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The Research Data Centre of the Centre for European Economic Research (ZEW-FDZ)

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1. Introduction

The ZEW research data centre (ZEW-FDZ[1]) offers external researchers[2] access to research data collected by the Centre for European Economic Research (Zentrum für Europäische Wirtschaftsforschung, ZEW, Mannheim)[3]. The ZEW-FDZ applies the guidelines of the "Commission on the Improvement of the Informational Infrastructure between Research and Statistics" (KVI, 2001) and contributes to the advancement of empirical research in economics and social sciences. In November 2012, the German Data Forum (RatSWD) accredited ZEW's data centre on account of its high-quality data access for external researchers.

The data provided by ZEW-FDZ are micro data derived from ZEW firm surveys, ZEW expert surveys and ZEW individual surveys. This data are accessible for external researchers in a *factually anonymized* form as Scientific-Use-Files. Moreover, external researchers can work with *formally anonymized* ZEW data within FDZ premises on request. Formally anonymized datasets contain no names or addresses, but all other original data of the interviewed firms or individual are stored in a stand-alone computer without network connection. Data cannot be downloaded from this unit. *Absolutely anonymized* Education-Use-Files on the basis of the Mannheim Innovation Panel (MIP) have been created for teaching purposes.

The ZEW-FDZ builds upon earlier efforts of the ZEW to make ZEW data available to external researchers. Prior to the start of ZEW-FDZ in January

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1 http://www.zew.de/zew-fdz

2 The use of data in the ZEW-FDZ is restricted to academic research projects and researchers working at universities or government-funded research institutions. In the ZEW-FDZ pilot phase, ZEW provides Scientific-Use-Files, Educational-Use-Files, data documentations and a computer workstation at ZEW-FDZ free of charge.

3 All individual and firm-related data collected in ZEW research projects shall remain strictly confidential according to the definitions of the data security law (BDSG). ZEW works on the basis of a data protection concept that fulfils the extensive statutory data protection requirements.

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2013, almost 280 external researchers used ZEW data, most of them analysed data of the MIP (250). ZEW is planning to further expand its range of research data. This would imply that data generated in future surveys will be added to ZEW-FDZ.

Section 2 of this paper gives an overview of the different datasets ZEW is making available to external researchers. These research datasets can be used within the premises of ZEW-FDZ. In section 3, I will briefly explain how the several Scientific-Use-Files are generated. In the last section, the Education-Use-Files of the MIP are described.

2. Data Provided

The ZEW research data listed below can be analysed on ZEW-FDZ premises for scientific projects (see also below an overview in Table 1). The major part of the data provided is micro data of firms. Data collected in expert surveys is provided by the "ZEW Financial Market Test" and the ZEW projects "Climate Negotiations" and "Transport Market Barometer". Two data sets collected from individual surveys "Eco-Cars" and "SECO@home" are on hand, too. The data available for analysis on ZEW-FDZ premises are the original survey data, i.e. not distorted or modified in any way. Hence, the data for external use in ZEW-FDZ have the same quality as the data used by ZEW researchers. Names and addresses are, of course, deleted from the micro data sets (formally anonymized). In addition, Scientific-Use-Files for eight data sets and Education-Use-Files for the Mannheim Innovation Panel are available (see sections 3 and 4).

Firm surveys:

The Mannheim Innovation Panel

Since 1993, the Centre for European Economic Research (ZEW) has been gathering data regarding the innovation behaviour of the German economy on an annual base (see e.g. Peters / Rammer, 2013; Rammer et al., 2012; Janz et al., 2001). The innovation survey covers firms from various industries including mining, manufacturing, energy- and water- supply, waste disposal, construction, business-related services and distributive services. The survey is representative for Germany and allows projections for the German firm population as well as for individual industries and size classes. The survey is conducted on behalf of BMBF (Federal Ministry of Education and Research) in cooperation with infas (Institute of Applied Social Science) and Fraunhofer ISI (Institute for Systems and Innovation Research). The MIP is the German contribution to the European Commission's Community Innovation Surveys (CIS).

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The annual innovation survey is designed as a panel survey including the same firms every year. Sample size varies among the survey years. In 2010 e.g., more than 6000 firms answered the written questionnaire. Every two years the sample is refreshed by a random sample of newly founded firms in order to substitute firms that are closing or left market through mergers. The MIP provides important information about the introduction of new products, services and processes, expenditures for innovations, ways to achieve economic success with new products, new services and improved processes. In addition, the MIP collects information on a number of competition-related issues which allows to study various topics in industrial economics.

KfW / ZEW Start-up Panel

Since 2008, ZEW, the KfW Bankengruppe and Creditreform are co-operating to implement and maintain the KfW / ZEW Start-Up Panel for Germany (see e.g. Fryges et al., 2010). The panel contains annual information on young firms founded since 2005 allowing the application of panel econometric methods for an adequate modelling of firm-specific heterogeneity. With regard to the cross-sectional dimension telephone interviews with approximately 6,000 new firms from all industries are conducted once a year (computer-aided telephone interviews, CATI).

The KfW / ZEW Start-up Panel enables a profound analysis of the temporal development of newly founded firms and their probability of survival or failure. Moreover the panel has high potential for cross-sectional analyses because of the large number of firms which are included in every wave of the survey. The scientific potential is further based on the fact that half of the firms surveyed by the KfW / ZEW Start-up Panel belong to the technology- and knowledge-intensive sectors of the manufacturing and services industry. This allows for differentiated analyses of new firms which are particularly important for the dynamics and international competitiveness of the economy.

Generational Change in Medium-Sized Firms

The firm survey highlights the generational change in medium-sized firms in Germany from the successors' perspective (see Gottschalk et al., 2010). The survey focuses on the development of firms after succession. In 2010, about 1,000 medium-sized firms, in which a generational change had taken place, were addressed in a telephone interview (CATI). The questions in the survey mainly addressed structural changes initiated by the new owner or manager, and the various problem areas the successor is confronted with in the firm and with external business partners. Furthermore, the role of the former owner can be analysed.

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High-Tech Start-up Panel

In 2006, ZEW initiated a survey of 1,000 German start-ups in high-tech industries founded since 1998 in order to examine the characteristics of high-tech firm's founders (level of education, job experience in science and industry) and characteristics of young firms (size, growth, R&D participation, innovation activities). In 2007, a second wave of this survey was carried out. In addition to a subsample of firms surveyed in 2006, a further sample of start-ups were interviewed, too (in sum n=3,000). The main topics were "Vertical Integration and Outsourced Business Functions" (see Gottschalk et al., 2007) and "Patterns in the Financing of Young High-Tech Firms" (see Fryges et al., 2007). The study was conducted on behalf of the economic journal Impulse and Microsoft Germany. In 2008, the survey has been transferred into the KFW / ZEW Start-up Panel (see above).

Surveys of Academic Spin-offs in Germany and Austria

In 2002, more than 20,000 start-ups in research and knowledge-intensive industries founded between 1996 and 2000 were asked about their founding history and their link to academic research through telephone interviews (CATI). The project was conducted on behalf of BMBF (Federal Ministry of Education and Research). In 2008, a subsample of the same firms (n=1,900) and a further sample of firms founded between 2001 and 2006 (n=10,000) were interviewed on behalf of BMWi (Federal Ministry of Economics and Technology) (see Egeln et al., 2010). Each firm was questioned about the importance of new scientific evidence and specific research results for their foundation process, and the relation between their founder and public research institutions (e.g. R&D co-operations, R&D orders). This information allows characterising start-ups according to their connections to academic research.

In 2003, the Austrian Federal Ministry for Transport, Innovation and Technology commissioned ZEW in cooperation with Johanneum Research Vienna to conduct a similar survey on start-ups in Austria founded between 1995 and 2002. The stratified sample (n=4000) includes firm foundations in research and knowledge-intensive industries. The survey was conducted through telephone interviews (CATI), too. A second survey was conducted in 2006 among some of the firms interviewed in 2003 (n=900) on behalf of the Austrian Federal Ministry for Transport, Innovation and Technology (see Egeln et al., 2006). Furthermore, a new sample (n=900) of start-ups from 2003 to 2005 were interviewed.

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ICT Survey

In 2002, the first wave of the ZEW ICT (information and communication technologies) survey took place (CATI). Further surveys were conducted in 2004, 2007 and most recently in 2010. About 4,400 German firms from the manufacturing and from selected service sectors with at least five employees were interviewed. The aim of the survey is to obtain a representative overview of the usage and diffusion of information and communication technologies in German firms and to analyse the impact of ICT on the firms (see e.g. the last IKT-Report of September 2010).

Economic Survey of the Information Sector

Since the third quarter of 2011, ZEW conducted a quarterly survey among firms in the information economic sector. About 1,000 firms report within a written questionnaire on their firm development in the last three months and their expectations for the following quarter. Alongside the economic development of the information sector, the inquiry also requests information on the diffusion of ICT and on investments in ICT. Furthermore, the survey gathers background information such as the number of employees and their respective qualifications, education and additional in-service training possibilities, as well as the innovativeness of the firm (see e.g. the current Branchenreport Informationswirtschaft from April 2013).

Eco-Innovation Survey

The telephone firm survey regarding in particular product- and business-related eco-innovations in firms was conducted by ZEW in 2003. The data was collected within the ZEW-project "Integrated Product Policy" which examined the determinants of eco-innovations. About 600 firms in the manufacturing sector with at least 50 employees participated in this survey (see e.g. Rehfeld et al., 2007).

Expert surveys:

ZEW Financial Market Survey

The ZEW Financial Market Survey has been carried out on a monthly basis since December 1991 (written questionnaire: online or postal). It reveals the German financial market's expectations on the development of six important international financial markets. 350 analysts from banks, insurance companies and large industrial corporations are asked about their expectations on a six-

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month horizon in specific areas: trend in economic activity, inflation rate, short-term and long-term interest rates, share prices and exchange rates. The financial markets in question are those of Germany, the United States, Japan, the United Kingdom, France, Italy, and the Eurozone in general. Furthermore, they are asked to assess the profit situation of 13 German industries. The survey consists of two parts: a standard part and a part focussing on current issues. ZEW calculates based on the experts' expectations the ZEW Indicator of Economic Sentiment. This leading indicator for the economic trend (ZEW Index) is followed closely by the public. Moreover, ZEW communicates the survey's detailed results in the monthly ZEW Finanzmarktreport (see e.g. the current ZEW Finanzmarktreport of July 2013).

Climate Negotiations

The survey provides information on 230 participants in climate negotiations, interviewed in 2004 with the aim of analysing the factors that influence the perception of fairness in international climate negotiations (see e.g. Böhringer / Vogt, 2003). The data was obtained through a worldwide survey using a standardised written questionnaire. The participants were all actively involved in the field of climate policy. The survey questions examine the personal views on the sense of fairness in international climate negotiations. The nationalities of the participants constitute the basis for the variables concerning the economic and ecological performance of their homeland. In addition, variables referring to the personal background of the interviewed persons are provided.

Transport Market Barometer

In 1998, ProgTrans AG (Basel) and ZEW implemented the "ProgTrans / ZEW Transport Market Barometer" (see e.g. the current Transportmarktbarometer of the 1st Quarter 2013) which collects information on trends in transport markets and establishing a panel of industry experts. The quarterly panel includes 25 selected experts from Germany's transport markets. The experts are contacted four times a year through a written questionnaire to assess the development of transport prices and volumes in seven transport market areas on a six-month horizon.

Individual surveys:

ECO-Cars

The ECO-Cars survey was a one-off activity to collect information on the role of ecological features of cars for buying decisions of car buyers (see e.g.

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Achtnicht, 2012, Ziegler, 2010). The survey was conducted on behalf of the Federal Ministry of Education and Research (BMBF) and examines the preferences of car buyers for alternative fuel types or propulsion technologies in cars and particularly for electric cars. The data stems from Computer Assisted Personal Interviews (CAPI) which were conducted in selected car dealership and technical inspection agencies (TÜV) between August 2007 and March 2008 in in 35 towns and municipalities across Germany. 598 potential car buyers – i.e. German residents with valid drivers' licenses who intend or could imagine buying a car in the near future – were interviewed. The main part of the survey referred to a stated preference discrete choice experiment with respect to the hypothetical buying situation. In the experiment each respondent answered six choice sets. The intentions was to stimulate a future car buying situation and thus to include all fuel types and propulsion technologies that are currently available in Germany and probably important in the future.

SECO@home

In 2009, energy (co-)decision makers in private households were interviewed to collect information on consumer preferences for sustainable energy consumption (see e.g. Achtnicht, 2011, Brohmann et al., 2009). Energy (co-)decision makers are people with major influence on the choice of electricity supply and consumption for the household (e.g. building energy retrofits or applied technologies). In a CAPI survey, 1,257 private households were interviewed, allowing statistically correct evaluations about varying age and income categories, and geographical units (regions north, south, etc.).

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Table 1

Overview ZEW data sets provided for external researchers

Name of Survey	Main Topics	Target Group[4]	Sample Size	Survey Year(s)	Perio-dicity	Survey Method
		Firm surveys				
MIP	innovation activities of firms	firms, at least 5 employees	3,000–6,000	since 1993	annual	written questionnaire
KfW / ZEW Start-up Panel	human capital of the founders, employment, innovation activities, financing	young firms	5,600–6,600	since 2008	annual	CATI
Generational Change in Medium-Sized Firms	structural changes in the firm	medium-sized firms after a generational change	1,000	2010	one-off	CATI
High-Tech Start-up Panel	human capital of the founders, innovation activities, financing	young firms	1,000 3,000	2006 2007		CATI
Surveys of Academic Spin-offs in Germany and Austria	importance of academic research for the firms	German and Austrian young firms	20,000 4,000 900, 900 1,900, 12,000	2002 2003 2006 2008		CATI
ICT Survey	usage and diffusion of ICT	firms, at least 5 employees	4,400	2002, 2004, 2007, 2010		CATI
Economic Survey of the Information Sector	business development and expectations	firms in the information industry sector	1,000	since 2011	quarterly	written questionnaire
Eco-Innovation Survey	eco-innovations in firms	manufacturing firms, at least 50 employees	600	2003	one-off	CATI
		Expert surveys				
ZEW Financial Market Survey	trend in economic activity	financial market experts	350	since 1991	monthly	written questionnaire

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Climate Negotiations	perception of fairness in international climate negotiations	participants of climate negotiations (worldwide)	230	2004	one-off	written questionnaire
Transport Market Barometer	trends in transport markets	experts in transport markets	250	since 1998	quarterly	written questionnaire
		Individual surveys				
ECO-Cars	role of ecological features of cars for buying decisions of car buyers	car buyers	600	2007/2008	one-off	CAPI
SECO@home	consumer preferences for sustainable energy consumption	decision makers in private households	1,300	2009	one-off	CAPI

[4] Usually, the target group is located in Germany when nothing else is mentioned.

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3. Scientific-Use-Files

Scientific-Use-Files are factually anonymized data sets that allow researchers to work with ZEW data outside the ZEW-FDZ, at their home institutions. Factually anonymized means that the data sets were manipulated in such an extent that re-identifying the surveyed participants would require an excessive amount of time, money and work (§3(7) BDSG). It is thus predictably impossible to re-identify firms or persons when using Scientific-Use-Files.

ZEW Scientific-Use-Files contain no data on a firm's or a person's name nor addresses and telephone numbers. Anonymization methods are applied for the Scientific-Use-Files provided by ZEW. To support anonymity, information that might allow conclusions about an individual firm or a single person is altered or completely deleted. Analysing Scientific-Use-Files requires awareness of the data distorting anonymization methods applied. However, there are several techniques to control for (intentionally) implied errors caused by the anonymization process (see e.g. Gottschalk, 2005b). To name but a few, measurement error models, for example, are useful to get consistent results in multivariate regression analyses. To avoid misinterpretations it is often necessary to use models for censored or truncated data.

ZEW always cautions when analysing factually anonymized micro data. ZEW recommends to use original data at ZEW-FDZ for any econometric study. Scientific-Use-Files should primarily be used for preparing a visit at ZEW-FDZ, e.g. to get familiar with the data structure and to write analytical codes.

Scientific-Use-Files are available for the following data sets: MIP, KfW / ZEW Start-up Panel, ZEW Financial Market Survey, ECO-Cars, Climate Negotiations, Eco-Innovation Survey, Transport Market Barometer, SECO@home. For data protection purposes, the Scientific-Use-Files of the MIP can be accessed by external researchers no sooner than three years after the implementation of the survey.

4. Education-Use-Files

Other than the Scientific-Use-Files, Education–Use-Files are absolutely anonymized. It is thus impossible to track back individual information on the participants of a certain survey. ZEW offers Education-Use-Files for the MIP from the survey years 1999, 2001 and 2009. This data is designed for use in teaching at higher education institutions in order to introduce and convey application possibilities of econometric analysis for firm data in the context of questions relating to the economics of innovation. The interpretation of the content is, however, limited and thus not suited to investigate research questions.

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To guarantee absolute anonymity, different anonymization methods are employed, thereby altering the original data radically. The Education-Use-Files of the MIP represents resamples of the micro data of the MIP from the surveys 1999, 2000 and 2009, which have already passed the first step of anonymization, which refer to non-metric characteristics of the firms. In the resample, the individual data of the metric variables in a dataset are drawings from the kernel density distribution of the original micro data and are no longer identical with the real observations. The observations cannot be clearly assigned to a specific firm. The original micro data form the basis for the creation of synthetic observations. The artificial data is supposed to contain the same characteristics, i.e. the same multivariate distribution function, as the original micro data. The basic philosophy is to create datasets that are suitable for all kinds of purposes. On the one hand, passing on artificial data does imply no violation of data protection because no real observations are provided. On the other hand, there is no loss of information as long as the given data reflects all parameters of the distribution of the original micro data (for a detailed description of the procedure, see Gottschalk, 2005a and 2005b.).

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