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DOES POSITIONAL CONSUMPTION GENERATE TECHNOLOGICAL INNOVATION?

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RESUMO

O consumo positional orientado por anseios de estatuto não produz, de forma plausível, ganhos de bem-estar para a sociedade, e é nesse caso uma fonte de ineficiência económica. Enquanto que alguns autores propõem políticas para corresponder a este problema, outros argumentam que estas causariam mais danos do que benefícios. Um dos argumentos mais relevantes contra a intervenção política é o de que o consumo posicional gera inovação, dessa forma produzindo benefícios económicos mais vastos. O presente trabalho pretende contribuir para esta discussão através do estudo da relação entre o consumo posicional e a inovação tecnológica. Para tal, parte-se de pressupostos teóricos comummente aceites sobre elementos que estruturam a relação em questão, e infere-se sobre as suas causas e consequências. Para além de permitir uma melhor compreensão do processo, os resultados do estudo indicam que o consumo posicional gera, provavelmente, menos benefícios sobre a inovação tecnológica do que alternativas de afectação de recursos de natureza material. Esta conclusão funda-se em três argumentos, relacionados com o papel relativo da inovação tecnológica como estratégia de marketing em mercados posicionais, com a exigência dos consumidores posicionais sobre o desempenho material das inovações, e com a capacidade das inovações geradas pelo consumo posicional para oferecerem benefícios de bem-estar.

Palavras-Chave: consumo posicional, preferências relativas, inovação, modelaçâo de agentes

ABSTRACT

Positional consumption led by wants linked to status concerns arguably does not produce welfare gains to society and is a source of economic inefficiency. While some authors propose policy remedies to bring a better collective outcome, others argue that they would cause more damage than benefits. One of the most important arguments against intervention is that positional consumption generates innovation, thereby producing wider economic benefits. This work aims to contribute to the discussion by studying the relation between positional consumption and technological innovation. It departs from commonly accepted theoretical assumptions on elements structuring the relation, and infers on its causes and possible outcomes. Besides achieving a better comprehension of the process, results indicate that positional consumption is likely to generate lower benefits from technological innovation than alternative resource allocations of material nature. This conclusion is founded on three arguments, related to the relative role of technological innovation as a marketing strategy in positional markets, the exigency of positional consumers towards the material achievements of innovations, and the ability of those innovations to deliver welfare gains.

Keywords: positional consumption, relative preferences, innovation, agent-based modelling

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1. INTRODUCTION

Consumption led by utility gains dependent on the consumption of other individuals is referred to in economics as *positional consumption*. Positional consumption is defined in opposition to *material consumption*, which provides utility directly through the intrinsic characteristics of the product rather than a relative evaluation of the product in comparison to those consumed by others. Mainstream economic theory implicitly assumes that all consumption is material. However, the consequences to welfare of the two types of consumption are rather different; because the value of positional goods depends on the consumer behaviour of other individuals, unlike with material consumption it cannot be assumed that the aggregate utility to society increases with the level of consumption. On the contrary, with status seeking consumption the aggregate utility achieved by consumers is theoretically not improvable, because the status of an individual is obtained at the cost of the status of other individuals. If one individual increases its status, the status of others in the group is reduced at an equivalent level. This phenomenon can be included in the category of externalities, since the action of an individual causes damage to others in the form of utility losses. The economic consequence of positional behaviour is an inefficient allocation of resources and, consequently, a loss of welfare.

Some authors argue that policy intervention should be used to recoil the process of positional behaviour and bring the economy to a more efficient equilibrium, with resources being directed to more beneficial purposes. Robert Frank, an eminent

advocator of policy action, claims that progressive consumption taxation would be an appropriate remedy (see e.g. Frank 1999). On the other hand, other authors, grounded on libertarian concerns, deny that policy intervention would be preferable to letting the market function on its own and argue that the social costs of policy would be greater than its benefits.

Among various reported objections to policy intervention, one of the most important is grounded on the role of consumption in the generation of innovation. Giving incentives to consume less would ignore the fact that consumption supplies the positive externality of stimulating innovation, which brings further benefits to society.

This work intends to contribute to this discussion by providing a better understanding of the relation between positional consumption and technological innovation. The fundamental question put in the first place is:

i Does positional consumption generate technological innovation?

As it will become clear, the answer depends on the particular type of positional consumption. It is therefore crucial to identify the main causes for the existence and intensity of such relation:

ii What are the fundamentals for existence and intensity of a relation between positional consumption and technological innovation?

For the discussion on the effects of policy, the issue of intensity of the relation is particularly relevant because positional consumption compares to alternative ways of allocating resources. A third issue important for policy and also discussed is whether the technological innovation caused by positional consumption is welfare enhancing:

iii Is innovation generated by positional consumption welfare enhancing?

According to the literature review carried out by the author, specific research dedicated on the issue of the relation between positional consumption and innovation has not been developed until the present time.

A general description of the methodological approach used in this work is given in Chapter 2. A review of critical topics and assumptions to the purpose of this work is provided in Chapter 3, comprising four main themes: consumer behaviour, positional consumption, innovation, and policy on positional consumption and effects on innovation. Chapter 4 theoretically builds on the characteristics of positional consumer behaviour, generation of innovations and producer marketing behaviour, to discern on the fundamental factors establishing a possible relation between positional consumption and technological innovation, in terms of existence, intensity and social utility. Chapter 5 presents a model representing the process of generation of innovation by positional consumption, aiming at a formal comprehension of the process and also the study of some of its factors of influence. Departing from previous findings, Chapter 6 concludes with a discussion on the relative benefits of positional consumption as a generator of technological innovation, as opposed other possible uses of resources. Finally, Chapter 7 provides a brief summary and the conclusions of this work.

2. METHODOLOGICAL APPROACH

The methodology used in this work follows a theoretical approach. Deductive reasoning is conducted in Chapter 4 to identify conditions for existence, intensity and welfare enhancement of technological innovation caused by positional consumption. Commonly accepted assumptions on elements structuring the relation under analysis - including the nature of positional consumer behaviour, generation of innovations and producer marketing behaviour - are used to infer conclusions on its causes and possible outcomes. A detailed description of relevant basic assumptions is presented without explicit notice throughout the review of critical issues in Chapter 3.

The model presented in Chapter 5 is built on an agent-based approach, and is used to conduct an experimental investigation of a system of positional consumption and innovation. The model partially incorporates the fundamental aspects of the phenomenon of relation between positional consumption and technological innovation identified in Chapter 4. Agent-based modelling is an appropriate approach to model and simulate the system in question because of the existence of interacting agents, contingency of their decisions on past decisions and presence of feedback loops, a set of elements that commonly set the stage for a higher emergent properties of the system. However, unlike common mathematical models, this simulation approach does not allow generalizing results, only providing suitable data for induction from controlled laboratory experimentation. A justification for the methodological approach concerning modelling is provided in more detail below.

3. REVIEW OF CRITICAL TOPICS

This chapter reviews topics critical for the object of research of this work. Understanding consumer behaviour and its drivers is essential both to comprehend why positional consumption is a reality and to comprehend attitudes of consumers towards new products and innovation. A review of the of the drivers of consumer behaviour is given in section 3.1. A perspective of the discussion carried out on the topic of positional consumption, and its economic consequences, is described in section 3.2. Innovation in the economy is reviewed in section 3.3, comprising its importance to economic development, its main drivers, and the concepts of new product positioning and adoption process. Finally, a description of the present discussion on policy on positional consumption and its effects on innovation is provided in section 3.4.

3.1 Consumer behaviour and its drivers

Consumption of positional type takes place within the higher edifice of consumption. Before describing direct causes of positional consumption and the way it might influence innovation, it is relevant to understand the more general motivations of consumption.

According to marketing theory, consumer choices are framed by *wants* that ultimately satisfy human *needs*. A need is a state of "felt deprivation of some generic satisfaction arising out of the human condition" (Kotler 2000). Needs are not socially created; they exist in the genetic construct of human mind. Wants arise to satisfy

needs, corresponding to "desires for specific satisfiers of these ultimate needs". Human wants are continually shaped and reshaped by social forces and institutions. Products, and consumption, exist to satisfy needs and wants. Maslow presented a widely disseminated theory of human needs, which also explains the most basic motives of consumption. According to him there are at least five sets of basic needs (Maslow 1943): physiological, safety, love, esteem, and self-actualization. Different sets of needs are related to each other, arranged in a hierarchy of urgency of satisfaction. The needs in the lower levels in hierarchy will monopolize consciousness and tend of itself to monopolize the various capacities of the human organism to seek its satisfaction. Higher level needs are minimized, even forgotten, until the lower level needs are not fairly well satisfied. The two lower sets of basic needs - physiological and safety - belong to the category of physical needs, love and esteem are categorized as social needs, and self-actualization needs belong to the category of needs of self.

Economists assume that consumers are *utility maximizers*, that is, they use their limited resources to acquire a bundle of goods that will render them the highest utility, which corresponds to satisfying the most of their needs. In evaluating a good, the consumer considers its set of attributes and places different values on these various attributes reflecting what he or she is seeking. Each product offers the customer a certain total utility at a certain price, and the consumer chooses which product maximizes the value-to-cost ratio.

Marketeers have gone much further than economists in trying to understand consumer behaviour, especially in studying the process of wants creation, not only by the needs that they serve but also by the complete set of circumstances that lead to them, including social, cultural, economic and situational contexts. For the purpose of this work it is relevant to note the importance of social environment for consumer behaviour. Kotler (2000) outlines reference groups, family and roles and statuses as

the main groups of social influence to a consumer. *Reference groups* are all those groups that influence a person's attitudes, opinions and values. Some are *primary groups*, such as family, close friends, neighbours, and fellow workers, and others are *secondary groups*, such as organizations they belong to. People are also influenced by groups they are not members of, such as *aspirational groups*. There are three ways in which a person may be influenced by reference groups: reference groups expose the person to possible new behaviours and life styles; persons normally desire to "fit in" their reference groups and that influences the person's attitudes and self-concept; reference groups create pressures for conformity that may affect the person's actual product and brand choices. The influence of reference-groups tends to be stronger when the product is visible and conspicuous to other people. *Family* plays an enduring role in influencing the consumer's attitudes, opinions and values. From family the person acquires a mental set not only towards religion, politics and economics but also towards personal ambition, self-worth and love. *Role* and *status* refer to the position of the person within groups. A role consists of a set of activities that the person is supposed to perform according to the definition and expectations of the individual and the persons around him or her. Each role has a status attached to it, which reflects the general esteem accorded to that role in society or the group. A person's roles and statuses influence not only general behaviour but also buying behaviour.

Mainstream economics science assumes that consumers are sovereign in the market, i.e. it is consumers' wants that define what is produced in the market. Therefore, wants are created by consumers themselves and producers just adapt to them by offering whatever is requested by those wants. Moreover, it is also widely assumed in economics research that consumers know best what is good for them, and that consequently no centrally designed interference with consumers' wishes should be

considered. On the other hand, the consumer sovereignty hypothesis is rejected by economists who note that the relation between consumers' wants and production also functions in the opposite direction. As noted e.g. by John Kenneth Galbraith (1958 p.127), this is made clear by the approach of marketeers towards sales; in his work, the marketeer tries to bring wants in consumers that relate to their basic needs. It is a task of the marketeer to engender a connection between needs and wants, and the ways in which that could be done are multiple, including advertising, innovation and product design strategies[1]. This, Galbraith asserts, is one of the reasons why the creation of consumer wants depends on the productive process by which they are satisfied.

The contradiction between the assumption of consumers knowing what is best for them - suggested by Alfred Marshal as a "starting-point" simplification for economic research purposes (cited by Galbraith 1958) - and reality, can be explained on psychological and social grounds. This has been deeply investigated by Tibor Scitovsky and later by others. Scitovsky (1976, p.4) noted for example that "[w]e gradually dismantled the Laws of God and came to believe in man as the final arbiter of what is best for him. That was a bold idea and a proud assumption, but it set back by generations all scientific inquiry into consumer behaviour, for it seemed to rule out - as a logical impossibility - any conflict between what a man chooses to get and what will be best satisfy him. Economists today consider the two synonymous. (...) That approach overlooks the fact that tastes are highly variable, easily influenced by example, custom, and suggestion, and constantly changed by the accumulation of experience". Prospect theory, developed by Daniel Kahneman and Amos Tversky (1979), intro-

[1] The existence of a causal relation between producer activities and consumer wants is well documented for example by the existence of the concept of *planned obsolescence* of the product, a marketing strategy used by producers to stimulate consumption, avoiding competition of other producers, and keeping price above production costs.

duced the challenge at an eminent level to assumptions of standard economics on rationality and utility carriers; prospect theory offered as a descriptive model of risky choice in which the carriers of utility are not states of wealth, but gains and losses relative to a neutral reference point, contrary to the standard *reference-independence* assumption where states of endowment are the carriers of utility (Kahneman 2003).

Psychological and biological research has made clear why people are not rational in their consumption decisions. The roots for less than rational behaviour lie in the evolutionary development of the human mind (see e.g. Shermer 2008). Human mind traces have been shaped in the hunter gatherer world of our ancestors, where "survival of the fittest" carved the evolution of our emotions and reason. In the past human history that defined our traits, the requirements for survival were somewhat different than in today's world, and the way our mind was designed does not fit the *homo economicus* simplification assumed by economists. In fact, human emotions often surpass reason. Although this may not seem logical even from an evolutionary perspective, the fact is that back in hunter gatherer societies humans frequently needed to take decisions essential for survival or reproduction that could not be reasoned - either due to lack of intelligence, processing time, or purpose of intents - and had instead to rely on instinctively forged emotions. For example, evolution explains why people are often too risk averse, on rational standards. In the past, when there were no institutions to secure our economic (or other kind of) decisions - like laws, enforcement authorities, or a monetary system - the effectively rational decisions more often than today relied on securing short term benefits than waiting for long term rewards. However, due to limitations of human reasoning, such behaviour more prone to short term preferences was, and still is, driven by our emotions. Another important form of irrationality is the fact that humans tend to be ineffective at predicting what will make them happy (Gilbert 2005). In fact, people tend to exaggerate their

predictions on happiness caused by future events, both at the positive and negative side of happiness. Because of this, decisions do not maximize happiness, or utility, as conventionally supposed. These examples of forms of irrationality apparently were useful to survival and reproduction of our ancestors, but it may not perfectly fit our current quest for wellbeing.

3.2 Positional consumption and its economic consequences

Evolutionism also explains why people are more prone to emulation than rational behaviour would lead them to. And, because products often possess attributes valued by consumers for their social significance, consumption is often used as a vehicle to emulation of the buyer of the product. Yet, even if consumers were totally rational, emulative behaviour would still be justified to a certain extent for the individual consumer, since social status potentially renders real benefits to their social and economic life.

The competitive search for emulation through the possession of goods or usufruct of services does not directly contribute to an increase in wellbeing, contrary to what is conventionally assumed by economists for any kind of product or service desired by consumers. Since emulation, or status, is achieved by any individual at the expense of the relative position of other individuals, the aggregate utility gathered through status seeking will be null for all individuals. Competition for status is therefore arguably[2] a zero-sum game, because status is of scarce supply.

[2] Although the consideration of positional behaviour in the economics discipline is a step towards more realistic assumptions on the behaviour of people by considering the existence of relative preferences, it may still be regarded as limited in its explanation. As described by Kahneman (2003), although the emergent behavioural approach to economics is extending the boundaries on held assumptions, there are no immediate prospects of economics to sharing a common theory of human behavior with the psychology discipline. The psychological dimension of satisfaction and utility is a complex field, for which the division into material and positional consumption still seems like a considerable simplification.

The same is true for any other goods or services' functionalities of imposed limited supply. For example, available homes close to a school of high ratings, and therefore wanted by parents for this attribute, are physically limited. This constrained supply generates a competition for those available slots, while the net utility achieved by the winners is fixed, and independent of the number of contestants and final house prices.

In both cases, individual consumption decisions do not produce the best outcome for the collective. Consumers use resources in the process of competition for their relative standing, while their welfare is on aggregate not improved. Consumers would, if they could, agree together on a better outcome for all.

Those goods whose value to consumers depends on the way other consumers consume it or its substitutes, are commonly designated in economics as *positional goods*. The term was coined by Fred Hirsch (1976), who more broadly defined the *positional economy* as relating "to all aspects of goods, services, work positions, and other social relationships that are either (1) scarce in some absolute or socially imposed sense or (2) subject to congestion or crowding through more extensive use". Hirsh made a distinction between the *positional* economy and the *material* economy. The later term encompasses items valued by consumers in an absolute sense, i.e. those whose value does not depend on any ranking in desirability. Positional behaviour is a source of external costs, because whenever an individual embraces it he or she will cause a cost to other individuals, materialized in the loss of value from their own consumption or activities.

The ideas entailed in the new definitions of Hirsch were not completely new at the time of his writings. A prior major breakthrough by a prominent economist in the description of behaviour associated with emulation and its economic consequences was performed by Thorstein Veblen (1899). Veblen described conspicuous leisure

and conspicuous consumption as two forms of quest for status and a result of human need for esteem and emulation. His main economic conclusion was that conspicuous consumption and conspicuous leisure are both a waste of resources. The term "Veblen effects" became later known as the phenomenon by which the demand for a consumers' good is increased because it bears a higher rather than a lower price (Leibenstein 1950).

In a time when prominent economists were investigating the relation between income and consumption growth, James Duesenberry (1949) made the case for a relative income theory of consumption. In earlier decades, the economic discipline had been seeking recognition as an exact science, capable of explaining economic phenomena through objective mathematically formalized systems; inherently, social and psychological aspects of consumption tended not to be considered within theories of consumer demand. Duesenberry, on the contrary, produced a consistent theory of consumer behaviour where social factors played a considerable part in determining consumer behaviour. Duesenberry's model recognized the importance of habit formation and considered that levels of expenditures could be increased not by changes in income or prices, but through an interdependence of preference systems that promoted a general desire for distinction and encouraged individuals to emulate the consumption behaviour of others (Mason 2000b).

Adding to the role of marketing mentioned in the previous section, Galbraith took the arguments of Duesenberry to make another point for the dependence between wants and the process by which they are satisfied. With emulative consumption, "the more wants are satisfied, the more new ones are born". Galbraith's ultimate point was that the case for consumption as welfare enhancing cannot be made, when it is generated within the process by which it is satisfied: "Consumer wants can have bizarre, frivolous or even immoral origins, and an admirable case can still be made

for a society that seeks to satisfy them. But the case cannot stand if it is the process of satisfying wants that creates the wants. For then the individual who urges the importance of production to satisfy these wants is precisely in the position of the onlooker who applauds the efforts of the squirrel to keep abreast of the wheel that is propelled by his own efforts" (Galbraith 1958).

Although it initially drew some attention by economists, the relative consumer preferences theory of Duesenberry eventually lost ground in the economic research agenda. Milton Friedman's permanent income theory, which assumed consumers' wants to be only dependent on their income, became the dominant reference for decades (Mason 2000b). Empirical support for Duesenberry's relative income theory of consumption came with findings on happiness, which have shown that happiness does not increase with economic growth (Easterlin 1972). When asked to rate their level of happiness, people did not provide significantly different answers on average in different stages of economic growth, which suggests that an increase in consumption is not translating into more welfare.

Fred Hirsch's book, "Social Limits to Growth" (Hirsch 1976), brought renewed attention to the matter. Hirsch drew severe economic consequences from positional consumption by saying that ultimate limits to welfare were imposed by the social nature of consumption. He argued that the range of private consumption containing a social element was much wider than generally recognized, and increasing. Since material needs - mostly physiological and safety needs - are almost completely fulfilled in developed societies, the growth in consumption increasingly bears on consumption of social significance. And therefore, "the satisfaction that individuals derive from goods and services depends in increasing measure not only on their own consumption but on consumption by others as well". Consequently, as the economic output grows, social welfare is increasingly frustrated by social limits to growth. The same type

of conclusion had already been expressed by Galbraith (1958, p.129): "As a society becomes increasingly affluent, wants are increasingly created by the process by which they are satisfied" and thus "in technical terms, it can no longer be assumed that welfare is greater at an all-round higher level of production than at a lower one. It can be the same."

Presently, the most eminent claim for policy action aiming the recoil of the positional economy comes from Robert Frank (1999, 2003). In various pieces of work, he provides extensive description of positional behaviour in the real world economy, and provides multiple comparisons with similarly wasteful collective practises. One example is an arms race between two countries, where mutual escalation of expenditure on armaments driven by context dependent fear for political independence, does not enhance security for either nation. The overall effect is a reduced welfare, since the extra spending comes at the expense of domestic consumption.

3.3 Innovation

3.3.1 Innovation as a source of economic development

Innovation seems to be the greatest driver of economic development in the long-run. Economic growth can theoretically occur either by increasing inputs such as labour, capital, and raw materials, or by increasing the productivity of those inputs. Technical innovation allows increasing productivity, and is widely pointed as the fundamental long-run driver of economic change. Furthermore, innovation is also a factor of stimulation of demand, by contributing to the fulfilment of its new wants, and in that way is instrumental in keeping the pace of production (see also sections 4.2 and **??**).

The core role of innovation in economic development has been prominently pointed

by Schumpeter. Schumpeter saw a process of *creature destruction* as the essential fact of capitalism, consisting of an "industrial mutation that incessantly revolutionizes the economic structure from within incessantly destroying the old one, incessantly creating a new one". This process is driven by innovations in its various forms: "the fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers' goods, the new methods of production or transportation, the new markets, the new forms of industrial organization that capitalist enterprise creates" (Schumpeter 1950, p.83). Schumpeter saw innovation and technological change as the major explanation for the empirically observed business cycles. In this, he embraced the work of Nikolai Kondratiev, who drew methodological foundations to explain long-run economic cycles on the basis of the historical framework (see e.g. Freeman and Louçã 2001). Kondratiev saw the irregularity in the replacement of capital goods as the main source of cycles, and concluded that they were caused by the appearance of technological innovations.

Following a growing recognition of the central role of innovation to economic development, extensive research on innovation has taken place in the last three decades. Major milestones on innovation research have been the recognition of economic change as an evolutionary process with innovation at its centre as opposed to an orthodox equilibrium view of economics (Nelson and Winter 1982), the analytical framework of systems of innovation (see e.g. Porter 1990; Lundvall 1992; Edquist 1997), or the concept of the knowledge-based economy (Drucker 1993).

On the political side, nowadays national Governments and international institutions take concrete steps to promote innovation through incentives and cooperation, generally with the expressed aim of increasing local competitiveness. Examples of this recognition are publications of international institutions on the importance of innovation are the Green Paper on Innovation of the European Commission (1995)

and the OECD publications e.g. on *The Knowledge-Based Economy* (1996) and *National Innovation Systems* (1997), as well as the presently very significant political economic instruments to stimulate R&D and innovation.

3.3.2 Drivers of innovation

Theories were developed to analyse and understand the nature of innovation and how it occurs. Each of them focuses on different fields, and the tendency has been to recognize the systemic nature of innovation development, where multiple factors intervene. For the purposes of the present work, relevant lines of research refer to the core originators of innovation, i.e. to which factors are essential for innovation to occur. In the 1950s the dominant assumption was that innovation departed from advances in science and technology, which lead to the development of new products. It is recalled as the *technology push theory*, and configures a simple linear process where scientific and technological advances push new products into the markets. An alternative *market pull theory* developed in the 1960s assumes, in opposition to the former, that innovation results from a process where the market needs pull a new product into the market. Researchers were later inclined to regard the real world as a mixed reality between these two theories. According to the *push-pull theory*, different functions of the firm, the technological and scientific community and the marketplace are linked in the process of innovation (see e.g. Galanakis 2006).

The mere assumption that positional consumption drives technological innovation implies the existence of a market pull generated by consumers' needs, as foreseen by the technology pull theory. The model considered in Chapter 5 configures such case, by assuming that technological innovation occurs whenever there is a latent demand for an innovative product sufficient in size and willingness to pay to compensate for the R&D costs necessary to develop the new product. In fact, it is sufficiently clear

that for technological product innovation to happen there must be a demand for it, or at least an expectation that it will happen. Within the sphere of private demand, a distinction is made between material demand and positional demand, and this work particularly analyses the role of the later as a potential driver of technological innovation.

3.3.3 Other issues - new product positioning and the consumer-adoption process

A useful concept for the analyses developed in the following chapter is that of *product positioning*. For various reasons, products have a limited life cycle, and to achieve their sales and profit objectives companies need to put new innovative products into the market. Product positioning involves tailoring a product marketing program - including product attributes, image, and price, as well as packaging, distribution, and service - to best meet the needs of consumers within a particular market segment.

A product's position is how potential buyers see the product, and is expressed relative to the position of competitors. The central issue of product positioning is to understand the dimensions consumers use to evaluate products of the class in question and make purchase decisions (Kotler 2000). Those dimensions relate to product attributes, and consequently firms try to understand which attributes most matter to consumers and what potential for further satisfaction of latent needs exists in the market. Once consumer perceptions are understood, and a positioning choice of the product is selected, firms take steps to align the marketing program behind the positioning choice.

One distinctive aspect shaping new product positioning is change. According to Trout and Rivkin (1996), nowadays the danger of losing market position is especially great, due to four primary reasons:

- The fast pace of changing technology

- The quick and unpredictable shifting of consumer attitudes
- The increase in competition within the global economy
- The increase in competition among creative executives

As a consequence, they argue that it is a time not so much for positioning as for *repositioning*.

New product positioning is important not only in the way the product is designed, but also in terms of how it is diffused in the consumer market. For the later aspect, the behaviour of consumers towards innovations is an essential issue. The *consumer-adoption process* is about the way how potential costumers come to learn about the new product, try it, and eventually adopt or reject it. Costumers have different attitudes towards novelty, and how they will react to it and its attributes. Different identifiable types of costumers commonly adhere to a new product in different phase of its presence in the market. The presently dominating theory on how firms should frame the costumer population and elaborate their product marketing strategy is the *early-adopter* theory. According to it, marketing efforts should be directed first to those persons who are likely to adopt the product early (Rogers 1995, pp.252-80). Individuals can be distinguished for their *innovativeness*, which refers to "the degree to which an individual is relatively earlier in adopting new ideas than the other members of his social system". The groups of individuals can be split into: 1) innovators, 2) early adopters, 3) early majority, 4) late majority, and 5) laggards. These groups can be represented in a bell-shaped curve of the adoption process, representing their volume and order of appearance in the market. To the early-adopter theory, Moore (2004) added that the most difficult step is making the transition between visionaries (early adopters) and pragmatists (early majority). If successful, a firm can create a bandwagon effect conducing to the product becoming a standard.

3.4 Policy on positional consumption and effects on innovation

3.4.1 Policy

As mentioned above, Hirsch's conjecture on social limits to growth originated a debate on possible political actions to better accommodate positional behaviour in the economic life. Hirsch himself assumed a prudent position on policy remedies against positional consumption (Hirsch 1976, p.178). He justified his prudence on the lack of knowledge of the costs and benefits of applying such kind of policies, although he provided enlightenment on the issues. His main conclusion for policy was that the most promising available means of minimizing costs implied by positional competition was to reduce the stakes for which positional competition is played. In the scope of education and job positions, this would translate into a reduction of income differentials, although it would not fully solve the problem since people compete not only for wages but also for job prestige. Alternative methods of allocation could be conceived, including restrictions to choice, which is already a practise in education positions. Although it pointed to directions for policy, Hirsch's work did not offer an operational blueprint for such advance, given the existence of restrictions and uncertainties related to those policies.

Before Hirsch, Duesenberry (1949, pp 92-104) had already suggested the need for intervention in an economic system with interdependent consumer preferences. His abstract model of an economy with interdependent preferences of consumption on income led to the conclusion that welfare maximization can be achievable only through progressive income taxation. Authors like Layard (1980), Ng (1986) and others also suggested income taxation to bring the balance of private and public expenditure to a level consistent with welfare objectives.

A step further on policy prescription is given by Frank, who advocates progressive

consumption taxation (Frank 1999, 2003)[3]. Frank's reasoning for a progressive consumption taxation proposal is founded on the observation that high-end consumers influence the consumption decisions of lower-end consumers, forcing an effect of "expenditure cascades". High-end consumers set the standard of what is 'special', and consumers at the following social stages are obliged to keep up to maintain the social status of their possessions. Offering one rose in an under-developed country may be special, but to give something special in an affluent country the number of roses offered must be multiplied by a few[4]. A house regarded as 'big' is much bigger in the 2000's than it was in the 1970's. Progressive consumption taxation would discourage high-end consumption and, consequently, erode the "expenditure cascade" that follows.

A simple model developed by Frank and Levine (2007) incorporating context dependence of consumption (based on Duesenberry's model) predicts a clear link between income inequality and observed savings rates, with the savings rate of any reference group declining when income inequality within that group rises, due to increased positional spending. This prediction is supported by available empirical evidence. Moreover, such relation between inequality and positional spending (and savings rates) arguably contradicts the conventionally believed trade-off between equality and economic efficiency (Frank 1999, pp 227-50), a notion primarily

[3] The defence by economists of consumption tax as opposed to an income tax is not original to Frank, although for different reasons. It has been made prominently by distinguished economists throughout the history of economic thought, including John Stuart Mill, Marshal, and Irving Fisher (Kaldor 1955). More recently, expenditure taxation has been advocated and extensively detailed in terms of its implementation and possible effects, most notably the "flat tax" by Hall and Rabushka (1995) and the more progressive "X tax" by David Bradford (2003), with some impact on USA policy (see e.g. Viard, Carroll and Ganz 2008). The main reasons for the defence of these authors of consumption taxation are the simplification of the tax system, its ability to tax people in accordance with what they consume rather than what they earn (thereby stimulating savings) and its fairness. To this, Frank added the advantage of slowing positional consumption to a level more consistent with collective interests.

[4] An example also given by Layard (1980).

formally introduced by Duesenberry (1949, p.103).

Progressive consumption taxes would, according to Frank, transfer the use of resources from wasteful positional consumption to other more useful purposes, like savings. And an increase in savings would likely promote economic growth in the long-run.

3.4.2 Effects on innovation

The generation of innovation by the process of positional consumption is a core issue for the policy under discussion.

The relation between interdependent preferences and the growth in sales of new goods has been pointed out as an important issue by Duesenberry (1949, pp 104-10). He argued that the "orthodox" theory of demand could not explain the phenomenon of adoption of new goods, and built a model of interdependent preferences that could.

An eminent recognition of the relation between the desire to achieve "distinction" and innovation within a broader cultural sense has been introduced by Pierre Bordieu (1984), the sociologist known for his theory of economic, cultural and social capital and for observing the close relation between judgments of taste and social position. According to his theory, new cultural products are developed and consumed in "a permanent revolution in tastes", and a cycle of innovation takes place in which new cultural forms are continuously introduced by those at the top of the social hierarchy, to be subsequently copied by others lower down the hierarchy (Trigg et al. 2008).

Critics of policy remedies over positional consumption generally do not question that positional consumption is a market failure. However, several do question that it should be a matter of State intervention. Kashdan and Klein (2006), commenting on the work of Frank, present the most extensive set of arguments against taxation on positional consumption known to the author of this work. Defending

more libertarian sensibilities about politics, government, and society, they argue that Frank "overstates the problem, overlooks various voluntary solutions, overlooks unintended consequences of using taxation, and neglects the Smithian incumbency on those proposing coercion". Among several objections to State intervention, they point that consumption by the wealthy ones is a driver of innovation. And, therefore, reducing positional consumption would remove the positive effect of consumption in its role as a force of innovation. Previous criticism to intervention on the grounds of the generation of innovation by positional consumption came from Gershuny (1983), who praised the benefits of technical change arguing against the ideas presented by Hirsch.

Progressive consumption taxation would weigh taxes on high-end consumers. How would this affect innovation? Hayek argued on the importance of high-end consumption to innovation: "What today may seem extravagance or even waste, because it is enjoyed by the few and even undreamed of by the masses, is payment for the experimentation with a style of living that will eventually be available to many" (cited by Kashdan and Klein 2006). In this respect, Kashdan and Klein add that "in the dynamics of a growing economy, the wealthy provide a market for goods that must be expensive in order to supply to be viable. The wealthy pay extra to enjoy the benefits of new goods, which, if suitable to human existence, will later become inexpensive and widely adopted". To internalize the costs of the competition for positional goods would therefore cease the positive externalities of the process towards innovation.

In a reply to Kashdan and Klein, Frank (2006) countered their arguments on innovation by noting that alternative capital allocation caused by positional taxation would also drive technological innovation. In the short run, Frank argues, "the tax would not change the total level of spending. Rather, it would shift the composition of spending in favor of investment", which would drive capital goods innovation and

research and development. Additionally, a higher rate of investment would, in the long run, cause an increase in the consumption level in relation to the low-savings trajectory through income growth.

Still, the issue remains on how would positional consumption compare to other resource allocations as a way of stimulating innovation and, ultimately, economic development. The author of this work is not aware of previous detailed analyses on the issue.

4. FUNDAMENTALS OF POSITIONAL CONSUMPTION AS A DRIVER OF TECHNOLOGICAL INNOVATION

Being innovation as crucial as it is to economic progress, for the purposes of understanding the consequences of the positional economy and related policies it is important to better comprehend the relation between positional consumption and innovation. This chapter identifies and analyses fundamentals of positional consumption as a driver of technological innovation, and draws some initial conclusions on how their effects compare to the generation of innovation from resource allocation alternatives. Firstly, it is identified under which circumstances - type of product and its positional attributes - does this relation occur and how (4.1). Secondly, an account on the fundamentals of the intensity of the relation is provided, including a comparison with those of spending with material purposes (4.2). Finally, assuming that the generation of technological innovation by positional innovation may be regarded as useful only in the extent to which it is welfare enhancing, we will see that it may not necessarily happen (4.3).

Before proceeding, a more precise **definition of the object of research** must be provided, both in the scope of positional consumption and technological innovation.

Hirsch's definition of positional products refers to those that provide utility which is scarce in some absolute or socially imposed sense or subject to congestion or crowding through extensive use. However, the eminent case of positional products refers to those entailing socially imposed scarcity (like status), as reflected in his own writings

on the subject and the discussions that followed among economists. In this work, any further references to positional consumption relate to products providing socially scarce utility.

Innovation is a broad concept with multiple interpretations; in a wide sense, it can be seen as a way of "finding strategies to better deal with the surrounding environment and to improve some utility function" (Araújo and Mendes 2009). This work focuses on innovation in the economic dimension. As a definition for it, we use the one including all stages from fundamental research to commercialization[1]. The inclusion of fundamental research in the definition of innovation is relevant here because it is perceived as crucial for economic progress. Moreover, the object of study is restricted to innovation in the *technological* sense[2], excluding other possible fields of innovation; this approach is used due to the arguable notion that it is mostly innovation of the technological kind that brings benefits to economic development in the long-run. Finally, for reasons explained in the following section, the analyses below become relevant in relation to the *product* as an object of innovation; they therefore confine to it, not covering other elements of the marketing strategy.

4.1 Fundamentals of existence of a relation

Is there a relation between positional consumption and technological innovation? The answer certainly depends largely on the exact object of positional competition, and particularly on whether that object can be improved through technological innova-

[1] As a reference we depart from the theory of W. Rupert Maclaurin, who included in the definition of technological innovation the stages of: fundamental science, applied research, engineering development and production engineering (referenced by Godin 2008). Maclaurin's work on technological change apparently included the first full-length discussion and theory of what came to be known as the linear model for innovation (Godin 2005, 2008).

[2] The definition of technology as "a capability given by the practical application of knowledge" (Merriam-Webster dictionary) fits the purpose of this study.

tion. The question to make is rather: under which circumstances does the influence of positional consumption over technological innovation exist?

Producers want to sell their products to make profits. On the other hand, when a technological innovation successfully meets consumers' needs and wants, they respond by buying the product. The conjunction of these two forces acts as an incentive for producers to pursue technological innovation. However, technological innovation is not the only possible way of attracting demand. The following sections clarify the conditions for its existence.

4.1.1 Which dimensions of innovation are affected by positional consumption?

Innovation, from a producer perspective, can take various forms. They can be reduced to four dimensions of change (Bessant and Tidd 2007):

- Product innovation: changes in products
- Process innovation: changes in the ways in which products are created and delivered
- Position innovation: changes in the context in which the products are introduced (like a change in the advertised purpose of the product)
- Paradigm innovation: changes in the underlying mental models which frame what the organization does (like shifting from a tailored made to a mass production process)

Product innovation may involve technologically driven improvements, depending on the type of attributes valued by the consumers and on the expected marginal returns from innovation of producers, as we will see below.

Process innovation may also involve technological innovation. However, the incentive for producers to innovative in this area is in principle independent of the type of consumption in cause, since its main advantage is a better use of resources and, consequently, lower production costs. The benefits of reducing production costs are independent of other factors. In this sense, it cannot be said that positional consumption adds to technological innovation any more than what is achieved through other types of consumption.

Position innovation seems prone to happen with positional innovation. However, it clearly does not directly involve technological change.

Paradigm innovation, according its definition, is about reframing the model of business in some way. Although it may require extensive product and process innovation, it is not itself fundamentally about technological innovation. Moreover, like with process innovation, there are no *a priori* reasons to believe that positional consumption influences possible paradigm innovations in a different way than other types of consumption.

Of the four dimensions of change, for the reasons specified only product innovation is identified as being of major relevancy for the study of the influence of positional consumption in technological innovation. The proceeding analyses in this work will therefore focus on product innovation only.

4.1.2 Strategies to attract demand

In their quest for demand for their products, producers continuously make efforts for consumers to perceive them as being desirable in relation to their competitors and/or in relation to products consumers already possess. This permanent urgency of producers can be sought through distinct vehicles:

- Product

- Communication
- Price
- Distribution

These forms coincide with the *four Ps* of the *marketing mix* famously spread in the marketing literature, namely: product, promotion, price and place (Kotler 2000). A review of their nature in relation to the possiility of existence of technological innovation is provided here.

Obtaining favourable consumers' perceptions through the **product** object can involve several elements. Marketeers distinguish three levels of product: the core product, the formal product and the augmented product. The *core product* refers to the core benefit(s) or service(s) provided to the buyer like hope, pleasure or nostalgia. The *formal product* is the larger "packaging" of the core product and consists of what the market recognizes as the tangible offer, including its quality, features, styling, brand name and packaging. The *augmented product* is the totality of benefits that the costumer receives or experiences by obtaining the product and includes services like installation, delivery, maintenance or warranty (Kotler 2000). For this work, we should regard that improvements in the product are achievable through some form of product innovation. And technological innovation is a possible way available to the producer of improving the product, particularly through provision of the elements of quality, features or augmented product services.

Communication is used, among other aims, to create or alter the perception by consumers of the products. Communication allows bringing favourable views of the product attributes, and their usefulness. This way of achieving the intended betterment of consumers' perceptions does not involve any form of product technological innovation.

Price can be used to influence users' perceptions in three completely distinct ways. First, price is a product attribute in itself, for its economic nature; consumers prefer products with a lower price, because it requires a lower economic effort for the purchase.

Price can also be a signal for quality; in this case, contrary to the former, consumers may prefer more expensive products because a high price leads them to believe that the product is of a better quality. Price acts in this way as a form of communication to the consumer.

Finally, price can act as a way to achieve exclusivity. With a very high price, a given product's sales can be restricted to high-end consumers, and in that way promote the consumer's views of the product attribute of exclusivity, potentially addressing their social and self needs.

Distribution refers to the channels, coverage, locations, inventory and transport by which the product is delivered to the costumer. It is a rather important marketing strategy for products valued on status concerns. However, like the previous, this marketing element does not directly involve technological product innovation.

Of these distinct possible strategies of improving users' perceptions of a product, we may conclude that only the first one - the product itself - directly involves product technological innovation.

4.1.3 Product value formation systems

Clarification is provided here on the value formation system of products according to their nature of being material or positional. Speaking generally of material products or positional products is a simplification of speech. In fact, products may be valued by consumers both for material and positional reasons. As mentioned above, consumers subjectively value products on the basis of attributes that address wants

and needs. A product usually possesses several relevant attributes to the consumer's value judgement. We may classify them in three groups, according to their value formation system:

- Material attributes, i.e. attributes valued independently of other people's choices;
- Positional attributes, i.e. attributes with a value for consumers dependent on other consumers' choices;
- Mix-valuated attributes, i.e. attributes simultaneously valued on material and positional grounds.

One may easily think of attributes of the three kinds, for example, for the automobile. Safety, reliability or fuel economy can generally be considered material attributes, since they are valued by the user for a strict economic, functional or safety reason. Luxury, provided by items such as a hornet button coated with gold, has no particular material usefulness and may be thus regarded as purely positional. Other attributes of the automobile, like power, space or comfort may be valued both materially and positionally, depending on the type of consumer needs being fulfilled. The multiattribute nature of products makes it possible that different versions of a same type of product rival in different markets for positionality. While cars with gold coated gadgets compete in the positional market for luxury, speedy cars compete in the positional market for power. Simultaneously, the same products may rival in a material market, due to their material attributes. Therefore, products may be simultaneously material and positional, i.e. they may be valued by consumers for both types of value creation system. Due to the multiattribute nature of consumers' product valuation system, the analysis below focuses on the attribute rather than the product.

4.1.4 Are positional attributes improvable through technological innovation?

The first condition for a type of consumption to generate technological innovation is that costumers' needs and wants, and their perceptions of the product, must be potentially deliverable through some form of improvement in the *product* elements prone to technological innovation - predominantly their quality, features or augmented product services.

This condition seems to take place with all forms of material consumption. In this type of consumption, utility is by definition originated directly by benefits intrinsically delivered by the product, independently of extrinsic factors like the consumption patterns of other consumers. And benefits intrinsically delivered by the product are related to its quality, features or services, rather than brand name, packaging or styling.

The same may not necessarily happen with consumption of positional nature, where the benefits perceived by consumers may not depend on attributes subjectable to technological innovation. For example, consider an automobile having exclusivity as the single attribute valued by the consumer, and that exclusivity is an attribute perceived by the consumer solely on the basis of the brand name of the car (a brand commonly used by high-end consumers). In this case, no technological innovation can directly influence the utility perceived by the consumer, since there is no connection between user valuation criteria and product elements prone to technological innovation. Consequently, the producer would not have any direct incentive to innovative on the product itself, but only to maintain the status of its brand.

To better establish the connection between attributes of different types of consumption and technological innovation, it is helpful to classify product attributes in relation to their proneness to technological innovation:

Non-technological attributes: Attributes for which consumer valuation cannot be improved through technological innovation. Non-technological attributes are always intangible objects, like exclusivity, prestige or beauty.

Technological attributes: Attributes whose valuation can be improved through technological innovation. Technological attributes may be tangible - power, reliability - or intangible objects - environmental friendliness, driveability or also prestige (if prestige can be improved through technology).

Technological intensity as an attribute: A product can be attractive to consumers by possessing top innovative technological features. As noted by Rogers (1995, p.213), "[o]ne motivation for many individuals to adopt an innovation is the desire to gain social status". To be at the top of technological innovativeness is, obviously, a relative concept in relation to other products of the same class, and therefore the attribute is a positional one. This type of attribute is a particular case of technological attributes in general. One possible actual example of technology as an attribute comes e.g. with top generation mobile phones, which some consumers appear to value mainly for its technological innovativeness, and the status it confers, in relation to previous models.

Consumption of a product will potentially generate technological consumption only if it includes technological attributes.

In line with the definition of material products, which implies that they are internally valued only by their intrinsic characteristics, it does not seem conceivable to identify an attribute that cannot be incorporated in the definition of technological attributes. A material product is valued by consumers through material attributes, and any conceivable material attribute seems to be improvable through innovation

of technological nature. Assuming this, we may assert that *all attributes of material products are potentially subject to technological innovation.*

On the contrary, positional goods include attributes not improvable through technological attributes. These are intangible attributes not related directly with quality, features or services. Some positional products (theoretically at least, and as exemplified above) may even not include any technological attribute, and therefore not being potentially subject to technological innovation in any degree. Table 4.1 presents possible examples of positional goods and their ability to generate technological innovation according to the nature of their attributes to consumers. The contents presented in the table are subjective, non-exhaustive, and variable within goods of the same class and across demand segments.

According to the assumptions of the examples of positional products and attributes in the table, positional consumption of automobiles, houses and clothing potentially generates technological innovation, but not perfumes or jewellery.

In those products where the potential for technological innovation exists - i.e. technological innovation can lead an increase in consumers' valuation of the product - , we may question whether it occurs and what determines its existence. The economic answer is simple: technological innovation occurs if the expectations of producers on marginal returns from investments in technological innovation are favourable in comparison to the other possible strategies to attract demand.

4.2 Fundamentals of intensity of the relation

The previous section identified factors that determine the existence of technological innovation, when consumption of positional nature is its cause. This section looks into factors that influence the intensity of this relation.

Positional good	**Attributes**	**Type**	**May consumption drive technological innovation?**
Automobiles	Power	T	Yes
	Reliability	T	
	Comfort	T	
	Space	T	
	Driveability	T	
	Beauty	N	
	Exclusivity	N	
	Prestige	N,T	
	Technology	T	
Perfumes	Odour pleasentness	N	No
	Exclusivity	N	
	Prestige	N	
Houses	Space	N	Yes
	Comfort	T	
	Functionality	T	
	View	N	
	Prestige	N,T	
	Technology	T	
Jewellery	Beauty	N	No
	Exclusiveness	N	
Clothing	Beauty	N	Yes
	Fashion	N	
	Exclusivity	N	
	Prestige	N,T	
	Comfort	T	
	Durability	T	

Legend: T - technological type; N - non-technological type

Tab. 4.1: Examples of positional goods, attributes, and propensity to drive technological innovation

First of all, a definition of intensity must be provided. Two types of intensity will be mentioned: absolute intensity and intensity to consumption. Absolute intensity of technological innovation refers to the absolute level of innovation carried out per period of time, independently of other factors. Intensity to consumption refers to the

ratio between the level of innovation carried out and the amount of consumption. The first type refers to innovation compared to time and the second refers to innovation compared to resources spent on consumption. Of these, only intensity to consumption is an indicator of the efficiency with which resources are applied on technological development.

In the identification of fundamentals determining the intensity of innovation generated by positional consumption, a distinction is made between internal and external factors, depending on them being intrinsically connected with the phenomenon of positional consumption.

4.2.1 Internal factors

Internal factors classify as those related intrinsically with the characteristics of the phenomenon of positional consumption. The internal factors identified here comprise:

- Consumer competition as a factor of absolute intensity
- Exigency of consumers towards technological deliver
- Product attributes and intensity to consumption

Consumer competition as a factor of absolute intensity

A crucially important factor behind the generation of innovation is the existence of competition between producers. But that holds true to all kinds of consumption. What is specific of positional consumption is the existence of competition between consumers. Direct or indirect competition for relative forms of utility among consumers has implications, firstly, on the intensity of generation of new wants. In a positional market, the utility achieved through possessing a product is neutralized after the status of the product is overcome in ranking by other products. This

volatility of utility does not occur with material products. Because the utility given by material products is of absolute instead of relative nature, a possible appearance of better products in the market does not remove any utility from the possession of a given product. As defined by Hirsch (1976), material products are "receptive to mechanization or technological innovation without deterioration in quality as it appears to the consumer".

While within material consumption the benefits of substituting an old material product by a better one are given by the difference in utility material between the two, in the case of positional products the mere availability of a higher-order product removes utility conferred by the one of lower-order, an utility that at the limit can be fully neutralized. This difference has extremely important consequences on need and want arousal. The loss of positional satisfaction derived from the emergence of higher-order products, and the consequent want to recoup that satisfaction, does not take place with material consumption, since a loss does not occur.

It is interesting to relate this phenomenon with the argument of Galbraith (1958) that consumer wants are created by the same process by which they are fulfilled. Indeed, the argument is confirmed literally by the process of positional want creation described here; by putting new products into the market, producers not only possibly give consumers the chance to take better products, but they also remove utility from products under their possession, stirring up the generation of new needs.

Fashion clothing is an example of the volatility of satisfaction delivered by positional consumption. Every year, marketeers try to bring new fashion standards into the clothing market, bringing clothing from previous years to an *out of fashion* standard, rendering it obsolete in terms of the satisfaction delivered to the consumers for being in fashion. That generates a cyclical dynamic of consumption for positionality in the market for fashion. On the other hand, clothing valued by consumers not for

its fashion but for its comfort - say winter sports clothing - in principle only attracts new consumers already possessing clothing of the kind if the new items provide a sufficiently increase of utility in relation to the fixed utility of the items already under their possession.

This particularity of positional consumption in utility and want formation, where satisfaction is lost by the emergence of higher-order products, suggests that the market pull for innovation in this type of consumption is stronger than it is with material consumption, where the utility gained by a product endures. But it must be noted that this drive for innovation occurs in parallel to a drive for consumption. A hypothetically high intensity of innovation occurs *because* there is a high intensity of consumption. This therefore says nothing of intensity of innovation to consumption, but only of absolute intensity.

The simulation of the model presented in Chapter 5 allowed to observe the positional market dynamics described here.

Exigency of consumers towards technological deliver

The later example also raises the issue of the exigency of consumers towards the technological upgrade of the products. There are reasons to believe that within material consumption the exigency of consumers for the practical benefits derived from innovation is greater than within positional consumption. In the former type of consumption, a consumer choice depends on the difference of (fixed) utility of the products at choice. In opposition, within positional consumption the appearance of a higher-order product eliminates utility of lower-order products, and therefore the choice depends on the utility of the higher-order product against a decreased utility of the alternative choices. This means that in material consumption, for a product to be successful in the market it must provide sufficiently significant practical benefits in comparison to the alternative product, while in positional consumption the new

product needs to achieve a higher position in ranking but not necessarily a significant difference in innovativeness, or material benefits delivered. Within positional consumption it may be enough for the product to be regarded as of higher order to be successful in the market, while in material consumption the material benefits must be sufficient to attract new consumers who already possess products of the same class. Whereas within material consumption a successful product must provide a truly significant increase in the value intrinsically provided, in positional consumption it just needs to be regarded by consumers as better than other products.

The following passage of an example given by Frank used for a different argument[3] is good to illustrate the plausible lack of relative exigency in technological deliver of positional goods: "the Porsche 911 Turbo, which accelerates from zero to sixty in 3.9 seconds, sells for about $150,000. Until recently, it was difficult to find another car with clearly better handling and performance. Then Porsche's own Carrera GT, introduced in 2004, raised the bar slightly. In the zero-to-60 sprint, it beats the Turbo by two-tenths of a second, and it is slightly more sure-footed on the track. To get these improvements, however, Carrera GT buyers must shell out nearly three times as much as for the Turbo" (Frank 2006). It is reasonably obvious that the Carrera GT is valued by consumers on positional grounds rather material. And, were it the opposite case, it is doubtful that the extra $300,000 would be worth the slight improvements in material performance.

It thus seems that within positional consumption it is theoretically possible to stimulate demand through minor marginal incremental technological advances, as long as they are regarded as such by the consumers. On the contrary, stimulating demand for material consumption is only possible if the technological advances pro-

[3] Frank used the example to argue that as the upper echelons of the relevant quality distributions are approached, the cost gradients often rise steeply.

duce an increase in (material) utility of sufficient size to justify the purchase. This plausible difference of exigency for technological advances between material and positional products suggests that the intensity of innovation to consumption is lower with the later than with the former type of consumption.

Product attributes and intensity to consumption

The nature of the product attributes is also relevant for the intensity of technological innovation to consumption. As mentioned above (4.1.4), unlike material products, positional products are not necessarily valued by consumers on the basis of attributes prone to technological innovation. And the fact that the consumer valuation system includes non-technological attributes increases opportunities for producers to attract demand through other means besides technological innovation.

A car positionally valued not only for its technological attributes but also in a significant way for its beauty, exclusiveness and prestige, offers the producer the opportunity to invest its resources in trying to improve consumer perception on these non-technological attributes instead of applying them in technological innovation. On the contrary, a car valued by consumers solely in a material sense would not have beauty, exclusiveness, prestige or other non-technological attributes in its value formation structure, and therefore the opportunities for improvement of product value would be more restricted to technological innovation in what refers to the product elements of quality, features and augmented product services.

The fact that positional products provide alternative opportunities, in addition to technological innovation, for producers to attract demand, suggests that the intensity of innovation to consumption tends to be lower with positional consumption than with material consumption. Marginal returns from investment on technological innovation tend to be less times rewarding, comparing to other available strategies to capture demand.

The example provided above comparing the positional *fashion* clothing with the material *comfort* clothing is also illustrative of this argument. While the efforts to attract demand for fashion clothing will fall upon making consumers perceive it as fashionable, which is only to reduced extent achievable through technological innovation, efforts to attract demand for comfort clothing clearly involve innovation applying materials science.

Synthesis on internal factors

The possible effects of internal fundamentals of positional consumption as a driver of technological innovation may be synthesized as follows:

- Consumer competition of positional consumption contributes for the absolute intensity of innovation, as compared to forms of consumption where consumer competition is not a driver of consumption.

- There are theoretical reasons to believe that the exigency of consumers towards technological deliver of positional consumption is lower than with material forms of spending, given that commercially successful technological advances of positional products require only that the product is regarded as better in relation to others while new material products have to deliver manifest improvements in practical usefulness. This plausible difference of exigency for technological advances suggests that the intensity of innovation to consumption is lower with positional than with material forms of spending.

- Positional products give additional opportunities, in alternative to technological innovation, for producers to attract demand, which suggests that its intensity to consumption tends to be lower with positional consumption than with material consumption.

Overall, these remarks point to positional consumption as a driver of absolute intensity of technological innovation due to the perpetuation of competition among consumers, although that intensity is in all likeliness weaker in the ratio to the resources spent, comparing to technological innovation generated by forms of material speding.

4.2.2 External factors

External factors classify as those related with contextual elements that in some way influence the pace of innovation driven by positional consumption. Those covered here are:

- Income distribution
- Relative increase of positional spending (Hirsch conjecture)
- Social networks structure

The identification of external factors is not exhaustive and their selection had no particular criteria except the perception of their relevancy by the author. Beyond the qualitative remarks provided here, they are also subject to formal analysis in the following chapter.

Income distribution

The issue of income distribution is particularly relevant for the object this work because the social significance of positional products is used by consumers as a signal to their social status, and they tend to do it accordingly to their income group. There is an obvious correlation between high-end consumption of positional products and high-end income individuals. Nonetheless, although this correlation exists, it must be noted that economic capital is not the only factor behind the demand for new

goods. As portrayed by the eminent sociologist Pierre Bordieu, beyond *economic* capital, also the *cultural* and *social* forms of capital play a crucial role in the process of cultural change (Bordieu 1986), of which status products are a core pillar.

Still, assuming a strong correlation between high-end consumption of positional products and high-end income individuals, it seems that the process of positional consumption and spending generally occurs in cascades along the consumer income spectrum, i.e. high-end income individuals consume the higher status products and are followed by the next groups in the income spectrum, who tend to copy the higher groups[4]. A process of consumption cascades like this is suggested and presented in detail by Frank and Levine (2007). Based on a variant of Duesenberry's model of relative income hypothesis (Duesenberry 1949) and on the analysis of empirical data, they argue that more inequality causes lower savings rates due to the tendency of consumers to imitate the consumption behaviour of high-end income consumers. This view contrasts with the above mentioned dominant assumptions of mainstream economics on the life-cycle and permanent income hypotheses, where increases in high-end consumption should have no effect on other individual spending decisions.

As described above, income inequality has been portrayed by authors as a factor that promotes the generation of technological innovation. According to them, the wealthy provide a market for innovative goods that must be sold at expensive prices in order to supply to be viable, and which may later become inexpensive and widely adopted. According to this view, there is an argument to be made against the application of fiscal instruments aimed at the recoil of the process of competition for positional goods, like a progressive consumption tax, since they would discourage innovation.

[4] In the marketing context, the term *trickle-down effect* is used to describe this phenomenon.

But is this really so? It is not immediately evident that inequality is good for innovation, looking at the factors that lead a producer to take the step to expend its resources in innovation, for two different reasons.

As is implicit in the authors' argument, it seems true that producers are more prone to taking the initial step to innovate if there is a sufficient expectation on sales returns in the first stage of the product lifecycle. Therefore if the first consumers of the product are more affluent, and consequently have a higher willingness to pay for innovative products, then indeed the first returns from sales should be higher.

However, it is also true that a lower inequality level translates into a larger mass of consumers closer in income to the top-end. If higher equality means that top-end consumers are relatively less rich, it also means that more consumers can be regarded as belonging to the high-end group, or close to it. Therefore, with a higher equality, innovative products would possibly be available to a broader mass of consumers. The returns from sales of an innovation are given by the product of the price by the number of sales. More equality may translate into a lower price, but in compensation it enlarges the base of early adopters of a new product. Income distribution differences thus entail two opposing forces over the pace of technological innovation, and it is not immediately clear which is stronger[5]. The model in Chapter 5 also illustrates this fact.

The second reason to doubt the advantages of inequality to innovation concerns the fact that those consumers in the group of *innovators* and *early adopters* (see 3.3.3), i.e. those who buy the innovative product first, do not necessarily coincide with the group of the richest. This is implied by Bordieu's argument that the relevant capital is not only economic, but also social and cultural. And, according to Moore (2004), the so called *innovators*, those technology enthusiasts who are fundamentally

[5] Similar arguments have been presented by Foellmi and Zweimller (2006).

committed to new technology and who take pleasure in mastering it and are thus typically the first costumers to anything new, are also people who commonly do not have much money. Therefore, a society with a more distributed income could possibly be one where the group of innovators had more resources to spend on innovative products.

Relative increase of positional spending (Hirsch conjecture)

According to Hirsch (1976), "social limits to growth" are imposed by the fact that the relative importance of the positional economy over the material economy increases with affluence growth. As basic material needs approach full satisfaction, consumers increasingly devote a higher share of income to positional spending. This is logically be so because while material satisfaction is indeed theoretically fully achievable, positional satisfaction can never be so because it is socially scarce[6].

A relative increase of positional spending would translate into a higher volume of positional consumption, and consequently into a higher volume of technological innovation derived from it (i.e. increasing absolute intensity of innovation from positional consumption). Whether this capital allocation is beneficial to others in relation to alternative resource allocations including material consumption is a topic discussed in Chapter 6. Moreover, the fact that consumption is increasingly positional in share also reduces the chances that the innovations generated will add anything to wellbeing

[6] Ellis and Heath (1983), as well as Brekke, Howarth and Nyborg (1998) and others, note that this assumption is not necessarily true. A formal analysis of Brekke et al. has shown that its validation depends on the specification of the utility function of consumers for material consumption and status seeking, and consequently according to them there is no a priori reason to expect less status-seeking behaviour in poor societies than in richer ones. Although the author of the present work agrees that status-seeking behaviour has always been present in human nature and their behaviour, it seems reasonable from the observation of consumption trends that status-seeking behaviour has been progressively more relatively important than material consumption. This assumption also is also plausible from an evolutionary perspective of *survival of the fittest*; to achieve their goal - reproduction - it makes sense that human beings would employ just enough of their resources on survival (material needs) and expend all their remaining resources on status-seeking to attract partners of the opposite sex.

(see 4.3).

Social networks structure

The importance of the social environment for consumer behaviour was pointed in section 3.1. It would be interesting to understand the effects over the level consumption and innovation of the type of social networks where positional consumers compare their consumption patterns with those of other consumers.

The positional competition for goods occurs within its own social context and structure of interactions. When one individual evaluates his position or that of other individuals in social ranking, he does so within his perceived social sphere, i.e. within his reference groups. One may discuss whether this social arena for positional competition is regarded by individuals as a large group of other individuals, like a region or a country, or on the contrary as a very small circle of close connections in the individual's particular social context, like family and closest acquaintances. Would there be different levels of innovation before different group sizes? On the other hand, we may question the importance of the nature and size of the influence group affecting each consumer's choices. Besides the size of the social groups of interaction of consumer preferences, it is for example probably important how far a consumer's influence group extends to social classes different than his.

The cultural, demographical and economical circumstances of a region might conceal different outcomes of the positional game and innovation generated by it. Effects of this kind of social network factors seem complex and are difficult to predict through common sense. The model in the following chapter is used to make an illustrative experiment.

Synthesis on external factors

The external factors identified here cover relevant evolving contextual social and economic tendencies that may influence the outcome of intensity of technological innovation from positional consumption. We have seen that income distribution has an influence on the decisions of producers to invest and develop innovations, and that the direction of that influence is not obvious *a priori*, unlike suggested by some authors. The relative increase of positional spending with the growth of affluence, as suggested by Hirsch and others, is expected to increase the absolute intensity of innovation. Finally, a point was made on the structure of social networks where the positional game evolves, an issue that is likely to influence the outcome of the process in disparate ways in different societies. These three factors may have implications both on absolute intensity of innovation and on intensity to consumption, although to some extent it is difficult to grasp their real effects due to the complexities in question. In the next chapter, some model simulations try to lift the curtain.

4.3 Is innovation generated by positional consumption welfare enhancing?

It is clear that, in all cases, innovation occurs to improve the utility function of some individuals. But that solely may not guarantee that innovation is welfare enhancing from the social perspective.

Rogers (1995, p.215) mentioned the possibility of overadoption of innovation, defined as the adoption of an innovation when experts would feel that it should be rejected. Together with insufficient knowledge on the part of the adopter, "[o]veradoption is one result of the prestige-conferring aspect of adopting an innovation".

We have seen that positional consumption is not, by itself, welfare enhancing. Someone's utility from status is obtained at the expense of the utility of others, and

the competition for social advantage results in a zero-sum game. If consumption only produces improvements in wellbeing if it is of material nature, then any kind of innovation will only contribute to welfare if it improves material utility. Inherently, innovation destined to improve positional attributes cannot improve wellbeing, unless in the way it also addresses other needs of material nature.

For example, if we assume that the odour of a perfume solely satisfies positional needs, then any possible technological innovation directed at improving the smell of perfumes cannot increase wellbeing because the additional satisfaction of one's needs (of smelling good, in relation to others) motivated by innovations in the chemistry of the substance is done at the expense of the satisfaction of the remaining. On the other hand, if the driving power of a car addresses simultaneously positional and material needs, an innovation destined at improving power to address the positional need will in the process also address the material need.

In conclusion, even if positional consumption does produce innovation, such innovation can only be regarded as positive for wellbeing if it is also able to address material needs in addition to the targeted positional needs, for only the satisfaction of the former is susceptible of increasing wellbeing. Innovation destined to improve positional attributes of a product will only be welfare enhancing if the same attributes are valued also on a material perspective, or if the technological advances are useful in some way to other material purposes.

5. DYNAMICS OF POSITIONAL CONSUMPTION AND INNOVATION - A MODEL

5.1 Introduction

This chapter presents an agent-based model representing a system of positional consumption and an inherent process of generation of technological innovation. The main aim is to obtain a better comprehension of the process. Secondly, it allows characterizing effects of some external factors on the pace of innovation generated in the model.

For representing the process of interaction between positional consumption of status goods and the possible generation of technological innovation through the creation of more advanced goods, the model is designed to contain the most elementary features of both positional consumption and the development of innovative goods as a function of the consumers' willingness to pay. The focus is on representing:

i A consumer valuation of goods grounded on status concerns (utility depends on other consumers' choices), being status provided by technological attribute(s) of the good;

ii The behavior of firms over technological innovation contingent on expected revenues, and;

iii A price decrease of existing goods with time due to increasing competition

between firms and production process efficiency.

A detailed description of the model is given below. But before proceeding to it, it is important to frame the model in face of the three questions discussed above. The previous chapter placed the analysis on three issues:

1. Does positional consumption contribute to the generation of any technological innovation? (4.1)

2. If so, in what measure? (4.2)

3. And finally, is the generated technological innovation welfare enhancing? (4.3)

The model allows analyzing aspects related essentially to the second topic. In short, it takes the conditions necessary for the existence of innovation as granted, incorporates the ability to test how certain factors determine the intensity of innovation, and does not have the ambition to clarify if it is welfare enhancing.

Explaining in more detail, as we have seen producers have several possible alternatives to improve the perceived value of a product, and technological innovation is one of them if the attribute(s) of the product can be improved through technological innovation. In relation to this condition, the model takes a positional product of which the perceived value can only be improved through technological innovation, being any other product improvement factors assumed neutral. The consideration of this type of product justifies the assumption that goods decrease their price with time; being the positional attributes of the good under question of technological nature, its price is subject to a downtrend pressure due to competition and production process efficiency, which would not necessarily happen with non-technological attributes. In responding to the first question, the model is useful to detail how these basic conditions lead to a process of technological innovation.

In relation to intensity of innovation, section 4.2 referred to internal and external factors to the process of positional consumption, influencing the intensity of generation of technological demand. The model incorporates four out of the six factors considered, namely the phenomenons of consumer competition, income distribution, relative increase of positional spending and social networks structure. The issues of exigency of consumers towards technological deliver and types of product attributes are not covered.

5.2 Methodology

The model follows an agent-based modelling (ABM) approach. The ABM approach seems to be the most appropriate choice for modeling the relation between positional consumption and technological innovation due to the fundamental role that interactions between agents (consumers and firms) have in the development of the process.

Axelrod and Tesfatsion (2005) remark that "when the interaction of the agents is contingent on past experience, and especially when the agents continually adapt to that experience, mathematical analysis is typically very limited in its ability to derive the dynamic consequences. In this case, ABM might be the only practical method of analysis". The process of technological innovation generated by positional consumption corresponds to this area of problems. In fact, unlike in the classical material consumption, when positional consumers evaluate the expected utility from the acquisition of a given good they do it by observing the distribution of goods possessed by all the other consumers in their relevant social network. Therefore the evolution of their decisions is fully interdependent with past decisions of other agents. A feedback loop occurs in this chain of events, whereby a decision of a consumer is determined by the decisions of the remaining consumers, which are later influenced

by that same decision. The same is true for the decisions of firms to engage in the creation of new, more technologically advanced goods. They depend on their expectations on future revenues produced by the new goods, and therefore by the distributional structure of goods possessed by the consumers in the social network(s), which is on its side also contingent on the possible previous creation of new goods.

In brief, the nature of the process is characterized by the existence of interacting agents, by the contingency of their decisions on past decisions and by the existence of feedback loops, all elements that make a mathematical approach difficult to realize and the ABM approach better able to deal with them.

5.3 The model

5.3.1 Structure of the model

The model is characterized by the following **agents**:

- C consumers, characterized by different levels of income;
- The industry, a single agent representing the aggregate behavior of firms in the economy;

The fundamental structural **assumptions** of the model are outlined and explained in the following lines:

- There is one type of good, with a technological attribute that provides consumers with status;
- Consumers aim to maximize individual utility; utility is obtained through status;

- There is a G number of versions of that type of good[1], each being characterized by having different levels of technological development;
- The utility provided by a good to a consumer depends on the technological level of the good and on the choices of the other consumers; the higher is the technological hierarchy and the least consumers have that version or superior versions of the good, the higher is the positional utility conferred by the good;
- The utility obtained in each simulation period is valid for that period only; consumers buy a good in each simulation period to obtain utility for that period;
- The budget of the consumer for buying a good in each period is determined by his income;
- Consumers' choices depend on the expected utilities provided by the goods, their prices and the available incomes of consumers; consumers have different willingness to pay for utility depending on their incomes.
- The industry can create a technologically more advanced good; to do that it must incur in research & development (R&D) for its development; a technologically more advanced version is created if the expected demand for the new version is able to exceed the R&D costs necessary for its development;
- When a new good is created, the industry sets its price at the level that maximizes revenues from sales, taking into account the number of consumers that would buy the good at each possible price;
- The price of the existent versions of the good decrease with time due to increasing competition of supply and production process efficiency.

[1] Versions of the good under study are further simply designated as *goods*.

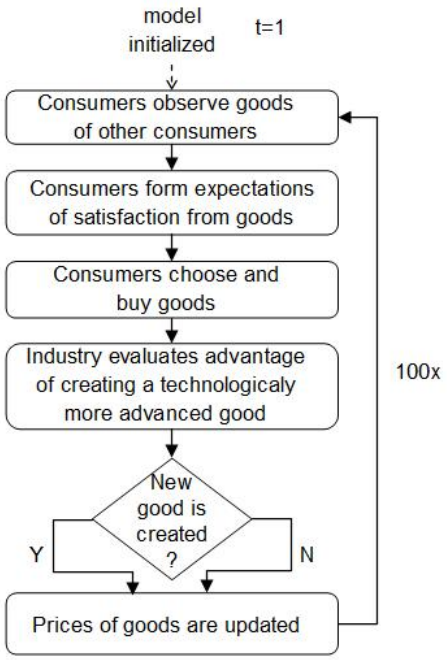

Fig. 5.1: Model structure

Figure 5.1 describes the sequence of steps of the model run. It consists of a cyclical sequence in which consumers observe the choices of other consumers, form expectations of the utility derived from each possible version of the good and decide which good to buy. Then the industry evaluates the possible advantage of developing a technologically more advanced good and decides whether or not to create the good. Finally, the prices of goods are updated and the following period starts.

The formal specification of the model setup is described in the following sections.

5.3.2 Consumer Incomes

Consumers have different levels of income, which increase with the index i representing individuals. Consumer incomes (W) follow a Weibull distribution curve, with a

cumulative form given by:

$$F(W(i), \bar{W}, k) = 1 - exp(-(\frac{W(i)}{\overline{W}})^k) \tag{5.1}$$

with $W(i) \geq 0$ and $\overline{W}$ being the average income.

The Weibull curve allows representing various configurations for the distributions of incomes, ranging from unequal to even distributions. The degree of (in)equality of the distribution depends on the constant k. Figure 5.3.2 represents three possible curve profiles, depending on k:

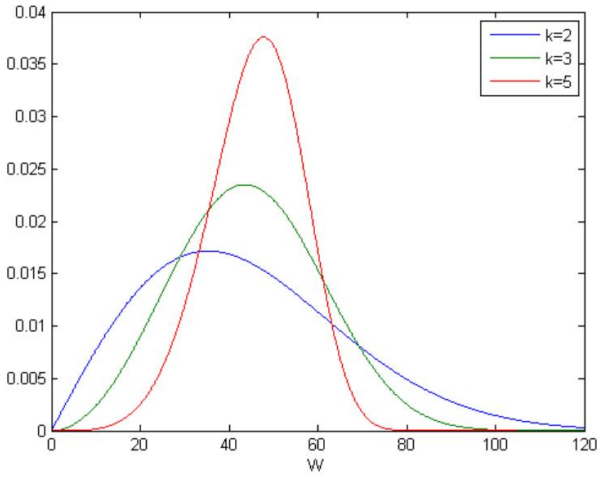

Fig. 5.2: Profiles of income distributions defined by a Weibull distribution

Consumers are willing to spend up to a fraction qp of their income in positional functionalities, where the full fraction qp of income would be actually spent by the consumer in the positional functionality if the good purchasable with that amount allowed them to reach the maximum possible utility derived from the positional functionality. This assumption is described below with more detail.

5.3.3 Prices of Goods

Each good g has a price $P(g)$. The prices of goods decrease with time due to increasing competition of supply and production process efficiency. Prices of goods evolve according to a negative exponential given by:

$$P(k) = P_{comp} + (P_{launch}(g) - P_{comp}).\exp(-\frac{t-t_0(g)}{k_p}) \tag{5.2}$$

where P_{comp} is the competitive market price - i.e. the price when there is full competition for the commercialization of the good and production efficient is optimized (in the long term) - $P_{launch}(g)$ is the price of a good g set by the industry in the period of its launch in the market, t is the present time, $t_0(g)$ is the period of creation of good g and k_p is a constant that determines how slow the price decreases[2].

5.3.4 Consumer Network

A consumer is influenced by a set of consumers, in his preferences over positional goods. The model is built on a network of consumers in which each consumer is influenced by a group of other consumers. The neighborhood of a consumer is the group of consumers by which he is influenced. The model assumes that the neighborhood of each consumer is composed by the set of individuals closest to their social class.

Social classes are defined by income levels. The neighborhood $N(i)$ of a consumer i therefore consists of the set of his N_s closest individuals in their income ranking [3], being N_s the size of the neighborhood. The formal definition of neighborhood is as

[2] k_p=20 in all simulations below.

[3] For the purposes of this work, a Ranking characterizes the hierarchical order of subjects before a given attribute. The ranking is a sequence of integers between one (1) and the number of subjects characterized by the ranking (C). Rankings are attributed by decreasing order of the attribute values of subjects. In this case, the subjects are the consumers and the attribute in their income.

follows:

$$N(i) := \begin{cases} N_p(i) & if \quad \frac{N_s}{2} < i \leq C - \frac{N_s}{2} \\ N_p(1 + \frac{N_s}{2}) & if \quad |i - 1| < \frac{N_s}{2} \\ N_p(C - \frac{N_s}{2}) & if \quad |C - i| < \frac{N_s}{2} \end{cases} \tag{5.3}$$

where $N_p(i)$ is the pseudo-neighborhood of i and is given by:

$$N_p(i) := \{j \in I : \ |i - j| \leq \tfrac{N_s}{2}\} \tag{5.4}$$

where I is the set of consumers.

Fig. 5.3: Examples of neighborhood in a network of 10 consumers with a neighborhood size of 4

As defined by the equations, the neighborhood of each consumer depends on his relative position on the income ranking. All consumers have the same number of neighbors. Therefore low-end and high-end consumers have an asymmetric neighborhood with more neighbors on one side of the income ranking than the other side, due to finiteness of the set of consumers. This definition implies that connections are unidirectional, i.e. where a consumer is influenced by the choices of another consumer

the opposite may not necessarily happen. Figure 5.3 illustrates examples of consumer neighborhoods.

5.3.5 Utilities

The positional utility provided by a good depends on how high that good is positioned in the technological hierarchy, and on the hierarchies of the goods possessed by other consumers. The value of the maximum achievable utility is one (1) and occurs if the consumer possesses the higher good in the technological hierarchy and no other consumers possess the same good. The minimum possible utility is zero (0) and occurs if all the remaining consumers possess goods of higher hierarchy than that of the individual concerned. The positional utility for an individual i for buying a good g is given by:

$$U(i,g) = \frac{N_{inf}(i,g)+\frac{1}{2}*N_{eq}(i,g)}{N_s} \tag{5.5}$$

where $N_{inf}(i,g)$ is the number of neighbors in the social influence network (neighborhood) of individual i who buy technologically inferior goods than g and $N_{eq}(i,g)$ is the number of consumers in the social influence network of individual i who buys equivalent goods (i.e. good g itself). In other words, having a superior good than that of another consumer within the influence neighborhood provides twice the positional utility of having the same good as another consumer, while having an inferior good does not give any positional utility at all.

The model assumes that the utility provided by buying good only lasts for the period of its acquisition, expiring at the beginning of the following period. Therefore the consumers have to buy a new good in a period to achieve any utility at that period. This corresponds to a system where consumers have to regularly renew their positional stakes, i.e. the positional utility conferred by a good expires after a certain

time and to maintain the status the consumers needs to buy another good. This assumption apparently fits traits of the real life, where the satisfaction conceded to the consumer by purchasing status goods is typically a provisory one.

Finally, it is implicitly assumed that material utility does not influence the choices of consumers; either the goods provide no material utility or they all do provide the same.

5.3.6 Consumer choices

The consumer's choice of a good in each period depends on his willingness to pay for utility, which is a function of his income. In each period, the consumer chooses the good with the better trade-off between price and utility. It is assumed that consumers do not downgrade their previous choices, i.e. they do not consider buying a given good if they have previously bought a more technologically developed one at some point in time.

The model assumes that, when taking a decision, the consumer successively compares pairs of goods. In each comparison, his preference is determined by the differences of potential utilities provided by the goods being compared and by his willingness to pay for utility. When comparing between goods g_m and g_n, the consumer chooses g_m if the difference in utilities between g_m and g_n is higher than the ratio between their difference in prices and the consumer's maximum budget assignable to the positional functionality. Formally, the choice falls on g_m over g_n if the following condition is met:

$$U(g_m) - U(g_n) \geq \frac{P(g_m) - P(g_n)}{W(i) * qp} \tag{5.6}$$

This definition implies that the consumer is willing to give a proportion qp of his income in return for U_{max}=1, configuring a willingness to pay for utility of $W(i) * qp$.

Another relevant assumption of the model is that consumers base their decisions on expected utilities, which are formed under the supposition that all other consumers maintain the options made in the previous period.

5.3.7 Innovation: creation of new goods

Technological innovation is reflected in this model by the creation of new, technologically more advanced goods. In each period, a new and technologically more advanced good may be created by the industry. For that to happen, the industry must invest a given amount in R&D (Crd). A new good is developed if the potential revenue (R_{pot}) derived by its expected sales in the following period is higher than the R&D costs that would be involved in its creation:

$$R_{pot} > Crd \tag{5.7}$$

The cost of R&D efforts necessary to create the new good is given in the model as a ratio f of the total income of consumers in the economy (W_{total}).

$$Crd = W_{total} * f \tag{5.8}$$

Fixing R&D costs in terms of total income allows testing effects of income distribution without variations in total income affecting the relative cost of R&D.

The potential revenue from a hypothetical new good is calculated on the basis of the price that would maximize the difference between revenues obtained from its sales and those obtained if the good is not created, considering the number of consumers

that would be willing to buy the good at that price:

$$R_{pot} = max_i\{(P_{max}(i, g_{new}) - P(g_{high})) * (C - i + 1)\}, i \in H \tag{5.9}$$

where g_{new} is the hypothetical new good, g_{high} is the present good with the highest ranking, H is the group of consumers who consumed g_{high} and $P_{max}(i, g_{new})$ is the maximum price that the consumer i would be willing to offer for the newly more advanced good. Deriving from inequality 5.6, $P_{max}(i, g_{new})$ results in:

$$P_{max}(i, g_{new}) = P(g_{high}) + (U(g_{new}) - U(g_{high})) * W(i) * qp \tag{5.10}$$

5.4 Results

5.4.1 Scenarios

The model was aimed at the comprehension of the process of technological innovation through the competition for positional goods. Its simulation allowed to observe the structure of dynamics behind positionality driven technological innovation.

It also allowed testing the influence of relevant factors towards the pace of innovation, particularly:

- **Income inequality (k)**; as described above, income inequality has been pointed out by prominent authors as a factor that promotes the market generation of technological innovation, and an argument against the application of instruments aimed at recoiling the process of competition for positional goods, like a progressive consumption tax.

- **Proportion of income allocatable to positional consumption (qp)**; testing this factor corresponds to testing the effects of the materialization of the

the Hirsch conjecture of growing relative positional spending with the increase of affluence.

- **Size and type of consumer network** (c); it is interesting, from the social network analysis perspective, to observe the effects over technological innovation that may arise from different sizes of the population of consumers and the extension of social influence through social classes.

The set of simulations realized is constituted by a baseline simulation, and further sets of simulations aimed at studying the influence of factors outlined here. The term *innovation*, or pace of innovation, refers here to the total number of new goods created during the simulation time.

Parameters / Scenarios		Population of consumers C	Consumer neighborhood size Ns	Parameter for income inequality k	Income fraction for posit. cons. qp	R&D costs (fraction of total income) f	Consumption frequency
Baseline	0	100	C-1	2	50%	2%	1
Income inequality	1.1	100	C-1	0.1 to 500	50%	2%	1
	1.2	100	C-1	0.1 to 500	50%	1.25%	1
Hirsch conjecture	2.1	100	C-1	2	0% to 150%	2%	1
	2.2	100	C-1	2	0% to 150%	2%	2
Number of consumers	3	1 to 500,000	C-1	2	50%	2%	1
Social Neighborhood (function of f)	4.1.1	100	2 to C-1	2	50%	0.5%	1
	4.1.2	100	2 to C-1	2	50%	1.25%	1
	4.1.3	100	2 to C-1	2	50%	2%	1
	4.1.4	100	2 to C-1	2	50%	3%	1
Social Neighborhood (function of k)	4.2.1	100	2 to C-1	0.5	50%	2%	1
	4.2.2	100	2 to C-1	1	50%	2%	1
	4.2.3	100	2 to C-1	2	50%	2%	1
	4.2.4	100	2 to C-1	3	50%	2%	1

Legend: White cells represent baseline values ; Grey cells represent tested values

Tab. 5.1: Model inputs

In the tested set of simulations some quantitative assumptions are applied: R&D costs for the creation of a new product are a fraction of total income (f) of 2%; the

competitive market price for each good (P_{comp}) is equal to zero (0), therefore prices of goods tend to zero in the long term; at the first period of simulation there are 3 goods with different prices and technological levels, and; the simulation runs for 100 periods of time.

The key parameters of the analyses performed are k, qp, C and N_s, respectively accounting for income inequality, maximum fraction of income spent in positional consumption, size of the consumer population and size of the consumer social neighborhood respectively. The values of R&D costs (f) and consumption frequency are also varied in some subscenarios. Table 5.1 describes the set of scenarios tested.

5.4.2 Baseline simulation - modelling positional competition and technological innovation

In the baseline simulation, the model takes an inequality coefficient (k) of 2 - a value similar to those found in typical societies[4] - , a maximum fraction of consumer income potentially expendable in the positional functionality (qp) of 0.5 - half the consumers' income - , a population (C) of 100 consumers with all consumers influencing each other - i.e. with a social neighborhood size (N_s) of 99 - and R&D costs being a fraction of total income (f) of 2%.

The results reveal a cyclical creation of new and technologically more developed goods driven by competition for positional goods. In the first periods of the simulation the consumers make their choices, according to their preferences, amongst the goods available in the market. After the matching between consumer preferences and the available goods, a latent demand for the consumption of a more technologically advanced good eventually surges and grows. As soon as the expected revenues for the industry by putting a more technologically advanced good into the market exceed

[4] A k of 2 is equivalent to a Gini index of 0.251 or a Hoover index of 0.219

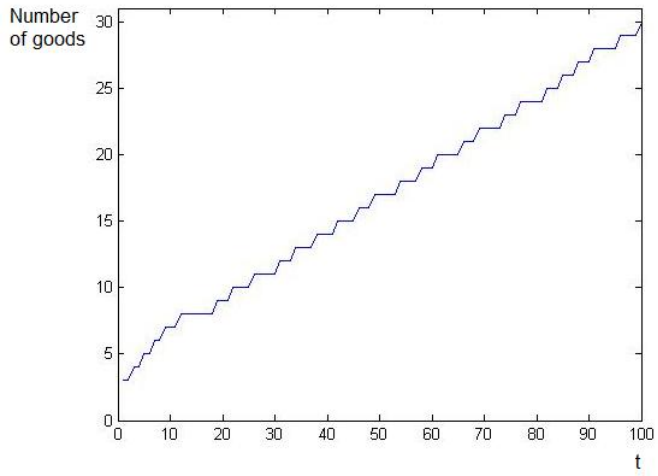

Fig. 5.4: Number of goods over time

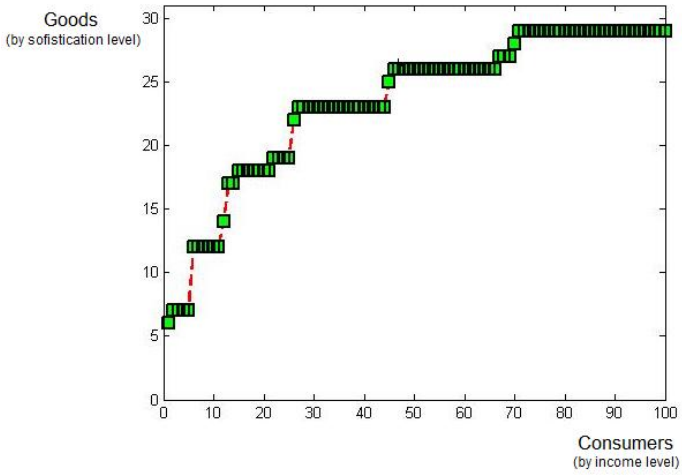

Fig. 5.5: Matching between consumers and goods, at $t = 100$

the R&D costs necessary for its development, the good is actually developed. The matching between consumers and goods is renewed at each period, a process which dynamically evolves both with the change of positional valuation of the of the goods - which changes when any consumer alters its choice - and the downtrend of prices of goods.

Figure 5.4 shows the number of existing goods in each period of time. New goods are added at a relatively stable rate, except during a warm-up phase of the simulation (until about the 20th period). At the end of the simulation, there are 30 goods in total, i.e. 27 new goods are created at a cycle of new product development of 3,7 periods. Figure 5.5 shows the match between consumers and goods after the last period of simulation. Consumers at the high-end of income are consuming goods at the high-end of sophistication, and consumers at the low-end of income are consuming the less sophisticated goods. The three initial goods have at this stage no longer any buyers. It is noteworthy that, in the last period, the good with the highest number of consumers is good number 29, which was, when consumers made their decisions, the most sophisticated one available. But as is possible to see in Figure 5.4, a new good is finally created in this period (good number 30), which happens precisely as a result of the fact that many consumers were already consuming the highest level good, enabling a strong latent demand for a new good.

The main fact of this dynamics of "competition" for positional goods together with a continuous price downtrend is a cyclical creation of more technologically advanced goods.

5.4.3 Income inequality

As we have seen above, the degree of inequality depends on the value of k in the Weibull curve defining the income distribution among the population of consumers. To check for effects of inequality over the level of innovation in the model, simulations were run with different values of k. Figure 5.6 shows the results obtained. It also shows the Hoover index - a measure of (in)equality - for the spectrum of tested k values. The higher is the Hoover index - and k - the most equitative is the defined income distribution.

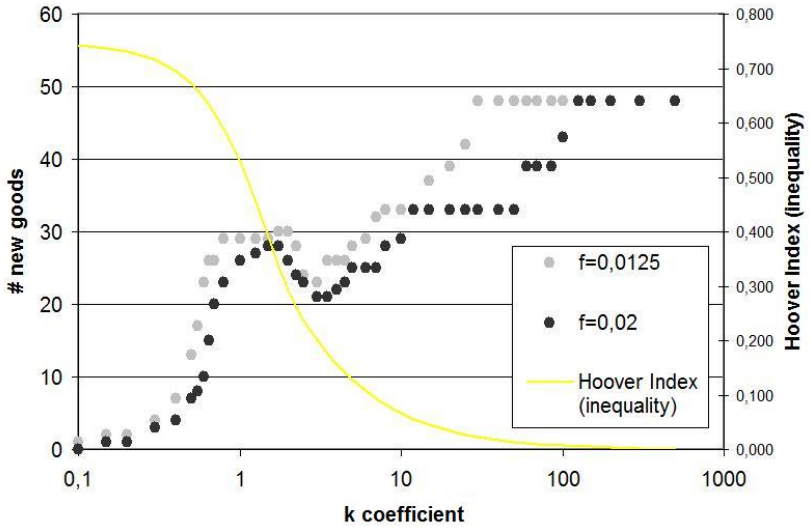

Fig. 5.6: Number of new goods with different income distributions

The general trend observed is that the dynamics of technological innovation improves with equality, although it breaks for values of k sensibly between 2 and 3. This result holds for different values of R&D costs (f), as is seen in Figure 5.6.

The relation between pace of innovation and equality level depends on two opposing drivers. In an unequal society, high-end consumers are willing to individually spend very large amounts of money to buy innovative goods, but there are not many consumers in that position. In a fairly equal society, high-end consumers do not have, in relative terms, so much funds, but there is a much larger pool of consumers with incomes very close to the highest earnings level. In this situation, despite the fact that high-end consumers are not willing to spend as high as in the unequal society, they together have a powerful multiplying effect. It is the balance between these two variants - price of the new good and number of consumers willing to pay for it - that determines whether technological innovation increases or decreases with the level of equality. In the large majority of income distribution setups of this model,

the massification of high-end consumption results a stronger driver of technological innovation than the relative wealth of the richest consumers.

It is useful to confront this result to the argument of Kashdan and Klein (2006), inspired by Hayek, that in the dynamics of a growing economy it is the wealthy that enable a market for goods necessarily expensive for its supply to be viable. As already put forward in Chapter 4, this result confirms that it is possible to have an even more viable market for new goods with a lower price for those goods, as long as there is a larger pool of consumers economically able to compete for the highest positional places (i.e. a less unequal society).

A note is also given on the above referred prediction of Frank and Levine (2007) that there is a positive link between income inequality and positional spending. At first look, the result of our model may seem opposite to their conjecture, given its negative link between inequality and innovation derived by positional consumption. However, Frank and Levine's result is grounded on a prediction of a decrease of the savings rate of the middle class, whereas our model assumes income available for positional spending as a constant (qp) ratio of income. Therefore, the results are not comparable.

5.4.4 Hirsch Conjecture

An analysis of the consequences of the materialization of the Hirsch conjecture, whereby "social limits to growth" are imposed by an increasingly important relative share of positional consumption, on the dynamics of technological innovation in the model, is provided here. The result of simulations with different shares of consumption dedicated to positionality shows decreasing returns of innovation to the share of allocatable income to positional spending (see Figure 5.7). This would imply that "social limits to growth" also apply to the "innovation factor" of positional

consumption.

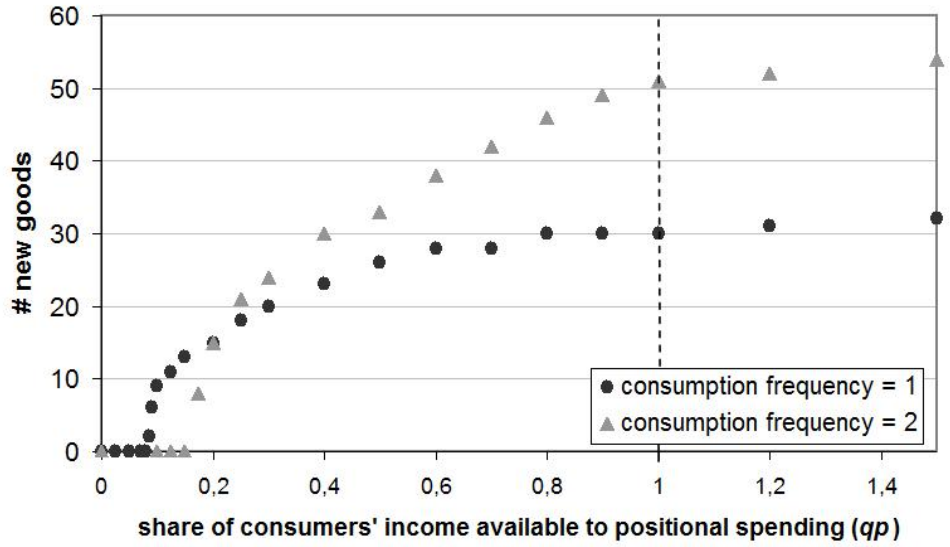

Fig. 5.7: Number of new goods as a function of the share of consumer income available to positional spending

However, this result of decreasing returns of innovation to positional consumption is subject to the assumption of the model that consumers exert their positional stakes (by consuming) at a constant rate (one good is bought at each period; its utility is valid for one period). It is plausible to expect positional stakes to be played more frequently as the budget available for positional consumption also increases. On this, the model shows that different frequencies of consumption may return different volumes of innovation; comparing the initially assumed consumption frequency of 1 with a consumption frequency of 2 (two goods consumed in each period, with half the period's income devoted to each) results show that the lower frequency returns more innovation for low levels of relative budget allocatable to positional spending whereas the higher consumption frequency returns more innovation for high levels of positional budget.

This suggests that, if the increment of positional spending carries with it an increase in consumption frequency, the result of decreasing returns of innovation to positional spending would not necessarily occur. In this respect, it should nevertheless remarked that the increase of frequency of positional consumption must have its own limits, posed by the finite pace at which consumers are able to incorporate information on changes in the "positional market"; only when consumers actually realize changes in their positional ranking and available positional goods can they form and deliver their consumption decisions. In other words, referring to the real world, even if income tended to infinite one would not expect frequency of consumption to tend to zero.

What could also happen is for the "size" of technological innovations to become bigger. Section 4.2.1 referred to the issue of exigency of consumers towards technological delivery and concluded that it should be logically bigger within material than positional consumption. Still, it may be conceded that beyond the generation of more goods or the increase of frequency of consumption, the increase of the budget destined at positional consumption may as well be translated into "bigger" discrete innovations.

5.4.5 Consumer network

The positional competition for goods occurs within its own societal context. When one individual evaluates his *position* or that of other individuals in the social ranking, he does so within his perceived social sphere, i.e. within the group of individuals with whom he regards as belonging to his group of influence.

On one hand, one may discuss whether this social arena for positional competition is regarded by individuals as a large group of other individuals, like a region or a country, or on the contrary as a very small circle of close connections in the

individual's particular social context, like family and closest acquaintances. In this scope it is interesting to test for the level of innovation occurring before different sizes of the social population (still assuming a fully connected influence neighborhood).

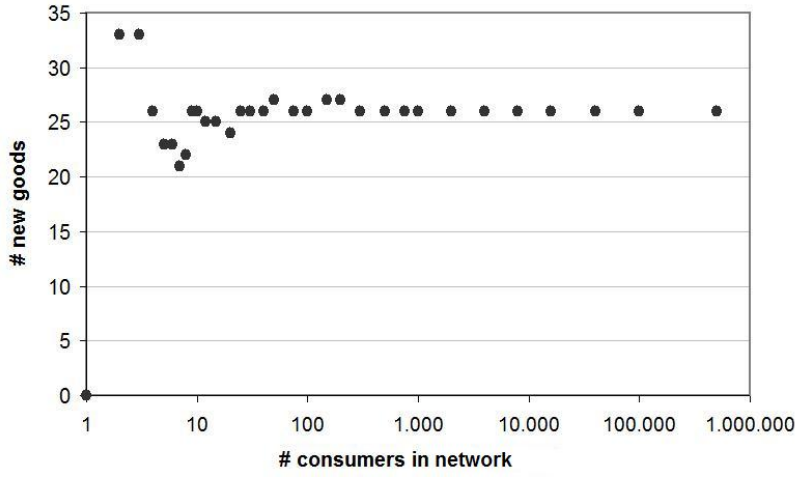

Fig. 5.8: Number of new goods as a function of number of consumers

The model produces quite stable results (Figure 5.8) before variations in population size, except for very low sizes of the social network (less than 10 consumer agents) where the number of goods produced varies no more than 25% of the common typical innovation output. Therefore, the size of the relevant social network for positionality shows no relevant effects on the intensity of innovation, unless very small networks are considered.

On the other hand, we may question the importance of the nature and size of the influence group affecting each consumer's choices (named above as the consumer neighborhood). A consumer neighborhood defined by proximity in social class (or level of income) was admitted; a consumer is influenced - in his evaluation of the utilities given by different goods - by his closest neighbors in social ranking. This accounts for a world where people compare themselves to friends, work colleagues

and residential neighbors, i.e. people who tend to belong to a similar income group.

Translating this question into the real world, the relevant focus would be less on the proportion and quantity of consumers within the whole population accounting for one's neighborhood, but rather on the extension of one's influence group to social classes different than its own. In the example above, a neighborhood consisting of all the consumers in the network would translate into a society where an individual would be influenced indifferently by any other individuals, disregard of their social class. Such was the case in the simulations presented in Figure 5.8. On the other hand, a small neighborhood in our model is analogous to a world where individuals compare their positional achievements with other individuals with a very similar social class.

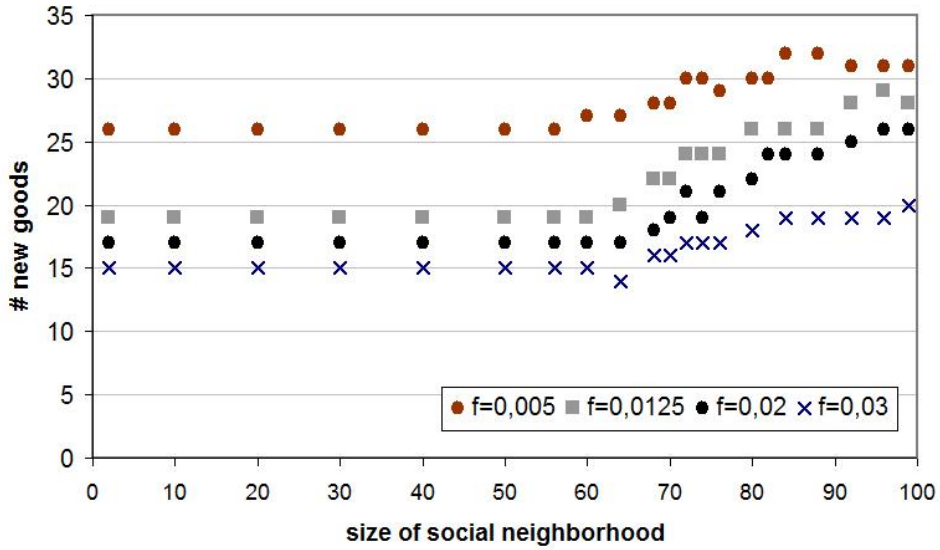

Fig. 5.9: Number of new goods as a function of size of social neighborhood, with different investment costs of R&D

Taking the baseline population of 100 consumers, different neighborhood sizes were simulated to account for its effects on the creation of new goods. In the first set

of simulations, different levels of R&D investment costs were tried (f). The baseline value for inequality of k=2 was assumed.

The simulated results for this inequality scenario have shown a perfectly stable amount of new goods for neighborhood sizes up to about 60% of the total number of consumers, whereas higher neighborhood sizes produced increasing levels of innovation (Figure 5.9). The result is robust for different levels of required investment on R&D. The explanation for this outcome is not straightforward, but can be traced. We know that ultimately the creation of new goods depends on the aggregate willingness to pay of the high end consumers, and apparently the willingness to pay of the group with the highest potential revenue for the industry is only affected by the size of the social neighborhood with neighborhood sizes relatively close to the total number of consumers, case in which the potential income tends to increase.

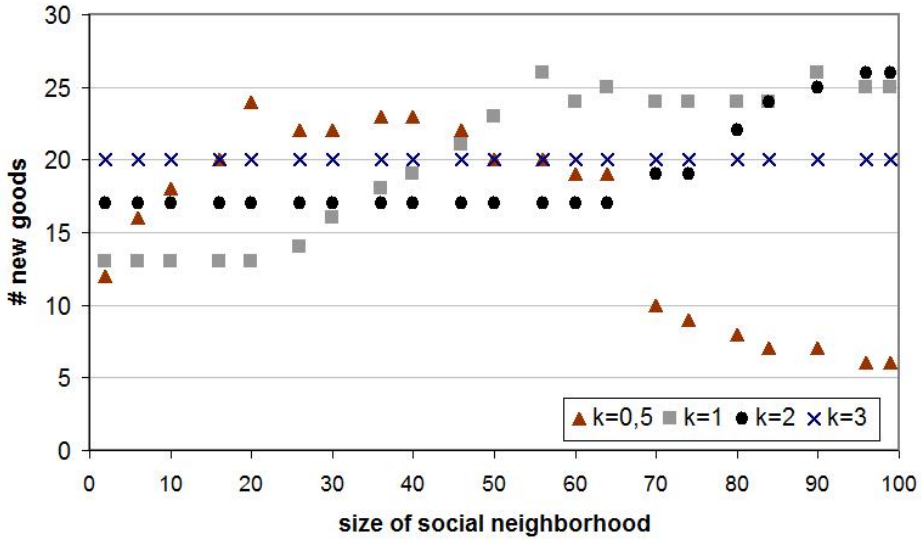

Fig. 5.10: Number of new goods as a function of size of social neighborhood, with different income distributions

However, this result is not generalizable to other inequality profiles. In fact, test-

ing neighborhood sizes with other inequality levels produces quite distinct results. As we can see in Figure 5.10, not only the partial non-dependence between neighborhood size and innovation does not occur for other income distributions, but also the direction of the observed relation varies largely with income distribution and differentially with neighborhood size. A high equality level (k=3) results in a null relation, with an invariable number of new goods produced. On the other hand, a society with a high inequality (k=0.5) produces results with disparate differential relations between neighborhood size and level of innovation.

The relation between types of networks of social interaction and the generation of innovation is complex, and depends highly on the income profile. It seems not to be possible to clearly characterize this relation in the real world. It is likely to vary largely from place to place depending on the socioeconomic structure of society.

5.5 Synthesis

With the aim of contributing to the comprehension of the relation between positional consumption and technological innovation of products, an agent-based model was developed to represent the process of technological development generated by the competition for consumption of positional goods.

In this model, the positional utility provided by the good in question is linked to its technological attributes, and consumers periodically play their stakes in the positional game by consuming it. There are different versions of the good differing in their technological level. New, more technologically advanced, versions of the good are developed and put into the market by the industry in each time period if the expected revenues from sales are higher than the costs of R&D for developing the more technologically advanced version. Simultaneously, prices of new goods decrease

with time due to increasing competition and productive efficiency. In each time period the consumers evaluate the expected positional utility achieved from each version of the good against their available budgets, and correspondingly decide which version to buy. The table in Figure 5.2 summarizes the main findings provided by the results of the simulations presented above.

Scenarios	Main Results
0. Baseline	Recurrent cyclical creation technologically more developed goods driven by competition for positional consumption and the downtrend of goods' prices.
1. Income inequality	The general trend observed is an increase of innovation with income equality, although this trend is broken locally. This outcome is determined by the aggregate effect between price of the innovative good and number of consumers willing to pay for it. In the model, the second element is therefore the stronger in most inequality profiles.
2. Hirsch conjecture	Model shows decreasing returns of innovation to the share of income allocatable to positional spending. This would imply that "social limits to growth" would apply also to the innovation generated by positional consumption.
3.1 Number of consumers	Size of the relevant social network for positionality shows no relevant effects on the speed of innovation, unless very small networks are considered.
3.2 Social Neighborhood	The relation between size of neighborhood of social interaction and the generation of innovation is complex, and depends highly on income distribution. It seems not to be possible to clearly infer a profile for this relation in the real world, which is likely to vary largely from place to place depending on the socioeconomic structure of society.

Tab. 5.2: Summary of simulations results

A recurrent cyclical creation of new technologically more developed goods is the main fact resulting from the process of competition for positional goods directed at technological attributes, associated with the possibility of creation of technologically more developed goods by producers at a given cost of R&D and with their market price decreasing with time.

Intensity of innovation depends on several model parameters, like the amount of R&D costs for the creation of new goods, the pace of decrease of prices, income in-

equality, the relative preferences of consumers for positional goods over other types of money applications, or the number of consumers and the type of network of influence between them. Simulations to test the effects of variations of some parameters over the intensity of innovation were producedcarried out. Reporting to the definitions of intensity of Chapter 4, we are referring here either to absolute intensity or intensity to consumption depending on the variables being tested. In all sets of scenarios tested except the materialization of the Hirsch conjecture, the number of new goods created reflects intensity to consumption, since resources available to positional spending are invariable. In the case under exception, the tested variable deals precisely with available resources to positional spending and therefore the number of new goods is only a proxy to absolute intensity of innovation.

Before different levels of income inequality, the model globally produces a negative relation between income inequality and the number of new goods created, although this rule is locally broken at points across the possible spectrum of income distribution profiles. This result has shown that, contrary to an argument put forward by authors who favour no State intervention over positional consumption, the market for innovation may happen to be higher in less unequal societies.

To check the consequences of the Hirsch conjecture on innovation, testing of different shares of positional spending showed decreasing returns of innovation to positional spending. This would imply that the "social limits to growth" imposed by increasing positional spending would also apply to the associated process of technological innovation, but this result depends on the assumption that the frequency to which consumers play their positional stakes is rigid. However, although frequency of consumption is likely to increase with wealth, it should be noted that it must also have its own limits, if not for other reasons at least due to restrictions in the ability of positional consumers to obtain information on the positional market.

Finally, the relation between the size of the group of influence of each consumer and the generation of innovation was seen to be a complex one, and highly dependent on income distribution. According to the results of the model, the profile of this relation in the real world is likely to vary largely from place to place, depending on the socioeconomic structure of the society in question.

6. POSITIONAL CONSUMPTION OR ANOTHER RESOURCE ALLOCATION FOR INNOVATION?

One of the arguably unintended consequences of taxation aimed at the reduction of the level of positional spending is that it will reduce the positive externalities of positional consumption in its role as a driver of innovation (Gershuny 1983; Kashdan and Klein 2006). A possible collective intervention to reduce the level of positional consumption could prevent innovation and, ultimately, economic development. As Schumpeter (1950, p.83) himself remarked, "a system - any system, economic or other - that at every given point of time fully utilizes its possibilities to the best advantage may yet in the long run be inferior to a system that does so at no given point of time, because the latter's failure to do so may be a condition for the level or speed of long run performance". Could the recoil of the level of positional consumption have an overall negative effect on welfare? This is the question to put when a case for political action is to be made.

Frank countered the worries by noting that the alternative spending allocation caused by positional taxation would also drive technological innovation. Even accepting that positional competition has a positive effect over innovation, there are no *a priori* reasons to believe that positional taxation reduces innovation, because the alternative increase in savings and investment would also have positive effects over innovation. Particularly, the fact that a progressive consumption tax translates into a higher savings rate would bring a higher devotion of resources to innovation in the

capital goods sector and in research and development in the short run. In the long run, effects on innovation of a high savings trajectory would even be increased due to a higher level of consumption (Frank, 2006).

Whether the outcome of positive effects over innovation is better in the short run in a *laissez faire* or in a taxed positional economy, depends simply on whether it is the first or the second case that directly generates the highest innovation. In the long run the answer is less straightforward, depending also on the dynamical effects of innovation and investment. If, in the short run, innovation is higher in the positional taxation scenario, it is clear that it will also be higher in the long run. However, if the *laissez faire* scenario produced higher short run innovation, both outcomes would still be possible in the long run depending on whether the additional short run innovation in *laissez faire* generated enough income growth to offset the income growth driven by additional investment in the positional taxation scenario.

In order to respond to the question of whether it is more beneficial to the development of technological innovation to have it being generated through positional consumption or other means of resource allocation, it would be necessary to objectively assess benefits over innovation of the alternatives. Focusing on the positional competition alternative, one would in this regard aim to assess if its process generates technological innovation and, if so, in what extent, particularly in comparison with other resource allocations. This has been the focus of Chapter 4.

We have seen that the existence of competition among positional consumers is a factor contributing to more innovation, as compared to forms of consumption where consumer competition is not present. However, this increase in innovation occurs by way of the amount of consumption, and therefore it says nothing on intensity of innovation to consumption and consequently neither on the efficiency of allocation of resources towards the generation of innovation.

The answer depends largely on what the particular object of positional competition is, and on the nature of the product attributes valued for status, which may be technological or non-technological. Some segments of positional consumption generate none or very few technological innovation. Others, more centred on technological attributes, may be effective in doing so. But overall, positional products provide additional opportunities, in alternative to technological innovation, for producers to attract demand, which suggests that its intensity to consumption is broadly lower with positional consumption than with material consumption.

Moreover, the exigency of consumers towards the technological deliver of positional consumption is theoretically lower than with material forms of consumption. To be successful in the market, positional products require only that the product is perceived as *better* in relation to other products, while new material products have to deliver manifest material improvements. This plausible difference of exigency for technological advances also suggests that the intensity of innovation to consumption is lower with positional than with material consumption.

These facts point to positional consumption as a driver of absolute intensity of technological innovation due to the perpetuation of competition among consumers, but plausibly that intensity is weaker in the ratio to the resources spent, comparing with forms of material spending. And it is the later aspect that counts for the purpose of the question of this chapter.

On top of this, the benefits to society of innovation generated by positional consumption must be questioned. We have seen that even if positional consumption does produce technological innovation, such innovation can only be regarded as positive for wellbeing in the extent to which it is able to address also material needs, for only the satisfaction of the later type is susceptible to increase wellbeing. If innovations do not lead also to a sufficiently relevant satisfaction of material needs, overadoption

of innovations can occur.

All in all, there are solid reasons to believe that positional consumption is aggregately less effective in achieving technological innovation than other uses of resources.

This assertion refers to positional consumption as an aggregate, and it may not be true to all forms of positional consumption. But unless taxation were directed at specific forms of positional consumption[1], which is not the case of the policy proposals under question, it is aggregate positional consumption that matters for the analysis.

[1] According to Mason (2000a), a previous brief implementation of specific taxation directed at luxury goods in the USA has not been a case of success.

7. SUMMARY AND CONCLUSIONS

Positional consumption is arguably a source of inefficiency for the economy. The search of positional benefits for the individual does not coincide with the collective good, and resources are spent without direct benefits to the society. Moreover, the predominance of positional consumption in the economy is apparently increasing as societies grow more affluent.

Some authors argue that such welfare losses are preventable through appropriate policy. Others are more sceptical and believe that State intervention is not justified. One of the main points against intervention to bring the competition for positionality to a lower level is that high-end positional consumption generates innovation, a positive externality.

To address this issue, this work has studied the relation between consumption of positional goods and technological innovation, mainly from a theoretical point of view. The question has been asked whether positional consumption generates technological innovation. It unfolded into several other questions: What are the fundamentals for existence of such a relation? Where it exists, which factors affect its intensity? Moreover, is the type of technological innovation generated welfare enhancing? Finally, what are the relative (dis)advantages of positional consumption, comparing to alternative ways spending, for technological innovation and welfare?

An agent-based model was developed to reproduce the process of technological development generated by the competition for consumption of positional goods. The

main fact resulting from its simulation is a recurrent cyclical creation of new technologically more developed goods, driven by the competition of consumers for status. It also revealed that the dynamics of this process is a complex one, of which the outcome may be significantly variable depending on socioeconomic characteristics of society, including its economic inequality level and the structure of interrelations of consumers in their judgements of positional value. A particularly relevant result was the demonstration that a high affluence level of high-end consumers (as opposed to a more equal society) is not necessarily favourable for the generation of innovation.

More significant conclusions on the relation at study and its effects on welfare came from the analysis of the implications of the nature of positional consumption towards marketing and innovation practises.

Producers have several marketing strategy alternatives to seek demand for their products, among which is the improvement of product value through technological innovation. Comparing such marketing opportunities between positional and material products, it was seen that the former present additional opportunities in alternative to technological innovation, due to the nature of their positional attributes, which are in several cases not improvable through technological innovation. This apparent lower importance of technological innovation as a vehicle to attract costumers to consumption of positional type suggests that it is a less efficient way of generating technological innovation as compared to material consumption.

The same conclusion is supported by the fact that the exigency of positional consumers towards the performance of the innovations delivered is plausibly less intense than that of material consumers. To attract demand, a positional product is only required to be perceived as 'better', while a material product needs to be sufficiently materially better to justify the price premium. And a lower exigency of consumers towards technological innovation arguably promotes it with less intensity

to the resources spent.

On the other hand, as illustrated also by the model developed, the fact that in a positional market consumers permanently compete for status may lead to a recurrent demand for new products and consequently, in cases, to technological innovation. Competition among consumers therefore generates a strong and persistent demand for technological innovation in some positional markets. However, this demand for innovation occurs in parallel to demand for consumption itself, i.e. there is a high intensity of innovation in an absolute sense, but not necessarily in the relation to the resources spent; generally on the contrary, as explicit in the two previous arguments.

Another issue concerns the effective creation of welfare benefits from innovation driven by positional consumption. These are not guaranteed, since welfare is only improvable in a material dimension; only where positionally driven innovations simultaneously address material needs can they be regarded as welfare enhancing.

All in all, a more diluted role of technological innovation as a marketing approach in positional markets, a lower exigency of consumers towards the effective delivery of innovations, and the fact that innovations generated by positional consumption are not necessarily welfare enhancing, seem to be strong reasons to believe that positional consumption is not a favourable means of generating technological innovation, as compared to other material applications of resources.

Further validation of this conclusion may be carried out in the future through empirical analysis.

If it is true, as it seems, the argument that remedies against excessive positional consumption would be prejudicial due to the elimination of positive effects on innovation, may be discarded.

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