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ENTRY, AGE AND SECTORAL SPECIALISATION OF VIENNESE FIRMS

This paper presents selected empirical facts pertaining to firm entries in Vienna. The age of firms in Vienna approximately corresponds to those in Austria as a whole. The median of the age distribution is 10 years. The greatest contribution to the most recent wave of new entries stems from personal and social services, as well as to software-intensive services. The econometric estimations indicate that in addition to the sector in which the firm is active, two other factors play a particularly important role in explaining the entry rate: the minimum efficient scale has a significantly negative effect (internal returns to scale); in contrast, the extent of horizontal clustering exerts a high and significantly positive influence (external returns to scale).

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In addition to the ongoing process of growth and change within existing enterprises, the entry of new firms is the major driving force of the continuous regeneration of an economic location's technological, managerial and entrepreneurial resources. *Mayerhofer* (1998) has identified the following social and economic goals, which are positively influenced by the establishment of new enterprises:

1. *Social mobility*: As an alternative to the traditional modes of ascending the social ladder within existing organisations, the founding of a firm enables the entrepreneur to develop and improve his or her own economic existence.
2. *Innovation*: As new firms find and develop their own market niches, they simultaneously contribute to greater product differentiation, and thereby increase the diversity and quality of available products and services.
3. *Competition*: The mere prospect of new competitors' potential entry in the market increases the competitive pressure on existing firms and thereby limits the leeway for monopolistic and oligopolistic behaviour.

Together, these micro-economic factors also contribute to the achievement of meso- and macro-economic goals:

4. *Structural change*: Market entries and exits are integral to the adaptation of local production structures to continuous changes in technology and demand.
5. *Growth*: In addition to the direct increases in value added, the establishment of new enterprises stimulates structural change, competition and innovation, which are prerequisites to the safeguarding of a business location's long-term growth potential[1].
6. *Employment*: The broad range of opportunities provided by new firms to the labour market includes self-employment, the generation of additional jobs, contributions to structural change and the modernisation of production, all of which have positive repercussions on long-term job security.

According to data from the *Austrian Economic Chamber* (2002), the number of newly established enterprises in Vienna rose sharply (on average by 7.9 percent per year) between 1993 and 2001. During 2001, the number of new entries amounted to 6,318. However, 69 percent of these newly established enterprises were one-person firms under sole proprietorship, the majority of which were not listed in the commercial register. With an average annual growth rate in their number of 11.6 percent, these, the smallest of all

[1] See also *Scarpetta et al.* (2002).

firms, contributed most dynamically to new firm growth[2], while the number of all other new entries increased during the same period (1993-2001) by an average of only 2.4 percent.

The aim of this paper is to provide an up-to-date survey of the stylised facts pertaining to selected aspects of firm entries based on data for Vienna. The data set consists of a special query of the commercial register compiled by the "Kreditschutzverband von 1870" (KSV). The disadvantage of this database is the insufficient representation of one-person firms not listed in the commercial register[3]. The advantages of the KSV database can be found in the comprehensive information it provides with regard to the age structure of firms, entries and exits, as well as its highly detailed system of classification according to industries. The KSV database takes firms as the primary unit of record. Firms which are based in Vienna and are therefore represented in the corresponding data can also have operating units and employees at other locations.

Structural factors influencing age distribution and the intensity of firm entry in Vienna

The following pages provide a detailed examination of firm entries in Vienna, which will then be viewed through the framework of several industry classifications. The results of this process will not only illustrate the direction of structural change according to the general schemes of classification implemented in official statistical evaluations, but will also take into account other decisive characteristics relevant to economic interpretation.

This article is structured in three parts: The first section introduces and explains the industry classifications used. A general overview of the founding patterns and age distribution of Viennese firms follows. Finally, firm entries after 1996 are examined more narrowly. These offer, as it were, a sampling of current trends in the establishment of new enterprises, the sectoral distribution of which is investigated with respect to further influential factors, such as growth in specific industries or various factors involved in the clustering process.

Characterising industrial structure

Our approach employs three new taxonomies of the manufacturing industry, which were created at WIFO in a series of research projects undertaken on behalf of the European Commission. The taxonomies were intended to offer a coherent set of empirical tools to facilitate inquiries into the relationship between industrial performance and intangible sources of competitive advantage (*Peneder,* 2001).

Table 1: Industry classifications

Manufacturing		Services	
Taxonomy 1: Factor intensities (*Peneder*, 2001)	Mainstream manufacturing Labour-intensive industries Capital-intensive industries Marketing-driven industries Technology-driven industries	*Taxonomy 4:* Factor intensities (*Mayerhofer – Palme*, 2001)	Other industries Labour-intensive industries Capital-intensive industries Software-intensive industries
Taxonomy 2: Skill requirements (*Peneder*, 2001)	Low-skill industries Medium-skill blue-collar industries Medium-skill white-collar industries High-skill industries	*Taxonomy 5:* Skill requirements (*Mayerhofer – Palme*, 2001)	Low skill Professional, vocational training Higher degree of education Highest degree of education
Taxonomy 3: Demand for external service inputs (Peneder in *European Communities*, 2000)	Industries with high inputs from knowledge-based services Industries with high inputs from retail and advertising services Industries with high inputs from transport services Other industries	*Taxonomy 6:* Functional separation	Construction Distribution Personal and social services Producer-oriented services

All three taxonomies were developed by statistical cluster analysis – a powerful technique specifically designed for classifying observations on behalf of their relative similarities with respect to a multidimensional array of variables. The basic idea is that of dividing a body of data into segments by creating a maximum homogeneity of observations within and maximum separation between them (*Peneder,* 1995). In the end, for each taxonomy, 98 NACE 3-digit manufacturing industries were completely and posi-

[2] Some of this spectacular growth might simply be attributable to a more complete representation of firms in the data.

[3] On the other hand, the exclusion of many of these very small firms limits the distortions caused by recent changes in the social security law, which has raised the number of one-person firms.

tively categorised. The industry types are summarised in Table 1. Detailed information on the taxonomies, data sources and methodology are presented in *Peneder* (2001).

- *Taxonomy 1* focuses on the distinction between tangible and largely location-bound, versus intangible and firm-specific factors of production. It thereby extends the approach of *Davies – Lyons* (1996), who discriminate between industries according to the relative importance of endogenous sunk investments in advertising and R&D (*Sutton,* 1991). The clustering process makes use of US data for wages and salaries, investments in physical capital, advertising outlays and R&D expenditures. These are assumed to span four independent dimensions of inputs for revenue generation. Ratios to total value added have been calculated for wages and physical capital. Expenditures on advertising and R&D are represented by their ratio to total sales. The latter were directly computed from firm-level data.
- *Taxonomy 2* is directed towards the human resources dimension and distinguishes between white-collar and blue-collar workers, and then for each, the shares of, respectively, high and low-skilled labour. These data stem from the OECD and cover employment shares for a sample of developed economies.
- Finally, *Taxonomy 3* segregates industries according to differences in kind and intensity of external service inputs. It was created using US input-output tables, available at the disaggregate level of 500 × 500 industries, and reveals typical combinations of service inputs purchased via external market transactions.

With respect to research on firm entries, a fundamental limitation of Peneder's three taxonomies is rooted in the fact that they are relevant only to the manufacturing industry. In connection with a project related to the eastern enlargement of the EU, *Mayerhofer – Palme* (2001) developed similar taxonomies for the services sector. In accordance with the original intentions for their application, these classifications are based on data for Austria. Of the numerous taxonomies developed, the following two classifications will be used in this section:

- *Taxonomy 4* differentiates service sectors on the basis of information provided by the non-agricultural structural business statistics of 1995, according to their typical input ratios (factor intensities) within the production process.
- *Taxonomy 5* is based on a special evaluation of the data from the Austrian microcensus of 1998, which provided information at the disaggregated industry level regarding the relationship between skill requirements and human resources (the highest degree of education attained by each sector of the labour force).

Finally, selected results will be presented in the form of a more traditional classification of the official statistics *(Taxonomy 6 – Functional separation)*. Table 1 summarises the industry classifications, which will be used in the following analysis.

The age distribution of Viennese firms

The age distribution of Viennese firms is generally quite skewed. The information supplied by our database indicates that more than 50 percent of the firms in Vienna (that is, 29,378 firms) were founded after 1990 (Table 2). More than 22 percent were founded in the 1980s and just under 12 percent in the 1970s. The sum of all firms founded earlier than the 1970s amounts to only 13 percent of the total. Of these, 728 firms date back to the 19th century or earlier. The oldest firm registered in the database was founded in 1540.

Table 2: The age distribution of Viennese firms in the sample

Period of entry	Number of firms	Percentage share	Percentage share, accumulated
Before 1900	728	1.31	1.31
1901 to 1925	911	1.64	2.95
1926 to 1945	1,044	1.88	4.83
1946 to 1960	1,918	3.45	8.28
1960s	2,621	4.72	13.00
1970s	6,560	11.81	24.81
1980s	12,385	22.30	47.11
1990s	29,378	52.89	100.00
Total	55,545	100.00	

Source: KSV, WIFO calculations.

The average age of 17 years is not particularly relevant in light of this skewed distribution. The median of the age distribution is more meaningful and amounts to 10 years. The categorisation of firms currently active in Vienna according to their period of entry reveals characteristics specific to certain sectors, which deviate significantly from the general age structure (Table 3). By far the eldest are the firms engaged in manufacturing: only one third of the manufacturing firms located in Vienna were founded later than 1990. In the heterogeneous group "other branches" (which includes agriculture and forestry, mining, energy and water), as well as in distribution (transport and trade) less than half of firms listed were founded after 1990. In personal and social services, as well as in producer-oriented services, approximately 60 percent of the new entries took place during the 1990s. Therefore, these sectors presently have the greatest shares of young firms. The age structure in construction corresponds to the average. As a whole, firms in the service sector are considerably younger than manufacturing firms (Table 4), the average age of which is nearly 32 years and the median year of entry 1981 (as opposed to 1991 for services).

Table 3: Share of firms in the sample by period of entry and sectors

Period of entry	Other sectors	Manufacturing	Construction	Distribution	Personal and social services	Producer-oriented services	Total
				Percentage share			
Before 1900	2.04	5.46	1.34	1.55	0.47	0.53	1.41
1901 to 1925	0.00	6.06	1.86	2.08	0.47	0.59	1.74
1926 to 1945	8.16	5.49	2.51	2.45	0.69	0.80	2.00
1946 to 1960	10.20	7.48	4.56	4.46	1.52	1.98	3.63
1960s	6.12	8.00	6.84	5.37	2.43	3.27	4.77
1970s	4.08	14.83	12.13	12.52	9.03	11.01	11.83
1980s	22.45	19.65	16.35	22.81	24.36	22.77	22.02
1990s	46.94	33.04	54.41	48.75	61.03	59.05	52.60

Source: KSV, WIFO calculations.

Both the *Kruskal-Wallis* and the *Median* test confirm that there are significant differences between all three sectors. These are non-parametric methods of testing, which provide robust results even when, as is the case of the taxonomies at hand, the variances are non-homogeneous. However, neither test can determine which group deviates significantly in a specific case. Table 4 therefore also includes the results of the *Kolmogorov-Smirnov* test (on the similarity of distribution), as well as of the *Mann-Whitney* test (on the rank correlation). Both tests reveal no significant deviation for the relatively small group of "other branches". Observed differences might thus occur purely by chance and therefore cannot be interpreted. On the other hand, these tests do confirm that in comparison to the total sample of firms, those in manufacturing are significantly older and those in services are significantly younger.

With regard to their age structures, most of the categories summarised in the six taxonomies of Table 1 are comprised of significantly different populations. Tests on Taxonomies 1 to 3 are based exclusively on the entire body of manufacturing firms, while Taxonomies 4 to 6 are based on the firms in the service sector as a sole entity. Therefore, the differences between these two large sectors discussed earlier do not distort the outcome of the tests. The results are provided in detail in Table 4. At this point, it is only necessary to summarise the most important observations:

The youngest populations within the manufacturing sector can be found above all in technology-driven (median year of entry 1986) and to a lesser extent in marketing-driven industries (median year of entry 1984). In these industries, the demand for external, knowledge-intensive services is particularly high. Old industries can be found primarily in capital-intensive production (median year of entry 1973). The case is similar for mainstream manufacturing (median year of entry 1979), which exhibits no special characteristics with respect to factor intensities. Less clear are the differences in the age of firms with respect to typical skill requirements. Within the services sector, the differences between the individual categories are almost always significant due to the great number of observations. It is, however, true that in light of the dimensions, the differences are considerably less pronounced than in manufacturing. Most noticeable is the slightly higher median age in the distribution sector.

As a whole, the results for manufacturing effectively confirm that dynamic industries consisting of relatively young firms are strongly characterised by 1. the use of intangible in-

vestments in research and marketing, 2. the skill levels of their of human resources, as well as 3. the availability of specialised, knowledge-based services.

Table 4: Differences in the age of firms by type of industry

	Average age	Median year of entry	Kolmogorov-Smirnov test	Mann-Whitney test
	Years			
Other sectors	22.55	1988	–	–
Manufacturing	31.74	1981	***	***
Services	16.09	1991	***	***
Taxonomy 1: Factor intensities (manufacturing)				
Mainstream manufacturing	35.18	1979	***	**
Labour-intensive industries	31.80	1980	**	**
Capital-intensive industries	42.29	1973	**	**
Marketing-driven industries	31.18	1984	**	**
Technology-driven industries	26.35	1986	***	***
Taxonomy 2: Skill requirements (manufacturing)				
Low-skill industries	36.05	1978	***	***
Medium-skill blue collar industries	31.74	1981	-	-
Medium-skill white collar industries	28.95	1984	***	***
High-skill industries	32.05	1984	-	-
Taxonomy 3: Demand for external service inputs (manufacturing)				
Industries with high inputs from knowledge-based services	27.34	1986	***	***
Industries with high inputs from retail and advertising services	33.30	1980	**	**
Industries with high inputs from transport services	34.26	1979	*	**
Other industries	33.56	1980	-	**
Taxonomy 4: Factor intensities (services)				
Other industries	14.85	1991	***	***
Labour-intensive industries	18.72	1990	***	***
Capital-intensive industries	15.60	1991	***	***
Software-intensive industries	12.93	1992	***	***
Taxonomy 5: Skill requirements (services)				
Low skill	13.91	1992	***	***
Professional, vocational training	18.32	1990	***	***
Higher degree of education	16.29	1991	***	***
Highest degree of education	15.26	1990	***	***
Taxonomy 6: Functional separation (services)				
Construction	17.96	1991	***	-
Distribution	19.22	1989	***	***
Personal and social services	12.64	1992	***	***
Producer-oriented services	13.45	1992	***	***

Source: KSV, WIFO calculations. – * . . . significant at the 10-percent level, ** . . . significant at the 5-percent level, *** . . . significant at the 1-percent level. With respect to "age" the Kruskal-Wallis and Median tests have a 1-percent level of significance for all taxon omies.

New entries and structural change in Vienna

In this section, we investigate the significance of industry specific factors as determinants of entry rates in the sample of Viennese firms. Beginning with simple Binomial test statistics, we then apply a logit regression to estimate the impact of structural characteristics on the entry rate. Finally, a multinomial logit regression is used to detect systematic influences on the sectoral distribution of the newly founded establishments.

Just like the age distribution, average rates of entry are characterised by systematic differences between industries. This particular structural component can, for example, be depicted by the number of new entries since 1996 or by their average share in the entire stock of firms represented in the data set. Binomial tests ("new entry" or "no new entry") indicate whether the various industries deviate significantly from one another. A striking aspect of the results in Table 5 is that as expected, the average share of new entries in manufacturing is significantly smaller than in services; however, within the individual manufacturing industries, no significant deviations can be determined. Only market exits exhibit a significantly larger share of traditional manufacturing industries, as well as for industries which typically demand very high skill levels. Market exits are significantly lower in labour intensive manufacturing, as well as in medium-skill, blue-collar industries.

Table 5: Firm entry and exit by type of industry

	Entries			Exits		
	Number	Ratio to total number of firms	Binomial test	Number	Ratio to total number of firms	Binomial test
Other sectors	12	0.2449	–	4	0.0816	–
Manufacturing	608	0.1485	***	494	0.1206	***
Services	13,875	0.2694	***	4,984	0.0968	–
Taxonomy 1: Factor intensities (manufacturing)						
Mainstream manufacturing	121	0.1526	–	117	0.1475	**
Labour-intensive industries	178	0.1488	–	124	0.1037	*
Capital-intensive industries	11	0.1122	–	14	0.1429	–
Marketing-driven industries	218	0.1455	–	169	0.1128	–
Technology-driven industries	72	0.1500	–	65	0.1354	–
Taxonomy 2: Skill requirements (manufacturing)						
Low-skill industries	138	0.1317	–	136	0.1298	–
Medium-skill blue collar industries	195	0.1621	–	115	0.0956	***
Medium-skill white collar industries	219	0.1450	–	182	0.1205	–
High-skill industries	48	0.1579	–	56	0.1842	***
Taxonomy 3: Demand for external service inputs (manufacturing)						
Industries with high inputs from knowledge-based services	186	0.1588	–	135	0.1153	–
Industries with high inputs from retail and advertising services	162	0.1434	–	123	0.1088	–
Industries with high inputs from transport services	132	0.1478	–	117	0.1310	–
Other industries	122	0.1391	–	116	0.1323	–
Taxonomy 4: Factor intensities (services)						
Other industries	2,504	0.2883	***	826	0.0951	–
Labour-intensive industries	5,829	0.2533	***	2,560	0.1113	***
Capital-intensive industries	852	0.1906	***	455	0.1018	–
Software-intensive industries	3,562	0.3169	***	906	0.0806	***
Taxonomy 5: Skill requirements (services)						
Low skill	3,778	0.3230	***	1,059	0.0905	**
Professional, vocational training	4,557	0.2677	–	1,754	0.1031	***
Higher degree of education	3,483	0.2397	***	1,549	0.1066	***
Highest degree of education	929	0.2234	***	385	0.0926	–
Taxonomy 6: Functional Separation (services						
Construction	1,670	0.3078	***	639	0.1178	***
Distribution	4,499	0.2223	***	2166	0.1070	***
Personal and social services	1,630	0.3226	***	568	0.1124	***
Producer-oriented services	4,948	0.2964	***	1,374	0.0823	***

Source: KSV, WIFO Calculations. – * . . . significant at the 10-percent level, ** . . . significant at the 5-percent level, *** . . . significant at the 1-percent level.

Due to their large number, it is easier to demonstrate the significance of the observable differences between the various categories in the services sector. Most remarkable is the average share of young firms in personal and social services, as well as in construction. Aside from the entries in software-intensive services, the even larger share of new firms in services requiring no special skills is especially conspicuous. In both categories, market exits are quite low. In industries demanding high and highest skill levels, the number of entries is lower. The same is true for labour and capital-intensive services.

The founding of a firm is the primary event for the economic unit in question. Since there are no observations of previous events, the derivation of direct causal effects is impossible[4]. What nevertheless can be evaluated is the economic environment and its effects on the intensity of entry (measured according to the probability that a randomly selected firm in the KSV database was founded after 1995).

There are many factors that could conceivably be influential. The following aspects can be examined more closely with respect to the databases available for this investigation and (in light of certain restrictions) be taken as exogenous:

[4] This would require, for example, a set of observations describing the persons who founded the firms.

Market growth

Above-average growth in demand creates new business opportunities and thereby increases the incentive for entries. In principle, it should be easier for young firms to realise new ideas and establish themselves in the market, the faster the entire line of business is growing. The average growth in sales of firms within the same industry (NACE 3-digit) in the fourth quartile (*grwt*) is used as an indicator. The hypothesis to be tested is therefore: $\frac{\partial\, p\,(entry)}{\partial\, grwt} > 0$.

Internal returns to scale

Economies of scale in production occur above all when fixed investment expenditures are high (for example for plant and equipment, research and marketing), as a necessary prerequisite for sustaining the position of the firm in the market. The degression of unit costs makes them a substantial entry barrier for firms which are young, and as a rule, still small. The size of the labour force in the third quartile of each industry (*mes3*) is used as an indicator of entry barriers attributable to economies of scale. This form of measurement approaches the idea of a minimum efficient scale, taking into consideration the skewed distribution of size. A negative relationship between the probability of entry and the minimum efficient scale can be expected: $\frac{\partial\, p\,(entry)}{\partial\, mes3} < 0$.

Extent of fluctuation

It is a stylised fact that the number of market entries correlates strongly with the number of exits. The estimate must therefore also take account of the possibility that in certain industries, firm populations fluctuate to a greater extent than in others (for example, due to varying volumes of sunk investments[5]). Assuming that exits from the market create opportunities for new entries, we can therefore expect a positive relationship to the probability of entry: $\frac{\partial\, p\,(entry)}{\partial\, exit} > 0$.

External returns to scale

According to a hypothesis formulated by Alfred Marshall, a large spatial concentration of related economic activities can increase the productivity of firms based at the respective location due to external returns to scale. Because we are dealing here with economies of scale, which arise outside of the business organisation (in contrast to internal returns to scale), the incentives for new firms to enter the market at such a location increase parallel to the size of the industrial clusters. In principle, we can therefore expect a positive relationship between the extent of the clustering and entry frequency.

These external effects can arise in horizontally related lines of business (for example, when the pool of qualified workers is expanded or the diffusion of knowledge is made easier), but can also be of vertical nature (for example, through the development of specialised supplier industries). The horizontal aspects of clustering tend to encourage a larger spatial concentration of activities within an industry. A relative measure of spatial concentration is the Gini coefficient; this paper implements the localised Gini coefficient, which is based on regional employment shares (*gini*). In comparison to other relative measures of concentration, variations in the middle sections of the distribution are emphasised; the susceptibility of the results to outliers is therefore slight. A disadvantage of the Gini coefficient is that in addition to external returns to scale, it also simultaneously measures the effects of internal returns to scale. The data for the spatial distribution of activities within each industry are taken from a special query by Statistics Austria for the whole country.

Horizontal clustering

The Ellison-Glaeser Index measures the average size of work areas. It indicates to what extent the spatial concentration observed in an industry is above the level, which would result if the firms were randomly distributed throughout the same location. However, both the Ellison-Glaeser Index and the Gini coefficient share the disadvantage that spatial concentration attributable to the proximity of natural resources is also taken into ac-

[5] When, in the case of market exit, it is not possible to transform investment expenditures back into liquid assets, we speak of "sunk costs". Sunk costs compound the problems of market entry because in the case of potential bankruptcy, even well established enterprises would be willing to sell their products at prices below average cost, and even as low as marginal cost. Higher sunk costs decrease the probability of exits as well as entries.

count. In the analysis of economic activity in Vienna, this aspect is nevertheless not likely to play a significant role. With respect to this investigation, we can therefore assume that the Ellison-Glaeser Index directly reflects the extent of spatial concentration as a result of horizontal clustering (*hocl*), whereby the probability of firm entry will most likely be positively influenced: $\frac{\partial\, p\,(entry)}{\partial\, hocl} > 0$.

Vertical clustering

In order to take the influence and intensities of vertical relationships between suppliers and customers into account, the following indicators will be used in the estimation:

- the share of intermediate demand for output will serve as an indicator of "forward linkages" (*fwdl*)[6],
- the share of intermediate inputs of the industries in question measures the "backward linkages" (*bwdl*)[7].

In addition, for the large non-manufacturing branches, special sectoral dummies will be used (*sc3* . . . construction, *sc4* . . . distribution, *sc5* . . . personal and social services, *sc6* . . . producer-oriented services). The model is therefore:

$$(1)\quad \log \frac{pr\,(entry=1)}{pr\,(entry=0)} = \alpha + \beta_1\, sc3 + \beta_2\, sc4 + \beta_3\, sc5 + \beta_4\, sc6 + \beta_5\, grwt + \beta_6\, mes3 + \\ + \beta_7\, exit + \beta_8\, gini + \beta_9\, hocl + \beta_{10}\, bwdl + \beta_{11}\, fwdl + \varepsilon\ .$$

The results of the logit estimation are summarised in Table 6. The goodness of fit of the model (Pseudo R^2) is relatively small, because firm-specific variation is very large. While the dependent variable takes the values "new entry" or "no new entry" and provides the only relevant information available at the firm-specific level, the explanatory variables can offer nothing more than a description of the general surroundings on the basis of diverse characteristics of industries. It is therefore not surprising that as a whole, the variation of the independent variables at the micro level cannot be adequately explained by the exclusive use of industry characteristics. This should in no case restrain us from an evaluation of the results for the individual coefficients.

Membership in one of the four service branches increases the probability of a new entry in the firm population under investigation (Table 6). When, for example, the minimum efficient scale increases by 1 unit, then the probability of finding a young firm in the sample, founded after 1995, declines by 0.79 percentage point.

Table 6: Determinants of the entry ratio

Results from logit regression, 1996-2001

Variable		Co-efficient	Standard deviation	*t* statistic	*p* value	Marginal effects	"Odds Ratio"
Construction	*sc3*	0.8222	0.20	4.02	0.000	0.16	2.28
Distribution	*sc4*	0.5751	0.14	4.03	0.000	0.11	1.78
Personal and social services	*sc5*	0.4755	0.24	1.96	0.050	0.09	1.61
Producer-oriented services	*sc6*	0.5967	0.19	3.13	0.002	0.12	1.82
Market growth	*grwt*	0.1987	0.18	1.12	0.262	0.04	1.22
Internal returns to scale	*mes3*	– 0.2337	0.06	– 3.70	0.000	– 0.05	0.79
Exits	*exit*	– 0.0005	0.00	– 1.61	0.107	– 0.00	1.00
Gini coefficient	*gini*	– 1.0903	0.79	– 1.38	0.167	– 0.22	0.34
Ellison-Glaeser Index	*hocl*	1.6819	1.00	1.69	0.092	0.33	5.38
Backward linkages	*bwdl*	– 0.0037	0.01	– 0.65	0.515	– 0.00	1.00
Forward linkages	*fwdl*	0.0198	0.01	2.84	0.005	0.00	1.02
Constant		1.9216	1.17	1.64	0.102	.	.

Source: KSV, WIFO calculations. – Number of observations = 32,924, Wald χ^2 (11) = 136.96, *p* value = 0.0000, Pseudo R^2 = 0.0320, Log likelihood = 18,878.941.

The Gini coefficient (for which no specific expectations can be formulated with respect to the measurement of spatial concentration, without adjustments for internal returns to scale) reveals no significant marginal effects. The opposite proves to be true with respect

[6] The "Input-Output Tables for Austria", published by Statistics Austria, were the source of data used in determining the discriminating variable, which represents the forward linkages of 3-digit Austrian industries in 1990.

[7] The Non-agricultural Structural Business Statistics of 1995 provided the data for the backward linkages at base prices for the ÖNACE 3-digit level.

to the positive influence of external returns to scale, as they are measured by the Ellison-Glaeser Index. When this measurement of horizontal clustering increases by 1 unit, the probability of finding a firm founded after 1995 rises by 5.38 percentage points. With an odds ratio close to 1, the impact of the two vertical cluster-oriented indicators on user-supply relationships appears considerably less important.

The binomial tests in Table 5 illustrate that some of the entry rates in the individual sectors and industry types deviate significantly from one another. Entries are therefore indicative of a significant structural component and the question arises, as to the way in which the explanatory variables for firm entries influence the sectoral distribution of newly established enterprises.

With certain modifications, the above model can be applied to this topic. Specifically, we are concerned with the question if and in what form the factors discussed above (market growth, fluctuations in firm population, as well as internal and external returns to scale) influence the probability that entries in certain types of industry occur more frequently than in others (Table 7). Contrary to the case for the simple logit regression, which calculates the probability of the binary outcomes "new entry" or "no new entry", a multinomial logit model will be necessary. For the data set, which has been reduced to all new entries since 1996, we investigate the probability according to which entries can be expected in a certain category within a taxonomy spanning several groups. In this set-up, the probability of a new entry to occur in sector *j* relative to the manufacturing sector as the comparison group is the endogenous variable. Equation *(2)* is therefore expressed as follows:

$$(2)\quad \log \frac{pr\,(entry = j)}{pr\,(entry = c)} = \alpha + \tilde{\beta}_1\, grwt + \tilde{\beta}_2\, mes3 + \tilde{\beta}_3\, exit + \tilde{\beta}_4\, gini + \tilde{\beta}_5\, hocl + \\ + \tilde{\beta}_6\, bwdl + \tilde{\beta}_7\, fwdl + \varepsilon\ ,$$

where $\tilde{\beta}_i = \beta_{i,j} - \beta_{i,c}$.

The coefficients $\tilde{\beta}$ indicate to what extent the corresponding variable influences the probability of finding a new entry in one of the four non-manufacturing sectors *j* relative to the probability of finding it in sector c – the control group. When the variable has nearly the same effect on both probabilities, then the coefficient is correspondingly small. The value is high, when the variable has greatly differing effects on both probabilities. The estimation is carried out for all sectors $j = 1, \ldots, 4$. The results must always be interpreted relative to the control group in manufacturing.

The goodness of fit of such a model is, due to the given structure of the data, already considerably better than in the general version of the model provided in Table 6. The variation in the observations for the variable new entries versus older enterprises was eliminated right at the beginning through the omission of all firms founded before 1996. What remains is the variation in the distribution of new entries in various sectors and types, which under the application of industry specific explanatory variables is more effectively limited.

Table 7 presents the determinants of the sectoral distribution of firm entries since 1996 for the four large branches in the service sector. Manufacturing serves as the control group. Independent of the fundamental considerations discussed earlier, the goodness of fit of over 0.7 is a very good value for a multinomial logit regression. The success of the model is further underlined in Table 8, which enables the comparison of observed realisations with predicted values. The last column provides the actual and the last line presents the predicted distributions for the five sectors (including the comparison group). The values found along the diagonal express the number of enterprises, which by means of the model can be correctly assigned to their respective sectors. In this specific case, the figures amount to 9,930 of the 13,355 new entries registered by the KSV since 1996, which means that the share of successful predictions exceeded 74 percent (with five possible alternative classifications for each individual observation).

Table 7: Determinants of the sectoral distribution of firm entries

Results from multinational logit regression, 1996-2001

		Coefficient	Standard deviation	*t* statistic	*p* value	Marginal effects
Construction						
Market growth	*grwt*	– 6.2386	4.02	– 1.55	0.120	– 0.0062
Internal returns to scale	*mes3*	– 2.3834	1.39	– 1.72	0.086	– 0.0017
Exits	*exit*	0.0816	0.05	1.59	0.111	– 4.8e-06
Gini coefficient	*gini*	– 87.1563	37.84	– 2.30	0.021	– 0.0522
Ellison-Glaeser Index	*hocl*	57.4092	19.82	2.90	0.004	0.0377
Backward linkages	*bwdl*	– 0.0707	0.10	– 0.70	0.485	– 0.0002
Forward linkages	*fwdl*	0.2845	0.24	1.17	0.243	0.0002
Constant		40.3093	20.25	1.99	0.047	
Distribution						
Market growth	*grwt*	1.6896	2.15	0.79	0.432	– 0.7261
Internal returns to scale	*mes3*	0.4062	0.67	0.60	0.547	0.2860
Exits	*exit*	0.0870	0.05	1.72	0.086	– 0.0011
Gini coefficient	*gini*	– 22.4303	16.39	– 1.37	0.171	– 7.6036
Ellison-Glaeser Index	*hocl*	– 1.4740	34.84	– 0.04	0.966	– 3.2426
Backward linkages	*bwdl*	0.1485	0.09	1.60	0.110	– 0.0098
Forward linkages	*fwdl*	– 0.0537	0.13	– 0.40	0.689	0.0057
Constant		– 10.7191	13.16	– 0.81	0.415	
Personal and social services						
Market growth	*grwt*	– 3.8911	5.42	– 0.72	0.472	– 0.0021
Internal returns to scale	*mes3*	– 8.6123	5.15	– 1.67	0.095	– 0.0027
Exits	*exit*	0.0938	0.05	1.76	0.078	1.6e-06
Gini coefficient	*gini*	18.7981	33.50	0.56	0.575	0.0096
Ellison-Glaeser Index	*hocl*	– 147.2666	62.77	– 2.35	0.019	– 0.0470
Backward linkages	*bwdl*	0.0680	0.14	0.47	0.637	– 0.0000
Forward linkages	*fwdl*	0.3135	0.31	1.02	0.306	0.0001
Constant		116.5122	65.46	1.78	0.075	
Producer-oriented services						
Market growth	*grwt*	5.3806	1.97	2.73	0.006	0.7343
Internal returns to scale	*mes3*	– 1.0197	0.91	– 1.13	0.260	– 0.2816
Exits	*exit*	0.0926	0.05	1.81	0.071	0.0011
Gini coefficient	*gini*	16.0608	13.54	1.19	0.235	7.6461
Ellison-Glaeser Index	*hocl*	14.9083	7.26	2.05	0.040	3.2519
Backward linkages	*bwdl*	0.1984	0.11	1.88	0.060	0.0100
Forward linkages	*fwdl*	– 0.0838	0.13	– 0.67	0.503	– 0.0061
Constant		0.4178	13.52	0.03	0.975	

Source: KSV, WIFO calculations. – Endogenous variable: Probability of entry in one of the four service sectors relative to probability of entry in manufacturing.

Table 8: The sectoral distribution of firm entries in Vienna 1996-2001

Observed versus predicted observations for the multinational logit modell

	Number of firms in sector (predicted)					Total (observed)
	Manufacturing	Construction	Distribution	Personal and social services	Producer-oriented services	
Number of firms in sector (observed)						
Manufacturing	289	23	26		270	608
Construction		1,189			481	1,670
Distribution	15		2,637	83	1,764	4,499
Personal and social services	21			1,055	554	1,630
Producer-oriented services	10		178		4,760	4,948
Total (predicted)	335	1,212	2,841	1,138	7,829	13,355

Source: KSV, WIFO calculations.

The constant not only takes account of differences in the number of entries (which are not influenced by outside factors), but also of the varying sizes of the groups and of general sectoral differences in the entry rates. The coefficients for the individual variables must therefore always be interpreted in relation to the control group in manufacturing. This means, for example, that in the case of a positive co-efficient for horizontal cluster-

ing in producer-oriented services, external returns to scale increase the probability of a new entry in producer-oriented services relative to manufacturing.

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Entry, Age and Sectoral Specialisation of Viennese Firms – Summary

This paper presents selected empirical facts pertaining to firm entries in Vienna. The research is based on data supplied by the "Kreditschutzverband von 1870" (KSV), which contains information regarding not only the age structure, but also sales and employment for a comprehensive sample of firms. Among the more general observations, the following four findings stand out:

1. *Industrial structure*: Vienna is a central location for producer-oriented services. Nearly 30 percent of all Viennese firms registered by the KSV fall into this category; their share is more than 10 percentage points higher in Vienna than in the average throughout Austria. Significantly smaller in number are the Viennese firms engaged in manufacturing (a 7 percent share in Vienna, as compared to 12 percent for the rest of Austria). In Austria as a whole, as well as in Vienna, the greatest share of all firms (nearly 35 percent) is engaged in distributional services.
2. *Age structure*: The age of firms in Vienna approximately corresponds to that in Austria as a whole. The median of the age distribution is 10 years. Firms in manufacturing (median year of entry 1981) are generally older than those in services (median year of entry 1991). Industries, which are strongly characterised by the use of intangible investments in research and marketing, by the skill levels of their human resources, and by the availability of specialised, knowledge-based services, consist to a great extent of younger firms.

When analysing the various factors which influence entry activity, we should consider the fact that the founding of a firm is the primary event for the economic unit in question. From information about the firm itself, it is neither possible to observe previous events nor to deduce causal effects. Available data, however, enable an investigation of selected aspects of the business environment and the influence of various structural factors on the probability of a new entry.

3. *Structure of new entries*: The greatest contribution to the most recent wave of new entries is attributable to personal and social services, as well as to software intensive services. In both groups, the share of new entries since 1996 amounts to more than 30 percent of the entire stock of businesses in this sector. In a comparison of firms with respect to skill levels, the highest entry intensity was in industries demanding the lowest skill levels. It is also remarkable that the structural change in the direction of producer-oriented services is not taking place by means of market entries, but rather through a below-average number of exits.
4. *Determinants of the intensity of entry*: The econometric estimations indicate that in addition to the sector, two other factors play a particularly important role in entry intensity: 1. the minimum efficient scale within an industry has a significantly negative effect (internal returns to scale); 2. in contrast, the extent of horizontal clustering exerts a high and significantly positive influence (external returns to scale). The significance of the individual factors varies, however, depending on the sector. For example, the positive external effects of horizontal clustering increase the probability of a new entry in producer-oriented services. New entries in these industries thereby profit in a particularly strong way from the density of similar producers in Vienna.

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