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**Working Paper**

## Multiple information search and employee participation in occupational pension plans

Thünen-Series of Applied Economic Theory - Working Paper, No. 114

**Provided in Cooperation with:**

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*Suggested Citation:* Johansen, Kathrin (2010) : Multiple information search and employee participation in occupational pension plans, Thünen-Series of Applied Economic Theory - Working Paper, No. 114, Universität Rostock, Institut für Volkswirtschaftslehre, Rostock

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**Thünen-Series of Applied Economic Theory**  
**Thünen-Reihe Angewandter Volkswirtschaftstheorie**

Working Paper No. 114

Multiple information search and employee participation in  
occupational pension plans

by

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2010

## **Multiple information search and employee participation in occupational pension plans**

by Kathrin Johansen<sup>†</sup>

*first version: February 2010*

### **Abstract**

Multiple searches for information can increase individual participation in occupational pension programs. This paper tests hypotheses derived from transaction cost theory and search theory to explain the formation of information networks on pensions. Using a dataset representative of the German population, we empirically investigate the determinants of network formation with respect to information about occupational pensions. We find that transaction costs, provision of information by the employer, quality of the intermediary, and subjective concern with this topic increase willingness to participate in a network and increase the number of network partners.

keywords: information search, occupational pensions, network formation

JEL-classifications: D83, J14

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Acknowledgments: We thank Doris Neuberger for helpful comments on this paper. The questionnaire used in this paper has been placed into the Omnibus Panel by Ipsos GmbH. Helpful advice on the questionnaire and discussions with Katharina Wendler (Ipsos Observer) are gratefully acknowledged. The usual disclaimer applies.

## 1. Introduction

Participation in pension plans that are apart from the public PAYG system is still low, so it remains a subject of discussion in Germany. In an earlier study (Dummann 2008a), we showed that employees of small and medium-sized enterprises are provided an occupational pension less often than those employed at large firms. Because of individual constraints and other attributes, individuals<sup>1</sup> contact banks, insurance companies and investment consultants as intermediaries to support retirement savings (Dummann 2008b). However, there is a very low level of participation in such individual plans. The more active employees—whether men or women—are in decisions about asset allocation and portfolio structuring, the more adequate the retirement savings. Men and women do not differ in terms of types of investment strategies (Papke, 2003).

An open question in the literature concerns whether employers aim to reduce risks when they adopt a pension plan (McCarthy 2006) or whether more information should be shared about employees to reduce asymmetric information between employers and third-party intermediaries.

Individuals face different types of costs, including transaction and search costs, in acquiring information about pension plans and finally signing a contract (Fritsch et al. 1996, p. 6). These costs need to be taken into account more closely with respect to occupational pensions, which are the focus of the present paper.

Of course, there are significant differences between what younger workers want and what those nearing retirement want. In this case intermediaries are helpful in overcoming information problems. The intermediary has responsibility not only to distribute products in order to maximize profits but also to include the knowledge and preferences of the client in the product decision. To support this decision process, the intermediary should take notice of different behavioral patterns, such as risk preferences. Which factors determine a client's choice of intermediary has been shown by Dummann (2008b).

In this paper, we suggest that networks are useful in find an optimal allocation of retirement resources. Individuals are not able to come up with an optimal decision about retirement savings products on their own and need assistance in evaluating their preferences, acquiring information about different products, and executing a plan. We derive this idea from Guiso et al. (1992), who find that precautionary saving is only slightly higher for single-income earners than for households and suggest that income risk might be shared in a network. We focus on the possibility of an employer, its employees and a financial intermediary<sup>2</sup> as an information network that has the aim of finding equilibrium between utility-maximizing employees and employers with respect to profit-

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<sup>1</sup> In this context “individual,” “household” and “employee” are taken as synonyms.

<sup>2</sup> We use “intermediary” as a generic term for banks, insurance companies and fund managers.

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maximizing intermediaries. Our paper is the first to relate this strand of literature to pension economics.

We suppose that individuals' performance in providing for retirement can be improved with better-quality consulting provided by the intermediary. In the ideal case the intermediary has a long-term relationship with the company or is willing to start one. Hung et al. (2009) and Hung and Yoon (2010) investigated for the U.S. financial market whether advice improves performance in financial actions and found that performance is better when advice is solicited than when advice provided automatically to the client. An analysis of the quality of consulting in the German banking sector (both commercial and private banks) provides pessimistic results; only a small amount of time is available to the consultant to clarify the client's aims, initial situation, preferences, needs, income situation and preparation for old-age (Oehler and Kohlert 2008). In an empirical analysis of German customers' willingness to change their retail bankers, Oehler and Wilhelm-Oehler (2008) found evidence that more than half of the customers were satisfied with their banks and showed little willingness to change; the percentage of customers who were not willing to change was higher for mutual savings banks.<sup>3</sup> Oehler and Wilhelm-Oehler also showed that the profitability of a bank increased if customer relationships were prolonged over the life-cycle. Those who did change banks did so because of the bank's level of expertise and high transaction costs. In order to prolong the relationship between an individual and the intermediary, Oehler and Wilhelm-Oehler recommend the intermediary secure the relationship by offering extra services, increasing service quality and differentiating between customers.

Depending on employees' socio-economic attributes, which influence individual choice of an intermediary for old-age provision<sup>4</sup>, employers may want to contact an intermediary that offers products and assistance to employees. In general, an employer knows his or her employees and is able to choose an appropriate intermediary (Oehler and Werner 2008).

We empirically investigate the determinants of formation of such a network among an employee, his or her employer and at least one financial intermediary. We formulate our research question as: Are information networks on the topic of old-age provision established and do they increase individual participation in occupational pension plans?

The paper is structured as follows. Chapter 2 provides the theoretical background of our analysis. Chapter 3 explains our estimation approach for testing our hypotheses, and we present and discuss the results of our survey. Finally, chapter 4 concludes.

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<sup>3</sup> Credit unions in the US.

<sup>4</sup> "Old-age provision" and "pensions" are interchangeable.

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## 2. Theoretical background

### 2.1 Transaction cost theory

Establishing a pension contract is not based solely on the availability of property rights, but on transactions, including vesting of disposal rights. Transaction costs in this respect cover all efforts an individual faces in initiation, settlement, monitoring and adjustment of a contract. These costs can be both monetary and immaterial (such as opportunity costs that are due to expenditure of time). According to Coase (1937), they arise if individuals want to make use of the price mechanism in the market. In contrast to classical arguments, the literature on transaction costs assumes individuals have bounded rationality so they are not able to capture all necessary information. People's actions depend on the environmental conditions, which may be characterized by uncertainty (e.g., uncertainty about the date of retirement, uncertainty about life expectancy, or uncertainty about returns on contributions) or costs (e.g., monetary costs during the contract period, repeated adjustments of contracts). Opportunistic individuals prefer a transaction atmosphere that depends on socio-cultural and technical factors. In case of transactions between individuals who are close to each other, such as through familial relations or an established network, interaction effects occur that differentiate these transactions from those made in non-recurring market actions (Picot et al. 2005, p. 56-62).

Transactions fulfill a coordination function that can work in a hierarchical form (top down or bottom up), in market coordination, or as a hybrid form of a network. The resources necessary and the resulting amount of transaction costs depend on the number of participants. These costs can be reduced by the introduction of an intermediary because, first, repeated small actions can be summarized to a single larger transaction; second, the frequency of transactions can be reduced; and, third, the overall number of contacts between all the individuals and the opposite market side can be minimized when the intermediary pools information. By searching for information, matching partners in the market, monitoring<sup>5</sup> and guaranteeing conditions, and negotiating, a (specialized) intermediary takes over several functions to improve the quality and standardization of a product (Rose 1999, p. 56-65).

If occupational pensions are concerned, the transaction costs in virtually every category can be minimized in our opinion if the employee has access to a network of at least one further contact person.

### 2.2 Theory of search

Before entering the discussion on network creation for increasing participation rates in occupational pensions, it is necessary to explain how the advice needed and collected by the individual can

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<sup>5</sup> See Diamond 1984 for delegated monitoring.

be distributed. Advice can be understood as a pool of information. According to Rose (1999, p. 11) information is defined as “a message that has significance for a recipient system.” It needs to be distinguished from knowledge which is purposive information and not transferrable (Rose 1999, p. 12/13). Search is an indicator of disequilibrium in an economy with uncertainty.

Theory of search assumes a simple search model: A risk-neutral individual or decision-maker searches for information concerning a good with a set of attributes in mind over an infinite period of time. Each observation the individual generates (or each piece of information) originates search costs. These costs increase with the amount of searching. On the other hand, the return on information acquisition increases with the amount of search spent, but with a decreasing slope. As long as the return on the search is below the expected return, the individual will keep searching. An optimum is found in the maximum of the difference between return on effort and search costs. The individual will continue the search as long as the additional value generated by the search is larger than a reservation value, called the stopping rule (Stigler 1961, Rose 1999, p.85/86).

An optimal search strategy is created by the decision-maker’s setting an individual reservation value of search, which means that a sequential search process is performed, but if the reservation value is reached, the individual stops all further activities (Kohn and Shavell 1974).

Information gathering is a process under uncertainty of the optimal outcome; in the case of pensions, this outcome is optimal pension coverage. Therefore, the search process follows sequential steps (McAfee and McMillan 1988). On the other hand, information procurement can also depend on the availability of a third party that assists in information-gathering, as well as individual ability and intensity of the search for information (Rose 1999). Finally, intensive search for information leads to an increase in social value (Hirshleifer 1971).

Therefore, we hypothesize,  $H_1$ : *If an individual’s transaction costs are low and his or her preferences for information are high, the individual will be more likely to participate in an information network and search for advice.*

### 2.3 Information sharing

Sharing personal information evolves both advantages and costs. Cate and Staten (2000) summarized the features of information-sharing as allowing for the ascertaining of needs, providing information customers are interested in, making advice more concrete and reducing costs.

Pagano and Jappelli (1993) modeled information-sharing for the credit market from a theoretical point of view. Banks pool their information into a single database so the characteristics of the applicants are available to every participant. The model provides the solution that information-sharing is profitable to the participants if mobility is high, transaction costs are low and the total number of participants in the system is high. If not all banks participate in the information-sharing network and

markets are contestable, no additional costs arise for acquiring further households because information-sharing does not occur among borrowers in most cases. However, if participants decide to share information, competition among banks increases, which increases lending activity (Pagano and Jappelli 1993, p. 1701-1705). If information is shared, a higher level of efficiency is reached because similar resources are used and long-term relationships can be established (Meijboom et al. 2004).

These explanations lead us to hypothesize  $H_2$  for the case of occupational pensions:

*H<sub>2</sub>: Greater mobility of the individual increases the demand for information, so highly mobile individuals are more likely to participate in information-sharing networks.*

Whether and how individuals form networks in order to exchange information will be discussed in the next section. In a general case, individuals who do not have any information about a topic and others who have certain knowledge need to be distinguished (Meijboom et al. 2004, p. 36). This will be taken into account in the empirical part of our analysis.

#### 2.4 Networks as instruments for efficient resource allocation

As we have seen, pooling of information is costly but increases individual benefits. From a microeconomic point of view, we have seen that asymmetric information can be overcome by contracts between agents and principals (Diamond 1984). In this model the principal's asking the agent to execute a project facing the risk of moral hazard. In order to overcome this problem, contracts need to include incentives and conditions so both sides benefit from the relationship. This arrangement between principal and agent can be called a network.

Definitions of networks differ across disciplines, and economists investigate both material and immaterial networks. Meijboom et al. (2004, p. 34) defined a network as "a formalized cooperation between independent organizations." Pappi (1993, p. 84) provided a sociological definition of networks as "players connected to each other by relationships of a specific type"; in addition, these relationships become more complex because of exchanges, coordinated actions and the need to make decisions within a system that is resource-consuming (Grunow 2000, p. 318).

Three levels of network formation can be distinguished with reference to pensions: the macro level, the meso level and the pure micro level. On the macro level, the three pension pillars compete with each other or support each other as they might be chosen jointly for old-age provision. The meso level offers possibilities for different types of intermediaries to cooperate in order to build a network between institutions. Finally, a pure micro cooperation consists of participants like the employee, employers, friends, neighbors, and relatives (all summarized as surroundings). We investigate joint networks at the micro and meso levels as we analyze information searches on occupational pensions of employees.



On each level, the relationship of a bilateral network (between two individuals) is established if the benefits are larger than costs. Blankart and Knieps (1992) and Thum (1995) explain both the cost and benefit side of networks. If the network is to be created, all participants of the network need to optimize their utility jointly. First, a pool of participants is created so that average costs shrink. As the number of participants increases, ways to convey information must be developed because the distance between the actors increases and not all information can be distributed directly. In the end, a critical mass of participants demanding this network is reached, after which the available capacity of the network decreases. According to transaction cost economics, these costs need to be minimized given individual preferences. Therefore, we develop hypothesis H3.

*H<sub>3</sub>: New participants will enter a network as long as the benefits for all members outweigh the costs of monitoring and signaling quality.*

On the other hand, economies of scale can be generated as information or goods are pooled and distributed more efficiently (e.g., Thum 1995). Moreover, network externalities can be identified that have individual benefits from participating in a network, depending on its technology and the total number of participants.

Wide strands of literature discuss networks not with respect to risk-sharing. Risks are understood as shocks on consumption or current income which then need to be smoothed according to the risk preferences of the individuals. The use of social networks as a mechanism for consumption smoothing has been discussed for developing countries. In this case networks serve as a buffering mechanism from exogenous shocks. Most empirical studies investigate which factors promote consumption-smoothing and the ability to overcome risks and exogenous shocks. Nyblom et al. (2003), Dercon and DeWeerd (2005) and Fafchamps and Gubert (2007) empirically investigate network formation with risk-sharing purposes in rural areas and found a positive influence of low transaction costs and small distance between the network participants.

For a more urban area, Adaman et al. (2006) used multi-stage logit estimations to investigate whether Turkish households use of social networks to buffer expenditure shocks. They find that wealth, more than membership in a social network, enhances the ability to apply for a formal loan. They also find that a distinction needs to be made between households that rely on money provided by a social network for everyday spending and households that use networks for irregular transfers. The latter group are more likely to apply for a formal loan.

We suggest that the individual attitude toward long- and short-term risk influences the individual attitude toward adopting a pension plan. One group chooses a risky plan because it expects high returns, while another chooses a more conservative plan because it is less risky, and others choose no plan at all. From an explorative perspective, we are interested in testing *H<sub>4</sub>: Individual attitudes*

*toward risks influence the amount of information searched and the number of people or intermediaries contacted.*

One of the main results provided by both theoretical and empirical studies on risk-sharing networks is the negative impact of distance. In the case of a large geographical or social distance, people do not know each other, so transaction costs for assistance during shocks rise. Thus, the benefits from establishing a network of large geographical areas are not well established. The same argument can be stated for occupational pensions: because of the variety of products, investment possibilities and legal changes during the past 10 years, demand for information is high, but if no one is available to provide information or if a group is highly heterogeneous, the likelihood that an information-sharing network will be established decreases.

*H<sub>5</sub>: Distance parameters negatively affect information networks because larger distances increase transaction costs and hamper information search.*

As Dummann (2008b) found, subjective attitudes influence the contacts between individuals and intermediaries concerning financial affairs. In a one-with-many relationship,<sup>6</sup> the influence of subjective attitudes might be of even more importance, so previous actions toward information acquisition and the subjective importance of information on the topic of old-age-provision yield to changes in the probability of network participation.

*H<sub>6</sub>: The more literate or knowledgeable an individual is on pensions, the larger his or her information network is.*

## 2.5 Summary

Our study is the first to connect theories of social networks and information-sharing in order to adapt them to pension economics. We are the first to investigate whether a network will exist (or be preferred) if occupational pensions are concerned and if the driving factors are provision of information by intermediaries or employers, quality of information, and personal involvement.

If an individual formulates preferences about income and consumption in future or retirement periods and is able to smooth a defined or flexible amount of income over time, the search for information will begin. Financial professionals and/or employers are able to distribute information on product range and risk because they have access to this information, but the individual might be interested in acquiring as much information as possible in order to come to an optimal solution to the decision problem. Therefore, the individual might not wish to contact an exclusive network of professionals if they completely mistrust the financial sector, but to receive information from the social surrounding solely or additionally. Social networks, such as those created by family, partners, friends, neighbors or associates might bring additional information: legal recommendations, news

<sup>6</sup> With one person (in our case the employee) acquiring information from more than one other person.

about costs, products others might have heard of, or even own experiences with occupational savings. If the individual is not willing to contact anyone, he or she can still acquire information via web research, brochures or other means. If the individual has a preference for old-age savings and decides to choose one or more contacts from which to receive information, the individual draws a conclusion regarding whether to participate in an occupational pension or not.

Multiple information searches on occupational pensions increases the subjective degree of information and finally leads to an increase in pension plan participation. All in all, all parties should be better off if an informational network is introduced. The employee is able to maximize utility over his or her life-cycle by consumption smoothing and saving. He or she is more satisfied with the job if s/he is offered an occupational pension plan and is satisfied with the financial advice s/he receives from the financial intermediary. Profit maximization can be achieved by the intermediary if s/he offers services, receives fees and contributions. Finally, an employer is able to follow his or her aim of profit maximization and to maximize utility by having access to loans from the intermediary, by reducing administrative work that is now forwarded to the intermediary, and by offering a pension plan (or even more than one way of providing a pension) to his or her employees, thereby increasing worker satisfaction. Table 1 summarizes our hypotheses, which will be tested in the next chapter.

Table 1: Summary of hypotheses

<b>Hypotheses</b>
<p><i>H<sub>1</sub>: Transaction costs</i>            If it is time or cost consuming to gather information about occupational pensions an individual will c.p. be skeptical towards this product and will less probable participate. If these costs can be reduced e.g. by shifting them to a further agent a network is established (simple form: bilateral network).</p>
<p><i>H<sub>2</sub>: Mobility</i>            If the market for occupational pension is contestable the number of competitors will be high. In this case costs for weighting of information rise. An individual will enter a network in case of high competition as it lowers individual costs. On the contrary the more mobile an individual is the less likely it will enter a network.</p>
<p><i>H<sub>3</sub>: Network size</i>            If a network exists new participants will enter this network as long as the benefits for all members outweigh the costs due to monitoring and signaling of quality.</p>
<p><i>H<sub>4</sub>: Risk</i>            A risk averse individual will share information in order to reach a highest degree of security.</p>
<p><i>H<sub>5</sub>: Distance</i>            A large distance between two parties increases the cost of information acquisition so that a network increases the utility from information search. Distance can be understood as social distance or geographical distance between the partners looking for information on occupational pensions.</p>
<p><i>H<sub>6</sub>: Literacy</i>            Financial literacy may increase the awareness for the necessity of additional retirement provision. An educated individual is aware of the fact that groups share information and thus individual utility may increase due to further information provided by the network.</p>

Source: own compilation

### 3. Empirical Analysis

#### 3.1 Dataset and variables

The data used in this study to test our hypotheses are taken from an own survey on representative German households. The aim of the questionnaire is to deliver an insight into motives for building an information network on occupational pension plans and influence factors hindering or promoting participation in an occupational pension plan. In joint work with the Ipsos GmbH, Mölln we placed the questionnaire into the Omnibus panel, which is carried out periodically. Employing C.A.P.I. (Computer Aided Personal Interview) techniques a random sample representative for the German residential population (according to official statistics) in private households age 14 and older is developed.

The interviews took place during the period from 12th October 2009 – 18th October 2009. In the end, the overall sample contains 989 interviews representative for a weighted number of 1000 individuals. Some of the questions are only related to the working population in Germany. Therefore, the sample will be reduced to a weighted number of 519 individuals.

Based on the answers of the individuals we created different variables which will be used in our empirical analysis. The description and definition of the variables is given in table 2.

Table 2: Definition of variables used in the regression analyzes

<b>Variable</b>	<b>Description</b>	<b>Exp. sign</b>
<b>dependent variable</b>		
N1	Dummy = 1 if respondent collects information on occupational pensions exclusively from his employer and a financial intermediary	
1N	Dummy = 1 if respondent collects information on occupational pensions at least from his employer and a financial intermediary	
<b>independent variables</b>		
AGE	Age of the respondent in years	+/-
MARRIED	Dummy = 1 if the respondent is married	+/-
SEX	Dummy = 1 if the respondent is male	+/-
HHSIZE	Number of members of the household	+/-
EDU	Dummy = 1 if respondent has a university (of applied sciences) degree	+
INCOME	Ordinal scaled (14 groups) increasing amount of household monthly net income	+
AG	Dummy = 1 if initiative on provision of information has been made by the employer	+
FDL	Dummy = 1 if initiative on provision of information has been made by a financial intermediary	+
CONTACT_C	Dummy = 1 if respondent has a contact person on occupational pensions inside the company	+
CONTACT_N	Dummy = 1 if respondent does not know who would be the contact person on occupational pensions	-
Q8I	“Information index” Dummy = 1 if respondent would sign/ or has signed a contract on occupational pensions if he received enough information from the employer AND/OR knows the product supplier	+
Q8Q	“quality index” Dummy = 1 if respondent would sign/ or has signed a contract on occupational pensions if he has a contributions guarantee AND/OR receives a return similar to that at the stock exchange AND/OR has portability of contributions AND/OR financial intermediary signalizes high quality	+
SAVE	Dummy = 1 if respondents saves periodically a flexible or fixed amount of money for old-age	+
TIME	Dummy = 1 if respondents prefers current consumption or does not have enough money to save	-
RISK	Ordinal scale 1 (does not apply) – 5 (completely applies) on willingness to accept risks in financial affairs	-/+
ADVICE	Ordinal scale 1 (does not apply) – 5 (completely applies) on subjective importance of advice on possibilities of old-age provision	+
CONCERN	Ordinal scale 1 (does not apply) – 5 (completely applies) on individual intensive concern with the topic old-age provision	+
SME	Dummy = 1 if respondent is employed in a SME	-
EXP80	Dummy = 1 if respondent expects to get age 80 or older	+
Q13	Numerical value: job change during the last 10 years?	+
MOBILITY	Interaction effect of dummy $Q13 \times SME$	+

Source: own compilation

### 3.2 Estimation approach

According to Kenny et al. (2006) information networks<sup>7</sup> can be defined in different ways, but we deal primarily with information networks related to occupational pensions. Figures 1(a) – 1(d) illustrate four different types of information networks that consist of several characters who participate in the information search process on company pensions. If a contact between the actors  $i, j, k, n$  is established, our contact indicator  $L$  reaches value 1. First, standard communication situations may occur in a one-to-one situation with an employer and an employee talking to each other, as the employer is the first person inside a company that an employee is likely to talk with about pensions (a). Second, an individual or employee may not search for information in only one direction but contact two persons (figures 1b and 1c). First we focus on an “exclusive network” with the employee solely acquiring information from his or her employer and from a financial intermediary (b). Then we evaluate factors that impact the creation of a network that consists of at least employer, employee and financial intermediary but with the possibility of including other people for further information, such as family, associates or others (c). Finally, diagram (d) illustrates the complete structure of a network that is denoted as a social relationship model. It covers all social relationships and information structures among the participants inside the network. Therefore, (d) it is the most complex and most exact way to explain network structures. However, because we have been able to interview only employees, we will deal primarily with figures 1(b) and 1(c).

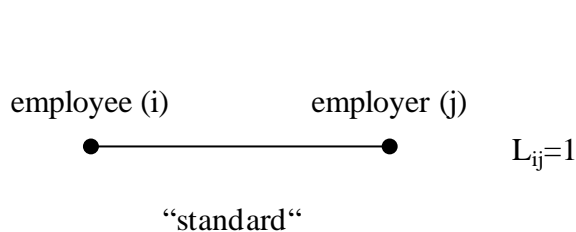


Figure 1(a): Standard relation

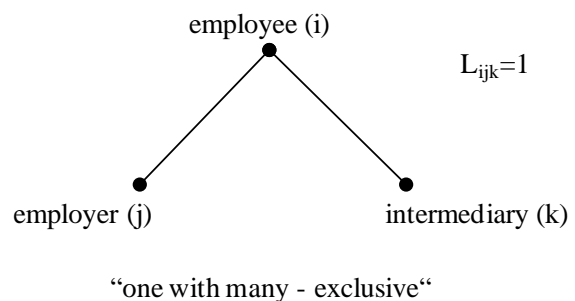


Figure 1(b): Exclusive network

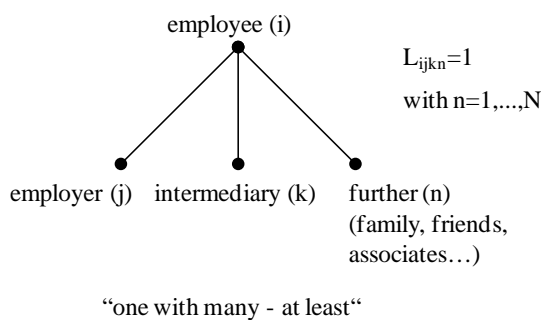


Figure 1(c): “at least”-network

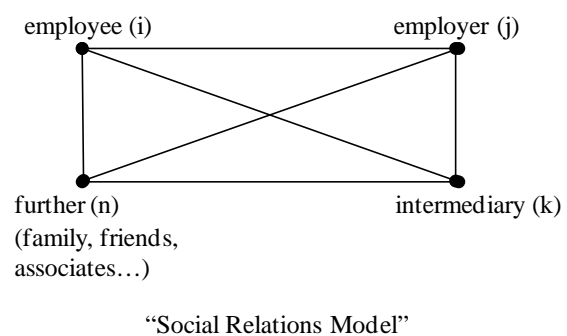


Figure 1(d): Full connection network

Source: own compilation according to Kenny et al. (2006), p. 14

<sup>7</sup> Relationship models or dyads are synonyms for networks.

Our empirical model of information search considers single relations between the employee and one other person as a dependent variable and in a second investigation multiple relations between the employee and at least two other persons as a survey including more sides of the network had technically not been possible. In case of a single relation information is distributed exclusively, so we refer to a “one-with-many-exclusive” network. If more people are contacted, we call it (according to Kenny et al. 2006) a “one-with-many-at least” network. Due to this implementation of networks our dependent variable is a binary dummy variable reaching the value “1” if this network is used by the respondent. We performed linear probability models, logistic regressions and probit regressions all using maximum likelihood estimation parameters based on the Likelihood ratio statistic (LR statistic) to compare which estimation procedure is the adequate one. In the end probit regressions were adopted. Furthermore, we performed several tests to check for problems of multicollinearity between independent variables and heteroscedasticity in the standard errors.

The regression model we finally employ using the probit procedure is similar to that of Murgai et al. (2002). They hypothesized similar to us that a model of (information) exchange localized within clusters explains the pattern of exchanges better than a model in which (information) exchanges are characterized by purely bilateral relationships. The probability of exchanges  $e$  between individuals  $i, j, k$ , increases if transaction costs  $d_{ijk}$  are minimized. This can be written as (1) and transcribed as (2) with  $c_{ijk} = 1$  if the agents of interest are in the same cluster. In that case contact  $L$  takes value  $L_{ijk} = 1$ . Whether contact and exchange are implemented depends on cluster characteristics  $c_k$ .

$$\Pr(e_{ijk} = 1) = f(d_{ijk}) \quad (1)$$

$$\Pr(e_{ijk} = 1) = \Pr(L_{ijk} = 1) = f(c_{ijk}, c_k) \quad (2)$$

The econometric model using a pair/triple of individuals exchanging information at least once as a dependent variable can then be written as (3)

$$e_{ijk}^* = \alpha d_{ij} + (\beta c_{ijk} + \gamma c_k) + \varepsilon_{ijk} \quad (3)$$

$e_{ijk}^*$  can be transformed into an observed variable (answer on the question whether a person contacts some others on the topic occupational pensions in our survey).  $d_{ijk}$ ,  $c_{ijk}$  and  $c_k$  are then captured by vector  $X_{ij}$  including a series  $N \times (N - 1)$  matrices that include the answers of our respondents on specific questions on occupational pensions.

In order to assess the goodness-of-fit of our regression models we use the McFadden pseudo  $R^2$  (McFadden 1974) provided by our statistical software package. In this form it denotes the mean squared improvement per observation (Menard 2002, p. 24/25, Cox and Snell 1989).

We furthermore tested our models for the occurrence of heteroscedasticity and in all regression models we tabulated heteroscedasticity consistent standard errors. Davidson and MacKinnon (1993)

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provide a summary of tests for heteroscedasticity in different regression models. As in most cases only the signs and significance values are interpretable due to the fact that the  $\beta$  coefficients are interpreted without the distribution function  $F$ .

### 3.3 Results

We performed several regression models on our data in order to find differences in the attributes of exclusive and “at least” networks, as well as between large and small companies. Our results are tabulated in table 3 for the complete dataset of working respondents for exclusive networks and; in table 4, the dependent variable changed for the full sample to “at least networks.” All the results reported in tables 3 and 4 are robust to changes and show high goodness of fit because of the relatively high  $R^2$ . These results will be discussed in the next paragraphs.

#### 3.3.1 Exclusive networks

According to our theoretical hypotheses, the existence of exclusive networks is an indicator of either high-quality information or limited access to information. If an individual has a small network of only employer and financial intermediary for information purposes related to occupational pensions, it is likely that the individual is either appropriately consulted by these advisors or faces high transaction costs to acquire more information. In that case, factors such as importance of advice or intensity of concern are expected to have significant influence.

The results show that only a small number of factors determine information acquisition from a small but specialized network. No statistical differences across socio-economic groups could be identified except INCOME. The coefficient for INCOME shows a significant sign, which can be explained by the idea that high-income earners are less likely to adopt an occupational pension plan than a private pension plan, so less information on company pensions is required.

Three of our hypotheses ( $H_1$ ,  $H_2$ , and  $H_4$ ) are rejected because the coefficients reveal no significant influence on the dependent variable. Distance, personal concern with the retirement topic (literacy), and risk are the driving factors for contacting a small network. If the employee knows who the contact person for his or her company pension is, he or she is likely to make use of an extended contact outside the social network. If the contact person is unknown to the employee, psychological and possibly geographical distance increase and the likelihood of an exclusive network decreases. The employee in that situation needs to spend more energy on looking for a person to contact, so forming a network is more complex than when the contact person is known. This result is indicated by the significance of CONTACT\_N. Therefore,  $H_5$  cannot be rejected.

Most of the theoretical papers that have analyzed network formation have assumed that individuals are risk-averse. Our survey shows that, for German employees, risk aversion or risk preference



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influences the likelihood of an exclusive network only to a small degree because the coefficient of RISK is significant but only at the 11% level. Therefore, there is reason to doubt the presence of high risk aversion. At the same time, regressions with the dummy variable (taking value 1 if the individual answered “3” on the question “I am willing to accept risks”) did not change our results, so it is not appropriate to say that a risk-neutral individual should be assumed either. However, risk aversion could be tested in further studies with a different variable that more effectively captures the degree to which an individual is able or willing to accept risks. A second factor related to  $H_4$  is the preference for future consumption and, thus, a need for significant current savings for the purpose of old-age provision. Our results show that this factor is not of importance for exclusive networks because the coefficient is not significant. Therefore,  $H_4$  has to be rejected.

The results for  $H_6$  indicate that the influence of personal attitudes towards basic attributes of company pensions and previous individual searches for information cannot be rejected. The high quality of the intermediary, portability, and perseverance of contributions (summarized in Q8Q) are statistically significant at the 5% level as is the subjective importance of advice (ADVICE). The more important quality and advice (not only information!) are for the individual, the more likely he or she will select a small network with those who are most likely to offer the information necessary for the special purpose. Moreover, well informed and knowledgeable individuals are more likely to contact the exclusive network on occupational pensions because the client has acquired some information already and needs only special and additional information. Therefore, we are not able to reject  $H_6$ . All other parameters that indicate the influence of typical transaction costs or an individual's mobility are not significant, so we have to reject hypotheses  $H_1$  and  $H_2$ . The initiative of the intermediary or employer and the mobility of employees in SMEs could not be identified as differences across company sizes, so it may be that motives related to literacy and contact availability are the only ones to influence exclusive networks for the whole sample. With a low degree of significance, income situation and attitude towards risk do not seem to be driving factors for exclusive networks.

Table 3: Estimation results for network “exclusive”

	Model I-1	Model I-2	Model I-3	Model I-4
AGE	0.079 (1.07)	0.084 (1.11)	0.08 (1.08)	0.092 (1.15)
AGE <sup>2</sup>	-0.001 (-0.75)	-0.001 (-0.78)	-0.001 (-0.74)	-0.001 (-0.94)
SEX	0.267 (0.98)	0.293 (1.04)	0.294 (1.03)	0.382 (1.30)
MARRIED	0.358 (0.87)	0.348 (0.84)	0.352 (0.85)	0.389 (0.89)
EDU	0.138 (0.69)	0.172 (0.81)	0.157 (0.76)	0.173 (0.78)
INCOME	**0.12 (-1.90)	*-0.112 (-1.67)	*-0.112 (-1.68)	*-0.132 (-1.79)
HHSIZE	-0.086 (-0.63)	-0.085 (-0.61)	-0.093 (-0.69)	-0.081 (-0.58)
AG	0.348 (1.25)	0.335 (1.12)	0.316 (1.10)	0.254 (0.81)
FDL	0.273 (0.55)	0.232 (0.50)	0.200 (0.43)	0.238 (0.48)
SAVE	0.138 (0.42)	0.153 (0.45)	0.169 (0.49)	0.026 (0.07)
Q8I	0.109 (0.43)	0.068 (0.27)	0.045 (0.19)	0.046 (0.18)
Q8Q	**0.440 (2.00)	*0.400 (1.87)	**0.415 (2.01)	**0.412 (1.96)
ADVICE	**0.341 (2.34)	**0.352 (2.36)	**0.348 (2.42)	*0.261 (1.79)
MOBILITY		0.035 (0.29)	0.051 (0.39)	0.126 (0.96)
SME			-0.119 (-0.43)	-0.263 (-0.93)
CONTACT_N				**0.651 (-1.93)
RISK				(*)-0.212 (-1.54)
CONCERN				**0.296 (2.22)
constant	***-5.567	***-5.863	***-5.635	***-5.756
N	496	460	460	460
Wald Chi <sup>2</sup>	***70.16	***64.11	***66.51	***61.06
Mc Fadden R <sup>2</sup>	0.1761	0.1737	0.1745	0.2276

Note: dep.var. N1, z-value in parentheses, heteroscedasticity robust standard errors, \* sign. at 10%, \*\* sign. at 5%, \*\*\* sign. at 1%

Source: own calculation

### 3.3.2 “at least”-networks

A larger network indicates a greater preference for more information since more people to contact generally means the availability of more information. A larger network may also indicate that the individual is insecure about the quality of the first contacts so is willing to accept a higher amount of transaction and search costs to ask more people for information..

Models II-1 to II-5, shown in table 4, present the results of our regressions. In model II-1, our descriptive statistics showed that “having a good feeling about a contract” was a dominant factor for the adoption of a pension plan, and the regression results showed the like for network adoption. Since we have no clear evidence concerning which factors determine a good feeling and since this variable became highly statistically significant in some of our regressions but insignificant when Q8I and/or Q8Q were included, we tested for endogeneity of this variable. Endogeneity tests showed that a good feeling in our sample is determined to a large extent by information about a product and by quality of services and the product (supplier) itself. Therefore, we excluded the variable “good feeling” from the analysis in favor of quality and information.

To begin with, the transaction cost argument cannot be rejected. If the employer (AG) and/or a financial intermediary (FDL), instead of the employee himself or herself, initiated the contact and offered some information, the employee is more likely to extend his or her network and acquire more information. In all combinations these variables are highly statistically significant at the 1% level. Thus,  $H_1$  cannot be rejected.

Our second hypothesis is related to distance. We expected those who are farther away from network partners not to participate. An inclusion of geographical distance parameters such as company size (SME) and mobility of employees in small companies (MOBILITY) did not produce significant coefficients but enlarged the overall goodness of fit of our regression models. Therefore, employees may have network interest independent of the size of their company. The coefficient of CONTACT\_C, indicating that a contact person for occupational pensions is available inside the company, is statistically significant at the 1%-level, so a lower distance resulting from the availability of a contact person in the company increases the availability of information. In other words, if the employee did not previously inform himself or herself, the company provides initial information on old-age provision and the employee may then be interested in acquiring further information. As more people are talked to, the information received at work is extended. Summarizing, employees contact a larger network when there is a contact inside the company, so it may be the case that a contact inside the company completes the set of information required by the individual. Therefore,  $H_2$  and  $H_5$  are partly rejected.

Risk and time preferences are hypothesized in  $H_4$ . We tested these hypotheses by including the variable SAVE to control for a preference to prepare for the future because it includes the item that

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an individual saves a regular fixed or flexible amount of money for retirement. This preference indicates that the individual acquires more information from a larger group of contact people. Across all models it is positively significant at the 1% and 5% levels. The preference to prepare for the future makes it necessary to contact more people and to collect more information from different sources in order to formulate explicit goals and find appropriate instruments that best suit one's preferences. On the other hand, risk aversion (RISK) does not influence the size of the network, so we do not reject hypothesis H<sub>4</sub>.

Where individual literacy or preference for information is concerned, a psychological determinant for demanding an old-age provision has been included by the item "expectation to get older than age 80." Life expectancy (EXP80) influences network participation only to a small extent, possibly because a longer life expectancy is more important for private pensions compared to occupational pensions, because private pension plans leave more room for diversified investments, so a network is not so large for the latter case. To control for this argument, we calculated correlations between subjective life expectancy and information networks on private pensions but identified no large and significant correlations. Thus, it seems more appropriate to us that information networks are built independently from life-expectation because old age provisions are more or less everybody's concern.

Finally, we tested subjective parameters such as importance of quality, portability or perseverance of contributions (Q8Q), importance of information provided by the employer, profile of the intermediary (Q8I) and importance of professional advice provided to the employee (ADVICE). All of these parameters show, as expected, a positive and significant influence on a minimum network consisting of employee, employer, financial intermediary and possibly others. Our non-rejection of H<sub>6</sub> implies that individual willingness, provision of information, and signaling of quality from the professional side increase the probability of network creation. If both sides signal their attributes, the market for this special information is established.

Summarizing, the subjective importance of old-age provision and the information and attributes of the other side of the market are determinants of a minimum network. The network may be extended by the individual according to his or her preferences and opportunity costs until the optimum level of information is reached or until the marginal cost of additional information on occupational pensions equals marginal utility from this information.

Table 4: Estimation results for network “at-least”

variable	Model II-1	Model II-2	Model II-3	Model II-4	Model II-5
AGE	(*) 0.055 (1.43)	**0.088 (2.16)	(*) 0.064 (1.51)	0.059 (1.28)	0.066 (1.43)
AGE <sup>2</sup>	(*) -0.001 (-1.52)	** -0.001 (-2.26)	(*) -0.001 (-1.53)	-0.001 (-1.25)	-0.001 (-1.34)
SEX	(*)0.189 (1.54)	**0.317 (2.42)	**0.261 (1.89)	*0.258 (1.74)	*0.248 (1.65)
MARRIED	**0.379 (2.14)	**0.412 (2.24)	**0.370 (1.90)	(*)0.307 (1.49)	(*)0.305 (1.48)
EDU	(*) 0.110 (1.53)	(*)0.119 (1.45)	(*)0.127 (1.51)	**0.195 (2.01)	**0.248 (2.47)
INCOME	** -0.062 (-2.34)	-0.01 (-0.38)	* -0.049 (-1.70)	** -0.067 (-2.06)	** -0.075 (-2.31)
HHSIZE	0.002 (0.04)	-0.077 (-1.12)	-0.013 (-0.17)	-0.031 (-0.38)	-0.021 (-0.25)
EXP80		*0.242 (1.74)	*0.251 (1.74)	*0.251 (1.62)	0.236 (1.50)
AG	***0.535 (3.46)	***0.608 (3.73)	**0.419 (2.45)	***0.458 (2.56)	*0.319 (1.70)
FDL	***1.197 (3.73)	***0.924 (2.85)	**0.696 (1.93)	**0.801 (2.27)	***0.899 (2.53)
SAVE	***0.852 (6.16)		***0.664 (4.28)	***0.471 (2.76)	**0.357 (2.01)
Q8I			***0.561 (3.88)	***0.442 (2.89)	***0.408 (2.66)
Q8Q			***0.437 (3.02)	**0.341 (2.45)	**0.401 (2.49)
FEELING	***0.379 (2.78)				
ADVICE				***0.322 (4.81)	***0.311 (4.54)
MOBILITY				0.066 (0.97)	0.073 (1.06)
SME				0.001 (0.01)	0.032 (0.16)
CONTACT_C					***0.504 (3.05)
RISK					0.035 (0.49)
const.	** -1.943	*** -2.392	*** -2.571	*** -3.396	*** -3.843
n	496	414	414	386	386
Wald Chi <sup>2</sup>	***98.49	***45.77	***102.34	***102.59	***106.45
McFadden R <sup>2</sup>	0.1483	0.0841	0.1861	0.2341	0.2519

Note: dep.var.: 1N, z-value in parentheses, heteroscedasticity robust standard errors \* sign. at 10%, \*\* sign. at 5%, \*\*\* sign. at 1% Source: own calculations

#### 4. Conclusions

An increase in information network participation could be a factor for an increasing participation in occupational pension plans. To find evidence for this conjecture, we derived hypotheses from economic theory and tested them with our own survey data. Support for the traditional argument that transaction costs hinder the search for network formation can only partly be found in our data. We find evidence that the transaction cost argument holds for the case of an “at least” network. As long as it is not necessary for the employee to take action, he or she will extend the circle of people to contact on the topic of occupational pensions. We also find evidence for multiple information searches; individuals prefer a wider range of people to talk to on old-age pensions and have an “at least” network instead of an “exclusive” but specialized network if they are intensively concerned about the topic. This finding suggests that multiple information sources are acquired if employees have a minimum knowledge or even good knowledge about this topic since, in either case, they may want to complete their knowledge by collecting more information in order to draw a conclusion. The reasons for collecting information may differ by individual. Our data show that many employees do not know which old-age provision is best, so increased information may lead them to an answer. Furthermore, quality and security have an impact on individual attitude toward adopting a pension plan, so policy regulation could enforce participation rates if quality standards or consulting rules are established which then lead customers to have a good feeling about their pension contract.

Our results lead to ideas for future research, which should extend the one-with-many framework to the SRM-level (social relations model-level). If evidence for a positive attitude on information networks can be found on the company level and on the financial intermediary level, further measures could be discussed and established to strengthen individual confidence in additional pensions.

Finally, this study has been conducted during a period of severe financial crisis which led to a substantial amount of consumer doubt about financial markets. We were not able to separate out effects that might originate from disturbances in the financial markets, so it would be useful to evaluate the impact of the financial crisis on customer attitudes toward the system of private and occupational pensions and whether information-sharing inside these networks could ease doubts.

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