# Trademarks and firm competitiveness: an empirical analysis of the world top R&D spending companies

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# The Impact of Import Competition on Firm Strategies

- in the last few decades, trade liberalization and the rise of China have created new challenges and opportunities for Europe and G7 countries

- successful firms have responded by adopting strategies such as:
  - quality upgrading (Khandelwal 2010; Amiti & Khandelwal 2013; Fernandes & Paunov 2016)
  - product and process innovation (Gorodnichenko et al. 2010), patenting and adoption of new technology (Bloom et al. 2016)
  - focusing on core products and skill upgrading (Mayer et al. 2014; Utar 2014)
  - moving from goods production to the provision of services (Breinlich et al. 2019)

Most of these strategies leverage on innovation and intangible assets

# Intangible Assets and Firm Competitiveness

- intangible assets (e.g. brands, knowledge, skills, . . . ) are playing an even increasing role in defining the competitiveness of firms and countries, as well as drivers of productivity
  - ≫ intangibles are less likely to be appropriated by other firms
  - ≫ intangibles especially important in global value chains, where most of the value accrues to non-manufacturing stages of production (design, after-sale services,. . . )
- intangibles capture an increasing share of value added ($\approx 30\%$)

## Intellectual Property Rights (IPR)

- Intellectual Property Rights (e.g. patents, trademarks) represent an important intangible asset for many innovative firms
- we investigate the impact of Chinese competition on the trademarking activity of a sample of large innovative companies

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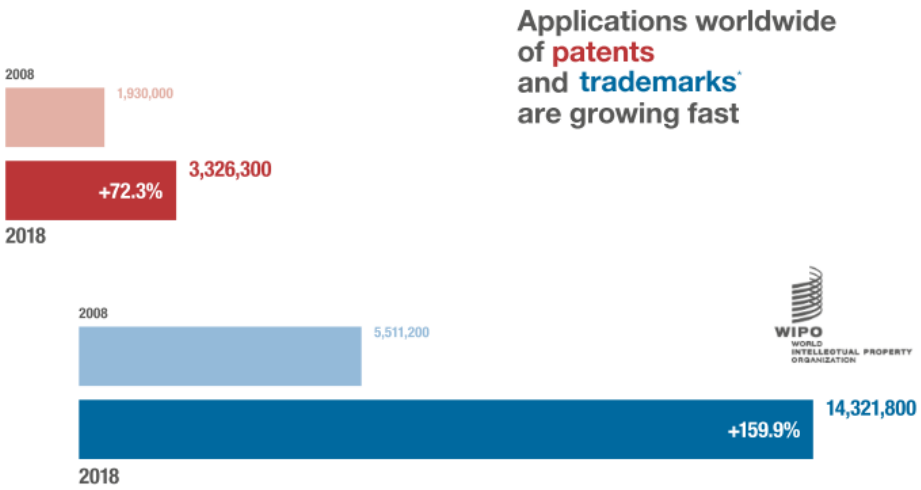
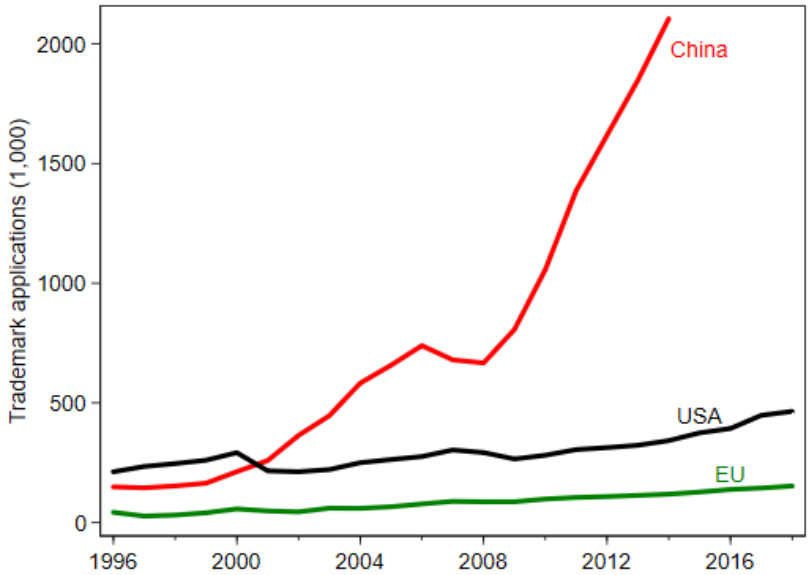
# Intellectual Property Applications on the Rise




Increasing importance of intangibles testified by fast growth in the number of patent and TM applications

Trends in TM registration activity



# Trademark Basics

a trademark (TM) is *any sign that individualizes the goods of a given enterprise and distinguishes them from the goods of its competitors* (WIPO)

- TMs are the most widespread form of intellectual property right
- TMs are cheaper and easier to file relative to patents

$\longrightarrow$ used by companies of all sizes, sectors, countries

$\longrightarrow$ preferred by young and small firms

Trademarks are used to

- convey information to consumers and signal quality/reputation
- reduce uncertainty and search costs
- create incentives for companies to provide expected quality
- differentiate products/services, increase the cost of imitation for competitors, deter entry

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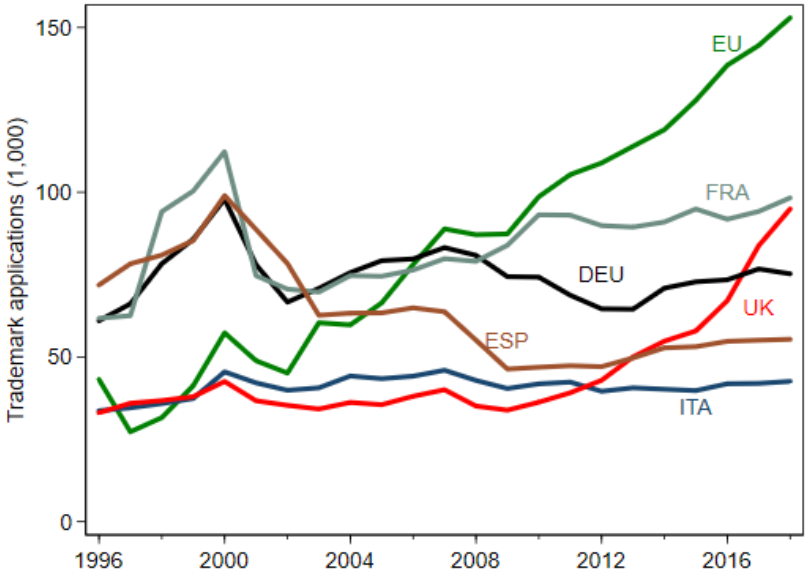
# Trademarks: Why Should We Care?

- TMs are an important component of firms' branding strategy
- TMs capture innovation in the service sector (where patents are less prominent)
- TMs correlate with the innovative effort by firms, but are more market oriented
- there is evidence that TMs have a positive effect on firm growth (Castaldi & Dosso 2018)

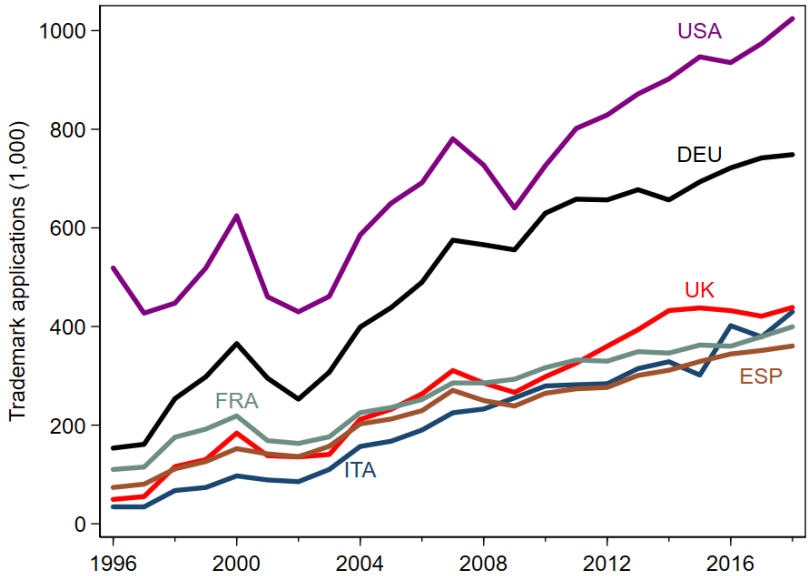
- TM registrations on the rise all over the world, increasing faster than other forms of IPR

# Trends in TM activity




Trademark applications by receiving patent office: European countries (1996–2018)

Trademarking activity by country of origin (1996–2016)



# Empirical Analysis

We take TMs as a measure of market-oriented innovation and investigate the impact of Chinese import competition on the strategies of European & G7 firms

**Hypothesis:**

*innovative firms facing high import competition from China use trademarks to signal quality and to differentiate themselves from (foreign) competitors*

We look at the impact of import competition on:

- the probability to register a TM
- the number of TMs registered by European/G7 firms
- the diversification strategy of firms: from production of goods to provision of services

# Data and methodology

- World top 2,000 R&D-spending firms (source: JRC/OECD COR&DIP© database, versions 2015 and 2017)
- Import penetration from China (sources: OECD-Stan + CEPII-BACI datasets)

- Variables:
  - trademarks by firm (2010-2014)
  - (log of) net sales and R&D expenditures by firm (2009-2014) to control for size and innovation effort
  - overall import penetration from China in the G7 countries (imports over internal consumption) by sector (2009-2014)
  - since firms in our database are large multinationals active on several markets, their *domestic* market is often not their main concern

# Descriptive Statistics

- 80% of firms in the COR&DIP database come from G7 or European countries (1,326 firms in our final sample)
- 70% of firms are in manufacturing
- Trademarking activity:
  - on average, 14.3 trademarks per firm annually (to USPTO)
  - 95% of firms in the sample register a trademark
  - 82% of firms register at least one TM in services
  - 20% have registered a TM in services for the first time during 2011–2014

# TM activity by firm location

| country | firms | share |
|---|---|---|
| USA | 526 | 32.2 |
| EU | 437 | 26.7 |
| Japan | 290 | 17.7 |
| China | 126 | 7.7 |
| Taiwan | 74 | 4.5 |
| Korea | 46 | 2.8 |
| Switzerland | 44 | 2.7 |
| India | 18 | 1.1 |
| Canada | 15 | 0.9 |
| Israel | 12 | 0.7 |
| Australia | 11 | 0.7 |
| others | 65 | 4.0 |
| Total | 1,636 | 100 |

| EU country | firms | share |
|---|---|---|
| Germany | 106 | 24.3 |
| Great Britain | 90 | 20.6 |
| France | 66 | 15.1 |
| Netherlands | 28 | 6.4 |
| Sweden | 27 | 6.2 |
| Italy | 24 | 5.5 |
| Denmark | 21 | 4.8 |
| Finland | 17 | 3.9 |
| Ireland | 15 | 3.4 |
| Spain | 15 | 3.4 |
| Austria | 10 | 2.3 |
| Belgium | 9 | 2.1 |
| others | 9 | 2.1 |
| Total (EU) | 437 | 100 |

# Regression Analysis

We run different versions of the following regression equation

$$TM_{i,s,t} = \alpha X_{i,t-1} + \beta ImpPen_{s,t-1}^{Chn-G7} + \delta_i + \delta_t + u_{it}$$

- where $i$ indexes firms, $s$ sectors, and $t$ years (2009–14)
- $TM_{i,s,t}$ stands for trademarking activity at the USPO
  - binary indicator = 1 if at least 1 TM
  - total number of TMs in whole period
  - categorical: goods-only Vs goods-and-services TMs
  - binary indicator = 1 if switching from goods only to goods-and-services TMs
- $X_{i,t-1}$ includes controls (size, R&D)
- $\delta_i$ and $\delta_t$ and individual and time effects
- $u_{it}$ is the error term (clustered by sector)

# Results

## 1. Probability to Register a TM

- firms more exposed to Chinese competition are more likely to register a TM
- effects is statistically significant, but (on average) economically small
- impact larger for European firms: a 10% increase in Chinese competition increases the likelihood to register a TM at the USPO by 23%

- the result holds both in cross-section and panel settings

# Results

## 2. Number of TM Registrations

- no effect of import competition on the number of TMs registered by companies located in G7 or European countries
- the *intensity* of TM activity determined by factors other than import competition

- result is consistent across a wide range of count models

# Results

## 3. Diversification of TM Portfolio

- higher import competition increases the likelihood of having a TM portfolio that spans both goods and service classes
- a 10% increase in Chinese imports $\Longrightarrow$ +1.7% probability of a diversified portfolio
- manufacturing firms facing stronger import competition more likely to *start* registering TMs in services

# Falsification Exercises

We perform two robustness checks:

1. use country-specific import penetration in the "headquarter country" of the company
   - if we are just picking up *globalization* or a general trend in TM usage, it should make no difference
   - on the contrary, in this case the import measure is never significant

2. reshuffle TM information across firms and re-estimate the impact of import penetration on randomly allocated TMs
   - repeat 100 times to obtain a distribution of coefficients
   - estimated coefficients from the original data well above the $95^{th}$ percentile of the distribution $\Longrightarrow$ not a statistical fluke

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# Wrapping Up

Import competition from China leads to

- higher probability to register a TM by large innovative firms located in G7 countries and Europe
- no effect on the number of TMs
- servitization of manufacturing $\longrightarrow$ firms exposed to stronger Chinese competition are more likely to
  - have a diversified portfolio of TMs comprising both goods and services
  - register a service-related TM for the first time

# Tentative Conclusions

## What do we learn?

- quality-based competition increasingly relevant to sustain competitiveness of European firms and countries
- IPR represent important *intangible assets* helping the branding strategy of firms
- branding especially important in the context of service provision, where “quality” of products more difficult to gauge

## Implications

- supply-side constraints may become binding (e.g. lack of skills) for some firms, sectors, regions
- IPR protection should take central role in trade negotiations (already happening)

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# The End

# Trademarks: Goods and Service Classes

- Nice classifications: 45 classes (1-34 $\rightarrow$ goods; 35-45 $\rightarrow$ services)
- For example:
  - Goods: Chemical goods, Vehicles, Textiles, Food
  - Services: Business and advertising, Telecommunications, Food, drink and accommodation

- Of the 1,268 firms registering to USPTO in 2010–2014 and located in G7 and Europe:
  - 1088 register at least one TM in services (82%); only 180 exclusively in goods (13%)
  - 260 have registered a TM in services for the first time in 2011–2014

# Probability to Register a TM

Dependent variable:

indicator = 1 if the firm has registered a TM in 2010–14

| | Probit | Probit | marg. effects | Probit | marg. effects |
|---|---|---|---|---|---|
| $\ln SALES_{2009}$ | 0.079** | 0.013 | 0.001 | 0.016 | 0.001 |
| $\ln R\&D_{2009}$ | | 0.195** | 0.017** | 0.206** | 0.017** |
| Import $Pen_{2009}^{Chn-G7}$ | 0.882** | 0.866** | 0.074* | 0.235 | 1.119** |
| EU | | | | -0.455* | 0.010 |
| Import $Pen_{2009}^{Chn-G7} \times$ EU | | | | 39.977** | |
| *marginal effect of import penetration by EU status* | | | | | |
| import pen x EU | | | | | 2.295** |
| import pen x nonEU | | | | | 0.020 |
| Observations | 1,299 | 1,287 | | 1,287 | |
| Pseudo R-squared | 0.028 | 0.049 | | 0.099 | |
| Correctly predicted values | 95.77 | 95.8 | | 95.8 | |

** p<0.01, * p<0.05; standard errors clustered by sector

a 10% increase in Chinese competition increases the likelihood that a European firm registers a TM by 23%

# Probability to Register a TM - panel approach

Dependent variable:

indicator = 1 if the firm has registered a TM in year $t$

| | RE probit | | Cond. FE logit† | | CRE Probit | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $\ln SALES_{t-1}$ | 0.249** | 0.254** | 0.257* | 0.199 | 0.180** | 0.176** |
| $\ln R\&D_{t-1}$ | 0.229** | 0.284** | 0.003 | -0.134 | -0.017 | -0.054 |
| Import $Pen_{t-1}^{Chn-G7}$ | 0.458 | 0.464 | 5.077** | 2.927 | 2.997** | 3.221** |
| Observations | 6,518 | 6,460 | 2,601 | 2,601 | 6,532 | 6,532 |
| firms | 1,319 | 1,316 | 526 | 526 | 1,323 | 1,323 |
| year FE | ✓ | ✓ | | ✓ | | ✓ |
| Country FE | ✓ | ✓ | | | | |
| year-country FE | | ✓ | | | | |
| mean indep. vars. | | | | | ✓ | ✓ |

** p<0.01, * p<0.05; clustered standard errors by sector, except cols 3–4

† 797 groups (3,931 observations) dropped because of all positive or all negative outcomes

# Count Models - Number of TM Registered

Dependent variable:
total number of TM registrations in 2010-2014

| | (1) Poiss | (2) NB | (3) T-Logit | (4) T-Poiss | (5) T-NB | (6) ZI-P | (7) ZI-NB |
|---|---|---|---|---|---|---|---|
| $\ln Sales_{2009}$ | 0.231* | 0.255** | 0.023 | 0.230* | 0.272** | 0.230* | 0.255** |
| $\ln R\&D_{2009}$ | 0.323* | 0.220** | 0.400** | 0.310* | 0.210** | 0.310* | 0.220** |
| Import $Pen_{2009}^{Chn-G7}$ | -0.016 | -0.092 | 1.851** | -0.081 | -0.182 | -0.081 | -0.092 |
| Obs | 1,287 | 1,287 | 1,287 | 1,233 | 1,233 | 1,287 | 1,287 |

**p<0.01, *p<0.05; clustered standard errors by sector
(1) Poisson; (2) negative binomial; (3–5) zero truncated logit/poisson/negative binomial; (6–7) zero-inflated Poisson/negative binomial

no effect of import competition on the number of TMs registered by G7 and European companies

# Diversification of TMs portfolio

Dependent variable:

indicator = 1 if firm registers a *service* TM in 2011–14 (none in 2010)

| | Probit | marg. effects | Logit | marg. effects |
|---|---|---|---|---|
| $\ln SALES_{2009}$ | -0.018 | -0.005 | -0.029 | -0.004 |
| $\ln R\&D_{2009}$ | -0.061* | -0.017* | -0.104* | -0.016* |
| Import $Pen_{2009}^{Chn-G7}$ | 0.624** | 0.172** | 1.094** | 0.172** |
| Observations | 1,287 | | 1,287 | |
| Pseudo R-squared | 0.014 | | 0.014 | |
| Correctly predicted values (%) | 80.11 | | 80.11 | |

**p<0.01, *p<0.05; clustered standard errors by sector

a 10% increase in Chinese competition increases the likelihood to diversify the portfolio of TMs by 1.7%

# Diversification of TMs portfolio: ordered Probit model

Dependent variable:

indicator = 1 if no TM; = 2 if only goods; = 3 both goods and service TM

| | All firms | Manufacturing |
|---|---|---|
| $\ln SALES_{2009}$ | 0.035 | 0.108*** |
| $\ln R\&D_{2009}$ | 0.235*** | 0.233*** |
| Import $Pen_{2009}^{Chn-G7}$ | 0.248 | 0.573** |
| marginal effects of import penetration on TM strategy | | |
| – no TM | -0.021 | -0.037† |
| – goods TMs only | -0.039 | -0.103** |
| – goods and services TMs | 0.060 | 0.139** |
| Observations | 1,287 | 949 |
| Pseudo R-squared | 0.046 | 0.080 |

**p<0.01, *p<0.05, †p<0.10; clustered standard errors by sector