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Firm entry and turnover: the nexus with profitability and growth

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Abstract The paper presents a new sectoral taxonomy, which classifies industries according to the opportunity and cost of experimentation. Econometric tests show for a sample of 24 countries that in the 1990s 'entrepreneurial' industries with a mutable and growing firm population experienced the highest growth in terms of value added and employment, but also the lowest growth of labour productivity. 'Entrepreneurial' industries generally earned a better profit-ratio than 'routinised' industries with an inertial population. The results are consistent with entrepreneurial theories of market competition, which suggest that entry follows profit opportunities but does not deplete them.

Keywords Corporate demography · Firm entry · Industry life cycle · Growth · Profitability

JEL codes C19 · L11 · M13 · O12 · L26

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1 Introduction

Designating characteristic differences between sectors in terms of their prevalent modes of innovation and competition, Winter (1984) introduced the notions of 'entrepreneurial' and 'routinised' regimes. Both concepts relate to different periods in the work of Joseph Schumpeter, who regarded independent entrepreneurs as the source of economic progress in his *Theory of Economic Development* (1911), but later in *Capitalism, Socialism and Democray* (1942) argued that innovation increasingly becomes a routine task of big enterprises with large and specialised research laboratories.[1]

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[1] Notwithstanding the inherent tension between the two concepts, both have independently developed a remarkable influence. While the emphasis on innovations by big business came to much prominence as the Schumpeter hypothesis in the empirical literature on *industrial organisations* (see, e.g., Scherer 1965; Geroski 1994; or Audretsch 1995), the earlier idea of innovation by independent entrepreneurs has increasingly become a hallmark of contemporary *entrepreneurship research*(see, e.g., Acs and Audretsch 2003; Shane 2004; or Venkataraman 1997.

Trying to reconcile the seeming contradiction within his own work, Schumpeter argued that the two modes correspond to different stages in the development of an economy.[2] While this interpretation as a historic law is generally rejected for lack of empirical support, Nelson and Winter (1982) made the decisive break by considering them as valid characterisations of distinct technological regimes that represent intrinsic differences between particular sectors and therefore can coexist at any stages of development.

This paper investigates whether and to what extent such sectoral regimes associate with differences in average profitability and growth. It first classifies 'entrepreneurial' and 'routinised' industries according to differences in terms of corporate net entry and turnover, and then tests for their statistical association with sectoral measures of performance. Section 2 discusses the concept of entrepreneurial and routinised regimes and relates them to the particular constellation of 'opportunity' and 'cost of experimentation'. Focusing on corporate net entry and turnover, statistical cluster analysis produces an empirical identification of the sectoral regimes. Section 3 develops theoretical conjectures concerning the nexus of the new taxonomy with profitability and growth. Section 4 explains the econometric specification, while Section 5 presents the empirical findings. Section 6 summarises and concludes.

2 'Entrepreneurial' and 'routinised' regimes: a sectoral taxonomy

This section presents a new industry classification. Depending on firm turnover and net entry rates it designates sectors as 'entrepreneurial' or 'routinised', which either can be growing, balanced, or declining. The process of classification starts with an intuitive typology that offers a first systematisation of the relevant dimensions, followed by the empirical identification of the taxonomy.

Please note that in earlier empirical applications Audretsch (1991) as well as Malerba and Orsenigo (1993) defined entrepreneurial and routinised regimes in terms of innovative behaviour (such as the share of innovations by small and medium sized enterprises or the appropriability of innovations). In contrast, Audretsch and Fritsch (2002) already extended the concept of technological regimes for innovative activity to develop the concept of 'growth regimes,' where the entrepreneurial regime is related to demographic characteristics of the firm population. Similarly, this paper aims at identifying 'competitive regimes' by demographic characteristics. As a consequence, the focus is not on the particular mode and extent of innovation, but on opportunity and entry barriers as determinants of the competitive environment more generally.

2.1 A tentative typology

Discriminating between entrepreneurial and routinised regimes by a sector's relative exposure to competitive entry, we consider two factors that potential entrepreneurs have to weigh up: The first is *opportunity*, which is composed of the overall incentives to participate in the market. Potential entrepreneurs might perceive an opportunity in various forms, such as actual price-cost margins, the potential for future growth, or the appropriability of novel ideas. None of these serves well as an operational definition that can provide a comprehensive and reliable measure for the following cluster analysis. Instead, we directly apply the net entry ratio (i.e. a year's entry minus exits divided by the total number of firms) as a proxy variable, that best summarises the total extent of entrepreneurial opportunity.

The second determinant is the *cost of experimentation*, which in addition to the initial expenditures on starting the business takes into account the cost incurred when the venture fails (i.e. whether one can resell assets or must write them off as sunk investments). Based on the straightforward rationale that *ceteris paribus* a high turnover indicates relatively low barriers to entry and exit and thus low cost of experimentation, we

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[2] According to Schumpeter (1942), what we now call the entrepreneurial mode dominates at the early stages of development, while the routinised regime gains ground at the later stages, ultimately depriving the economy of its entrepreneurial resources.

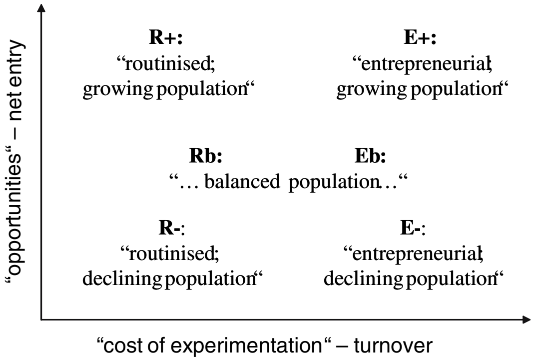

Fig. 1 An inductive typology of routinised versus entrepreneurial markets

use as proxy the sum of entry and exits divided by the total firm population, i.e. the turnover rate.

Figure 1 offers a first systematisation of different combinations between entrepreneurial opportunity and the cost of experimentation. In the typology we define routinised regimes *R* by low rates of firm turnover, since high cost of experimentation confine the competitive threat of novel entrepreneurs and give a competitive edge to established business. Conversely, we define entrepreneurial regimes *E* as industries where firm turnover is high and the population rather mutable, implying that incumbent firms find it difficult to defend their market against competitive entry by new ventures. Depending on the rate of net entry, the firm populations can either be growing, balanced, or declining.

2.2 The empirical taxonomy

Appendix A provides the details on the method and measures used for the empirical taxonomy, while this and the following paragraphs only aim at a very brief explanation of the procedure. We thereby explore an international database provided by the OECD firm level study (Bartelsman et al. 2003), which offers a roughly harmonised and sectorally disaggregated collection of firm demographic characteristics for ten of its member countries. Because of the limited scope of the database, the paper pursues an indirect method, first producing typical sectoral profiles of the relevant variables and then applying the resulting classification as independent variables in the regression analyses and non-parametric tests.[3]

To begin with, the variables are the employment weighted net entry and turnover rates of about 40 sectors in the ten countries covered by the database[4] after calculating the standardised values of the means for the 5 latest years available (mostly in the second half of the 1990s). Before standardisation, the sample exhibits a mean turnover of eight and a net entry rate of .3 companies per hundred firms. Without employment weights the mean turnover rate is 21% while the net entry ratio is 2.7%, which shows that exiting firms were generally smaller in numbers but larger in size than entrants.

For the current analysis, the process of classification encompasses three steps, two of them applying deliberate methods of statistical clustering. The *k*-means method produces a first partition, which reduces the large initial data set such that it can be used more effectively in the second step of hierarchical clustering. Since one aim is to separate outliers in this first step, Euclidean distance is the chosen measure of dissimilarity. The resulting cluster centres enter as objects in the following hierarchical clustering, which applies the City-block distance. Preserving a higher degree of complexity in the output produced, hierarchical techniques require a heuristic interpretation of the surfacing patterns. In the Appendix A, the dendrogram of Fig. 2 supports this by means of a graphical representation.

The common clustering of data from the various countries implies that any sector can be

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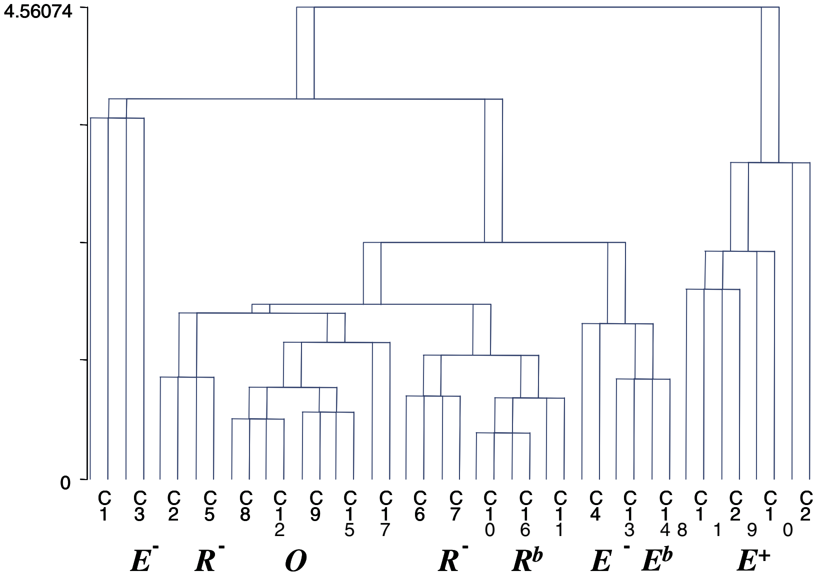
[3] This taxonomic approach is particularly useful in relatively new areas of empirical research, when only a limited number of countries can be relied on providing comparable data of sufficient quality (Peneder 2003). This is precisely the setting of the current analysis. Application of the new taxonomy extends the available data from the initial ten countries, that participated in the firm-level study, to 24 developed economies, which are consistently covered in a much more comprehensive database of sectoral economic activity.

[4] The OECD reports harmonised data on corporate demography for the United States, Germany, France, Italy, United Kingdom, Canada, Denmark, Finland, the Netherlands and Portugal, most of them originating from business registers or social security databases. For a detailed documentation see Bartelsman et al. (2003).

Fig. 2 Cluster dendrogram with average linkage method and city-block distance



identified as belonging to two or more different categories. Not surprisingly, we find much variation between economies, as the frequency distribution across the various categories in Table 1 demonstrates. For the purpose of a single joint identification we must further aggregate the information for individual countries into a common taxonomy. In most cases, the frequency distribution produced a marked single peak in one of the six categories, which then determines the sector's final identification. In a few instances, however, identification required some reasoned intervention that is also documented in the Appendix A.

The statistical cluster analysis reveals that actual data rarely disperse nicely into compartments as, for instance, envisioned a priori in Fig. 1. Most notably, the two hypothetical observations of entrepreneurial markets with declining firm population (E^{-}) and routinised markets with growing population (R^{+}) are very rare and were dropped.

To validate the outcome of the clustering process, Table 2 presents the mean turnover and net entry rates for each of the newly created sector types. The first row gives the number of observations, the majority of which belongs to the intermediate group of other industries, which are not characterised by any pronounced deviation from the overall mean of industries. This outcome shows that sharp and robust discriminations only appear at the edges of the distribution. Giving priority to the robustness of the classification, we must accept a rather large intermediate category and not break it up into further subclasses.

Subject to that limitation, the taxonomy performs well in discriminating industries with regard to both dimensions. Firm turnover is substantially higher in the entrepreneurial sectors and lower in both kinds of routinised regimes, while the group of other industries takes the intermediate position as envisaged. Entrepreneurial industries with a growing population (E^{+}) are the most mutable, whereas routinised industries with a balanced population (R^{b}) show the lowest turnover rate. The net entry rate is highest among industries in the category of E^{+}, lowest among R^{-}, and hardly differs between the groups E^{b}, R^{b} and *other*.

3 Theoretical conjectures

This section proposes some general conjectures about the nexus between sectoral performance

Table 1 The sectoral taxonomy of firm entry and turnover (with ISIC codes in brackets)

ISIC	Industry name	Initial clusters						Final
Rev. 3		E^+	E^b	E^-	R^b	R^-	O	Classification
Entrepreneurial industries with growing population (E^+)								
55	Hotels and restaurants	4	3				2	E^+
64	Post and telecommunications	3			2	2	1	E^+
72	Computer and related activities	3	1			1	1	E^+
74	Other business activities	4	1			1	1	E^+
70–74	Real estate renting and business activities	4	1			1	2	E^+
Entrepreneurial industries with balanced population (E^b)								
01–05	Agriculture, hunting, forestry and fishing	2	2	2			2	E^b
30	Office accounting and computing	1		2	2		1	E^b
45	Construction		5	2			2	E^b
50–74	Business sector services		4			1	3	E^b
90–93	Other community social and personal services	1	2	1	1		3	E^b
Other industries (O)								
10–14	Mining and quarrying	1		2	1	2	2	O
21–22	Pulp, paper, printing and publishing		1		1	2	5	O
24	Chemicals and chemical products	2			1	1	4	O
25	Rubber and plastics products					2	6	O
26	Other non-metallic mineral products				1	2	7	O
28	Fabricated metal products					1	6	O
29	Machinery and equipment n.e.c.				1	1	6	O
31	Electrical machinery and apparatus nec				1	2	5	O
32	Radio, television and communication equipment				1	3	4	O
36–37	Manufacturing n.e.c.; recycling	2				3	5	O
50–52	Wholesale and retail trade; repairs		2			1	6	O
60–63	Transport and storage			1	1		5	O
66	Insurance/pension exc. compulsory soc. sec.			1	1	1	4	O
67	Activities related to financial intermediation	1	1			1	3	O
70	Real estate activities	2	1			1	3	O
71	Renting of machinery and equipment		1			1	2	O
73	Research and development	1			1	1		O
85	Health and social work	1			2		4	O
Routinised industries with balanced population (R^b)								
2,423	Pharmaceuticals			1	3	1		R^b
23	Fuel products				2	2	3	R^b
27	Basic metals	2			2	3		R^b
27–28	Basic metals and fabricated metal products		2		3	1	3	R^b
33	Medical precision and optical instruments		1		2	2	2	R^b
34	Motor vehicles, trailers and semi-trailers				4	3		R^b
34–35	Transport equipment	1			5	2	1	R^b
40–41	Electricity gas and water supply	1			3	3	1	R^b
80	Education	1			2	1	3	R^b
Routinised industries with declining population (R^-)								
15–16	Food products, beverages and tobacco	1		1	1	5	2	R^-
17–19	Textiles, clothing, leather and footwear			3		6	1	R^-
20	Wood and products of wood and cork		2			6	2	R^-
35	Other transport equipment	1		1	1	3	2	R^-
65	Financial interm. exc. insurance & pensions	1			1	4	1	R^-
65–67	Financial intermediation		1	2	1	3	2	R^-
75	Public administration and defence	1	1	1	1	2	1	R^-

Note: The sum over frequencies is less then ten when data were missing for some countries

Table 2 Turnover and net entry rates by sectoral regime

Variables/Industry type	Entrepreneurial		Other	Routinised		
	Growing (E^+)	Balanced (E^b)	(O)	Balanced (R^b)	Declining (R^-)	
Number of observations		38	55	217	67	73
Turnover	*Mean*	11.72	9.90	7.75	6.66	7.63
	Standardised	.95	.56	–.12	–.54	–.18
Net entry	*Mean*	1.9	.21	.35	.48	–.51
	Standardised	.93	–.02	.00	.08	–.55

Note: Entry and turnover rates are employment weighted

and the different nature of our new industry groups in terms of firm entry and turnover. The focus is first on gross operating profits and then on growth rates of value added and labour productivity. Because of the lack of a comprehensive and fully specified model of differential sectoral profitability and growth, we summarise the theoretical conjectures only in terms of general statistical associations, or tendencies.

3.1 The profitability nexus

At the most fundamental level, the probability of market entry by firm i is determined by its assessment of two factors: (i) opportunity and (ii) cost of experimentation. The first determinant refers to expected post entry operating profits π_i^e, and the second to investment F required to enter the market (see, e.g., Geroski 1995):

$$Z_i = \beta(\pi_i^e - F) + \varepsilon_i \tag{1}$$

For the sake of simplicity, we assume that F is equal for all potential entrants within the same market. From a static viewpoint with perfect competition among rational and homogenous agents, entry will occur as long as the discounted value of expected returns is higher than the entry cost, i.e. if $\pi_i^e > F$. Since entry depresses the incumbents' price setting power, profits decline while entry increases. In equilibrium, expected post entry profits net of entry cost would be zero ($\pi_i^e – F = 0$) for all firms i, and Z_i will only depend on stochastic variations without any systematic component. Therefore in a world of static equilibrium and perfect competition (with positive entry cost but no strategic interaction) the baseline conjecture is to expect no significant differences in the average profitability between industries.

Conjecture $C0_{\text{prof}}$ – Equilibrium with perfect competition:Competitive entry will occur as long as the discounted value of expected returns is higher than the entry cost. In equilibrium, supernormal profits are competed away. Consequently, industries do not differ systematically in terms of average profitability, i.e.

$$C0_{\text{prof}} : \frac{1}{N}\sum_{i=1}^{N} Z_{ij} = 0; \text{for any industry}\, j.$$

Deviations from the model of perfect competition arise when expected operating profits π_i^e depend on F, as is the case when the cost to start a business in the industry are sunk. The point is that incumbents can deter entry and maintain supernormal operating profits $\pi_i > F$ by dampening expectations about the post entry returns for potential new competitors. This is possible because of the credible threat to write-off their sunk investment and pursue an aggressive pricing strategy in the case that entry actually occurs. Since expected post entry operating profits π_i^e are lower than the actual profits π_i without entry, the competitive threat of potential new entrants does not eliminate the excess profits. The start-up cost F thus becomes an effective barrier to entry, which tends to increase market concentration and the incumbents' price setting power (Bain 1956;[5] Schmalensee 1986; Slade 2004).

What further complicates the matter is that entry barriers do not need to be exogenous, but

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[5] Bain (1956, p. 3) actually defined barriers to entry by the "extent to which established sellers can persistently raise their prices above a competitive level without attracting new firms to enter the industry."

can also result from endogenous strategic interactions among incumbent firms, who, for instance, lobby for certain legal privileges or engage in escalating marketing and R&D races. In other words, incumbent firms might excessively raise expenditures on sunk investments in order to increase the cost of entry (Sutton 1991, 1998). Consequently, entry barriers also depend on strategic actions to preserve long-run profitability.

In short, the general implication of the industrial organisations literature for a cross section of industries[6] is that barriers to entry, and hence the accordingly lower dynamics of firm creation and turnover, associate with a higher average profitability in the industry. Since market concentration and profitability are potentially endogenous, simple causal inferences can be misleading, invoking a more cautious approach that attempts to identify general statistical regularities.

> *Conjecture* $C1_{\mathrm{prof}}$ *– Equilibrium with market power*A sector's profitability tends to rise with the height of entry barriers, because these facilitate entry deterrence and strategic interaction. Consequently, average profitability is higher in industries that are characterised by low rates of corporate turnover, i.e. $C1_{\mathrm{prof}}: \frac{1}{N_l}\sum_{i=1}^{N_l} Z_{il} < \frac{1}{N_k}\sum_{i=1}^{N_k} Z_{ik}$ with l representing entrepreneurial industries with high, and k routinised industries with low rates of firm turnover.

While industrial organisations focuses on market power and strategic interaction within a well defined equilibrium framework, alternative concepts of entrepreneurial competition emphasise disequilibria, heterogeneity, and rivalry among agents with inchoate knowledge about the market. Most notably, Schumpeter (1911) and Kirzner (1997) share an understanding of competitive markets as fast moving environments in which restless and rivalrous entrepreneurs seek their opportunities to make profit. Even when assuming that the market moves towards equilibrium (as does Kirzner but not Schumpeter), this process takes time and entrepreneurs can make an extra profit from being first in creating or discovering new opportunities. Consequently, the entrepreneurial discovery of opportunities for profit (net of entry cost) is no longer a mere transitory effect, but constitutes an essential and recurrent characteristic of the competitive process.

This perspective is consistent with the empirical evidence of large turbulence within corporate populations as presented, for example, in Haltiwanger (2000) or Bartelsman et al. (2003). What the data suggest is that to a considerable degree actors are ignorant about the precise match between opportunities and their own capabilities (Jovanovic 1982). Start-ups are simply not capable to make an accurate guess about their post entry profits, often failing within a few years after beginning their operations. Furthermore, firms are not homogenous but differ in their competitive strengths and weaknesses, as we see, for instance, when competitive entrants displace incumbent firms that do not meet the elevated market standard. From this alternative perspective, entry and exit are the outcome of continuous experimentation among heterogeneous and reasoning, but never perfectly rational, 'agents of change' (Audretsch 1995).

The upshot of the disequilibrium view is that *entrepreneurs thrive on change, because change is what offers new opportunities for profit*. Contrary to the previous discussion, this perspective can accommodate with a positive relationship between average profitability and entry, which has been confirmed by many empirical studies (see, e.g., Mansfield 1962; Dunne and Roberts 1991; Sleuwaegen and Dehandschutter 1991; or Carree and Thurik 1996). However, it also implies the critical and provocative assumption, that opportunities may persist (at least for some considerable time), even though they attract more entrepreneurial initiative. One explanation might be Schumpeter's endogenous creation of opportunities by new entrants. Alternatively, Kirzner (1997) or Schultz (1975) assume that

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[6] That is, without knowing further details about the precise strategic interaction of firms within the particular industries.

opportunities from changing tastes or technology arise exogenously, but at a speed that is sufficient for markets to move faster than competitors can generally adjust (Peneder 2001).

> *Conjecture* $C2_{\text{prof}}$ *– Opportunity-seeking entrepreneurship*:Industries with higher average profitability induce more opportunity-seeking entrepreneurship. *Ceteris paribus* industries with high corporate turnover thus also tend to exhibit above average profitability, i.e.
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> $C2_{\text{prof}}: \frac{1}{N_l}\sum_{i=1}^{N_l} Z_{il} > \frac{1}{N_k}\sum_{i=1}^{N_k} Z_{ik}$ with l representing entrepreneurial industries with high, and k routinised industries with low rates of firm turnover.

It is important to note, that all the three conjectures remain logically consistent with two fundamental mechanisms that should not be denied. First, profits induce entry ('opportunity effect'). Second, entry tends to raise competition and thereby decrease profits ('competition effect'). The difference is that in conjecture $C0_{\text{prof}}$ the competition effect is omnipotent and thus eliminates all supernormal profits, while conjecture $C1_{\text{prof}}$ allows these profits to persist because of barriers to entry. In contrast, the final conjecture $C2_{\text{prof}}$ assumes that supernormal profits can persist in a dynamic market, even if entry barriers are insignificant, because opportunities are continuously restored either by endogenous innovation or exogenous changes of tastes and technology.

3.2 The growth nexus

Turning to the effects of distinct sectoral regimes on the average growth of value added and labour productivity, the first question of interest is whether we expect growth to be balanced or not. Focusing only on macroeconomic variables, most steady state balanced growth models (implicitly) assume that all industries grow at equal rates (see, for instance, Barro and Sala-i-Martin 1995; Solow 2000). Again, we make use of the strict equilibrium rationale as a convenient baseline conjecture.

> *Conjecture* $C0_{growth}$ *– Balanced growth*Under the assumptions of a steady state balanced growth path all factors grow in equal proportions and differences between industries are only due to temporary exogenous shocks. Consequently, there won't be systematic and significant differences in the growth of value added (ΔVA) or labour productivity (ΔLP) between sectors, i.e.
>
> $C0_{\text{growth}}: \Delta\text{VA}_l - \Delta\text{VA}_k = 0$, and $\Delta\text{LP}_l - \Delta\text{LP}_k = 0$ for any pair of industries l and k.

In contrast, evolutionary economists emphasise the importance of differential growth and structural change (see, e.g., Metcalfe 1998). However, a precise conjecture about which sectoral regimes can be expected to be more conducive to higher growth than others is anything but straightforward. At the most general level, we find three reasons why the corporate dynamics of entry and exit should associate positively with the process of economic growth and development. First, new and potential rivals bid down prices, limit the leeway for anticompetitive behaviour in the market at given costs, and raise the cost discipline among incumbent firms. Consequently, lower prices induce additional demand and raise the level of output ('competition effect'). Second, entry and exit foster the continuous regeneration of an economy's technological, managerial and entrepreneurial resources, thereby enhancing the adaptation of local production structures to continuous changes in technology and demand ('structural adaptation effect'). Third, corporate start-ups put new combinations of resources and ideas to a test on the market. More entry implies more experimentation and raises the probability of successful novel combinations. As they discover and develop new market niches, start-ups contribute to greater diversity and quality of products and services ('innovation effect').

The problem with the above reasoning is that the economic functions of competition, structural adaptation, and innovation do not exclusively reside in the process of creative destruction that is triggered by new start-up companies. The 'competition effect' can also be caused by potential entry (Bain 1956; Baumol, Panzar, and Willig 1982) and therefore need not be visible in the data on corporate demography. 'Structural adaptation' can also be achieved by organisations that learn to adjust to changes of technology or demand and thus escape the perils of creative destruction (March 1999). Finally, big enterprises might be better equipped to sustain the 'innovation effect', because of their greater capacity to finance and run large and specialised research laboratories, and subsequently bring major inventions to the market (Schumpeter 1942). In short, the above reasons won't lead us to any general predictions about differential growth rates in relation to the extent of firm entry and turnover and thus translate poorly into conjectures about average growth rates of the new sectoral regimes.

What we need is a theory that relates specifically to the distributional characteristics of firm entry and exit in an industry. We find that in the industry life cycle model of Klepper (1996), which pays particular attention to the shift from product to process innovation throughout industry evolution. To briefly recapitulate, the model's rationale begins with the assumption of heterogeneous firms, whose distinct capabilities establish their potential to generate product innovations. This way, the model ties the number of product innovations to the number of independent firms, with the straightforward implication that a growing firm population also raises an industry's potential to generate product innovations. Because each product innovation has the potential to attract new customers, demand can expand faster when industries are relatively new and exhibit a growing firm population. In short, Klepper's model leads us to expect a positive relationship between the net entry of firms in an industry and its growth of demand and output.

Yet, this is not where the story ends. As firms grow, their increasing size raises the returns to process innovations, which cause prices to decline and smaller firms to exit the market. As the number of firms declines, the diversity of product innovations shrinks, further strengthening the advantage of large incumbents. Consequently, as increasing returns to process innovations drive out product variety, mature industries tend to experience higher growth of labour productivity. Following some basic intuitions of Klepper's model, we may thus draw two opposite but mutually consistent conjectures about the nexus of firm entry and turnover with the growth of value added on the one hand and labour productivity on the other. Furthermore, since the growth of employment is a joint outcome of output and productivity growth, we may extend our conjectures and conclude that entrepreneurial industries with a growing firm population is the only sector type from which me may consistently expect a solid and above average contribution to the creation of jobs.

Conjecture $C1_{\text{growth}}$ – Differential growth over the life cycle:Entrepreneurial sectors with a growing firm population generally associate with an above average growth of demand and value added, while routinised regimes tend to outperform them in terms of labour productivity growth, i.e.

$C1_{\text{growth}}$: $\Delta\,\text{VA}_l > \Delta\,\text{VA}_k$,$\Delta\,\text{LP}_l < \Delta\,\text{LP}_k$, and $\Delta\,\text{EMP}_l > \Delta\,\text{EMP}_k$, with l representing entrepreneurial industries with a growing, and k routinised industries with a declining firm population.

4 Econometric specification

For the econometric specification, we are interested in the impact of the sector type k on a performance variable y after controlling for the influence of operating in country n at time t, while simultaneously taking account of possible interaction effects between industry types and countries. The simple linear model therefore takes the form:

$$y_{knti} = c + \alpha_k + \beta_n + \gamma_t + \phi_{kn} + \varepsilon_{knti} \tag{2}$$

with i = individual observations; k = sector classes 1 to K; n = countries 1 to N; and t = years 1 to T.

What makes the model different from standard OLS regressions is that the independent variables take nominal values representing different categories, instead of being continuous (interval scaled). The standard technique for estimating the parameters of the linear model, when the independent variables are nominal, is the analysis of variance (ANOVA) regression (see, e.g., Sharma 1996). With $\bar{y}$ being the overall mean of the dependent variable, this panel regression estimates the *main effects* of the various categories of industry types, countries, or years, as the difference to the pooled mean of observations, i.e.

$$\alpha_k = \bar{y}_k - \bar{y}, \beta_n = \bar{y}_n - \bar{y}, \text{and} \gamma_t = \bar{y}_t - \bar{y}.$$

Introducing an additional interaction between the sector types and countries produces *kn* additional categories, which account for the various combinations of the two factors. Their impact is estimated as the difference between the actual mean of each pair *kn* and the main effects of group membership (without interaction), i.e.

$$\phi_{kn} = \bar{y}_{kn} - \hat{y}_{kn} \text{with } \hat{y}_{kn} = \bar{y}_k + \bar{y}_n - \bar{y}.$$

Since the panel regression applies the method of ordinary least squares, the objective is to minimise the error sum of squares (or *within* group squared deviation), which equals the total sum of squared deviations minus the sum of squared deviations explained by the model (or *between* group deviations). Taking account of the interaction between *n* and *k* in addition to the main effects, we get the following expression, where each individual observation *i* is defined by the sector type *k*, country *n*, and year *t*:

$$\begin{aligned} \min: & \sum_{k=1}^{K}\sum_{n=1}^{N}\sum_{t=1}^{T}\sum_{i=1}^{M_{knt}} [y_{knti} - (\bar{y}_{kn} + \bar{y}_t)]^2 \\ &= \sum_{k=1}^{K}\sum_{n=1}^{N}\sum_{t=1}^{T}\sum_{i=1}^{M_{knt}} (y_{knti} - \bar{y})^2 \\ &- \left(T \sum_{k=1}^{K}\sum_{n=1}^{N} M_{kn}(\bar{y}_{kn} - \bar{y})^2 \right. \\ &\left. + KN \sum_{t=1}^{T} M_t(\bar{y}_t - \bar{y})^2 \right) \end{aligned}$$

On the left hand side is the squared deviations of each observation from its respective group mean, i.e. the unexplained within variation. The right hand side begins with the total variation expressed as squared deviations of each observation from the overall mean. The following term is the sum of squared deviations of the group means from the pooled mean, i.e. the explained variation between categories. Thus, the ANOVA estimator is a method of moments type estimator which equates the sum of squares to their expectations and solves the resulting linear system of equations. Written down in terms of the above model, Table 3 summarises the conjectures on profitability and growth from the previous section.

For balanced panels ANOVA generally produces best quadratic unbiased estimators of the

Table 3 Summary of testable conjectures

Theoretical rationale	Dependent variable y	Conjectures (α_k)
Equilibrium with perfect competition	Profitability (*PCM1, PCM2*)	$\alpha_j = 0$ for all j.
Equilibrium with market power	Profitability (*PCM1, PCM2*)	$\alpha_{E^+} < 0$; $\alpha_{E^b} < 0$; $\alpha_{R^b} > 0$; $\alpha_{R^-} > 0$.
Opportunity-seeking entrepreneurship	Profitability (*PCM1, PCM2*)	$\alpha_{E^+} > 0$; $\alpha_{E^b} > 0$; $\alpha_{R^b} < 0$; $\alpha_{R^-} < 0$.
Balanced growth	Growth of value added (ΔVA), labour productivity (ΔLP), and employment (ΔEMP)	$\alpha_j = 0$ for all j.
Differential growth and industry evolution	(i) Value added growth (ΔVA)	$\alpha_{E^+} > 0$; $\alpha_{R^-} < 0$.
	(ii) Labour productivity growth (ΔLP)	$\alpha_{E^+} < 0$; $\alpha_{R^-} > 0$.
	(iii) Employment growth (ΔEMP)	$\alpha_{E^+} > 0$; $\alpha_{R^-} < 0$.

Note: *E* = Entrepreneurial regime; *R* = Routinised regime; *O* = Other sectors; '+' = ...'with growing population'; '*b*' = ...'with balanced population'; '–' = ...'with declining population

Table 4 Industry-type effects (after controlling for independent country and time effects)

Industry types (‘*Other*’ dropped)	Price-cost margin (*PCM 1*)	Price-cost margin (*PCM 2*)	Growth of labour productivity	Value added growth	Employment growth
1992/1993–2000[a]					
E^+	.080 (10.9)**	.070 (7.0)**	–.013 (2.5)*	.026 (4.7)**	.037 (13.7)**
E^b	.109 (17.4)**	.152 (19.3)**	–.013 (3.0)**	–.021 (4.6)**	–.007 (2.9)**
R^b	–.049 (8.6) **	–.045 (6.2)**	.002 (.5)	–.003 (.8)	–.005 (2.5)*
R^-	–.030 (6.1)**	.032 (5.0)**	–.000 (.1)	–.027 (7.7)**	–.024 (14.1)**
Observations	10,339	6,800	8,172	8,172	8,172
R-squared	.27	.24	.09	.10	.12
1992/1993–1996[a]					
E^+	.081 (7.8)**	.074 (5.56)**	–.016 (2.2)*	.016 (2.1)*	.031 (9.2)**
E^b	.102 (11.6)**	.147 (14.1)**	–.010 (1.7)	–.018 (2.8)**	–.007 (2.3)*
R^b	–.051 (6.4) **	–.039 (4.1)**	.006 (1.1)	–.003 (.5)	–.004 (1.5)
R^-	–.022 (3.2)**	.038 (4.5)**	–.005 (1.0)	–.028 (5.8)**	–.022 (10.3)**
Observations	5,740	3,862	4,157	4,157	4,157
R-squared	.25	.26	.07	.08	.16
1997–2000					
E^+	.080 (7.7)**	.064 (4.2)**	–.009 (1.3)	.035 (4.6)**	.044 (10.3)**
E^b	.116 (13.3)**	.158 (13.3)**	–.015 (2.5)*	–.024 (3.7)**	–.007 (1.9)
R^b	–.045 (5.6) **	–.053 (4.8)**	.002 (.5)	–.010 (1.7)	–.007 (2.2)*
R^-	–.040 (5.7)**	.024 (2.4)**	–.004 (.9)	–.026 (5.3)**	–.027 (10.1)**
Observations	4,599	2,938	4,015	4,015	4,015
R-squared	.30	.22	.17	.17	.10

[a] All data on growth start with the year 1993; price-cost margins in 1992

Note: Absolute value of *t*-statistics in parentheses; *significant at 5%; **significant at 1%; *PCM1* = gross operating surplus/value added; *PCM2* = (gross operating surplus—gross fixed capital formation)/value added

variance components (Baltagi 2001, p. 162). It is, however, also based on the assumptions of normal distribution and homoscedasticity (equal variances). Even though it is generally considered to be relatively robust with respect to violations of the first assumption, heteroscedasticity can pose a serious problem, especially when the sample sizes differ, as is the case for the new sector types. As a consequence, we will also run a series of non-parametric tests. In addition to the Kruskal Wallis and Median tests, which tell whether the overall taxonomy discriminates significantly, we also apply the Kolmogorov–Smirnov test for equality of distribution functions and the Wilcoxon rank-sum (Mann–Whitney) test for each pair of industry types.

5 Empirical findings

Table 4 presents the panel regressions with independent country, time, and industry type effects for two different measures of price-cost margins as well as the sectoral growth of labour productivity, value added and employment. The vast majority of interaction effects between industry types *k* and countries *n* were not significant so that these were omitted from the final estimations. Table 5 summarises the results of the non-parametric tests, which consistently confirm that the observed differences between the sectoral regimes are robust and significant irrespective of the assumptions about normal distribution and equal variances. All the data on sectoral performance stem from the OECD STAN database and cover the years from 1992 (in the case of price cost margins) or 93 (for all growth rates) to 2000 for a total of 24 countries. It is evident that the performance measures are determined by a number of factors that are not controlled for in the above specification. We consequently encounter a lot of unexplained variation in the data. Since this paper cannot offer a fully specified theoretical model of sectoral profitability and growth, the estimations won't settle questions of the precise causality at work. This is why we only

Table 5 Non-parametric tests on the difference between sectoral regimes (1992/1993–2000)

Variable	Number of observations	Group mean	Group median	Greater than median: no/yes	Kolmogorov–Smirnov/Wilcoxon rank sum test by sector type				
					E^+	E^b	O	R^b	R^-
Price-cost margin (PCM1)									
E^+	780	.414	.408	235/545	–	–	*	*	*
E^b	1,156	.443	.416	362/794	*	–	*	*	*
O	4,859	.327	.300	2,582/2,277	*	*	–	*	*
R^b	1,465	.281	.276	821/644	*	*	*	–	–
R^-	2,079	.296	.288	1,173/906	*	*	*	*	–
Price-cost margin (PCM2)									
R^+	451	.159	.179	173/278	–	*	*	*	*
E^b	816	.247	.215	228/588	*	–	*	*	*
O	3,148	.088	.104	1,724/1,424	*	*	–	*	*
R^b	992	.049	.055	644/749	*	*	*	–	*
R^-	1,393	.114	.133	1,724/1,424	*	*	*	*	–
Value added growth									
E^+	560	.090	.075	156/404	–	*	*	*	*
E^b	842	.045	.042	457/385	*	–	*	*	*
O	3,786	.066	.052	1,808/1,978	*	*	–	–	*
R^b	1,230	.065	.055	574/656	*	*	–	–	*
R^-	1,754	.038	.025	1,091/663	*	*	*	*	–
Employment growth									
E^+	560	.044	.037	115/445	–	*	*	*	*
E^b	842	–.001	.004	403/439	*	–	–	–	*
O	3,786	.006	.005	1,740/2,046	*	–	–	*	*
R^b	1,230	.001	.000	632/598	*	–	*	–	*
R^-	1,754	–.019	–.012	1,196/558	*	*	*	*	–
Labour productivity growth									
E^+	560	.045	.036	316/244	–	–	*	*	*
E^b	842	.047	.037	463/379	–	–	*	*	–
O	3,786	.060	.045	1,845/1,941	*	*	–	–	–
R^b	1,230	.064	.049	579/651	*	*	–	–	–
R^-	1,754	.059	.043	883/871	*	–	–	–	–

Note: *Significant at 1% level; Kruskal–Wallis and Median test are significant at 1% level for all the variables

E = entrepreneurial regime; R = routinised regime; O = other sectors; '+' = 'with growing population'; 'b' = 'with balanced population'; '–' = 'with declining population

seek for stylised facts in the sense of the representation of a general tendency.

However, in order to gain additional insights about the causality at work and simultaneously test the robustness of our findings, Table 4 also exhibits the results for the two subperiods 1992/1993–1996 and 1997–2000. Under the assumption that most data, which entered the clustering algorithm, roughly represent the sector's firm demographic characteristics around the year 1996, the general idea is to split the performance variables into one period before and one after the occurrence of entry/exit. If, for example, entrepreneurial industries associate with high profits in the first period, but not in the second, we have a strong indication of equilibrium tendencies, where high profits induce entry, but then decline due to the growing number of competitors. If, however, above average returns persist despite high net entry rates, one is inclined to doubt the usual equilibrium rationale and rather turn to alternative explanations as discussed in the theoretical conjectures above.

5.1 Profitability

The first measure for profitability (*PCM1*) is the "operating surplus" defined as value added minus labour cost (payroll), and then divided by total value added. *PCM1* thus provides an aggregate measure of profit before taxes, financial charges and depreciation. Even though it is a very crude variable, it can be broadly interpreted as a firm's cash flow that is either paid to the shareholders, used for raising reserve assets, or for financing investments. Apparently, we critically miss the expenditures on capital use to derive a variable that reflects profits more closely. Lacking reliable sectoral data on capital depreciation, we simply subtract the current expenditures on gross fixed capital formation for the second measure of price-cost margins (*PCM2*). Only in the special case of zero net investment is this equivalent to the expenditures on capital use. More generally, however, the new variable proxies the cash flow after financing current capital investments, which is either available for the distribution of profit or for raising shareholder value through the build-up of equity capital and reserves.

The regression results in Table 4 show that the sector-type dummies from the new taxonomy significantly affect both measures of profitability. Based on our data and methodology, we can thus reject conjecture $C0_{\mathrm{prof}}$, which was derived from a strict equilibrium rationale with perfect competition. While $C0_{\mathrm{prof}}$ served as a stylised benchmark, the conjecture $C1_{\mathrm{prof}}$ more realistically assumed that industries differ because of the presence of market power, expecting that routinised industries with low corporate turnover are more profitable. Straightforward as the rationale might be, it is not supported by the data, even though the particular choice of the two measures on profitability makes a difference. While the group of routinised industries with a balanced population exhibits a negative coefficient in both regressions, their sign switches from a negative effect on *PCM1* to a positive impact on *PCM2* for industries with an inertial but declining population. This finding was not anticipated in the previous considerations and seems to reflect a tendency of routinised industries with a declining population to curb investments and retain a higher portion of the cash flow for better alternative uses by their shareholders. For both measures of profitability it is the entrepreneurial types that exhibit higher price-cost margins than the comparison group of 'other' industries with an intermediate profile of firm entry and turnover. Interestingly, the coefficient is highest for entrepreneurial industries with a balanced population, which is not explained by either conjecture. The estimations for separate time periods hardly differ from the overall results, which strongly confirm the entrepreneurial perspective of market competition as summarised in conjecture $C2_{\mathrm{prof}}$. Also the non-parametric tests largely confirm the robustness of our results from the regressions.

The regressions also include year and country dummies, which are not displayed in the table. The year dummies are hardly significant, which is consistent with the above observation of a high degree of persistence of profit rates through time. Conversely, we find a strong pattern of country effects. With the USA being the comparison group, almost all significant coefficients are positive. Given the dynamic performance of the US economy in that period, the most likely explanation for its below average returns is an overall higher degree of competition, which dampened profits but strengthened demand and output.

5.2 Growth of productivity, value added, and employment

The new taxonomy highlights a number of significant differences in the growth rates among the sectoral regimes. We generally observe a positive association between market dynamics and net entry, although the distinction between entrepreneurial and routinised sectors according to the overall mutability of the firm population clearly matters. For instance, while the group of entrepreneurial industries with a highly mutable and growing population (E^{+}) experienced the highest growth in terms of value added and employment among all the five industry types, it experienced a particularly low growth of labour productivity, with all the three coefficients being significant in the estimations for the entire period (but not for labour productivity growth in the years after 1996).

Comparing the two groups of entrepreneurial and routinised sectors with a balanced firm population (E^{b} vs. R^{b}), the latter consistently outperforms the former in terms of the growth of labour productivity and value added, no matter what time period we choose. Not surprisingly, the routinised industries with an inertial but declining firm population (*R*) are characterised by the least dynamic markets, experiencing the lowest growth of value added and the sharpest decline in employment. Again, the non-parametric tests confirm the robustness of the results from the ANOVA panel regressions.

Since the coefficients on the year dummies are not displayed in Table 4, let us briefly mention that they are all significant in the regressions on the growth of labour productivity and value added, demonstrating the exceptional global dynamics in the benchmark years 1999 and 2000. For employment, the year dummies capture the particularly weak performance in the years 1992–1994, but otherwise they are not significant. Apart from a few exceptions, the country effects on sectoral performance relative to the US are all negative and significant, highlighting the outstanding growth performance of the US economy during that period.

The evidence of both the panel regressions and the non-parametric tests leads us to reject the notion of balanced growth in conjecture $C0_{\mathrm{growth}}$. Applying the new taxonomy revealed systematic differences in the sectoral growth rates. While the relatively new industries in the entrepreneurial mode with a growing firm population are more successful in expanding demand and hence production, the comparison group and the routinised industries perform better in raising labour productivity. This result concurs best with the alternative conjecture $C1_{\mathrm{growth}}$, which we had built upon the rationale of Klepper's industry life cycle model.

The results further show that net entry as a general proxy for entrepreneurial opportunity is not sufficient to capture differences in the sectoral dynamics, since among industries with a balanced firm population, the ones in the routinised mode clearly outperform the entrepreneurial ones in a number of variables. The analysis demonstrates that we must also take into account the overall mutability of the firm population, which reflects the different cost of entry and exit.

6 Summary and conclusions

Using a new database provided by the OECD firm-level study, this paper investigates the link between the firm demographic characteristics of net entry and turnover with sectoral performance in terms of profitability and the growth of value added, labour productivity and employment. Based on the distinction between 'opportunity' and 'cost of experimentation' as major determinants of firm creation and destruction, statistical cluster analysis identifies a new sectoral classification that is comprised of five distinctive sector types. In addition to exploring the sectoral distribution of firm demographic characteristics, the new taxonomy is instrumental for circumventing restrictions in data coverage and provides a categorical variable for the following econometric analyses.

Panel regressions and non-parametric tests demonstrate that the nexus of entry and turnover with profitability and growth is more complex than initially anticipated. To give a brief characterisation of the sectoral regimes:

- *Entrepreneurial industries with a mutable and growing population* present themselves as a particularly distinctive sector type, where the high output growth allows to maintain high price-cost margins despite a growing number of firms and low productivity performance.

- In contrast, *entrepreneurial industries with a mutable but balanced population* maintained above average profits despite low growth and productivity performance. The presumably low cost of market entry explain the high level of entrepreneurial initiative, and many of the new enterprises are likely to be of a comparatively small scale.

- Considering its low profitability, *routinised industries with an inertial and balanced firm population* appear to be mainly characterised by intense cost competition and a limited scope for market expansion so that competitive performance typically depends on the technical efficiency of operations.

- Finally, in *routinised industries with an inertial but declining firm population* the combined effect of enduring productivity growth with little growth of demand implies a particularly harsh environment for maintaining jobs.

To summarise, the empirical findings support the following conclusions.

First, the analytical distinction between entrepreneurial and routinised regimes as introduced by Winter (1984), Audretsch (1991) or Malerba and Orsenigo (1993) clearly makes a difference in terms of the average profitability and growth performance of individual industries.

Second, growth of value added and employment is significantly higher among entrepreneurial industries with a mutable and growing firm population. In contrast, their growth of labour productivity is lower. This finding is consistent with conjectures drawn from the industry life cycle model of Klepper (1996), which implies that firms in the young and entrepreneurial industries primarily expand the market through product innovations, whereas those in routinised sectors have stronger incentives to improve their productive efficiency by means of process innovations.

Third, entrepreneurial industries with a mutable firm population generally exhibit a significantly higher profit ratio than the other sectors, suggesting that business start-ups will generally follow where opportunities for profit are high. Conversely, based on the same evidence one is inclined to reject the idea that entry and firm turnover will generally bring markets close to the benchmark of perfect competition, or, alternatively, that routinised industries are more profitable because of their higher barriers to entry and exit. The empirical finding is thus consistent with the dynamic perspective of market competition as emphasised, most notably, by the Austrian and the Schumpeterian tradition in economics, as well as the more recent literature on entrepreneurship research (see, for instance, Acs and Audretsch 2003; or Shane 2004). In short, opportunities for profit induce entry, but in particularly entrepreneurial industries the disequilibrating forces appear strong enough to continuously upset the market and prevent their depletion.

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Appendix: The statistical cluster analysis

Statistical cluster analysis can be described as the art of finding groups in data. Peneder (2005) provides a detailed discussion of how cluster analysis can be applied to the task of creating industry classifications, explaining the manifold trade-offs involved in the particular choices one has to make, also demonstrating their varying impact on the final outcomes by means of numerical examples and a geometric representation. For further instructions on the basic methodology, the interested reader may, for example, turn to the textbooks by Anderberg (1973), Kaufmann and Rousseuw (1990) or Gordon (1999).

Measures of dissimilarity[7]

The clustering process starts with a given data matrix of $i = 1,\ldots,n$ observations for which characteristic attributes x are reported for $j = 1,\ldots,p$ variables. The initial data set of the dimension $n \times p$ is then transformed into a symmetric dissimilarity matrix of dimensions $n \times n$ observations with d_{ih} being the coefficients of dissimilarity for observations x_i and x_h. Among available measures of dissimilarity, the Euclidean distance euc_{ih} appears to be the most natural because of its direct application of the Pythagorean Theorem:

$$\mathrm{euc}_{ih} = \sqrt{\sum_{j=1}^{p} (x_{ij} - x_{hj})^2} \quad 0 \leq \mathrm{euc}_{ih} < \infty \qquad (A.1)$$

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[7] For methodological literature on statistical cluster analysis see, for example, Anderberg (1973), Kaufmann and Rousseuw (1990) or Gordon (1999).

Operating with the squared differences, the Euclidean measure is sensitive to outliers. Alternatively, the closely related Manhattan or *city block distance* prescribes equal importance to any unit of dissimilarity, because it simply calculates the sum of the absolute lengths of the other two sides of the triangle:

$$\text{cityb}_{ih} = \sum_{j=1}^{p} \left| x_{ij} - x_{hj} \right| \quad 0 \leq \text{cityb}_{ih} < \infty \qquad (2)$$

First step: the k-means method

For the k-means method, one must divide the set of observations by a pre-defined number of clusters k. For example, k nearly equal-sized segments can be formed as an initial partition. Cluster centres are computed for each group, which are the vectors of the means of the corresponding values for each variable. The objects are then assigned to the group with the nearest cluster centre. After this, the mean of the observations are recomputed and the process is repeated until convergence is reached. This is the case when no observation moves between groups and all have remained in the same cluster of the previous iteration. With this method, a critical and potentially manipulative choice is the initial number of clusters k. Outliers in the data can seriously distort the cluster means. By increasing the number k, more and more outliers will be segregated as separate clusters so that the remaining objects will be classified as though the outlier were not there. Again, there is a trade-off. If the number of clusters k is too large, the problem of missing information about the relative dissimilarity between clusters makes it difficult to find a meaningful final structure for the total set of observations. I therefore consistently apply the following self-binding rule-of-thumb: "*Choose the lowest number k that maximises the quantity of individual clusters l which include more than 5% of the observed cases.*" Since the data set is comprised of 450 observations, the 5% benchmark is 22 cases. Running the k-means algorithm on a dissimilarity matrix made up of Euclidean distances between any pair of observations for all values of k ranging from 2 to 35, the lowest number fulfilling the above rule turns out to be $k = 21$ with $l = 11$.

Second step: hierarchical clustering

Preserving a higher degree of complexity in the output produced, hierarchical techniques require a heuristic interpretation of the surfacing patterns. The dendrogram in Fig. 2 supports this by means of a graphical representation. The branches on the bottom of the chart represent one entity each, while the root on top represents the entire set of objects. As we move upwards on the chart, the degree of association between objects is the higher, the sooner they are connected by a common root. When groups with more than one object merge, various methods differ in the determination what precisely the dissimilarity between groups is. We apply the common and intuitively appealing average linkages method, whereby the average dissimilarity between all the observations is compared for any pair of groups.

Figure 2 shows the final cluster dendrogram for the 21 groups defined by the prior k-means procedure. Investigating the mean values in each of the variables (not displayed), clusters *C1* and *C3* turn out to be outliers. Together they comprise only 12 observations that must be characterised as highly mutable industries with a declining population (E^{-}). At the other end of the cluster chart, the groups *C18*–*C21* comprise 50 observations for which the population is also highly mutable but fastly growing (E^{+}). Finally, clusters *C4*, *C13* and *C14* establish a group of mutable industries, by and large, characterised by a balanced population (E^{b}). Clusters *C8*, *C9*, *C12*, *C15* and *C17* form a particularly large category of 204 observations with no pronounced deviations from the mean in any of the two characteristics. For the purpose of empirical applications, this residual category of other industries (O) establishes a useful comparison group. Next, clusters *C10*, *C11* and *C16* are easily interpreted as 66 observations of inertial industries with a balanced population (R^{b}). Finally, *C2* and *C5* as well as *C6* and *C7* can be combined according to their common profile of low turnover and negative net entry (R). This latter class is made-up of 74 observations.

The 'consensus' classification

For the purpose of a single joint identification, we finally aggregate the information into a common 'consensus' classification.[8] In most cases, the frequency distribution produced a marked single peak in one of the six categories, which thus identified the final classification of an industry. In a few instances, some reasoned intervention became necessary. For example, in ISIC 90–93 the peak of the frequency distribution appears with the large group of other sectors O, whereas the categories E^+, E^b, and E^- would comprise more cases when taken together. In that instance, this industry became E^b instead of O. Similarly, some sectors had no single peak. When the majority of observations were clearly within either of the entrepreneurial or the routinised regimes, I accordingly identified them as E^b or R^b. In a few cases, where observations were widely spread across entrepreneurial and routinised regimes, the final classification was with the residual category of other industries.

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[8] See Gordon (1999) for recommendations on how to construct *consensus* classifications.

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