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Trade-off across privacy, security and surveillance in the case of metro travel in Europe

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Abstract

Privacy issues related to mass surveillance received unprecedented attention in 2013 and 2014. While the debate so far has focused on internet-based surveillance, the concerns raised by increased awareness of state surveillance capabilities have far reaching consequences for discussions on legislation relating to security, privacy and liberty in a range of domains.
Focusing on train/metro travel we investigate whether Europeans perceive similar security and privacy issues as have been raised in recent discussions about surveillance. This paper presents preliminary findings from the empirical phase of PACT, a three year pan-European project. PACT has as its centerpiece a large scale survey of privacy & security preferences. The survey is designed to elicit respondents' preferences related to various security and privacy aspects involved in three contexts, including train/metro travel. Using data from the pilot we demonstrate the application of stated preference methods in the context of security and privacy. The stated -preference exercise gathers preferences related to CCTV, CCTV data handling, type of security personnel, type of physical security check, delay due to security checks, and cost of security/surveillance. Using discrete choice models to estimate willingness to pay for different security/surveillance features we aim to provide the missing evidence on valuation of public security and surveillance.

Peer-review under responsibility of the Association for European Transport
Keywords: Security, Privacy, PACT, Travel, CCTV camera, Stated Preference method

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1. Background

With the ever evolving landscape of security concerns regarding transportation infrastructure, there has been an extensive public debate about how individual preferences can be incorporated into the process of policy–decision making. This is particularly important when it comes to investment decisions concerning security technologies, which aim to provide a greater level of security to travelers. This debate is especially pertinent where such security infrastructure has the potential to impinge upon privacy (Salter, 2008).

Mass transit systems can be both the means and the targets of terrorist attack. In recent years, public transport systems have been targets in several terrorist attacks worldwide due to their vulnerability and ease of access. This includes attacks in Madrid in 2004 and London in 2005. In addition, the attack on transport infrastructure can cause panic, disruption, and fear among the public. Safety and security issues have thus received more attention in recent years. In response to the security threats, travel authorities are adopting a wider range of security measures to try and mitigate the risk of such events occurring again.

However, increased security and surveillance measures – in many cases – require travelers to compromise their privacy. For example, CCTV cameras are increasingly becoming a ubiquitous feature on metro/train facilities. The recent mass surveillance related revelations have elevated the importance of discussion related to storage and sharing of CCTV data (Bigo et. al., 2013). This is especially critical as the CCTV cameras get sophisticated capabilities such as face recognition.

PACT – 'Public perception of security and privacy: Assessing knowledge; Collecting evidence, Translating research into action' a 7th European Framework Programme project† investigates the security and privacy issues in detail. PACT is a three year project aimed at understanding the public perception of security and privacy across 27 European Member States. A key part of this project is a pan-European survey. The findings from the survey will inform the debate on privacy and security. The survey uses stated -preference experiments to estimate people's preferences and willingness to pay for security and surveillance measures. These findings can also provide a missing link on public valuation of security/surveillance measures to support decision-making regarding security infrastructure investment.

The aim of this paper is to share the preliminary findings of the PACT project focusing on individual preferences related to security and privacy issues in the context of train/metro travel. In particular, the objectives of this paper are to determine the key factors driving individuals' choice between alternative scenarios of train/metro travel and to estimate willingness-to-pay (WTP) for specific aspects of security and surveillance.

The paper is organized as follows. Firstly, we discuss the development of the stated preference experiment followed by the description of pilot data. Next, we report the findings from the pilot data analysis including WTP estimations. The final section contains conclusions and describes the future work to be undertaken in the analysis of the main survey.

2. Survey instrument

We use a survey based around a stated -preference experiment in order to objectively measure respondents' preferences to different levels of security and privacy characteristics in the context of train/metro transport. Stated -preference methods have been used extensively in the fields of marketing, transport demand analysis and environmental science (Louviere and Woodworth, 1983; Louviere, 1992; Louviere et al., 2000; Ryan et al., 2001). Using experimental design, the researcher constructs a series of hypothetical choice scenarios. In each choice scenario the respondent indicates the most preferred alternative (Fig. 1). Analysis of these preferences can yield information on the relative importance of the attributes used to describe the alternatives.

Potoglou et al. (2010) and Veisten et al. (2011) have recently used the stated preference experiments in the field of travel security and privacy. Veisten et al. (2011) focus on air travel and do not consider type of security measures

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in the stated-preference experiment. Potoglou et al. (2010) focus on train travel in the UK. Both studies include effectiveness of the security measures in their experimental design but do not consider the privacy issues related to data protection. In our study we apply this method for a travel choice involving security measures both with and without privacy implications. We avoid explicitly specifying the effectiveness or implication of security measures and violations of privacy in the choice scenarios. Thus the preferences provided by respondents are based on their perceptions related to effectiveness of security and surveillance measures and likelihood of violation of privacy.

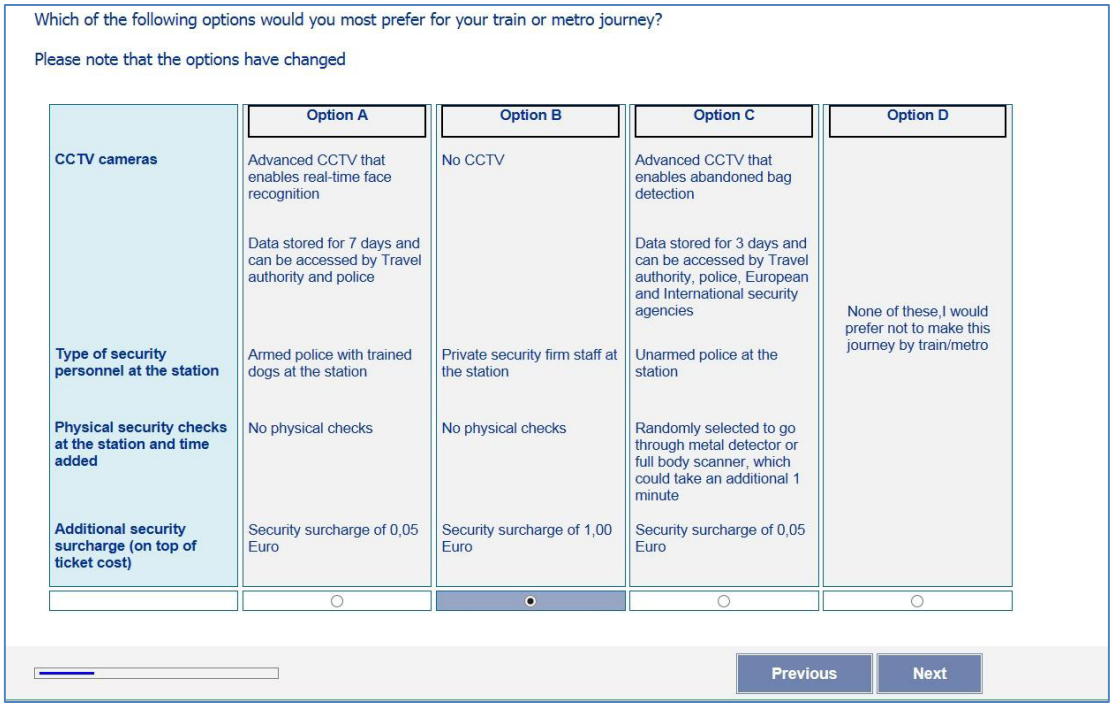

Fig. 1: Example of the stated preference experiment

The stated preference experiment in our study involved asking respondents to indicate their preferred setting when travelling by metro or train. Each alternative was described using different attributes including, the type of CCTV cameras, type of physical security check, etc. Further, each attribute was defined by a level, for example, the attribute 'type of CCTV cameras' might take a value 'standard CCTV cameras' or 'Advanced CCTV which allows abandoned bag detection' in the description of one of the alternatives. Different configurations of levels across all the attributes differentiated one alternative from another in a given choice scenario. The choice scenarios were generated using an experimental design. The experimental design covered a wide range of attributes and levels to encourage respondents to compare and consider a trade-off between the attributes and alternatives.

The process of selecting the attributes and levels was informed by focus groups in UK, Greece and Lithuania, stakeholder consultations, expert interviews, and a workshop with PACT's consortium members. Focus groups provided the opportunity to obtain feedback regarding the public's reactions, attitudes, knowledge and behavior related to privacy and security issues in train/metro travel. Stakeholders and experts in the transport security area were involved in the discussion of refining the attributes and development of the choice scenarios. Their advice was particularly helpful in identifying the plausible range of attributes levels (e.g. the legal duration for which the CCTV footage can currently be stored, the magnitude of realistic cost surcharge for security measures in the price of

train/metro tickets). Attributes and levels listed in Table 1 were used to generate an experimental design matrix using the commercially available software Ngene (Ngene, 2011).

Table 1. Attributes and levels used in the experimental design.

	Attribute	Details	Levels
1	Recognition capabilities in CCTV cameras	Closed circuit television cameras are often used at stations and inside vehicles to monitor the recorded activities or those in real time. This attribute describes if a CCTV camera is used and any advanced features that the camera can have.	None, CCTV cameras not used Standard CCTV Advanced CCTV that enables abandoned bag detection Advanced CCTV that enables real-time recognition of suspicious movement of people Advanced CCTV that enables real-time face recognition
2	Time period for storing the CCTV information	Period for which CCTV data will be stored by the travel authority (conditional on presence of CCTV)	Data not stored Data stored for 3 days Data stored for 7 days Data stored for 15 days Data stored for 45 days
3	Who has access to CCTV information	Type of authorities who can access the CCTV data (conditional on presence of CCTV)	Only the travel authority Travel authority and police Travel authority, police and European security agencies Travel authority, police, European and International security agencies
4	Type of security personnel at the station	Type of security personnel when present	None Private security firm staff Transport authority security staff Unarmed Police Armed police with trained dogs
5	Security measures at the station	Type of security measures when deployed	None Randomly selected for full body pat-down and bag check Randomly selected to go through metal detector or full body scanner
6	Time to pass through security checks and related queues	Delay incurred due to security checks (No delay if no security measure deployed)	10 seconds 30 seconds 1 minute 2 minutes 10 minutes No delay
7	Additional security surcharge (on top of ticket cost)	For UK, the amount in Euro is converted in GBP using exchange rate and displayed after rounding off	None 5 Euro cents 10 Euro cents 30 Euro cents 50 Euro cents 1.00 Euro

Since no prior information was available on the direction or magnitude of the effects we used zero priors to generate a D-efficient design. The final design contained 120 choice scenarios and was divided in 24 blocks. Each block contained five choice scenarios per respondent keeping the survey length short for the respondents. Fig. 1 presents one of these 120 choice scenarios. In addition to the three alternatives described using the attributes, we also included a fourth "None of these" alternative in each choice scenario to allow respondents to indicate that they do not prefer the configurations indicated by the three alternatives.

In order to engage respondents in choice making it is necessary to make the choice scenarios realistic and frame them as close as possible to their real life experiences. Frequently this is done by asking questions related to their last experience in this context. For example asking the details about their last journey on train/metro and then presenting the choice scenarios as options available for a similar journey in the future. The survey questionnaire therefore included questions related to the characteristics of the last train/metro journey (trip duration, cost, frequency of travel, etc.) before the choice scenarios.

Respondents were also asked how concerned they feel about a list of security threats involved in train/metro travel and about possible privacy threats related to use of surveillance and physical search. The objective of asking these questions was to make respondents aware of different security and privacy issues involved in train/metro travel. These questions can inform respondents' choice making in the following hypothetical choice scenarios.

The questionnaire closed with some attitudinal questions and socio-economic questions. Responses to these questions can be incorporated into the choice models to capture differences across the population (observed heterogeneity). The train/metro travel experiment was one of three experiments implemented in the PACT survey. The survey also included choice experiments in the domains of Internet and Healthcare; details of which are beyond the scope of this paper. The complete PACT questionnaire can be accessed from PACT website (PACT D2.2, 2013).

3. Data

PACT's main stage data collection involves collecting approximately 1,000 responses from each of the 27 European Member States. This paper uses data collected from the pilot survey in Italy, Denmark and Romania in May 2013.

Denmark, Italy and Romania were chosen for pilot to represent different cultures and demographics across EU27. At least 50 interviews were conducted in each country. The internet based survey was used for all 54 respondents in Denmark. Whereas all 50 interviews in Romania were conducted in person (face-to-face). Both the internet and face-to-face surveys were used for 26 and 24 respondents in Italy, respectively.

The mix of countries and survey methodologies is intended to provide information on how people from different parts of Europe respond and if these responses differ by the survey methodology. The pilot survey also provides an opportunity to test and refine the experimental design before the main survey.

The pilot data collection aims to achieve a nationally representative sample based on age, gender and region. However, in the interest of having a sample from different regions the age distribution of the sample in Italy is slightly skewed in this pilot data. The sample composition is presented in Tables 2 and 3. Due to smaller sample sizes in the pilot, we combine responses from all three countries for estimation of the choice models.

The pilot survey did not exclude respondents who have never travelled by train/metro. This was motivated by a desire to also recruit respondents from urban/rural areas without a train/metro facility to avoid biasing the sample further than necessary. This seemed justifiable as the surveillance and security measures used in the choice scenarios are commonplace and respondents should be familiar with them. Encouragingly we find that only about 15% of respondents have never travelled by train/metro (Fig. 2) while a majority of the respondents have experience of travelling by train/metro.

Table 2: Demographic composition of respondents by country and data collection method

		Denmark	Italy			Romania
		Online	Online	Face-to-face	Total	Face-to-Face
Gender	Male	27 (50%)	15 (58%)	12 (50%)	27 (54%)	24 (48%)
	Female	27 (50%)	11 (42%)	12 (50%)	23 (46%)	26 (52%)
	Total	54	26	24	50	50
Age	18-34	11 (26%)	7 (27%)	3 (12%)	10 (20%)	17 (34%)
	34-54	20 (36%)	9 (35%)	11 (46%)	20 (40%)	17 (34%)
	55+	23(38%)	10(38%)	10 (42%)	20 (40%)	16 (32%)
	Total	54	26	24	50	50

Table 3: Geographic composition of respondents by country and data collection method

Denmark		Italy				Romania	
Region	Online	Region	Online	Face-to-face	Total	Region	Face-to-face
Jylland	19(33%)	Nord-ovest	7 (27%)	5 (21%)	12 (24%)	Transilvania, Banat, Crisana,Maramures	15 (34%)
Syddanmark	10(21%)	Nord-est	7 (27%)	5 (21%)	12 (24%)	Oltenia, Muntenia, Dobrogea	20 (36%)
København	18 (31%)	Centro (i)	3 (11%)	5 (21%)	8 (16%)	Moldova	10 (21%)
Sjælland	7 (15%)	Sud	6 (22%)	9 (37%)	15 (30%)	Bucharest	5 (9%)
		Isole	3(11%)		3 (6%)		

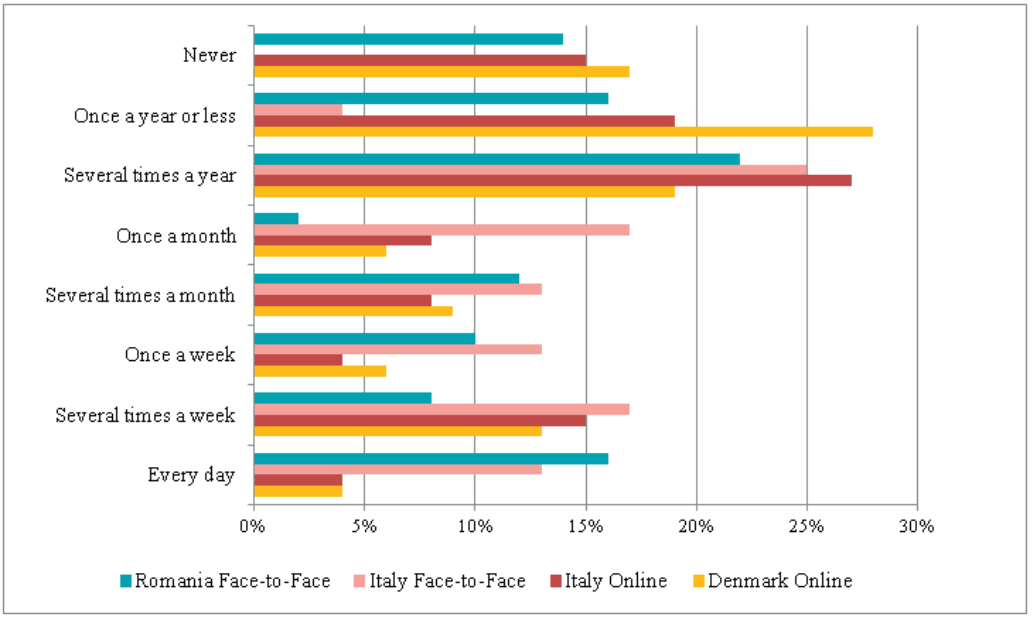

Fig. 2: Respondents' frequency of travel by metro/train/other mass public transport

4. Modelling approach and results

This section presents preliminary choice modelling results using 154 complete responses collected in the pilot survey. Each of these respondents answered five stated preference questions providing 770 observations for the development of discrete choice model. From the analysis of the diagnostic questions following the SP scenarios, respondents showed a good understanding of the SP choices presented to them and indicated that the scenarios and combinations presented therein were realistic. We judge this sample size is sufficient to develop choice models with the design attributes used in the choice experiment; however, this relatively small sample size does not allow us further to explore the effects related to socio-economic and attitudinal variables.

The stated -preferences obtained through the choice experiments are analysed using a multinomial logit model. The model is based on the principle of Random Utility Maximisation (RUM) (Ben-Akiva and Lerman, 1985). According to RUM, a respondent choses an alternative which provides maximum utility. Utility is a latent construct divided in two components – deterministic and random (error) component. The deterministic component of the utility can be specified using observable variables which are likely to affect the respondent's choice as follows:

$$V_{ij} = ASC_j + \sum_{k=1}^{K} \beta_{jk} X_{jk}$$

where:
V_{ij} is deterministic component of utility for individual i and alternative j
ASC_j is the alternative specific constant of the alternative j
X_{jk} is kth variable which describes the alternative j, k=1,.., K
β_{jk} is the coefficient to be estimated

The multinomial logit model assumes that the error components are extreme value (or Gumbel) distributed, and the choice probability P_{ij} of an alternative j for individual i is given by:

$$P_{ij} = \frac{exp(V_{ij})}{\sum_{j'=1}^{J} exp(V_{ij'})}$$

The MNL specification is based on the assumption of independence from irrelevant alternatives (Train 2009). This assumption can be relaxed using a nested logit or random parameter logit model. Further, to account for correlations between multiple stated preference responses from one respondent, a panel specification can be specified. Due to the small sample size in the pilot analysis, we however use the simple MNL model and the relaxations mentioned above are left for future analysis when we have the larger dataset collected from across Europe.

4.1. Preliminary choice model results

Table 4 presents estimated parameters of the multinomial logit model. Since the choice scenario involves three unlabelled alternatives only one alternative specific constant is included, placed on the utility of the "None of these" alternative (ASC_None of these). This constant is positive and significant indicating preference for this alternative over the three travel alternatives. The choice of the "None of these" alternative captures various issues. It could indicate that none of the configurations presented in other alternatives are acceptable to respondents. However, sometimes respondents may also select this alternative when they do not understand the stated preference-choice exercise. The proposal for the main survey is to use a simplified choice scenario with two instead of three main alternatives, which should make the choice task easier.

Table 4: MNL model estimation results

Attribute	Coeff.	t-ratio
ASC_None of these	0.75	3.38
CCTV Camera		
Standard CCTV	0.82	3.26
Abandoned bag detection	0.93	3.84
Real-time recognition of suspicious movement of people	0.96	3.78
Real-time face recognition	1.02	4.26
No Camera	Reference level	na
Storage of CCTV data		
45 days	0.32	1.82
15 days	0.08	0.47
7 days	0.42	2.39
3 days	0.29	1.73
Real time only	Reference level	na
Access to CCTV data		
Travel authority, police, European and International security agencies	0.20	1.27
Travel authority, police and European security agencies	0.27	1.79
Travel authority and police	0.16	1.09
Only the travel authority	Reference level	na
Type of security personnel at the station		
Private security firm staff	0.61	4.17
Travel authority security staff	0.34	2.26
Unarmed police	0.36	2.35
Armed police with trained dogs	0.05	0.27
No security personnel	Reference level	na
Random security checks		
Pat-down and bag check	-0.04	-0.30
Metal detector or full body scanner	0.21	1.77
None	Reference level	na
Time for security checks (minutes)	-0.04	-2.79
Additional security surcharge on top of ticket cost (Euro cents)	-0.009	-6.11
Observations	770	
Final Log Likelihood	-954.0	
D.O.F	20	
$Rho^2(0)$	0.106	
$Rho^2(c)$	0.094	

The highlights of the findings for each attribute used in the choice scenario are summarized below:

- **Recognition capabilities of CCTV cameras**: compared to the base level, "no camera", all levels are significant with a positive sign and the magnitude of the coefficient increases with the increased

functionality of the CCTV cameras. The estimated parameters indicate that respondents prefer CCTV cameras and they even prefer advanced, over standard CCTV technology.

- **Time period for storing CCTV information**: compared to the base level, "real time storage", all coefficients are positive and the majority of them are significant at the 90% confidence level. This suggests that respondents prefer CCTV information to be stored over situations where CCTV data are not stored. This preliminary finding should be received with caution as additional feedback suggests that some respondents were not able to understand the term "real time data storage".
- **Who has access to CCTV information**: compared to the base level "only travel authority has access to CCTV information" only the level corresponding to "Travel authority, police and European security agencies" was significant (at 90% confidence level). None of the other levels are statistically significant, which may indicate that respondents are less sensitive to the level of access to CCTV data.
- **Type of security personnel at the station**: Compared to the "none (no security personnel)" level, the remaining attribute levels are positive and most of their coefficients are significant at the 95% confidence level. This indicates a higher preference for having security personnel at the station, in general. The level "armed police with trained dogs" is not statistically significant.
- **Security measures at the station**: compared to the base level of no random security checks most levels are not statistically significant with the exception of "Metal detector or full body scanner" which is significant at 90% confidence level.
- **Time to pass through security checks**: The delay due to security checks enters as a continuous variable in the utility of alternatives. The coefficient for delay is significantly estimated with a negative sign as expected.
- **Additional security surcharge (on top of ticket cost)**: Similar to delay, the cost also enters as a continuous variable in the utility. The cost coefficient is strongly significant and negative. Respondents dislike paying for security measures.

Use of the stated -preference method in this study also allows us to estimate the willingness to pay for security or surveillance measures used at travel facilities. The significant coefficients for attribute levels are used along with the cost coefficient to estimate the willingness to pay (Table 5). In a simple linear model such as the one we use in this study, the WTP is simply estimated as negative ratio of the coefficient of a given attribute level to the coefficient of cost. Since all the coefficients in this study (with the exception of delay) are estimated with respect to a base level, the WTP is for changes in the level of a given attribute with respect to the base level. As the cost attribute was presented as the per trip ticket cost, the WTP estimates also correspond to the value per trip.

Respondents' WTP is estimated as 0.88 Euro for standard CCTV cameras and 1.10 Euro per trip for advanced CCTV cameras. Potoglou et al. (2010) estimate the WTP for standard CCTV at UK rail premises at £2 (approximately 2.41 Euro). Comparatively, our values are less than half of that estimate. The respondents are willing to pay up to an additional 0.46 Euro for storage of CCTV data and 0.30 Euro to share the CCTV data across Europe. Due to lack of previous studies on the WTP for storage and sharing of CCTV data in this context we are unable to validate our estimates.

The WTP for having security personnel at station ranges from 0.39 to 0.66 Euro. The highest WTP is observed for reducing the delay in security checks. Respondents are willing to pay up to 2.57 Euros per trip to reduce the delay by an hour. The guide value of working time for rail passengers in UK appraisals is £39.65 /hour (approximately 47 Euros) in 2010 prices (WebTAG 3.5.6, 2013). The value of non-working time for passengers of all modes is specified as £5.71/hour (approximately 6.7 Euros) in 2010 prices. Further the guidance suggests one minute of average lateness to be equivalent to three minutes of journey time (WebTAG 3.5.7, 2013). Comparatively, our preliminary estimate of WTP to reduce travel delay due to security checks is smaller. While the WebTAG values provide an approximate benchmark it should be noted these values are specific to the UK context and vary greatly by trip purpose, income and travel mode.

Table 5: Willingness to pay estimates

Attribute	WTP (Euro)
CCTV Camera	
Standard CCTV	0.88
Abandoned bag detection	1.01
Real-time recognition of suspicious movement of people	1.04
Real-time face recognition	1.10
No Camera	Reference level
Storage of CCTV data	
45 days	0.35
15 days	*
7 days	0.46
3 days	0.31
Real time only	Reference level
Access to CCTV data	
Travel authority, police, European and International security agencies	*
Travel authority, police and European security agencies	0.30
Travel authority and police	*
Only the travel authority	Reference level
Type of security personnel at the station	
Private security firm staff	0.66
Travel authority security staff	0.37
Unarmed police	0.39
Armed police with trained dogs	*
No security personnel	Reference level
Random security checks	
Pat-down and bag check	*
Metal detector or full body scanner	0.23
None	Reference level
Time Savings in security checks (hours)	2.57

* Coefficient not significant at 90% confidence level

4.2. Security and Privacy Concerns in Metro/Train Travel

In addition to the stated preferences, information on wide range of factors related to security and privacy was collected in a series of questions asked prior to the choice experiment. These questions also provide an opportunity to obtain insight into the preferences regarding some attributes which are not included in the stated preference questions to avoid information overload.

Fig. 3 shows a summary of the security concerns identified by the respondents in the context of train/metro travel. In general, most respondents report petty crimes as being of higher concern than security threats. The majority of the respondents (88%) report that pick-pocketing is a concern followed by antisocial behaviour (62%) and vandalism (56%). Only 34% of respondents reported terrorism as a concern to their security.

Fig. 4 shows a summary of the privacy threats identified by the respondents. Just over half of the respondents (51%) report that none of the presented factors are a major privacy concern. About 21% of the respondents report that they are concerned with the potential misuse of the travel data for tracking individuals' whereabouts.

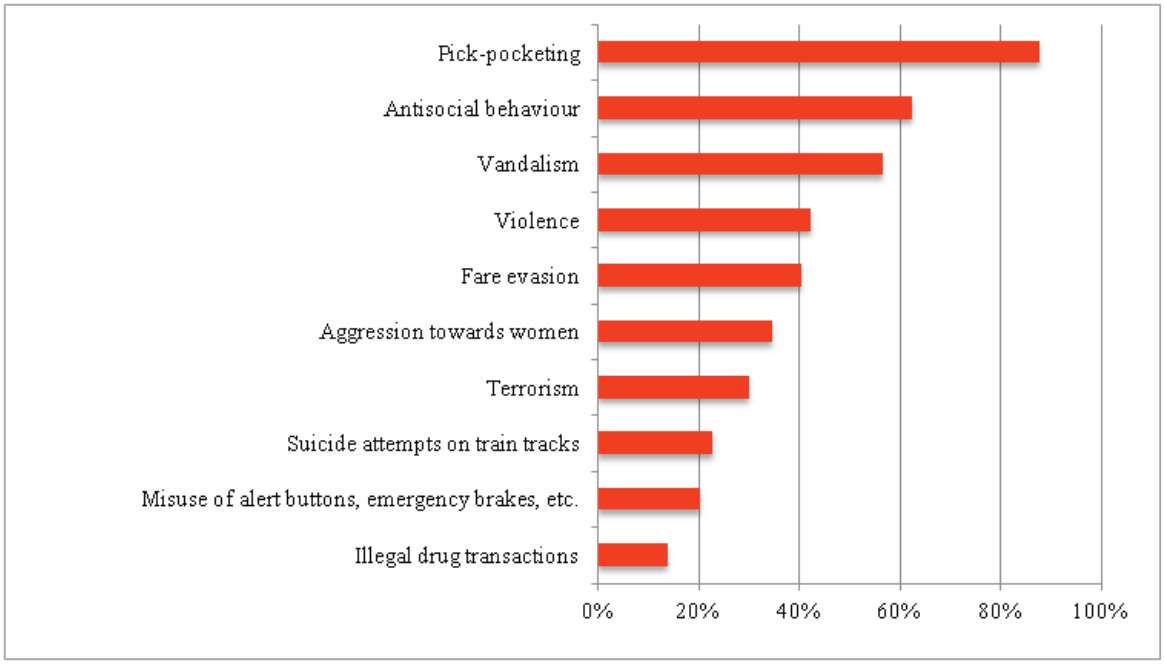

Fig. 3: Security related factors which concern the respondents while travelling by metro or train

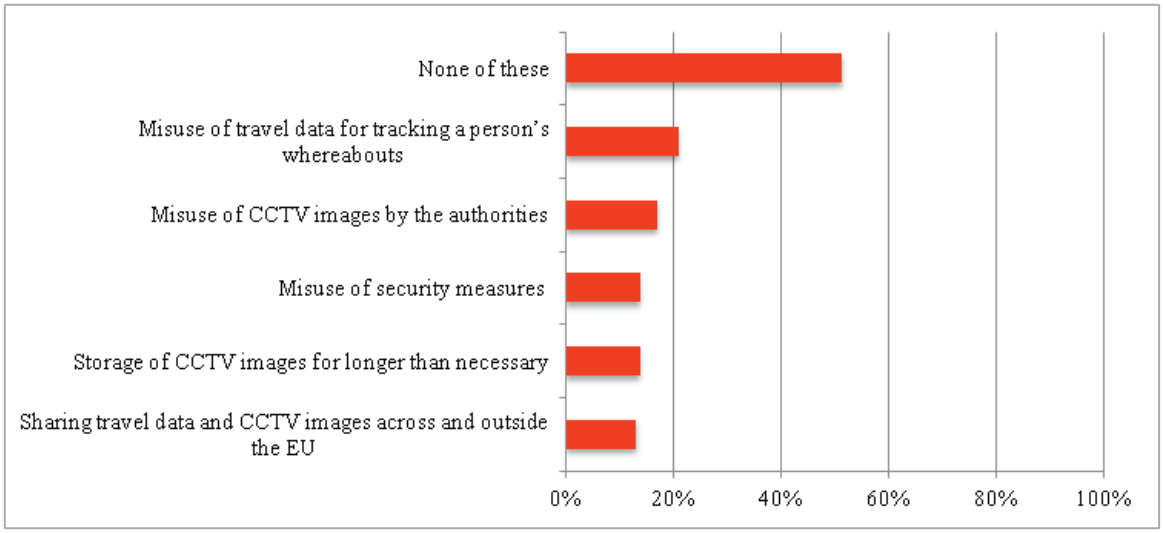

Fig. 4: Privacy related factors which concern the respondents while travelling by metro or train

5. Conclusion and future work

The PACT survey has been designed to understand public perception of security and privacy using stated -preference methods. Using the data collected in the pilot survey this paper investigates public perceptions in the context of train/metro travel in three European Member States.

This paper demonstrates the application of stated -preference methods to capture the trade-offs between security and privacy. The findings of the pilot survey are encouraging. Respondents engage in the stated preference experiments and in the process provide useful data that can also be used to estimate the willingness to pay for security and surveillance measures. In general respondents prefer travel situations with CCTV cameras and they prefer advanced CCTV over standard CCTV. Respondents perceive negatively the travel delay due to security checks and additional surcharge to cover cost of security and surveillance measures.

The willingness to pay estimates for various attributes range widely. While these are preliminary findings from a pilot survey, the study provides useful evidence on the valuation of security and surveillance measures. The results might be thus considered as a useful first step to fill the gap in existing knowledge on the value placed on CCTV data storage and sharing in the context of train/metro travel across Europe.

The pilot survey analysis has also helped to refine the PACT questionnaire for the main data collection across EU 27 Member States. Following the experience from the pilot the stated preference experiment has been simplified to make it more accessible to the general public across the EU (PACT D2.3). Using the larger dataset from the main survey it will be possible to estimate choice models which can account for heterogeneity across countries and various population segments.

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References

Ben-Akiva, M. and S. R. Lerman (1985), Discrete Choice Analysis: Theory and Applications Travel Demand, Cambridge: The MIT Press.

Bigo, D., Carrera, S., Hernanz, N., Jeandesboz, J., Parkin, J., Ragazzi, F., & Scherrer, A. (2013). Mass Surveillance of Personal Data by EU Member States and its Compatibility with EU Law. CEPS Liberty and Security in Europe No. 61, 6 November 2013.

Louviere, J. (1992). Experimental choice analysis: introduction and overview. Journal of Business Research 24, 89–96.

Louviere, J.J., Hensher, D.A., Swait, J.D.(2000). Stated Choice Methods: Analysis and Application. Cambridge Press, Cambridge.

Louviere, J., Woodworth, G. (1983). Design and analysis of simulated consumer choice or allocation experiments: an approach based on aggregated data. Journal of Marketing Research 20, 350–367.

PACT D2.1 Knowledge Consolidation Workshop Report. (2012). Available from: http://www.projectpact.eu/deliverables/wp2-survey-design/d2.1-methodological-workshop-report/D2.1%20KCW%20Meeting%20Report.pdf/view, Accessed on 21st December 2013 .

PACT D2.2 Methodological Report on Survey Design and Survey Questionnaire (2013). December 2013.

PACT D2.3, Report on the analysis of pilot data.(2013). December 2013.

Potoglou, D., Robinson, N., Kim, C.W., Burge, P. and Warnes, R.,(2010) Quantifying individuals' trade-offs between privacy, liberty and security: the case of rail travel in UK. Transportation Research Part A, 44, pp169–181.

Ryan, M., Bate, A., Eastmond, C.J., Ludbrook, A. (2001). Use of discrete choice experiment to elicit references. Quality in Health Care 10, i55–i60.

Salter, M. (2008) Political science perspectives on transportation security, Journal of Transportation Security, 1(1), 29-35.

Train, K. E.(2009)., Discrete Choice Methods with Simulation. 2nd Edition, Cambridge University Press, United Kingdom.

Veisten, K., Flügel, S., & Bjørnskau, T. (2011). Public's Trade-off between a New Risk-based Airport Screening and Asserted Terror Risk Impact: A Stated Choice Survey from Norway. Journal of Transportation Technologies, 1(2), 11-20.

WebTAG Unit 3.5.6 Values of Time and Vehicle Operating Costs, UK Department for Transport, (2013). Available from: http://www.dft.gov.uk/webtag/documents/expert/pdf/u3_5_6-vot-op-cost-120723.pdf, Accessed on 21st December 2013.

WebTAG Unit 3.5.7 The Reliability Sub-Objective, UK Department for Transport, (2013). Available from: http://www.dft.gov.uk/webtag/documents/expert/pdf/u3_5_7C-the-reliability-sub-ojective.pdf, Accessed on 21st December 2013.