Telecommuting potential analysis

Abstract

Commuting is a problem for developed societies that translates into economic, social and environmental losses. This study is set to explore the potential of telecommuting.

The empirical study started with interviews to build a survey that was answered by 126 Lisbon commuters. Results show interviewees perceived telecommuting consequences are in line with extant research and that attitudes towards telecommuting (productivity, and cost savings) are predictors of the intention to accept telecommuting offers. Likewise, professional tenure and work-to-home stress foster a more favourable attitude related to productivity / quality of working life while displacement mode (active) and home-to-work stress foster a more favourable attitude related with cost savings.

The study concludes that there is considerable potential for telecommuting and that the process of implementing telecommuting as an HRM policy is doable based on the attitudes identified in the model developed.

Key words

Commuting; Potential of telecommuting; Remote work, Attitudes towards telecommuting, HRM

Introduction

Commuting is affecting the overall cities, which generates economic, social, and environmental costs. As demonstrated in a research conducted by Ferreira et al. (2014), Portuguese commuters travel approximately 50 million kilometres (km) by car each day. Regarding the kilometres travelled in inter-municipality commuting, 59% correspond to the trips within the main metropolitan areas, Lisbon and Porto. This confirms that Portuguese people commute more in metropolitan regions, where there is more traffic congestion, and so more economic costs.

Urban consolidation led to the expectation of masses of people dislocating regularly to work, shopping, get some entertainment, and fulfil their social duties amongst many other possibilities. Traffic jam became an expectable urban landscape at certain hours due to the convergence of social rhythms mostly to work and return home. Additionally, the urban growth patterns, with emerging suburbia, created a class of individuals that spend considerable time and money to assure their transportation, the commuters.

Although such pattern is discernible across most of – if not all – large metropolitan areas in the world, its consequences can be dare, putting sustainability at hazard both from the social, economics, and ecological points of view.

With the shift to services economy and the increased use of IT, some societies have bet on replacing the traditional job post by working from home. This became known as "telecommuting" because workers will remain bounded to most of the duties they had, but without the assumption that they must be physically present at their job post to actually perform their duties.

The changes that Lisbon experienced in the last decades with growing metropolitan areas, and the rise of automobile ownership, is matched by scarce knowledge on the adoption of telecommuting in this country. In this context, this study focuses on the overall potential of telecommuting, as we evaluate a possible explanative model for adopting telecommuting with a diverse sample of Portuguese workers.

It is particularly interesting to understand to what extent it is inevitable, and whether its impact justifies the formulation of new Human Resources management policies. In this way, the study sets itself the general goal of evaluating telecommuting potential by means of self-reported perceptions of in-job time reduction, cost reduction, and effectiveness differential while exploring possible attitudinal and psychological predictors of intention to accept telecommuting offers. To achieve these goals, we questioned "What are the predictors of attitudes towards telecommuting and intention to accept telecommuting offers?" as estimators of telecommuting potential.

Literature review focused on the rise of commuting, its impacts and potential effectiveness. The remaining of this work proceeds with the report of an empirical study.

The study's nature is qualitative and quantitative, starting with interviews that were conducted to residents in metropolitan Lisbon from different sectors to gain insight into

specific variables operating in this context. Based on this information and crossing it with the literature review, we built an online survey to test the predictive model between sociodemographics, job-related variables (workload, extra work), telecommuting-related variables (displacement modes, time, cost, stress) and attitudes towards telecommuting plus intention to accept telecommuting offers.

By having a better understanding of telecommuting with a Portuguese sample, it is expected to tap its potential so that organizations can better consider this way of organizing work to overcome the challenges that an urban and professional life place. In order to think of an HR policy concerning telecommuting, it is important to understand the patterns of association between certain sociodemographics, work design (workload), transportation options and costs in order to understand which variables should lead to better acceptance of telecommuting, where it is advantageous.

Literature Review

Telecommuting

The traditional job post can be associated to the concept of commuting, since millions of people use car or another mode of transport to go to their workplace, spending their time on it. Commuting refers to traveling from the home to the workplace (Mattisson et al., 2015) and the person who does that on a daily basis is known as a "commuter". This includes those who travel using a car, public transport and also those who uses a bicycle or even walk.

The results based on Gallup's annual Work and Education poll showed an increase in telecommuting in the U.S., between 1995 and 2016, where 43% of workers said they have telecommuted (Hickman and Fredstrom, 2018) against 9% twenty years before. Also, according to the FlexJobs and Global Workplace Analytics's report (Parris, 2017), 3.9 million U.S. employees, or 2.9% of the total U.S. workforce, work at least half of the time from home, up from 1.8 million in 2005 (115 percent increase since 2005).

According to Eurostat, telecommuting in the European Union has increased ever since 2006. The proportion of employees working from home was 11.8% in 2006, while in 2015, the overall proportion grew up to 14.5% (Picu and Dinu, 2016).

But telecommuting is still a long way off as an economy-wide phenomenon. Just because technology is changing and developing, it does not mean that the workplace as a physical institution will cease to exist but will make commuting to work increasingly optional and part-time (Mokyr, 2001). As mentioned by Picu and Dinu (2016), the globalization of business and the technology's advancements will continue to change the nature of future work flexibility, offering more people the chance to work remotely.

According to a study conducted by *SHRM Foundation* in collaboration with the *Economist Intelligence Unit* (2013), the proliferation of communication and information technology is slowly diminishing the proportion of employees working from a central office. The remote work is on the rise (Picu and Dinu, 2016), leading to the fall of traditional job post.

Alongside, the digitization of the economy brought a set of new services such as the trade of software, video, computer games, digital TV, call centres, digital design (CRC), e-learning and moocs, online shopping, and banking (Moriset & Malecki, 2009). These services replaced traditional ones providing the same service at a lesser cost.

The different types of commuting are grouped into two major categories: active and passive commuting (Künn-Nelen, 2016). The active category includes commuting by bicycle or walking and the passive category encompasses commuting by car or public transport.

Commuting by car is more stressful than any, since those who go by private vehicle have more health problems. According to Gatersleben and Uzzell (2007), the passive commuting modes are more stressful and also more boring. As mentioned by Gatersleben and Uzzell (2007), active commuting modes, as opposed to passive, are more relaxing and exciting.

Telecommuting impacts

Many companies implement telecommuting because it offers an answer to human resources problems, such as recruitment, retention, staffing flexibility; it also relates with facilities issues (office space or parking) and, sometimes, emergency readiness (Pratt, 1991). Bailey and Kurland (2002) mentioned other advantages of telecommuting, such as improved productivity, job satisfaction, employee retention and attraction, and organizational loyalty. According to Tredup (2016), telecommuting contributes to

increase productivity and improves the engagement at work while helping employees gain a better work-life balance (especially those with children, Cascio, 2000). Through the reduction in commuting, telecommuting supports the environment and local infrastructures as well (Picu and Dinu, 2016). Telecommuting leads to reduced costs of working, not only via savings in transportation, time and money, but in many cases in formal business attire that is not required if workers telecommute (Gajendran and Harrison, 2007). It also contributes to save space and money for companies by eliminating or reducing a physical office, and increases employee morale and loyalty by offering them work in a location of their choice (Picu and Dinu, 2016).

Conversely, by spending more time with their family telecommuters can also experience more conflict between work and family, since work can interfere with family and family can interfere with work as well (Allen et al., 2015). According to Madden and Jones (2008), being connected to technologies creates more hours of work and leads the telecommuters to check e-mail outside of normal working hours. An increase on telecommuting also contributes to isolation as, according to Harpaz (2002), telecommuters become more isolated not only from other people (friends/family), but also from public institutions.

There might be context-dependent outcomes related with telecommuting effects. Although the meta-analysis conducted by Gajendran and Harrison (2007) found significant positive effects, when the intensity of telecommuting reached 2 ½ days per week, a zero-sum game (trade-off) was identified between the positive effects in the family and the negative effects in the relationship with coworkers.

Other recent studies in different locations have also highlighted the benefits of telecommuting. For example, Ansong and Boateng (2018) conducted a study that examined the potential benefits of adopting telecommuting in the operations of Ericsson Ghana. Many benefits were found, namely increased productivity, reduced absenteeism, reduced turnover, reduced air pollution, fuel conservation, among others.

In Pakistan, Lahore, telecommuters witnessed a better social life and began to spend time with family and friends (Zia and Bilal, 2017).

In Hong Kong, a study by Leung and Zhang (2017) showed that the more people use information and communication technologies to work at home, the greater they perceive their work-family borders to be flexible and also permeable.

Evaluating telecommuting effectiveness

To be effective, telecommuting requires organizational support given to employees (Allen et al., 2015). According to Lautsch et al. (2009), supervisor's support is also relevant for the acceptance and administration of telecommuting work arrangements.

Technology is another aspect that can provide and facilitate effective telecommuting. The success of remote work is possible through communication tools that can best simulate face-to-face interactions (Waber, 2013).

The individual differences may influence the ability to effectively work from home, such as planning behaviour and self-regulatory skills which enable individuals to function effectively in an environment (home) that provides them a great deal of control (Lapierre and Allen, 2012). It means that individual characteristics that promote self-regulation lead to a better focus on their work tasks at home (Allen et al., 2015).

Overall, to become effective, telecommuting requires that organizational performance is achieved with reasonable costs while allowing for work to be controlled. So, among others, it involves organizational and supervisory support as well as technology and individual skills aligned with the challenges that telecommuting poses.

Attitudes towards telecommuting

Several studies have focused on attitudes towards telecommuting. One of them, a study conducted in Singapore (Lim and Teo, 2000), examined attitudes towards teleworking among information technology (IT) professionals from a large local IT organisation. There are four categories of variables influencing individuals' attitudes towards teleworking: demographic characteristics, work-related attitudes, support factors, and perceived advantages and disadvantages to individuals and organisations. A similar study was conducted in Turkey (Iscan and Naktiyok, 2005) in many internet companies, where demographic characteristics, household attributes, support factors, and perceived advantages and disadvantages of telecommuting to individuals, organisations and society were analysed to grasp individuals' attitudes towards telecommuting.

Findings showed no organisational disadvantages such as loss of data security or equipment accountability.

Overall, attitudes towards telecommuting may result from considerations about displacement modes, displacement time, transportation costs and psychological costs translated as stress experienced in traveling from home to work and back from work. We hypothesized that **the higher these cost-variables get, the more favourable the attitude towards telecommuting will be (Hypothesis 1)**. Adopting less expensive modes of displacement (e.g. walking as compared with automobile), having longer commuting times, paying more for transportation or feeling more stress will be positively associated with attitudes towards telecommuting. Additionally, the workload and full working hours (extra work) and sociodemographic variables should be taken into consideration as control variables.

Attitudes are especially important because they strongly condition behavioural intentions (Ajzen and Fishbein, 2005) and are susceptible of intervention targeting behavioural change (Verplanken and Wood, 2006). Within organizational settings attitudes were found to predict behaviours via the mediation of behavioural intention ranging from explained variances as high as .62 (Kim and Hunter, 1993) to .28 (Sheeran, 2002). These variations reflect the complexity of the objects towards which attitudes are measured but extant literature have well established this link between attitudes and behaviour via behavioural intention (Webb and Sheeran, 2006). Also, the intention to telecommute should reflect considerations of positive impact on effectiveness and cost savings. Therefore, we hypothesize that **more favourable attitudes towards telecommuting will be positively associated with intention to telecommute** (**Hypothesis 2**).

In addition, the literature review suggested a plausible research model where a set of predictors (sociodemographics, work related, and commuting experience) may explain attitudes towards telecommuting that, in turn, should explain intention towards telecommuting, as follows (Figure 1).

Figure 1 near here

Method

Research design

The goals of this research advise both the use of an inductive and deductive approach. In an inductive approach, data moves from the specific to the general (Chinn and Kramer 2004), as opposed to deductive, which moves from the general to the specific and is based on an earlier theory or model (Burns and Grove 2005). Firstly, due to the context dependency of commuting phenomenon we opted to deploy a qualitative phase that reflected an inductive approach. With this task we intended to extract the meanings and reported personal accounts of commuting experience as well as individual's conceptions and attitudes towards changing that experience. Once ideas and meanings were extracted via content analysis, we drafted a set of items that represented the categories. These items were translated into a survey as a scale with quantitative answering in order to collect data for the hypothetic-deductive phase via quantitative data analysis. Hence, we opted to use a mixed method approach.

Data analysis strategy

As the research design uses a mixed method approach we explain data analysis strategy both for the qualitative and quantitative phases. Data from interviewing were recorded and transcripted. We opted to conduct content analysis with a summative approach (Hsieh and Shannon, 2005) covering advantages and disadvantages into three categories: economic, social, and environmental. Frequencies suggested their centrality in the interviewee's life.

Quantitative data was firstly analysed with exploratory factorial analysis to validate new proposed measures. Validity testing followed Hair et al. (2010) criteria, namely: KMO>.500, Bartlett's X^2 non-significant (p>.05), MSAs above .500, communalities for each item >.500, each emerging scale must have face validity (interpretable) and load on each item at least .600 with no *crossloadings* (after Varimax rotation). The total explained variance by the factorial analysis after rotation should be at least 60% and in the present study we opted to extract factors on the basis of Kaiser criterion (eigenvalue > 1). The reliability of each scale was measured by means of Cronbach alpha and should attain .70 or, as the scale is tentative, at least .60 for acceptance.

Hypotheses were analysed via hierarchical Multiple Linear Regression with a significant p set at .05 and testing for all assumptions as well as common issues such as multicollinearity (where VIF must be below 5), distribution of variables should be normal (Kolmogorov-Smirnov statistic non-significant for p =.05) and residuals should be normally distributed.

Sample

Interviewees were selected as individuals experiencing daily commuting for work reasons.

The sample comprises 126 employed individuals that replied an online survey. The sample is mostly female (60.3%) and averaging 35.4 years-old (sd=11.9) with minimum 20 and maximum age 62 years-old. The occupations participants reported are very diverse with largest proportion operating in the education and professional training industry (23.1%), performing administrative or operative functions (21.4%), managerial or supervisory functions (11.1%), bank and finance (8.5%), professional services (8.5%), sales and marketing (6%), HR services (5.1%) and IT (4.3%) with the remaining spreading in several occupations such as pharmaceutics, police, drivers, and even a bar tender. The sample purposively comprises a varied array of occupations to avoid biases in telecommuting estimation arising from occupational specificity.

Measures

The main objective of the semi-structured interview is to understand the type of functions that each interviewee performs and the modes of transport used with their respective costs and time spent on travel, and to understand the interviewees' elaborations about the way their job/work can be done remotely. The ultimate purpose is the extract the main variables linked with measuring attitudes towards and the potential of telecommuting.

The survey comprehends four sections and integrates all the information extracted from the qualitative phase. It comprises four measures plus sociodemographics.

Home-work displacement experience was measured with 4 items covering: displacement modes (1=automobile, 2=public transports (bus, subway, train, boat, other), 3=bicycle, 4=walking, and 5=other), time ("How long do you take, on the average day, in your home to work displacement - add go and return time."), costs ("How much do

you estimate your home-to-work transport costs are - monthly value in euro currency."), and stress level ("Consider your commuting period. How stressful is it for you?). The last item was measured with a scale ranging from 0 ("no stress at all") to 100 ("extremely stressful"). We composed the "displacement mode" variable in such a way that it can be read as an ordinal variable with higher value reflecting less costly modes of displacement (costly as regards maintenance and operation).

Telecommuting outcome potential was measured with two items namely: telecommuting workload potential ("From all hours workload you reported weekly, how many would you estimate could be done from your home?"), and telecommuting cost-saving potential ("How much would you estimate to save if those hours were home-based? – weekly basis in euro currency"; these include transport, food, attire cost savings).

Attitudes towards telecommuting was measured with a 10-item novel scale built from the literature review crossed with interviews analysis. The items comprehend a wide array of issues that include cost, productivity, work-life balance, quality of life, environmental impact, health, and stress. Respondents were requested to answer in a 5 point Likert scale (1="Totally agree", 5="totally disagree"). The items were:

1. *Work from home largely compensates if one takes into consideration transport and food costs (of the alternative, work at the job post).*
2. *My productivity would be higher working from home than the one I have today at my job post.*
3. *Working from home would give me more time for my family and friends.*
4. *Working from home would give more resting time.*
5. *My concentration level would be higher working from home compared with the one I have working from my job post.*
6. *Working from home would improve my quality of living.*
7. *Environmental pollution would diminish if I worked from home, as I would not have to physically displace to my job post.*
8. *I would eat healthier food if instead of displacing physically to my job post I would rather work from home.*
9. *My professional life would be less stressful if I would work from home.*

10. *Working from home would offer more advantages than disadvantages to me.*

This scale is psychometrically sound (KMO=.836, .783<MSA<.888, Bartlett's X^2=605.658, 36 df, p<.001) after removal of one item due to low communality (I would eat healthier food if instead of displacing physically to my job post I would rather work from home). Factorial analysis explains 67.5% total variance after rotation (varimax) and showed a two-factor solution (table 1): "quality of working life" (F1) and "cost savings (time, money and ecology) F2", showing both good reliability (α=.889 and α=.794, respectively).

Table 1 near here

Telecommuting acceptance was measured with a single item requesting the respondents' willingness to accept telecommuting if offered by their current employer. The options were: 1= "I would not accept whatever the benefit they wanted to offer me", 2="I would only accept if offered a net wage increase – with no meal subsidy waving", 3="I would accept even if they wanted to cut on my salary (but only if this matched my costs savings with transport etc.)", and 4="I would accept even facing net salary reduction". In case individuals selected the fourth option (accept with net losses) we asked what would be a reasonable percentage of such net loss.

Sociodemographics: Gender (1=female, 2=male), Age, profession, industry (1=Financial and accounting services, 2=Insurance, 3=Banking sector, 4=Health, 5=Transportation, 6=Education, 7=Industry, 8=other), place of living (post code first 4 digits), place of work (post code first 4 digits), professional tenure (1=less than 1 year, 2=2 to 5 years, 3=6 to 10 years, 4=11 to 20 years, 5=over 20 years), and weekly workload (in hours both regular and extra).

Results

From a descriptive point of view, the different modes of transport used by 126 respondents for commuting shows that 48.4% commute by private vehicle, followed by

public transports (39.7%). Only a few percent commute by bicycle or walking. This shows most of respondents use passive commuting modes to go to their workplace (table 2).

Table 2 near here

On an average day, the time spent in home to work and work to home displacement vary in the sample. Only 11% spend up to 20 minutes. 35.8% spend 21 to 40, and 16.7% 41 to 60 minutes. Just a few percent take long hours on commuting: only 0.8% take 121 to 140 minutes and other 0.8% take 141 to 160 minutes. But there is still a considerable percentage of respondents (8.7%) that report taking more than 160 minutes.

Most respondents stated they work between 31 and 40 hours a week at their job post (63.5%) while a small percentage reported to work between 41 to 50 hours (12%) and between 21 to 30 weekly hours (11.9%). Only a marginal percentage reported working between 51 to 60 hours (2.4%).

Taking into consideration that the full-time workload is set between 35 and 40 hours a week, we took this upper level as the cut-off to calculate the amount of overtime work. When directly asked to make an estimation of the full working hours individuals perform per week (when including work taken home), findings show approximately half the sample reports taking extra work to finish at home, which means that they work more hours other than the ones at their job post. Table 3 shows the extra hours people perform their tasks, besides those spent at their workplace.

Table 3 near here

If people that take work home are the same who make long commuting hours, then the true magnitude of work-related time is very high.

Table 4 shows monthly transport costs on commuting, in euros. A considerable number of respondents (38.9%) estimated a monthly expenditure between 31 to 60 euros in transports and 22.3% between 61 to 90 euros. Despite being a smaller percentage, there is 7.3% that report spending more than 150 euros. These figures should be considered against the average national wage that is set at 1144 euros as per October 2016 according with Trading Economics.

Table 4 near here

The level of stress caused by commuting directions differs. Tables 5 & 6 show the stress level reported by participants suggesting that for some the commuting period from home to work is more stressful than from work to home, and for others the reverse.

Considering the period of commuting from home to work (table 5) 50.1% reported a stress level up to 40 points in the 100-point stress scale. About 1/3 of the sample reported 60 or more stress points. Only 6.3% reported having “no stress at all”.

Considering the period of commuting from work to home (table 6), 23.8% reported between 61 to 80 the stress level, and there is also a small percentage that considered the commuting period very stressful (8.8%).

Table 5 near here

Table 6 near here

Considering the potential for work done remotely (expressed in hours), for example at home (table 7), 35.7% of respondents reported they could work 11 to 20 hours remotely, and 34.3% estimate that they would be able to transfer remotely up to 10 hours. Less than 1% estimated potential remote work hours between 41 to 50 hours.

Table 7 near here

To better understand how extra-work relates with workload we calculated a simple proportion by dividing reported extra-work hours by the reported workload. Almost the majority reports no extra-work with the largest share of those who do fall in the +20%to +25% worked hours beside regular scheduled.

One of the aspects that shows the potential to telecommute is the savings people make from working remotely. Table 8 refers to euros saved monthly due to estimated potential hours worked away from job post. These include savings in transport, food, attire. About 36.3% estimated savings of 240 or more euros, including a small percentage (6.4%) that reports savings of more than 480 euros.

Table 8 near here

Table 9 shows the intention to accept telecommuting if offered by current employer and the options were:

1= “I would not accept whatever the benefit they wanted to offer me.”

2=”I would only accept if offered a net wage increase – with no meal allowance waving.”

3=”I would accept even if they wanted to cut on my salary (but only if this matched my costs savings with transport).”

4=”I would accept even facing net salary reduction.”

The largest share of answers (44.4%) fell in option two, which means that they accept telecommuting if the employer offered a net wage increase. They want benefits from both sides: the savings from not having to commute while increasing their net salary keeping their meal allowance. 27.8% would accept to telecommute even with salary cut, but only

if this matches their costs saving with transport. This can mean that these workers are aware of the advantages of this type of work, and this is why they do not mind losing salary by working from home, under the condition of keeping their purchase power. About 12% would accept to telecommute even facing net salary reduction. This means that they trade-off purchase power for quality of living. Workers that chose this option four (unconditional yes) are clearly those who are the most receptive segment in the population. At opposite position lies a considerable percentage (15.9%) that would not accept to telecommute whatever the benefit the employer is willing to offer them.

Table 9 near here

Whenever individuals selected the fourth option (accept with net losses), we asked what would be a reasonable percentage for them of such net loss. From those who selected this option 33% would be willing to give up 5% of their salary while 47% would be willing to give up 10%. A fifth would be willing to relinquish between 15% and 20%.

Overall, the large majority of respondents is not willing to lose any salary. The exceptions would only go to as far as -20% net loss.

Bivariate statistics

Table 10 displays the average (or frequency for nominal variables) and their respective bivariate statistics.

Average reported monthly commuting costs of 67.8 euro might be surprising when considering the average displacement time of 67.4 minutes. The substantial standard deviation is suggestive of two groups of respondents, one with low transportation costs and another one with high. The average reported level of stress (in a 100-point scale) is moderate (48% and 43%) for going to and returning from work, respectively.

Among variables under study it is the correlation between age and professional tenure that stands out (r=.906) which poses threat of multicollinearity. We shall keep this in mind in future analyses. Besides this the level of stress experienced by respondents from traveling home to work and vice versa tends to be correlated

Table 10 near here

Hypotheses testing

The emergence of two factors within attitudes towards telecommuting implies the original model is refined into more detail (Figure 2).

Figure 2 near here

The **first hypothesis** focused on the predictors of the attitudes towards telecommuting, namely sociodemographic variables, workload and extra work, the displacement modes, as well as estimated time and costs (monetary and psychological, expressed as distress). As the attitudinal variable comprehends two factors (F1 – Productivity/QWL, and F2-Costs) we conducted two hierarchical linear regressions with three steps: the first comprehending the individual sociodemographic (gender, age, industry, professional tenure), the second step comprehending job-related variables (weekly workload, and extra-work), and the last one comprehending displacement mode, displacement time, transportation costs, experienced stress from home-work and vice versa.

For the Productivity/QWL related attitude towards telecommuting, findings show a significant model (table 11) explaining 21.6% (adjusted variance) with professional tenure showing a significant beta of .501 ($p<.05$) rendering all steps significant [$F_{step1}(4, 113)=3.575$, $p<.01$; $F_{step2}(6, 111)=2.919$, $p<.05$; $F_{step3}(11, 106)=3.927$, $p<.01$]. None of the variables inserted at step 2 had significant association but at step three professional tenure did have a significant beta of .294 ($p<.01$). Because of the VIF indicator attached to this variable, we repeated the regression analysis without its major correlate (age), the overall significant patterns remained the same, but the explained variance fell to 20.6% (adjusted) thus probably reflecting true explained variance.

For the costs related attitude towards telecommuting, findings show a significant model (table 12) explaining 18.9% (adjusted variance) with neither sociodemographic variables [$F_{step1}(4, 113)=1.055$, $p=.382$] nor work-related variables [$F_{step2}(6, 111)=0.844$, $p=.539$] showing significant associations. However, two significant associations were found for the third block of variables [$F_{step3}(11, 106)=3.480$, $p<.01$] with displacement mode (Beta=-.226, $p<.05$) and work-home stress (Beta=.290, $p<.05$) playing a role.

Findings **partially corroborate hypothesis 1**, where predictors vary in explaining attitudes towards telecommuting, from professional tenure to stress. It is noteworthy highlighting that experienced stress is a common denominator amongst predictors for both cases.

Table 11 near here

Table 12 near here

Hypothesis 2 established a plausible positive relation between attitudes towards telecommuting (ATT) and Telecommuting Acceptance Intention. Controlling for sociodemographics, the linear regression showed significant coefficients of association between these variables as follows (tables 13 & 14).

The model explains 26.6% (adjusted variance) with none of the sociodemographic variables playing any meaningful and significant role [$F(4, 118)=.846$, $p>.05$] while at the second step, both attitudinal variables relate with significant variance [$F(6, 116)=8.373$, $p<.01$]. The second step, thus, added significant explained variance to the model [$\Delta R^2=.274$, $F(2, 116)=22.802$, $p<.01$]. There is some indication of multicollinearity (VIF>5) but it concerns only variables that were not significantly related with the criterion variable and thus can be disregarded.

Table 13 near here

Table 14 near here

The findings **corroborate the second hypothesis** suggesting that respondents have both considerations of quality of working life / productivity and cost when deciding their degree of telecommuting acceptance. It is noticeable that no sociodemographic variable had significant association with the telecommuting acceptance intention thus ruling out gender, age, industry and tenure differences in our sample.

The joint findings are depicted in Figure 3 representing only those variables that had at least one significant association in the model.

Figure 3 near here

Discussion and conclusions

The study explores the potential of telecommuting, where attitudes towards telecommuting and intention to accept telecommuting offers were the central focus. The motivating research question concerned two minor goals: a) to address telecommuting potential by means of self-reported perceptions of in-job time reduction, cost reduction, and effectiveness differential, and b) to test an explanative model linking sociodemographical, psychological, and operational drivers to attitudes and behavioural intention.

This was empirically tested by means of a twofold approach: qualitative first followed by quantitative, through a questionnaire. The qualitative consisted of interviewing commuters inquiring for personal accounts of commuting experience and implicit theories about commuting and telecommuting. This gave clues to build a questionnaire, intended to collect structured data about sociodemographic variables, psychological, operational, attitudes towards telecommuting, and behavioural intention (probability of accepting telecommuting offer with varying compensation scenarios).

Interviews suggested that the general citizen does not have a deep reflection made yet about telecommuting to fully grasp its nature and consequences. However, there is a widely shared opinion that telecommuting brings advantages both at the economic and environmental levels, as well as disadvantages at the social level. In the same way as interviewees' responses, authors such as Mokhtarian et al. (1998), Pendyala et al. (1991) mentioned the reduction of costs (transport or others) as the advantage of telecommuting. Less stress was referred by Handy and Mokhtarian (1996), more time for family and friends by Mokhtarian and Salomon (1994), and less pollution by Mokhtarian et al. (1998). Conversely, telecommuters do experience social isolation (Feldman & Gainey, 1997) and professional isolation (Harpaz, 2002). Conflict between family and work was also referred by many authors such as Greenhaus and Beutell (1985), and Allen et al. (2015). Interruptions (Allen et al., 2003) and distractions (Kraut, 1989) are other drawbacks of telecommuting. Many previous studies on telecommuting place advantages of this new form of work more at the economic level, and disadvantages at social level. It means that there are similarities in interviewees' responses compared to what is known in previous systematic studies.

At the descriptive level, the questionnaire showed the majority of the sample opts for private vehicle or public transports (both passive modes of displacement), takes between 20 to 60 minutes daily in commuting (go and return), and reports having modestly low monthly transportation costs. It also reports regular full-time workload (within the 35-40 hours weekly) but about half the sample reports having no extra time, while those who do add approximately 1 to 10 hours extra weekly.

The majority reported a possible margin of up to 20 hours a week from their workload that could be done remotely. The estimated cost savings from these hours puts the majority ranging up to 160 euro a month. It should be noted that not all types of work can be done remotely, since some tasks require face-to-face contact, just as demonstrated by Bélanger (1999). But nowadays the development of information and communication technologies lead to new forms of work such as telecommuting, which presents benefits for workers, for society and also for environment.

The level of stress reported both in the home-to-work and work-to-home traveling is quite similar and is set slightly below the midpoint scale.

A high percentage of respondents would accept telecommuting offer under the condition that it implies a net salary gain, and there is a small but considerable percentage that do not accept to do telecommuting whatever the benefit the employer is willing to offer them.

Overall, the profile of the sample is similar to accounts in mass media about the use of automobile versus public transportation in metropolitan Lisbon. The sample does not comprise a large proportion of workers that match the high commuters profile observable in some large metropolis in the world. This is expectable, but it will also lower the potential savings and impact of telecommuting compared with a study focusing only on heavy suburbia telecommuters.

The predictors of sociodemographic nature, such as professional tenure, those of a psychological nature, namely home-to-work and work-to-home stress, and those operational namely the displacement mode, were found to influence attitudes towards telecommuting, thus partially corroborating the first hypothesis.

Commuting is known to be related to stress especially when individuals use passive transportation modes (Gatersleben and Uzzell, 2007) and our sample did report high level of passive commuting. Although stress levels can be considerable they may also be inconspicuous such as mood change at home (e.g. Novaco et al., 1990) which we would not be able to account on the basis of a single general question about stress, such as the one we asked. Being subjectively answered, it is quite possible that respondents may bias true stress levels, as compared with objective measures. We contend this did not occur in our sample as the magnitude of stress reported matched the magnitude of potentially related stress drivers such as average displacement time.

It was rather surprising that work-to-home and home-to-work stress predicted different attitudinal dimensions. We could not locate a single source that would offer explanation on the basis of previous empirical studies. However, we believe that the home-to-work subjective travel experience differs from work-to-home in the sense that it might be more pressing to reach at a specific hour in the first (for punctuality sake) when compared with the later. It is also common that people might not avoid rush hour in the morning, but employers give them leeway to leave at a later hour at their will, as long as they are not breaking labour relations agreements.

The home-to-work stress association with productivity/QWL might be explained by the eventual perception that wasted time and fatigue accumulated in displacement at morning rush hour can lower workers' ability to focus, to produce, and as well as their perceived quality of working life. The work-to-home stress association with cost savings is possibly explained by commuters' perception that they could be already at home, saving all the time and money as when going back to home they might find more attention to reflect on their personal life. Also, the possible extra costs from not being at home, e.g. paying extra-time children care. Once again, these are but speculative possibilities as we found no previous study on this issue or reporting similar findings.

The second hypothesis was supported. As expected, the intention to accept telecommuting offers is influenced by attitudes towards telecommuting, namely productivity/QWL and cost savings. It means that the more favourable the attitudes towards telecommuting are, the higher the telecommuting acceptance intention is.

As in any study, methodological and conceptual options imply limitations we should acknowledge. The present study departed from a modest non-random sample size. However, the participation was entirely free, with guarantees of being anonymous and confidential and without any reward. This could have biased answers towards what respondents believe is the implicit theory (Podsakoff et al., 2003).

We opted to separate the home-to-work from work-to-home traveling due to the possibility that individuals adopt strategies to avoid rush hour or have differentiated working schedules. We believe this is novel compared with literature reviewed but future studies may want to incorporate further detail on the precise time slots people use to travel, and perceived traffic congestion for those who use their own vehicle.

We believe more variables can be collected to better grasp the idiosyncrasies of each individual. For example, spending 20 minutes from home-to-work by bicycle and living 5km away is not the same of 20 minutes by car and living 10km away due to traffic congestion. Likewise, having or not responsibilities outside work, e.g. picking up children at school, may entirely change the psychological pressure to leave work at a specific hour. The same goes to jobs where one is given time exemption versus another job that requires check in biometric points. Quantitative measures are needed for statistical inference, but they do have this downside of reducing diverse experience to a same figure. We did opt to conduct also an initial qualitative study, but it is far from enable clarification about

idiosyncratic situations that might be needed to account for true commuting experience. So, future studies may address this challenge.

Overall, findings show the potential for telecommuting is far from being negligible, especially as urban areas sum up displaced workers. In the area where respondents live, and accepting a large measurement error due to the sample size and nature, cost savings, productivity and quality of working life are definitely positive outcomes from opting to telecommute. The estimated individual benefits may be largely surpassed by the organizational and societal benefits as they operate in synergy affecting systemic health costs, productivity rates, fixed operational business costs (that could be translated in higher profit margins and lower consumer prices), better environmental sustainability, and better quality of life. At a certain level, the qualitative inquiry converged upon these outcomes. However, social or relational impact might become an issue for research although it did not emerge in the questionnaire but is only expressed as having more free time for family and friends. So, perhaps it gains visibility when individuals are actually experiencing social isolation and could be a target for a specialized research exploring its possible multidimensional nature as regards satisfying relational needs.

We believe this study fulfils the established objectives, as well as contributes, albeit modestly, to answer the motivating research question. Although the potential could not be exactly ascertained, it is motivating to find a working explanative model leading to behavioural intention to accept telecommuting offers, which could inform in future HR development or management policies.

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Tables and Figures

Table 1 - Rotated Component Matrix[a]

	Component	
	1	2
My concentration level would be higher working from home compared with the one I have working from my job post	.885	.062
My productivity would be higher working from home than the one I have today at my job post	.866	.201
Working from home would improve my quality of living	.756	.283
Working from home would offer more advantages than disadvantages to me	.727	.436
My professional life would be less stressful if I would work from home	.676	.397
Working from home would give me more resting time	.102	.863
Work from home largely compensates if one takes into consideration transport and food costs (of the alternative, work at the job post)	.161	.737
Working from home would give me more time for my family and friends	.388	.696
Environmental pollution would diminish if I worked from home, as I would not have to physically displace to my job post	.314	.671
Cronbach alpha	.889	.794

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Table 2 - How do you displace from home to workplace?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Private vehicle	61	48.4	48.4	48.4
	Public transports	50	39.7	39.7	88.1
	Bicycle	1	.8	.8	88.9
	Walking	9	7.1	7.1	96.0
	Other	5	4.0	4.0	100.0
	Total	126	100.0	100.0	

Table 3 - If you take extra work with you to finish at home, how many more hours do you think you work per week? (If you do not take extra work to home, please indicate "0")

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	62	49.2	49.6	49.6
	1-5	18	14.4	14.4	64.0
	6-10	25	19.8	19.8	83.8
	11-15	5	4.0	4.0	87.8
	16-20	8	6.4	6.4	94.2
	21-30	2	1.6	1.6	95.8
	36	1	.8	.8	96.6
	45	1	.8	.8	97.4
	50	1	.8	.8	98.2
	60	2	1.6	1.6	100.0
	Total	125	99.2	100.0	
Missing	System	1	.8		
Total		126	100.0		

Table 4 - How much do you estimate to be your home-work transport costs (monthly amounts, in euros):

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	9	7.1	7.3	7.3
	<30	16	12.7	13	20.3
	31-60	49	38.9	39.8	60.1
	61-90	28	22.3	22.8	82.9
	91-120	7	5.6	5.7	88.6
	121-150	15	4.0	4.1	92.7
	> 150	9	7.1	7.3	100
	Total	123	97.6	100.0	
Missing	System	3	2.4		
Total		126	100.0		

Table 5 - Consider your commuting period from home to work. How stressful is it for you? Scale ranging from 0 ("no stress at all") to 100 ("extremely stressful").

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	6	4.8	4.8	4.8
	<20	22	17.5	17.5	22.3
	21-40	31	24.7	24.7	47.0
	41-60	24	18.3	18.3	65.3
	61-80	29	22.3	22.3	87.6
	81-100	14	11.2	11.2	100.0
	Total	126	100.0	100.0	

Table 6- Consider your commuting period from work to home. How stressful is it for you? Scale ranging from 0 ("no stress at all") to 100 ("extremely stressful").

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	8	6.3	6.3	6.3
	<20	27	21.5	21.5	27.8
	21-40	28	22.3	22.3	50.1
	41-60	22	17.5	17.5	67.6
	61-80	30	23.9	23.9	91.5
	81-100	11	8.8	8.8	100.0
	Total	126	100.0	100.0	

Table 7 - From all hours workload you reported weekly, how many would you estimate could be done from your home?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	14	11.1	11.2	11.2
	<10	43	34.3	34.4	45.6
	11-20	45	35.7	36.0	81.6
	21-30	20	15.8	16.0	97.6
	31-40	2	1.6	1.6	99.2
	41-50	1	.8	.8	100.0
	Total	125	99.2	100.0	
Missing	System	1	.8		
Total		126	100.0		

Table 8 - How much would you estimate to save if those hours were home-based? – Monthly basis in euro currency. These include transport, food, attire cost savings

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	22	17.5	18.0	18.0
	<80	26	20.7	21.2	39.2
	81-160	30	23.8	24.5	63.7
	161-240	16	12.7	13.1	76.8
	241-320	7	5.6	5.7	82.5
	321-400	10	7.9	8.2	90.7
	401-480	3	2.4	2.4	93.1
	>480	8	6.4	6.6	100.0
	Total	122	96.8	100.0	
Missing	System	4	3.2		
Total		126	100.0		

Table 9 - If tomorrow your employer propose to you working at a distance, to what extent would you accept it?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 – Unconditional negative	20	15.9	15.9	15.9
	2 – Conditional pos. net salary gain	56	44.4	44.4	60.3
	3 – Conditional pos. same net salary	35	27.8	27.8	88.1
	4 – Unconditional positive	15	11.9	11.9	100.0
	Total	126	100.0	100.0	

Table 10 – Correlation matrix

		Med / Freq	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13
1.	Gender	60% (F)	-	1												
2.	Age	35.4	11.9	.246**	1											
3.	Industry	-	-	.172	-.068	1										
4.	Professional Tenure	2.99	1.28	.200*	.906**	-.089	1									
5.	Workload	37.0	8.8	.015	.088	-.189*	.121	1								
6.	Extra-work	6.34h	11.2h	.125	.114	.085	.138	-.040	1							
7.	Displacement Mode	-	-	-.284**	-.279**	.014	-.244**	-.078	-.146	1						
8.	Displacement Time	67.4min	48.7min	-.160	-.044	-.035	-.105	-.115	-.034	.040	1					
9.	Transport Costs (monthly)	67.8€	57.7€	.134	.223*	.036	.151	-.135	.425**	-.329**	.070	1				
10.	Home-Work Stress	47.9	27.6	.009	.024	-.111	-.016	.006	.004	-.156	.350**	.118	1			
11.	Work-Home Stress	43.6	28.1	.075	.272**	-.038	.198*	-.083	.058	-.201*	.475**	.300**	.598**	1		
12.	ATT_Costs (Likert 1-5)	3.59	.90	-.097	.103	-.191*	.199*	.202*	.012	-.152	.077	-.051	.331**	.254**	1	
13.	ATT_Productivity (1-5)	4.04	.82	-.040	.108	-.109	.152	-.005	.103	-.295**	.059	.234**	.275**	.349**	.582**	1
14.	Telecommuting Accept. Intention (1-4)	2.35	.89	-.089	.067	-.050	.111	.145	.024	-.175	.225*	-.165	.166	.271**	.510**	.470**

Table 11 – Summary for hierarchical regression for predicting Attitude Towards Telecommuting (Productivity / QWL)

Model	Variables	Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF	R^2	ΔR^2	F ΔR^2
Step 1									.112	.112	3.575 (p<.01)
	(Constant)	3.913	.349		11.219	.000					
	Gender	-.182	.177	-.097	-1.031	.305	.884	1.132			
	Age (years-old)	-.024	.017	-.309	-1.460	.147	.175	5.699			
	Industry	-.057	.032	-.161	-1.780	.078	.955	1.047			
	Professional tenure	.364	.152	.501	2.397	.018	.180	5.567			
Step 2									.136	.024	1.539 (p=.219)
	(Constant)	3.245	.517		6.277	.000					
	Gender	-.195	.177	-.104	-1.107	.271	.875	1.142			
	Age (years-old)	-.020	.017	-.260	-1.223	.224	.172	5.799			
	Industry	-.048	.032	-.136	-1.487	.140	.925	1.081			
	Professional tenure	.320	.154	.440	2.083	.040	.174	5.733			
	Workload	.017	.010	.159	1.746	.084	.940	1.064			
	Extrawork	.002	.007	.019	.209	.835	.968	1.033			
Step 3									.290	.153	4.573 (p<.01)
	(Constant)	3.121	.616		5.067	.000					
	Gender	-.284	.170	-.152	-1.674	.097	.817	1.225			
	Age (years-old)	-.024	.016	-.310	-1.532	.128	.164	6.091			
	Industry	-.037	.030	-.104	-1.218	.226	.912	1.097			
	Professional tenure	.337	.145	.463	2.330	.022	.170	5.897			
	Workload	.016	.009	.153	1.752	.083	.879	1.137			
	Extrawork	.003	.007	.037	.408	.684	.795	1.257			
	Displac. mode	-.109	.080	-.127	-1.364	.176	.777	1.287			
	Displac. time	-.001	.002	-.038	-.391	.697	.714	1.400			
	Transport. costs	-.002	.002	-.100	-.986	.326	.656	1.524			
	Home-Work stress	.010	.004	.294	2.785	.006	.601	1.664			
	Work-Home stress	.004	.004	.120	.992	.324	.458	2.182			

a. Dependent Variable: ATT_Productivity

Table 12 – Summary for hierarchical regression for predicting Attitude Towards Telecommuting (Cost savings)

Model	Variables	Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	Collinearity Statistics Tolerance	Collinearity Statistics VIF	R^2	ΔR^2	F ΔR^2
Step 1									.036	.036	1.055 (p=.382)
	(Constant)	4.045	.327		12.383	.000					
	Gender	-.095	.165	-.056	-.574	.567	.884	1.132			
	Age (years-old)	-.005	.016	-.064	-.291	.772	.175	5.699			
	Industry	-.025	.030	-.078	-.830	.408	.955	1.047			
	Professional tenure	.143	.142	.218	1.001	.319	.180	5.567			
Step 2									.044	.008	0.443 (p=.643)
	(Constant)	4.083	.489		8.351	.000					
	Gender	-.109	.167	-.064	-.650	.517	.875	1.142			
	Age (years-old)	-.005	.016	-.064	-.287	.775	.172	5.799			
	Industry	-.027	.030	-.086	-.893	.374	.925	1.081			
	Professional tenure	.137	.145	.209	.942	.348	.174	5.733			
	Workload	-.001	.009	-.009	-.089	.929	.940	1.064			
	Extrawork	.006	.007	.088	.935	.352	.968	1.033			
Step 3									.265	.222	6.398 (p<.01)
	(Constant)	4.239	.563		7.529	.000					
	Gender	-.280	.155	-.166	-1.802	.074	.817	1.225			
	Age (years-old)	-.017	.015	-.242	-1.176	.242	.164	6.091			
	Industry	-.016	.028	-.050	-.576	.566	.912	1.097			
	Professional tenure	.175	.132	.267	1.323	.189	.170	5.897			
	Workload	.003	.008	.035	.395	.693	.879	1.137			
	Extrawork	-.001	.007	-.013	-.138	.890	.795	1.257			
	Displac. mode	-.175	.073	-.226	-2.392	.019	.777	1.287			
	Displac. time	-.002	.002	-.124	-1.256	.212	.714	1.400			
	Transport. costs	.002	.002	.159	1.549	.124	.656	1.524			
	Home-Work stress	.004	.003	.118	1.098	.275	.601	1.664			
	Work-Home stress	.009	.004	.290	2.356	.020	.458	2.182			

a. Dependent Variable: ATT_Costs

Table 13 – ANOVA for model

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.683	4	.671	.846	.499[a]
	Residual	93.578	118	.793		
	Total	96.260	122			
2	Regression	29.090	6	4.848	8.373	.000[b]
	Residual	67.170	116	.579		
	Total	96.260	122			

a. Predictors: (Constant), Professional Tenure, Industry, Gender, Age

b. Predictors: (Constant), Professional Tenure, Industry, Gender, Age, ATT_Productivity/QWL, ATT_Costs

c. Dependent Variable: Telecommuting Acceptance Intention

Table 14 – Summary for hierarchical regression for predicting Telecommuting Acceptance Intention

		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics				
Model	Variables	B	Std. Error	Beta	t	Sig.	Tolerance	VIF	R^2	ΔR^2	F ΔR^2
Step 1									.028	.028	.846 (p=.449)
	(Constant)	14.477	.346		41.857	.000					
	Gender	-.193	.172	-.107	-1.119	.265	.902	1.108			
	Age (years-old)	-.004	.016	-.056	-.257	.798	.172	5.804			
	Industry?	-.013	.032	-.038	-.412	.681	.953	1.050			
	Professional tenure	.125	.151	.180	.830	.408	.175	5.703			
Step 2									.302	.274	22.802 (p<.01)
	(Constant)	11.980	.478		25.084	.000					
	Gender	-.117	.148	-.065	-.795	.428	.896	1.116			
	Age (years-old)	.005	.014	.073	.387	.699	.169	5.934			
	Industry	.014	.027	.042	.524	.601	.929	1.077			
	Professional tenure	-.034	.132	-.049	-.258	.797	.167	5.974			
	ATT_Costs	.352	.096	.361	3.656	.000	.619	1.617			
	ATT_Productivity/QWL	.275	.103	.254	2.672	.009	.663	1.508			

a. Dependent Variable: If tomorrow your employer propose to you working at a distance, to what extent would you accept it?

Figure 1 – Research model

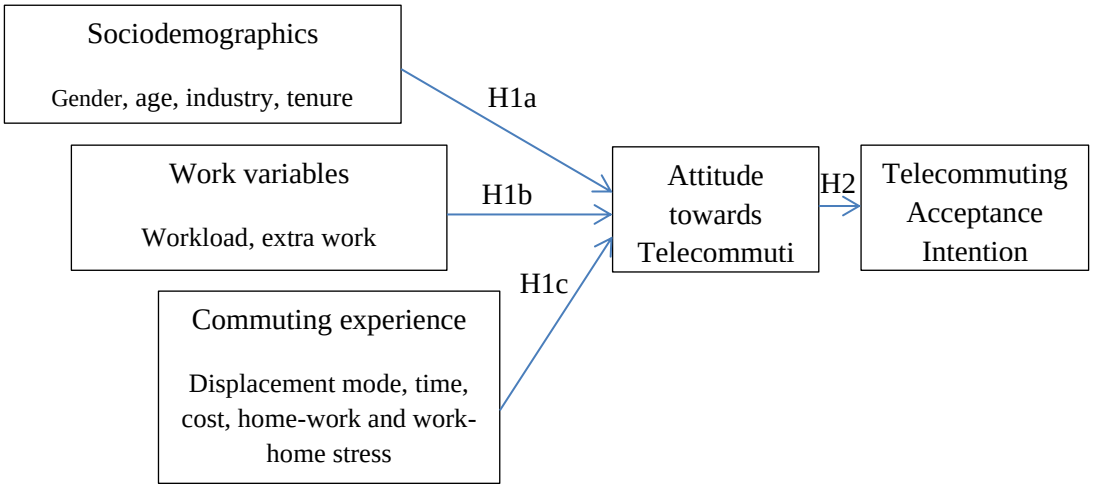

Figure 2– Redesigned research model

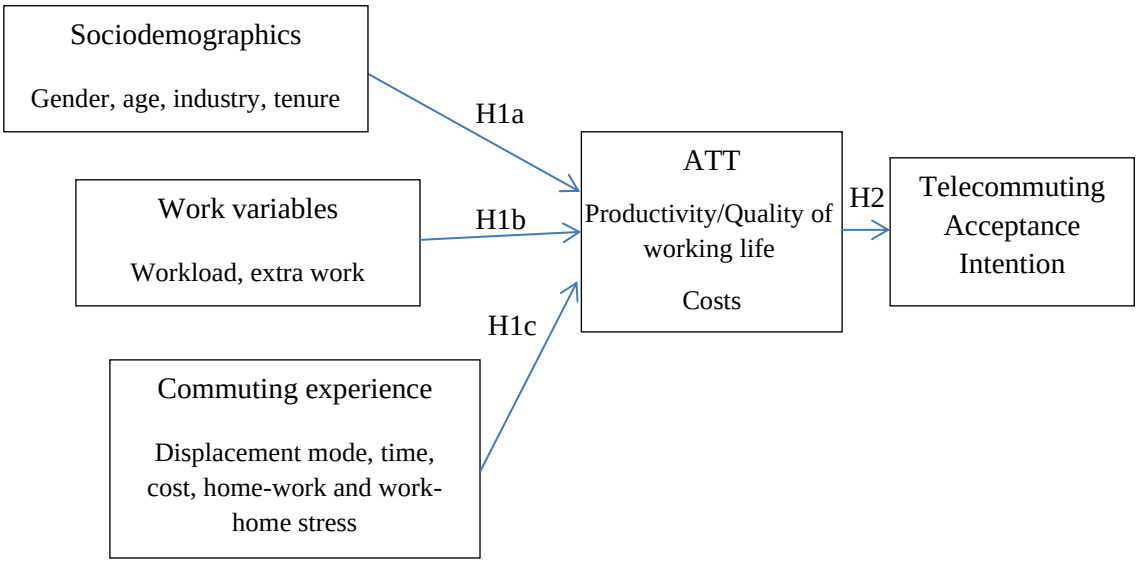

Figure 3 – Empirical associations