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Analyzing entrepreneurship with the Finnish Linked Employer-Employee Data (FLEED): Matching and qualitative properties of the data

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No. 920

Mika Maliranta – Satu Nurmi

ANALYZING ENTREPRENEURSHIP WITH THE FINNISH LINKED EMPLOYER-EMPLOYEE DATA (FLEED).

Matching and qualitative properties of the data*

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ABSTRACT: This paper explores the potential of the Finnish Longitudinal Employer-Employee Data (FLEED) in the analysis of entrepreneurship. It is found that these data are excellent for analyzing a certain sort of self-employed individuals who exercise their profession on their own account (elinkeinonharjoittajat). In these cases, where the company can be identified on the basis of the personal code of the self-employed, it is possible to see both sides of the self-employed, their individual characteristics and the properties their companies. On the other hand, the present data do not allow linking the limited liability companies to their owner entrepreneurs directly, which currently seriously limits the usefulness of the data for entrepreneurial analysis. Two possibilities to improve the situation are considered. Firstly, the self-employed can be matched to their companies by using background information of the self-employed and the companies. Our experiment shows, however, that relatively reliable matches can be found only for a rather small sample of the self-employed. A much more promising but more expensive option might be to use taxation registers on the ownership compiled by the taxation authorities. Linking individuals with companies on the basis of the ownership would open a great variety of interesting research opportunities.

MALIRANTA, Mika – **NURMI**, Satu, **ANALYZING ENTREPRENEURSHIP WITH THE FINNISH LINKED EMPLOYER-EMPLOYEE DATA (FLEED). Matching and qualitative properties of the data**. Helsinki: ETLA, Elinkeinoelämän Tutkimuslaitos, The Research Institute of the Finnish Economy, 2004, 20 s. (Keskusteluaiheita, Discussion papers, ISSN 0781-6847; No. 920).

TIIVISTELMÄ: Tämä tutkimus selvittää suomalaisen yhdistetyn työantaja–työntekijä-aineiston (FLEED) käyttömahdollisuuksia yrittäjyystutkimuksessa. Aineisto näyttää soveltuvan erinomaisesti elinkeinoharjoittajien tutkimiseen, koska näissä tapauksissa yritykset identifioituvat suoraan yrittäjän oman henkilötunnuksen kanssa. Tällöin nähdään yrittäjän kaksi puolta; hänen henkilökohtaiset ominaisuutensa sekä hänen yrityksensä ominaisuudet. Toisaalta nykyinen aineisto ei anna mahdollisuutta yhdistää osakeyhtiömuotoisia yrityksiä niiden omistajayrittäjiin, mikä tällä hetkellä merkittävästi rajoittaa aineiston käytettävyyttä yrittäjätutkimuksessa. Tutkimuksessa selvitetään kahta vaihtoehtoista tapaa parantaa tilannetta. Ensiksi, yrittäjät voidaan yhdistää heidän yrityksiinsä käyttämällä hyväksi yrittäjien sekä yritysten taustatietoja. Kokeilumme kuitenkin paljastaa, että suhteellisen luotettavia yhdistämisiä kyetään tekemään vain melko pienelle yrittäjäjoukolle. Paljon lupaavampi, mutta kalliimpi vaihtoehto näyttäisi olevan verottajan kokoamien, yritysten omistusta koskevien rekisterien hyödyntäminen. Yksilöiden yhdistäminen yrityksiin omistajuuden perusteella tarjoaisi mahdollisuuksia moniin tutkimuskysymyksiin.

Keywords: Data, self-employment, entrepreneurs

JEL code: L10 , M13

Preface

The aim of this paper is to shed light on the usefulness of the Finnish Longitudinal Employer-Employee Data (FLEED) in the entrepreneurial analysis. This work is a part of the two separate but related projects that deal with the issues of the entrepreneurship. The first project with a tighter and more direct focus on the entrepreneurship is funded by the National Technology Institute (Tekes) and is being carried out at the Etlatieto. By using various different statistical sources this project aims to answer the question "Where do the entrepreneurs come from?" The other project, funded within the Research Programme for Advanced Technology Policy (ProACT) that is initiated and funded in collaboration with the Ministry of Trade and Industry and the Tekes, has a somewhat broader scope dealing with the various effects of globalization of trade and ownership in the host country, including those on the Finnish entrepreneurship.

This work is primarily a data description and secondarily a descriptive analysis of entrepreneurship, or we should rather speak of self-employment. Chapter 2 provides data description. Descriptive analysis conducted in Chapter 3 is utilized to explore the limits of the current data and to find ways to improve the data for these purposes. Chapter 4 draws some conclusions and includes suggestions for the future work in developing data for entrepreneurial analysis in Finland.

A key question is the links between the self-employed and their companies that would allow analyzing the relationship between the characteristics of the self-employed individuals and the performance and the properties of their businesses. We study the coverage of the linked self-employed and the representativeness of the sample after the linking exercise. Two methods to increase the number of the links are considered. The first is to create matches by means of background information of individuals and companies. The second possibility would be to use information on ownership in the future work.

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1 INTRODUCTION

This paper explores the potential of the **F**innish **L**ongitudinal **E**mployer-**E**mployee **D**ata (FLEED) in the analysis of entrepreneurship. The database is constructed in Statistics Finland by linking various administrative registers. The FLEED data set is a restricted version of the so-called "effectiveness data" ("vaikuttavuusaineisto") at the individual level, which is supplemented with the identity of the employer, including company and establishment codes. The data include large amounts of relevant information on the background characteristics of each individual, e.g., education, age etc. Furthermore, a great advantage of the data is that it allows following the life cycles of both individuals and companies. In addition, by using employer-employee links it is possible to create (or improve) longitudinal identifiers for companies and establishments (Baldwin, Dupuy, & Penner, 1992). When a large proportion of the employees of a certain company appear in the company in the following year, it can be inferred that these two companies are the very same, even if they seem to have a different code. Thus, linked employer-employee data is useful in identifying company demographic events and in analyzing the dynamics of business activity and job creation.

The fact that the data allow identifying whether an individual is employed, unemployed or self-employed and, in addition, linking with the employer opens promising outlook.[1] Using information on each individual's history and on the life cycle of the company, it is possible to address, for example, the following questions: What kind of careers entrepreneurs have before they start to exercise their profession or business on their own account and choose to bear entrepreneurial risk? More generally, which factors increase an individual's probability of becoming an entrepreneur? What are the roles of "unemployment push" and "entrepreneurial aspiration pull" (see e.g. Johansson, 2000; Hyytinen & Ilmakunnas, 2004)? And how do new small businesses develop after the start-up? With these data it is possible to study which factors will predict successful entrepreneurial career in terms of survival, growth and productivity. The data also provide a good opportunity to analyze carefully the role of entrepreneurship in job creation, job destruction and mobility of labor in the business sector.

The data also include links between companies and their establishments. These links are useful for various purposes. They allow determining the regional structure of activities of multi-unit companies. These links might also be useful for distinguishing artificial deaths and births of companies from real ones, i.e., from those involving just a change in the company name or identification code. As a rule, establishment code remains the same even if the mode of ownership changes, as long as business activities stay basically the same.

On the other hand, some features of the data pose challenges for the entrepreneurship analysis. One problem is that it is not always appropriate to interpret the self-employed to be synonymous with the entrepreneur (see Johansson, 2000). What a researcher usually has in mind is an innovative person, who has a business of his own and who continuously tries to develop and expand it. However, a survey by Rouvinen and Ylä-Anttila (2004), for example, shows that this kind of characterization only fits to some of the self-employed. On the other hand, the characterization seems to be quite apt for many individuals who would be categorized as wage-earners. Strictly speaking, they may not have a large share of direct ownership but their income may still be quite tightly related to the per-

[1] A study by Kangasharju and Pekkala (2002) is, to our knowledge, the first attempt to use the Finnish linked employer-employee data in the analysis of the companies run by the self-employed.

formance of the business they are running. Put differently, some wage-earners may have a lot of freedom to apply their innovative ideas and, in addition, they have to bear a substantial amount of "entrepreneurial-type risk".

Another, a more practical problem is that for a substantial proportion of the individuals the linking code to the company is missing. This problem seems to plague especially the self-employed individuals. The links can be found mainly for those self-employed who run the business that is identified (up to year 1997) with a code-number that is identical with that of the person, that is to say it is the personal identity code. For other cases, which are usually more interesting, the links are essentially missing. This is very unfortunate because the link provides us with an opportunity to gauge "entrepreneurial behavior" of the person that should be reflected in the development and characteristics of the company. The mere link with the Financial Statements Statistics database, in particular, would be very useful. In addition, valuable information could be obtained from the innovation surveys, R&D surveys, patent registers, ICT surveys etc.

In this paper, some basic features of the FLEED data will be described. Some descriptive statistics will be given to provide some flavor of the data. Furthermore, we can evaluate how representative our samples are when some self-employed drop out due to missing links. This is crucial because one of the main purposes of this exploration is to study how many self-employed can be linked with the company directly and reliably. If a large number of missing links between self-employed and their companies will be found, an inevitable question arises: is the available sample representative for the total population of the self-employed, or of the entrepreneurs?

For an in-depth entrepreneurship analysis we would need a large and representative data set. Hence, there might be a need to extend the coverage of the linked self-employed and their companies by other means. Some efforts towards this aim will be exerted by using specific information on individuals and companies, i.e., their location and industry, and trying to increase the number of matches. Possibilities to use other registers unutilized so far will be considered as well.

2 DATA

2.1 VARIABLES

The FLEED data include a lot of information on individuals (age, education, marital status, socio-economic status etc.). Importantly, it includes the code of the employer (company code) and the local kind-of-activity unit (establishment code). Information on these companies and establishments is also extensive including such variables as industry, employment, sales, location etc.

Table 1 lists some main variables that are useful when analyzing entrepreneurs and their companies using information from the FLEED, the Business Register (BR) and the Financial Statements Statistics (FSS). Each individual, establishment and company is identified by a time-invariant encrypted code.

Table 1. The variables used in the present study

Variable	Source/Description
Individuals	***FLEED***
SHTUN	Encrypted identifier of individual
TTYOTU	Wage earnings
TTYRTU	Entrepreneur earnings
TTYOTUR	Unemployment benefit
SVATVA	Taxable income
SVATVP	Taxable capital income (from 1993)
AMAS1	Occupation (1): '1' = 'Wage earner' '2' = 'Self-employed'
PTOIM1	Main activity, '11' = 'Employed'
IKÄ	Age
SP	Sex
SIVS	Marital status
KTUTK	Education code (break in 1997)
SOSE	Socio-economic status
PETY	Family type
SPHTUN	Encrypted identifier of spouse
Establishments	***BR***
SYKSTUN	Encrypted identifier of establishment
NTALATP	Industry code (NACE) of establishment
LV	Sales, in euros
HK	Employment
HKYR	Entrepreneurial labor input
KUNTA	Municipality
NUTS4	The NUTS 4 regions
PALKKA	Wages
Companies	***BR***
SYRTUN	Encrypted identifier of company
NTALAYR	Industry code (NACE) of company
LV	Sales
HK	Employment
PALKKA	Wages
Companies	***FSS***
SYRTUN	Encrypted identifier of company
TOL95	Industry code (NACE) of company
TPLV	Sales
TPHENK	Employment
PALKAT	Wages
JAL	Value added
KATE	Operating margin
KOPO	ROA = (Net income + financial expenses + taxes)/assets, %
SUHTVELK	(Short-term debts + long-term debts + required reserves)/sales, %
RAHKUST	Financial expenses/long-term debts, %
QUICK	Current financial assets/short-term debts
CURRENT	(Current financial assets + inventories)/short-term debts

Comment [mma1]: Tietoa siitä, kuinka monille toimipaikoille tieto on saatu suoraan ja kuinka monille se on estimointu (tunniste-muuttuja?) Tämä voidaan selvittää kyllä myös epäsuorasti tutkimalla keskipalkkaa. Jos toimipaikan keski-palkka on sama kuin moodi keski-palkka, niin se on lähes varmasti estimoitu. SN: Palkat on aina esti-moitu monitoimipaikkaisille henki-löstön lkm:n perusteella. Mika Kar-jalainen lupasi laittaa jotain dokkaria, jos löytyy.

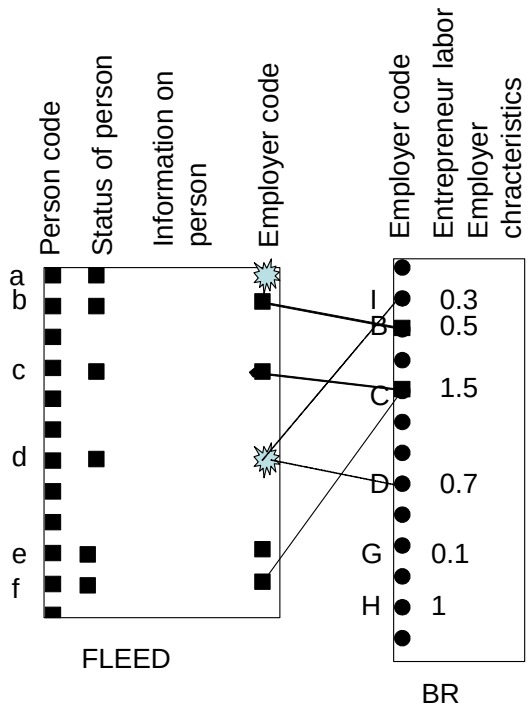
2.2 LINKING PROCEDURE AND THE COVERAGE OF THE SAMPLE

Basically the data cover all workers from 16 to 70 years. Consequently all workers employed by establishments and companies that appear in the Business Register of Statistics Finland should be covered. However, for various technical reasons all workers have not been linked to their establishments and/or companies. Therefore, there are a number of establishments and companies in the Business Register that cannot be found in the FLEED. Usually these are very small business units. Linked employees cover 80–90 per cent of the total employment (see Ilmakunnas, Maliranta, & Vainiomäki, 2001). The data cover years from 1988 to 2000, but information is not complete for all years. There are some breaks in the series especially between years 1992 and 1993.

The FLEED data include the company code of the employer at the end of the year. In those cases where an individual has multiple employers the most important one has been selected. Figure 1 gives an illustration of the linking of persons with companies. In our example, six self-employed individuals (*a – f*) can be identified from the FLEED. For four of them there is a non-missing company code (*b*, *c, e* and *f*). For three of these it is possible to track a link to the Business Register (*b, c* and *f*). The company code of *e* cannot be found in the BR. Although the Business Register is principally complete, these kinds of mismatches sometimes occur for different technical reasons. For self-employed *a* and *d* the company code is missing. One possibility is that they actually do not have a company to which they should be linked (case *a*). A more probable case is that there is a company that they own and for which they work (case *d*). If fact, there may be several such companies, but we are more interested in the *prime company* of the self-employed (company *D* in case of the self-employed *d*). It might be defined as the company for which he or she gives the largest labor input. Alternatively, it may be the company which is the most important in terms of ownership. Finally, it is also possible that there are several self-employed persons who work for the same company (*c* and *f* work in company *C*). In that case it might be useful to define one *prime entrepreneur* of the company. It may be the person who has exerted largest contribution to the company as measured by income or ownership.

Links can be studied from the company side as well. According to Figure 1 there are six companies that have entrepreneurial labor input that is more than zero. Companies *B, D, G* and *I* have entrepreneurial labor input that is less than one when measured in full-year equivalent terms. Company *B* can be linked to individual *b* and company C to individual *c* and *f*. Let us assume that individual *c*'s income exceed those of *f*'s, who only works part time. So *c* is the prime entrepreneur of the company *C*. Company *D* has an entrepreneur *d* that appears in the FLEED but *d* is not directly linked with *D* in the data. Company *G* and *H* have entrepreneurial labor input, but these individuals are not classified as self-employed in the FLEED.

Figure 1. Linking self-employed in the FLEED with companies in the Business Register (BR)



Variable AMAS1 is central because it indicates the status of the individual. Self-employed are indicated by '2'. These individuals are identified as self-employed basically due to the fact that they are insured on the basis of the Self-Employed Persons' Pension Act (YEL) or the Farmers' Pension Act (MYEL). The law applies to self-employed with residence in Finland and aged 18–64. Self-employment must have continued at least for four months after they have reached the age of 18 and income should not be less than a certain threshold (5504,14 euros in 2004). The entrepreneur's family member may also be interpreted as a self-employed person if he or she works in the company but not as an employee. A partner in a general partnership and a responsible partner in a limited partnership are considered as entrepreneurs in the law as well (see Laatunen & Vidlund, 2003). The system is compulsory for those whose ownership in a limited liability company is more than 50 per cent.

There were 163 000 self-employed insured by the YEL pension act and 100 000 insured by the MYE at the end of year 2001. Table 2 shows that in the FLEED there are 250 000–330 000 self-employed depending on the year. Unfortunately only some of them can be linked with their company or establishment. Furthermore, it is found that the coverage of the linked observations varies over time. Only few self-employed persons are linked with their company or establishment up to year 1990. In 1991 the number of those self-employed, which can be linked with their business, rises to 90 000. A more careful investigation indicates that up to year 1997 these are mainly the cases where the company has the personal code (that is 10-digit before encrypting) of the self-employed, i.e. the person is "elinkeinonharjoittaja". The number of other cases is indicated in column (4).

The company codes of those self-employed that are "elinkeinoharjoittajia" have been changed from the personal identity code to the official company code (that is 8-digit code before encrypting)

since 1998. However, there is a separate file that includes a listing of company codes with their respective personal identity codes. By using this key the column 3 in Table 2 can be continued in a relatively comparable way. It can be noted, however, that the year 2000 constitutes another discrepancy. Although the total number of self-employed remains relatively stable (decreases modestly, in fact), the number of those self-employed equipped with a company link increases somewhat. There are about 10 thousand such links where the company code cannot be associated with the entrepreneur's personal identity code directly, as before 1998, or indirectly as since 1998. A more careful look at the data reveals that in year 2000 some self-employed persons are linked with quite large companies. This is in sharp contrast to the earlier years where self-employed persons are only linked to small or very small companies, mostly through identical company and personal identity codes. Column 5 shows the direct links between self-employed and establishments, which are effectively missing until year 1998. However, the self-employed can be linked to establishments indirectly by using the links between company codes and establishment codes.

Table 2. Number of self-employed workers in FLEED

Year	(1) AMAS1='2'	(2) AMAS1='2' with company code	(3) AMAS1='2' Company code identical with personal identity code[2]	(4) Column (2) – Column (3)	(5) AMAS1='2' with establishment code
1988	329 466	334	334	0	250
1989	332 387	60	60	0	58
1990	328 392	46	46	0	17
1991	314 935	89 015	89 014	1	0
1992	302 759	78 457	78 456	1	0
1993	297 095	88 959	88 959	0	0
1994	290 648	89 321	89 321	0	0
1995	268 261	89 762	89 762	0	0
1996	258 928	71 581	71 526	55	55
1997	255 155	73 253	72 640	613	613
1998	251 432	74 623	*74 572*	51	72 879
1999	247 045	74 185	*74 168*	17	73 813
2000	245 880	80 435	*70 032*	10 403	79 393

2.2.1 LINKING WITH THE BUSINESS REGISTER

The Business Register is the basic data source for obtaining company and establishment-level information on business activity and performance. In the following, we will examine the links between the FLEED and the Business Register data, now by restricting to year 1995 and only including the non-farm business sector (NACE main industries C–K) in the FLEED. We also study some basic characteristics of the samples obtained non-randomly through the linking procedure.

Table 3 summarizes the characteristics of the self-employed in different linking cases described in Figure 1. The table reveals that more than half of the self-employed in the FLEED have a com-

[2] A break between years 1997 and 1998, see text.

pany code. Furthermore, 72% of these company codes can be found in the Business Register. Thus, 38% of the self-employed have a direct link to the Business Register. Almost all of these cases can also be matched with the establishment-level data (97%). There are no self-employed linked to a company with multiple self-employed. This can be explained by the fact that the links for the self-employed with limited liability companies, where multiple links can be expected to occur, are currently missing in the FLEED.

In addition, we can analyze the representativeness of the sample by comparing some average characteristics between different cases. Self-employed having a company code seem to have notably lower average earnings than those without a company code, when earnings are defined as the sum of wage and entrepreneur earnings. This is due to the current emphasis on the self-employed in contrast to the entrepreneurs attached to the limited liability companies in the FLEED. When taxable income is used that include taxable earnings and taxable capital income, the results are similar, but the gap between linked and non-linked becomes narrower. In contrast, average age and average number of schooling years do not differ much between different cases.

Table 3. The number and characteristics of the self-employed by different cases in the business sector in 1995

Case	**Nobs**	**Average earnings (€)**	**Average taxable income (€)**	**Average age**	**Average no. of schooling years**
1. The self-employed (cases a-f)	124 834	21 897	20 443	43.5	10.8
2. The self-employed with a company code (cases b, c, e and f)	66 610	16 255	17 395	43.5	10.6
3. The self-employed with the BR company code (cases b, c and f)	47 666	17 880	18 988	43.9	10.6
4. The self-employed linked to a company with multiple links of self-employed (cases c and f)	0	0	0	0	0
5. The self-employed without a company code (case a and d)	58 224	28 352	23 929	43.6	11.1
6. The self-employed with a link to establishment through company code (case 3. above)	46 207	17 990	19 085	43.9	10.6

When we look at the company side in Table 4, companies can be divided into two groups having positive entrepreneurial labor input and having entrepreneurial labor of at least 0.5 full-time employment equivalents. The latter group comprises less than half of all "entrepreneurial companies". One third of all "entrepreneurial companies" (case 1) have a link to one self-employed in the FLEED, whereas 39% of the companies with at least 0.5 entrepreneurs (case 2) have a link to one self-employed. As expected, there are no companies with links to more than one self-employed. When we compare the sales and wages in the different samples, the averages are higher in companies with more entrepreneurial labor input. This may be partly explained by the fact that there is a positive correlation (0.26) between positive entrepreneurial labor input and total labor input. Similarly to earlier findings on linked entrepreneurs, for linked companies, the mean sales and wages are lower than the average. For companies with linked self-employed the median wage sum is, in fact, zero.

Table 4. The number and characteristics of "entrepreneurial companies" by different cases in the business sector in 1995

Case	Nobs	Average sales (€)	Median sales (€)	Average wage sum (€)	Median wage sum (€)
1. Companies with positive entrepreneurial labor input (cases B, C, D, G, H and I)	128 206	163 254	51 129	15 432	0
2. Companies with entrepreneurial labor input not less than 0.5 (cases B, C, D and H)	57 538	290 789	97 381	26 864	1009
3. Case 1 and a link with one self-employed	42 117	79 484	41 038	4 384	0
4. Case 2 and a link with one self-employed	16 537	135 033	68 789	7 026	0

Furthermore, we can use information on the establishments in the BR that can be linked with "entrepreneurial companies" and the self-employed. Table 5 shows that around 30% of establishments belonging to companies with entrepreneurial labor input can be matched with the self-employed in both cases 1 and 2. Moreover, sales and wages correspond to the company-level averages. To summarize, it seems that the BR samples cover only a limited number of the self-employed and the representativeness of the samples could be better.

Table 5. The number and characteristics of establishments that can be linked with the self-employed in the business sector in 1995

Case	Nobs	Average sales (€)	Median sales (€)	Average wage sum (€)	Median wage sum (€)
1. Establishments that are owned by companies with positive entrepreneurial labor input	131 872	158 466	52 138	15 003	0
2. Establishments that are owned by companies with entrepreneurial labor input not less than 0.5	71 621	243 954	85 944	22 447	841
3. Case 1 and a link with one self-employed	42 492	78 537	41 206	4 345	0
4. Case 2 and a link with one self-employed	21 416	115 621	60 884	5 919	0

Finally, we will examine the sectoral coverage of the self-employed with a link to the Business Register over the period 1991–2000. Table 6 shows the number of the linked self-employed in the FLEED in relation to the number of entrepreneurs according to the National Accounts in the main sectors. For the entire business sector, the coverage varies between 45% and 33% declining over the period. In total manufacturing (CDE), the number of linked entrepreneurs is on average one third of the NA figures. The covered proportions are somewhat higher in construction (F), wholesale and

retail trade (G) and transport and communication (I), whereas the coverage is lower in hotels and restaurants (H) and real estate and business services (K).

Table 6. The number of the linked self-employed in the FLEED in relation to the National Accounts by sector in the business sector

	Linked in FLEED/National Accounts (%)							FLEED	NA
	CDE	F	G	H	I	K	Total	Nobs	Nobs
1991	38.3	39.9	50.9	34.1	77.3	22.9	44.7	58 710	131 400
1992	36.3	32.8	51.8	31.9	64.7	21.7	40.8	51 732	126 900
1993	33.6	37.2	51.1	27.0	66.8	21.7	40.8	49 950	122 400
1994	35.0	37.0	45.4	28.5	62.3	19.3	38.3	47 354	123 500
1995	32.6	36.9	46.3	31.1	60.3	16.9	36.7	47 666	129 900
1996	27.6	33.4	39.9	28.9	57.6	18.0	34.0	45 941	135 300
1997	27.6	34.4	36.9	24.2	57.2	20.9	33.8	47 762	141 200
1998	33.4	36.8	39.7	23.8	58.3	21.5	35.8	49 123	137 200
1999	29.2	35.8	38.6	21.6	55.8	20.2	33.6	47 878	142 400
2000	31.9	38.4	39.4	21.5	56.8	20.8	34.7	50 421	145 400

2.2.2 LINKING WITH THE FINANCIAL STATEMENTS STATISTICS DATA

The Financial Statements Statistics (FSS) include information on company balance sheets and income statements allowing the calculation of various financial indicators. According to Table 7, the number of self-employed that can be linked to the FSS data in 1995 closely corresponds to the number of matches when using the BR data. In addition, the average characteristics of the self-employed remain very similar.

Table 7. The number and characteristics of the self-employed linked with the Financial Statements Statistics data in the business sector in 1995

Case	**Nobs**	**Average earnings (€)**	**Average taxable income (€)**	**Average age**	**Average no. of schooling years**
Self-employed linked to the Financial Statements Statistics data	47 270	17 705	18 799	43.9	10.6

The Financial Statements Statistics also allow the comparison of some financial indicators between all companies and "entrepreneurial companies" that have a link to a self-employed person in the FLEED. [3] Unfortunately the FSS does not include any information on entrepreneurial labor input. Table 8 reveals that the "entrepreneurial companies" have lower sales and wages than the average, which corresponds to the earlier results with the BR data. In addition, the average value added per employee is lower in "entrepreneurial companies", whereas profitability measured by the operating margin ratio is higher than the FSS average. Average return on total assets (ROA) is very high in both groups. "Entrepreneurial companies" seem to have considerably lower relative indebtness,

[3] Financial indicators are calculated as unweighted averages.

measured by the ratio of debts to sales, than the average. The ratio of financial expenses to long-term debts is also relatively lower in "entrepreneurial companies". The quick ratio and the current ratio seem to indicate that liquidity does not differ much between these two samples. One should be, however, careful especially when comparing these indicators between "entrepreneurial" and "non-entrepreneurial" companies. To give an example, it seems highly likely that the operating margin includes a considerable amount of compensation for labor input conducted by the self-employed.

Table 8. The number and characteristics of "entrepreneurial companies" in the Financial Statements Statistics data in the business sector in 1995

	1. All companies	**2. Companies with a link with one self-employed**
Nobs	186 594	47 270
Average sales (€)	894 429.6	98 667.4
Median sales (€)	64 205.0	41 418.5
Average wage sum (€)	113 067.9	7 440.6
Median wage sum (€)	4 204.7	0.0
Average value added/person (€)	44 410.7	35 291.1
Average operating margin/sales (%)	23.6	39.4
Average return on total assets (%)	314.8	382.5
Average debts/sales (%)	81.2	34.6
Average financial expenses/long-term debts (%)	102.5	26.2
Average quick ratio	4.9	4.7
Average current ratio	6.4	6.2

2.2.3 LINKING THE SELF-EMPLOYED TO OTHER COMPANY DATA

Information on the innovative activity of entrepreneurs would offer interesting possibilities for research. However, the R&D Statistics and Innovation Surveys of Statistics Finland mostly include a sample of larger companies. As a consequence, no entrepreneurial links are available in 1995 to the R&D data and only 9 self-employed can be matched with the innovation survey in 1996. With the patent data we could expect more matches, but it turns out that we only can find two self-employed with a link to a company that has applied for at least one patent in Finland in 1995 These findings emphasize the need to find another solution in order to analyze the role of the self-employed in innovations.

2.3 LINKING NON-LINKED

2.3.1 LINKING WITH BACKGROUND INFORMATION

Background information on the self-employed and companies can be used as an attempt to increase the number of matches. Matching procedure is done in 5 steps using information on the municipality and industry available for both the self-employed and companies.

The most reliable cases are those where the self-employed can be directly linked to the company code, which is the same as the personal identity code (quality=1).[4] In the second step, self-employed are matched to companies with the same industry code at the 5-digit level and, in addition, requiring that the municipality where the person inhabits is the same as the municipality of the company. In most cases there are more than one matches, so, in the first place, we only accept the unique matches (quality=2). Secondly, if there are more than one self-employed linked to a company, we choose the one with the highest entrepreneurial income. Correspondingly, if there are more than one companies linked to a self-employed, we choose the one with the highest entrepreneurial labor input (quality=3).

To further loosen the criteria, we require that the self-employed inhabits in one of those communities of residence where most of the company's employees inhabit. In this main functional region (or travel-to-work area) of the company, we only include those communities where more than 25% of the personnel inhabit. This usually consists of 1–2 communities.[5] Only unique matches are accepted with the same 5-digit industry (quality=4) or 4-digit industry (quality=5). Finally, the match with the highest quality is chosen for each self-employed and company.

Table 9 shows the number of matches after the linking procedure is done for years 1995 and 1997 with the FLEED and the BR data. There is an 11% increase in the total number of linked observations in 1995 when compared to the directly linked cases (quality=1), and only a 7% increase in 1997. This would suggest that linking with background information does not have a large effect on the coverage of the sample.

Table 9. The number of matches after linking with location and industry in the business sector in 1995

Quality	1995	1997
1	47 676	47 777
2	1 107	547
3	3 770	2 420
4	27	6
5	262	223

2.3.2 LINKING WITH REGISTERS ON OWNERSHIP

Linking self-employed and companies by means of background information concerning industry, location and the mode of income is an incomplete and inaccurate method. Another option is to try to obtain the links from the registers on ownership. Taxation authorities have data on those individuals and companies that are the owners of the company and to whom the company has paid a dividend. Of course, many companies have several owners and many self-employed have ownership in several companies. It is useful to focus on the links between the primary entrepreneurs and the primary companies. An additional complication may be due to fact that an individual may be an owner of a company through one or more companies. In some cases identification of the ultimate beneficiary individual owners may be a very challenging task to do. On the other hand, most of the cases are likely to be quite simple. As long as we are interested mainly in those entrepreneurs whose main aspiration is to exercise their profession in their own company, these kinds of linked data will probably suffice quite well.

[4] There are 10 cases where the person does not have a company code in the FLEED but can be directly linked with the BR company code on the basis of the personal identity code. This explains the different number of observations in Table 3.
[5] The number of matches did not increase notably when the travel-to-work area was defined more widely, e.g., using 10% threshold.

3 SOME DESCRIPTIVE ANALYSIS ON SELF-EMPLOYMENT WITH THE FLEED

One great advantage of the FLEED data is that it is covers all working-age persons over a relatively long period. Thus, the data allow us to compare characteristics of the self-employed with those of wage-earners or the unemployed, for example. Furthermore, it is possible to study transitions between different groups over time.

In the following exercise we identify 5 different groups from the FLEED:

Group 1 The self-employed in the business sector

Group 2 Full-year wage-earners in the business sector (those who have not received any unemployment payments during the year)

Group 3 Less than full-year wage-earners in the business sector (those who have received some benefit payments during the year but the benefits are less than earnings, i.e. wages plus entrepreneurial income)

Group 4 The unemployed (those whose insurance benefits exceed earnings)

Group 5 Other (those who are not in the work force in the business sector; workers in the public or agriculture sectors, students, house wives etc.)

Figure 2 provides us with a graphical illustration of the increase in jobs for the wage-earners and the decline in the number of the self-employed especially during the recovery period 1994–1996.

Figure 2. The number of the self-employed (group 1) and the wage-earners (group 2) in the business sector in 1995

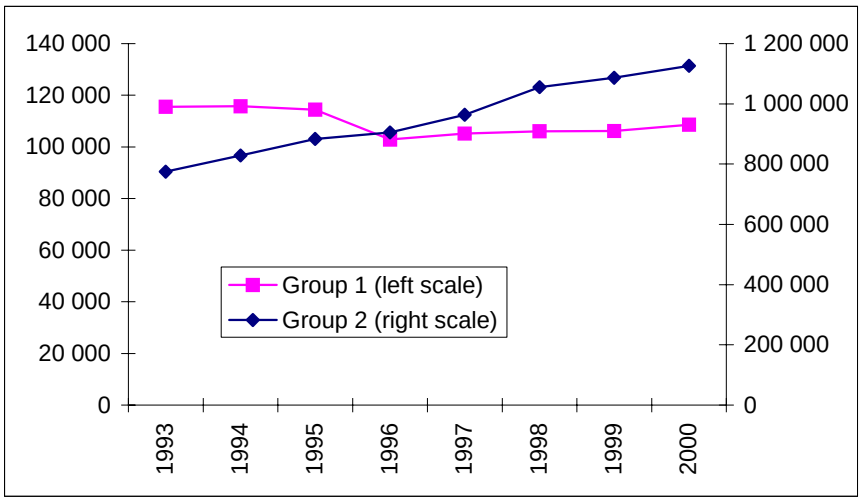
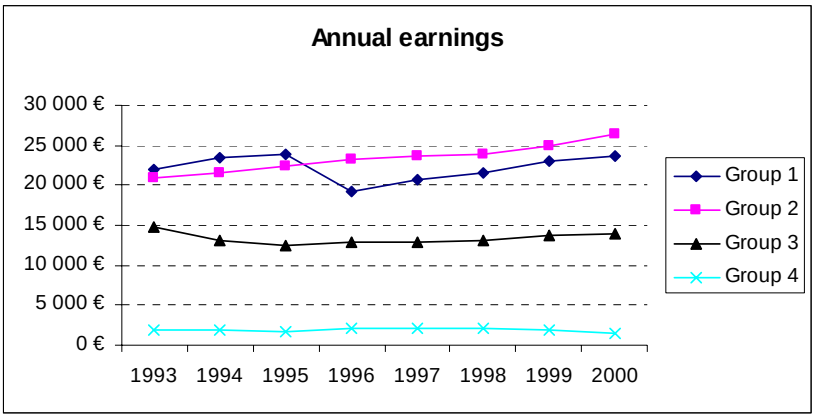


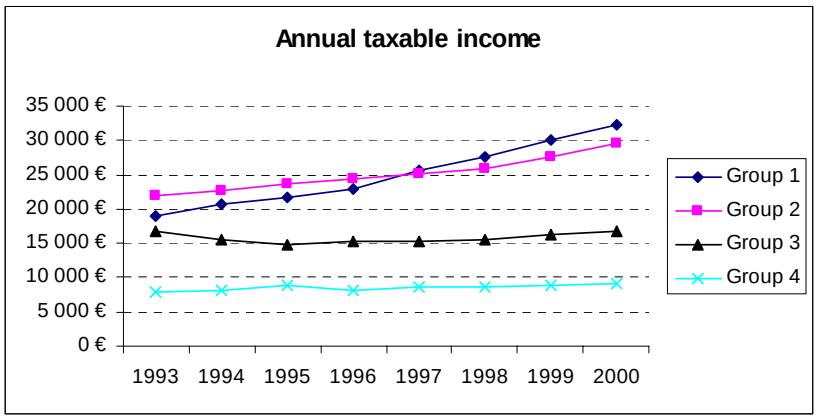
Figure 3 shows annual earnings (wages plus entrepreneurial earnings) and annual taxable income of each group in 1993–2000. According to the figure, there appears to be a decline in earnings of the self-employed in 1996.

One problem with this measure of earnings is that capital income is excluded, which may be an important part of the income of the self-employed. Furthermore, opportunities and incentives to shift entrepreneurial earnings to capital income may have changed over time. Indeed, when we look at the development of taxable income, which includes taxable earnings and capital income, we find that development has been substantially more favorable among the self-employed. The increase in income has been more rapid among the self-employed than among full-year wage-earners. Of course, compositional changes may have played a role here. This issue will be tackled later by looking at the development of income in the context of analyzing transitions of the individuals between the groups from year to year.

Figure 4 indicates, among other things, that on average, wage-earners have much higher number of schooling years compared to the self-employed. The increase in the average years of schooling has been relatively similar among different groups. Average age of the self-employed is higher than among the wage-earners (or other groups), and it is rising, in contrast to that of the full-year wage-earners.

Figure 3. Annual earnings and income by group in 1993–2000 in the business sector in 1995





Note: group 1 = self-employed, group 2 = full year wage-earner, group 3 = wage-earning and unemployment during the year, group 4 = unemployment insurance benefit is the main source of income.

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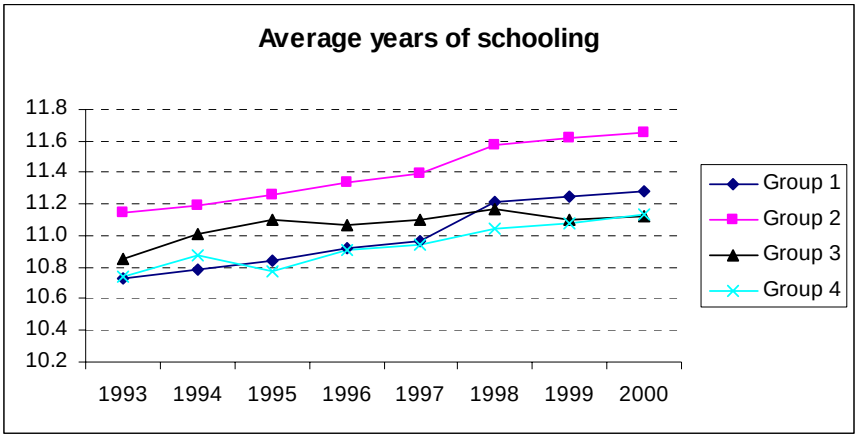
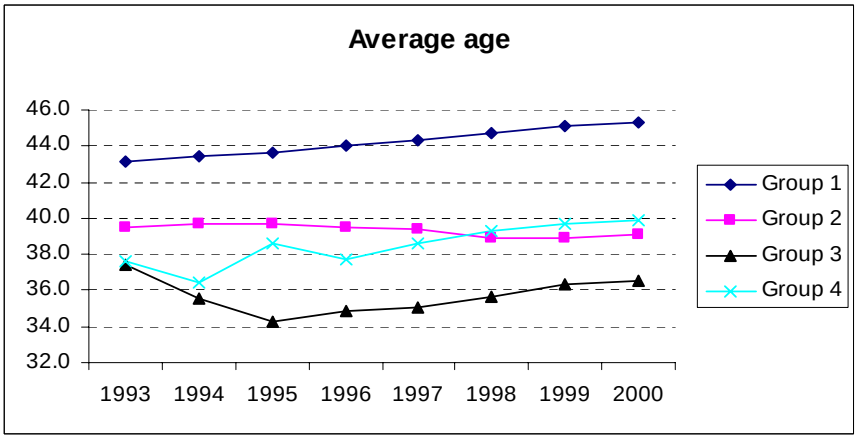
Figure 4. Average years of schooling and average age of the groups in the business sector in 1995





Note: group 1 = self-employed, group 2 = full year wage-earner, group 3 = wage-earning and unemployment during the year, group 4 = unemployment insurance benefit is the main source of income.

Table 10 describes the transitions of individuals between the groups from year to year according to the FLEED.[6] We find that in the business sector 79–89 percent of the self-employed remain self-employed in the following year. The second common destination of the self-employed is outside the labor markets.

We also find that unemployment is positively related to the propensity to become self-employed. Those who have experienced unemployment in some degree have a higher propensity to become self-employed than those who have not obtained any unemployment benefits. Further, the propensity to become self-employed is highest among those whose main source of income is unemployment insurance benefit. These findings are consistent with those by Johansson (2000), for example.

[6] For earlier analysis on the transitions between self-employment, wage-earning and unemployment with the Finnish data on individuals, see Uusitalo (2001), Holm and Onnela (2004), and Poutvaara and Tuomala (2004).

Table 11 reports the relative levels of taxable income in different groups, the reference being those who are self-employed both in the current and previous year. Usually those individuals who have moved from the self-employment to the wage-earning enjoy the highest income. The gap to other groups has widened rapidly over time and is remarkably high in 2000. At the same time, the income levels of the continuing self-employed have increased relative to the levels of the continuing full-year wage-earners.

Table 12 shows the growth rate of taxable income from year to year in different groups. Over the whole period 1994-2000, the average growth rate has been somewhat higher for the continuing self-employed than for the continuing full-year wage-earners, mostly due to relatively strong growth among the former group in years 1993-94 (10%) and especially in 1996-97 (15%). We also find that those unemployed who move to self-employment experience much higher income growth than those who move to the full-year wage-earning. This can be largely understood by the fact that the initial income level is so low in the former group. In other words, the unemployed with very low income seem to have a higher propensity to become self-employed than the unemployed with higher income. As can be seen in Table 11, those who move from unemployment to self-employment usually enjoy clearly lower income levels than those who move from unemployment to wage-earning. However, the gap has been diminishing.[7]

These findings are consistent with the view that those who have very low initial income levels are more willing to become low-income self-employed, especially in the years of economic hardship. While there is an increasing amount of opportunities to wage-earning for less-skilled and low-income individuals, this might provide at least a partial explanation for the different growth paths of the number and average income level of the self-employed when compared to the wage-earners. On the other hand, the improvement in the economic conditions seems to have offered better opportunities to increase income by moving from self-employment to full-year wage-earning, as can seen in Table 12.

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Deleted: Table 7 reports the relative levels of taxable incomes between the groups, the reference being those who were self-employed both in the current and previous year. Usually those individuals who have moved from the self-employment to the wage-earning enjoy the highest incomes. The gap to other groups has widened rapidly over time and was remarkably high in 2000. At the same time, the income level of the continuing self-employed has increased relative to the level of the continuing full year wage-earners. ¶

Deleted: Table 8 shows the growth rate of taxable income from year to year in the different groups. The average growth rate has been somewhat higher for the continuing self-employed than for the continuing full year wage-earners, mostly due to strong growth among the former group in years 1994 and in 1997 in particular. We also find that those unemployed who move to self-employment experience much higher income growth than those who move to the full year wage-earning. This can be largely understood by the fact that the initial income level is so low in the former group. In other words, the very low income unemployed seems to have higher propensity to become self-employed than higher income unemployed. As can be seen in the table, those who moved from unemployment to self-employment enjoy usually clearly lower income level than those moved from unemployment to wage-earning. However, the gap has been diminishing. These findings are in keeping with the view that those who have very low initial incomes are ready to go in for low income self-employment and especially in the years of economic hardship. While there is an increasing amount of opportunities to wage-earning for less skilled and low income individuals this might provide at least a partial expl ... [1]

[7] For a more comprehensive analysis with econometric methods on these issues with Finnish data, see Poutvaara and Tuomala (2004)

Table 10. The distribution of transitions between groups from year to year

		Group in *t* + 1					
Year	**Group in *t***	**1**	**2**	**3**	**4**	**5**	**Total**
1993	1	85.6 %	2.4 %	0.3 %	4.3 %	7.3 %	100.0 %
	2	0.5 %	86.9 %	2.8 %	1.1 %	8.8 %	100.0 %
	3	0.4 %	55.8 %	24.3 %	5.0 %	14.4 %	100.0 %
	4	1.6 %	1.5 %	7.2 %	58.1 %	31.7 %	100.0 %
	5	0.3 %	2.5 %	2.2 %	7.5 %	87.5 %	100.0 %
1994	1	84.8 %	3.1 %	0.3 %	4.0 %	7.7 %	100.0 %
	2	0.4 %	88.3 %	1.8 %	0.8 %	8.6 %	100.0 %
	3	0.5 %	56.5 %	19.5 %	4.8 %	18.7 %	100.0 %
	4	1.5 %	2.4 %	7.3 %	55.0 %	33.8 %	100.0 %
	5	0.3 %	2.8 %	1.9 %	7.2 %	87.8 %	100.0 %
1995	1	78.9 %	3.5 %	0.3 %	3.5 %	13.8 %	100.0 %
	2	0.4 %	87.5 %	2.9 %	0.8 %	8.5 %	100.0 %
	3	0.5 %	49.9 %	22.6 %	5.6 %	21.4 %	100.0 %
	4	1.2 %	1.9 %	5.8 %	50.7 %	40.4 %	100.0 %
	5	0.2 %	2.9 %	2.0 %	6.8 %	88.1 %	100.0 %
1996	1	88.4 %	3.2 %	0.2 %	2.7 %	5.5 %	100.0 %
	2	0.4 %	89.4 %	2.1 %	0.5 %	7.6 %	100.0 %
	3	0.5 %	55.2 %	22.6 %	3.6 %	18.0 %	100.0 %
	4	1.2 %	2.4 %	7.7 %	50.8 %	37.9 %	100.0 %
	5	0.2 %	3.5 %	2.3 %	5.9 %	88.0 %	100.0 %
1997	1	88.8 %	3.4 %	0.2 %	2.6 %	5.0 %	100.0 %
	2	0.4 %	90.0 %	2.2 %	0.5 %	6.9 %	100.0 %
	3	0.5 %	54.9 %	21.5 %	4.1 %	19.1 %	100.0 %
	4	1.2 %	2.8 %	7.3 %	52.3 %	36.4 %	100.0 %
	5	0.2 %	4.8 %	2.3 %	5.4 %	87.4 %	100.0 %
1998	1	88.2 %	3.3 %	0.2 %	2.6 %	5.6 %	100.0 %
	2	0.4 %	87.1 %	2.9 %	0.6 %	9.0 %	100.0 %
	3	0.5 %	50.5 %	23.8 %	4.8 %	20.4 %	100.0 %
	4	1.2 %	2.6 %	6.5 %	51.6 %	38.1 %	100.0 %
	5	0.2 %	4.4 %	2.0 %	4.9 %	88.5 %	100.0 %
2000	1	89.0 %	2.4 %	0.2 %	2.8 %	5.5 %	100.0 %
	2	0.4 %	87.8 %	2.1 %	0.7 %	9.1 %	100.0 %
	3	0.4 %	53.0 %	23.7 %	4.1 %	18.8 %	100.0 %
	4	1.3 %	2.6 %	7.1 %	51.0 %	38.0 %	100.0 %
	5	0.3 %	4.4 %	2.0 %	4.9 %	88.4 %	100.0 %

Note: group 1 = self-employed, group 2 = full year wage-earner, group 3 = wage-earning and unemployment during the year, group 4 = unemployment insurance benefit is the main source of income, group 5 = other.

Table 11. The relative taxable income between groups in the business sector in 1995 (reference is those that are self-employed both in initial and end year = 100)

		Taxable income in $t+1$				
Year	**Group in t**	**1**	**2**	**3**	**4**	**5**
1993	1	100	109	63	21	73
	2	100	110	83	49	71
	3	77	93	80	49	64
	4	54	71	62	36	41
	5	67	60	67	35	56
1994	1	100	111	62	22	71
	2	99	110	75	45	70
	3	72	88	71	43	62
	4	54	72	59	33	41
	5	63	57	61	35	56
1995	1	100	119	58	21	69
	2	95	109	78	44	69
	3	65	81	69	42	60
	4	52	66	55	31	41
	5	70	53	59	33	58
1996	1	100	115	57	24	72
	2	88	99	68	37	57
	3	61	73	63	35	50
	4	47	58	50	28	34
	5	64	48	54	30	50
1997	1	100	137	59	33	78
	2	92	98	66	36	58
	3	58	71	59	32	50
	4	45	56	47	27	34
	5	63	42	50	26	52
1998	1	100	142	49	33	79
	2	94	96	64	34	49
	3	58	65	56	31	46
	4	47	49	43	25	31
	5	71	40	47	25	49
1999	1	100	182	48	36	76
	2	98	94	59	34	47
	3	54	65	54	28	43
	4	45	50	41	24	29
	5	69	40	46	23	47

Note: group 1 = self-employed, group 2 = full year wage-earner, group 3 = wage-earning and unemployment during the year, group 4 = unemployment insurance benefit is the main source of income, group 5 = other.

Table 12. The relative growth of taxable income between groups in the business sector in 1995 (reference is those that are self-employed both in initial and end year)

		Group in $t+1$				
Year	**Group in t**	**1**	**2**	**3**	**4**	**5**
1993	1	10 %	5 %	6 %	-63 %	-2 %
	2	-4 %	6 %	-1 %	-36 %	-10 %
	3	-5 %	11 %	6 %	-24 %	-5 %
	4	89 %	56 %	47 %	-2 %	18 %
	5	17 %	29 %	16 %	-20 %	2 %
1994	1	8 %	17 %	5 %	-65 %	-8 %
	2	-2 %	8 %	-1 %	-39 %	-8 %
	3	4 %	21 %	10 %	-23 %	2 %
	4	95 %	66 %	59 %	0 %	23 %
	5	18 %	42 %	31 %	-15 %	5 %
1995	1	4 %	16 %	-12 %	-66 %	-5 %
	2	-4 %	6 %	-3 %	-40 %	-9 %
	3	1 %	24 %	10 %	-22 %	4 %
	4	108 %	64 %	63 %	-1 %	19 %
	5	14 %	41 %	26 %	-20 %	4 %
1996	1	15 %	40 %	1 %	-48 %	2 %
	2	3 %	7 %	-4 %	-43 %	-14 %
	3	4 %	23 %	10 %	-27 %	1 %
	4	124 %	70 %	65 %	1 %	23 %
	5	21 %	49 %	27 %	-20 %	4 %
1997	1	9 %	40 %	7 %	-40 %	1 %
	2	5 %	9 %	-5 %	-45 %	-9 %
	3	5 %	26 %	10 %	-29 %	2 %
	4	96 %	70 %	64 %	0 %	23 %
	5	17 %	46 %	28 %	-21 %	5 %
1998	1	11 %	48 %	0 %	-39 %	7 %
	2	5 %	10 %	-5 %	-43 %	-10 %
	3	17 %	25 %	8 %	-28 %	0 %
	4	100 %	76 %	67 %	1 %	26 %
	5	18 %	47 %	25 %	-21 %	6 %
1999	1	10 %	104 %	8 %	-37 %	2 %
	2	2 %	11 %	-4 %	-48 %	-14 %
	3	11 %	26 %	11 %	-29 %	1 %
	4	97 %	84 %	72 %	3 %	27 %
	5	12 %	53 %	28 %	-21 %	5 %

Note: group 1 = self-employed, group 2 = full year wage-earner, group 3 = wage-earning and unemployment during the year, group 4 = unemployment insurance benefit is the main source of income, group 5 = other.

4 CONCLUSIONS

The Finnish Longitudinal Employer-Employee Data have various properties that are useful in the analysis of the self-employment. For more ambitious efforts in the field of entrepreneurial analysis, some further steps, however, will be needed to develop the data. The registers on the ownership and paid dividends that are compiled by the taxation authorities provide us with promising opportunities to trace out the links between the entrepreneurs and their businesses. In many cases, the distinction between the entrepreneurs and the wage-earners is by no means unambiguous (see e.g. p. 218 in Kangasharju & Pekkala, 2002). The extended FLEED data might give an exceptionally powerful tool for disentangling this issue comprehensively. It is worth noting that these kinds of data would also be useful for studying more general questions, for example, how much does the ownership of the company encourage employers or employees to exert more efforts for their employer or for their companies?

We have conducted some descriptive analysis on the self-employed. The main motivation for this exercise is to evaluate the suitability of the data for various purposes. Furthermore, our brief analysis brings up some interesting findings about self-employment. Our rough methods yield some evidence giving support to the view that in many cases individuals have entered self-employment as a last resort. Comprehensive micro data with detailed information on individuals and their businesses, together with more sophisticated methods, allows distinguishing different circumstances. When is self-employment a superior opportunity to put one's creativity into effect and when is it the second-worst option?

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Table 8 shows the growth rate of taxable income from year to year in the different groups. The average growth rate has been somewhat higher for the continuing self-employed than for the continuing full year wage-earners, mostly due to strong growth among the former group in years 1994 and in 1997 in particular. We also find that those unemployed who move to self-employment experience much higher income growth than those who move to the full year wage-earning. This can be largely understood by the fact that the initial income level is so low in the former group. In other words, the very low income unemployed seems to have higher propensity to become self-employed than higher income unemployed. As can be seen in the table, those who moved from unemployment to self-employment enjoy usually clearly lower income level than those moved from unemployment to wage-earning. However, the gap has been diminishing. These findings are in keeping with the view that those who have very low initial incomes are ready to go in for low income self-employment and especially in the years of economic hardship. While there is an increasing amount of opportunities to wage-earning for less skilled and low income individuals this might provide at least a partial explanation for why the growth of the number of the self-employed has not paralleled with that of the wage-earners and the average income level of the self-employed has increased over time. On the other hand, the improvement in the economic conditions seem to have offered better opportunities to increase incomes by moving from self-employment to full year wage-earning as can seen in Table 8.

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