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Perception of innovation in Spain

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Abstract

The present paper analyses the perception of innovation of individuals in Spain and the factors associated with it. Data from 2015 and 2018 about individuals from the Spanish surveys are used. The data include several measures of innovation perception, gender, age, educational level, and other socioeconomic and technical variables. The aim of this paper is to determine the perception of innovation, in its different aspects, of Spanish people. To this end, several ordered logit models have been developed to determine how much the socio-demographic characteristics and other aspects of innovation affect the perception of innovation. Results indicate that people have a better perception of innovation if they are training in innovation or have good Information and Communication Technology skills. Among the main results, there is evidence of a gender gap in the perception of innovation, as well as differences according to digital skills.

Key words and phrases: perception, innovation, survey data, ordered logit.

JEL Classifications: C21, C25, D12, D83, J24, L63, L86, L96, M15.

1. Introduction.

Innovations are an important part of the further advancement of societies in general as well as of companies in particular. Individuals can benefit from the advantages of innovations, while companies can maintain or increase their market share and profitability.

In the current economic environment, innovation is a common characteristic of both services and manufacturing enterprises, including sectors as tourism where innovation has become compulsory in the quest to achieve long term competitiveness (Iorgulescu & Ravar, 2013).

Management literature has identified high-skilled human capital as a crucial dimension of innovation processes at the firm level. In Fonseca, De Faria, & Lima (2019), authors introduce an alternative view of human capital measuring of cognitive analytical and interpersonal tasks: the degree of abstractism and they hypothesize that while the degree of abstractism has a linear positive relationship with the propensity to innovate, the relationship between abstractism and product innovation performance follows an inverted u-shaped relationship.

The implications and implementation of bridging social capital and competence trust are key determinants of successful innovation processes. King, Fielke, Bayne, Klerkx, & Nettle (2019) show that a better understanding of social capital and trust is needed to enable innovation facilitators and project managers to design and undertake fixed term rural innovation projects effectively.

In some sectors, scientific or technological innovations often encounter mistrust and rejecting reactions from consumers, resulting in the decreasing acceptance of those innovations, for example in the food sector (Albertsen, Wiedmann, & Schmidt, 2020).

Kim, Kim, & Nam (2016) present a study of the innovation resistance model in order to investigate the factors that impact the resistance to In-Vehicle Infotainment (IVI) systems in the Korean market (Kim et al., 2016). Conclusions of this paper show that the technographics, subjective norm, and prior similar experience are direct and powerful antecedents for resistance.

The acceptance of innovations and technology adoption is heavily dependent on the individual attributes and beliefs of potential adopters. A way to facilitate the acceptation is through Pilot-Test-Demonstration (PTD) projects and it is important to understand the influence of a PTD's organizational setup on technology perception (Grimm, Kretschmer, & Mehl, 2020).

The other way to facilitate the adoption of innovations is increasing of knowledge, with the advent of e-learning technologies in the past decade, the accessibility to training, teaching, and learning has drastically increased (Liao & Lu, 2007).

Start-ups have to design adequate business models to manage consumers' initial trust perceptions of digital innovations because the success rate depends on consumers' initial trust perceptions. In Konya-Baumbach, Schuhmacher, Kuester, & Kuharev (2019), five experiments explore how start-ups can signal trustworthiness to overcome low initial trust perceptions and boost adoption.

In the same spirit, Hauser, Tellis, & Griffin (2006) argue that the success of an innovation depends on its adoption by consumers. This study makes valuable contributions to the existing literature. The need to overcome low initial perceptions of consumer trust for the successful commercialisation of digital innovations and trust in the online context.

Entrepreneurial innovation expectedly benefits individuals job satisfaction, the balance between work and family, and life satisfaction as Jensen, Liu, & Schott (2017) show in China. Among entrepreneurs around the world, innovation benefits job satisfaction, the balance between work and family, and life satisfaction.

A study of 32 European countries (Grande, Muñoz de Bustillo, Fernández-Macías, & Antón, 2020) finds that innovation is associated more with job creation than with job destruction, but the study also finds a psychological risk associated with innovation.

In Spain, Borraz-Mora, Bordonaba-Juste, & Polo-Redondo (2017) studied the Innovation Resistance Theory (IRT) in e-banking with implications for management in terms of overcoming the resistance of non-adopters to innovation. Liébana-Cabanillas, Sánchez-Fernández, & Muñoz-Leiva (2014b), also in Spain, study the use of mobile payment and the resistance to use this technology, concluding that if users have not previous experience, they are not going to use technology.

The focus of this paper is to analyse the innovation perception related with economic and job issues of Spanish people, and the determinants associated with them. The main questions to answer are whether exists a gender gap and, also, whether or not the level of education really influences on the perception of innovation. Furthermore, is there a relationship between Internet and the different types of lifestyles associated with age?.

This paper is divided into five sections. The next section contains the literature review. Section 3 shows the data used in the analysis, followed by the methodology used for the analysis. Results are presented in section 4. The last section presents the conclusions of the study and includes policy recommendations and limitations.

2. Literature review.

According to Hong, Nam, & Kim (2020), studies on the adoption of new technologies are based on two main perspectives, technology acceptance and technology resistance. Therefore, two subsections will show the perspective of technology acceptance and technology resistance. Finally, the last subsection will show the innovation resistance background.

2.1. Technology acceptance perspective

The literature mainly focuses on three theoretical approaches to technology acceptance, namely the Technology Acceptance Model (TAM), the Theory of Planned Behaviour (TPB) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Kim & Kankanhalli, 2009).

Davis (1989) considers TAM methodology as the most accepted methodology for understanding an individual's adoption of new technologies. Furthermore, the TAM suggests that perceived usefulness and perceived ease of use are the two main antecedents of technology acceptance.

Attitude towards human behaviour, subjective norms and perceived behavioural control are the three main antecedents affecting human behaviour suggested by the TPB (Ajzen, 1991).

Finally, according to Venkatesh, Morris, Davis, & Davis (2003) the UTAUT can be consider as a model that unifies the antecedents of technology acceptance previously identified by the theories of TAM, TPB, theory of reasoned action, social cognitive theory and diffusion of innovation theory.

UTAUT explains how performance expectancy, effort expectancy, social influence and facilitating conditions affect behavioural intention and usage behaviour. In other words, how subjective norms and perceived usefulness, perceived ease of use and perceived behavioural control affect behaviour and use (Venkatesh et al., 2003).

In addition, individual characteristics, such as age, gender and experience, are theorised to moderate various UTAUT relationships (Tsourela & Roumeliotis, 2015).

Technology acceptance indicates that personality traits, generalised beliefs and predispositions about technology, and other individual and demographic traits may affect the adoption of technology-based systems (Im, Jung, Kim, & Shin, 2003; Meuter, Bitner, Ostrom, & Brown, 2005; Parasuraman, 2000).

A gender gap is found related to consumer technological innovativeness (Tsourela & Roumeliotis, 2015; Liébana-Cabanillas, Sánchez-Fernández, & Muñoz-Leiva, 2014a; Lee, Cho, Xu, & Fairhurst, 2010; Lee, Park, Yoon, & Park, 2010). Men tend to show a greater tendency to seek novelty and innovation, in the early stages of using new technologies (Chau & Hui, 1998; Liébana-Cabanillas et al., 2014a).

Based on the UTAUT and previous literature (Morris & Venkatesh, 2000; Venkatesh & Morris, 2000), it is theorised that gender and age play a moderating role in behavioural intention. Thus, behavioural intention will be moderated by gender and age, such that the effect will be larger for males and, in particular, for younger males (Venkatesh et al., 2003).

According to Tsourela & Roumeliotis (2015), in terms of the gender gap, the results suggest that women are more influenced by the extent to which the use of a Technology-Based System (TBS) will provide them with benefits and by the perceived influence of significant others (such as family or friends) on their use.

In terms of the age gap, younger people are more affected by the perceived benefits and influence of other members of society on the use of a TBS. Furthermore, neither the ease

of use nor the available resources and support affect people of different ages. Regardless of the age of a potential consumer, their predisposition towards the use of a TBS will not be impaired or altered (Tsourela & Roumeliotis, 2015).

2.2. Technology resistance perspective

Resistance to change is defined by Ram (1987) as the behaviour of trying to maintain the current state and not adopting the innovation when faced with pressure to change from the current state.

Consumer resistance is one of the main causes of failure of any innovation (Talwar, Talwar, Kaur, & Dhir, 2020). Therefore, some researchers have studied the concept of innovation resistance. Markus (1983) describes that user resistance to both innovation and policy comes from a loss of power. Ram & Sheth, (1989); and, Szmigin & Foxall (1998), among others, separate the concept of resistance from a mere "not trying to innovate" to three distinct types of consumer behaviour: rejection, postponement and opposition.

According to Röth & Spieth (2019), an individual's resistance to change will positively affect the relationship between a project's innovativeness and risk. For instance, there are positive relationships between the technological and market innovativeness of an innovation project and its perceived risk. This relationship becomes negative when innovation is interpreted as a threat. Röth & Spieth (2019) show that an underlying context and an individual's dispositional resistance to change influence the assessment of innovativeness and risks of an innovation project. Thus, the context of an innovation project interacts with an individual's resistance to change. When environmental signals indicate that change is associated with potential losses, personal stress and insecurity, they are likely to trigger individuals to resist change, focus on negative associations and overemphasise potential losses and risks. On the other hand, signals that change is desirable will encourage individuals to develop positive associations at the expense of perceived potential losses and risks (Röth & Spieth, 2019).

Consumer resistance to innovation is as important an aspect of consumer behaviour as acceptance and adoption (Seth, Talwar, Bhatia, Saxena, & Dhir, 2020). Furthermore, to

understand innovation resistance, it is necessary to explain why consumers are unwilling to adopt a possibly useful new offering (Groß, 2015; Nel & Boshoff, 2019).

Talwar et al. (2020) classifies the literature on consumer resistance to change into four broad areas: resistance to digital innovations, organisational resistance to technological innovations, resistance to health technological innovations and consumer resistance to (offline) innovations.

Resistance to innovation is defined by Saga & Zmud (1994) as a tendency among consumers to maintain their status quo and avoid using new technologies. To which Mani & Chouk (2018) add that this is combined with resistance to change. Consumer resistance can be described as unwillingness to try innovations, negative response to innovations, lack of motivation to use the innovation and total non-acceptance (Antioco & Kleijnen, 2010; Tansuhaj, Gentry, John, Lee Manzer & Cho, 1991).

Heidenreich & Kraemer (2015) distinguish the literature on innovation resistance into two groups: active and passive. Active Innovation Resistance (AIR) can be defined as the negative attitude towards a new product after its evaluation, and Passive Innovation Resistance (PIR) can be defined as the predisposition of consumers to resist innovation even before evaluating it.

Talwar et al. (2020) define consumer resistance to digital innovations as a barrier to the adoption of any innovation resulting from advances in Information and Communication Technology (ICT). Barrier or resistance driven by various personal, situational, contextual, regulatory and product-related factors, such as age, innovativeness, predisposition to maintain the status quo, cultural aspects, government surveillance, innovation characteristics, and manifested in varying degrees, as mentioned above, which are: rejection, opposition or postponement.

2.3. Innovation resistance

Most studies on resistance to digital innovations have used various theories of consumer behaviour to explain consumer resistance and non-adoption of digital innovations. The IRT was first proposed by Ram (1987) and later modified by Ram & Sheth (1989). IRT describes consumer resistance through different barriers that hinder the adoption of an

innovation. According to IRT, usage, value and risk barriers represent functional barriers, while tradition and image barriers refer to psychological barriers to innovation. A usage barrier relates to the usability of the service and the changes consumers need to make to use it. In the digital context, a usage barrier represents the time effort, and a risk barrier represents the financial burden and uncertainty of choice (Heinze, Thomann, & Fischer, 2017).

In fact, IRT has been used alongside other popular theoretical frameworks, such as TAM and UTAUT (Oh, Park, & Min, 2019; Soh et al., 2020). For example, two important measures of TAM, perceived usefulness and perceived ease of use, have a significant association with innovation resistance (Talwar et al., 2020).

Active innovation resistance is considered to be one of the main drivers of innovation rejection and is traditionally related to five product-specific adoption barriers that drive this negative attitude formation: functional barriers, psychological barriers, in new product evaluations, to product technology innovations, and to mobile service innovations (Joachim, Spieth, & Heidenreich, 2018).

Kim et al. (2016) refer to the innovation resistance model to investigate the factors affecting resistance to IVI systems in the Korean market. The results show that technographics, subjective norm and previous similar experience are direct and powerful antecedents for resistance. Contrary to expectations, previous similar experience triggered a negative perception towards IVI systems. The results offer implications not only for car manufacturers and network operators, but also for policy makers.

Social influence directly reduces the innovation resistance of inexperienced consumers, while it directly increases the innovation resistance of experienced consumers (Matsuo, Minami, & Matsuyama, 2018). Furthermore, the effect of barriers was found to be different for experienced and inexperienced consumers.

Little is known about the most conspicuous market actors resisting innovations: innovation resistance leaders. Innovation resistance leaders are defined as figures in the media and as active opponents who act against an innovation to exert influence at the societal level.

Hietschold, Reinhardt, & Gurtner (2020) conceptualise a new type of resistors who, based on their self-identity, carry out two distinct and newly identified processes of resistance diffusion.

Incumbent firms face the challenge of how to adapt to changes in the external environment (Egfjord & Sund, 2020). If innovators in an incumbent or traditional firm perceive the world in a different way than their colleagues in the lead business, they will propose solutions to the "wrong" problems (in the minds of the lead business managers) and thus face resistance. Traditional firms, defined as firms that are already in a strong market position, face the unique situation of having to balance the exploration of new business models with the exploitation of existing ones (Bogers, Sund, & Villarroel, 2015; Frankenberger, Weiblen, Csik, & Gassmann, 2013; Jensen & Sund, 2017; Sosna, Trevinyo-Rodriguez, & Velamuri, 2010; Teece, 2018).

If the organisation wants to balance the exploration of new innovative business models with the needs of existing core activities, organisational actors have to achieve a common understanding of new trends and the development of innovation solutions to exploit opportunities and defend against threats.

3. Research tools and instruments

This section contains two sub-sections. The first one to show the data that will be used for this study and the second to focus on the methodology used in this study.

3.1. Database

The sample consists of two surveys with data on 2,487 and 6,308 personal interviews about the perception on innovation: "Actitudes y comportamientos innovadores", conducted by Spain's Centro de Investigaciones Sociológicas (CIS, 2015) and "Innovarómetro", conducted by Spain's Centro de Investigaciones Sociológicas (CIS, 2018), too. The centre is an official government body that produces high-quality statistics that are well-suited to the analysis. The CIS micro-data have been made freely available through the Internet (CIS, 2015, 2018). The basic tabulation of the survey is available in

the CIS website (2015, 2018). The surveys are about individual private people and include questions about socio-demographics, innovation perception, use and knowledge of ICT, etc.

The data were gathered using personal interviews, and eight different measures of innovation perception. The innovation perception scale ranged between 1 and 4, where 1 corresponds to the lowest level of perception and 4 to the maximum.

The data are representative nationwide by gender, age and education level, thus making them appropriate for the analysis.

Table 1 contains a demographic profile of the respondents to both surveys and their descriptive statistics. It could be seen that the demographic profile is similar both years, that is for the representative nationwide survey done both years by CIS.

[Table 1 goes here]

Figure 1 shows, as a percentage, individuals' responses to the perception of each of the innovation-related questions. The response is on a scale of 1 to 4, where 1 corresponds to "do not agree at all" and 4 to "strongly agree". It can be seen how the response of individuals has changed between 2015 and 2018.

[Figure 1 goes here]

The descriptive statistics of the different measures of innovation perception are shown in table 2 for both years. It could be seen the different mean, standard deviation and sample size by innovation between both years.

[Table 2 goes here]

3.2. Methodology.

The perception of the innovation is a Likert scale, from 1 to 4, where 1 means the low perception of the innovation and 4 the maximum perception. Peel, Goode, & Moutinho (1998) concluded, ordered models should be employed where the dependent variable is ordinal in this kind research.

In Fullerton (2009) it is possible to find the conceptual framework of ordered logistic regression, that is a very common methodology used in social science research.

This paper is going to use ordered logit models. The equations are estimated by Ordered logit using STATA 16. Then the Brant test (Brant, 1990) is used to test if the parallel regression assumption is violated or not. If this assumption is violated, it is suggested by Williams (2016) to estimate a generalized ordered logit. Generalised ordered logit models give a binary logit estimate for each of the levels of the ordered variable, in this case, perception of innovation. Williams (2016) argues that these models solve the problem of non-parallelism of the results of the ordered logit model. In this paper the models are estimated by ordered logit.

4. Results.

This section presents the results of the various models of innovation perception that have been developed. These models analyse the determinants of perception and their quantification. Specifically, there are 8 models (by year) about perception of innovation estimated by ordered logit.

4.1. Innovation is essential for economic growth.

Table 3 shows the ordered log-odds regression coefficients for 2015 and 2018 (firsts columns) for the perception that innovation is essential for the economic growth.

If people think that innovation allows companies to save money, their perception that innovation is essential for economic growth is better. The same happens with perception about innovation increasing people's quality of life, improving access to products and services for all citizens and the perception that many people have difficulties adapting to innovations. The first one (that allows companies to save money) has the biggest coefficient, thus if it increases one point (from 1 to 2, or 2 to 3…), the perception about innovation being good for economic growth increases almost one point (0.76 in 2015 and 0.72 in 2018), that could change perception from 1 to 2, or 2 to 3… (remember that

perception of innovation are variables with a Likert scale from 1 to 4, and 1 means that they have a bad perception and 4 the best one).

If the individual has received a training course, he/she has a better perception of innovation related to the economy than if the individual has not participated in a training course. This variable is significant in 2015, but not in 2018.

People are more satisfied with a work which promotes creativity and new ideas, they have better perception about economic growth and think that innovation is essential to it.

The models for both years are significant, and the parallel regression assumption is not violated.

4.2. Innovation leads to the loss of traditional customs and lifestyles.

The last two columns in table 3 shows the ordered log-odds regression coefficients for 2015 and 2018 for the perception that innovation leads to the loss of traditional customs and lifestyles, too. Here, it is important to note that if the respondent has a "good" perception on innovation, the coefficients should be negative, since the question is a negative perception.

For 2015, the perception of innovation leads to job losses because companies need fewer workers has a significative and big coefficient (0.80), that means if people thinks that it could happen (change the perception from 1 to 2, or from 2 to 3…) then their perception about innovation leads to the loss of traditional customs and lifestyles increase almost one point (from 1 to 2, or from 2 to 3…). Similarly, the perception that innovation improves access to products and services for all citizens, but the coefficient is lower (0.299).

However, if the respondent uses Internet to carry out transactions, him/her perception about innovation leading to the loss of traditional custom and lifestyles is lower than if s/he does not use Internet to carry out transactions. In the same way, if the respondent has special programs at work such as teleworking, flexible or reduced working hours… s/he has a worse perception about that innovation leading to the loss of traditional customs and lifestyles than if s/he does not use those special programs at work.

The perception that many people have difficulties in adapting to innovations in 2018 has a significant and big coefficient (0.839), that means that if they change from 1 to 2, or 2 to 3, or 3 to 4, the perception of innovation leads to the loss of traditional customs and lifestyles change in 0.839 points, in that case if the perception changes almost one point (from 1 to 2…), they will have a worse perception on innovation. In the same way and such as 2015, but with a lower coefficient (0.159), is the perception that innovation leads to job losses because companies need fewer workers.

In 2018, the same as in 2015, the perception that innovation increases people's quality of life has a negative and significative coefficient; and the same with the use of Internet to carry out transactions.

In both years, if the respondent is more satisfied with a work that promotes the creativity and new ideas, s/he has a lower perception on innovation leading to the loss of traditional customs and lifestyles. Furthermore, people that take risks to progress in life and people with more years of education go in the same way.

[Table 3 goes here]

4.3. Innovation allows companies to save money.

First columns of table 4 shows the perception that innovation allows companies to save money for 2015 and 2018.

It could be seen that people who think that innovation in essential for economic growth think that innovation allows companies to save money. The coefficient is close to one (0.800 in 2015 and 0.887 in 2018), hence the two variables moves in the same direction and at the same time, while the other variables in the model are held constant. If the perception about innovation increases people's quality of live and that innovation improves access to products and services for all citizens increases one point the perception that innovation allows companies to save money increase almost half point.

There is difference in the perception that innovation allows companies to save money between males and females, males have better perception than females.

4.4. Many people have difficulties in adapting to innovations.

Last two columns of table 4 shows, for 2015 and 2018, the perception of many people have difficulties in adapting to innovations.

Here there are differences between the two years. The perception that innovation causes unnecessary consumption has the biggest coefficient in 2018. In 2015 it is the second one and the perception that innovation leads to job losses because companies need fewer workers is the biggest one. The difference on perception that many people have difficulties in adapting to innovations between males and females is significative and negative in 2015 (not in 2018). Thus, males think that is less important the difficulty of people in adapting to innovation than females.

People who use Internet to carry out transactions thinks that is less important the difficulty of people in adapting to innovation than people who don't use Internet to carry out transactions (in 2015 and 2018).

[Table 4 goes here]

4.5. Innovation increases people's quality of life.

Table 5 shows the perception that innovation increases people's quality of life for 2015 and 2018 in the first columns.

In 2015, the coefficient of the perception that innovation improves access to products and services for all citizens are more than one. Thus, if the perception of the respondent change in one point, the perception that innovation increases people's quality of life change in more than one point (1.293), ceteris paribus other variables. Also, for 2018, the coefficient is bigger than one (1.385) and significative, too. For the ones who think that innovation leads to the loss of traditional customs and lifestyles, the perception that innovation increases people's quality of life is worst (-0.276 in 2015, and -0.175 in 2018) and significative.

The difference between males and females is positive and significative in 2018. Males have a better perception that innovation increases people's quality of life than females. Also, it could be seen that one year more of education gives a better perception of

innovation related with quality of life. Also, if the respondent is open to new ideas, s/he has a better perception on innovation related with quality of life that if s/he is not open to new ideas (in both 2015 and 2018).

Model for 2015 doesn't violate the parallel regression assumption and models for both years are global significative.

4.6. Innovation causes unnecessary consumption.

Last two columns of table 5 show, for 2015 and 2018, the perception of innovation causes unnecessary consumption.

For 2018, if the respondent thinks that many people have problems in adapting to innovations, s/he is going to think that innovation causes unnecessary consumption. And, in the same way are the people who think that innovation lead to job losses because companies need fewer workers and that innovation leads to the loss of traditional customs and lifestyles. Hence, if people have a bad perception on innovation because is difficult to adapt to or have conservative values or think that innovation leads to job losses, they think that innovation causes unnecessary consumption.

The results are similar in 2015, but there are two variables that have a negative coefficient. If the respondent has a good economical position perception or if s/he did a training course that made him/her interested in ICT, s/he has a lower perception that innovation causes unnecessary consumption.

[Table 5 goes here]

4.7. Innovation improves access to products and services for all citizens.

First columns of table 6 shows the perception that innovation improves access to products and services for all citizens for 2015 and 2018.

All the coefficients are positive (except age) in 2015. Hence, if one variable increases in one point (1000 euros in the personal income case), the perception that innovation improves access to products and services for all citizens will increase the coefficient value

points. Here is important to observe that the coefficient about the perception that innovation increases people's quality of life is one, thus if this perception change in one point, the perception that innovation improves access to products and services for all citizens change one point, too.

Similar results have been observed in 2018 for those variables. But two variables have negative coefficients: age and education. Hence, older people or people with higher education level have worst perception that innovation improves access to products and services for all citizens.

4.8. Innovation leads to job losses because companies need fewer workers.

Last two columns of table 6 show, for 2015 and 2018, the perception about innovation leads to job losses because companies need fewer workers.

The perception that innovation causes unnecessary consumption, that innovation leads to the loss of traditional customs and lifestyles and that many people have difficulties in adapting to innovations have a positive coefficient (and significative), in this case a change into one of them in one point, ceteris paribus the other variables, will increase the perception that innovation leads to job losses because companies need fewer workers. However, the perception that innovation increases people's quality of life has a negative coefficient, thus if this perception increases in one point, the perception that innovation leads to job losses will decrease.

The perception that innovation leads to job losses for males is lower than females, hence males have a lower perception than females. Furthermore, people with one more year of education have less perception that innovation leads to job losses.

People who use special programs at work have a better perception about innovation and thinks that innovation **doesn't** lead to job losses because companies need fewer workers than people who don't use special programs at work. However, in 2015, if the respondent has a job where the salary is by goals, the perception that innovation leads to job losses is worst than if the respondent doesn't have a salary by goals.

There is a change in the perception of the innovation leads to job losses between 2015 and 2018. If the respondent has a good economical position perception (that is not by the family, is obtained working hard) in 2015 has a positive coefficient and in 2018, a negative coefficient. Thus, in 2018 the respondent thinks that working hard the innovation **doesn't** lead to job losses, but in 2015 not.

[Table 6 goes here]

5. Conclusions

The aim of this paper is to determine the perception of innovation, in its different aspects, of Spanish people. To this end, several ordered logit models have been developed to determine how much the socio-demographic characteristics and other aspects of innovation affect the perception of innovation.

The results about gender gap are consistent with Na & Shin (2019) who suggest that the government promote innovation and market participation of women and firms to foster innovation among female workers. Also, European Commission (2020) considers that, particularly in Spain, according to the latest figures, the issue of gender and minorities should be addressed.

There is a relationship between education level and innovation perception, it could be seen that if people have more level of education, they have a better perception of innovation increase quality of life, that innovation is essential for economic growth, that doesn't lead to the loss of traditional customs, doesn't lead job losses. In the other hand, they have the perception of innovation doesn't improve access to products and services for all citizens.

If Spanish people use Internet to carry out transactions, their perception about innovation leads to the loss of traditional custom and lifestyles is lower than if they don't use Internet to carry out transactions. This result is consistent with Ekdale et al. (2015), where journalists understand the need to use innovation, but not their audience.

A key finding of Gray (2001) was that for teachers to use innovations, the learning process must be individualised. Participants indicated that collaboration, meaningful content and

time were the factors that contributed most to their ability to learn and use the methodology.

In summary, it is found that the perception of the different aspects of innovations shows significant differences between gender, age and educational level, mainly. These results are linked to the literature, but should nevertheless be taken into account, which is why some policy recommendations are presented below.

5.1. Policy recommendations.

Understanding innovation as the introduction of new solutions in response to problems and policy instruments defined as techniques developed to achieve specific goals, some policy recommendations can be considered as policy instruments trying to contribute to economic prosperity and welfare. These recommendations are aimed at different actions focused on three different target groups: government, business and individuals.

According to the relationship observed between education and innovation perception the following actions **for the government** can be considered. On the one hand, it is necessary to improve the ICT skills of society, and to include innovation in the educational process from the training of trainers, as in Gray (2001) that teachers trained in innovation could apply it at work. In this way, ICT skills would be acquired at a very early age. On the other hand, to avoid the digital divide, training and education must be provided at all levels. People who use technology are not scared by it and are more adventurous in trying out new technologies and innovations (Tsourela & Roumeliotis, 2015).

With regard to **companies**, it could be interesting to try to promote innovation in female workers and CEOs, as proposed by Na & Shin (2019). Moreover, trained workers have a better perception of innovations and less resistance to them, which will help to incorporate innovations in companies. Moreover, marketing campaigns could be conducted to show future customers that innovations are good for society, hence that innovations can be incorporated into day-to-day life.

Finally, some general comments **to individuals**, should be considered. It is not possible to stop the innovation process, but if they learn how to use the technologies and the innovation process, it could improve their quality of life.

Including innovation in lifestyle does not necessarily imply an extraordinary increase in consumption of technology.

5.2. Limitations

One of the limitations that can be found in this document is that we have two surveys from two non-consecutive years and that they have not been carried out on the same population, although both are representative. This means that the analysis is cross-sectional and we can only see if there has been a change between these two years.

On the other hand, the global pandemic in 2020 has meant that society in general has had to move to a virtual world, and this may have led to a change in the perception of innovations.

5.3. Future research

One possible line of research would be to analyse the perception of innovation in the post-COVID-19 era, as the pandemic has changed the way things are done from traditional to virtual work.

Obtaining panel data could help to understand the process of innovation perception in Spain over the last few years.

On the other hand, a European comparison before and after the pandemic could show interesting results.

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Table 1.

Demographic profile of respondents and descriptive statistics

		2015		2018	
		Frequency	**Percent**	**Frequency**	**Percent**
GENDER	Male	1215	48.9	3066	48.6
	Female	1272	51.1	3242	51.4
AGE	18-24	210	8.4	511	8.1
	25-34	403	16.2	899	14.2
	35-44	509	20.5	1295	20.5
	45-54	456	18.3	1192	18.9
	55-64	369	14.8	971	15.4
	65-74	302	12.1	851	13.5
	> 75	238	9.6	590	9.3
LEVEL OF STUDIES	No Studies	87	3.5	395	6.3
	Primary	492	19.8	1028	16.3
	High School	1353	54.4	3425	54.4
	College	555	22.3	1452	23.0
		Avg.	**Std. Dev.**	**Avg.**	**Std. Dev.**
INCOME	Personal	820.11	745.53	934,09	814.51
	Family	1642.17	1101.93	1782,65	1175.20

Table 2.

Descriptive statistics of the different measures of innovation perception

Variable	Year	Obs.	Mean	Std. Dev	Min	Max
Innovation is essential for economic growth	2015	2,378	3.41	.635	1	4
	2018	5,991	3.32	.623	1	4
Innovation leads to the loss of traditional customs and lifestyles	2015	2,392	2.49	.984	1	4
	2018	6,037	2.63	.901	1	4
Innovation allows companies to save money	2015	2,218	3.23	.714	1	4
	2018	5,554	3.13	.693	1	4
Many people have difficulties in adapting to innovations	2015	2,434	3.26	.701	1	4
	2018	5,996	2.91	.782	1	4
Innovation increases people’s quality of life	2015	2,316	3.09	.783	1	4
	2018	5,913	3.06	.724	1	4
Innovation causes unnecessary consumption	2015	2,338	2.87	.923	1	4
	2018	5,872	2.89	.848	1	4
Innovation improves access to products and services for all citizens	2015	2,276	3.06	.730	1	4
	2018	5,870	2.97	.703	1	4
Innovation leads to job losses because companies need fewer workers	2015	2,379	3.00	.943	1	4
	2018	5,977	2.94	.868	1	4

Table 3.

Ordered Logit (1)

	Innovation is essential for economic growth		**Innovation leads to the loss of traditional customs and lifestyles**	
	2015	**2018**	**2015**	**2018**
Innovation allows companies to save money	.761*** (0.11)	.720*** (0.07)		
Many people have difficulties in adapting to innovations	.309*** (0.10)	.046 (0.06)	.159** (.08)	.839*** (0.06)
Innovation increases people's quality of life	.432*** (0.11)	.975*** (0.08)	-.307*** (0.08)	-.157*** (0.06)
Innovation improves access to products and services for all citizens	.429*** (0.12)	.335*** (0.07)	.299*** (0.07)	.049 (.06)
Innovation leads to job losses because companies need fewer workers			.800*** (0.07)	.688*** (0.05)
USE: Internet to carry out transactions			-.371*** (0.14)	-.157* (0.10)
USE: Special programs at work			-.335** (0.15)	.018 (.09)
Work that promotes the creativity of the workers and the contribution of new ideas	.134*** (0.05)	.154*** (0.02)	-.099*** (0.04)	-.062** (0.03)
A job where the salary is by goals			.045** (0.02)	-.009 (.01)
Take risks to progress in life			.043* (0.02)	.034** (0.02)
Competition perception	.077** (0.03)	.027 (0.02)		
Have attended to a training course to acquire job-related skills	.268* (0.16)	.047 (0.10)		
Family Income (miles)	.181** (0.08)	.081** (0.04)		
Personal Income (miles)			-.176** (0.08)	.033 (.05)
Education	.096*** (0.02)	.068*** (0.01)	-.043*** (0.02)	-.051*** (0.01)
LR χ^2 (p-value)	266.54 (0.0000)	675.92 (0.0000)	357.89 (0.0000)	830.64 (0.0000)
Pseudo R^2	0.1762	0.1651	0.1121	0.1190
Brant test χ^2 (p-value)	23.92 (0.158)	23.35 (0.178)	35.22 (0.037)	118.95 (0.000)
n	896	2292	1174	2757

Notes: Standard deviation in parenthesis. * Significant at 10%, ** significant at 5% and *** significant at 1%.

Table 4.

Ordered Logit (2)

	Innovation allows companies to save money		**Many people have difficulties in adapting to innovations**	
	2015	**2018**	**2015**	**2018**
Innovation is essential for economic growth	.800*** (0.11)	.887*** (0.07)	.232** (0.09)	.031 (0.06)
Innovation allows companies to save money			.204*** (0.08)	.197*** (0.06)
Many people have difficulties in adapting to innovations	.180** (0.09)	.218*** (0.05)		
Innovation causes unnecessary consumption			.392*** (0.06)	.804*** (0.05)
Innovation increases people's quality of life	.510*** (0.09)	.345*** (0.07)		
Innovation improves access to products and services for all citizens	.439*** (0.09)	.582*** (0.07)	.166** (0.08)	.123** (0.05)
Innovation leads to job losses because companies need fewer workers			.433*** (0.06)	.606*** (0.05)
USE: Internet to carry out transactions			-.339** (0.13)	-.339*** (0.09)
A job that does **not require** continuous training	-.040* (0.02)	.044* (0.02)		
Take risks to progress in life			-.043** (0.02)	-.019 (0.01)
it is important to take into account all points of view			.076*** (0.03)	.008 (0.02)
New ways of marketing products or services have been introduced that have affected their working environment	.295** (0.12)	-.008 (0.03)		
Family Income (miles)	.124** (0.06)	.141*** (0.03)		
Personal Income (miles)			.127* (0.07)	-.118*** (0.04)
Male	.223* (0.12)	.129* (0.08)	-.203* (0.11)	.083 (0.07)
Age			-.006* (0.00)	.012*** (0.00)
LR χ^2 (p-value)	268.81 (0.000)	572.39 (0.000)	197.00 (0.000)	959.51 (0.000)
Pseudo R^2	0.1115	0.1040	0.0626	0.1225
Brant test χ^2 (p-value)	57.04 (0.000)	65.91 (0.000)	28.36 (0.164)	160.93 (0.000)
n	1143	2785	1507	3407

Notes: Standard deviation in parenthesis. * Significant at 10%, ** significant at 5% and *** significant at 1%.

Table 5.

Ordered Logit (3)

	Innovation increases people's quality of life		**Innovation causes unnecessary consumption**	
	2015	**2018**	**2015**	**2018**
Innovation leads to the loss of traditional customs and lifestyles	-.276*** (0.06)	-.175*** (0.04)	.540*** (0.05)	.485*** (0.04)
Many people have difficulties in adapting to innovations			.514*** (0.06)	.724*** (0.04)
Innovation improves access to products and services for all citizens	1.293*** (0.08)	1.385*** (0.02)		
Innovation leads to job losses because companies need fewer workers			.692*** (0.05)	.678*** (0.04)
Open to new ideas	.067*** (0.02)	.081*** (0.02)		
Eco. position perception	.054*** (0.02)	.005 (0.01)	-.042** (0.02)	-.017* (0.01)
TRAINING: It has made him/her interested in ICT			-.096** (0.04)	.042 (0.03)
Family Income (miles)	.104* (0.06)	.076** (0.03)		
Male	-.139 (0.11)	.216*** (0.07)		
Education	-.007 (0.01)	.041*** (0.01)		
LR χ^2 (p-value)	341.24 (0.000)	805.13 (0.000)	649.69 (0.000)	1782.16 (0.000)
Pseudo R^2	0.1090	0.1202	0.1259	0.1395
Brant test χ^2 (p-value)	26.51 (0.022)	60.88 (0.000)	66.59 (0.000)	41.56 (0.000)
n	1406	3251	2008	5294

Notes: Standard deviation in parenthesis. * Significant at 10%, ** significant at 5% and *** significant at 1%.

Table 6.

Ordered Logit (4)

	Innovation improves access to products and services for all citizens		**Innovation leads to job losses because companies need fewer workers**	
	2015	**2018**	**2015**	**2018**
Innovation is essential for economic growth	.551*** (0.09)	.479*** (0.06)		
Innovation leads to the loss of traditional customs and lifestyles	.223*** (0.05)	.070* (0.04)	.569*** (0.06)	.557*** (0.04)
Innovation allows companies to save money	.340*** (0.08)	.491*** (0.06)		
Many people have difficulties in adapting to innovations			.488*** (0.07)	.520*** (0.05)
Innovation increases people's quality of life	1.004*** (0.08)	1.190*** (0.06)	-.190*** (0.07)	-.169*** (0.05)
Innovation causes unnecessary consumption			.730*** (0.06)	.649*** (0.05)
A job that does **not require** continuous training			.046** (0.02)	.003 (0.02)
A job where the salary is by goals			-.037** (0.02)	.0133 (0.01)
USE: Special programs at work			-.368*** (0.13)	-.293*** (0.08)
it is important to take into account all points of view			-.057** (0.03)	.013 (0.02)
Eco. position perception			.172*** (0.06)	-.041*** (0.01)
Personal Income (miles)	.172** (0.07)	.035 (0.04)		
Age	-.001 (0.00)	-.007*** (0.00)		
Male			-.179* (0.10)	-.177*** (0.06)
Education	.001 (0.01)	-.046*** (0.01)	-.037*** (0.01)	-.054*** (0.01)
LR χ^2 (p-value)	376.34 (0.000)	928.91 (0.000)	662.17 (0.000)	1316.02 (0.000)
Pseudo R^2	0.1135	0.1254	0.1689	0.1388
Brant test χ^2 (p-value)	64.62 (0.000)	100.77 (0.000)	74.90 (0.000)	118.54 (0.0000)
n	1565	3607	1525	3856

Notes: Standard deviation in parenthesis. * Significant at 10%, ** significant at 5% and *** significant at 1%.

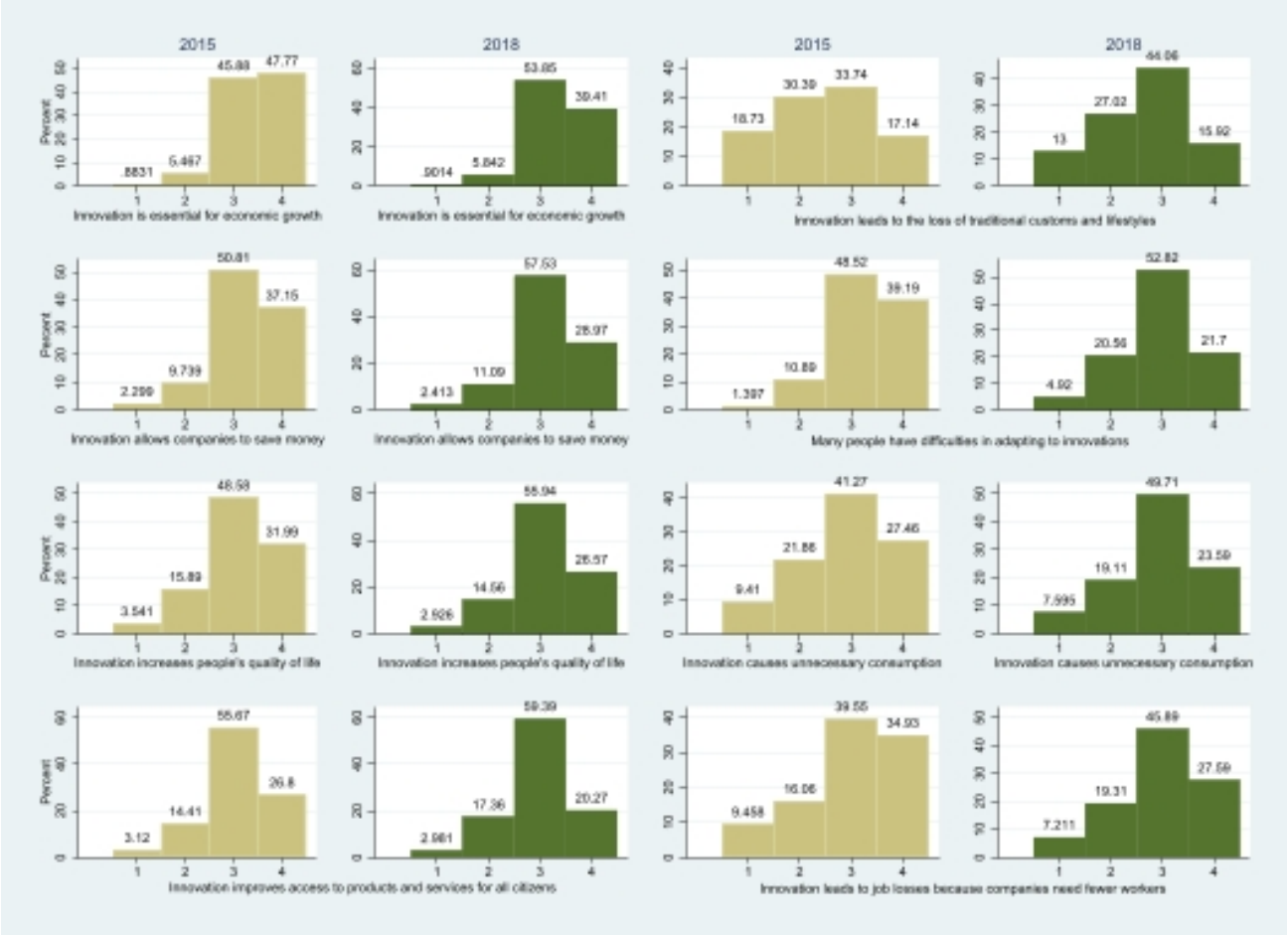

Figure 1.

Perception of innovation