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THREE STAGES OF NET ENTRY INTO AUSTRIAN MANUFACTURING: ENTREPRENEURIAL EXPERIMENTATION AND ACTUAL ENTRY

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THREE STAGES OF NET ENTRY INTO AUSTRIAN MANUFACTURING: ENTREPRENEURIAL EXPERIMENTATION AND ACTUAL ENTRY

by

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Abstract

In this paper we explore the determinants of changes in the industrial populations rates in Austrian manufacturing. The research questions whether or not the nature and causes of the net entry of firms across three different stages of entry-exit decision and firm growth are different. Our econometric analysis suggests that there are differences in leading to the determination of the entry and exit at different stages of the entry-exit decision, and that aggregate growth and disaggregate growth (measured in employment terms) play a major role.

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Keywords

Net-entry rates, determinants of entry and exit.

JEL

1. Introduction

Entry and exit play an important role in the evolution of industries. The entry and exit of firms in industrial sectors is related to industrial growth and decay. On the one hand it is often argued that new firms are attracted into new and innovative industries displaying high net entry rates, and that declining sectors are characterised by high net exit rates. On the other hand there is evidence that entry and exit are related to a process of turbulence, where new entrants displace old firms without changing totals, leading to a healthier industrial structure, leading to productivity growth in the population of firms if it can be taken for granted that more efficient firms replace the least efficient ones. This aspects of entry and exit call for a evaluation of policies that aim at encourage new firm formation, especially if the sensitivity of entry to short run disturbances in business conditions and sectoral variations are taken in account.

The present study aims to enrich the existing empirical evidence, drawing on evidence form a small industrialised country with a traditional industrial structure and characterised by low entry and high survival rates (see Hauth 2001, OECD 1999) and to extend the scope by dealing not only with effective entry but also with a measure of potential entry, which refers to the creation of ideas which proved unsuccessful at early stages. This entrepreneurial experimentation is an important form of investment which does not show up in any national accounting (Jovanovic 2001). We study the determinants of population dynamics at three different stages of the entry and exit process. By looking at changes in determinants of changes of net entry of firms (entries-exits) at three different stages of industrial competition, we study both macroeconomic influences and sectoral ones. The first population which we call potential population consists of all operating firms and includes entrepreneurial experimentation at a progressed stage. The other two populations are subsets of this set of firms, the first one is the set of all active firms and the second the set of firms with more than 20 employees. While the changes in the number of firms in the potential population is related to incentives to enter, and may reflect also the overconfidence of entrepreneurs (Cammerer and Lovallo 2000), we suggest that changes in the other populations reflect first of all the interaction of "successful experimentation" and the working of the selection mechanism of the market (e.g. Metcalfe 1998).
To analyse the relationships mentioned above, the study is organised as follows, in the next section we present the construction and interpretation of the net-entry rates and provide descriptive statistics for the net entry rates. In the third section we outline the research strategy and the specification of the regression model. The fourth section presents the econometric analysis and the interpretation of the results. Concluding remarks close the paper.

2. Stages of net entry

Net entry

The dynamics on a industry level are determined by growth and decay processes of incumbent firms, leading to exit and the entry of new firms. In this paper we concentrate on population dynamics as sources of industrial dynamics and study their determinants. In empirical work two categories of measurement of entries and exits have been used, gross entry (exit) and net entry. Gross entry relates directly to the number of new firms (exiting firms), while the latter is the change in the population of firms in a industry over a periods. Net entry measures treat exits as negative entries and excludes detail on firm turnover. The net entry rate is given as $(N_t - N_{t-1}) / N_{t-1}$ where N represents the number of firms operating in each sector and t refers to time. The net entry rate was preferred to absolute net entry as net entry rates do not take in account the influence sector size.

The co-ordinated measure of population dynamics is the change in the stock of firms (net entry). While the exit decision of incumbent firms is determined primarily by the selection property of the market process, the entry decision is made essentially outside of the market and governed by expectations regarding potential profit opportunities. This shows that entry and exit decisions are based on different inducements, barriers and information sets (new entrants can be supposed to be less informed than incumbents on the competitive nature of the market in question) but linked by the co-ordination of the market.

Critical to the use of gross or net measures is in each case whether the processes involved relate specifically to the number of surviving firms - net entry - or to the total number of participants - gross entry (Geronski 1991). Moreover, using net entry rates leads to low degrees of statistically significant variation in the dependent variable because its values may cluster around zero. But the use of net entry rates in empirical work was criticised primarily on the basis that the implicit assumption of the symmetry or otherwise in the determinants of both entries and exits is too strong. Following Caves and Porter (1977) who suggested that that barriers to entry are at the same time barriers to exit, that is barriers to mobility, Evans and Siegfried (1992) have claimed that the combination of entry and exit into a net measure forces a strong requirement for symmetry in the explanation as the same causal underpinnings need to be taken in account. Fotopoulos and Spence (1997) in contrast argued that such an interpretation may hinder to uncover the real causality, as different forms of symmetry and asymmetry may be at work making the interpretation of results more complex. This shows that net entry must not be interpreted in same way as gross entry, as it represents the interaction between gross entry and gross exit.[1] Six cases emerge:

1. The first four cases refer to the assumption that the relationship between entry and exit and a independent variable (VA) is symmetric. VA may be regarded to be a growth of GDP, price-cost margin or any other conceivable independent variable. (i) If the relationship is negative for both entries and exits, and entries are more elastic than exits, then the relationship between the net entry rate and the influence will be negative (see table 1), (ii) if the relationship is negative and exits are more elastic than entries then the sign of the relationship will be positive (see table 1). This two cases can be thought as representing symmetric mobility barriers. Cases (iii) and (iv) are displayed in table 2. Here is assumed that the relationship is positive between VA and entry and exit. Higher values of VA lead to more entry activity and at the same time to more exits.

Table 1 Symmetry between entry and exit I: negative relationship

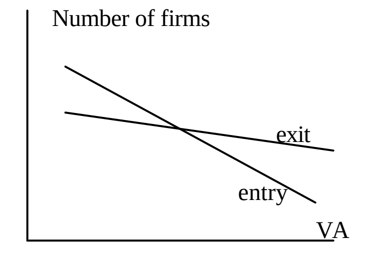
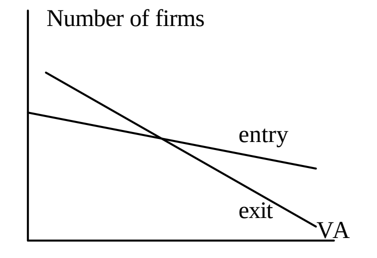
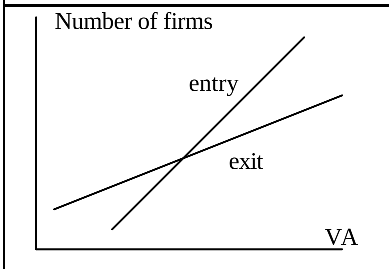
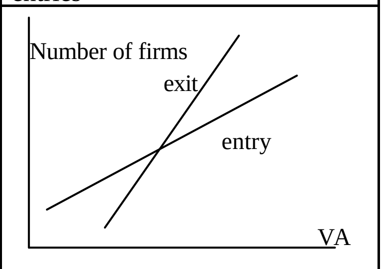
(i) Entries more elastic than exits	(ii) Exits more elastic than entries
	
Negative relationship between NER and VA	Positive relationship between NER and VA

Table 2 Symmetry between entry and exit II: positive relationship

(iii) Entries more elastic than exits	(iv) Exits more elastic than entries
	
Positive relationship between NER and VA	Negative relationship between NER and VA

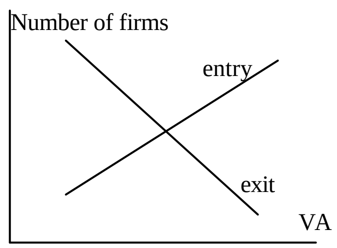
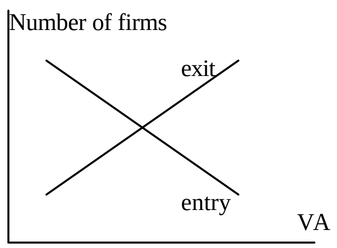
[1] This following draws heavily on Fotopoulos and Spence (1997).

2. Cases (v) and (vi) cover the asymmetric cases, where the relationship between net entry and the independent variable is governed by the relationship entry has to the independent variable.

Only if the assumed relationship between entry and exit and an independent variable is asymmetric, the net entry rate can be interpreted as if it were an entry rate. The assumption of symmetry needs further qualification regarding the relative elasticities of entries and exits in respect to the independent variable.

In the present study the use of net entry rates was necessitated by the availability of data. The data on actual entry in Austrian manufacturing were obtained from the annual publications of the annual statistical survey of Austrian manufacturing (Industrie- und Gewerbestatistik) from Statistik Austria and calculated as the net change in the number of firms. [2]

Table 3: Asymmetry between entry and exit

Entry is positively related to VA, exit in a negative way.	Entry is negatively related to VA, exit in a positive way.
	
Positive relationship between NER and VA	Negative relationship between NER and VA

Stages of net entry

In this research we posit that population dynamics are measurable at three different points in the process of population change, by three different populations. We distinguish:

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[2] What we measure are neighter firms nor establishments, but reporting units. We will call this entities further on firms, as we think that their reality is closer to firms than to plants .This claim is vindicated by comparison to the "Arbeitsstättenzählung" which is caried out every 10 years by Statistik Austria and where every plant is counted. The "Arbeitsstättenzählung reports a much higher number of plants than the industrial statistics or the membership statistics of the Austrian Chamber of Commerce.

1. A *potential population* defined as the set of firms already operating and of entrepreneurial experimentation in a late stage. The data to construct this measure comes from the Austrian Chamber of Commerce and is based on their membership statistics. In Austria membership in the Chamber of Commerce is compulsory for every firm. Therefore a new entry is associated with a new membership in the related branch (Fachverband). And each definitive exit is associated with the cancellation of the membership. In the "Mitgliederstatistik" firms only memberships which last more than six months are taken in account. The data is not exactly comparable to the data from the "Industriestatistik", as firms are allowed to hold multiple memberships, while in the "Industriestatistik" the division along branch lines is made for large firms (plants) only if they produce a large fraction in an industry which is associated with a different "Fachverband" than their primary activity (information by Mr. Mazanek, Statistik Austria, May 2001). As membership data describes a population of firms which can operate in an industry included in the "Fachverband" but does not need to be associated with actual production activities, we interpret this population of firms as reflecting the potential population of firms, which could enter the market. Membership in a "Fachverband" is a necessary but not a satisfying condition for actual entry.

   This population reflects, regarding the entry side also potential entry, that is, firms which have the intention to enter the market but decide in the end not to enter and do not begin production, and regarding the exit side, firms which ceased to produce but did not give up the intention to re-enter.[3] The potential population should cover primarily the incentives to enter, and the determinants for exit.[4] Annual net entry rates (NER) are calculated from the membership data as the number of memberships in year *t* minus number of memberships in year *t-1* over the number of memberships in year *t-1*. These net entry rates we will call for further reference NER-WK.

2. The *actual population* is the set of active firms. The data used to construct this population measure is number of firms in a "Fachverband" provided by the industrial statistics. This number relates to all firms which were active in a given year. The net entry rate for this population will be denoted as NER.

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[3] From the membership stock we deleted all firms which had "ruhende Mitgliedschaften", that is firms which did not cancel their membership but cannot be expected to enter soon. That means the re-entry of such a firm is considered as a new entry.

[4] Because we use only changes in the number of firms , we expect (on a-priori grounds) that errors relating to takeovers, to changes in location and to multiple memberships by single firms are reduced.

3. The third population we consider is the a *restricted population* which includes all firms with at least 20 employees. The data to construct this population measure is provided by the industrial statistics. We interpret this population as reflecting the relevant population of firms in an industry, including only those firms which grew above some critical level of size or new firms entering the market which employ more than 19 employees. The censoring point (20 employees) is arbitrary but reflects the low average firm size in Austrian manufacturing.[5] The net entry rate in this population is denoted as NER-20.

The comparability of the data is given by the use of the same two-digit level of industrial classification. Industries are classified by „Fachverbände“ which are based on the divisional structure of the Austrian Chamber of Commerce. The classification along 'Fachverbände" is similar to the standard classification along SIC-Codes. We were forced to use the Classification of the Chamber of Commerce, as their data on memberships is available only in terms of "Fachverbände". This classification is generally biased towards large firms, but needs not to be the case in all industries.

We use three sets of firms, which are subsets of each other. We decided not to subtract the populations from each other as we expected that distorting influences would increase in importance. The restricted population is a subset of both the actual and the potential population. And all firms in the actual population are also included in the potential population. We interpret that changes in the potential population reflect primarily incentives to entry and forces to ultimate exit, changes in the actual population of operating firms serves as middle point, where determinants of actual entry interact with the determinants of actual exit. The restricted population is interpreted to reflect primarily the processes of growth and decline of established "small" firms and the entry and exit of "larger" firms.

As we argue that this three populations reflect three different stages of firm growth and decay, the changes in the populations dynamics correlated in a positive way. As the correlation analysis presented in table 4 shows this is indeed the case, all correlations are significantly positive and the correlation coefficient is diminishing with distance.[6]

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[5] Other possible censoring points could have been 40 employees, which would reflect a growth barrier, where the span of control of the entrepreneur requires management by delegation. Note that the choice of 40 would be equally arbitrary, as the technology of production is instrumental for determining the span of managerial control. And the critical level of control could be 20 for one sector but 40 for another.

[6] This may reflect also the characteristics of entry into Austrian manufacturing, the entry rates being low in international comparison, while the survival rates being extremely high (see Hauth 2001). For single sectors the correlation is sometimes negative between NER-WK and NER and NER-20.

Table 4 Correlations between net entry rates in different Populations, Austrian Manufacturing 1984-1994.

	NER-WK	NER	NER-20
NER-WK	1		
NER	0.464 ***	1	
NER-20	0.176 **	0.384 ***	1

Notes: across time and sectors. (***) significant at the 0.01 level, (**) significant at the 0.05 level.

Table 5 presents the descriptive statistics for the net entry rates by sectors for Austrian manufacturing for the period 1984 to 1994 and Table 6 the descriptive statistics by time. The means of the net entry rates are small and show some sectoral variation at all levels of populations. The temporal variation is smaller than the sectoral suggesting that there are long run sectoral differences. Nevertheless there are also small temporal influences indicating that the general business climate influences entry and exit behaviours. For most of the sectors the net entry rates are negative, i.e. experience net exits. Figure 1 displays the three net entry rates for each of the 209 points of observation and figure 2 the net entry rates per sector considered. Both figures show that the highest net entry and net exit rates can be observed for NER-20.

*** insert figure 1 and figure 2 here ***

Table 5: Descriptive statistics for net entry rates into Austrian manufacturing by sector, 1984-1994

		Mean	Std.Dev.	Minimum	Maximum	Cases
Petroleum and Coal refining	NER-WK	0.0149	0.0379	-0.0541	0.0625	11
	NER	-0.0136	0.0613	-0.1290	0.0741	11
	NER-20	-0.0574	0.0866	-0.2105	0.0833	11
Stone and ceramic industry	NER-WK	-0.0047	0.0205	-0.0399	0.0293	11
	NER	-0.0099	0.0133	-0.0399	0.0023	11
	NER-20	-0.0062	0.0199	-0.0308	0.0318	11
Glass and glass product manufacturing	NER-WK	0.0018	0.0408	-0.0811	0.0429	11
	NER	-0.0138	0.0350	-0.1000	0.0377	11
	NER-20	-0.0039	0.0353	-0.0732	0.0526	11
Chemical industries	NER-WK	-0.0095	0.0132	-0.0294	0.0131	11
	NER	-0.0114	0.0239	-0.0614	0.0243	11
	NER-20	-0.0134	0.0216	-0.0442	0.0295	11
Manufacture of paper	NER-WK	-0.0154	0.0393	-0.0769	0.0328	11
	NER	-0.0279	0.0287	-0.0789	0.0000	11
	NER-20	-0.0123	0.0409	-0.1081	0.0540	11
Printing and Publishing	NER-WK	-0.0018	0.0145	-0.0266	0.0215	11
	NER	-0.0063	0.0272	-0.0403	0.0339	11
	NER-20	-0.0055	0.0260	-0.0494	0.0260	11
Wood	NER-WK	-0.0236	0.0080	-0.0362	-0.0112	11
	NER	-0.0252	0.0085	-0.0375	-0.0150	11
	NER-20	-0.0283	0.0594	-0.1111	0.0779	11
Furniture and fixtures	NER-WK	-0.0101	0.0227	-0.0508	0.0144	11
	NER	-0.0122	0.0194	-0.0414	0.0164	11
	NER-20	-0.0018	0.0415	-0.0463	0.0754	11
Food and tobacco	NER-WK	-0.0064	0.0249	-0.0409	0.0561	11
	NER	-0.0157	0.0182	-0.0570	0.0084	11
	NER-20	-0.0105	0.0243	-0.0556	0.0220	11
Leather producing industry	NER-WK	-0.0527	0.0556	-0.1364	0.0455	11
	NER	-0.0624	0.0824	-0.1667	0.0769	11
	NER-20	-0.0473	0.1237	-0.2727	0.1429	11
Leather processing industry	NER-WK	-0.0495	0.0317	-0.1026	0.0000	11
	NER	-0.0596	0.0362	-0.1091	-0.0103	11
	NER-20	-0.0840	0.0582	-0.1628	0.0000	11
Basic metal products - foundries	NER-WK	-0.0085	0.0202	-0.0325	0.0233	11
	NER	-0.0161	0.0281	-0.0625	0.0299	11
	NER-20	-0.0181	0.0308	-0.0755	0.0179	11
Basic metal products – except foundries	NER-WK	0.0062	0.0473	-0.0988	0.0533	11
	NER	-0.0132	0.0485	-0.0750	0.1000	11
	NER-20	-0.0183	0.0881	-0.1200	0.1481	11
Machinery and appliances, except electrical	NER-WK	0.0144	0.0150	-0.0145	0.0326	11
	NER	0.0128	0.0207	-0.0116	0.0529	11
	NER-20	0.0118	0.0363	-0.0688	0.0532	11
Transportation Equipment Manufacturing	NER-WK	0.0082	0.0243	-0.0350	0.0455	11
	NER	0.0098	0.0259	-0.0417	0.0429	11
	NER-20	0.0179	0.0286	-0.0483	0.0461	11
Fabricated metal products except machinery	NER-WK	-0.0001	0.0074	-0.0103	0.0105	11
	NER	-0.0054	0.0158	-0.0316	0.0149	11
	NER-20	0.0003	0.0258	-0.0346	0.0478	11
Electrical Equipment and Appliances	NER-WK	0.0012	0.0213	-0.0292	0.0275	11
	NER	0.0041	0.0231	-0.0369	0.0471	11
	NER-20	0.0081	0.0242	-0.0338	0.0498	11
Manufacture of textiles except clothes	NER-WK	-0.0306	0.0111	-0.0561	-0.0164	11
	NER	-0.0320	0.0130	-0.0488	-0.0024	11
	NER-20	-0.0344	0.0335	-0.0817	0.0227	11
Manufacture of clothes	NER-WK	-0.0378	0.0170	-0.0702	0.0021	11
	NER	-0.0449	0.0305	-0.0871	0.0094	11
	NER-20	-0.0557	0.0352	-0.1262	-0.0034	11

Table 6 Descriptive statistics for net entry rates into Austrian manufacturing by year, 1984-1994

		Mean	Std.Dev.	Minimum	Maximum	Cases
1984	NER-WK	-0.0193	0.0229	-0.0561	0.0333	19
	NER	-0.0229	0.0357	-0.1579	0.0052	19
	NER-20	-0.0122	0.0399	-0.1538	0.0541	19
1985	NER-WK	-0.0069	0.0277	-0.0448	0.0429	19
	NER	-0.0006	0.0368	-0.1000	0.1000	19
	NER-20	-0.0139	0.0528	-0.1111	0.1481	19
1986	NER-WK	0.0030	0.0261	-0.0469	0.0455	19
	NER	-0.0085	0.0205	-0.0397	0.0253	19
	NER-20	-0.0171	0.0390	-0.0845	0.0526	19
1987	NER-WK	-0.0079	0.0335	-0.0811	0.0455	19
	NER	-0.0053	0.0278	-0.0625	0.0428	19
	NER-20	-0.0336	0.0818	-0.2727	0.0510	19
1988	NER-WK	-0.0082	0.0423	-0.1364	0.0625	19
	NER	-0.0023	0.0327	-0.0920	0.0408	19
	NER-20	-0.0054	0.0660	-0.1613	0.1429	19
1989	NER-WK	-0.0025	0.0400	-0.1053	0.0561	19
	NER	-0.0128	0.0440	-0.1333	0.0645	19
	NER-20	0.0091	0.0473	-0.0769	0.1250	19
1990	NER-WK	-0.0059	0.0345	-0.0769	0.0588	19
	NER	-0.0114	0.0384	-0.0694	0.0769	19
	NER-20	-0.0112	0.0569	-0.1111	0.0833	19
1991	NER-WK	-0.0142	0.0338	-0.0778	0.0324	19
	NER	-0.0360	0.0392	-0.1429	0.0238	19
	NER-20	-0.0185	0.0493	-0.1250	0.0419	19
1992	NER-WK	-0.0187	0.0377	-0.1250	0.0533	19
	NER	-0.0460	0.0450	-0.1667	0.0093	19
	NER-20	-0.0318	0.0685	-0.1667	0.1429	19
1993	NER-WK	-0.0108	0.0205	-0.0439	0.0253	19
	NER	-0.0201	0.0366	-0.0871	0.0741	19
	NER-20	-0.0402	0.0456	-0.1250	0.0260	19
1994	NER-WK	-0.0267	0.0361	-0.1026	0.0215	19
	NER	-0.0329	0.0377	-0.1091	0.0290	19
	NER-20	-0.0330	0.0461	-0.1515	0.0299	19

Specification of the model

The strategy of research is to use the same set of variables in order to study whether or not the net entry behaviour in the three population is different. For this purpose we use as determinants the variables compiled at the level of the actual population, which reflects all operating firms in the market and macroeconomic determinants.

industry determinants

A number of industry-specific variables were employed. They refer to sectoral growth and opportunity as well as sector-specific barriers to mobility.

Price-cost margins are used as a proxy for sectoral *profitability*. We define the price-cost margin as value-added minus payroll over sales. This variable is usually expected to be positively related to net entry rates, as high price-cost margins are interpreted as incentive to entry. However, it is also possible to get negative relationship. When entry is deterred by high barriers to entry and exit by high barriers to exit, high price-cost margins can go along with low levels net entry rates – entry is blockaded (Duetsch 1975). Therefore price-cost margins should be seen in conjunction to the effectiveness of the barriers to entry and exit. If the barriers to entry and barriers to exit are asymmetric we should expect that entry is positively associated with the price-cost margin and exits in a negative way. If the asymmetry assumption holds the net entry rate should be positively associated with higher price-cost margins. Under symmetry, both entry and exit are assumed to be positively related to price cost margins, the sign of the relationship depends on the elasticity of response to changing price-cost margins. If entry is more elastic than exit we should expect a positive and when exits are more elastic then we should expect a negative relationship between net entry and price cost margins. As other studies we take price-cost margins 'in phase' with net entry rates (Ymawaki 1991, Duetsch 1975, Fotopoulos and Spence 1997, 1999), on the one hand because empirical studies of gross exit have shown that exit is more responsive to profitability than entry (Rosenbaum and Lamort 1992, Shapiro and Khemani 1987), and on the other hand because exit (entry) can also take place when the profitability is high (low) which refers to the heterogeneity in terms of techniques of production and managerial abilities. This leads us to suspect that profitability may not be very significant in the following regressions.

Capital requirements for entry were proxied by the ratio of sectoral fuel and energy consumption in monetary values to sectoral sales. This variable can be thought to represent *capital intensity*, as mechanisation and capital intensity go hand in hand. This rather imperfect measure for capital intensity was also used by Shapiro and Khemani (1987) and Fotoupolos and Spence (1997 and 1999), and is based on the idea that higher consumption of fuel and energy represent a higher degree of mechanisation and hence a higher use of capital. But as not all firms in a sector (and even in a market) use the same technique of production this measure is not free of ambiguity. Capital intensity is usually seen as barrier to entry, and as far the installed capital represents sunk costs also as barrier to exit. Thus we expect both under the hypothesis of symmetry (barrier to exit) and asymmetry a negative sign.

The *complexity of operations* or *degree of vertical integration* within a sector is proxied by the value added to sales ratio. Complexity of operations and vertical integration are expected to be negatively associated with entry and also with exit, suggesting a negative symmetric relationship. The sign then is dependent on the elasticities of entry and exit. We expect a negative sign, as we expect entry to be more responsive than exit to increases in the complexity of operations within a sector.

Small firm presence is represented by the ratio of the number firms with less than 20 employees over the number of total firms operating in an industry. We interpret this variable as characterisation of the industry and as indicator for the turbulence within the industry. A higher small firm presence should go along with higher entry and exit rates. We expect a positive relationship between entries and exits and the presence of small firms. The sign of the relationship depends crucially on the fact whether entries or exits are more elastic in regard to the presence of small firms.

Industry growth from the preceding period is expected to have a positive impact on net entry rates, as market size increases, gives entry a greater possibility to be successful, and reduces the selection pressure of competition (e.g. Metcalfe 1998) - unless the opportunities created by industry expansion are translated in the expansion of incumbent firms, rather than by new entry. The relationship between industry growth and entries and exits is asymmetric and positive.
We express industry growth in employment terms. We preferred this aspect of the growth process in an industry to the growth in sales, as employment growth reflects the industry growth above the level productivity growth and thereby excludes industry growth which is induced by progressive mechanisation. As our hypothesis is that industry growth makes room for potential entrants, we expect a positive sign.

Relative labour costs are defined as the average wage of a sector over the average wage for total manufacturing. On the basis that labour costs increase with the skill level of workers, as they represent rents from investment in human capital, we interpret this variable as *skill intensity* (human capital intensity) of an sector. Effects of unionisation and other influences may distort this interpretation. Nevertheless, we interpret this variable in the following way: If the resource constraint on skilled labour is binding we should expect that raising skill requirements works as an impediment to entry. But this is likely to be a special case applying only to a few professions (e.g. programmers). In general we expect that the resource constraint is not binding. As under the influence of the globalisation of the production sphere there is a general tendency towards the upgrading of products in the manufacturing sectors of high developed countries (as Austria) we expect a asymmetric relationship between the revealed difference in labour costs and entries and exits, with entries being positively associated and exits being negatively associated with higher skill intensity. Therefore, we expect a positive sign.

Macroeconomic determinants

We employ wholesale price index for producer goods as proxy for cost of capital. Taking everything else constant, a higher cost of capital should be associated with lower entry and higher exit, as a higher cost of capital makes entry more expensive and also new investments. The relationship between entries and exits and the cost of capital is asymmetric and the expected sign negative.

The growth rate of the gross domestic product captures the conditions of overall state of the economy and the business climate. The expected sign of the variable depends on assumptions of symmetry and asymmetry. Fotopoulos and Spence (1997) have argued that nearly every conceivable outcome in terms of the sign can be expected on theoretical grounds. First it can be argued that better business conditions influence entry and exit in a asymmetric way, increasing entry and reducing the pressure to exit. But this scenario seems to be plausible only with extreme amplitudes in the change of the business climate. More reasonable seems the assumption that the growth rate influences entry and exit in a symmetric way, especially if results indicating the symmetry of gross entry and gross exit are taken in account (e.g. Fotopoulos and Spence 1998). The form this influence takes is related on the one hand to the question who captures the opportunities of growth, incumbent firms or new entrants and on the other hand related to the supply of entrepreneurship.

If we consider that both entry and exit are related in a positive way to higher growth rates of GDP then the sign of the influence depends on the elasticity of the respective response of gross entry and gross exit. Table 2 summarises the two cases. If there is a surplus in the supply of firms entry may be less elastic than exit and higher growth rates of GDP are associated with lower net entry rates, and translate themselves over-proportionally into growth of incumbents. On the other hand if incumbents are unable to capture the growth opportunities then the economy is more accommodating to new firms and net entry rates increase with higher growth. The sign of the relationship is positive.

On the other hand a “recession push” scenario implies higher gross entry and gross exit in economic downturns (see table 1). The plausibility of this scenario is related to the observation that during phases of increasing cyclical unemployment, individuals are “pushed” into an entrepreneurial role (e.g. Storey 1991) and higher turnover rates during economic downturns may result. Both cases of positive and negative signs can exist under this hypothesis.

model estimation and results

In order to estimate the influence of the determinants we use a panel data econometrics. A common method to estimate panel data models is the least squares with dummy variables model (LSDV). This was also the first method we used. But it turned out that the cross-sectional intercepts absorbed nearly all information and very few was left for the remaining variables. A second problem was heteroskedasticity between cross-sections and that the data showed first order autocorrelation. For these reasons we decided to use the cross-sectionally heteroskedastic and timewise autoregressive model suggested by Kmenta (1986, p. 618) for pooled cross-section and time-series data. We used this model also because the LSDV (fixed effect estimator exploits primarily the within dimension of the data, determined as the OLS estimator in a regression in deviations from individual means and we wanted to explore both the between and the within aspects. This is made feasible by the Kmenta model which moreover incorporates two assumptions: regression disturbances are mutually independent but heteroskedastic, and - concerning the time-series properties - autoregressive.

More in detail the assumptions of the Kmenta model are:

1. Cross-sectional heteroskedasicity: $E(e_{it}^2) = s_i^2$
2. Crossectional independence: $E(e_{it}e_{jt}) = 0 \quad (i \neq j)$
3. first order autocorrelation: $e_{it} = r_i e_{i,t-1} + u_{it}$

where the e_{it} refer to pooled OLS disturbances for the *i = 1,...,N* cross-sections and *t = 1,...,T* time periods. r_i is the autocorrelation coefficient and s^2 denote the cross-sectional disturbance variances. The parameter $?_i$ varies from one cross-sectional unit to another. In our econometric study we followed the estimation instructions by Kmenta (1986: 618-620). The first step is a pooled OLS estimation. The resulting estimates of the regression coefficients are unbiased and consistent, and are used to calculate the regression residuals e_{it}. These are used to calculate consistent estimates of *?*, according to:

$$\hat{r}_i = \frac{\sum e_{it}e_{i,t-1}}{\sum e_{i,t-1}^2} \quad (t=2,3,...,T).$$

In order to remove autocorrelation, we perform a Prais-Winsten transformation to the original data and run a second OLS regression. The resulting regression residuals, $u*$, are used to estimate consistent variances of u. A second transformation is carried out to remove heteroskedasticity. Each Prais-Winsten-transformed variable is divided by s obtained from

$$s_{ui}^2 = \frac{1}{T-K}\sum_{t=1}^{T}\hat{u}_{it}^{*2} .$$

Finally, the resulting regression equation is estimated with the OLS method. Its disturbance $u**$, fits the assumptions being asymptotically non-autoregressive and homoskedastic.

In order to vindicate the use of the Kmenta model different tests to detect heteroscedasticity and autocorrellation were performed. As tests to detect heteroskedasticity we used a variant of the Breusch-Pagan Largrange Multiplier test for panel data (the results of this test are reported in table 7). Under the null hypothesis of homoskedastic errors the distribution of the test statistic is asymptoticly χ^2 with d.f. equal to the number regressors (Verbeek 2000: 325). For all equations the test comfortably rejects the null of homoskedastic errors. In addition to this test we applied a LM-test for groupwise heteroscedasticity which takes in account only the diagonal elements of the variance-covariance matrix (Greene 1999). As expected in the light of the results of the previous test, this test rejected strongly the null of groupwise homoscedasticity, as the test value was higher than the critical χ^2 with 19 d.f. at the 1% level of significance (see table 7). To detect autocorrelation we used first a generalised test based on the Durbin Watson test by Bhargava et. al (1983). In contrast to the time-series case the inconclusive region for the panel data Durbin-Watson test is very small. We could not reject positive autocorrelation at 5% of significance for NER-WK. And for negative autocorrelation the same is true for NER and NER-20. As this test is based on a fixed effect model it may not capture the autocorrelation effects were looking for. And as we were interested in the autocorrelation of each cross sectional unit, we investigated the single first-order autocorrelation coefficients. These suggested the presence of high autocorrelation.

Table7 Estimates of net entry of firms at three stages in Austrian manufacturing, 1984-1991 (T-values in parentheses)

Variable	(1)			(2)			(3)		
	NER-WK	NER	NER-20	NER-WK	NER	NER-20	NER-WK	NER	NER-20
Constant	-6.7380*** (-3.308)	-3.2182 (-1.491)	-1.7155 (-0.869)	-3.7864** (-2.466)	-3.4560** (-2.178)	-0.9624 (-0.609)	-3.6855* (-1.886)	0.7434 (0.414)	0.1502 (0.087)
Price-Cost margins	-0.0497 (-1.239)	-0.0198 (-0.517)	-.00812 (-0.242)	0.0236 (0.659)	0.0006 (0.013)	0.0179 (0.479)	-0.0785** (-2.087)	0.0080 (0.183)	0.0111 (0.305)
Capital intensity	-0.0392 (-0.787)	-0.7408 (-1.507)	-0.0102 (-0.197)	0.0093 (0.8397)	-0.1052** (-2.194)	-0.0025 (-0.050)	-0.0446 (-0.753)	-0.0206 (-0.419)	-0.0392 (-0.744)
Complexity (vertical integration)	-	-	-	-0.1152*** (-7.589)	-0.0129 (-0.718)	0.0291 (-1.608)	-	-	-
Small firm presence	-0.0320*** (-11.084)	0.0109* (-1.747)	-0.0283** (-2.580)	-0.0370*** (-14.653)	-0.0116 (-1.496)	-0.0195 (-1.571)	-0.0087** (-2.244)	0.0039 (0.691)	-0.0023 (-0.156)
Industry growth (employment growth)	0.0577* (1.925)	0.4032*** (10.966)	0.7387*** (22.464)	0.0487** (1.982)	0.3910*** (10.076)	0.7128*** (19.191)	0.0779*** (3.370)	0.3539*** (10.938)	0.6928*** (20.269)
Skill intensity	0.0107*** (3.532)	0.0087** (2.237)	0.0122*** (3.019)	0.0338*** (8.033)	0.0114** (2.259)	0.0131*** (3.261)	0.0356*** (7.533)	0.0165*** (3.573)	0.0181*** (4.250)
Cost of capital	-	-	-	-	-	-	-0.0003*** (-7.399)	-0.0002*** (-4.206)	-0.0002** (-2.979)
Growth of GDP	0.1820*** (2.709)	-0.3326*** (-3.784)	-0.2222** (-2.353)	0.1838*** (3.370)	-0.2597*** (-2.919)	-0.1508 (-1.507)	0.1992*** (3.810)	-0.3298*** (-3.940)	-0.1130 (-1.172)
Adjusted R^2	0.82	0.45	0.75	0.89	0.39	.075	0.89	0.71	0.76
LM-test (Breusch-Pagan)	71.35	101.37	64.88	77.55	105.49	74.90	87.57	111.60	75.39
LM-test (groupwise heteroscedasticity)	71.35	70.84	69.99	77.55	77.08	77.31	74.84	74.08	73.08
DW (panel)	1.78	2.35	2.18	1.83	2.36	2.18	1.78	2.35	2.18
Condition Index	12.45			23.10			251.55		
N	209	209	209	209	209	209	209	209	209

*** statistically significant at the 1% level
** statistically significant at the 5% level
* statistically significant at the 10% level

The results of the estimation are reported in Table 7. Equation (1) represents the basic version which includes profitability, capital intensity, small firm presence industry growth, skill intensity and growth of real GDP as independent variable. Equations (3) and (4) are extensions, while Equation (2) adds complexity, Equation (3) adds the cost of capital to the basic equation.

The results for equations (1) and (2) are not subject to serious multicollinearity, the highest condition index (Belsely et.al., 1980) being below the warning cut-off of 30 which signals severe multicollinearity. However when the cost of capital was included in the regression (equation (3)), the condition index was higher than 30. We report the results as from the results emerges that the multicollinearity influences in a severe way only the influence of profitability. The adjusted R^2 indicated in Table 7 is the adjusted R^2 of the last regression, which is much higher than the adjusted R^2 of the first regression.

The effect of *profitability* on net entry rates was significant only for NER-WK, but not for NER and NER-20. The variability of the sign variable is odd if considering its primary importance in theoretical work. In equation (1) net entry rates are related generally in a negative way to the profitability. When complexity is added (equation (2)) the picture changes, the influence becomes positive across all populations albeit being very insignificant. Taking in account the working of barriers to entry and issues of symmetry may relieve this puzzle. A negative sign may reflects that (i) high barriers to entry, as in this case higher price-cost margins do not signal an attractive incentive for entry (e.g. Duetsch 1975) or the presence of significant sunk costs which increases the incentive for incumbents to retaliate, having a similar influence on net entry rates (Kessides 1991), and/or signals (ii) that profits have a symmetric influence on entry and exit, as shown in studies concerned with gross entry and exit by Dunne and Roberts (1991) and Fotopoulos and Spence (1998). The negative sign shows that exits react more strongly to changes in profitability. By taking in joint consideration the barriers to entry especially capital intensity and the complexity of operations shows that price cost estimates are sensitive to their inclusion. This may suggest that the influence of profitability is distorted by barriers to entry which we could not take in account, due to data limitations (e.g. advertising ratios and R&D intensities). On the other hand the insignificance may also be a reflection of the heterogeneity of entrepreneurs in regard to their expectations (and over-confidence). This issue cannot be resolved on the basis of the available data (see Camerer and Lovallo 1999 for a study of overconfidence in a experimental setting).

The effect of *capital intensity* displays the expected sign except in the regression (2) for NER-WK but is significant only changes for NER. The negative sign suggests that capital intensity in a symmetrical way as a barrier to mobility but is less important as barrier to exit. The result suggests that capital intensity is not important as barrier to entry.

Complexity on the other hand – when included in the regression - is significant for NER-WK and important for NER-20.[7] But with a different sign. While higher complexity of operation and vertical integration of active firms seems to reduces the incentive to enter, the result suggests that this may be conducive for the growth of already established small firms and for the entry of larger firms. This suggests that complexity might be symmetrically associated with entry and exit but that the elasticity of entry and exit of the response changes with the population considered.

Small firm presence is always negatively associated with NER-WK and important for the other populations except when the cost of capital is taken in account. Small firm presence is thought to be symmetrically associated with both entry and exit. Under this assumption the negative sign signals that exits are more elastic than exits in their response to the number of small firms in a sector. It is highly plausible that a higher number of small active firms in a sector restricts the room for new entry and makes exit for the average small firm more probable: The incentive to enter is less elastic than the propensity to exit. For NER and NER-20 small firm presence is important and significant only if the cost of capital is not taken in account. Interestingly small firm presence has a variable directionality for NER, its sign is negative for NER-20 in all three regressions, suggesting that a high number of small firms reflects rather turbulence than opportunities to growth.

The results concerning *industry growth* (decline) are the strongest. They are highly significant and positive for all three populations. This result suggests that there is a strong asymmetric relationship between industry growth and net entry. Interestingly this relationship is in each equation considered much stronger for NER and especially NER-20 than for NER-WK. This shows that industry growth works not primarily as incentive to enter but first of all in the direction of weakening the selection pressure of competition within a sector, or the other way around: lower growth or even decline of industry employment is associated with negative net entry rates.

The *skill intensity* proxied by relative labour cost is strongly significant and always positive across all populations. Raising skill intensity seems to be associated with higher net entry rates. More than every other variable taken in consideration this may reflect the very location of entry opportunities and industry growth.

Of the two macroeconomic factors the cost of capital is highly significant across all three populations and carries the expected negative sign. This suggests that a higher cost of capital lowers net entry

[7] Significant refers to a statistical significance at the 10 percent level, while important refers to a t-value higher than 1.

rates. The negative sign shows, that under the hypothesis of symmetric influence of the cost of capital on entry and exit, that exit is more elastic than entries across the three populations.

The second macroeconomic factor, the growth of real GDP, has a variable directionality across the populations but is significant for NER-WK, NER and NER-20. The result suggests that the incentives for entrepreneurial experimentation are pro-cyclical to wide movements in the economy while both actual net entry and net entry into the population with firms with more than 20 employees is counter-cyclical. This results can be interpreted in terms of over-confidence. The positive coefficient at the NER-WK level gives credibility to this view, insofar as, if the influence of wider economic movements is symmetrical in respect to entry and exit, and suggests that entry is more sensitive than exit to changes in the business climate for entrepreneurial experimentation but that exit is more elastic than exit in the other two populations. Higher net exit rates in the NER and the NER-20 in economic upturns suggest that entrants are over-optimistic and fail to deliver the requirement of successful entry and in the light of the strong results of industry growth this suggests that economic upturns do translate into growth opportunities for incumbents.

Conclusion

The aim of this paper was to test the consistency of the determinants of net entry for three different populations of firms. The results show that there are differences in the determinants of entry, suggesting that especially the determinants for potential entry and for actual entry are different. Industry growth is the single most important determinant for net entry in all populations. And it seems that industry growth works much more in the direction of increasing the growth prospects of incumbent firms and the incentive to enter of “larger” firms than as incentive for entrepreneurial experimentation. A difference was also uncovered regarding the influence of the complexity of operation of existing firms and on the incentive to entry. Higher complexity of operations discourages entrepreneurial experimentation but fosters growth prospects of incumbent firms (and entry of larger firms). Capital requirements seem not to be barriers to entrepreneurial experimentation, they seem to be much more important for actual entry but not for growth processes. Skill intensity on the other hand seems to be closely associated with net entry across the different populations indicating the location of the positive directions in industrial development.[8] In regard to macroeconomic variables the influence of the cost of capital is uniformly negative and of the same magnitude. The influence of business

[8] On the other hand our results can be subject to criticism insofar as they capture the manufacturing sector in a general decline of number of firms and in terms of employment. Further research in this direction should then uncover whether or not our results are robust to processes of industrial growth and decline. This is especially interesting as some authors have indicated that the processes of growth and exit in declining industries are governed by a different economic logic (e.g. Matcalfe 1998, Ghemawat and Nalebuff 1990).

conditions shows a similar sharp distinction between the population including entrepreneurial experimentation and the two populations reflecting actual operating firms. Economic upturns translate into a higher level of entrepreneurial experimentation but also into a higher rate of exits of operating firms, indicating the possibility that a large number of actual entrants are overconfident in regard of the market test.

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Appendix

A.1 Data sources

All industry variable definitions for the independent variables utilise published and unpublished data resulting from the annual industrial survey conducted by Statistics Austria (Österreichisches statistisches Zentralamt (various issues). Industrie- und Gewerbestatistik. Teil 2, Vienna.) for the years 1983-1994. The NER and NER-20 were also taken form this source. The NER-WK were constructed using the data from the membership statistics of the Austrian Chamber of Commerce (Wirtschaftskammer Österreich (various issues), Mitgliederstatistik, Vienna.) The macroeconomic variables were taken from the WIFO-database.

A.1.2 Correlation matrix of independent variables

	PCM	CI	COMP	SFP	GI	SI	CoC	GDPGR
Price cost margins	1.00000							
Capital intensity	.18520	1.00000						
Complexity	.54905	.03385	1.00000					
Small firm presence	-.03514	-.11356	-.33913	1.00000				
Growth of industry	.19215	.07643	.12267	-.04717	1.00000			
Skill intensity	.15286	.31999	-.16604	-.01069	-.04109	1.00000		
Cost of capital	-.07893	.13870	-.02871	-.03350	-.05996	-.12340	1.00000	
Growth of GDP	.08765	-.09999	-.00174	.02949	.34449	.03024	-.36726	1.00000

A.1.3 The "Fachverbandsgliederung"

The industry classification refers to Austrian "Fachverbände" i.e., to membership in the Austrian Chamber of Commerce. This classification is comparable to two digit SIC. It is biased towards large businesses, but this is not a strict rule.

Table A1: Industries („Fachverbände") we used in this study:

Code	„Fachverband"	
020	Erdölindustrie	Petroleum and Coal refining
030	Stein- und Keramische Industrie	Stone and ceramic industry
040	Glasindustrie	Glass and glass product manufacturing
050	Chemische Industrie	Chemical industries
060	Papiererzeugende Industrie	Manufacture of paper
070	Papierverarbeitende Industrie	Printing and Publishing
090	Sägeindustrie	Wood
100	Holzverarbeitende Industrie	Furniture and fixtures
110	Nahrungs- und Genußmittelindustrie	Food and tobacco industry
120	Ledererzeugende Industrie	Leather producing industry
130	Lederverarbeitende Industrie	Leather processing industry
140	Giessereiindustrie	(basic metal products - mills)
150	NE-Metallindustrie	(basic metal products – except mills)
160	Maschinen- und Stahlbauindustrie	Machinery and appliances, except electrical
170	Fahrzeugindustrie	Transportation Equipment Manufacturing
180	Eisen- und Metallwarenindustrie	Fabricated metal products except machinery
190	Elektroindustrie	Electrical Equipment, Appliance, and Component Manufacturing
200	Textilindustrie	Manufacture of textiles except clothes
210	Bekleidungsindustrie	Manufacture of clothes

Figure 1 Net entry rates across population by observation

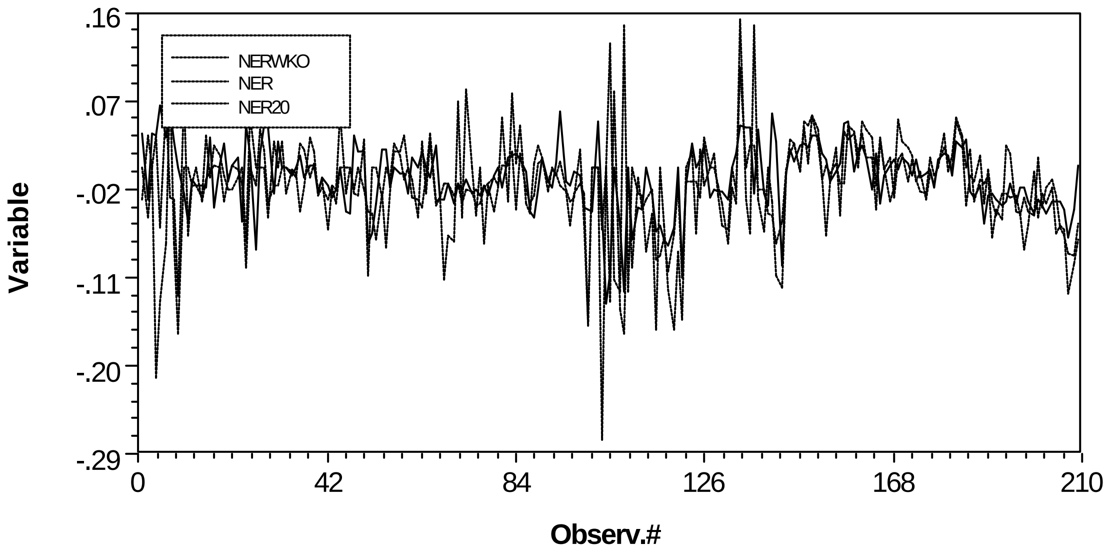

Figure 2 Net entry rates across populations per sectors