INSIDER AGROTERRORISM THREAT AND HIGH RELIABILITY IN TURKEY PROCESSING

By

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ABSTRACT

In 1984, a cult group poisoned salad bars at several Oregon restaurants with *Salmonella Typhimurium* bacteria causing an outbreak of salmonellosis. As a result, 751 people became ill. This act was described by federal agencies as the first recorded event of agroterrorism in the United States.[1] The events of September 11, 2001, and the subsequent anthrax incidents increased concerns about unconventional terrorist attacks, including attacks on the U.S. food supply. This study uses survey data, cross tabulations, and a discrete choice model to characterize risk within work groups and to determine the marginal effects of factors affecting the probability of insider threat in turkey processing. Processed turkey is a valuable food commodity with a total U.S. production of $2.72 billion in 2003.[2] The results indicate that being aware of rules preventing employees from carrying potentially dangerous materials onto the work floor, punishments against acts of intentional contamination, strictly following instructions to keep food safe and secure at work, and functioning as a High Reliability Organization were significant determinants in minimizing insider threats. These results provide guidance to facilitate policies to sustain safer food.

Key Words: agroterrorism, high reliability organization, probability of intentional contamination, cross tabulations, discrete choice model, turkey processing

INTRODUCTION

The food industry and agriculture in general remain absolutely essential to the social, economic, and political stability of the U.S., constituting a significant percent of the country's overall gross domestic product.[3] One in eight people work in some component of the agricultural sector – more if food processing is included – making the industry one of the largest employers in the U.S.[4]

Moreover, the U.S. is the largest producer of food and agriculture products in the world. The U.S. agriculture industry is a $200 billion business with over $55 billion in exports each year. Over 500,000 farms and 6,000 meat, poultry and egg production establishments, including 57,000 food processors provide foods to local and export markets.[5] Therefore, the down stream effect of any deliberate act of sabotage or contamination in the U.S. food industry would be significant, creating a tidal wave effect that would be felt by all other sectors. Unfortunately, food processing plants (such as the case study plant) with widespread distribution networks, and with employees from various countries who speak a variety of languages, remain highly vulnerable to deliberate disruption.

According to the World Health Organization (WHO) (2002, p. 6), "food is one of the most vulnerable sectors to intentional contamination by debilitating or lethal agents."[6] Therefore, the contamination of food by terrorists poses a real and current threat; and food contamination at one location could have global public health implications and substantial economic loss to the food sector. Insider agroterrorism threats, like the traces of ricin poison found in two jars of baby food in Irvine, California in July 2004, pose even greater concerns.

The goal of this study is not only to help increase awareness and mindfulness of food security to processors, but also to identify or determine best practices for the industry by

evaluating the applicability of high reliability principles and risk communication strategies in turkey processing. Specific objectives include:

1. To characterize risk groups and to evaluate the role of High Reliability Organization (HRO) in minimizing insider threat in turkey processing. Turkey is an important food commodity (the main product consumed every Thanksgiving Day in the U.S.), whose total value of U.S. production amounted to $2.72 billion in 2003.[2]
2. To determine the probability of insider threat in a turkey processing facility and the marginal impact of HRO in minimizing insider threat.
3. The case study plant has been operating since 1930s and its products are sold in every state in the U.S. and to foreign countries; therefore, it is considered a representative of the food processing industry. The results of this study can serve as examples to other food processing plants.

This study also tests the hypothesis that food processing facilities with employees from various nations who do not speak English well, if at all, pose a high insider threat that can increase the probability of intentional food contamination. However, this study suggests that an effective tool that can be used by food processors to mitigate processing risk is to follow high reliability principles that encourages effective risk communication between frontline employees, management, and policy makers.

REVIEW OF CONCEPTS

High Reliability Organizations (HROs): The study of High Reliability Organizations seeks to discover how people organize for high performance in settings where the potential for error and disaster are overwhelming.[7] HROs focus on developing a culture of safety and on encouraging mindful actions in organizations by minimizing errors and mitigating risks.

Some organizations have come to learn that safety and risk mitigation are best developed in a culture that supports front-line workers, and in which constant communication is encouraged to minimize human errors. This safety culture can reflect a highly reliable organization and may motivate organizational identification by employees. A discrete choice model is used in this paper to characterize risk within work groups and to determine the marginal effects of HRO in mitigating insider threats in turkey processing.

Risk Communication and Intentional Food Contamination: Risk and food safety risk communication has been defined by several authors as the probability of occurrence multiplied by the combination of hazard (in this case, the consequences of insider contamination) and outrage (the fear of the unknown).[8-11] Risk communication focuses on the identification of threats, assessments and projections of possible harm, and management strategies to eliminate, reduce, and control the threats.[12]

Some risk scholars see risk communication as simply the process of informing the public of conclusions reached by risk analysts and managers. Others see risk communication as an integral part of both assessment and management processes; thus, reflecting a complete risk analysis framework.[13] Therefore, risk communication in this study is viewed as a context where all stakeholders – those who are exposed to danger as much as those who generate it – should have some control over its management, as in an HRO culture.

Agroterrorism: This type of terrorism can be defined as the deliberate contamination of food for human consumption with chemical, biological, physical, or radionuclear agents for the purpose of causing injury or death to civilian populations or disrupting social, economic or political stability.[14] The vulnerability of the food supply to potential acts of deliberate contamination is a national concern, especially after the terrorist attacks of September 11, 2001.

Insider threat: Acts of food sabotage like the introduction of physical particles, microbial pathogens, and chemical or toxin agents at various points along the farm-to-table food continuum. Terrorists could attack livestock or crops if their primary intent is to cause severe economic dislocation. Such an attack, according to the 2003 GAO report on bioterrorism, would cause severe disruption of the U.S. economy, as the agriculture sector accounts for 13% of the U.S. gross domestic product and 18% of domestic employment. Terrorists could also contaminate processed food products if their primary motive is to cause bodily harm to humans.

Whether terrorists target food products or livestock and crops for deliberate contamination, serious public health and economic consequences are at stake. In today's global market, the contamination of food in one country can have a significant effect on public health in other parts of the world.[15] The mere threat of such an attack would seriously undermine consumer confidence in the safety of the food supply and destabilize export markets. For example, when terrorists threatened to release foot and mouth disease in New Zealand, that nation's export markets and economy as a whole were placed in jeopardy. The discovery of even a single contaminated food product could result in nations closing their borders to trade of that product.[12]

The potential impact of contaminated food on human health from deliberate acts of sabotage can be inferred from reports of unintended foodborne disease outbreaks.[16] A concerted, deliberate attack on food could be more devastating than an accident, especially if a powerful chemical, biological, or radionuclear agent is used. A terrorist using the food supply as a vehicle for attack would likely attempt to use an agent that would maximize the damage and deaths associated with the contamination.

While a widespread terrorist attack on the America food industry has not occurred. Examples of deliberate food contamination in the U.S do exist. They include:

1. In September 1984, members of a religious cult contaminated salad bars in Dallas, Oregon restaurants with *Salmonella typhimurium* and 751 became sick. This attack was reportedly a trial run for a more extensive attack that was planned to disrupt local elections later that year.[17]
2. In 1996, a reference strain of *Shigella dysenteriae* type 2 was used by a disgruntled laboratory worker to deliberately contaminate food to be consumed by colleagues causing illness in 12 people.[18]
3. In January 2003, the CDC reported that 92 people became ill after purchasing ground beef that was intentionally contaminated with nicotine from a Michigan supermarket. An employee was indicted for intentionally poisoning 200 pounds of meat sold in the supermarket.[19]
4. In Irvine, California on July 28, 2004, ground-up castor beans with trace amounts of ricin poison was found in two jars of baby food that also included notes that the food had been contaminated.[20]

RESEARCH QUESTIONS

This research question is based on a selected case study turkey processing plant that has been operating since the 1930s. Its products are sold in every state and to foreign countries. The plant provides 300 jobs for its community and surrounding area. The plant employs workers who represent many cultural groups. Overall, this production facility can be considered representative of most medium-size processing firms.

The over-arching research question in this study is *What role does risk communication in HRO culture play in minimizing insider threats or deliberate acts of food contamination?* Based on the review of relevant literature, three specific research questions were established for this study:

RQ_1 *= What are the high risk groups of employees in the case study plant based on the job title?*

RQ_2 *= Do employees at the case study plant perceive the plant to be a high reliability organization?*

RQ_3 *= Is there low or high probability of intentional contamination in the processing plant, and what factors contribute to these risk levels?*

METHODS

This study uses survey data, cross tabulations, and a discrete choice model (binary logit) to characterize risk groups and determine the probability of low or high intentional contamination in turkey processing. The marginal effects of having characteristics of an HRO and other factors that mitigate the risks of insider agroterrorism threats are also determined. A survey questionnaire, available in English and Spanish, was distributed to 271 employees of a Midwest turkey plant. Out of the 271 surveys sent to employees, 190 were completed and returned, yielding a response rate of 70%. Of the 190 surveys completed and returned, 167 were filled out in English, while 23 were filled out in Spanish. The survey consisted of 32 questions: Ten background and demographic questions, 12 questions about intentional contamination, and ten HRO perception index questions. The demographic questions measures respondents' job categories, primary language, origin, immigrant or non-immigrant, and length of time they have worked in the plant and in other processing plants.

The intentional contamination questions dealt with the possible ways in which employees can identify areas and pathways of an insider threat. The HRO perception index and communication questions dealt with information sharing, the plant's management, concern about the possibility of making a food safety error, the plant's commitment in correcting any shortcomings in the food safety inspection process, and whether employees' actions directly contribute to the prevention of food safety problems.

Procedures: Three methods were used to analyze the data:

1. Cross tabulations were used to characterize employees' risk groups based on job title.
2. The reliability of the survey instrument for this study was tested using SAS statistical analysis software to calculate Cronbach's alpha.
3. A Discrete Choice Model (Binary Logit) was used to measure the probability of insider threat of intentional contamination in the case study processing plant. This method has been used successfully by several authors.[21-23]

The goal of any processing firm is to minimize the probability of an outbreak from either unintentional or intentional contamination. The utility to minimize risk can be characterized as a discrete choice model.[24] In our example or data, this utility is reduced to a logit model because of the two choices for the dependent variable. The dependent variable (contamination $Y_i = 1$, or no contamination, $Y_i = 0$) was proxied with questions like: whether employees have experienced any incidence or act of deliberate contamination by carrying unwanted or restricted materials to the work floor, and not following work instructions. The probability of deliberate contamination was measured by: $F(X\beta) = \frac{1}{1+e^{-X\beta}} =$ (estimates) and $1 - F(X\beta)$ otherwise. A utility index function for contamination $\gamma_i *$ is calculated as $\gamma_i * = \beta X + \varepsilon$, where, X is a vector of independent or explanatory variables, i is the observation, and ε is the random error term.

Thus, the probability of contamination ($\gamma = 1$) is observed as a function of γ_i* if $\gamma_i^* > 0$ or $X\beta + \varepsilon > 0$, and 0 otherwise. Marginal effects are calculated as

$\frac{\partial F(X\beta)}{\partial X\beta} * \frac{\partial X\beta}{\partial x} = f(X\beta) * \beta_j$ where $f(X\beta)$ is a probability density function equal to $\frac{e^{X\beta}}{(1+e^{X\beta})^2} * \beta_j$, and e are the natural log notation. Table 1 summarizes the variables used in the logit model and their descriptive statistics.

RESULTS

RQ₁ *= What are the high risk groups of employees in the case study plant based on the job title?* The results of the cross tabulations (Tables 2, 3, and 4) indicate that the categories of employees who are most likely to be considered higher risk groups are: line workers, employees whose primary language is not English, and immigrants. These categories of employees revealed that they generally are unaware of rules preventing them from carrying unwanted materials onto the work floor, are not aware of punishments against acts of deliberate food contamination, and sometimes or not always strictly follow instructions to keep food safe at work. Thus, they are characterized as a higher risk group.

Table 2 shows the categories of employees who strictly follow work instructions to keep food safe and those who do not. All the managers strictly follow instructions to keep food safe at work, but only 17 of 22 supervisors, 99 of the 141 line workers, and 13 of the 18 janitorial workers strictly follow orders to keep food safe at work. While six line workers sometimes strictly follow orders to keep food safe at work, five line workers do not always strictly follow orders to keep food safe, thereby characterizing them as a higher risk group.

Table 3 presents a summary of employees who are aware of rules that prevent them from carrying unwanted materials onto the work floor. Eighty-two percent of employees in the case

study plant are aware of rules preventing them from carrying unwanted materials onto the work floor, following the standard sanitation operating procedures, and handling of food safely. Again, the line workers are presented here as a risk group because 27 employees who directly handled and processed the product in various work areas (processing points) responded that they were not aware of rules banning unwanted materials from the work floor.

Table 4 summarizes the categories and numbers of employees who are aware of punishments against acts of intentional food contamination in the plant. Overall, only 63.16% of the employees are aware of punishments for acts of intentional contamination. Most importantly, two of the three managers are unaware of punishments for acts of deliberate food contamination; seven out of 22 supervisors are also not aware of these punishments. The majority of employees who are unaware of such punishments are the line workers (53 out of 141), again indicating that they are a high risk group.

RQ_2 *= Do employees at the case study plant perceive the plant to be a high reliability organization?*

The alpha for the survey instrument was 0.87. The closer Cronbach's alpha is to 1, the more reliable the survey instrument is. Thus, the instrument for this study was found to be highly reliable.

Employees generally perceive their plant to be functioning as an HRO, and this HRO structure of the plant has a high marginal impact on the low probability of deliberate food contamination. This study indicates that some characteristics of HROs function in the turkey processing plant which contributes significantly to the low probability of food sabotage in the workplace. The plant's concern about the possibility of making a food safety error and its commitment in correcting any shortcomings in food safety inspection process are important

HRO characteristics. Moreover, a previous study to examine communication perceptions related to food safety risk at the case study plant suggested that employees generally perceived the plant to be an HRO.[25]

Functioning as an HRO is a significant determinant that might lower the probability of intentional food contamination. All organizations face risk; however, high reliability characteristics work to instill a culture of safety and to mitigate the risk of failures in organizations. Therefore, risk-adverse organizations work to develop highly reliable practices by constantly surveying their surroundings for early signs of impending hazards. Consequently, one implication of functioning as an HRO is that employees detect and report any deviations from the normal processing procedures. The result of RQ_2 is validated with the marginal impacts from the following logit model.

RQ_3 *= Is there low or high probability of intentional contamination in the processing plant, and what factors contribute to these risk levels?*

The results predicted that there is a very low probability of an insider threat in this processing plant. The outcome of the discrete choice model revealed that the occurrence of intentional contamination measured by the dependent variable is very low (p = 0 .01); conversely, the probability of intentional contamination not occurring (p = 0.85) in the plant is high.

Table 5 presents the results of the binary logit model and the marginal effects of determinants of intentional contamination. Table 5 also summarizes the important determining factors affecting the probability of intentional contamination. The coefficient, p-value, elasticities, and standard errors for the binary logit model are included. The goodness-of-fit test shows a high predictive value of 86.32% for the model and a McFadden R^2 of 0.09. Several

models were run, and the model was selected based on the goodness-of-fit, the number of significant variables, and the absence of multicollinearity among variables.

The majority of coefficients are significant. The first two HRO perception indices OVCPFS (the concern about the possibility of making a food safety error) and OVCSFSI (the commitment to correct any shortcomings in food safety) are significant (p = .05 and .01), but the third HRO variable, EACPFS (employees actions directly contribute to the prevention of food safety problems) is not significant (p = .67). Being aware of rules preventing employees from carrying unwanted materials onto the work floor (UNWMAT) is also significant (p = .08). Strictly following instructions at work to keep food safe and secure (FSINSTR) is significant (p = .00), while receiving enough training to keep food safe and secure by identifying and reporting any deviations from the normal processing practice (ETIRAIC) and employees' state of origin or nationality (ORIGIN) are both significant (p = .01 and .02). The results in Table 5 indicate that the high reliability (HRO) perception indexes, strictly following work instructions, being aware of unwanted materials on the work floor, receiving enough training on food protection, and employees' origin are significant determinants in minimizing insider food threats in the case study processing plant.

The marginal values (Table 6) show that the variables with least impact on the probability of no contamination (Y=0) are being aware of punishments against acts of deliberate contamination (POIC) and employees' actions contributing to the prevention of food safety problems (EACPFS). The variables with the greatest impact on the probability of no contamination (Y=0) are strictly following orders to keep food safe (FSINSTR), commitment to correcting any shortcomings in food safety inspection (OVCSFSI), being aware of rules that prevent unwanted materials onto the work floor (UNWMAT), and the plant's concern about the

possibility of making a food safety error (OVCPFS). When considering the probability of contamination (Y=1), the most important variables are OVCSFSI, OVCPFS (the HRO perception index), and FSINSTR, with POIC being the least important. The data indicate that the HRO perception index is a significant determinant in minimizing the risk of insider threat or intentional contamination at the turkey processing facility.

CONCLUSIONS AND DISCUSSION

The binary choice model reveals a very low probability of intentional food contamination in the case study processing plant, but this probability is not zero. The model identifies the following significant determinants for minimizing intentional contamination: HRO perception variables, strictly following work instructions to keep food safe during processing, being aware of rules preventing employees from carrying unwanted materials onto the work floor, receiving enough training to keep food safe, being able to identify and report acts of insider threats of food sabotage, and employees' nationality or state of origin.

The data revealed that most employees not only perceive their organization as functioning as an HRO, but they also strictly followed orders to keep food safe at work. Employees' strict adherence to instructions suggests that the plant's management has been effective in communicating policy. Similarly, the data show that employees have developed a reliance on food safety information from top management officials who are mindful of delivering safe products to their customers.

Another indicator of high reliability is the finding that most employees (81.6%) are aware of rules preventing them from carrying unwanted materials onto the work floor. Moreover, restricting access to unknown or unauthorized persons is already standard practice in the

processing plant. However, it will be workers in the plant that might present a greater threat (insider food sabotage), due to their access to raw materials, process, and finished foods.

Unfortunately, not all of the data reflect effective policies or procedures. For example, employees did not perceive that they receive enough training on food protection and security. The marginal impact of this training variable showed that if management increased training the probability of contamination will decrease. Thus, increasing required training on food protection and food safety risks, especially for newly hired employees, should be beneficial.

Overall, this research used a discrete choice model (binary logit) to reveal that the probability of intentional food contamination is low at the case study processing facility. But food still remains one of the most vulnerable sectors to intentional contamination by debilitating or lethal agents. Therefore, the contamination of food by terrorists poses is a real and current threat. One lesson that the tragic events of September 11, 2001 have indelibly etched upon the minds of most Americans is that terrorists will seek new and unexpected methods in their attempts to harm the U.S.[26] This nation's food supply and agricultural industries could be a target for these new methods.

While this vulnerability cannot be completely eliminated, this study suggests the food processing industry can minimize insider agroterrorism threats by: (1) functioning in a highly reliable manner, (2) communicating food safety rules to all groups of employees, (3) targeting training needs to frontline and newly hired employees, (4) providing incentives for detecting and reporting risks, (5) compensating employees annually for achieving target safety performance standards, (6) taking precautionary and security measures against insider agroterrorism threats, (7) enhancing food safety programs to include possibilities of deliberate contamination, and (8) designating a food security management coordinator.

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Table 1. Variables and their Descriptive Statistics used in the Logit Model

Variable Name	Variable Description	Responses	Descriptive Statistics		
			Mean	Mode	SD
FSINSTR	Do employees strictly follow instructions to keep food safe at work?	Always = 1 Many times = 2 Sometimes = 3 Not always = 4 Blank (N/A) = 9	2.02	1	2.34
UNWMAT	Are employees aware of rules preventing them from carrying unwanted materials onto the work floor?	Yes = 1 No = 0 Blank (N/A) = 9	0.91	1	0.92
ECHECK	Are employees screen for unwanted materials before they begin work?	Yes = 1 No = 0 Blank (N/A) = 9	0.45	0	1.35
ETIRAIC	Do employees received enough training to identify and tell acts of (intentional) contamination?	Strongly agree = 1 Agree = 2 Neither = 3 Disagree = 4 Strongly disagree = 5	2.91	2	1.35
POIC	Are employees aware of punishments against acts of deliberate food contamination?	Yes = 1 No = 0 Blank (N/A) = 9	0.87	1	1.42
ORIGIN	Employees' nationality or state of origin?	SD = 1; ND = 2 MN = 3; TX= 4 Mexico = 5 Vietnam = 6 Others = 7		1	2.26
OVCPFS	The plant is concerned about the possibility of making a food safety error (HRO Perception Index 1)	Strongly agree = 1 Agree = 2 Neither = 3 Disagree = 4 Strongly disagree = 5	2.22	2	1.06
OVCSFSI	The plant is committed to correcting any shortcomings in food safety inspection process (HRO Perception Index 2)	Strongly agree = 1 Agree = 2 Neither = 3 Disagree = 4 Strongly disagree = 5	2.11	2	0.94
EACPFS	Employees' actions directly contribute to the prevention of food safety problems (HRO Perception Index 3)	Strongly agree = 1 Agree = 2 Neither = 3 Disagree = 4 Strongly disagree = 5	2.26	2	1.03

Table 2. Categories of Employees Who Strictly Follow Instructions to Keep Food Safe/Secure at Work

Job Title (JT)	F=1[*]	F=2	F=3	F=4	F=5	F=9	Total
JT=1[**]	3	0	0	0	0	0	3
JT=2	17	3	1	0	0	1	22
JT=3	99	19	6	0	5	12	141
JT=4	4	1	0	0	0	0	5
JT=5	1	0	0	0	0	0	1
JT=6	13	0	1	0	0	4	18
Total	137	23	8	0	5	17	190

[*] F=1 is always; F = 2 is many times; F = 3 is sometimes; F = 4 is few times; F = 5 is not always; and F = 9 is omitted response.

[**] JT = 1 is management; JT = 2 is supervisor; JT = 3 is line workers; JT = 4 is office staff; JT = 5 is security; and JT = 6 is cleaning and sanitization.

Table 3. Categories of Employees Who Are Aware of Rules Preventing Unwanted Materials at Work

Job Title	UNWMA=0*	UNWMA=1	UNWMA=9	Total
JT=1**	1	2	0	3
JT=2	2	20	0	22
JT=3	27	112	2	141
JT=4	1	4	0	5
JT=5	0	1	0	1
JT=6	2	16	0	18
Total	33	155	2	190

*UNWMA = Are employees aware of rules preventing unwanted materials at work? UNWMA = 0 is no; UNWMA = 1 is yes; UNWMA = 9 is blank.
**JT (job title) =1 is management; JT=2 is supervisor; JT=3 is line worker; JT= 4 is office staff; JT=5 is security; and JT=6 is cleaning and sanitization.

Table 4. Categories of Employees Who Are Aware of Punishments Against Acts of Intentional Contamination

Job Title	POIC=0*	POIC=1	POIC=9	Total
JT=1**	2	1	0	3
JT=2	7	15	0	22
JT=3	53	84	4	141
JT=4	0	4	1	5
JT=5	0	1	0	1
JT=6	3	15	0	18
Total	65	120	5	190

*POIC= Are employees aware of punishments against acts of intentional contamination? POIC=0 is no; POIC=1 yes; and POIC=9 is blank.

**JT (job title) =1 is management; JT=2 is supervisor; JT=3 is line worker; JT= 4 is office staff; JT=5 is security; and JT=6 is cleaning and sanitization.

Table 5. Parameter Estimates and Coefficients of Binary Logit Model of Employees' Characteristics on Intentional Contamination

Variable Names	Variable Description	Coefficient	*p*	Elasticity
OVCPFS	HRO index 1	-0.06	.05	-1.16
s.e.		(0.03)		
OVCSFSI	HRO index 2	0.08	.01	1.44
s.e		(0.03)		
EACPFS	HRO index 3	-0.01	.67	-0.20
s.e		(0.02)		
FSINSTR	Work Instructions	0.03	.00	0.51
s.e.		(0.01)		
UNWMAT	Unwanted Materials	-0.08	.08	-0.61
s.e.		(0.04)		
ETIRAIC	Received Training	-0.47	.01	-1.21
s.e.		(0.02)		
ORIGIN	Origin	-0.02	.02	-0.58
s.e.		(0.01)		
POIC	Punishments for IC	-0.00	.96	-0.01
s.e.		(0.02)		
McFadden R^2	0.09			
Percentage Correct Predictions	86.32%			

The values in parentheses are standard errors. Variables are defined in Table 1.

Table 6. Marginal Effects for Binary Logit Model

Parameters	Probability of Y=0	Probability of Y=1	Marginal Effects
OVCPFS	-0.05	-0.10	-0.06
OVCSFSI	0.07	0.13	0.08
EACPFS	-0.01	-0.02	-0.01
FSINSTR	0.03	0.05	0.03
UNWMAT	-0.07	-0.13	-0.08
ETIRAIC	-0.04	-0.08	-0.05
ORIGIN	-0.02	-0.04	-0.02
POIC	-0.00	-0.00	-0.00

Variables are defined in Table 1.