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Jean-Pierre Centi

Nathalie Rubio

### **INTELLECTUAL PROPERTY RIGHTS AND ENTREPRENEURSHIP: ON THE PRECEDENCE OF TRADEMARKS**

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## INTELLECTUAL PROPERTY RIGHTS AND ENTREPRENEURSHIP : ON THE PRECEDENCE OF TRADEMARKS

*Intellectual property rights (IPR) protect invention and creation. We know how much ideas (knowledge and innovation) contribute to economic growth. Endogenous growth models with technical progress point out the externalities problem plaguing R&D, and thereby show how legal protection, through exclusive intellectual property rights, affects economic growth. Most of the time those models focus on patent which is one special form of IPR. While the relation between patents as legal protection of intellectual property and economic growth is not challenged, the China case is quite odd and brings up some questions. The People's Republic of China has experienced an exponential growth rate during the last decade. This might be explained partially by the endeavour to match with "reasonable" level of protection of intellectual property. When we look closer to the legal protection in China, we find that there is a tremendous amount of trademarks registration (WIPO data) per year (we start the empirical investigation in 1985). These empirical findings give rise to the following question: while recent growth models focus merely on patent, wouldn't it be relevant to distinguish patent and trademark as different vectors of growth? In order to answer, we have to establish a systematic link between trademarks, as intellectual property rights, and growth. We suggest that this link is established as soon as we do not limit innovation to technological change. In other words, this link is established when we do not narrow the function of the entrepreneur to that of an innovator but when we also consider the entrepreneur in alertness. Integrating the Kirznerian entrepreneur in the analysis allows us to partially understand the economic growth of China and suggests that the China case is not an exception but rather that we should find the same pattern of growth in developing countries that start to protect intellectual property.*

**Key-words:** Intellectual property rights, trademarks, entrepreneur, growth.

**JEL :** K11, M13, O1

**Jean-Pierre Centi**, Professor at the University Paul Cézanne (Aix-en-Provence)

**Nathalie Rubio**, Research Fellow at the University Paul Cézanne (Aix-en-Provence)

## 1. Introduction

Intellectual property rights (IPR) protect invention and creation. We know how much ideas (knowledge and innovation) contribute to economic growth. Endogenous growth models with technical progress point out the externalities problem plaguing R&D, and thereby show how legal protection, through exclusive intellectual property rights, affects economic growth (Romer 1993). Most of the time those models focus on patent which is one special form of IPR. Patent protects substantial innovation by granting a temporary monopoly and thus gives incentives to invest in R&D. Patent is essential to promote innovation, but also it is a vector of technological dissemination. In the nineties, emerging countries realized how important intellectual property rights were, and therefore started to draft intellectual property legislation and adhered to the Trade Related Aspects of Intellectual Property Rights (TRIPs) agreements. Reinforcement of intellectual property rights in developing countries aims at attracting foreign (developed countries) advanced technologies at first. Transfers of high technologies, through international trade, foreign direct investments, licensing, or joint-ventures, take place only if the host countries protect effectively intellectual property rights. Econometric researches<sup>1</sup> show that developing countries with “weak” intellectual property protection do not accede to modern technologies.

In developing countries, human capital is low and technologies are so poor that they cannot invest in R&D, but they may benefit from technology transfers that will contribute to their economic development.

While the causation relationship between patents as legal protection of intellectual property and economic growth is not challenged, the China case is quite odd and brings up some questions. The People’s Republic of China has experienced an exponential growth rate during the last decade. This might be explained partially by the endeavour to match with “reasonable” level of protection of intellectual property. Indeed, since 1980 (China adhered to the WTO in 1980), China ratified most of the fundamental treaties concerning the protection of property rights. China also changed its own legislation so as to conform to international law, but the differences between administrative regions makes the enforcement of law uncertain.

When we look closer to the legal protection in China, we find that there is a tremendous amount of trademarks registration (WIPO data) per year (we start the empirical investigation in 1985). In 2002, the number of registered trademarks (by the residents) – the other form of intellectual property – was 2,8 times greater than in France, 3,6 times greater than in Germany, and 4 times greater than in UK. At the same time, the number of patents registration remains much less than the selected European countries.

These empirical findings give rise to the following question: While recent growth models focus merely on patents, wouldn’t it be relevant to distinguish patent and trademark as different vectors of growth? In order to answer, we have to establish a systematic link between trademarks, as intellectual property rights, and growth. We suggest that this link is established as soon as we do not limit innovation to technological change and as soon as we include “trade innovation”. In other words, this link is outlined when we do not narrow entrepreneurship to characteristics of an innovator but when we also consider *alertness* in the Kirznerian meaning of entrepreneurship.

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<sup>1</sup> Cf Romer (1993), Aitken and Harrison (1994), Feenstra and Hanson (1997), Dougherty (1999). Maskus (2000).

Trademarks do not protect an innovation in a Schumpeterian sense but gives incentives to differentiate products and services, and differentiation is a kind of innovation in a Kirznerian sense. Indeed, differentiation (or products diversity) is a “trade innovation” since it lubricates the market process. The prospect of differentiation boosts up the market dynamic by encouraging competition. Indeed, the capacity of the entrepreneur and precisely his alertness is triggered by the competitive environment. Trademark, as an intellectual property right, gives to the entrepreneur the opportunity to reveal his talents as a “profit catcher”.

According to empirical findings in China case, we suggest that the two kinds of entrepreneurs perform sequentially and that the Kirznerian entrepreneur comes in the first step – especially in the first step of the developing process. The Kirznerian entrepreneur is not an exceptionally talented person; he rather is the one who detects profit opportunities. It is the reason why he performs before the innovator (Schumpeterian entrepreneur) who requires a large stock of human capital. As Hayek mentioned (1937, 1945), knowledge does not amount only to scientific knowledge but also to particular circumstances of time and place.

This sequential approach does not exclude the idea that both kinds of entrepreneurs, notably at the further stages of economic growth, perform simultaneously. The WIPO data even show that the amount of registered patents (by residents) started to increase sharply in 1996 while the amount of registered trademarks (by residents) was still increasing.

Integrating Kirznerian entrepreneurship in the analysis allows us to partially understand the economic growth of China and suggests that the China case is not an exception but rather that we should find the same pattern of growth in developing countries that start to protect intellectual property.

## **2. Intellectual property rights and growth: the patents supremacy**

The neoclassical approach of growth, in particular the random exogenous technological progress hypothesis, showed its limits. In the 80's a lot of work have been done regarding the growth theories, highlighting the endogenous aspect of innovation. The first models generation by Romer (1986, 1990) and by R. Lucas (1988) emphasis the power of 'ideas' and human capital in growth. Ideas and knowledge come to improve production and are the principal engine of technological progress and thus contribute to economic growth. However, they generate social benefice higher than the private benefice captured by the inventor. In that sense, protection of intellectual property provides a stimulus to innovation since it guarantees exclusivity to innovator by reducing the gap between social and private benefice.

Endogenous growth models have followed the Romer (1990) and Helpman (1991) and Aghion and Howitt (1992) perspectives. Products of the intellect are typically non-rival. That is, once such a product has been created, it can be used by many parties at little or no additional costs. Endogenous growth models hold on increasing return to scale and imperfect competition. The possibility of charging a price higher than the marginal cost give incentives to innovate since it allows firms to get research investments back. Endogenous growth models focus on the power of expected profit

to motivate the production innovation. The central idea of endogenous growth models is that productivity is enhanced by increases in product variety.

A number of endogenous growth models are based on the idea that innovation is carried out to make profits on the introduction of new products. But each new product added to the stock of human knowledge decreases the cost of innovation. Thereby, the rate of growth will vary directly with the rate of introduction of new products. Moreover, the larger the stock of human capital is the faster the economy will grow. Thus, the institutions that are conducive to the accumulation of human knowledge, such as intellectual property rights, increase innovation and economic growth.

Endogenous growth models came to consider mainly patents as a protection of intellectual property rights because they are directly linked to technological progress which is the pillar of the models. Gould and Gruben (1996) try to add others forms of intellectual property rights such as trademarks but they quickly fall into the relation between patents and growth because they do not explain how trademarks could affect growth. Kwan and Lai (2003) also propose growth models embracing all forms of intellectual property rights (Patents, trademarks and copyright). Once again, such models fail to distinguish each category of IPR and by doing so keep the patent on the first place of economic growth.

### **3. Trademarks as a significant indicator of innovation? The case of China**

The numbers of registered patents and trademarks are indicators of technological innovations and products and services differentiation respectively<sup>2</sup>.

Trademarks are words, signs, symbols of combination thereof that identify goods and services as produced by a particular person or a company, therefore allowing consumers to distinguish between goods originating in different sources. They belong to the family of IPRs, and once registered benefit from legal protection against unauthorized use by entities other than the legal owner. The legal protection of trademarks allows an exclusive right on the use of the sign appended on the product. This is not limited in time since it does not confer a monopoly power to the producer<sup>3</sup>. Trademarks reduce information costs for the consumers and gives incentive to invest in product quality and maintain, even increase quality<sup>4</sup>. This form of IPRs allows producers to differentiate on the market. Economides (1989), suggests that because trademarks help consumers to make choice in the huge spectrum of variety and quality of goods, they are essential to the efficient allocation of resources in the productive process.

Registration (applications for registration) of trademarks indicates that new kinds of products will be supplied on the market. In other words, trademarks registrations indicate that products with new characteristics will be supplied in order to meet a potential demand which has not yet been satisfied.

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<sup>2</sup> Concerning trademarks, application for registration is also an indicator of differentiation. Indeed, registration of trademarks does not depend of the product "innovation" but on the distinctivity of the trademark.

<sup>3</sup> We may admit that advertising on the basis of trademark contributes to building up a good will to the advertiser advantage. But this not threatens competition.

<sup>4</sup> Economides (1989), for example, suggest that trademarks give incentives to produce constant quality products. Klein and Leffler (1981), Landes and Posner (1987), Shapiro (1982), and Maskus (2000) consider that trademarks give rise to improved global quality.

Widely used innovation and creativity indicators are R&D expenditures, technical personnel and patents (which are linked to R&D expenditures). Those indicators fit essentially the firms, sector of activities, and countries with high financing capacity.

Trademarks could be a relevant complementary indicator for smaller economies but also for activities such as service sectors and also for low-tech industries where smaller firms contribute to most of the final output.

Mendoça and co-authors (2004) mention that trademark-based indicators could be useful to study:

- the rate and direction of product innovations in different industrial sectors,
- international patterns of specialization,
- links between technological and marketing activities,
- the evolution of economic organizations and structures.

Schmoch (2003) highlight the suitability of trademarks as an indicator of innovation . He finds a highly significant correlation between innovation and trademarks in the manufacturing sector.

Hummels and Klenow (2002), in the vein of Krugman (1980) show a positive relation between the largeness of an economy and products variety<sup>5</sup>. This kind of models attempts to establish a link between the largeness of an economy and the differentiation (either horizontal or vertical) of products. Those considerations lead to suppose that a positive relation exists between economic activity and trademarks when they are considered as an indicator of horizontal differentiation.

Veall (1992) integrates the legal protection of trademarks in the traditional model of product differentiation<sup>6</sup>, but he does not distinguish this form of legal property right from patent.

The “Third Community Innovation Survey” (CIS3) (2004)<sup>7</sup> shows that most part of the firms that register both trademarks and patents are “innovative” firms. This supports the idea that registered trademarks could also be used as an indicator of innovation.

WIPO data are a useful tool to make comparison of the use of patents and trademarks between countries.

These Data show that the number of trademarks registered in China is sizeable. While the amount of registrations effected was 22 458 in 1985, the number of trademarks reached 236 006 in 2002. In more detail, the amount of registrations effected in the name of China residents was 173 589 in 2002 which is 2.8 times greater than in France, 3.6 times greater than in Germany, and 4 times greater than in UK.

China also experienced an increase in registrations of patents from 1996. The evolution of registered patents in the name of non-residents follows with a sharp increase.

In China the total amount of registered patents was booming from 44 in 1985 to 21473 in 2002, which is nevertheless 2,5 times lower than in France and UK, and 2.8 times lower than in Germany (in 2002).

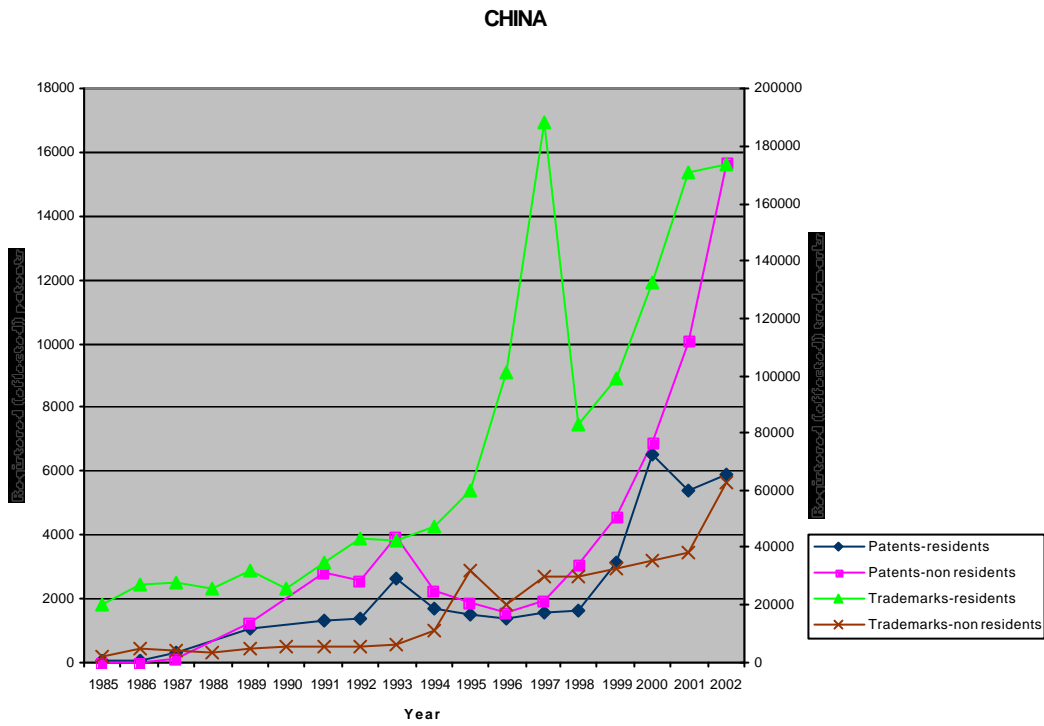
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<sup>5</sup> A higher GDP increases the number of varieties of products rather than the quantity produced per variety.

<sup>6</sup> Cf. Perry, M.K, and Groff, R. H (1986).

<sup>7</sup> « Innovation in Europe. Results for the EU, Iceland, and Norway », European Communities.

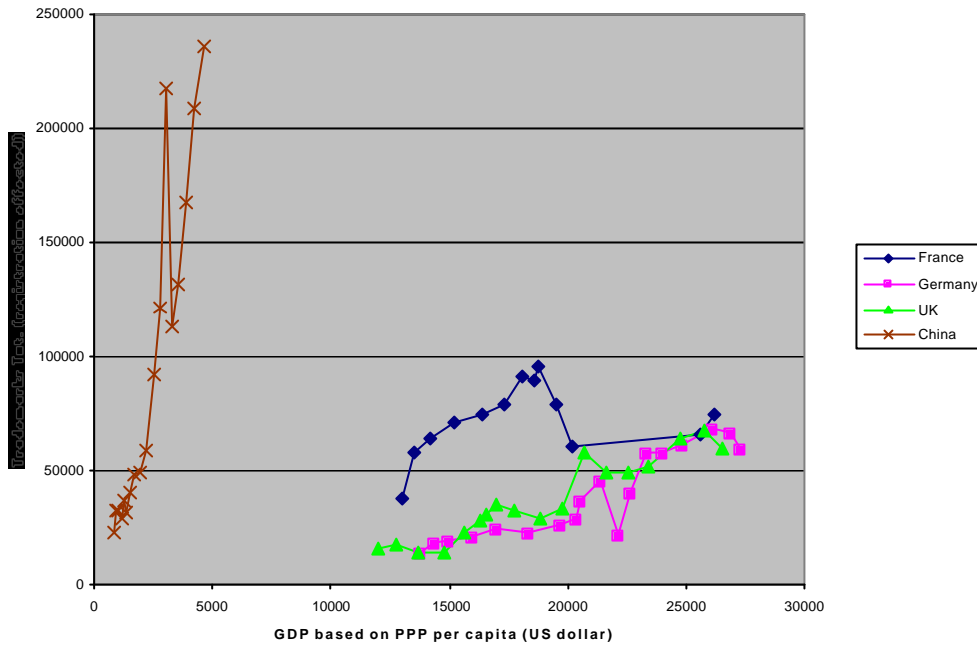
Graph 1:



Source: WIPO

Graph 2 (a)

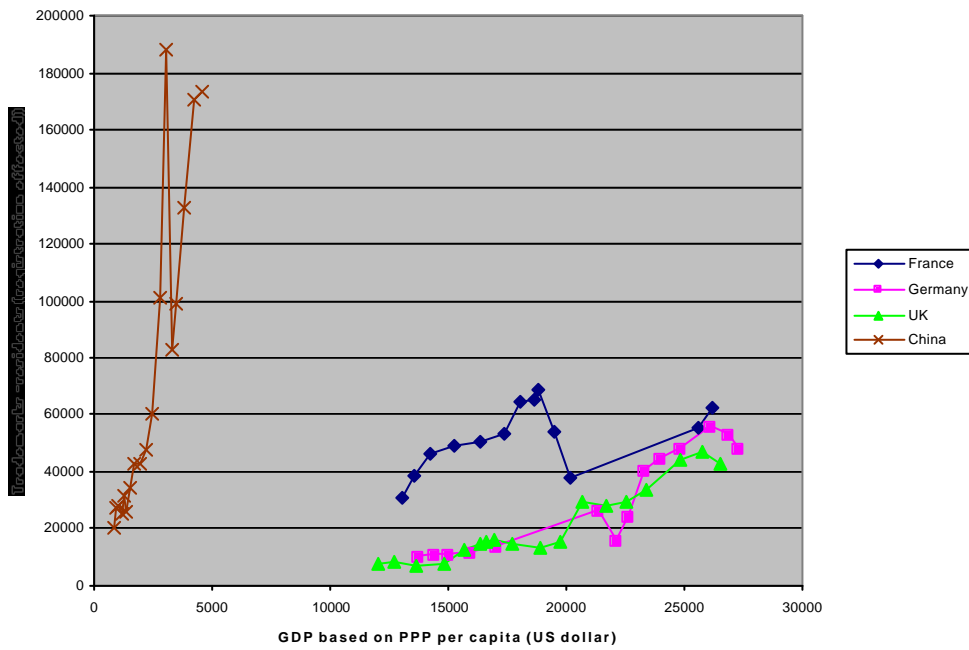
**Trademarks Tot./GDP**



Source: WIPO, ECONSTATS

**Graph 2 (b)**

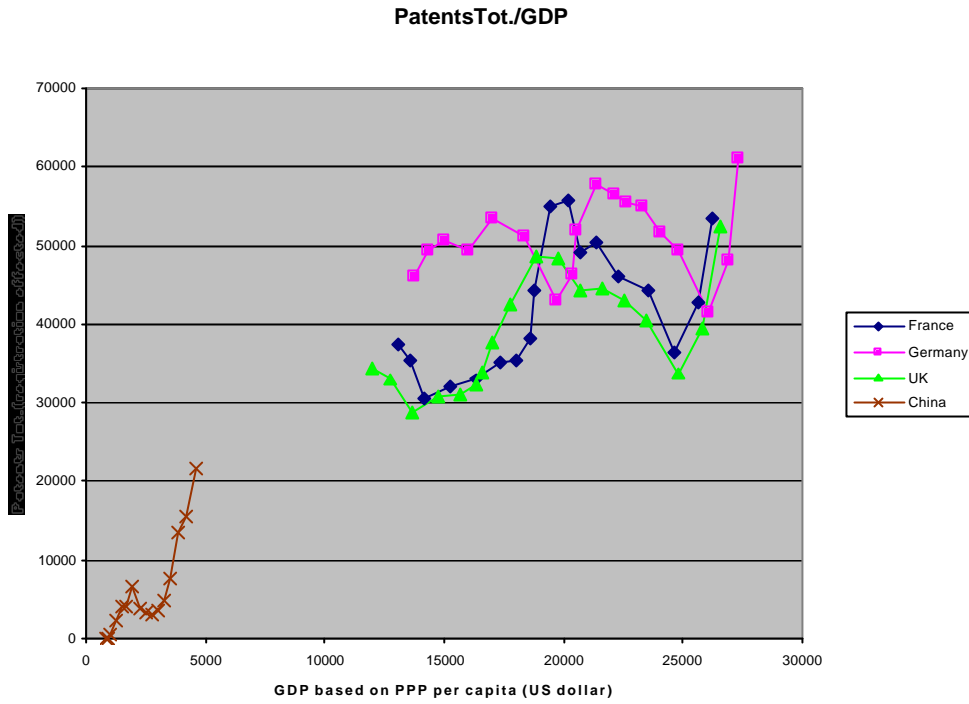
**Trademarks (residents)/GDP**



Source: WIPO, ECONSTATS

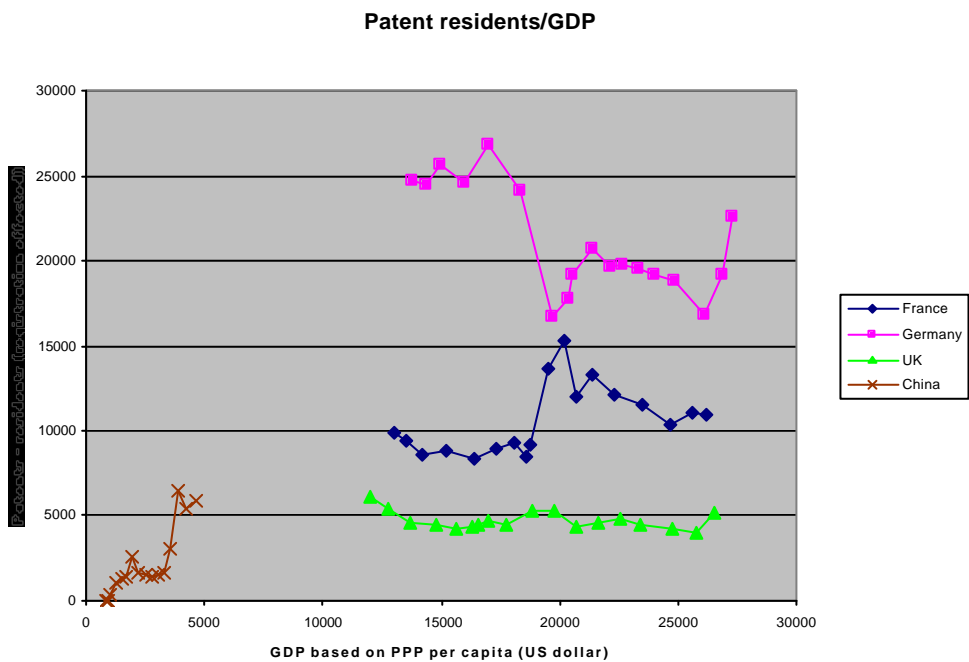
**Graph 3 (a)**





Sources: WIPO, ECONSTATS

**Graph 3 (b)**



Sources: WIPO, ECONSTATS

Graphs 2 (a,b) and 3 (a,b) present quantities of trademarks and patents registered weighted by GDP per capita. These graphs show noticeable differences between the

selected European Union member states and China. At low GDP per capita (and even at equal absolute levels of GDP), China experiences greater quantity of registered trademarks than the selected European member state. Moreover, the evolution holds through time since registrations of trademarks follow a sharp growing trend. The distribution of trademarks is presented in Annex 1a. It displays the distribution of product and services according to the Nice Classification. (Annex 1b). It is revealing about the specialization in China and the wideness of the range of products and services supplied on the domestic market. The distribution shows that trademarks are concentrated in categories 25, 9, 30, 29, 12 of the Nice classification (Annex 1a).

As expected, China shows much lower quantities of registered patents than in European countries. However the Graph 1 shows that the trend of patents registration is growing. Primo Braga and co-authors (2000) explain that between 1994 and 1995, less than 5% of world patents registered are located in developing countries.

It does not suggest that the two kinds of intellectual property rights are substitutes but that trademarks is a vector of domestic markets dynamic more available to developing countries. The substitution of the two forms of intellectual property rights at stake in this paper is suggested in the graphs which presents other countries intellectual property rights registration..

The case of Spain is also interesting. The Graph 4 in Annex 2 shows that while patent registrations (total patents) start to increase from \$ 14,000 per capita (GDP), trademarks registrations increase at \$ 9,000 per capita. The amount of registered trademarks (both in the name of residents and non residents) is even greater than in other European countries. Moreover; data show that trademarks are mainly registered in the name of residents and that patent registrations in the name of residents are constantly very low. The level of patents protection is the same as the UK but with a major difference. In UK the amount of total patent registration follows the European trend. The case of Korea is also displayed in the graph . It shows that while total patent registrations follow an increasing trend from a value of \$ 9,000 per capita, the amount of total patent registrations remains lower than in European Union countries (except Spain) until it reaches the value of \$ 15,000 per capita. Concerning trademarks, the curve shows an increasing trend from \$ 5,000 per capita. The amount of registered trademarks is even greater than UK and Germany at equal GDP values.

The main part of the literature attempts to display a relationship between trademarks and growth through trademark-based indicator of differentiation. But it says nothing about the theoretical explanation of such a relation. While the relation between patents and growth has been scrutinized both through empirical and theoretical approaches, intellectual property rights on trademarks as an engine of growth is not truly considered.

#### **4. Intellectual property rights: two views of the entrepreneurial role**

The striking fact is that the institutionalization and enforcement of intellectual property rights protection in China – a developing country whose the GDP growth rate reached 9,5% in 2004 – did contribute to the deep transformation of the economy. Traditionally, intellectual property rights have referred to two categories: (1)

Intellectual property rights that stimulate inventions and creativity (patents, copyrights, layout designs for integrated circuits, plant breeders rights); (2) Intellectual property rights that resolve informational asymmetries between sellers and buyers on certain attributes of goods and services (trademarks, geographical indications).

According to the indicators presented above, experience in China and other developing countries shows that legal protection of the second sort of intellectual property, through registered trademarks, is far more related to such exponential growth than patent protection<sup>8</sup>. As trademarks are in majority registered as local ownership of property rights, that is by local people who are endowed to varying degrees with entrepreneurial ability and who are seeking “knowledge of the particular circumstances of time and place” (Hayek, 1945: 52), without doubt such dynamics that gives rise to products and services differentiation should be integrated into economic growth models. Yet much of the focus of the literature on endogenous growth is limited to that innovation consisting of technological advances. This is a partial view of creativity and the discovery of opportunities, which is related with a specific conception of the entrepreneurial role and economic organization.

In endogenous growth models, the innovations lead of the entrepreneur together with scientific knowledge are mainly considered as the driving forces of technical progress and the essential features of economic growth in the capitalist system. As an alternative, the entrepreneur is replaced by corporate innovation enjoying simultaneously economies of scale, trained management and bureaucratized R&D. Yet when we are looking at China’s economic growth and other developing countries as well, the entrepreneurial role in the take-off stage of exponential economic growth does not seem to be related with technological innovation, but rather with the discovery of unexpected profit opportunities within the market process. In other words, we are facing in the growth process two different entrepreneurial roles, one associated with patents and the other associated with trademarks. Some specifications of both kinds of relationship are worthy to be made, the main question being whether one kind of entrepreneurial role takes precedence over the other.

## **5. The entrepreneurial process of change through patents**

In recent economic growth theory, innovation is no more a peripheral part. Incorporation of technical progress brings about two insights. First, such introduction is the outcome of R&D activity, which turns inventions into profit-making innovations. Second, these models entail upwards developments in the field of institutions, and especially the protection of industrial property and intellectual property rights. This kind of endogenous growth explanation is insightful when, as a follow-up, it happens to emphasize the importance of market institutions.

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<sup>8</sup> One may presume that policy-makers in developing countries are historically reluctant to embrace patents protection and rather more inclined to confer legitimacy on trademarks. Although the debate over the nature of patents has long been controversial, and nationalistic wishes may have deny the rights of foreign firms, such presumption does not really hold. In some way or another, the conclusion in 1994 of the international treaty called “Trade Related Aspects of Intellectual Property Rights” showed that most of the developing countries, and especially China, committed themselves to comply with intellectual property rights standards.

Innovation may occur at different levels of intellectual property protection. The higher is the level, the higher is the expected rate of return on research and development of new processes and products, and the more constant is the outflow of innovations. Even though the enhancement of patents is not a perfect solution<sup>9</sup> – the issue being to resolve of who gets to own what, where, and for how long – the right of an exclusive use of the holders for some stipulated period of time and their simultaneous commitment to disclose information to the public about inventions have historically played an influential role in economic development. Notwithstanding the tricky balance between the competing objectives of intellectual property rights, the latter are likely to stimulate R&D, and thus are an important lubricant for the competitive process and economic growth<sup>10</sup>.

Economic growth theory is now able to show the mechanisms of endogenously produced technology and their importance for achieving sustainable growth. In such framework, firms are involved in some kind of innovations race: efficient though every firm may be, it is forced from the market to innovate if it wishes to survive. Such a view of the innovative process is in line with Schumpeter's thesis about the long-run economic development of the capitalist system, first as a consequence of entrepreneurial innovations, then of corporate innovations. As a corollary, here we are no more facing perfect competition, but rather some kind of monopolistic competition, and firms have incentives to set up many kinds of linkages regarding their technological advances: patents and licenses are there to facilitate these agreements among firms. In fact this innovative process appears to be run by managers who have strong incentive to follow up the innovation path rather than successful real-world entrepreneurs. Some even go thus far to argue that, because of the limited period of time, the patent holder would refrain from investing; it is also added that, because of external economies, incentives in R&D would be reduced, so that unless government pours subsidies into the process, R&D would not be Pareto-efficient in the long-run<sup>11</sup>. In contrast with this instrumentalist defense of R&D, patent races in the real world show that every innovative firm has an incentive in proving to be the first to create and produce new and more effective goods; this contradicts the alleged necessity of subsidies and bears evidence of the ability of patents to stimulate R&D through the private property rights they convey.

The endogenous economic growth model that has been surveyed in section 2 was based on horizontal products differentiation<sup>12</sup>. Every new good is added to the existing ones and widens the consumer's range of choice. Aghion and Howitt (1992) contributed to endogenous growth explanations: they extended Romer's model while giving to their argument the Schumpeterian perspective of the "creative destruction". According to them, economic growth is generated by a random sequence of innovations resulting from risky research activities and producing an increase in product quality. Therefore, discovering goods of higher quality pushes out goods of lower quality while the discovery of some new product erases the former monopolistic profit and creates a new temporary monopoly. This kind of entrepreneurial initiative

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<sup>9</sup> See Kremer (2002).

<sup>10</sup> The philosophical content of « property rights » and the nature of rights should deserve attention, especially when patents are construed as welfare-based regulations; some have been tempted going down this utilitarian sliding slope.

<sup>11</sup> Romer (1986)

<sup>12</sup> Dixit and Stiglitz (1977). This is an increase in the diversity of available goods.

and entry is part and parcel of a dynamic process in which each entrepreneur seeks to oust his rivals. In Aghion and Howitt's modeling, research is no more construed in a deterministic way, but it is a risky activity in the sense that it may be unproductive. This endogenous growth model is more in line with Schumpeter's view of entrepreneurship<sup>13</sup>.

Schumpeter regards profit as the incentive that stimulates entrepreneurship and sees in innovations a powerful phenomenon. Through his introduction of new products, new marketing methods, the opening up of new markets and supply sources, and new ways of organizing the enterprise, the entrepreneur is viewed as a destroyer of existing enterprises. These changes result in "creative destruction". The entrepreneur, as the agent of change, keeps the process going through innovations waves (or clusters).

Not only Schumpeter does not regard monopoly as an obstacle, but also he defines profit as the premium put upon a successful innovation and a reward which is temporary and vanishes in the subsequent process of competition and adaptation<sup>14</sup>. According to Schumpeter, the entrepreneur necessarily has aggressive characteristics and shows creativity as well as innovative ability; an individual is an entrepreneur when, acting for an anticipated personal gain, he moves an industry and the whole economy away from equilibrium. Successful entrepreneurship constitutes an economic shock and sets in motion destruction because it disrupts the existing plans of those in the displaced industry. Yet the destruction is creative. Innovative, creative entrepreneurs thus drive the continual technological change which is, to Schumpeter, the essence of capitalism. The author gives also the portrayal of the entrepreneur as a leader, in contrast with the "imitators". To Schumpeter, the entrepreneur should show boldness out of the ordinary, notably because it is hard to form and to deal with new schemes. Schumpeter's entrepreneur has the psychological qualities of self-confidence, innovative ability, and aggressiveness, all characteristics that encourage ignorance of the conventional wisdom and disruption of the old-fashioned way of living and doing things. These are specific as well as rare qualities<sup>15</sup>. The Schumpeterian entrepreneur is, in some way, a Promethean character showing obvious resemblance with Nietzsche's "superman"<sup>16</sup>.

The extension of endogenous growth theory paves the way to Schumpeter's entrepreneur. It integrates the idea that, to become an entrepreneur in that sense, the fulfillment of heavy investment in human capital is required<sup>17</sup>. It also welcomes

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<sup>13</sup> Schumpeter {1934 (1983)}.

<sup>14</sup> Schumpeter {1939 (1989)} and {1942 (1994)}.

<sup>15</sup> This near mythical figure is not really new. It finds its origin in some forerunners. Von Wieser already drew attention on the entrepreneurial role as a driving force of capitalism's evolution. Going further back, one should recall the French-Irish economist Richard Cantillon to whom Schumpeter dedicated a real admiration and who, for the first time in the history of economic thought, put forward the entrepreneur personage in his *Essai sur la nature commerce en général*, published in 1755.

<sup>16</sup> Schumpeter (1939) argued that innovations require « New Plant », operated in "New Firms" and implemented by "New Men". Later on (1942) he attempted to drop his assumption about "New Men" in emphasizing that "the social function [of the entrepreneur] is already losing its importance (...) [and] innovation itself is being reduced to routine" (p.132).

<sup>17</sup> This is not to say that, in these models, the government has no role in human capital formation; on the contrary government spending in massive schooling is considered as essential.

the idea that secure property rights and the rule of law have become important determinants of the economic development of nations<sup>18</sup>. In that vein, the enforcement of intellectual property rights, especially regarding patents and licenses, is admitted to provide strong incentives to owners to preserve the value of their assets. Not only property rights have a positive impact on physical capital formation, but also on human capital formation in disclosing new knowledge. The entrepreneurial insights change the nature of inputs as well as outputs: that new characteristics of goods may be discovered means that property rights are constantly created and abandoned. Therefore, associated with knowledge creation, the rights creation process is in itself open-ended, requiring both determination of new property rights and extension of property rights. It follows that the growth rate of new knowledge contributes to human capital formation and is itself correlated with the increasing investment in R&D and the corresponding number of innovations as it is calculated by the number of registered patents.

The theory of endogenous growth clearly sets off the idea that patents are likely stimulating innovations. In such framework, the Schumpeterian entrepreneur endorses the crucial role of being the driving force of change through registered patents that are viewed as the lubricant of the competitive process. The shift toward large corporations and trained management and bureaucratized R&D does not remove the positive impact of patents and licenses on innovation. Notwithstanding the insights of these explanations about growth and development, they don't tell the whole story. Even though patents registrations boomed in China since 1998 (especially from foreign patentees), they were plainly lagging behind the sharp increase in trademarks registrations from residents. Moreover, at the same levels of GDP, the numbers of trademarks registrations were far higher in China than in developed countries of the EU; yet in consideration of patents registrations, there is evidence of the reverse at the same levels of GDP. In other words, trademarks and brands appear to be a dynamic vector of growth in developing countries, so that there is room for another crucial role of the entrepreneur, different from the role assigned to him by Schumpeter.

## 6. The entrepreneurial process of change through trademarks

Economic growth models are based on the innovators' capabilities and R&D expenditures, which both involve massive investment in human capital. Moreover, emphasis is put on the place of government, which in affording schooling appears to be the *sine qua non* of human capital formation<sup>19</sup>. But is there any reason why such a process could not be undertaken by a heavily bureaucratized research machinery within a centrally-planned economy? If the heroic Schumpeterian entrepreneur appears at the origin of major breakthroughs, the role of the entrepreneurial insight

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<sup>18</sup> The exclusivity and transferability of private property rights are two major criteria that facilitate the assignment of significant relative values and the expansion of exchanges. See Alchian (1961) and Demsetz (1967).

<sup>19</sup> Lucas (1988) offers a formal framework where human capital is viewed as a factor of production. In a quite different context, Becker (1975) investigates the rationality of investing in human capital. Both approaches shed light on the positive relationship of human capital accumulation and economic growth. Endogenous growth models show that government spending in human capital formation is a determining factor of economic growth (Barro, 1990); therefore, in increasing the rate of schooling, the government is of the utmost importance in consideration to the formation of human capital.

*within* the competitive market process is widely underestimated. In fact, as it has been observed above, within the market process, firms make an increasing use of brands and trademarks as a dynamic competitive device.

At first sight, the place that trademarks take in economic growth does not seem so obvious, especially when growth is turned toward increasing quantities of outputs. Strictly speaking, brands and trademarks are not linked with inventions as are innovations in the Schumpeterian theory. While patents may be stimuli to innovate, property rights on trademarks are used for other purposes, in particular to stimulate product differentiation and business diversification. More generally, trademarks may cover a very broad range of activities and are closer to commercialization than are patents.

It is indeed uneasy to consider that, because they don't require a technological breakthrough, either words or logos or symbols are able to generate a real effect on growth and development, while the positive relationship of innovations and R&D with growth is no more to be proved. This is likely the reason why explanations of endogenous growth can be satisfied with using registered patents as a tool for assessing change in the economy, due to legal protection whose patentees benefit for their innovations. It seems that economic growth explanations have little to say about trademarks and branding activity and their relationship with the quality attributes of products, reputation, advertising, signaling changes and so forth. Yet undeniably all these features are the outcome of the emergence of profitable opportunities, and undisputedly they give evidence of the constant competitive nature of the market activities as well as the dynamic role of the entrepreneur through the diversification of goods and services and the multiplication of exchanges. Applications for trademarks registrations by residents boomed in China in the 90s. Even though the difference in the use of trademarks is to be questioned, the numbers of trademarks in this country were, as noticed above, far higher than they were in major member-states of the EU. One may admit that high and medium technology industries do use trademarks, but where applications for trademarks proliferate are the more likely the final consumer products and services sectors, that is to say all activities requiring marketing capabilities that are main ingredients in trade competitiveness.

While intellectual property rights as patents protection exercise an influence on investment incentives, intellectual property rights as trademarks are correlated with entrepreneurship in the Kirznerian sense rather than the Schumpeterian one. This kind of entrepreneurship, associated with freedom to enter markets in which there are unexploited opportunities for profit inspiring new activities, is part of a rivalry process where each entrepreneur seeks to outdo others in offering better deals to consumers. This is competition, based on discovery and awareness, and it is a matter of evolution rather than (industrial) evolution.

It is clear that, especially in many industries where there are high fixed costs and low marginal costs, firms invest heavily to develop their products; each firm seeks to leap over the leader's technology and to get a high market share, but as it was aforementioned, these are fragile monopolies or temporary market powers. Under permanent threat from innovative competitors, the market is contestable: despite high concentration in these industries, competition does exist. The striking fact is that even

if in the most successful emergent economies there is a growing importance of the innovation race in new technologies sectors, the prime form of competition, given the paramount importance of trademarks registrations by residents, is of another kind, revealing other market capabilities, notably the role of entrepreneurial insights. As Kirzner (1973) stresses, the “alertness to opportunities” is the hallmark of the entrepreneur.

The entrepreneurial character of human action will be all the more significant so as competition is intense. Competition in that sense shows the real dynamics of the market, which allows the selective process of who serves us the best and which urges every entrepreneur on being on his guard, *i.e* on being *alert* to hitherto unperceived existing opportunities<sup>20</sup>. As Kirzner explains, prices convey information in that they reveal discrepancies. The entrepreneurial role consists of alertly “discovering” where such discrepancies (“errors”) have occurred and to make clear what were the errors, and these discoveries are the very sources of opportunities. There, is no “destruction” in that way, since errors were “there”, but according to Kirzner, this entrepreneurship is the *sine qua non* of a market economy<sup>21</sup>. In such a view of the market process, trademarks registrations take up their room as they stimulate competition. Trademarks allow the *alert* entrepreneur, not to guarantee successful activity (only the market is able to reward entrepreneurial action), but to offer him the possibility of revealing his skills in detecting profit opportunities, and they allow also consumers to identify, and therefore to reward, talented entrepreneurs.

In propping entrepreneurial skills, brands and trademarks are themselves supported by advertising. It is usually argued that advertising is conveying and providing cheaper information to consumers than other means. According to the Kirznerian view of the market process, advertising mainly alerts consumers to the existence of unsuspected opportunities. Empirically, the *homo agens* may be characterized as knowing some things and not knowing others, so that the crucial issue is *ignorance*<sup>22</sup>. Yet, over time, he *discovers* things he was previously unaware and enlarges his range of choices. To face such new opportunity means that a consumer may discover some good for the first time: accordingly, advertising should not necessarily be viewed as changing tastes, but as revealing tastes to the hitherto unsuspecting consumer. Thus entrepreneurial *alertness* is coupled with entrepreneur’s ability to turn consumer’s attention to something he was hitherto unaware. The entrepreneur’s attempt to discover the actual set of consumer tastes, in widening the range of consumer’s choice, widens also the diversity in products offerings, so that product differentiation is the outcome of a high degree of competition. Advertising can thus be conceived as integral part of what Hayek (1968) referred to competition “as a discovery procedure”<sup>23</sup>.

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<sup>20</sup> Kirzner (1973)

<sup>21</sup> The essence of Kirznerian entrepreneurship is independent (but not incompatible) with the qualities of boldness and creativity (Kirzner, 2000, Chap. 13).

<sup>22</sup> Mises (1949) was first to consider the purposeful individual’s acts in a situation of widespread ignorance of the actual market conditions and man’s endeavour to overcome some uneasiness and to look for new possibilities.

<sup>23</sup> See Kirzner (1973).



“Discovery procedure” is not something that is limited to big firms and developed countries. It means that, in the open-ended universe, a process that stimulates the discovery of unknown opportunities is working effectively. This has nothing to do with industrial concentration and the threat of competitors. Nevertheless, competition as a discovery procedure is the essence of the market process and trademarks are primarily involved in this process, out of which there would be no difference with a centrally-planned economy.

## 7. Trademarks precedence

The contrast between Schumpeter’s view and Kirzner’s view triggered of numerous and various, even conflicting comments<sup>24</sup>. Here we are not determined to enter fully into this debate. However, our analysis on trademarks and patents is in line with Kirzner when he asserts: “*the Schumpeterian view of the entrepreneurial role and my own view can both be simultaneously accepted (...). My own focus on the entrepreneurial role was inspired by the objective of enabling us to see the inside workings of the capitalist system*”<sup>25</sup>. Our purpose is not to comment on the equilibrating properties of entrepreneurial activity<sup>26</sup>, but rather to stress the precedence of Kirznerian entrepreneurship over Schumpeterian entrepreneurship in two important ways.

(a) From the diagrams above commented, it is strongly suggested that, as in emergent developing countries – especially the most dynamic ones – the trademarks booming comes before the patents expansion, Kirznerian entrepreneurship precedes Schumpeterian entrepreneurship. The Kirznerian entrepreneurial insight is the big part of the first stages of economic growth in free-market economies. The trend of trademarks registrations by residents in China during the 90s was correlated with free-market and “competition as a discovery procedure”, based on entrepreneurial insight. Entrepreneurs flourish within market institutions such as property rights, and correspondingly trademarks proliferate with the decentralized form of a free-market economy.

Enhanced trademark protection helps to generate differentiation of entrepreneurs on the marketplace. It does not only allow widening of the range of market products, but it also urges quality competition and investment in brand name capital and trust. As they exacerbate the skills of the profit-making entrepreneur – as opposite to the rent-seeking entrepreneur –, trademarks contribute positively to the founding of the competitive procedure and to its keeping. In the first stages of economic growth, Kirzner’s entrepreneur comes chronologically before Schumpeter’s innovator entrepreneur, all the more so as the former is neither a human being of exception nor an engineer. In China, as we noticed, the boom in trademarks registrations came mainly from residents, or “people on the spot”. Here we are facing the Hayekian “knowledge problem”: it is the problem that not everyone knows everything. We have

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<sup>24</sup> See Kirzner (2000), Chap. 13.

<sup>25</sup> Kirzner (2000), Chap. 13, p. 254.

<sup>26</sup> One of Kirzner’s reiterated propositions is set up in these terms: «For understanding the equilibrium tendencies of markets in general, my own view of the entrepreneur as alert to opportunities (...) is valid and significant” (Kirzner, 2000, Chap. 13, p. 240 and p. 253).

to take into account first that a consumer's preferences are generally unknown to others until he discloses them by choosing one product or service against another, and second that every individual has the private knowledge of being in a unique location of place and time. The quality of much economic knowledge is related to its private nature. Moreover, tacit and private knowledge are radically different from scientific knowledge. Only the *alert* individual person, *i.e.* Kirzner's entrepreneur, is able to detect this unique relevant information and may have an incentive to catch this profit opportunity in discovering the consumers' needs.

In the light of this Austrian theory, the function of the market is to overcome this knowledge problem in enabling market participants to take advantage of available unperceived opportunities for mutually gainful exchanges. Therefore it is arguable to assert that the take-off of economic growth in a developing country cannot be achieved in the market system if the way to solve the knowledge problem is not implemented. In this way, the *alert* entrepreneur assumes a crucial role, well before the coming of the innovator entrepreneur, and in close relationship with this kind of entrepreneurship trademarks registrations prove their time precedence over patents registrations.

(b) This sequential approach of the coming first of the Kirznerian entrepreneur, and afterwards the Schumpeterian entrepreneur does not cast in doubt on the possible coexistence of both types of entrepreneurs, as well as it does not question the possible further coexistence of trademarks and technological innovation. Indeed, China's data show that the numbers of patents from residents sharply increased since 1996, while the numbers of trademarks registrations were simultaneously and continuously increasing. At higher levels of GDP, in developed countries, the numbers of patents registrations are, as if they were a switching, plainly higher than in emergent developing countries, while the number of trademarks registrations is lower than in emergent developing countries. Yet, not only trademarks registrations do not disappear in the presence of the impressive technological advances, but they do represent a significant weight in the growth process<sup>27</sup>. The innovator entrepreneur does not oust the Kirznerian entrepreneur: both kinds of skills are added and combined within a cumulative growth process where competition as a discovery procedure is once again a vital condition of the market system. Here, the precedence of trademarks means that the Kirznerian entrepreneurial insight remains the most relevant cause of the capitalism's success, rather than scientific knowledge and the correlated patents and licenses.

The argument here is not of course to deny that scientific knowledge may be embedded in business firms as it is in universities. Some rightly argue that innovation today is not so much radical as it is under the elitist Schumpeterian entrepreneur's thumb; it is rather incremental, that is more in line with the last view on entrepreneurship that Schumpeter offered in 1942 {1994} where the heroic leader is

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<sup>27</sup> There seems to be a positive correlation between the use of patents and the use of trademarks, which is empirically worthy of further research. However, assuming that, with the help of the usual technical tests, such correlation is fairly proved, this would not allow to substitute trademarks for patents in the (neoclassical) endogenous growth models, because the latter in privileging scientific knowledge and routinized R&D don't make way for the real driving forces of the market process, that is the entrepreneurial acts that really separate the market system from other type of economic organisation.

replaced by the professional teams of the large corporations. Evenson (1984) holds that R&D is mainly the field of “innovation through adaptation”. That means that, as the endogenous growth theory later explained, innovative ideas depend upon knowledge and human capital, which become, as afore-mentioned, the critical factor of economic progress. However, what makes the difference between the market system and a centrally-planned economy is not noticeable.

One could say that behind patents prevails the institutional dimension of property law and contracts, which – as opposed to policy wishes – guide decision-makers and reduce transaction costs of commercial activity. Yet this alone would be an incomplete driving force of the market. The process through which good ideas are introduced into the market-place, and become marketable and commercially viable products and services, requires the revelation of that sort of individual (subjective) perception of costs and benefit that describes the discovery procedure. In other words, it requires the cultivation of that aspect of human action which is *alert* to profit opportunities.

## **8. Conclusion**

Within the market order, social institutions are crucial in serving to facilitate coherence of a process which is inherently rivalry and competitive. Private property rights and contracts are part of such institutional framework that, in reducing transaction costs of commercial activity, create the necessary conditions for economic progress and growth. Although we did not deal here with the ultimate source of “intellectual property”, we have been considering intellectual property rights as part of this legal and institutional framework which allows discovery and the implementation of new local technology. Much of the focus of the endogenous growth theory is today related with those intellectual property rights that stimulate invention creativity and technological innovation, and that make of knowledge and human capital the engine of economic progress and growth. According to that view, either the former elitist Schumpeterian entrepreneur or the later Schumpeterian firm organization integrating anonymous routine-like innovativeness and bureaucratized activity, is viewed as the essence of the market. The indicators of patents registrations, either in developing or developed countries, seem to give relevance to such argument. However, another category of intellectual property rights, namely trademarks, has been plainly ignored. The contrasting facts are that (1) at the former stages of economic growth the numbers of trademarks registrations from residents are far higher than the numbers of patents registrations, and (2) at further stages of development, even though there is a switching in the trends, as patents registrations seem to increase faster than trademarks registrations, the latter are far from being negligible. In this paper an attempt has been made to show why trademarks registrations are and remain the significant and relevant indicator of economic progress in the market system.

Trademarks are inescapably an integral aspect of the market economy. The precedence of trademarks means that, even though at some stage in the growth path, and especially at the highest levels of GDP, the Schumpeterian entrepreneur and the Kirznerian entrepreneur are combined, the former does not oust the latter in the growth process of the capitalist system. Differently and more than complementariness between the two types of entrepreneurs, the precedence of trademarks over patents is meant to argue that the Kirznerian entrepreneurial insight within the market process is and remains the relevant cause of the capitalism success. In focusing on scientific knowledge and routine-like R&D, the endogenous growth models don't make room for the real entrepreneurial acts that represent the driving forces of the market process. One may presume that the exclusion of trademarks in the mainstream growth theory is not simply neglect but methodological limitation.

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### Annex 1a:

Products and services classification	Application for registration				Registration			
	Residents	Foreigners		Total	Residents	Foreigners		Total
		Application (China)	Application (Madrid)			Application (China)	Application (Madrid)	
1	8486	1095	326	9907	4140	660	436	5236
2	5937	437	111	6485	2957	240	163	3360
3	13685	1676	611	15972	5505	775	707	6987
4	2846	258	73	3177	1394	231	104	1729
5	22621	1625	586	24832	7448	1020	788	9256
6	8376	613	250	9239	3982	278	334	4594
7	15411	1391	412	17214	7596	696	549	8837
8	2788	294	151	3233	2124	269	182	2575
9	26851	3766	1160	31777	17961	2742	1302	22005
10	3623	664	241	4528	1913	463	305	2681
11	15661	976	371	16908	10619	722	455	11796
12	10038	1006	282	11326	6660	579	310	7549
13	767	46	19	832	621	51	31	703
14	3986	730	339	5055	1556	356	400	2345
15	870	186	31	1087	539	97	47	683
16	9389	1405	533	11327	5085	987	639	6711
17	3160	392	160	3712	1641	256	207	2104
18	8584	1092	426	10102	2857	486	502	3847
19	9898	398	172	10468	5503	262	214	5979
20	7432	592	270	8294	3701	326	321	4348
21	4939	608	237	5784	2653	366	282	3309
22	1410	162	62	1634	853	106	78	1037
23	1692	152	45	1889	1052	101	50	1203
24	5847	597	190	6634	3947	392	228	4567
25	61632	2917	755	65304	24070	1159	766	25995

26	2277	175	56	2508	802	108	66	976
27	1158	175	90	1423	534	101	92	727
28	5273	1126	286	6685	2489	651	353	3493
29	16635	736	209	17580	13179	569	287	14035
30	25780	1367	351	27498	14893	1005	416	16314
31	9242	334	115	9691	5427	234	139	5800
32	9100	560	218	9878	3622	264	291	4177
33	13316	293	222	13831	8332	260	237	8827
34	2784	222	87	3093	2977	283	122	3382
35	14510	1121	546	16177	5787	666	668	7115
36	4835	404	222	5461	1763	325	260	2348
37	5293	489	283	6065	2290	332	351	2973
38	2853	392	335	3580	1496	382	378	2256
39	4181	265	195	4641	2074	247	235	2556
40	2775	286	144	3205	1837	252	158	2247
41	7481	1106	433	9020	408	828	563	5409
42	5938	888	677	7503	3764	706	850	5320
43	10771	549	117	11437	2007	117	139	2263
44	4651	266	115	5032	2066	189	160	245
45	988	80	49	1067	350	49	55	454
Total	405620	33912	12563	452095	206070	21188	15253	242511

**STATISTIQUES DES DEPOS ET ENREGISTREMENTS DES MARQUES PAR CLASSE (2003)**

*Source : CTNO (China Trademarks National Office)*

**Annex 1b**

**Class Headings**

- Class 1** Chemicals used in industry, science and photography, as well as in agriculture, horticulture and forestry; unprocessed artificial resins, unprocessed plastics; manures; fire extinguishing compositions; tempering and soldering preparations; chemical substances for preserving foodstuffs; tanning substances; adhesives used in industry.
- Class 2** Paints, varnishes, lacquers; preservatives against rust and against deterioration of wood; colorants; mordants; raw natural resins; metals in foil and powder form for painters, decorators, printers and artists.
- Class 3** Bleaching preparations and other substances for laundry use; cleaning, polishing, scouring and abrasive preparations; soaps; perfumery, essential oils, cosmetics, hair lotions; dentifrices.
- Class 4** Industrial oils and greases; lubricants; dust absorbing, wetting and binding compositions; fuels (including motor spirit) and illuminants; candles and wicks for lighting.
- Class 5** Pharmaceutical and veterinary preparations; sanitary preparations for medical purposes; dietetic substances adapted for medical use, food for babies; plasters, materials for dressings; material for stopping teeth, dental wax; disinfectants; preparations for destroying vermin; fungicides, herbicides.
- Class 6** Common metals and their alloys; metal building materials; transportable buildings of metal; materials of metal for railway tracks; non-electric cables and wires of common metal; ironmongery, small items of metal hardware; pipes and tubes of metal; safes; goods of common metal not included in other classes; ores.
- Class 7** Machines and machine tools; motors and engines (except for land vehicles); machine coupling and transmission components (except for land vehicles); agricultural implements other than hand-operated; incubators for eggs.
- Class 8** Hand tools and implements (hand-operated); cutlery; side arms; razors.

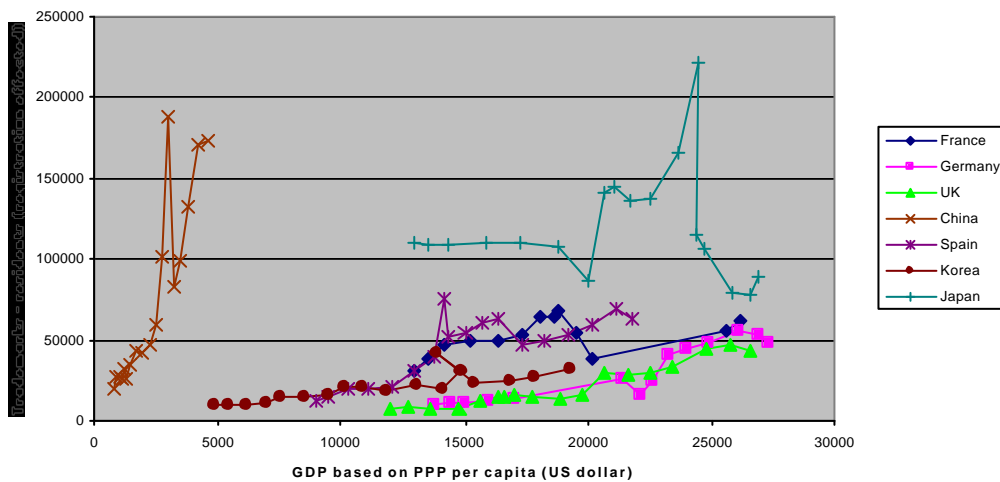


- Class 9** Scientific, nautical, surveying, photographic, cinematographic, optical, weighing, measuring, signalling, checking (supervision), life-saving and teaching apparatus and instruments; apparatus and instruments for conducting, switching, transforming, accumulating, regulating or controlling electricity; apparatus for recording, transmission or reproduction of sound or images; magnetic data carriers, recording discs; automatic vending machines and mechanisms for coin-operated apparatus; cash registers, calculating machines, data processing equipment and computers; fire-extinguishing apparatus.
- Class 10** Surgical, medical, dental and veterinary apparatus and instruments, artificial limbs, eyes and teeth; orthopedic articles; suture materials.
- Class 11** Apparatus for lighting, heating, steam generating, cooking, refrigerating, drying, ventilating, water supply and sanitary purposes.
- Class 12** Vehicles; apparatus for locomotion by land, air or water.
- Class 13** Firearms; ammunition and projectiles; explosives; fireworks.
- Class 14** Precious metals and their alloys and goods in precious metals or coated therewith, not included in other classes; jewellery, precious stones; horological and chronometric instruments.
- Class 15** Musical instruments.
- Class 16** Paper, cardboard and goods made from these materials, not included in other classes; printed matter; bookbinding material; photographs; stationery; adhesives for stationery or household purposes; artists' materials; paint brushes; typewriters and office requisites (except furniture); instructional and teaching material (except apparatus); plastic materials for packaging (not included in other classes); printers' type; printing blocks.
- Class 17** Rubber, gutta-percha, gum, asbestos, mica and goods made from these materials and not included in other classes; plastics in extruded form for use in manufacture; packing, stopping and insulating materials; flexible pipes, not of metal.
- Class 18** Leather and imitations of leather, and goods made of these materials and not included in other classes; animal skins, hides; trunks and travelling bags; umbrellas, parasols and walking sticks; whips, harness and saddlery.
- Class 19** Building materials (non-metallic); non-metallic rigid pipes for building; asphalt, pitch and bitumen; non-metallic transportable buildings; monuments, not of metal.
- Class 20** Furniture, mirrors, picture frames; goods (not included in other classes) of wood, cork, reed, cane, wicker, horn, bone, ivory, whalebone, shell, amber, mother-of-pearl, meerschaum and substitutes for all these materials, or of plastics.
- Class 21** Household or kitchen utensils and containers (not of precious metal or coated therewith); combs and sponges; brushes (except paint brushes); brush-making materials; articles for cleaning purposes; steelwool; unworked or semi-worked glass (except glass used in building); glassware, porcelain and earthenware not included in other classes.
- Class 22** Ropes, string, nets, tents, awnings, tarpaulins, sails, sacks and bags (not included in other classes); padding and stuffing materials (except of rubber or plastics); raw fibrous textile materials.
- Class 23** Yarns and threads, for textile use.
- Class 24** Textiles and textile goods, not included in other classes; bed and table covers.
- Class 25** Clothing, footwear, headgear.
- Class 26** Lace and embroidery, ribbons and braid; buttons, hooks and eyes, pins and needles; artificial flowers.
- Class 27** Carpets, rugs, mats and matting, linoleum and other materials for covering existing floors; wall hangings (non-textile).
- Class 28** Games and playthings; gymnastic and sporting articles not included in other classes; decorations for Christmas trees.
- Class 29** Meat, fish, poultry and game; meat extracts; preserved, dried and cooked fruits and vegetables; jellies, jams, compotes; eggs, milk and milk products; edible oils and fats.

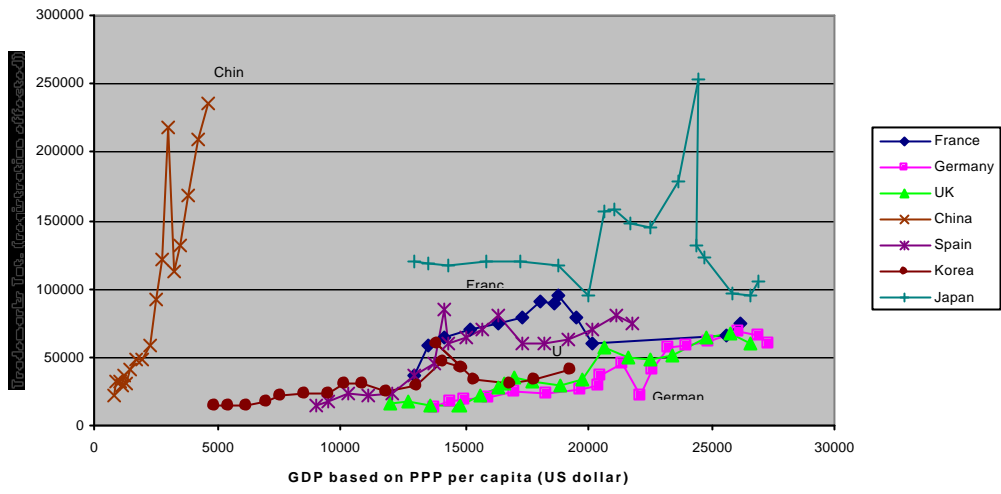
- Class 30** Coffee, tea, cocoa, sugar, rice, tapioca, sago, artificial coffee; flour and preparations made from cereals, bread, pastry and confectionery, ices; honey, treacle; yeast, baking-powder; salt, mustard; vinegar, sauces (condiments); spices; ice.
- Class 31** Agricultural, horticultural and forestry products and grains not included in other classes; live animals; fresh fruits and vegetables; seeds, natural plants and flowers; foodstuffs for animals, malt.
- Class 32** Beers; mineral and aerated waters and other non-alcoholic drinks; fruit drinks and fruit juices; syrups and other preparations for making beverages.
- Class 33** Alcoholic beverages (except beers).
- Class 34** Tobacco; smokers' articles; matches.
- Class 35** Advertising; business management; business administration; office functions.
- Class 36** Insurance; financial affairs; monetary affairs; real estate affairs.
- Class 37** Building construction; repair; installation services.
- Class 38** Telecommunications.
- Class 39** Transport; packaging and storage of goods; travel arrangement.
- Class 40** Treatment of materials.
- Class 41** Education; providing of training; entertainment; sporting and cultural activities.
- Class 42** Scientific and technological services and research and design relating thereto; industrial analysis and research services; design and development of computer hardware and software; legal services.
- Class 43** Services for providing food and drink; temporary accommodation.
- Class 44** Medical services; veterinary services; hygienic and beauty care for human beings or animals; agriculture, horticulture and forestry services.
- Class 45** Personal and social services rendered by others to meet the needs of individuals; security services for the protection of property and individuals.

## Annex 2:

**Trademarks (residents)/GDP**

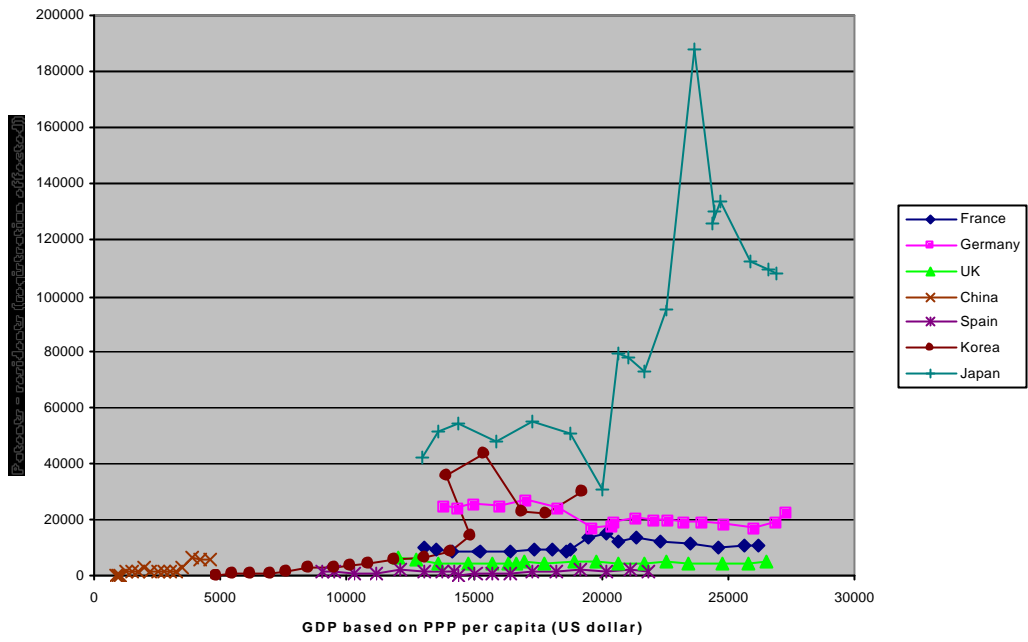


### Trademarks Tot./GDP

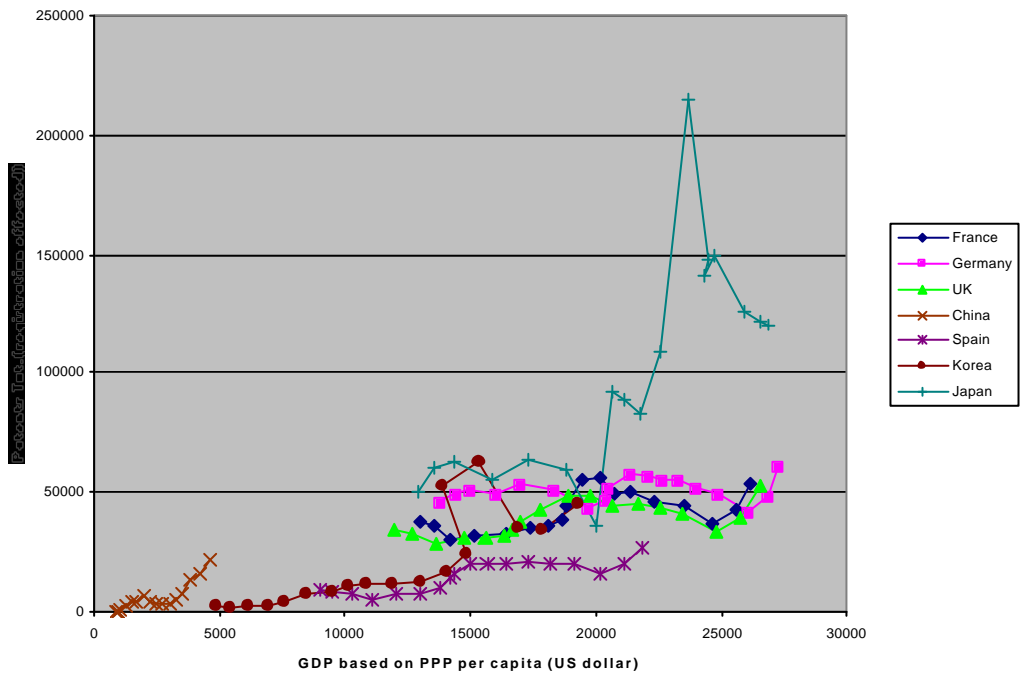


Sources: WIPO, ECONSTATS

Patent residents/GDP



PatentsTot./GDP



Sources : WIPO, ECONSTATS