

# Are Trademarks and Patents Complementary or Substitute Protections for Innovation?

Patrick Llerena

Valentine Millot

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# Motivation

- IP rights are one major component of firms' strategies to appropriate the benefits of innovation. Patents are one obvious appropriability means, but not the only one.
- Trade marks (TM) can constitute an other appropriability means
  - TM used to launch new products, as a basis for advertising
  - TM used as barrier to entry (consumers likely to remain loyal to pioneer brand)
- TM often associated to other protection means : secrecy (*Coca-Cola*), lead-time, or patents (pharmaceutical industry) (Davis 2006, surveys on appropriability)
  - Are those various tools complementary ?

# Purpose of the model

- Previous literature investigating the possible complementarity between different types of IPRs (Graham & Somaya 2006, von Graevenitz & Sandner 2009)
- But those studies do not look at the interaction effects of IP rights in their core function as legal protection devices.

Yet patent and TM protections are likely to reinforce each other

# Purpose of the model

- Our approach: Are TM and patents intrinsically interdependent?

Underlying asset considered as given

In terms of optimal IPR strategy: do TM and patents interact with each other and how?

Implies to model the effect of the various IPRs

- Theoretical + empirical analysis

# Theoretical Model

# The Model – General Framework

- Basic framework

One market for an innovative product

The product can be imitated by competitors instantly -  
Maximum one imitating firm – Cournot duopoly

Each firm may incur advertising expenditure, which contribute to building their goodwill stock, in a dynamic framework

Advertising expenditure are not totally appropriable by firms and are subject to spillovers (Friedman 1983)

# The Model – General Framework

- Model dynamics

Pioneer firm appears by innovating in product (creation of a new market)

The firm chooses to register a patent, or a TM, or both, or nothing

Competition starts either in  $t=0$  if no patent, or in  $t=T$ , length of the patent

The firms choose production and advertising levels

The firms start advertising and selling the product

# Model Specifications

- Goodwill evolution (Nerlove & Arrow 1962):

$$G_2 = a_2 + (1 - \delta)G_1$$

- Total amount of goodwill benefiting the leader in each period:

$$G_t + \bar{s}\bar{G}_t$$

- Inverse demand function:

$$P_t = \alpha - \beta(Q_t + \bar{Q}_t) + \tau\sqrt{G_t + \bar{s}\bar{G}_t}$$

- Objective function:

$$\max V = (P_1 - c)Q_1 - a_1 + r[(P_2 - c)Q_2 - a_2]$$

# Modelling IPR effect

- Patent effect:

Gives monopoly power to the leader in the first period

# Modelling IPR effect

- Trademarks:

*“Any sign, or any combination of signs, capable of distinguishing the goods or services of one undertaking from those of other undertakings, shall be capable of constituting a trademark” (TRIPs Art. 15)*

# Modelling IPR effect

- TM effect: Increases the level of appropriability of advertising expenditure

TM legally prevent other parties from benefiting from the reputation built by the firm by creating confusion on the origin of the product

If the leader does not register a TM, its goodwill has the characteristics of a public good : the rate of advertising spillovers benefiting the follower is equal to 1.

If the leader registers a TM, the rate of advertising spillovers benefiting the follower is equal to  $s < 1$ .

# Modelling IPR effect

- Key assumption: The reputation of the product during the monopoly period coincides with the reputation of the monopoly brand

If the leader files both a TM and a patent, advertising expenditure incurred during the patent period benefit only its own reputation (no spillovers from first period)

# Modelling IPR effect

- Goodwill of the leader and of the follower in second period, depending on the leader's IPR strategy:

		TM	No TM
PAT	Leader	$(1 - \delta) a_1 + a_2 + \overline{sa_2}$	
	Follower	$\overline{a_2} + sa_2$	$\overline{a_2} + (1 - \delta) a_1 + a_2$
No PAT	Leader	$a_2 + (1 - \delta) a_1 + \overline{s} (\overline{a_2} + (1 - \delta) \overline{a_1})$	
	Follower	$\overline{a_2} + (1 - \delta) \overline{a_1} + s (a_2 + (1 - \delta) a_1)$	$\overline{a_2} + (1 - \delta) \overline{a_1} + a_2 + (1 - \delta) a_1$

# Methodology

- Determine leader and follower's optimal advertising and production levels, depending on the IPR strategy choices:

no TM – no PAT	no TM – PAT
TM – no PAT	TM – PAT

- Calculate resulting intertemporal profits  $V$
- Determine complementarity or substitutability of TM and patents, using the supermodularity approach:

$$V^{TM,PAT} - V^{0,PAT} > ? < V^{TM,0} - V^{0,0}$$

- This amounts to comparing the benefit of filing a TM in the case of patent protection and in the case without patent

# Results

- Interpretation: the interaction between patents and TM is characterised by two counterbalancing effects

Substitutability effect: TM benefits the firm only when it faces competition, thus less advantageous when the firm has also a patent (if patent protection was infinite in time, the benefit of filing a TM would be null)

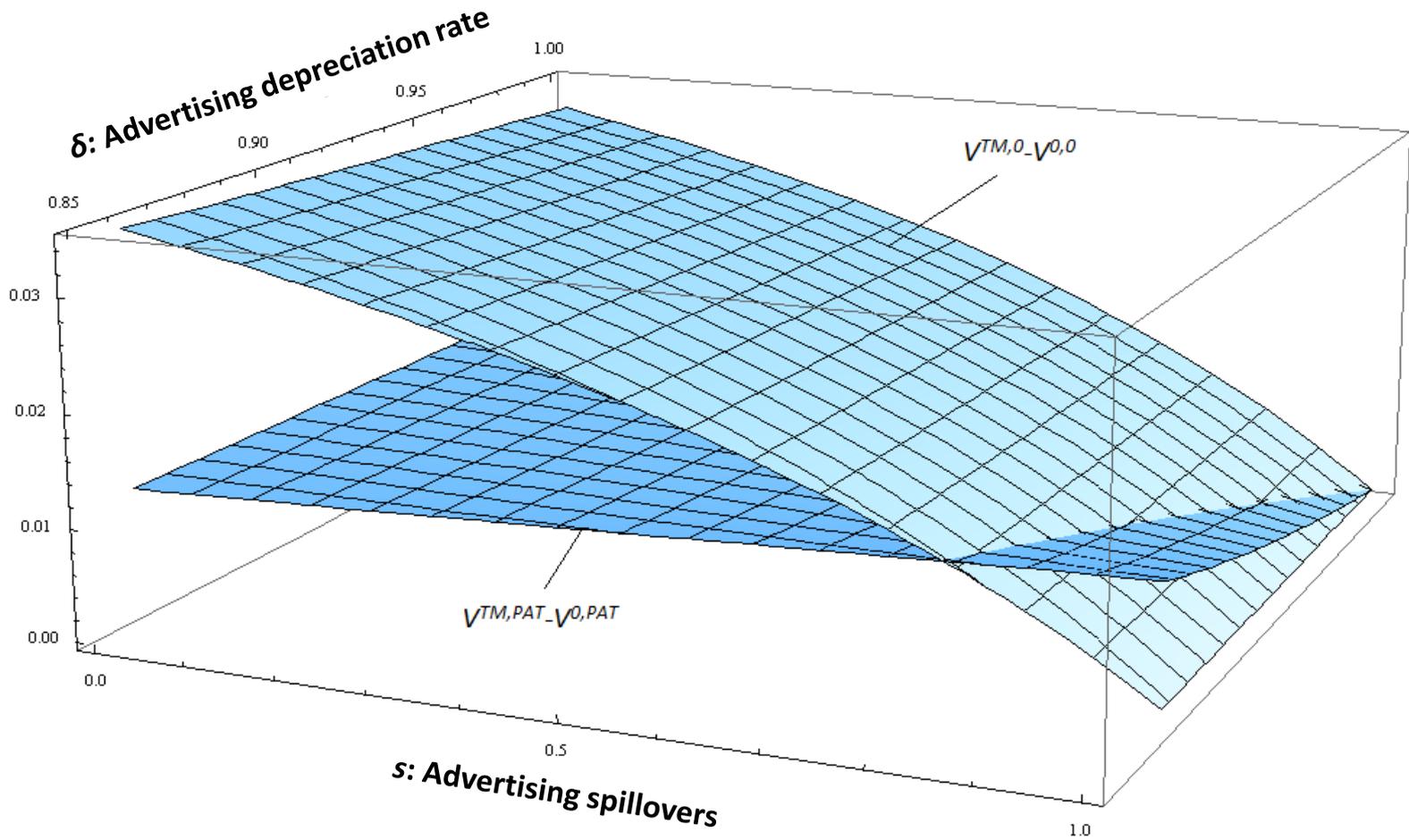
Complementarity effect: TM makes it possible to capture entirely the goodwill built during the monopoly period. TM benefits in the second period are all the more important if the firm had a patent in first period

Depending on the characteristics of the market, the first effect or the second effect is predominant

# Results

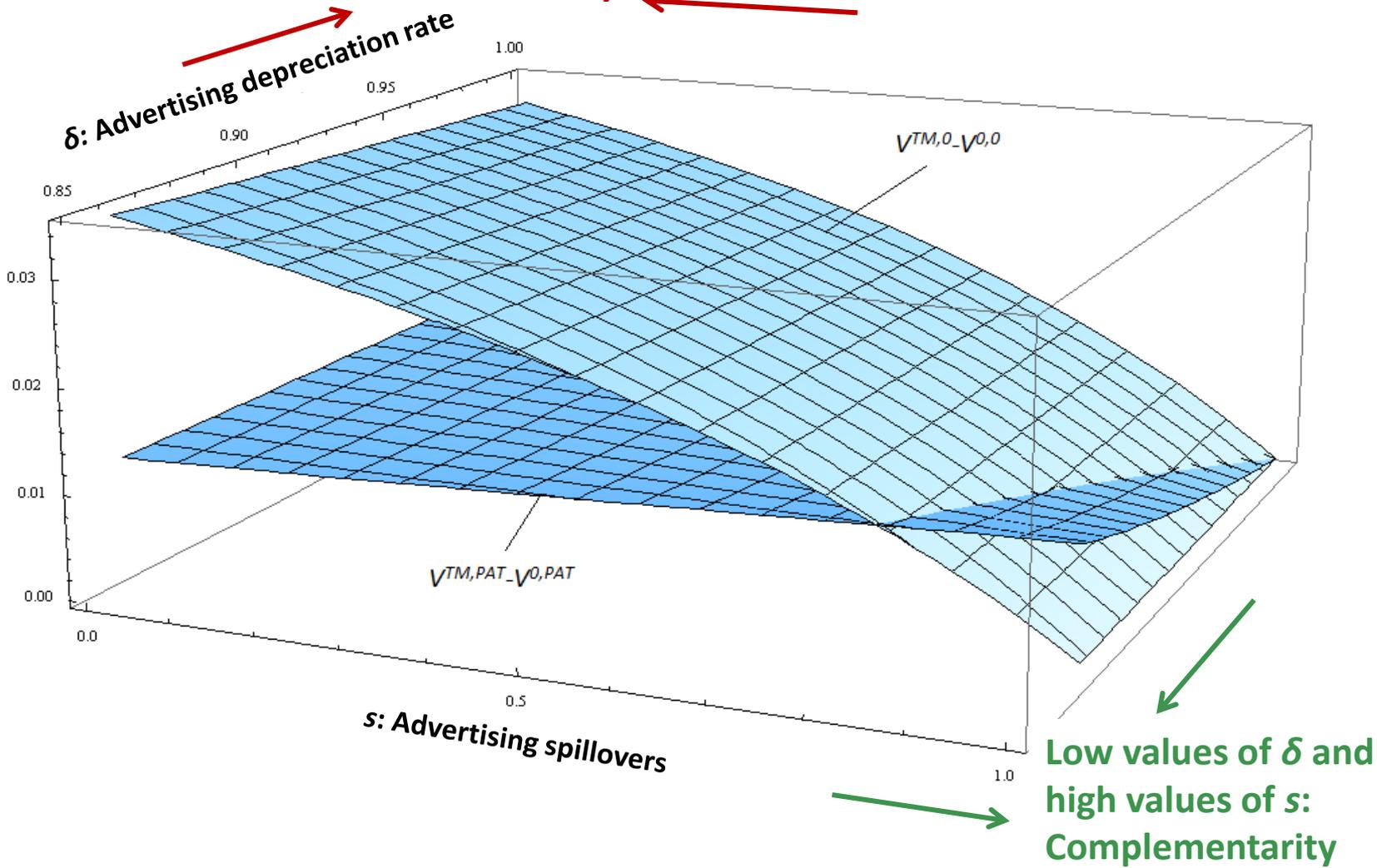
- The complementarity TM-patent is increasing with the level of spillovers in case of TM protection and decreasing with the depreciation rate of advertising
- Depending on the level of those exogenous parameters, TM and patents are found to be complementary or substitute.

# Results



# Results

High values of  $\delta$  and  
low values of  $s$ :  
Substitutability



# Empirical application

# Methodology – Model specifications

- **1<sup>st</sup> step**: Firm performance model

Market value approach:  $V = qA$ ,

$V$  = firm current market value,  $A$  = current value of firm's total assets

$q$  depends on firm's IPR strategy

*1<sup>st</sup> specification:*

$$\ln(V_t) = \beta_1(1_{0-0}) + \beta_2(1_{TM-0}) + \beta_3(1_{0-PAT}) + \beta_4(1_{TM-PAT}) + \gamma \ln(A_t)$$

*2<sup>nd</sup> specification:*

$$\ln(V_{t=1}) = \ln(V_{t=0}) + \beta_1(1_{0-0}) + \beta_2(1_{TM-0}) + \beta_3(1_{0-PAT}) + \beta_4(1_{TM-PAT}) + \gamma \ln(A_{t=1}) - \gamma \ln(A_{t=0})$$

- **2<sup>nd</sup> step**: Complementarity test

One-sided Student's t test:  $H_0 : \beta_1 - \beta_2 - \beta_3 + \beta_4 \geq 0$

# Data

- Sample of 785 French publicly-traded firms
- Accounting and financial variables retrieved from ORBIS©
- Matched with patents and trademarks applications at INPI, EPO and OHIM between 1998 and 2007
- Various sectors represented (59% services, 41% manufacturing)
- 1<sup>st</sup> specification:
  - Firm's market value and assets in 2007
  - Stock of trademarks and patents applied between 1998 and 2007
- 2<sup>nd</sup> specification:
  - Firm's market value and assets in 2007 and 2005
  - Stock of trademarks and patents applied in 2006-2007

# Results - total sample

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable : ln (Market Value 2007)						
ln (Total Assets 2007)	0.915** (0.010)		0.914** (0.010)	0.914** (0.010)	0.937** (0.014)	0.879** (0.031)
1 <sub>0,0</sub> (98-07)				-5.793** (0.162)	-6.111** (0.196)	
1 <sub>0,PAT</sub> (98-07)		0.061 (0.449)	0.079 (0.150)	-5.715** (0.220)	-6.192** (0.199)	
1 <sub>TM,0</sub> (98-07)		0.673** (0.206)	0.184** (0.045)	-5.609** (0.160)	-5.898** (0.188)	
1 <sub>TM,PAT</sub> (98-07)		1.488** (0.263)	0.254** (0.051)	-5.540** (0.164)	-5.838** (0.195)	
age			-0.001* (0.000)	-0.001* (0.000)	-0.001 (0.001)	0.000 (0.000)
ln(MV2005)					0.735** (0.042)	
ln (Total Assets 2005)					-0.631** (0.047)	
1 <sub>0,0</sub> (06-07)					-1.409** (0.293)	
1 <sub>0,PAT</sub> (06-07)					-1.407** (0.296)	
1 <sub>TM,0</sub> (06-07)					-1.380** (0.289)	
1 <sub>TM,PAT</sub> (06-07)					-1.334** (0.284)	
constant	-5.712** (0.138)	4.646** (0.933)	-5.793** (0.162)			
N	785	785	785	785	556	556
R-sq	0.960	0.220	0.962	0.994	0.995	0.998

1 <sub>TM,0</sub> > 1 <sub>0,0</sub>	4.10**	0.92
1 <sub>0,PAT</sub> > 1 <sub>0,0</sub>	0.53	0.03
1 <sub>TM,PAT</sub> > 1 <sub>0,0</sub>	4.96**	1.64+
1 <sub>TM,PAT</sub> > 1 <sub>0,PAT</sub>	1.22	1.03
1 <sub>TM,PAT</sub> > 1 <sub>TM,0</sub>	1.64+	1.04
Complementarity test: one-sided Student test (t statistics): $H_0 : 1_{TM,PAT} - 1_{0,PAT} > 1_{TM,0} - 1_{0,0}$		
	-0.06	0.58

One-sided t-test critical values - H0 rejected if:

	$H_0: x \leq 0$	$H_0: x \geq 0$
<b>5%</b>	$t > 1.645$	$t < -1.645$
<b>10%</b>	$t > 1.282$	$t < -1.282$

# Results - specific sectors

	(1) Pharma & Chemicals	(2) Pharma & Chemicals	(4) Computer & elec. equipment	(5) Computer & elec. equipment
One-sided Student test: t statistic				
$1_{TM,0} > 1_{0,0}$	1.22	-0.58	1.01	-1.24
$1_{0,PAT} > 1_{0,0}$	0.07	-2.46**	0.64	3.45**
$1_{TM,PAT} > 1_{0,0}$	1.92*	0.30	1.30+	0.33
$1_{TM,PAT} > 1_{0,PAT}$	6.00	3.60**	0.77	-2.83**
$1_{TM,PAT} > 1_{TM,0}$	1.53+	1.55+	0.49	1.36+
Complementarity test: $H_0 : 1_{TM,PAT} - 1_{0,PAT} > 1_{TM,0} - 1_{0,0}$				
	0.51	2.83**	-0.36	-1.86*
		Compl. (0.01 level)		Substitut. (0.05 level)

One-sided t-test critical values -  $H_0$  rejected if:

	$H_0: x \leq 0$	$H_0: x \geq 0$
<b>5%</b>	$t > 1.645$	$t < -1.645$
<b>10%</b>	$t > 1.282$	$t < -1.282$

# Conclusion (1)

- Patents and TM are intrinsically interrelated : the protection of technological assets has an impact on the protection of reputational assets

# Conclusion (2)

- The outcome of this interrelation -complementarity or substitutability- is not straightforward. The interaction between the two IP rights is characterized by two counterbalancing effects:

A temporal substitutability effect: the patent period reduces the time during which the firm faces competition and needs TM to protect its reputation against other firms

A complementarity effect: the TM enables the firm to extend the reputational benefits of the monopoly period beyond the expiration of the patent.

The predominant effect depends on exogenous parameters, especially the level of advertising spillovers in case of TM protection, and of advertising depreciation rate.

# Conclusion (3)

- Optimal IP rights strategy may then vary from one context to another

In sectors such as microelectronics where products tend to depreciate rapidly and where technology is not well codified (so that advertising is above all advertising for the brand), patents and TM are likely to be substitutes.

In sectors such as pharma where the life cycle of products tends to be long and where technology is well codified (so that advertising performed by firms is likely to benefit the product in general), patents and TM tend to be complementary.

- Teece 1986 : Appropriability of innovation depends on the possibility to use complementary assets. → **the relationship between the assets may also vary according to context**

# Conclusion (4)

- Twofold implications:

Firm IPR management: benefit of using different types of IPRs depends on the context in which the firm is operating – beyond the question of availability of the various IPRs, benefits and costs of the various combinations have to be examined

Economic analysis : IPR strategies of firms are not homogeneous. This should be taken into account whenever looking at firm portfolios

Thank you!

[valentine.millot@oecd.org](mailto:valentine.millot@oecd.org)