by  $c_i \in \{1..m\}$ , from the poorest to the richest. Two types of goods are available in the economy: basic goods (B) and luxury goods (L). At each time  $t$ , each individual  $i$  spends all his income on consumption; a share  $\theta_t^i \in [0, 1]$  of his income is devoted to good (L) and a share  $1 - \theta_t^i$  to good (B).  $\theta_t^i$  is called consumption profile of individual  $i$  at time  $t$ . We set that three main factors are involved in the process of demand formation in a social context: imitation, differentiation and innovation.

People aim at imitating their peers and individuals from the upper classes. The imitation process follows a bayesian-updating rule. Then, during the differentiation process individuals seek to distinguish their consumption profile from individuals belonging to strictly lower classes. A threshold parameter  $\delta$  defines the maximal proximity tolerated by each individual with respect to individuals from lower classes. Differentiation occurs if individuals belonging to distinct groups are distant by less than  $\delta$ . Finally, what we call innovation is the production of a new consumption profile by an agent, independently from other individuals' profile. The innovation process follows a truncated normal law between 0 and 1.

We first study analytically each process, separately, and then simultaneously. We then use simulation (run on NetLogo) to implement the whole model where all individuals act simultaneously. This first stage of the model takes place in a non-monetary framework.

## 3 Summary of the results

We first conduct a two classes analysis (*i.e.*  $m = 2$ ) where we primarily look at the impact of each process: innovation, imitation and differentiation, taking place alone. The central role of innovation is to include inter-individual variety into the model. The innovation process is a random walk. When analyzing the imitation and differentiation process, we find that they act in a similar way on the consumption profile. The role of both imitation intensity, controlled for the size of the class, and differentiation intensity are symmetric ones. Both processes act together on the strength and the speed of evolution of the profiles. While imitation tends to bring closer the consumption profiles in an exponential way, differentiation tends to drive them exponentially away one from another. We are thus in the presence of two antagonistic dynamics, so that a

fixed point can only result from an equilibrium state between the two forces.

We also study the joint effect of imitation and differentiation. We observe a *pursuit racing* phenomenon, in the sense that the consumption profile of the lower class *is following the shape* of the one of the upper class. Indeed, the *pursuit racing* schema is such that, by the differentiation process, class 2 profile keeps staying ahead of class 1 profile, and this despite the imitation dynamics of this latter. We find that, outside of boundary cases, the distance separating both consumption profiles converges exponentially toward a limit distance. therefore, this primary analysis confirms our hypothesis that there actually exists a differentiation of the consumption profile by income classes. Note that this limit distance is proportional to the threshold  $\delta$ . Moreover, the time of convergence toward a boundary is a decreasing function of one of the imitation and differentiation intensities and is decreasing with  $\delta$ .

Concerning the whole model, we are seeking some sets of parameters' values for which each class  $c$  displays a unique and specific consumption profile. By doing so, we are looking for a stable structure of consumption, which fits the fact that the consumption profile of rich people embodies luxury goods, while poorer people are only purchasing basic goods. The strength of our model leans on the fact that we do not need to enforce special characteristics on luxury goods, such as being an innovative or a traditional good. An item is defined as luxurious by its ability to exhibit social distinction. One emerging property of the simulations is the appearance of two distinct consumption profiles within the upper class in the two-classes analysis, within the middle and the upper class in the three classes analysis, and mainly within the middle class in the four classes analysis. Note that these emerging profiles are also clearly distinct from all the consumption profiles of the other classes and are persistent in time. This splitting phenomenon can therefore be interpreted as the emergence of additional consumption classes, or more precisely as the emergence of consumption sub-classes. It appears that the splitting phenomenon is related to both the relative size of each class and the intensity of the imitation and differentiation parameters. We observe that low levels of the imitation-intensity parameter tend to foster the appearance of splits, while the differentiation-intensity and the threshold parameter  $\delta$  act on the distance separating the two profiles resulting from the split. Note that we never observe any persistent split within the lowest class. Interestingly, this latter class is the only one which only imitates and never differentiates itself. This observation tends to suggest that it is the differentiation process which is in action when splits occur. Indeed when the degree of imitation is low, the differentiation process has a larger influence in the determination of the consumption profile. If we now try to interpret these results, it is interesting to see that they are quite in tune with sociological evidence. Indeed, Warner and Lunt (1941) propose a social categorization based on the individual perception of one's social space. According to this empirical study society appears to be divided into three main classes: the upper, middle and lower class, themselves divided in two sub-classes, the upper-upper, the lower-upper, the upper-middle, the lower-middle, the upper-lower and the lower-lower class. Apart from the sub-division of the lower class on which we will come back to later on, our splitting phenomenon seems to fit this sociological framework quite well. Indeed, this sub-class consciousness explains both the splits that occur within the middle and the upper classes in the three classes analysis, but also

the fact that, when we already deal with four classes (the middle class being defined as the second lowest class  $c = 2$ ), we observe a split only within the middle class since the distinction between lower-upper and upper-upper class is already done. For what concerns the lowest class, the absence of split, due to our previous hypothesis that individuals only differentiate themselves with respect to individuals belonging to strictly lower classes, fits the idea of Bourdieu, according to which intra-class distinction does not appear within the more modest class, but only within the upper classes, and especially within the bourgeoisie, which corresponds to our middle class.

Further developments would consist in including the model in a monetary framework. This second stage of the model would connect luxury goods with high price levels. The introduction of price would also allow investigating the link between luxury consumption and income inequality. In particular we seek to test the existence of Veblen effects and to confront our model with the stylized facts on the elasticity of demand with respect to price for each categories of commodities.

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