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# Determinant factors affecting technology transfer in a university environment. The researcher's perspective

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## Key points

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- There are several papers studying University Technology Transfer process.
- Although not many study the factors that affect the researcher decision to be involved in that process.
- This exploratory research is related to that research gap, and it provides a conceptual framework to study those factors and some empirical evidence about them.

# AGENDA

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- Introduction
- Conceptual framework/Literature review
- Research questions and methodology
- Results analysis
- Conclusions

# Introduction

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- Members of the research group Ebusiness (UMA). Main Research lines:
  - Technological innovation strategies:
    - Organizational level:
      - Innovation, Business value creation by Internet
      - CRM as a business strategy
    - Individual level:
      - Technology Acceptance Model (TAM) applied to blended learning settings.
  - Technology/Knowledge transfer (researcher perspective)
- **With several Technology transfer contracts and with a spin off company → Special interest in this topic**

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## Introduction

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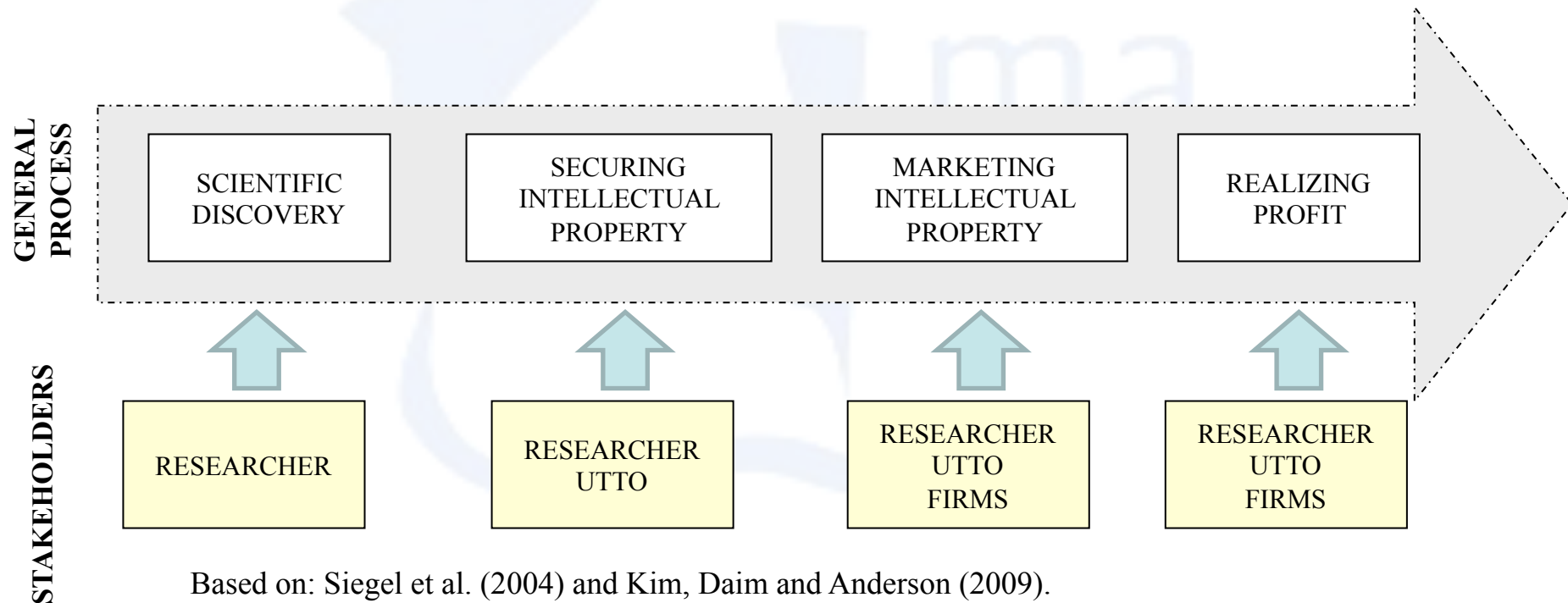
- The situation in Spain (summary):
  - Since the eighties all Spanish Universities have a University Technology Transfer Office (UTTO).
  - Spanish Law recognizes the possibility of the University researcher to sign a transfer contract with private companies/Public Institutions.
  - This formal contract is the most used TT way of the three main possibilities (exploiting a patent, formal contract, starting a spin-off).
  - UTTOs manage these contracts.
  - 546 M € in contracts between Universities and companies/Public Institutions in 2007, a 28% higher than the previous year (last available report RedOTRI, 2008).

## Conceptual framework/Literature review

- TT could be considered as the transfer of new concepts, products or processes from one organization to another for the business benefit of both parties (Decter, Benet and Leseure, 2007).
- There are formal and informal mechanisms for UTT (Link, Siegel and Bozeman, 2007). Formal mechanisms include some kind of legal instrument and informal ones are more informal communication processes.
- UTT includes (Bercovitz and Feldmann, 2006): financing research projects, licenses, hiring researchers, creation of spin-offs.
- **We consider formal UTT as the formal relation between a University researcher and a company/Public institution based on signing a legal agreement (approved by the UTTO of that University) or licensing a patent.**

# Conceptual framework/Literature review

## GENERAL PROCESS OF UNIVERSITY TECHNOLOGY TRANSFER AND STAKEHOLDERS INVOLVED

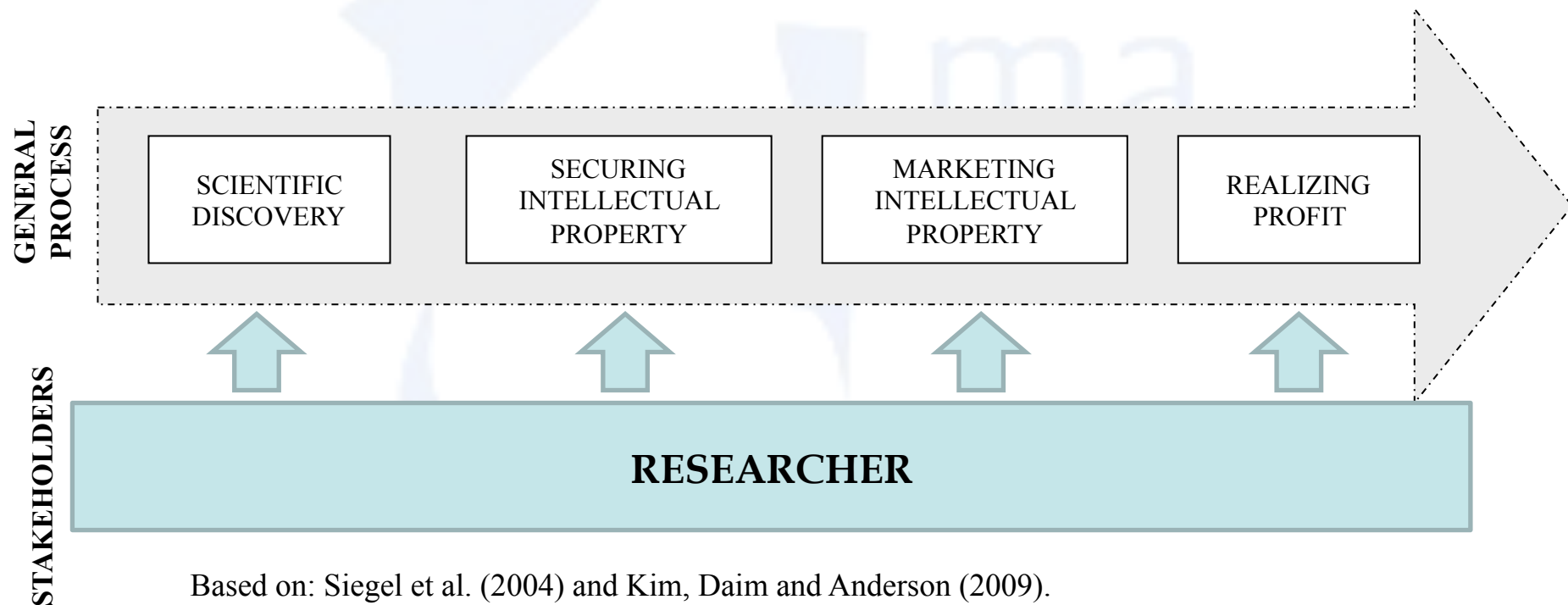


Based on: Siegel et al. (2004) and Kim, Daim and Anderson (2009).

Triple Helix Model (Etzkowitz, 2002). Open innovation (Chesbrough, 2004, 2005) .

# Conceptual framework/Literature review

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# Conceptual framework/Literature review

## FACTORS AFFECTING UNIVERSITY TT (RESEARCHERS PERSPECTIVE)

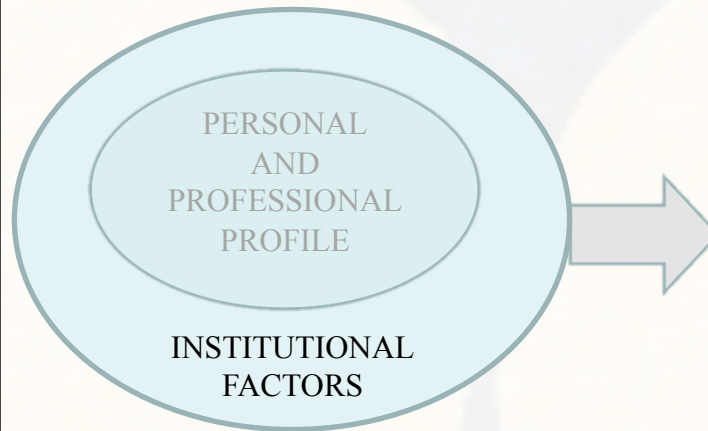
PERSONAL  
AND  
PROFESSIONAL  
PROFILE



FACTORS	REFERENCES
Gender	Link, Siegel and Bozeman (2007), Boardmand and Ponomariov (2009).
Age	Boardmand and Ponomariov (2009).
Scientific Area	Landry, Amara and Ouimet (2007)
Experience (years, n° publications)	Bercovitz and Feldman (2006), Zhou and Zhu (2008), Hoye and Pries (2009).
Opinions and attitudes (toward business collaboration and entrepreneurship)	Lipinski, Minutolo and Crothers (2008), Hoye and Pries (2009), Boardmand and Ponomariov (2009).
TT previous experience	Hoye and Pries (2009).

# Conceptual framework/Literature review

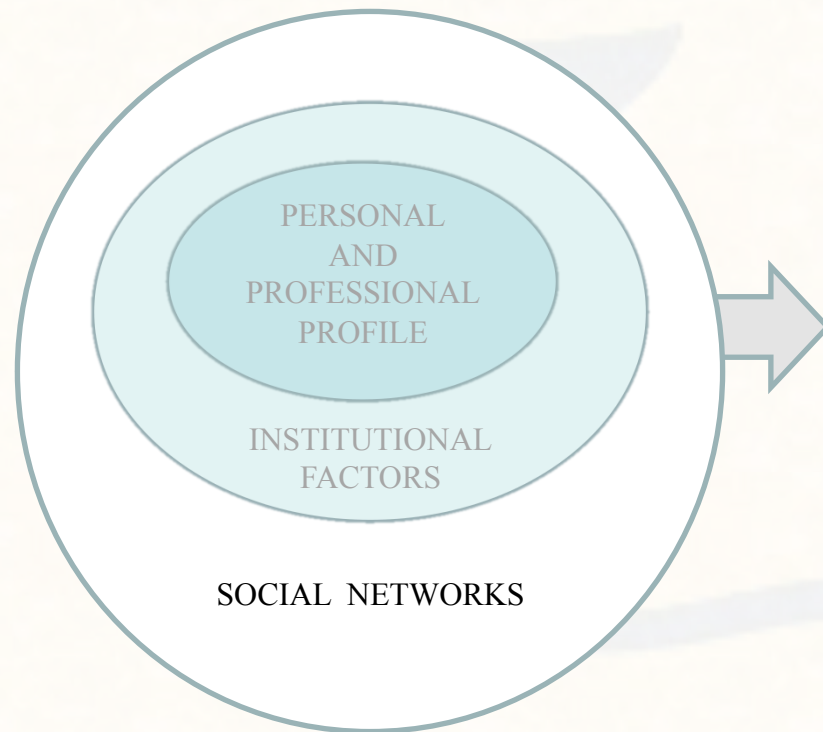
## FACTORS AFFECTING UNIVERSITY TT (RESEARCHERS PERSPECTIVE)



FACTORS	REFERENCES
Cultural norms	Link, Siegel and Bozeman (2007), Debackere and Veugelers (2005), Siegel et al. (2004), Lipinski, Minutolo and Crothers (2008), Kim, Daim and Anderson (2009).
Informative obstacles	Siegel et al. (2004).
Lack of flexibility/Bureaucracy	Link, Siegel and Bozeman (2007).
TT tradition	Lipinski, Minutolo and Crothers (2008).
UTTO's staff capacity and motivation	Siegel et al. (2004), Zhou and Zhu (2008), Kim, Daim and Anderson (2009).
Research group characteristics <ul style="list-style-type: none"> <li>• Size</li> <li>• Experience (years)</li> <li>• Composition</li> <li>• Chair behavior</li> <li>• Cohort effects</li> </ul>	Bercovitz and Feldman (2006), Zhou and Zhu (2008), Kim, Daim and Anderson (2009), Boardmand and Ponomariov (2009).

# Conceptual framework/Literature review

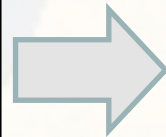
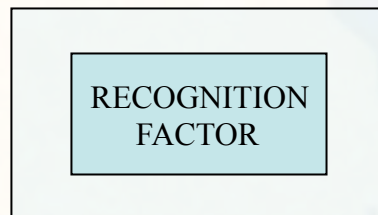
## FACTORS AFFECTING UNIVERSITY TT (RESEARCHERS PERSPECTIVE)



FACTORS	REFERENCES
With former students	Link, Siegel and Bozeman (2007), Boardmand and Ponomariov (2009).
With public institutions	Decter, Bennet and Leseure (2007).
Among researchers	Debackere and Veugelers (2005).
With businesses <ul style="list-style-type: none"><li>• Conjoint research projects</li><li>• Time devoted to contacts</li></ul>	Landry, Amara and Ouimet (2007), Link, Siegel and Bozeman (2007), Hoye and Pries (2009).

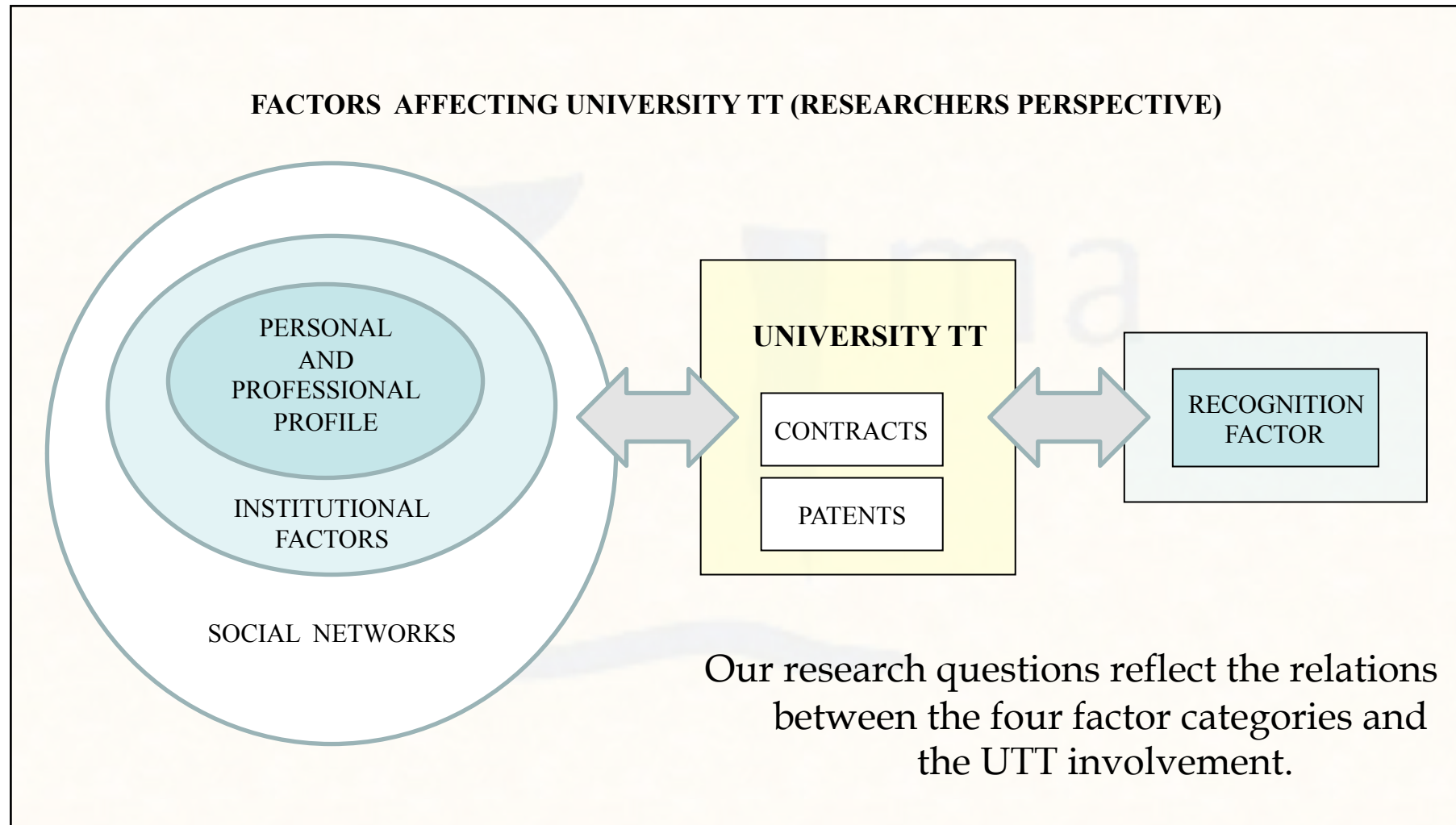
# Conceptual framework/Literature review

## FACTORS AFFECTING UNIVERSITY TT (RESEARCHERS PERSPECTIVE)



FACTORS	REFERENCES
Economic remuneration <ul style="list-style-type: none"><li>• Monetary benefits</li><li>• Funding facilities</li><li>• Grants</li></ul>	Siegel et al. (2003), Bercovitz and Feldman (2006), Link, Siegel and Bozeman (2007), Debackere and Veugelers (2005), Siegel et al. (2004), Decter, Bennet and Leseure (2007), Zhou and Zhu (2008), Boardmand and Ponomariov (2009).
Non-economic compensation <ul style="list-style-type: none"><li>• Valuation (promotion, prestige)</li></ul>	Siegel et al. (2003), Link, Siegel and Bozeman (2007), Debackere and Veugelers (2005), Decter, Bennet and Leseure (2007).

# Conceptual framework/Literature review



## Research Questions

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1. The personal and professional profile of the researcher is related to his/her involvement in TT processes.
2. The institutional factors are related to the researcher involvement in TT processes.
3. The social networks of the researcher are related to his/her involvement in TT processes.
4. The recognition factor is related to the researcher involvement in TT processes.

## Methodology

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- **Empirical study of researchers that were managing directors of research teams of 10 Universities (1583).** These people were elected for being strategic informants for the TT process (they normally have more TT experience than young researchers). Answer rate: 24.13%, sampling error 4.55%, sample: **382 respondents**.
- **Statistical Analysis in 2 steps:**
  1. To answer the research questions exploring the differences between researchers being involved in TT processes and the others. [Mann-Withney U test as the data were not normal]
  2. To propose detailed factors-related hypothesis and test them with a correlation analysis. [Spearman coefficient]

## Results: descriptive analysis

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- **Socio demographics of the sample:**
  - Respondents have an average age of **50.66 years**, 24 years of experience at the University.
  - The average size of the research group is 11.15 (s.d. 3.48).
- **University Technology Transfer:**
  - Only 17.5% of research groups have registered a patent.
  - 52.9% of research groups have signed a contract for TT (according to the article 83 of Spanish Universities Law). A 48.7% of them were signed with companies, followed by Public Institutions and other private institutions.
  - 11.8% were involved in both ways of TT (patents and contracts).

## Results: Personal and Professional Profile

ITEMS	SIGNIFI- CANCE	DIFFERENCE BETWEEN MEANS
Age	0,066	Non significant
Years in the university	0,279	Non significant
Scientific Area	0,000	<b>Significant</b>
Opinions and attitudes (toward business collaboration and entrepreneurship): personal achievement	0,229	Non significant
Opinions and attitudes (toward business collaboration and entrepreneurship): learning and personal growth	0,033	Non significant
Opinions and attitudes (toward business collaboration and entrepreneurship): independence	0,578	Non significant

Similar to Landry, Amara and Ouimet (2007), **there are some areas of knowledge that are more active in UTT processes.** In our case those areas were Physiology, Biochemistry and Molecular Biology, and Chemical Engineering.

H1.1. The Scientific Area of the researcher is correlated with his/her involvement in TT

## Results: Institutional factors

ITEMS	SIGNIFI- CANCE	DIFFERENCE BETWEEN MEANS
Research Group experience (years)	0,033	Significant
Number of members of the Research Group	0,000	Significant
Number of members being Doctors	0,299	Non significant
Number of members being active employees in public institutions different from the University	0,682	Non significant
Number of members being active employees in private companies	0,009	Significant
Cultural norms: negative valuation of the Institution	0,388	Non significant
Cultural norms: negative image for the researcher	0,021	Significant

- The **experience and composition of the research group** were found as significant.
- In the context of the cultural norms, **the negative image for the researcher of being involved in UTT processes** was significant.

This could reflect a **cultural difference of Spanish Universities** related to other countries, where this was found positive (see Siegel et al., 2003; Boardman and Ponomariov, 2009).

H2.1. – H2.4. Experience, Member, P. Members, Negative Image are correlated with the researcher involvement in TT

## Results: Social networks

ITEMS	SIGNIFICANCE	DIFFERENCE BETWEEN MEANS
Conjoint research	0,000	Significant
Time devoted to contact with companies	0,000	Significant
Contact with UTTO	0,000	Significant
Time devoted to contact with UTTO	0,000	Significant
Contracts signed under Research group initiative	0,000	Significant
Contracts signed under Company initiative	0,000	Significant
Contracts signed under UTTO initiative	0,000	Significant
Contracts signed under other University's services initiative	0,102	Non significant
Contracts signed under others initiative	0,181	Non significant
Interactions with researchers of private companies	0,000	Significant
Time devoted to these contacts	0,014	Significant

**Conjoint research and time devoted to contacts with companies, in short, linkages with companies** as research users, were found significant (Landry, Amara and Ouimet, 2007; Hoyer and Pries, 2009)

H3.1-H3.9 Social networks of the researcher are correlated with his/her involvement in TT processes.

## Results: Recognition

ITEMS	SIGNIFICANCE	DIFFERENCE BETWEEN MEANS
Monetary benefits	0,036	Significant
Funding facilities	0,668	Non significant
Grants	0,425	Non significant
Relevance of TT in the salary (bonuses linked to this)	0,016	Significant
Improvement of the curriculum of the researchers	0,066	Non significant
TT valuation from your institution	0,643	Non significant
TT valuation from your research group	0,694	Non significant
TT valuation from your centre	0,789	Non significant

H4.1. Monetary benefits, as recognition factors, are correlated with the researcher involvement in TT.

H4.2. Bonuses linked to TT, as recognition factors, are correlated with the researcher involvement in TT.

## Results: Hypothesis testing

FACTOR	ITEMS/HYP.	SPEARMAN COEFFICIENT	SIFNIFICANCE	HYPOTHESIS TEST
<b>1. PERSONAL AND PROFESSIONAL PROFILE</b>	H1.1. Scientific Area	0,183	0,000	Accepted
	H2.1. Research Group experience (years)	-0,010	0,851	Rejected
<b>2. INSTITUTIONAL FACTORS</b>	H2.2. Number of members of the Research Group	0,247	0,000	Accepted
	H2.3. Number of members being active employees in private companies	0,157	0,002	Accepted
	H2.4. Cultural norms: negative image for the researcher	0,143	0,005	Accepted

## Results: Hypothesis testing

FACTOR	ITEMS/HYP.	SPEARMAN COEFFICIENT	SIFNIFICANCE	HYPOTHESIS TEST
<b>3. SOCIAL NETWORKS</b>	H3.1.Conjoint research	0,253	0,000	Accepted
	H3.2.Time devoted to contact with companies	0,219	0,000	Accepted
	H3.3.Contact with UTTO	0,316	0,000	Accepted
	H3.4.Time devoted to contact with UTTO	0,343	0,000	Accepted
	H.3.5.Contracts signed under Research group initiative	0,624	0,000	Accepted
	H3.6.Contracts signed under Company initiative	0,662	0,000	Accepted
	H.3.7.Contracts signed under UTTO initiative	0,222	0,000	Accepted
	H.3.8.Interactions with researchers of private companies	0,352	0,000	Accepted
	H.3.9.Time devoted to these contacts	0,141	0,006	Accepted
<b>4. RECOGNITION</b>	H.4.1. Monetary benefits	0,045	0,384	Rejected
	H.4.2. Relevance of TT in the salary (bonuses linked to this)	-0,130	0,011	Accepted

## Conclusions

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- The proposed research framework is valid for studying the researcher involvement in TT processes.
  - We found empirical evidence of relations of the personal and professional, the institutional, the social networks and the recognition factors and the TT participation of the researcher.
- There are correlations between:
  - Scientific Area
  - Size of the research group, cultural norms
  - Social networks
  - Bonuses linked to TT
  - ... and TT involvement

## Conclusions: implications

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- For University managers:
  - They should promote social networks between private companies and scientists, with more formal and informal contacts.
  - They are areas of knowledge and experienced researchers (probably 'repeat commercializers') that could be used as best practices examples.
  - There are still cultural barriers to TT, as a negative image of being involved in those processes. Changing this will depend on the University strategy.
- For researches:
  - To be involved in TT processes they should improve their social networks.

## Conclusions: limitations

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1. **Geographical limitations:** this study is limited to a particular part of Spain, and limited to 10 Universities, which could mean there are differences between the attitudes of researchers in this area compared to other parts of the country.
2. **The study was based only on quantitative data:** it could be enriched considering qualitative methods.
3. **Cross-sectional study approach:** this is a non-longitudinal study. The use of longitudinal data would have allowed us to analyse how much the factors change over time.

## Conclusions: further research

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1. To study social networks in more detail.
2. To include the influence of “repeat commercializers” (Hoye and Pries, 2009) on other researchers as a factor.
3. To include cultural differences with other countries.
4. To conduct a longitudinal study.

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