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A Matched Employer-Employee Panel Data Set for Austria: 2002-2005

by

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Abstract

Matched employer-employee (panel) data sets are gaining increasing importance in the analysis of labour markets. In collaboration with Statistics Austria we recently initiated the set up of a matched employer-employee panel data set for Austria, which covers the years 2002-2005. The aim of the paper is to introduce the data set to a broader audience. We first present the set up of the panel data, indicating in more detail the data sources and matching procedure underlying the matched employer-employee data set for Austria. In a second step we show descriptive statistics of the main variables included in our data set. These various statistics encompass three levels of analysis: the aggregate level (i.e. the entire sample), firm level and individual (employee) level.

Zusammenfassung

Verknüpfte Arbeitgeber-Arbeitnehmer (Panel-) Datensätze gewinnen in der Analyse von Arbeitsmärkten zunehmend an Bedeutung. In Zusammenarbeit mit Statistik Austria haben wir den Aufbau eines verknüpften Arbeitgeber-Arbeitnehmer Panel-Datensatzes für Österreich über die Jahre 2002 bis 2005 initiiert. Das Ziel dieses Artikels ist es, diesen Datensatz einem größeren Publikum gegenüber bekannt zu machen. Zunächst stellen wir dessen Aufbau vor, wobei wir explizit sowohl auf die zugrunde liegenden Datenquellen als auch die Verknüpfungsprozedur eingehen. In einem weiteren Schritt präsentieren wir deskriptive Statistiken der im Datensatz enthaltenen Kernvariablen. Zu diesem Zweck betrachten wir drei unterschiedliche Analyseebenen: die Stichprobe als Ganzes, die Firmenebene sowie das einzelne Individuum.

1. Motivation

In recent years data that combine employees' characteristics and specifications of the firms and jobs they work in – i.e. matched employer-employee data sets - have become increasingly available (see Abowd and Kramarz, 1999a, for an excellent review on the availability and analysis of such data and Abowd and Kramarz, 1999b, for an econometric analysis of these data). They are either available as a cross-section or more preferably as a panel over several years. Moreover, the sampling might be either on the firm's or the employees' level. Regarding the design, these data are either based on administrative data, specific surveys or a combination of both.

The advantage of the matched employer-employee data set provided is the combination of economic data (e.g. value added) of enterprises, on the one hand, and socio-demographic data (e.g. age and job tenure) of employees for each firm, on the other hand. Socio-demographic data of employees are not otherwise covered by enterprise statistics. Similarly, the workforce statistics only contain the characteristics of employees, but no economic information on the firms they work for. Matched employer-employee data account for the heterogeneity across employees and across firms. These data allow to investigate the relative contribution of employees vs. firms characteristics for various relevant labour market outcomes such as wage determination, for instance.

Applications based on these data sets include studies on labour mobility, unemployment, wage compensation, productivity, etc. Matched employer-employee data allow us e.g. to compare the productivity levels of enterprises with different age structures and other characteristics of their employees, but also to control for possible firm-specific effects such as size and age of the firm or type of organisation (multi-plant vs. single-plant firms) etc. An excellent review of further potential applications is given in Hamermesh (2007). As argued in Abowd and Kramarz (1999a) these data sets provide the empirical foundation of refinements in the theory of production and in workplace organisation.

So far, for Austria there exists only a cross-sectional matched employer-employee data set for 2001 (Prskawetz et al., 2008). This cross-sectional data set is based on matching information about Austrian firms from the structural business statistics with information on the socio-demographic characteristics of employees from the population census of 2001. Recently, Statistics Austria in collaboration with the Vienna Institute of Demography has generated for the first time a panel of matched employer-employee data for the years 2002-2005[1]. Similar data sets already exist in Germany, France, Finland, Sweden and US. These kinds of data sets present the basis for various international research, e.g. in Germany (Zwick, 2005 and Kuckulenz, 2006) or France (Crépon et al., 2002 and Aubert and Crépon, 2006).

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[1] The authors thank Statistics Austria for the set up of the data set and for valuable support in generating the descriptive statistics.

Similar to the cross-sectional matched employer-employee data of 2001 in Austria, the structural business statistics is the main source of data on the firm level. To include the socio-demographic characteristics of employees, data from social security and wage tax have been used. The aim of our paper is to discuss the setup of these data and present first descriptive results.

The structure of the paper is as follows. In section two we outline the construction of the data and introduce core variables of the matched employer-employee data set. In section three we present - based on tables and graphs - the structure of our employer-employee panel data set with respect to firm as well as employee characteristics. Where possible we add a comparison with our employer-employee cross section data set of 2001 (Mahlberg et al., 2009). Moreover, we provide some figures for the complete Austrian economy in order to verify representativeness of our sample. We present conclusions in section 4.

2. Data

The newly created panel data set contains yearly employer-employee data from Statistics Austria for the years 2002-2005. The data set emerged from matching firm-level data from the *structural business statistics* of Statistics Austria with data from the *Main Association of Austrian Social Security Institutions* ("Hauptverband der Sozialversicherungsträger") and *wage tax data* of Austria (see Figure 1).
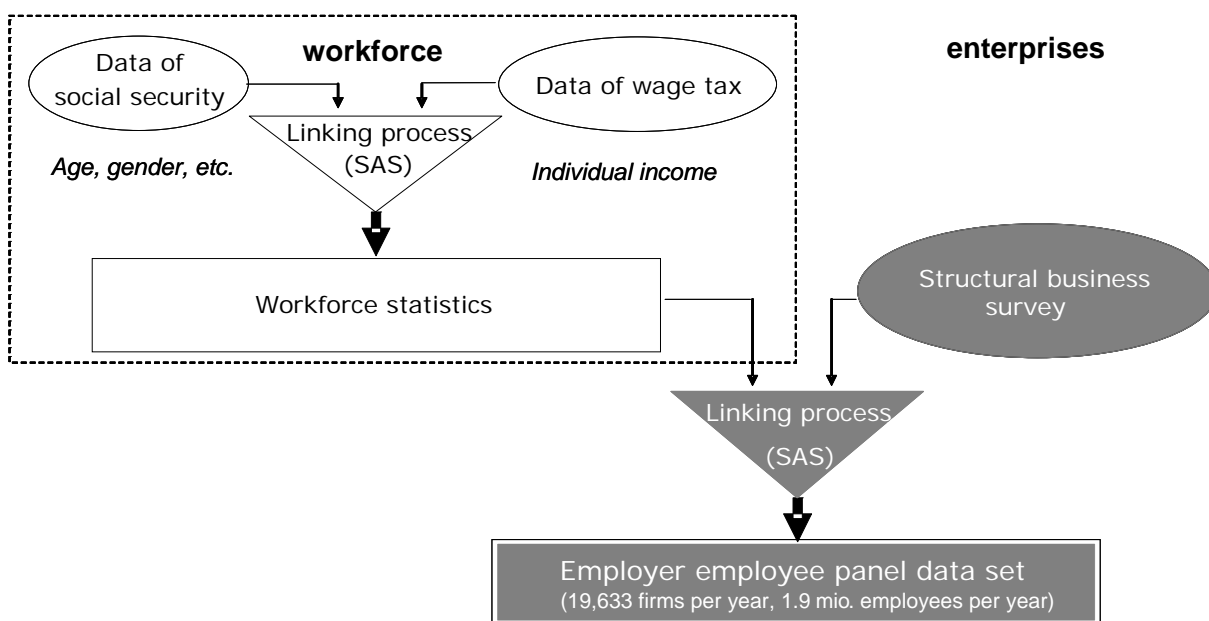

Figure 1: Merging of workforce characteristics and structural business statistics.

Structural business statistics as well as data of social security and wage tax contain a firm identifier which allows matching these three data sets. As the assignment of self employed persons to their firms is ambiguous, individual data of this group of workers is excluded from the data set. Temporary agency workers ("Zeitarbeiter") are assigned to temporary employment companies and not to the firms they actually work for. All persons with certain other atypical employment relationships like service contract ("Werkvertrag") are also not matched to their employer. The matched data set contains data on 19,633 firms and approximately 1.9 million employees per year.[2] The data set covers around 7% of the Austrian firm population in the investigated sectors, which produce around 66% of value added and employ around 56% of workers employed. With regard to the firm level our panel data set is constructed to be balanced. Currently the data cover the years 2002-2005.

Our *firm characteristics* are collected from the structural business survey of Statistics Austria. This survey is conducted yearly and provides data concerning the structure (single-plant vs. multi-plant firm), sector affiliation, employment, investment activities and performance of enterprises at the national and regional level in a breakdown by economic branches in accordance with OeNACE[3]. Its scope covers the economic branches of production (NACE-section C "Mining and quarrying", NACE-section D "Manufacturing", NACE-section E "Electricity, gas and water supply" and NACE-section F "Construction") and selected sections of the service sector (NACE-section G "Wholesale and retail trade; repair of motor vehicles and motorcycles, personal and household goods", NACE-section H "Hotels and restaurants", NACE-section I "Transport, storage and communication", NACE-section J "Financial intermediation" and NACE-section K "Real estate, renting and business services"). Not included in the survey are the sectors "Agriculture, hunting and forestry" and "Fishing" (NACE-sections A and B) as well as "Education", "Health and social work", "Other community, social and personal service activities", "Activities of households" and "Extra-territorial organizations and bodies" (NACE-sections L to Q). The structural business survey includes economic indicators of 29,371 enterprises in 2002, 31,966 enterprises in 2003, 32,891 enterprises in 2004, and 34,312 enterprises in 2005, respectively. It contains the following indicators: type of firm (single-plant vs. multi-plant), location of firm (municipality), industry/sector affiliation, value added, no. of workers, revenue, personal expenditures, intermediate inputs, investments, sum of wages, no. of self-employed, no. of white-collar workers, no. of blue-collar workers, no. of apprentices, no. of home workers, no. of part time workers. In addition, legal form and year of

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[2] In the matching process we excluded firms (a) for which we did not find any employees in the workforce statistics, or (b) which could not be observed in all years, or (c) where the number of employees in the structural business statistics and in the workforce statistics differ too much, or (d) where distinctive reorganisation took place during the observation period.

[3] NACE (Nomenclature of economic activities) is a code that represents the classification of economic activities within the European Union. The OeNACE is the Austrian version of NACE, and therefore the Austrian Statistical Classification of Economic Activities. An additional hierarchical level – the national sub-classes – was added to represent the Austrian economy in a more detailed and specific way. All the other levels of OeNACE are identical with the corresponding levels of NACE. For details see European Commission (2002) and Statistics Austria (2003). In this article we use the OeNACE version of 2003, because in our data that encompass the years 2002 to 2005 the firms are classified according to this version.

foundation are taken from the enterprise register of Statistics Austria. From these firm characteristics we computed the key variables on firm level as shown in Table 1.

The *workforce characteristics* are taken from social security as well as wage tax data. The social security data are collected from the Main Association of Austrian Social Security Institutions and provide information on date of birth, gender, assessment base for social security contributions ("Bemessungsgrundlage") and remunerations ("Sonderzahlungen") (vacation pay, Christmas pay, balance sheet pay, etc.), location of residence, citizenship and job tenure (length of stay in a firm) of individuals employed in firms. In principal these data contain all employees (white-collar and blue-collar workers, home workers, apprentices, full-time and part-time workers) and some self-employed persons.[4] The Main Association provides individual data of employees to Statistics Austria, which in turn is responsible for calculating the workforce statistics.[5] From these indicators we constructed the key variables of individual workers aggregated on firm level which are presented in Table 1.

The data of wage tax contain wages and salaries at the individual level, social status (apprentice, blue-collar worker, white-collar worker, public servant, pensioner, etc.) and whether a person is full-time or part-time employed. Data of wage tax in 2005 are based on approx. 7.8 million pay slips ("Lohnzettel") issued to employees and pensioners. These data are collected by the Austrian tax authorities and also used for the set up of the workforce statistics. Wage tax is a special form of income tax and is collected via deductions from the taxpayer's wages or pension. While the structural business statistics is based on yearly averages (with regard to the number of employees), social security data count every single employee, who has ever been working in one of the included firms. This issue is of special importance, when these two data sets are related to one another for analytical purposes. Table 1 shows the list of variables and the specific data set they are drawn from. Further illustrations regarding these variables are given in the Appendix (Tables A.1 – A.10).

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[4] In Austria all employees and most of self employed persons are obliged by law to register to Austrian Social Insurance independently of their salary.
[5] The dataset provides no information on educational attainment of employees. Therefore information on human capital in the workforce of the firms is not available

Table 1: List of variables.

Variable	Source	Parameter Value
Firm Level		
Region (NUTS level 2 [6])	SBS	9 Dummies (0,1)
Section (OeNACE 2003)	SBS	9 Dummies (0,1)
Division (OeNACE 2003)	SBS	46 Dummies (0,1)
Legal Form	Register	15 Dummies (0,1)
Type of Firm: Multi-plant	SBS	Dummy (0,1)
Investments into Fixed Assets per Worker	SBS	Values in T€
Value Added per Worker [7]	SBS	Values in T€
Age of Firm: Time since Date of Foundation	Register	Values in Years
Firm Size Intervals	SBS	Values in # of Employees
"Occupation" Groups	SBS	$0 \leq$ Shares ≤ 1
Part-Time Employees	SBS	$0 \leq$ Shares ≤ 1
Gender	SBS	$0 \leq$ Shares ≤ 1
Individual Level		
Age Groups	HV	$0 \leq$ Shares ≤ 1
Tenure I Interval	HV	$0 \leq$ Shares ≤ 1
Tenure II Interval	HV	$0 \leq$ Shares ≤ 1
Citizenship	HV	$0 \leq$ Shares ≤ 1/ Dummies (0,1)

Note: SBS denotes "Structural Business Survey of Statistics Austria", Register denotes the enterprise register of Statistics Austria, and HV stands for the "Hauptverband der Sozialversicherungsträger"

As can be seen from Table 1 experience is proxied by two kinds of firm-specific tenure, which we construct from three and respectively two original variables in the data set: These in turn exist of i) the length (= number of days) of a certain kind of employment relationship being upright during the current year, ii) the length of the current kind of employment relationship being upright until the end of the previous year, and iii) the length of an earlier kind of employment relationship having ended before the current year (but after the beginning of 2002) and being upright until the current kind of employment relationship has started within a certain firm. Thereby, the sum of all three variables is defined as "Tenure I", while summing up only the first two variables is referred to as "Tenure II". Thus, our tenure variable refers to "firm specific experience". Unfortunately both tenure variables are systematically left-censored before 2002, as we cannot track changes, which have taken place before that date.[8]

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3. Descriptive Statistics

We structure our descriptive statistics into three parts. Firstly, we have a look at the panel as a whole and show the distribution of firms with respect to certain characteristics, i.e. region, economic sector etc. More specifically, since we have a balanced panel we present all statistics for the first year of the panel, i.e. 2002. Whenever data availability is sufficient, we compare those results to our previous matched employer-employee data set that was based on a cross-section in 2001 (Prskawetz et al., 2008 and Mahlberg et al., 2009). Secondly, we move to the enterprise level and present descriptive statistics for the average firm. Thirdly, we show characteristics at the individual level, i.e. employee characteristics. Besides information based on the sample breakdown into NACE and NUTS units respectively, some comparative figures with the Austrian situation are provided.

3.1. The Sample

As compared to 34,347 firms in our cross section data set for the year 2001 our current matched employer-employee panel data set ranging from 2002 to 2005 is characterised by approximately half of its size. Corresponding to about 1.9 million employees it originally encompasses 19,633 firms in each year, and thus nearly accords to our former cross-sectional subsample of 17,371 "large" (> 9 employees) firms[9] in 2001. Our data set is balanced with regard to enterprises included. Since, as a rule, only enterprises with more than 19 employees are included in the structural business statistics, we completely disregard our former subsample of "small" (< 10 employees) firms here.

Compared to our overall cross section data in 2001, Table 2 indicates a lower share of firms in the hotel sector (NACE H) and a higher share of firms in the transport sector (NACE I) for the panel data in 2002. On the contrary we find – in comparison to the overall and the "large" firm sample of 2001 – less manufacturing (NACE D) firms and more trading (NACE G) firms in the 2002 sample.

Table 2: Distribution of firms across business sectors, 2002.

NACE	C	D[10]	E	F	G	H	I	J	K
2001, all firms	0.00	0.26	0.01	0.13	0.27	0.09	0.05	0.02	0.16
2001, large firms	0.01	0.33	0.01	0.17	0.22	0.05	0.06	0.02	0.13
2002	0.00	0.23	0.00	0.16	0.30	0.06	0.08	0.02	0.14

Comparing the distribution of firms across sectors between the official statistics for Austria and our sample (see Figure 2) reveals that our sample includes relatively more manufacturing (NACE D) and construction (NACE F) firms, but less enterprises affiliated in the hotel (NACE H) and real estate sector (NACE K). A possible

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[9] We decided upon this threshold value, as only firms with at least 10 employees have been contacted in the training survey, which in turn has been decisive for our 2001 analysis.

[10] It should be kept in mind, that particularly NACE D is very heterogenous, so that there probably is a great variance in the distribution with regard to several of the below mentioned characteristics.

explanation may be the exclusion of small sized companies, which are more common in some sectors than in others.

A more disaggregated distribution of firms by economic sector (cf. Appendix Table A.2) is presented in Figure 3. With 16% each, the majority of firms is allocated in construction (Div. 45) and wholesale trade (Div. 51), followed by retail trade (Div. 52) and other business activities (Div. 74) with 8%-9% respectively. Business with motor vehicles (Div. 50), the hotel sector (Div. 55) as well as land transport (Div. 60) include an additional 6% of the total sample.
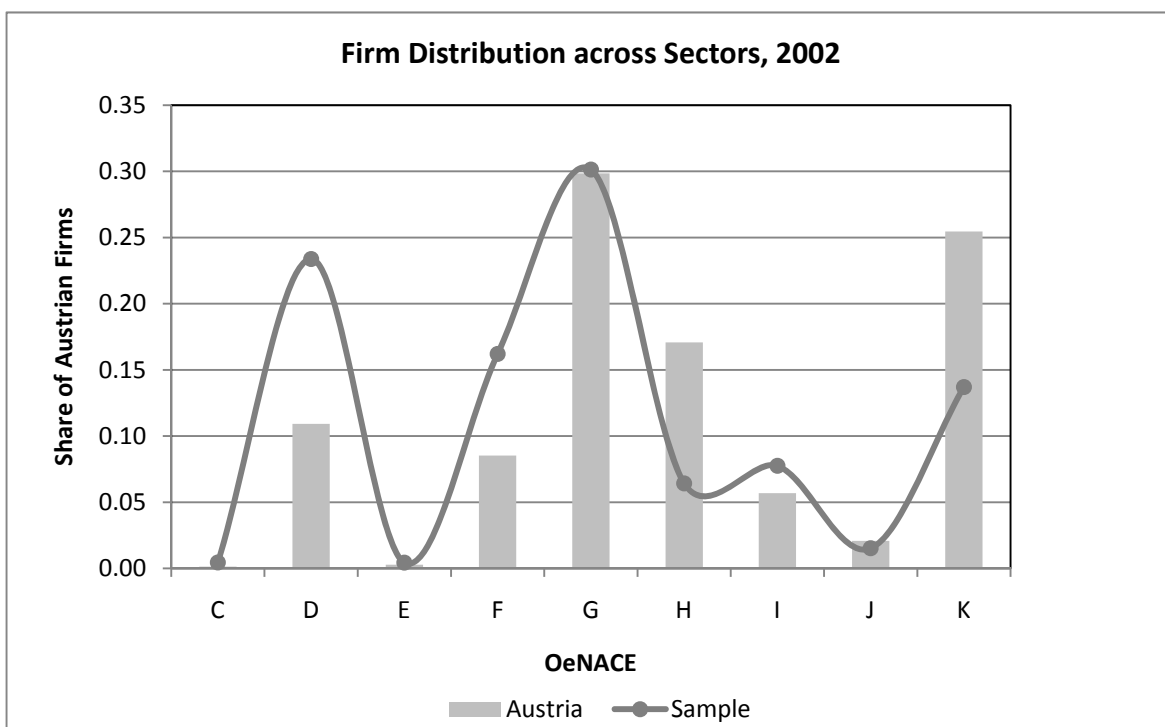
Figure 2: Firm distribution across sectors (OeNACE one digit), 2002.

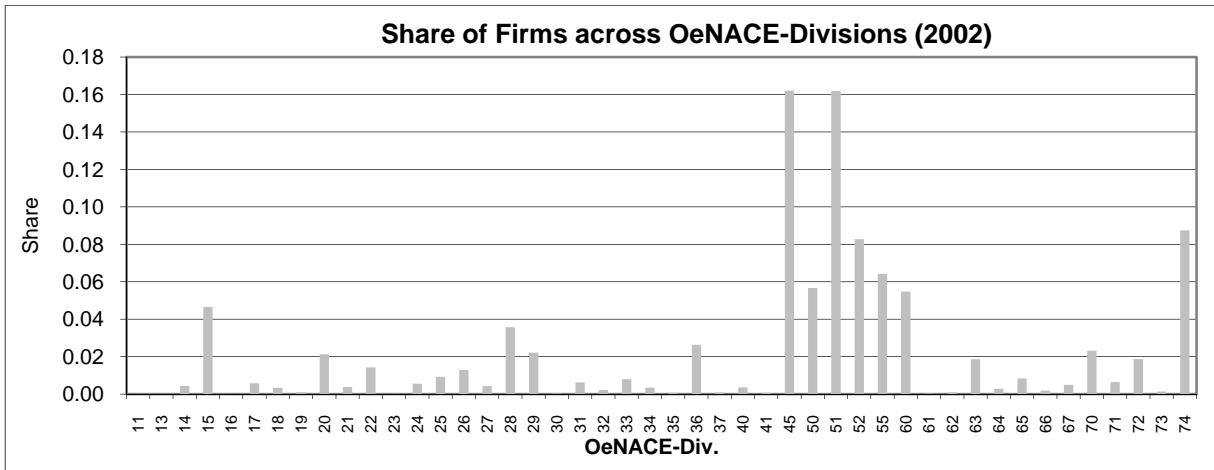Source: Own calculations based on Statistics Austria (2004, Table 1)

Figure 3: Firm distribution across sectors (OeNACE two digit), 2002.

The geographical distribution of firms across NUTS (cf. Appendix Table A.3) is summarised in Table 3. The majority of firms is located within Vienna (NUTS 13, 22%) as well as upper (NUTS 31, 18%) and lower (NUTS 12, 17%) Austria. The overall distribution is a bit closer to that of our former cross-sectional data set of 2001 restricted to "large" firms. Carinthia (NUTS 21, 6%) and Vorarlberg (NUTS 34, 6%) are among the industrially least active regions within our sample.

Although our panel is balanced, we can observe minor changes in the firm distribution with respect to NACE- or NUTS affiliation respectively, over the period 2002-2005. This may be due to the fact, that some firms either define themselves to fit better into another economic sector and/ or they locally change their headquarters.

Table 3: Distribution of firms across regions, 2002.

NUTS	11	12	13	21	22	31	32	33	34
2001, all firms	0.03	0.16	0.21	0.07	0.14	0.16	0.08	0.10	0.06
2001, large firms	0.03	0.17	0.22	0.06	0.13	0.18	0.08	0.09	0.05
2002	**0.03**	**0.17**	**0.22**	**0.06**	**0.12**	**0.18**	**0.08**	**0.10**	**0.06**

With respect to firm size, Table 4 indicates, that two thirds of the Austrian firms, which are included in our panel data set, have between ten and fifty employees.[11]

Table 4: Number of firms across size intervals, 2002.

Size Interval (# of Employees)	= 1	1 > size < 5	5 ≥ size < 10	10 ≥ size < 20	20 ≥ size < 50	50 ≥ size < 100	100 ≥ size < 500	500 ≥ size < 1,000	≥ 1,000
2002	63	581	1,660	6,242	6,630	2,204	1,906	215	132

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[11] It is important to note, that the numbers are not representative for firms with less than 10 employees.

In terms of the legal forms of the firms (see Table 5), nearly two thirds of the firms are organised as close corporations ("Ges.m.b.H.") followed by limited partnerships ("KG") and one-person companies ("Einzelfirma").[12]

Table 5: Distribution of firms across (main) legal forms, 2002.

Legal Form	"Ges.m.b.H."	"KG"	"Einzelfirma"	"AG"	"Genossenschaft"	"OHG"
2002	0.62	0.17	0.14	0.03	0.01	0.01

The share of multi-plant firms, which is slightly rising over the period of observation (2002: 28%, 2005: 31%), is nearly as high as it was in 2001 for "large" firms (32%), while it was much lower for the whole sample (20%). Since our panel is balanced, this obviously means, that existing former single-plant firms are expanding over time. We observe a particular jump from 2003 to 2004.
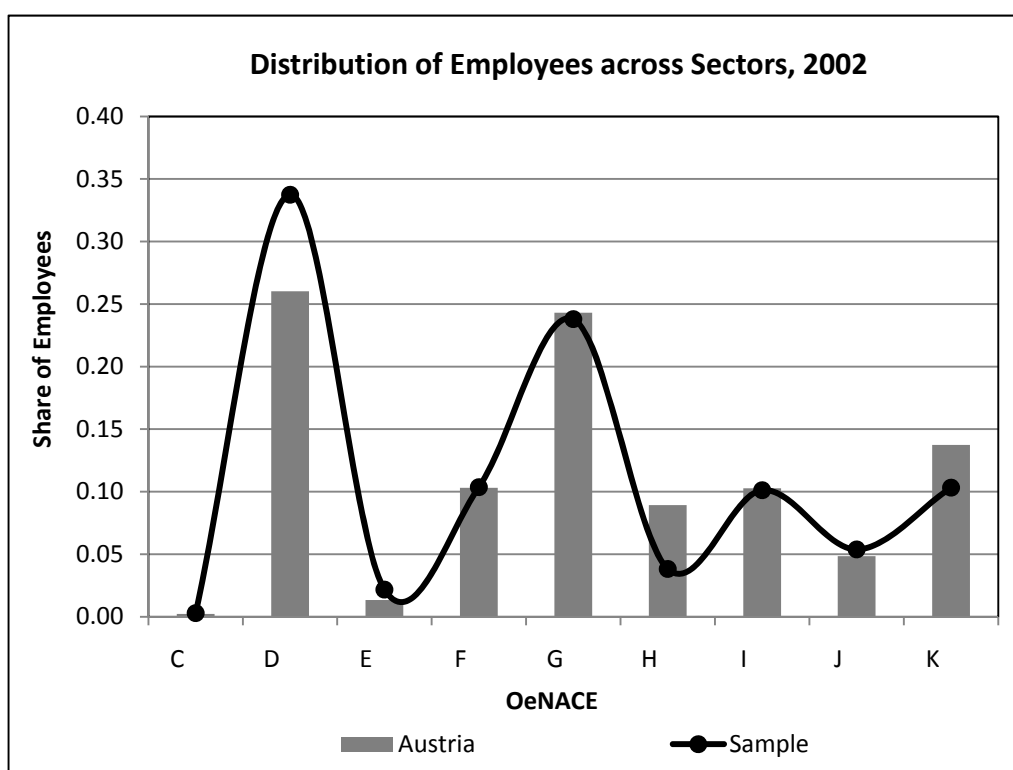

Figure 4: Workforce size across sectors, Austria vs. sample

Source: Own calculations based on Statistics Austria (2004, Table 1)

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[12] Since for juridical purposes a proper English translation of the companies' legal forms is hard to reach, we decided to keep the German identification: "GmbH." = „Gesellschaft mit beschränkter Haftung", „KG" = „Kommanditgesellschaft", „AG" = „Aktiengesellschaft", „OHG" = „Offene Handelsgesellschaft".

Comparing the structure of our sample to the population of Austrian enterprises affiliated in sectors C to K (see Figure 4), it gets clear, that although we are roughly able to mirror the relative pattern in-between the sectors, there are quite some deviations particularly in the sectors D (manufacturing), H (hotels and restaurants) and K (real estate, renting and business activities) .

The picture for the comparison of the gross value added across sectors within our sample and within the Austrian economy (see Figure 5) looks very similar. Moreover, the discrepancies for the single industries are a bit more moderate than in case of sector sizes (cf. Figure 4).
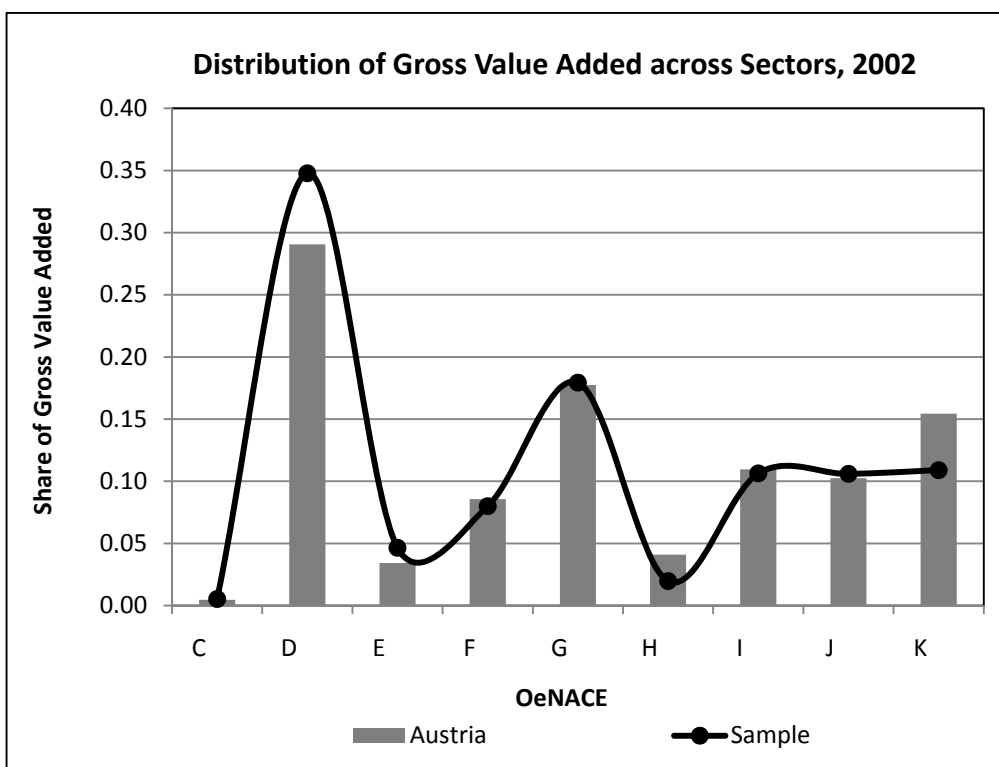

Figure 5: Gross value added across sectors, Austria vs. sample

Source: Own calculations based on Statistics Austria (2004, Table 1)

3.2. Firm Characteristics

After a general description of the sample properties (i.e. the distribution of firms with respect to various characteristics), we proceed with descriptive statistics for the average firm. More specifically we present detailed information on firm size and age, financial measures, occupation, working time, gender and age of the employees across economic sectors and geographical regions.

3.2.1. Size and Age

The mean size of a firm strongly depends on the way of measuring it, i.e. whether we count every employee, who has been working in a certain firm within the considered year – even if it has only been a very short period as it is usual in sectors of seasonal fluctuations like construction or the hotel industry – or whether we just account for the respective yearly average across months. Thus, not only the information in our two current data sources (Structural Business Statistics and Main Association of Austrian Social Security Institutions) are in themselves hardly comparable, but this problem remains with regard to the structural business statistics in 2001, since the method of counting changed after that year. While in 2001 the structural business statistics indicates the number of workers at the end of the year, it shows the annual mean of employment in 2002.

The average firm ("large" firm) within our cross section sample employed 47 (89) persons *by the end of* 2001 whereas these were 69 persons *on average* and 103 persons *in total* during the year 2002.[13] According to Table 6 the mean number of employees across industries is highest in sector E (electricity, gas and water supply) with 344 employees per firm, which only accounts for a small part of our firms, followed by NACE J (financial intermediation) with 246 employees.

Table 6: Mean number of employees across firms by NACE, 2002.

NACE	C	D	E	F	G	H	I	J	K
2002	45	100	344	44	55	41	90	246	52

Geographically (see Table 7) the average firm size (= number of employees) is distributed more evenly than across economic sectors (cp. Table 6). The largest firms are located in Vienna (NUTS 13), whereas the smallest ones on average may be found in Burgenland (NUTS 11).

Table 7: Mean number of employees across firms by NUTS, 2002.

NUTS	11	12	13	21	22	31	32	33	34
2002	45	66	93	59	61	71	68	50	57

With approximately 18 years since its foundation the average firm now is a little bit younger (older) in 2002 than a "large" (average) firm in 2001 and of course ageing takes place during our four-year period under consideration.

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[13] Due to the construction of our merged data set and depending on the characteristic under observation the base for the following tables and graphs differs with regard to the numbers of employees per year: mean number of employees (Structural Business Statistics) vs. sum of employees (Main Association of Austrian Social Security Institutions). See also Table 1 for the respective data source.

3.2.2. Financial Measures

The mean value added per firm is much higher in our panel data set (≈ 70 TEUR) in 2002 than for any kind of firm (≈ 50 TEUR) in 2001[14]. Table 8 shows, that the firms with the highest value added per worker can be found in NACE J (financial intermediation) – with a decisive jump in 2005 – and K (real estate, renting and business services) with approximately 150 TEUR per worker as well as NACE E (electricity, gas and water supply), which slightly rises during the four-year period. The hotel sector (NACE H) is characterised by lowest average labour productivity per firm.

Table 8: Mean "productivity" (= value added per employee in TEUR) across firms, 2002.

NACE	C	D	E	F	G	H	I	J	K
2002	93	49	128	43	64	34	65	158	154

With approximately 20 TEUR also mean investment into fixed assets per worker across firms is higher for a firm in our balanced panel data set than in the cross section from 2001. Of course, these financial parameters strongly depend on the business cycle.

3.2.3. Occupation, Part-time, Gender

As indicated in Table 9, self-employment[15] is a corporate form of small sized enterprises (< 10 employees). The share of white and blue collar workers is rather similar splitting the number of employees per firm into equal portions. As our sample predominantly encompasses "large" firms, this leads to an under-representation of self-employed persons.

Table 9: Mean distribution of employees across occupations per firm, 2002.

„Occupation"	self-employed	white collar	blue collar (incl. homeworker)	apprenticeship
2001, all firms	0.21	0.38	0.37	0.05
2001, large firms	0.03	0.42	0.49	0.06
2002	**0.03**	**0.46**	**0.45**	**0.06**

While – according to Figure 6 – the NACE categories E (electricity, gas and water supply), G (wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods), J (financial intermediation) and K (real estate, renting and business activities) are clearly dominated by white collar workers, blue collar (+ home) workers account for the largest share in sectors C (mining and quarrying), D

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[14] See also Table A.11 for further characteristics and a sample comparison. While the former figure is based on the annual average number of employees, the latter one relies on the number of employee at the end of the year.

[15] Self-employed persons include assisting family members here. Homeworkers are explicitly displayed only in NACE D.

(manufacturing), F (construction), H (hotels and restaurants) and I (transport, storage and communication). Overall, particularly the share of mining and quarrying (NACE C) as well as electricity, gas and water supply (NACE E) may be neglected (see Table 2). The share of apprenticeships is highest in NACE F (construction).
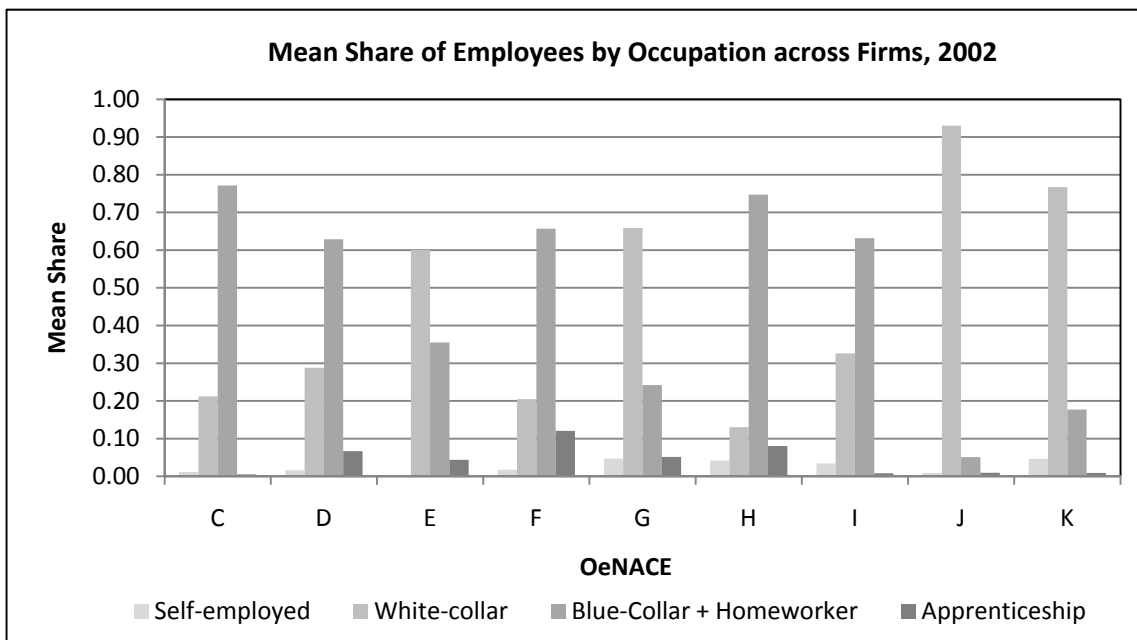

Figure 6: Mean share of employees by occupation across firms, 2002.

While we are obviously able to mirror the rough pattern of the complete Austrian economy (see Figure 7), particularly three crucial differences occur: The first two concern the share of self-employed persons, which is much higher for hotels and restaurants (NACE H) and to an especially large extent in the financial intermediation sector (NACE J). Moreover, the transport, storage and communication industry (NACE I) is marked by a clearly prevailing share of white-collar workers as opposed to our sample. These findings might be due to the fact, that Figure 6 displays firm averages across NACE for our sample, whereas the picture for the Austrian situation in (cf. Figure 7) is directly based on occupation shares across NACE.
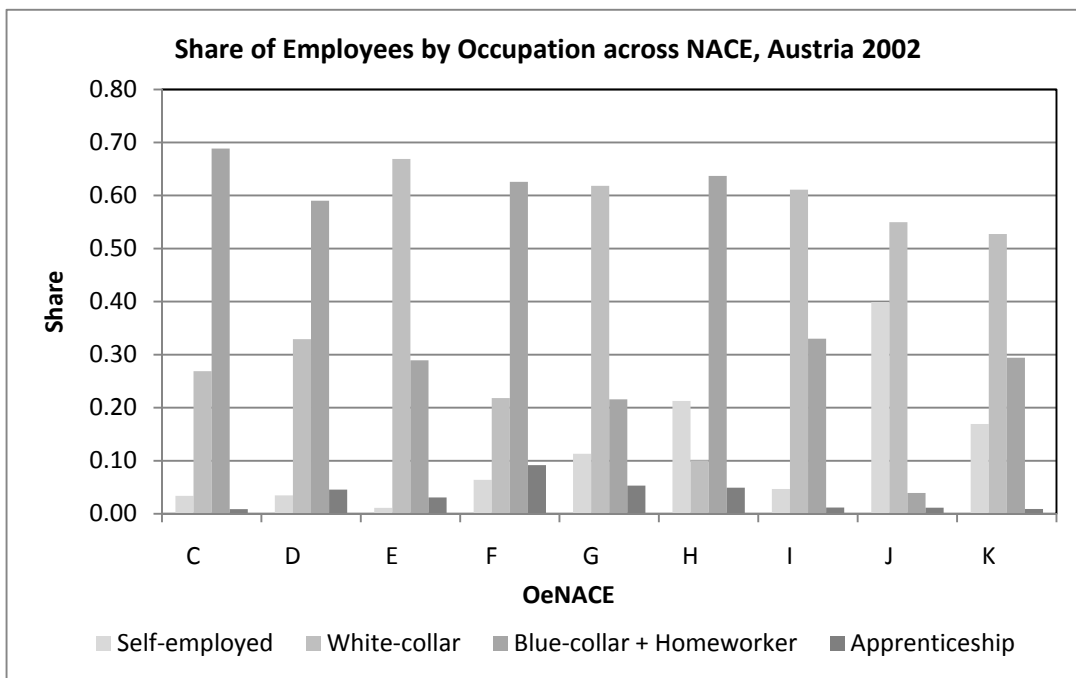
Figure 7: Share of employees by occupation across NACE, 2002, official statistics.

Source: Own calculations based on Statistics Austria (2004a, Table 3, 2004b, Table 2). As opposed to our data set these figures encompass imputed numbers.

Over the complete sample the share of part-time working contracts across panel firms in 2002 is of the same size as for all firms in 2001 (13%) and increases slightly during our observation period to above 15% in 2005. Table 10 shows, that part-time work is most common in sector G (wholesale and retail trade), H (hotels and restaurants), J (financial intermediation) and K (real estate, renting and business activities).

Table 10: Mean share of part-time employees across firms, 2002.

NACE	C	D	E	F	G	H	I	J	K
2002	0.05	0.10	0.09	0.06	0.18	0.13	0.09	0.16	0.18

A rising share of part-time employees might be connected to a rising share of women, which is highest in exactly the same industrial sectors. Overall, one third of the employees within an average firm are women (see Table 11), which corresponds to our cross-section sample of "large" firms.

Table 11: Mean share of female employees across firms, 2002.

NACE	C	D	E	F	G	H	I	J	K
2002	0.12	0.30	0.17	0.12	0.44	0.52	0.22	0.53	0.45

15

Unfortunately, we cannot verify the potential correlation of part-time work and female employees directly, as we make use of firm level data (based on the Structural Business Statistics here). Nevertheless, the distribution across economic branches shows certain analogies (see Tables 10 and 11). A first hint for a strong correlation might be provided by Figure 8 below indicating a positive relationship between the average share of women and the average share of part-time employees across firms by business sector.
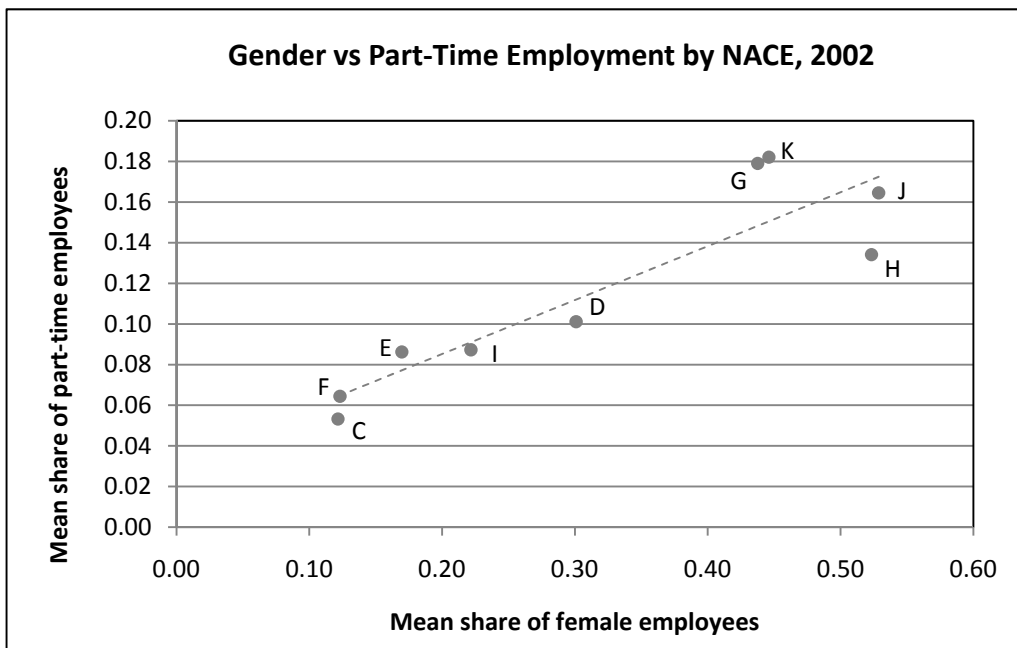

Figure 8: Gender versus part-time employment by NACE, 2002.

On the contrary, the interrelation between old aged employees and part-time work within our sample seems to be less clear-cut (Figure 9). Thus, there is no hint for a distinct utilisation of part-time employment prior to retirement.[16]
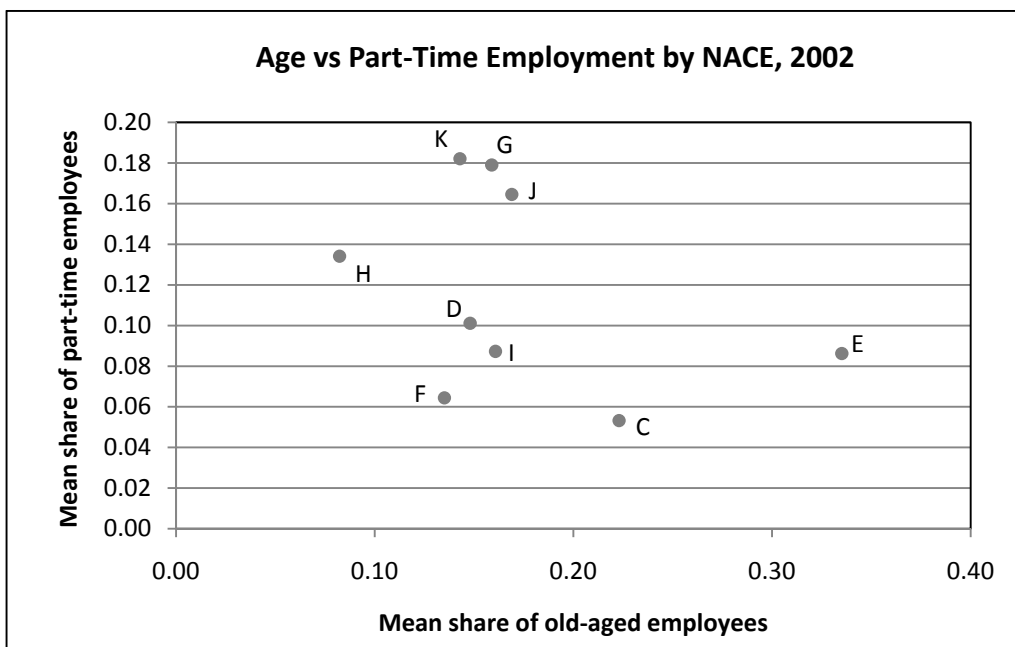
Age vs Part-Time Employment by NACE, 2002

Figure 9: Gender versus part-time employment by NACE, 2002.

3.2.4. Age

Self-employed persons are not matched to enterprises. Therefore we miss their individual characteristics. Consequently, self-employed individuals are not counted within the age distribution of a firm's workforce, although they contribute to overall and hence average value added in the firm. The latter is calculated based on the structural business statistics.

Regarding the age distribution of the employees in Figure 10, the workforce in the average firm is a little bit younger in 2002 to 2005 than in 2001, but naturally we observe slight ageing over time, i.e. the share of employees aged 50 years and older rises, while the share of employees younger than 30 years decreases. Thereby, the share of middle-aged (30 ≤ age < 50 years) employees remains rather stable and comprises half of a firm's workforce. Over the complete sample the picture is slightly more rejuvenated and therefore more similar to firms with 10 or more employees in 2001.

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[16] See Graf et al. (2009) for an analysis on the Austrian old age part-time scheme.
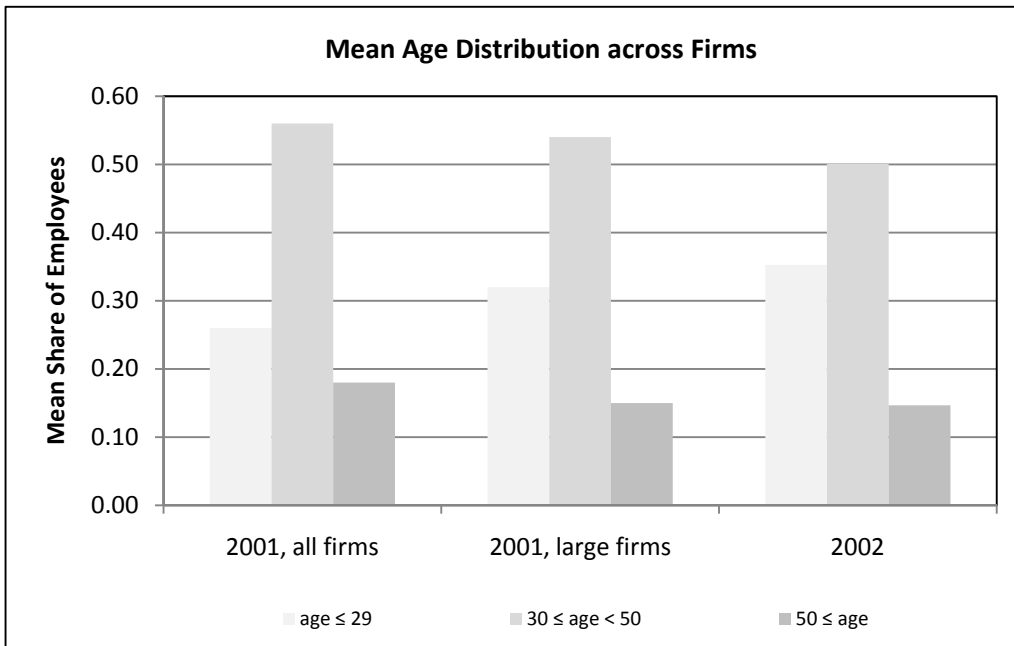
Figure 10: Mean age distribution across firms, 2002.

The only sector, where the average firm is clearly dominated by young employees, is that of hotels and restaurants (NACE H), while the middle aged group is leading in all other business areas (see Figure 11). An enterprise in the electricity, gas and water supply industry (NACE E) is on average characterized by the highest share of old aged employees, which is probably due to former long time working contracts.
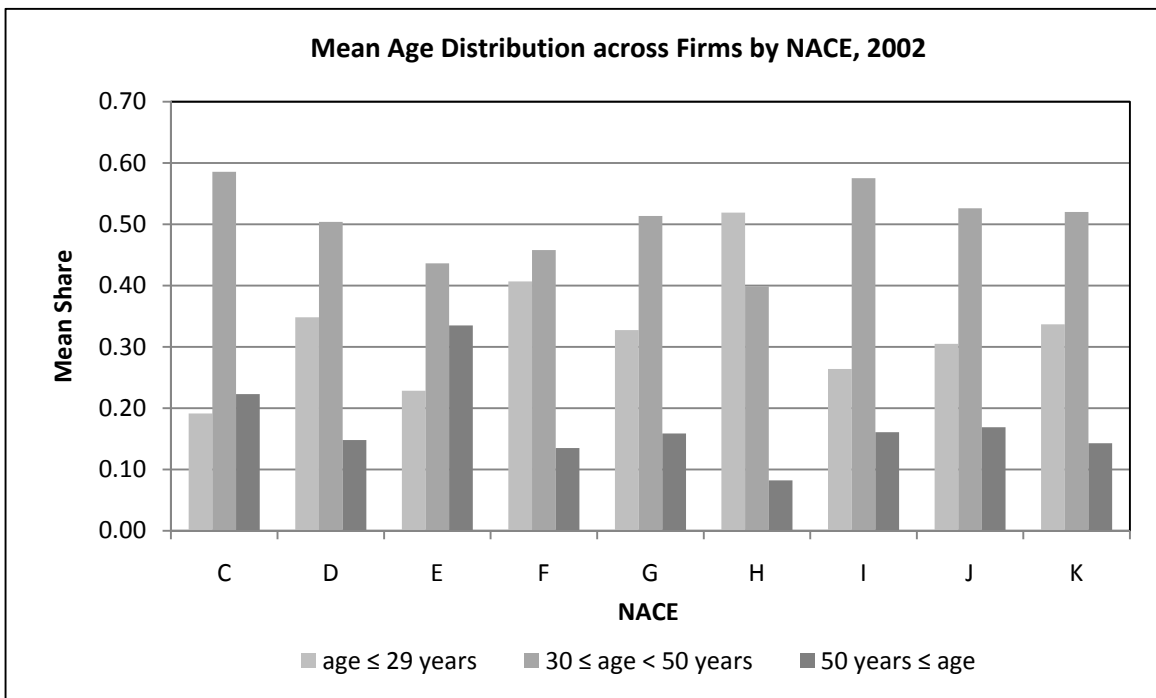

Figure 11: Mean age distribution across firms by NACE, 2002.

Ageing is prevalent in firms of each economic sector (see Figure 12), whereby NACE E (electricity, gas and water supply) seems to be the most stable one.
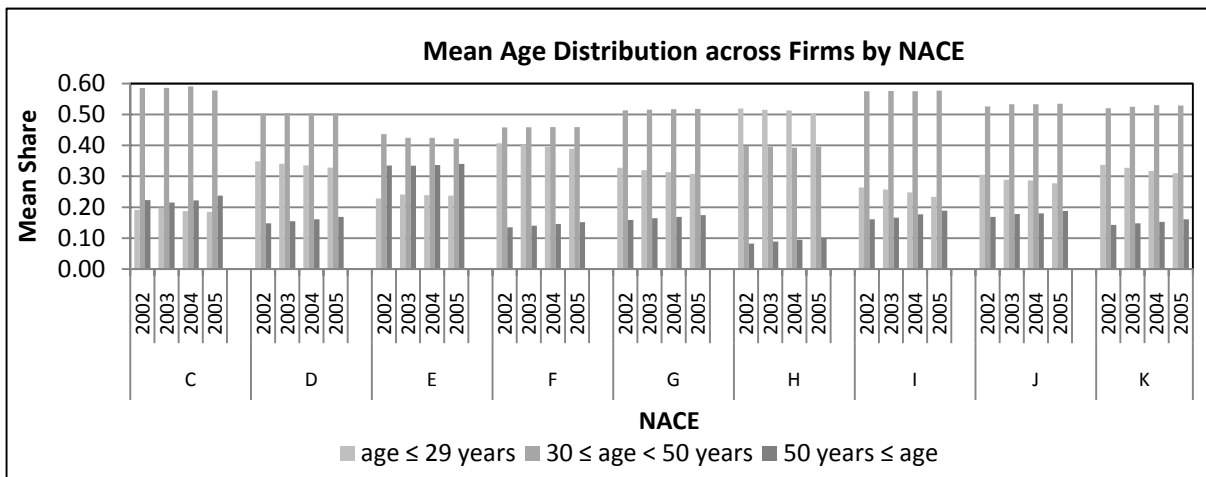

Figure 12: Mean age distribution across firms by NACE, 2002-2005.

Plotting the respective mean age share of firms against average firm productivity (= mean value added) over NACE categories (see Figure 13) indicates, that obviously the only negative relationship exists with respect to young employees below the age of 30 years. However, whether the cross-sectional correlations are indeed indicating any pure relation between productivity and age shares of employees within firms should be the topic of further research. The panel structure of this data set allows applying panel data methods to disentangle the relation between these two variables.
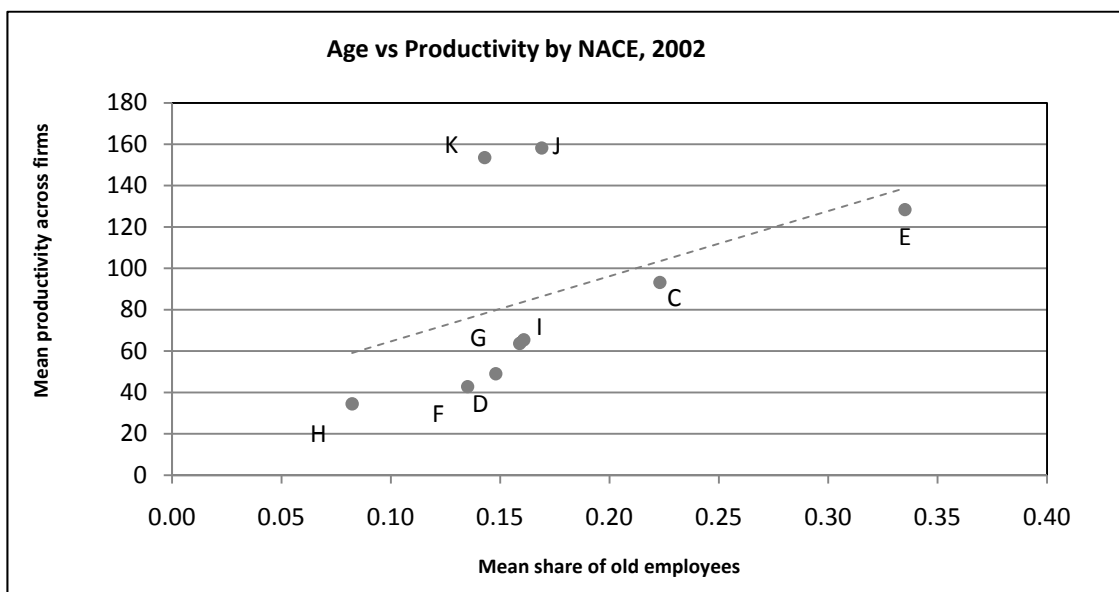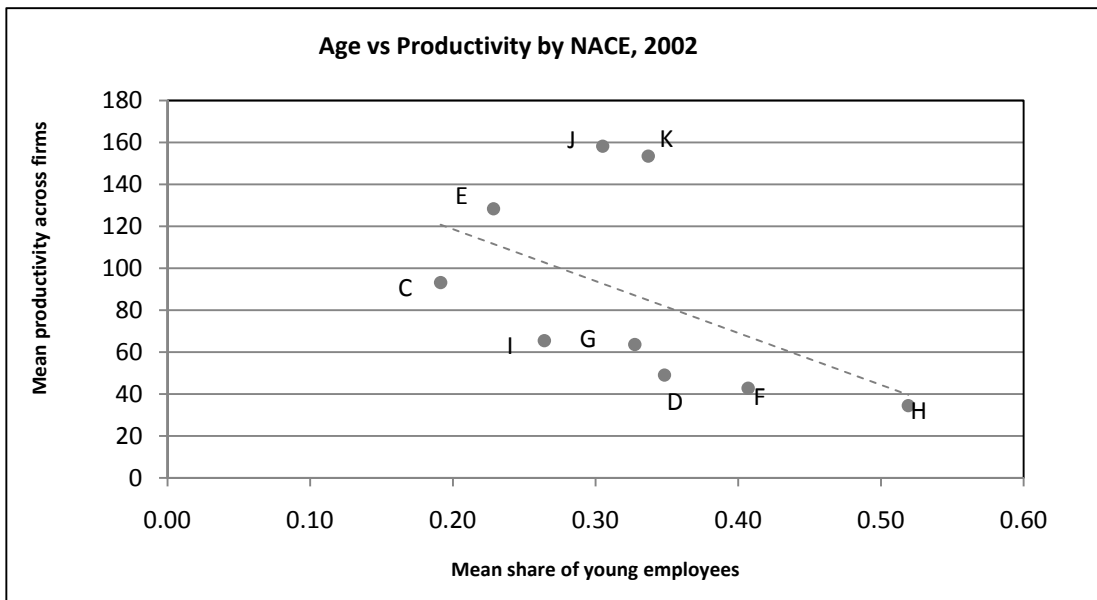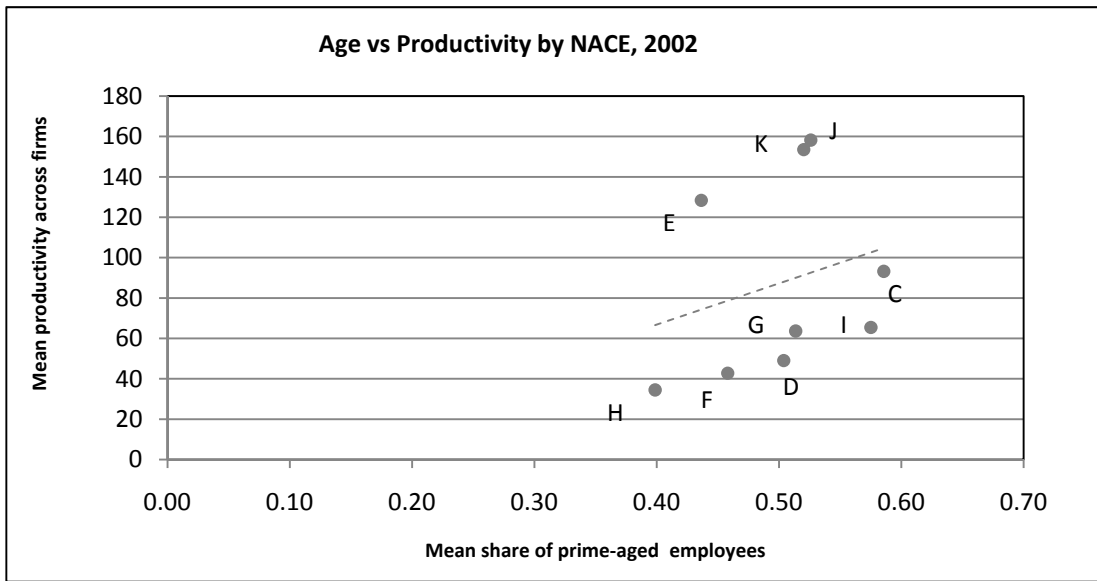
Figure 13: Mean age vs. mean productivity across firms by NACE, 2002.

3.3. Individual Level

3.3.1. Age

The following figures summarize characteristics for the average employee within economic sectors, i.e. we ignore the firm level and present mean values across all firms within each sector.

Looking directly at the age distribution over economic branches in Figure 14, i.e. without averaging over firms beforehand, even makes clear, that the oldest age group

dominates in NACE E (electricity, gas and water supply), whereas the hotel sector (NACE H) is rather young. Thus, the impact of old aged employees is arithmetically mitigated through averaging over firms (cf. Figure 11). This insight also emphasises the importance to distinguish between different levels potentially serving as a base for analysis. Realising that a certain sector is marked by an old age distribution should not be equated with the risk of an "over-ageing" economy, since the picture might be completely different for a single firm, which constitute the productive units. Of course, there might be quite some variance among different firms, as the age distributions depend on various factors and are thus very heterogeneous.
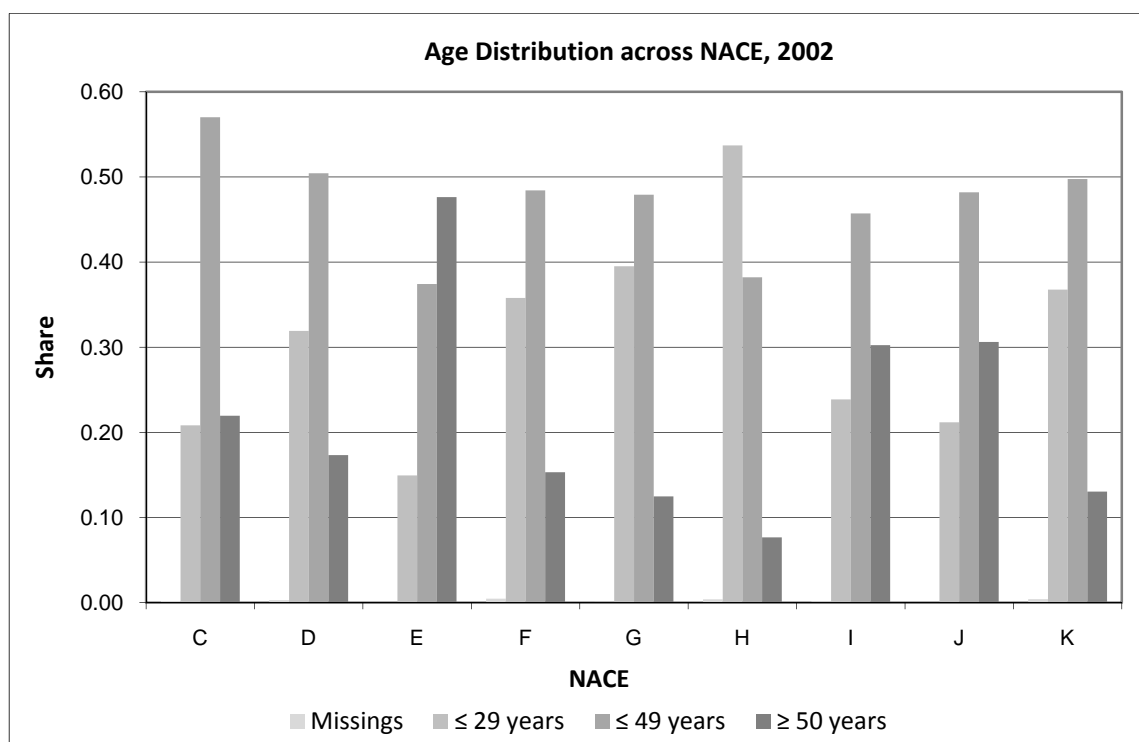
Figure 14: Age distribution across NACE, 2002.

As compared to the economically active Austrian population our sample workforce is a little bit younger (see Figure 15). More specifically, while the share of old aged employees is of roughly the same size, our sample includes a higher share of young employees at the expense of the prime-aged group. Due to the construction of our age groups the comparison is not very detailed. The age composition in our data set and of the Austrian economically active population should be compared with particular caution because our data set comprises only employed persons working in the sectors NACE sections C to K, whereas the statistics about the Austrian workforce includes also persons working in sectors not covered by structural business statistics (NACE sections A and B as well as L to Q) and self employed persons in all sectors. Thus, age selection with regard to certain industries might be driving this comparative picture.

Figure 15: Age distribution.

Source: Own calculations based on Statistics Austria (2006), Tab. 2.15[17]

3.3.2. Tenure
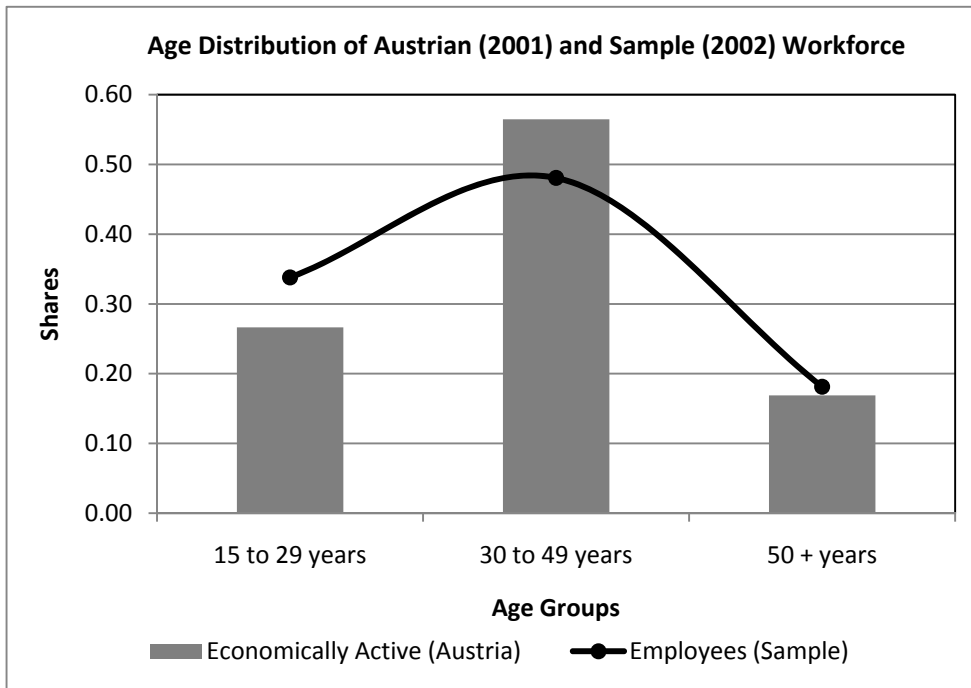
Besides the fact of being biased due to left-censoring by the beginning of 2002[18] our tenure measures may include two different effects.[19] Firstly, employment contracts of the birth cohort of employees, who are close to retirement, have been of a more long lasting manner (cp. NACE E) than it is common nowadays for younger birth cohorts entering the labour market. Secondly, one year more of age means one year of additional tenure by definition if the worker remains in the same job. Thus, obviously due to the requirement of a lot of seasonal labour in the hotel and restaurant business (NACE H), the average tenure per employee here is very low in this sector.

Of course, the pattern is very similar, no matter, whether we concentrate on the length of the current qualification (Tenure II) or whether we additionally append a former qualification status at the same employer (Tenure I). What is intuitively clear is the fact, that the latter definition of tenure exceeds the former in length (see Figure 16).

---

[17] „Economically Active" (Austria): population census; "economically active" if working time per week ≥ 1h

[18] We are not able to follow any changes affecting the tenure that happened before the year 2002. On the contrary, existing and stable employment relationships are included in the data.

[19] For a deeper description of the variable see page 4 and Table A.10 in the Appendix. Since due to the described reasons both kinds of tenure are identical in 2002, we switch to the last year of our panel data period here.
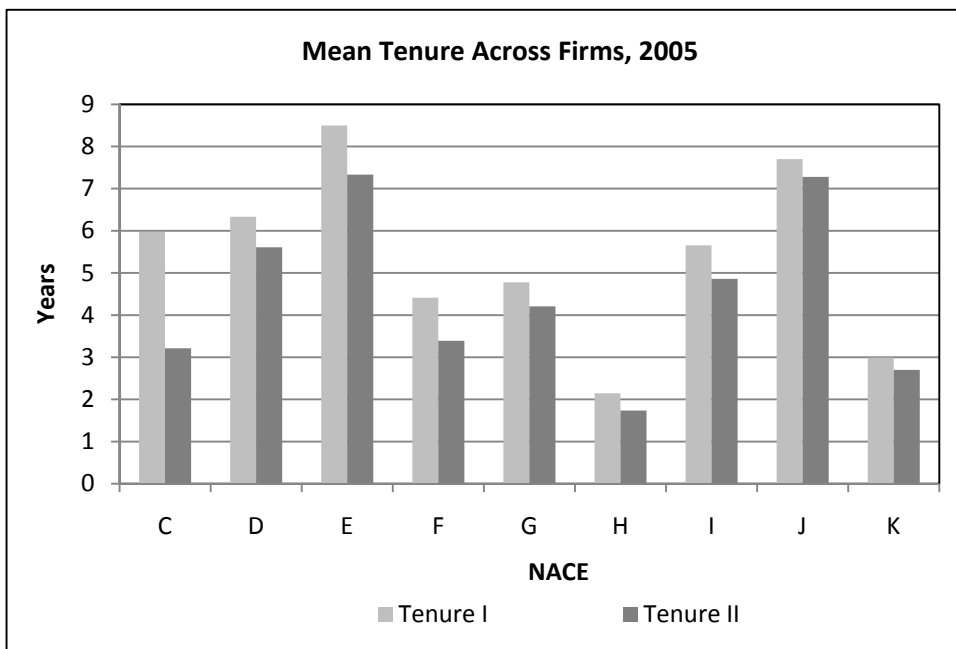
Figure 16: Mean tenure across firms, 2005.

Overall (see Figure 17), most employees show a tenure of either less than 1/4 year or 5 to 10 years, which again confirms the employment pattern within the two contrary branches (NACE E and H). Of course, for shorter time intervals it is Tenure II that collects a larger share of employees than Tenure I, while it is the contrary for longer time intervals. Thus, the picture is more left-skewed for the former and rather right-skewed for the latter. Since data recording started at the end of 1971, the highest possible tenure found still lies below 40 years.
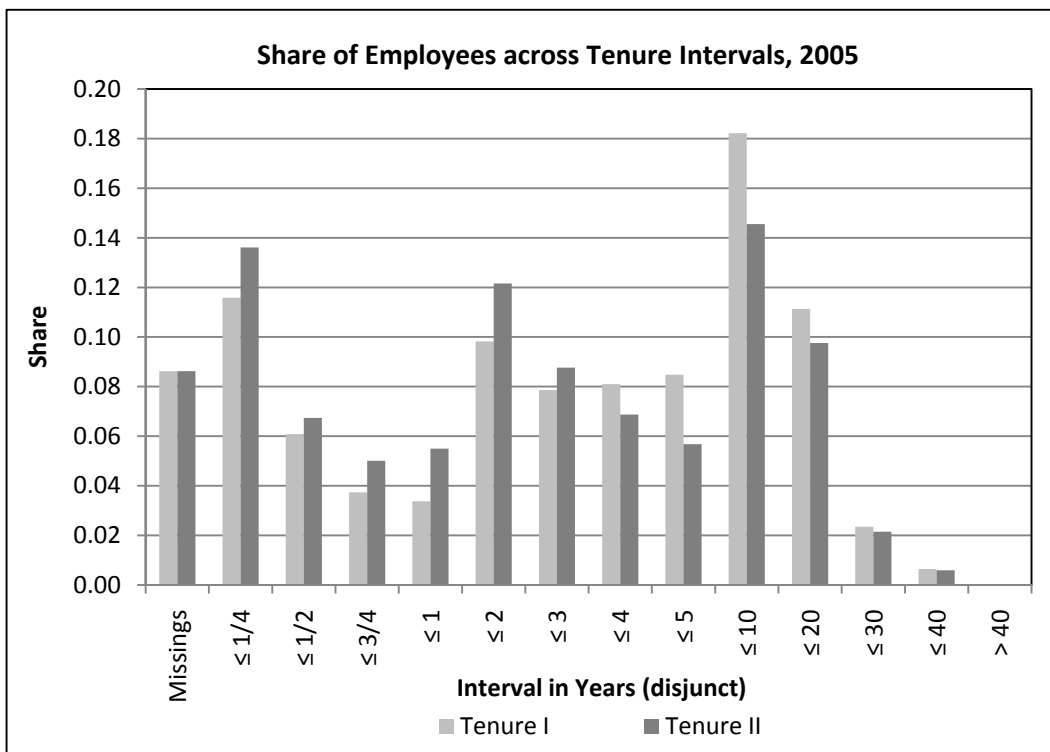
Figure 17: Share of employees across tenure intervals, 2005.

3.3.3. Citizenship

Austrian employees account for the main part of different citizenships with about 70% (see Table 12). The largest group of employees with foreign citizenship are from Former Yugoslavians (5%). Presumably driven by seasonal work the hotel sector (NACE H) seems to be the most heterogeneous one (see Figure 18). (The left y-axis refers to the line graph for Austria, the right y-axis scales the bars for further citizenships.)

Table 12: Share of employees across citizenships, 2002.

Citizenship	Austria	Germany	Former Yugoslavia	Turkey	EU 27 (rest)	World (rest)	Stateless	Unknown	Missings
2002	0.71	0.01	0.05	0.02	0.02	0.01	0.02	0.00	0.15
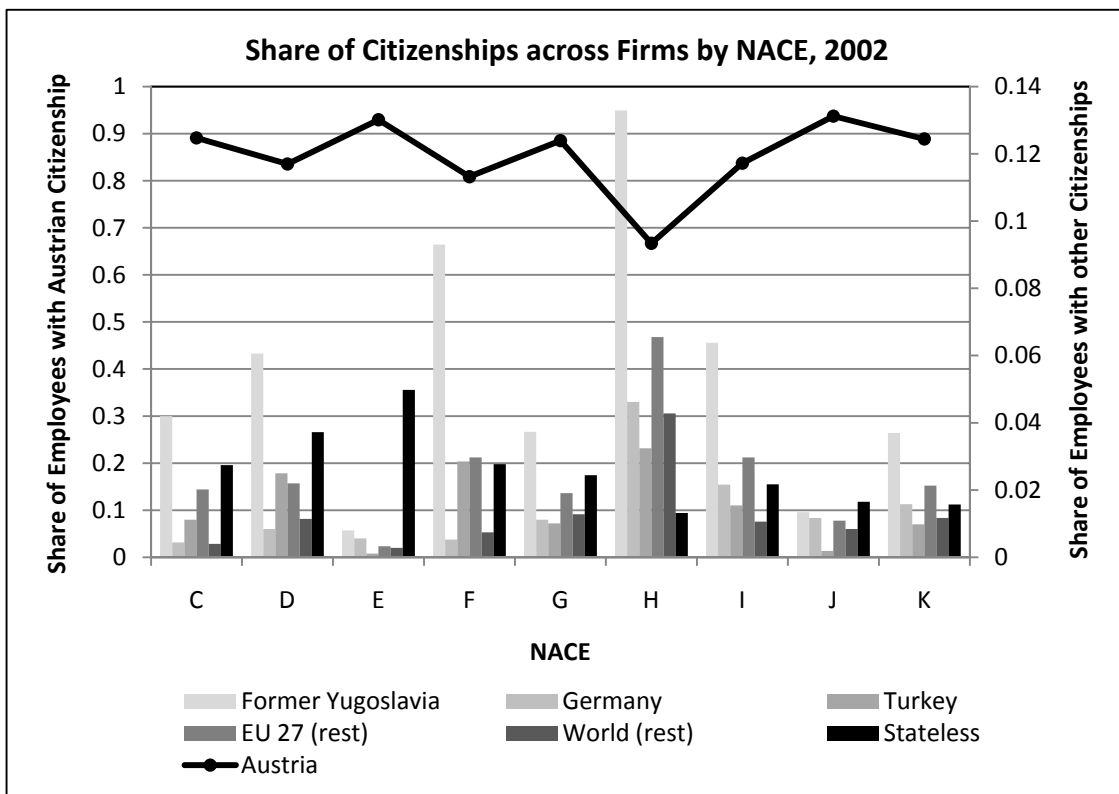
Figure 18: Share of citizenships across firms by NACE, 2002.

4. Conclusions

Within this paper we have introduced a newly set up data set for Austria that combines economic information from the employer's side at the firm level with socio-demographic variables of the associated employees at the individual level. Such matched employer-employee data sets have recently gained increasing importance for studies on the labour market. While we have already set up a cross-sectional data set of this type for 2001 in Austria, it is the first time to have available a matched employer-employee panel data set for Austria. Main advantages of our panel data set include the possibility to account for heterogeneity of various enterprises in the complete sample as well as across economic sectors or location over several years and with respect to the considered firm and employee characteristics. First analytical attempts based on the unconditional correlation give first hints towards an empirical relationship between gender and part-time work as well as age and productivity, for instance. As indicated in our sample, the respective level of aggregation is of decisive importance, since cumulative as well as average effects may be quite different in a single firm than in a whole sector. In the next years the data set is planned to be updated by further reporting years as soon as additional data on the structural business statistics, social security and pay slips become available.

Appendix

Table A. 1: Classification of NACE-sections (one digit).

Code (Statistics Austria)	Economic Sections
A	Agriculture and forestry
B	Fishing
C	Mining and quarrying
D	Manufacturing
E	Electricity, gas and water supply
F	Construction
G	Wholesale and retail trade
H	Hotels and restaurants
I	Transport, storage and communication
J	Financial intermediation
K	Real estate, renting and business activities
L	Public administration, national defence, social security
M	Educational system
N	Health and social work
O	Other community, social and personal service activities
P	Private households with employed persons
Q	Extra-territorial organizations and bodies

Table A. 2: Classification of NACE-divisions (two digit).

Code (Statistics Austria)		Economic Sections
A	01	Agriculture, hunting
	02	Forestry, logging
B	05	Fishing, fish farming
C	10	Mining of coal and lignite
	11	Extraction of crude petroleum and nat. gas
	14	Other mining and quarrying n.e.c.
D	15	Manufacture of food products and beverages
	16	Manufacture of tobacco products
	17	Manufacture of textiles (except clothing)
	18	Manufacture of wearing apparel, dressing; dyeing of fur
	19	Manufacture of leather and leather products
	20	Manufacture of wood and of products of wood and cord (except furniture)
	21	Manufacture of pulp, paper and paper products
	22	Publishing, printing, reproduction of recorded media
	23	Manufacture of coke, refined petroleum products and nuclear fuel
	24	Manufacture of chemicals, chemical products
	25	Manufacture of rubber and plastics products
	26	Manufacture of other non-metallic mineral products
	27	Manufacture of basic metals
	28	Manufacture of fabricated metal products
	29	Manufacture of machinery and equipment n.e.c.
	30	Manufacture of office machinery and computers
	31	Manufacture of electrical machinery and apparatus n.e.c

	32	Manufacture of radio, television and communication equipment and apparatus
	33	Manufacture of medical, precision and optical instruments, watches and clocks
	34	Manufacture of motor vehicles, trailers and semi-trailers
	35	Manufacture of other transport equipment
	36	Manufacture of furniture; manufacturing n.e.c.
	37	Recycling
E	40	Electricity, gas, steam and hot water supply
	41	Collection, purification and distribution of water
F	45	Construction
G	50	Sale, maintenance and repair of motor vehicles
	51	Wholesale trade and commission trade
	52	Retail trade; repair of household goods
H	55	Hotels and restaurants
I	60	Land transport; transport via pipelines
	61	Water transport
	62	Air transport
	63	Auxiliary transport activities; activities of travel agencies
	64	Post and telecommunications
J	65	Financial intermediation
	66	Insurance and pension funding
	67	Activities auxiliary to financial intermediation
K	70	Real estate activities
	71	Renting of machinery and equipment without operator
	72	Computer and related activities
	73	Research and development
	74	Other business activities
L	75	Public administration and defence; compulsory social security
M	80	Education
N	85	Health and social work
O	90	Sewage and refuse disposal, sanitation and similar activities
	91	Activities of membership organizations n.e.c.
	92	Recreational, cultural and sporting activities
	93	Other service activities
P	95	Activities of households
Q	99	Extra-territorial organizations and bodies

Table A. 3: Classification of NUTS-categories.

Code (Statistics Austria)	NUTS categories
11	Burgenland
12	Lower Austria
13	Vienna
21	Carinthia
22	Styria
31	Upper Austria
32	Salzburg
33	Tyrol
34	Vorarlberg

Table A. 4: Legal forms of Austrian firms.

Legal Form[20]	
"Ges.n.b.R."	Gesellschaft nach bürgerlichem Recht
"OHG"	Offene Handelsgesellschaft
"KG"	Kommanditgesellschaft
"Ges.m.b.H."	Gesellschaft mit beschränkter Haftung
"AG"	Aktiengesellschaft
"Genossenschaft"	Genossenschaft, Reg. Genossenschaft, Reg. Gen.m.b.H.
"Sonstige"	e.g.: Verein (privater), Öffentl. Unternehmungen etc.
"Einzelfirma"	Einzelfirma, nicht protokolliert oder protokolliert
"OEG"	Offene Erwerbsgesellschaft
"KEG"	Kommandit Erwerbsgesellschaft
"Vers.verein"	Versicherungsverein auf Gegenseitigkeit
"Sparkasse"	Sparkasse
"Privatstiftung"	Privatstiftung
"Europ. wirt. Int.vereinigung"	Europäische wirtschaftl. Interessenvereinigung
"Ausländ. Rf"	Ausländische Rechtsform

Table A. 5: Size intervals for firms according to the number of employees.

Size Interval
size = 1
1 > size < 5
5 ≥ size < 10
10 ≥ size < 20
20 ≥ size < 50
50 ≥ size < 100
100 ≥ size < 500
500 ≥ size < 1000
size ≥ 1000

Table A. 6: Arbitrarily chosen tenure intervals in years.

Tenure Interval
tenure ≤ ¼
¼ > tenure ≤ ½
½ > tenure ≤ ¾
¾ > tenure ≤ 1
1 > tenure ≤ 2
2 > tenure ≤ 3
3 > tenure ≤ 4
4 > tenure ≤ 5
5 > tenure ≤ 10
10 > tenure ≤ 20
20 > tenure ≤ 30
30 > tenure ≤ 40
tenure > 40

---

[20] Due to juridical peculiarities in the respective meaning of a firm's legal form depending on the language we kept this table in German.

Table A. 7: Groups of citizenships.

Citizenship
Austria
Turkey
Germany
Former Yugoslavia
Rest of EU 27
Rest of World
Stateless
Unknown

Table A. 8: Occupational groups (based on LSE data).

Occupation
Self-employed
White-collar
Blue-collar
Home worker
Apprenticeship

Table A. 9: Age groups.

Age
age ≤ 29 years
30 years ≤ age < 50 years
50 years ≤ age

Table A. 10: Tenure – examples.

Year	Duration in current year (1)	Duration of supply (2)	Duration of supply new (3)	Tenure I (1) + (2) + (3)	Tenure II (1) + (2)
		one continued employment relationship			
2002	365	2922	0	3287	3287
2003	365	3287	0	3652	3652
2004	366	3652	0	4018	4018
2005	365	4018	0	4383	4383
		one change of employment relationships (in 2003)			
2002	365	5754	0	6119	6119
2003	365	2	6117	6484	367
2004	366	367	6117	6850	733
2005	365	733	6117	7215	1098
		many short employment relationships in the same firm			
2002	62	0	0	62	62
2003	50	0	62	112	50
2004	38	0	112	150	38
2005	37	0	150	187	37
		break in employment			
2002	273	120	0	393	393
2003	0	0	0	0	0
2004	122	0	393	515	122
2005	365	122	393	880	487
		two changes of employment relationships (in 2003 and 2004)			
2002	365	1795	0	2160	2160
2003	365	2160	0	2525	2525
2004	341	79	2446	2866	420
2005	365	306	2560	3231	671

Note:

duration in current year: the length of a certain kind of employment relationship being upright during the current year

duration of supply: the length the current kind of employment relationship being upright until the end of the previous year

duration of supply new: the length of an earlier kind of employment relationship having ended before the current year (but after the beginning of 2002) and being upright until the current kind of employment relationship has started within a certain firm

Explanation:

"Experience" is proxied by two kinds of firm-specific tenure, which we constructed from three and respectively two original variables in the data set: These in turn are

- i) the number of days a person has been assigned to at least one kind of "qualification" during the current year,
- ii) the number of days until the end of the previous year this person has been assigned to that kind of "qualification", which is the first one still existing in the current year, and
- iii) the number of days this person has been assigned to another kind of "qualification" in the past, which has ended at the latest, before the current kind of "qualification" has started.

- The sum of all three variables is defined as "Tenure I", while summing up only the first two variables is referred to as "Tenure II".

- Thereby, potential periods of not being employed as well as parallel validity of different types of "qualifications" within the same firm are not counted.

- Thus, depending on the number of co-existing employers, one person may be included more than once in the data set.

- Hence, in case of a "qualification" change that exactly happens at the beginning of the current year, if the person has no other "qualification" in the current year that started in the previous year or earlier, ii) will be empty.

- Consequently, we cannot track changes, which happen before the year 2002, so that iii) does not have an entry, while ii) starts counting at the point in time of the change.

- Additionally, our constructed tenure variables are biased insofar as on average employees in 2005 are automatically assigned to a higher tenure than employees in 2002.

- Moreover, in case, that a person is assigned to more than a single kind of occupation, the variable "qual" is empty.

Table A. 11: Sample comparison according to several characteristics.

Variable	Value added per Worker (in T€)	Investment into Fixed Assets per Worker (in T€)	Age of Firm (in Years)	Multi-plants (Share)	Female Employees (Share)	Part-Time Employees (Share)	Age of Employees (Share)		
							Young	Middle	Old
2001, all firms	53.03	17.26	15.83	0.20	0.39	0.13	0.26	0.56	0.18
2001, large firms	52.40	12.20	18.57	0.32	0.34	0.11	0.32	0.54	0.15
2002	**69.28**	**18.72**	**18.32**	**0.28**	**0.34**	**0.13**	**0.35**	**0.50**	**0.15**

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