TI 2003-014/3
Tinbergen Institute Discussion Paper

Modelling Entrepreneurship

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MODELLING ENTREPRENEURSHIP: UNIFYING THE EQUILIBRIUM AND ENTRY/EXIT APPROACH

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Abstract

Two approaches can be distinguished with respect to modelling entrepreneurship: (i) the approach focusing on the net development of the number of entrepreneurs in an equilibrium framework and (ii) the approach focusing on the entries and exits of entrepreneurs. In this paper we unify these approaches to arrive at a model explaining the equilibrium and actual number of entrepreneurs and the entry and exit rate of entrepreneurs simultaneously and consistently. We apply our unified approach to the Netherlands using self-employment data for the 1960-99 period. We find error-correction of about 20% per year and a very different situation in terms of disequilibrium before and after the early 1980s. Periods of high unemployment appear to be characterized by both high entry and high exit rates.

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1. Introduction

Entrepreneurship is believed to influence economic progress in several respects.[2] To give some examples, entrepreneurship is said to influence the competitiveness of markets, the degree of innovation in an economy, the diversity of available products, productivity, (un)employment, and growth of GDP per capita. There is a growing literature producing empirical validation for these consequences of entrepreneurship (see, e.g., the overview of Carree and Thurik, 2003). Both economists and policy makers are interested in knowing more about the driving forces behind entrepreneurship. While the former group is often satisfied with just giving qualitative explanations for why things are as they are, the latter is especially interested in quantitative assertions about future developments: what will be the future development of entrepreneurship? To what degree will these developments change if circumstances alter? In this paper we aim at developing a model explaining the rate of entrepreneurship, which is also appropriate for forecasting purposes using simulation analyses. Next to the development of the number of entrepreneurs, also the degree of *volatility* in entrepreneurship rates is of importance to progress. The degree of volatility is the rate at which incumbent entrepreneurs are displaced/replaced by new entrepreneurs.[3] It is a totally different matter whether an increase in entrepreneurs of, say, 2% is accompanied by entry and exit rates of 3% and 1% (low volatility) or accompanied by entry and exit rates of 10% and 8% (high volatility). Hence, we aim at developing a model that explains both these phenomena of *net* entry and its components of *gross* entry and *gross* exit consistently at the same time.

We focus on two existing strands in the literature that explain self-employment using empirical modelling. The *first*, which we will label as the equilibrium approach, analyses time-series data to develop a model explaining the net development of entrepreneurs. The first to do such an exercise was Blau (1987) analysing the upturn in the self-employment rate in the United States, which started in the early seventies. From a methodological point of view, the method of analysis was improved by Parker (1996) and applied to the United Kingdom. Since then, it has also been applied by Robson and Wren (1999) and by OECD (2000, chapter 5). With the exception of the model of Blau (1987), all the models in this approach are characterized by estimating a long-term equilibrium equation and a short-term equation; they are linked through an error correction mechanism. Carree et al. (2002), focusing more on the economic consequences (rather than determinants) associated with high and low levels of self-employment rates, also use an error correction model. The *second* approach, which we will label the entry/exit approach, is the entry/exit literature initiated by Mansfield (1962) and Orr (1974). The entry/exit literature has traditionally focused on explaining rates of entry and exit from incentives like profitability and growth and from (entry and exit) barriers like minimum efficient scale. The literature has been extended to the interdependencies of entry and exit by studies like Shapiro and Khemani (1987), Rosenbaum and Lamort (1992), Carree and Thurik (1996) and Fotopoulos and Spence (1998). Entry

[2] For practical purposes, we define in this paper an entrepreneur as a self-employed business owner and use the terms self-employed and entrepreneurs interchangeably. There exists a wide literature on how to define entrepreneurship (De Wit, 1993, pp. 2-3).

[3] More precisely, in the literature volatility is defined as twice the minimum of the entry and exit rate of entrepreneurs.

rates and exit rates are estimated, accounting for their interdependence: at the one hand entry invokes exit (displacement) and on the other hand exit causes entry (replacement).

The main contribution of this paper is in unifying these two approaches leading to a model, which explains simultaneously and consistently the development of the equilibrium number of entrepreneurs, the actual number of entrepreneurs, and the entry and exit rates of entrepreneurs. From the perspective of the equilibrium approach an advantage of the unification is the greater explanatory power of the model. It can be estimated to what extent a determinant influences the entries and exits of entrepreneurs, and not just the net development of self-employment rates. In addition, in the unified approach consistent insight is gained in the causes of *volatility* in entrepreneurship. From the perspective of the entry/exit approach, the advantages of the unification are the modelling constraints on the entry and exit equations, arising from imposing consistency with the equilibrium approach. Most importantly, this provides a solution of the problem of how to model the interdependence between entries and exits. Our unified approach quite naturally leads to error-correction terms in the equations for the entry and exit rates. These error-correction terms take care for the necessary interdependence between entries and exits, so that the implied net development of the total number of entrepreneurs remains plausible, also when simulating over longer periods. This is a novelty in the entry/exit approach.[4] We apply our unified approach to the Netherlands, thus illustrating the usefulness of the approach and finding some interesting results at the same time.

2. The self-employment rate in the Netherlands

In this paper we develop a model that explains simultaneously the development of (i) the equilibrium and actual number of entrepreneurs and (ii) the entry and exit rate of entrepreneurs. Subsequently, we apply this model to the case of the Netherlands. The development of the number of entrepreneurs and the number of businesses are intimately interrelated. Hence, the model developed in this paper could also be used to explain the development of the number of businesses. The model will focus on the entrepreneurship *rate*, that is: the percentage of self-employed in the workforce. Hence, the model also gives insight in the development of *the average firm size* as measured in number of employees, this average being the reciprocal of the entrepreneurship rate.

Since we will apply our model to the Netherlands, let us show how actual developments have been in this country. See Figures 1 and 2. From Figure 1 we see that the development of the entrepreneurship rate is U-shaped. It decreased steadily from about 14% in 1960 until somewhat above 8% in the eighties. After that it increased until about 11% in 1999. This U-shape is typical. It is observed in many Western countries, be it that the year(s) for which the entrepreneurship rate reaches its minimum, differs between countries (see e.g. Carree et al., 2002). Starting from 1987, data on the number of entries and exits of entrepreneurs are also available. It is observed from Figure 2 that both the entry

[4] Carree and Thurik (1999) is the only study in which also an error-correction term is included in the entry and exit equations. However, they do not explain the equilibrium number of entrepreneurs, but equate the relative change of the equilibrium number of entrepreneurs to the relative change of output.

and exit rates – defined as the number of entries/exits relative to the total number of entrepreneurs - increased over 1987-1999. The increase of exits was moderate, whereas the entry rate nearly doubled.

Figure 1. The self-employment rate

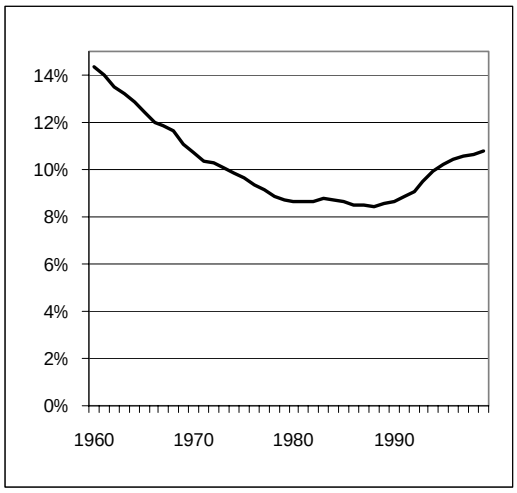
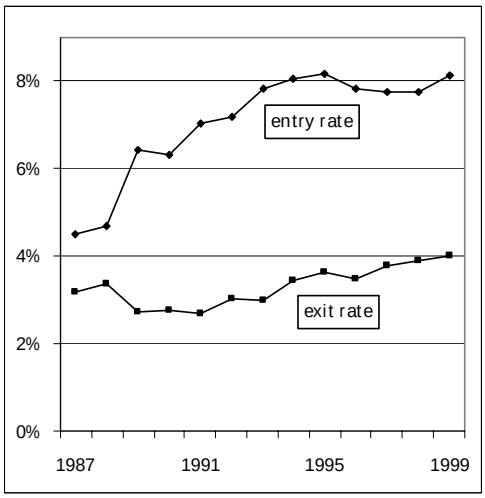


Figure 2. Entry and exit rate of entrepreneurs



3. The model

First, we introduce the part of the model describing the net development of entrepreneurs according to the equilibrium approach. Subsequently, we extend the model by introducing the entry/exit approach.

The equilibrium approach

We postulate an equation governing the development of the long-term equilibrium number of entrepreneurs *N**:

$$\ln N^* = \alpha + \beta t + \ln L + \delta \ln D^* \qquad (1)$$

We choose a log-specification so that a particular change on the right-hand side invokes the same relative change in the equilibrium number of entrepreneurs, irrespective of its current level. On the right-hand side, we include a constant α and a constant growth rate β (time is denoted by *t*). We allow for a *regime switch* in our model, in the sense that we include the possibility of different growth rates in different time periods. The workforce *L* is included as a determinant. We think that there is no convincing theoretical reason why the scale of the economy (as measured by the workforce *L*) should have an independent influence on the equilibrium entrepreneurship rate. Hence, we assume that the size of the effect of *lnL* is unity so that *ceteris paribus* the development of the equilibrium number of entrepreneurs is identical to that of the workforce. Finally, we include a number of other determinants D^*. We choose a log-specification, which implies assuming constant elasticities δ.

The short-term development of the actual number of entrepreneurs *N* is described by:

$$\Delta \ln N = \beta_N + \gamma_N \Delta \ln L + \delta_N \Delta \ln D^* - \varepsilon_N \left[\ln N - \ln N^*\right]_{-1} + \varsigma_N \ln D + u_N \qquad (2)$$

The variables of $\ln D$ are taken in deviation of their respective means. The elasticity of the workforce, γ_N, is allowed to have a value not equal to unity. On the short term the actual number of entrepreneurs could develop differently than the size of the workforce.[5] The other determinants of the equilibrium number of entrepreneurs (D^*) also appear as determinants of the actual number of entrepreneurs, be it with a different elasticity, δ_N. The error-correction term links the development of the actual number of entrepreneurs to its equilibrium value. It states that when the actual number of entrepreneurs differs from its equilibrium value with, say, +10%, in the next year the number of entrepreneurs will decrease with ε_N times 10%. Hence, in the long term the actual number of entrepreneurs follows its equilibrium value. Finally, there is room in our model for determinants D, which do not influence the equilibrium number of entrepreneurs but only the short-term development of the actual number. The error term u_N catches all unobserved determinants.

Extension with the entry/exit approach

The above model only describes the net development of the number of entrepreneurs. Now, we will extend this model by distinguishing explicitly between entries and exits of entrepreneurs. By definition the net relative change in entrepreneurs is equal to the difference of the entry rate *E* and the exit rate *X*:[6]

$$\Delta \ln N \quad \equiv \quad E - X \qquad (3)$$

We exploit this definition by specifying the equations for entry and exit rate completely analogous to the equation (2) describing the net change in entrepreneurs:

$$E = \beta_E + \gamma_E \Delta \ln L + \delta_E \Delta \ln D^* - \varepsilon_E \left[\ln N - \ln N^*\right]_{-1} + \varsigma_E \ln D + u_E \qquad (4)$$

$$X = \beta_X + \gamma_X \Delta \ln L + \delta_X \Delta \ln D + \varepsilon_X \left[\ln N - \ln N^*\right]_{-1} + \varsigma_X \ln D + u_X \qquad (5)$$

[5] For example, in case the expansion of the workforce is largely due to the increase in the female participation ratio, the short-term effect may be less than one since women have been on average less inclined to start new ventures when compared to men.

[6] We have identity equation (3) because we define the entry rate $E = \ln(1 + e / N_{-1})$ and the exit rate $X = \ln(1 + x / N)$ where e is the number of entrants and x is the number of entrepreneurs exiting. Identity (3) follows directly from the identity $N \equiv N_{-1} + e - x$.

The identity equation (3) results in the following restriction to hold for the constant in the model: $\beta_E + \beta_X = \beta_N$. Analogous restrictions hold for the other parameters γ_N, δ_N, ε_N and ζ_N.

From the perspective of the entry/exit approach, the advantages of the unification are the modelling constraints on the entry and exit equations, arising from imposing consistency with the equilibrium approach. Imposing consistency with the equilibrium approach also helps to specify possible determinants in the entry and exit equations. From the equilibrium approach it is directly clear whether determinants should be specified as relative changes (determinants D^*) or as log-levels (determinants D) in equations (4) and (5). Consistency also suggests which proxies to use for a certain determinant. For example, in most studies on entry/exit some proxy is included for growth. From the equilibrium approach it becomes clear that the relative growth of employment is the most natural candidate for such a proxy in the entry and exit equations (4) and (5).

4. Theory: a regime switch

The determinants of the development of entrepreneurship can be seen from different angles. In the short review below, we will distinguish between economic, technological, demographic, social/cultural and policy determinants.[7] Our data period only covering forty years does not allow for the inclusion of a long series of determinants. In addition, many of proposed determinants have a trend-like development making it hard to discriminate between these and other unobservable effects. Therefore, we choose an approach in which a regime switch is exogenously introduced.

Economic factors

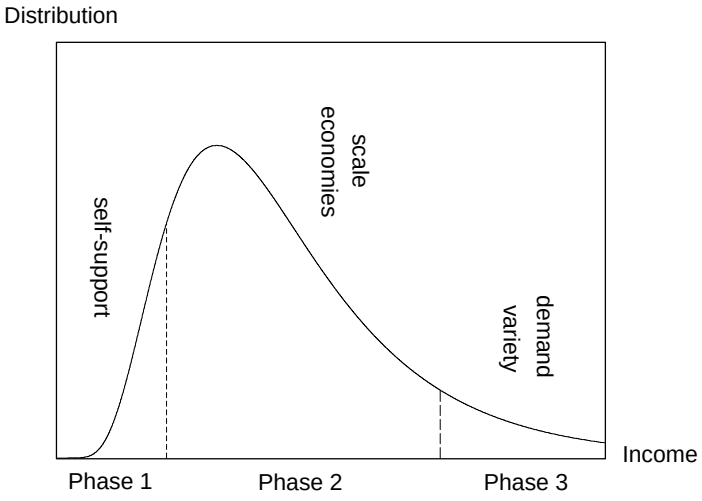
Most industrialized countries have witnessed an increasing variety of new products. Jackson (1984) demonstrates that higher income groups not only have higher consumption expenses per household, but also purchase larger number of different types of commodities per household. It can be assumed that in the past decades the increased demand variety was driven by a growing per capita income. This increasing diversity in consumer demand has provided new opportunities for small and new firms entering into market niches. The decrease in diversification as reported by Jovanovic (1993) suggests that large enterprises relying on scale economies have not been able to benefit from this increased diversity. A large share of the increased consumer demand is spent for (personal and business) services (Francois and Reinert, 1995). The sector structure (as for instance indicated by the employment share of manufacturing industries) may therefore influence the rate of entrepreneurship. On average (and barring railways, airlines and communication services) the service industries are characterized by a relatively small enterprise size, reflecting a higher demand for entrepreneurship.

The described increase in demand variety can be considered only part of the changing characteristics of demand throughout the different phases of economic development. We distinguish three

[7] See for more comprehensive overviews, e.g., De Wit (1993) and Verheul et al. (2002).

phases. In Phase 1 the population is largely self-supporting and have no money to buy products for which scale economies are present. Self-employment rates are high during this phase as there are no large companies capable of enjoying scale economies and of hiring employees. Many developing countries are still in this first phase of economic development. In Phase 2 the incomes have risen to a level at which products can be bought which fulfil more than just the basic needs. Examples include refrigerators, televisions, banking services and cars. The scale and scope advantages in developing, producing and marketing these products have been described by Chandler (1990). Phase 3 has incomes rising beyond a level at which the full range of standardized products can be afforded and money is left for specific preferences. In this phase we have arrived in the top of Maslow's Hierarchy of Needs. The social, esteem and self-actualization needs make standardized products less attractive. Scale economies become less important and consumer markets become more fragmented. In Figure 3 we show a stage of economic development in which the majority of consumers earn enough to buy standardized products and only a minority can afford individualized products. When incomes rise further and the income distribution shifts to the right more consumers will be able to buy individualized products. The shift in the characteristics of demand can partly explain the decrease *and* increase in self-employment rates. Whereas the rising incomes first lead to a transition of Phase 1 to Phase 2 and to *less* self-employment, it will lead to *more* self-employment during the transition from Phase 2 to Phase 3.[8]

Figure 3: The relation between income growth and characteristics of demand



[8] Changes in the extent of income inequality may also contribute to increased demand variety, next to increase in average income. We have included the Gini inequality coefficient in an earlier version of the long-term equilibrium equation and found it to have a highly significant positive effect on the self-employment rate. However, causality may also run in the other direction: higher levels of self-employment induce more income disparity. Parker (1997) presents empirical evidence that the main cause of rising self-employment income inequality over the 1976-91 period in the U.K. was a substantial increase in the heterogeneity of the self-employed themselves. Hence, we decided not to incorporate measures of income inequality into the equation as presented.

An important economic push factor that may explain increased self-employment is (threat of) unemployment. A high level of unemployment is assumed to result in more start-ups, but might also negatively influence the exits of entrepreneurs (few job alternatives). However, when structural unemployment is very high this may also cause a feeling of malaise and discourage entrepreneurship (see Hamilton, 1989 and Meager, 1992). There is conflicting evidence on the effect of unemployment on the development of the number of entrepreneurs or on the entry of new firms (see Storey, 1991). Recently, Carree et al. (2002) find for a sample of 23 OECD countries over a twenty-year period that there is a significantly positive effect. However, the effect may be relatively small in the Netherlands due to a well-developed welfare system. Unemployment benefits in the Netherlands are relatively high making the financial consequences of becoming or being unemployed less dramatic.

A related economic pull factor is the expected entrepreneurial income versus expected wage income. Obviously, the better the prospects of entrepreneurial income as compared to the wage income of an employee, the lower the opportunity costs of entrepreneurship and the more people will be attracted to becoming entrepreneur. The limited wage increases in the Netherlands since the *Akkoord van Wassenaar* (1982) therefore may have contributed to the attractiveness of becoming self-employed.[9] Occupational choices are also influenced by the risks of entrepreneurship (failure) versus those of wage employment (dismissal). In this respect the increased flexibility of the labour market in the Netherlands as a result of the 1982 agreement may have lowered opportunity costs of entrepreneurship. Finally, a high interest rate may also imply high opportunity costs of entrepreneurship because of foregone alternative investment opportunities. Besides, personal financial resources often do not suffice for a business start-up, which forces potential entrepreneurs to make use of other sources of capital, like debt capital.[10] A high interest rate will thus discourage these potential entrepreneurs from starting up a business. For empirical support of these contentions see Evans and Jovanovic (1989) and Parker (1996).

Technological factors

Technological change has been the prime driving force behind entrepreneurial ventures in new industries like electronics, biotechnology and software. The 1960s and early 1970s were dominated by rather stable technological trajectories, in which increasing scale could reap economies. This development contributed to an increase in average firm size in many Western economies. The last quarter of the 20th century, however, brought the advent of new technological paradigms, such as most notably the information and communication technology (ICT) revolution, creating a wave of process and

[9] The *Akkoord van Wassenaar* (Nov. 19, 1982) between employers' organisations and unions was initiated by the right-wing government headed by Prime Minister Ruud Lubbers. The enormous increases in unemployment in the period 1980-82 in the Netherlands led the employers' organisations and unions to agree upon (i) limited wage increases; (ii) shorter working weeks, early retirement and increased part-time labour; (iii) decentralisation of labour relations. The *Akkoord van Wassenaar* was the main building block of the Dutch *Poldermodel*.

[10] Growth in average wealth (including equity, inheritances and home ownership) may therefore also contribute to the supply of entrepreneurship as more people have financial opportunities to start a business.

product innovations.[11] ICT tends to decrease scale economies, thus creating possibilities for small firms. It may also decrease transaction costs, thus stimulating the trend towards outsourcing and favouring networks of independent producers above large corporations (Bernardt and Muller, 2000). Additionally, the wave of new products means that an increasing share of products is positioned at an early stage of the product life cycle. As young industries usually have room for a relatively large number of enterprises (Carree and Thurik, 2000; Klepper and Simons, 1999), this again stimulates entrepreneurship.

Demographic factors

As propensities towards entrepreneurship differ between demographic groups, several characteristics of the population such as (changes in) the age distribution and the female labour participation rate are factors that could influence the self-employment rate.[12] People in the middle age cohorts have the highest prevalence of incumbent entrepreneurs. However, prevalence rates of nascent entrepreneurship are highest in the age group between 25 and 34 (Reynolds, 1997; Van Gelderen et al., 2001). Future developments may of course change the propensities to start a business for each age category.

Social and cultural factors

Personal characteristics (skills and attitudes) influence the decision to prefer entrepreneurship to wage employment. A prominent example of such a characteristic is the degree of risk aversion (see Kihlstrom and Laffont, 1979, and Van Praag, 1996, chapter 5). Also the availability of role models, perceptions of desirability and previous experiences (emigration and other displacements, job dissatisfaction) may play a role in this respect. The surveys by Brockhaus (1982) and by Shapero and Sokol (1982) provide an overview of relevant variables. However, it is difficult to gather aggregate data on cultural values and personal qualities necessary for an analysis at the macro-level. Besides, many of these variables, such as the cultural characteristics assembled by Hofstede (1980), are probably rather stable over longer periods of time (see Wildeman et al., 1999, p. 25). However, it can hardly be disputed that the status of entrepreneurship in the Netherlands has improved considerably since the 1980-82 economic downturn period. Reynolds et al. (1999) mention in their Global Entrepreneurship Monitor that an entrepreneurial culture can be characterized by a high value placed on independence and autonomy; capacity to accommodate differences in income levels among households and individuals; tolerance of income disparity; respect for those that accumulate wealth; absence of stigma to those who fail in their entrepreneurial activities.

[11] The widespread use of personal computers in small enterprises was triggered by the introduction of the IBM PC in 1981. It validated the PC as a legitimate business tool. The introduction of the IBM PC-XT computer with the first (10 Mb) hard-disk drive in 1983 considerably improved the usefulness of personal computing for business applications.

[12] The female labour participation rate has grown strongly in the last quarter of the twentieth century in the Netherlands. In 1975 the female labour participation rate (women labour force divided by women population aged 15 to 64 years) was just 31%. It increased to 65% in the year 2000. Source: OECD Labour Market Statistics.

Policy

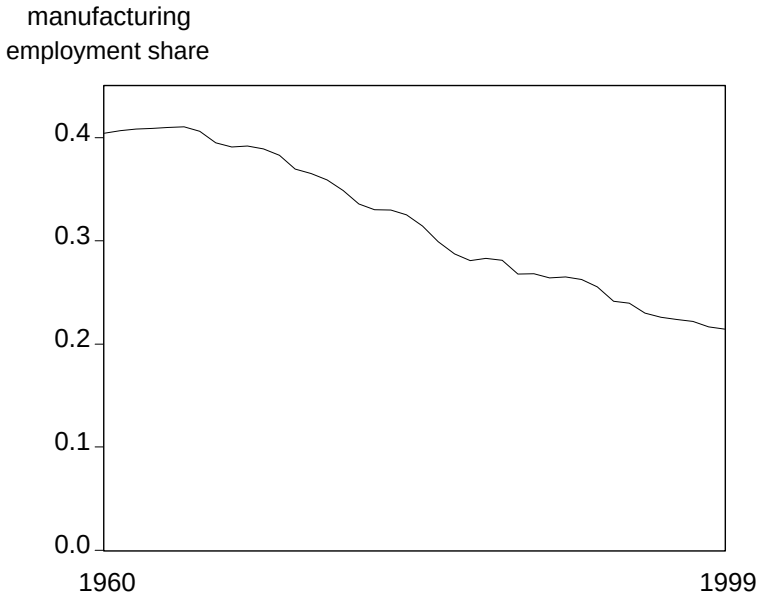
The framework described by Verheul et al. (2002) points out that government can influence entrepreneurship directly and indirectly. Indirect policy affects entrepreneurship through determinants mentioned above. Examples of indirect policy means are anti-cartel legislation, privatisation, fiscal measures stimulating labour force participation and legislation influencing the opportunity costs of entrepreneurship (like income policy and bankruptcy policy). The above-mentioned *Akkoord van Wassenaar* has had several indirect effects promoting entrepreneurial ventures. Regulations and tax policy towards entrepreneurship are direct measures. Research in Sweden, for example, indicates that a high share of large enterprises may result from poor regulation with respect to starting and existing small companies (Davis and Henrekson, 1999; Henrekson and Johansson, 1999). Carree and Nijkamp (2001) present evidence that deregulation in the Netherlands in 1993 reducing the legal barriers to entry has led to more retail businesses.[13] Robson and Wren (1999) find a negative relationship between self-employment and the marginal tax rate. However, they find a positive relationship with the average tax rate, reflecting that opportunities of evasion are greater for entrepreneurs.

Selected determinants in our model

The theoretical discussion suggests a long list of determinants of the self-employment rate. However, some of them are unobservable and others have a trend-like behaviour making it hard to discriminate between the influences of one or the other. Variables which have largely shown an upward trend-like pattern include home ownership rates, female participation rates and the share of persons with a university degree. We have decided to introduce a regime switch in the *equilibrium* equation to proxy for economic, technological, cultural and developments before and after 1982. The year 1982 was chosen because it marked (i) the *Akkoord van Wassenaar* restoring profitability of enterprise; (ii) the start of an almost twenty year long period of strongly increasing stock market prices (leading to increased wealth and individualism); (iii) the start of increasing appreciation for the role of entrepreneurs after the period of 'social engineering'; (iv) the introduction of personal computers wide-spread used in small businesses. In the Appendix we will discuss a (potential) second regime switch, that of 1992/93, when the legal barriers to starting new ventures were reduced in the Netherlands. The only determinant of the *equilibrium* rate next to the two time trends representing the regimes is the manufacturing share of employment (*MAN*). It has been argued that the main reason for the increased presence of small firms is, simply, the sectoral shift away from manufacturing to service industries. In Figure 4 the development of the manufacturing employment share is displayed. It largely has a downward trend-like pattern. We introduce two short-term determinants: a measure of 'room for profits' (*PROF*), defined as one minus the labour income quote, and the number of unemployed (*UNEMP*). Both are expected to have a positive effect on the subsequent change in the self-employment rate.

[13] Another study for the Netherlands indicates that business licensing may hinder entry of new enterprises (Bosma et al., 1999).

Figure 4: The manufacturing share of employment



5. Application to Dutch data

We estimate our model on time series data for the Netherlands for the period 1960-1999. Data on the number of entrepreneurs and entry and exit rates of entrepreneurs are derived from EIM Business and Policy Research. Data on the explanatory variables are derived from OECD, the Netherlands Bureau of Statistics (CBS) and the Netherlands Bureau for Economic Policy Analysis (CPB). There are two different approaches to estimate equations (1) and (2). The *first* approach is to estimate the parameters of equation (1) and to insert those into equation (2). This two-step procedure involves replacing the unobservable N^* in equation (1) by the actual number of entrepreneurs N and adding an error term.[14] Basically, this procedure assumes that the time series is long enough to assure that the predicted rate of self-employment is an accurate estimate of the equilibrium rate – given the explanatory variables. The *second* approach is to substitute equation (1) into equation (2) and to simultaneously estimate the long-term equilibrium and short-term parameters. We introduce two time trend variables,

[14] Since we are using an error-correction approach the common approach is to perform a cointegration analysis on the long-term equilibrium relation. However, the time period under investigation is somewhat short and, in addition, we experienced the problem that the time series of $\ln N^*$ is found to be I(2). The augmented Dickey-Fuller test (with a constant and either with a trend or not) indicates a unit root in levels *and* in first differences. This is not very surprising given the U-shape of Figure 1.

t_1, which is one in 1960 and increases up to 23 in 1982 to stay at that value until the end of the period, and t_2, which is zero up till 1982, becomes one in 1983 and increases up to 17 in 1999. In the first approach, we first estimate equation (1) governing the development of the long-term equilibrium number of entrepreneurs *N**.

Equilibrium rate of entrepreneurship

We present two alternative specifications for equation (1), one excluding the effect of the manufacturing employment share and one including this variable. Results are presented in equation (6) and (7), respectively (standard errors between brackets):

$$\underset{\quad (0.013)}{\ln N^* = -1.934} + \underset{\quad (0.0008)}{\ln L} - \underset{\quad (0.0011)}{0.0252 t_1} + 0.0155 t_2 \qquad R^2 = 0.953 \tag{6}$$

$$\underset{\quad (0.115)}{\ln N^* = -2.351} + \underset{\quad (0.0025)}{\ln L} - \underset{\quad (0.0032)}{0.0338 t_1} + \underset{\quad (0.141)}{0.0045 t_2} - 0.516 \ln MAN \qquad R^2 = 0.966 \tag{7}$$

We find that changes in the equilibrium rate of entrepreneurship are on average –2.52% yearly up till 1982 (regime 1), while they are +1.55% yearly after 1982 (regime 2). Once we introduce the manufacturing share of employment (*MAN*) the trend of the second regime fails to remain significant. It suggests that the increase of the self-employment rate in the Netherlands since 1982 might largely be explained from changes in the sectoral composition. The effect of the manufacturing employment share is negative, as expected. We choose the parameter estimates of equation (7) for the second step of the estimation procedure.

There are various reasons for the downward trend observed in regime 1. Since the important inventions of the Industrial Revolution, focus was aimed at large businesses. Policy in the Netherlands was especially directed at regulation. Large businesses were protected and cherished, because they provided many jobs. The idea was that large businesses were able to raise the investments required for innovations. A consequence was that unions became powerful (countervailing power), which resulted in high wages and low profit margins for businesses. Because of the regulated business environment, start-up costs were also high. As a consequence, the motivation for becoming entrepreneur was relatively low. Moreover, an important barrier was that potential business founders experienced a negative attitude to business failure and bankruptcy of the public, the business community and financial institutions. In the 1980s a shift took place in the opposite direction (regime 2). More and more entrepreneurs tried their luck and were successful. The source of this shift can for an important part be addressed to the rise of the knowledge-based economy. The introduction of ICT has been very helpful in generating new ideas and products that could be produced by small firms and were innovative

enough to compete with larger firms' productions. Start-up costs diminished and profit opportunities became more apparent. Moreover, the Dutch government choose to make a turn in policy conduct, acknowledging the benefits created by continuing accretion of young firms with new products, new ideas and enthusiastic entrepreneurs (and their motivated employees). This was reflected in attempts to change the existing stigma on failure, to extend the educational programs on entrepreneurship and to lower the existing improper barriers. As will be clear from the above discussion there are many intermingled factors responsible for the downward trend in regime 1 and the subsequent upward trend in regime 2.[15] The results suggest that outsourcing by large manufacturing firms leading to many new firms in the service sector has been a major factor.

Short-term dynamics

Table 1 shows the estimates of equation (2) describing the short-term dynamics, viz. the net change in entrepreneurs. We estimate four different specifications. In model (i) we use the two-step procedure and insert the estimated equilibrium equation (7) into equation (2). In this model we do not consider additional determinants D. In model (ii) we use the second procedure and insert the equilibrium equation (1) into equation (2) and estimate the parameters α, β and δ alongside with the short-term determinants. Model (iii) is identical to model (ii) with two determinants D included. These variables are $PROF$, a measure of 'profitability' defined as one minus the labour income quote, and $UNEMP$, the number of unemployed. Both variables are one-period lagged. Model (iv) is identical to model (iii) but with the lagged endogenous variable $\Delta ln N_{-1}$ included (with parameter ρ). The inclusion of this variable is common in error-correction models and implies an alternative short-term dynamics specification. In case $\rho > 0$ part of the development of the self-employment rate is not explained for by the error-correction mechanism or the other short-term determinants. It indicates a 'demonstration' or 'multiplier' effect (see Gort and Konakayama, 1982, Johnson and Parker, 1994 and Carree and Thurik, 1996).

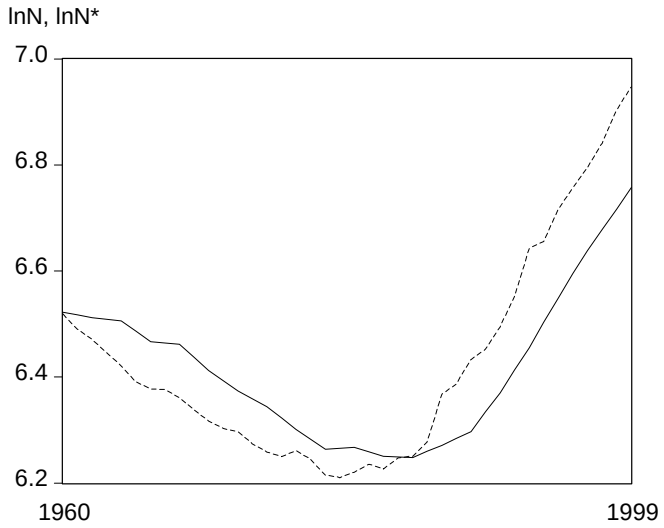
The results in Table 1 show that model (i) performs clearly worse than model (ii). The low DW-statistic of 0.46 for model (i) also indicates misspecification. Hence, it appears that choosing to estimate the equilibrium equation alongside with the short-term dynamics is the preferable procedure. The results for the equilibrium equation in model (ii) shows about equal estimates for the trend values as those in equation (7). However, the impact of the employment shift away from manufacturing industries is estimated to be much stronger. The speed of the error correction process hardly differs between the two procedures and is roughly 25% yearly. This speed of adjustment is much higher than that estimated by Carree et al. for a data set of OECD-countries in the 1976-96 period. However, it is smaller than that estimated by Carree and Thurik (1999) who find a value of 38% yearly for the Dutch retail sector in the 1981-88 period. The short-term effects in model (i) are about equal to the long-term effects. In model (ii) the short-term effects are much smaller than the long-term effects and they are

[15] A tempting but dangerous strategy would be to include a few readily available proxies for some of the discussed factors, while leaving out the time trends. The proxies would be sure to catch up the influence of the left-out factors, so that the effects of these proxies (and their underlying variables) would be strongly overestimated.

estimated not to be significantly different from zero. We will continue with the second procedure estimating long- and short-term effects simultaneously.

Models (iii) and (iv) have additional short-term determinants included. Both the effects of 'profitability' and unemployment are estimated to be positive, as expected, but never significant. This may be the consequence of the disequilibrium in terms of self-employment and the disequilibria in terms of wage share of value added and of unemployment to be interrelated. In Figure 5 we show the actual (straight line) and equilibrium number of self-employed as estimated from model (iii). The figure indicates that the actual and equilibrium curves cross at the time of the regime switch. Before the regime switch there were always too many self-employed compared to the estimated equilibrium number and after the regime switch there were too few. The unemployment rate has also been quite low before it started to rise dramatically in the 1980-82 period. Hence, the period up till 1980 has been one of low unemployment and a too high self-employment rate while the reverse was the case for most of the period after 1980. The (potential) error-correction and unemployment push impacts have been occurring in the same time periods and are hard to discriminate. The results presented should be interpreted with care. The number of observations is relatively low, certainly when compared to the number of variables included in models (iii) and (iv).

Figure 5: The logarithm of actual and equilibrium number of self-employed



Entry and exit

We dispose of only a small number of observations for the entry/exit equations (4) and (5). We have available data for the 1987-1999 period. Still we think it is of interest to illustrate the unified approach and share the results. We will take the equilibrium equation as estimated in model (iii) as starting point so as to have a limited number of parameters to be estimated. In Table 2 we present the results for the entry and exit equations with and without restrictions due to the identity equation (3). The models are estimated with Seemingly Unrelated Equations (SUR) estimation to take the possible correlation between the error terms of equations (4) and (5) into account. The results of the unrestricted and uni-

fied approach differ considerably for a number of effects. We think that is mainly due to the large difference in the number of parameters (twelve versus six) estimated taking into account that there are only 26 observations.

The results indicate that entry is strongly influenced by the error-correction process.[16] This suggests that the error-correction process largely goes through adjustments of the entry rate. For example, in case there are too many self-employed compared to the equilibrium, it is more likely for the entry rate too go down than for the exit rate to go up. Exit is much less influenced and also in the wrong direction (note that ε_X has a positive sign in equation (5)). This result can be a consequence of the limited variability in the exit rate in the 1987-1999 period: it mainly fluctuated between 3% and 4%. The effect of 'profitability' is significant for both the entry and exit equations in case of unrestricted estimation, and both with the expected sign. This is an unexpected result given the lack of impact found in model (iii) of Table 1. This inconsistency in the results disappears in the unified approach. The effect of unemployment becomes positive and significant in the unrestricted gross entry equation. In the unified approach both the effects of unemployment on entry and exit are significant. It would appear that high levels lead to more entry, but also more exit. One explanation for this result is that self-employment due to push factors also disappears relatively quickly from the market.[17]

6. Conclusion

In this paper we unify two approaches with respect to the modelling of the rates of entrepreneurship. The first approach is the 'equilibrium' approach seeking to estimate the long- and short-run developments of the number of self-employed. The second approach is the entry/exit approach seeking to determine the determinants of gross entry and exit rates and their interdependencies. The proposed manner of modelling the entries and exits of entrepreneurs has several advantages. First, it allows for parameter constraints necessary when the amount of data periods available is small. Second, it indicates which of determinants should be incorporated into the models in levels or first differences (or both). Third, the consistency imposed on the entry and exit equations allows for more adequate simulation exercises concerning future developments of the self-employment rate. The empirical application to Dutch data indicates how the method works and what sorts of results may be expected.

The determinants and future development of self-employment is of interest to policy makers. Self-employment has been claimed to can partly resolve unemployment, to stimulate innovative activities and to be a high valued occupational choice in modern economies. A range of different variables affects the rate to which people choose to become or remain self-employed. The separate effects of these variables are not easy to determine. The current paper provides a framework that may be helpful in this respect. Future research should concentrate on applying the unifying approach on larger datasets, especially for the entry/exit equations.

[16] Carree and Thurik (1999) also find evidence of the entry rate of firms to play a more important part in the error-correction process than the exit rate.

[17] Taylor (1999) finds that no less than 40% of Britain self-employment ventures started since 1991 have not survived their first year in business. This suggests strong correlation between increased entry and increased exit rates on a very short notice.

Appendix: A second regime switch

There may have been a second regime switch in the year 1992/93. From January 1993 on there was an important relaxation of requirements to start new ventures (see Carree and Nijkamp, 2001). Also from 1993 on, the ICT revolution became even more pronounced with the Internet.[18] We introduce two time trend variables, t_1, which is one in 1960 and increases up to 23 in 1982 to stay at that value until the end of the sample period, t_{2A}, which is zero up till 1982, becomes one in 1983 and increases up to 10 in 1992 to stay at that value until the end of the sample period, and t_{2B}, which is zero up till 1992, becomes one in 1993 and increases up to 7 in 1999.

Estimation of (1) with three different regimes results in the following equations for the equilibrium number of entrepreneurs (standard errors between brackets):

$$\ln N^* = \underset{(0.010)}{-1.942} + \ln L \underset{(0.0007)}{-0.0241 t_1} \underset{(0.0015)}{+0.0095 t_{2A}} \underset{(0.0030)}{+0.0294 t_{2B}} \qquad R^2 = 0.971$$

$$\ln N^* = \underset{(0.072)}{-2.410} + \ln L \underset{(0.0016)}{-0.0337 t_1} \underset{(0.0022)}{-0.0034 t_{2A}} \underset{(0.0027)}{+0.0182 t_{2B}} \underset{(0.089)}{-0.578 \ln MAN} \qquad R^2 = 0.987$$

The estimation results would suggest support for a second regime switch. However, one should take care regarding this conclusion given the small number of observations (1992-1999). Part of the strong increase in the self-employment rate from the mid 1990s on in the Netherlands has been due to the so-called *Zelfstandigen Zonder Personeel* (ZZP, self-employed without employees) in the construction, transport and ICT industries.

[18] In 1993 Mosaic, a point-and-click browser for the World Wide Web was developed. Mosaic was released to users free of charge and its ease of use made it very popular. As a result, home pages of organizations and individuals began to proliferate on the Web. Source: Moschovitis et al. (1999).

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Table 1: Determinants of the change in number of self-employed $\Delta ln\, N$

Variable	Parameter	(i)	(ii)	(iii)	(vi)
Equilibrium equation (1)					
Constant	α	-2.351	-2.939*	-3.062*	-2.963*
			(0.188)	(0.374)	(0.410)
Trend 1	β_1	-0.0338	-0.0424*	-0.0438*	-0.0421*
			(0.0037)	(0.0050)	(0.0064)
Trend 2	β_2	0.0045	0.0059	0.0032	0.0009
			(0.0042)	(0.0077)	(0.0092)
$ln\, MAN$	δ	-0.516	-1.147*	-1.284*	-1.184*
			(0.219)	(0.378)	(0.424)
Error-correction equation (2)					
Constant	β_N	-0.017*			
		(0.008)			
$\Delta ln\, L$	γ_N	1.053*	0.121	0.079	0.041
		(0.349)	(0.148)	(0.160)	(0.147)
$\Delta ln\, MAN$	δ_N	-0.512*	-0.142	-0.169	-0.078
		(0.237)	(0.099)	(0.106)	(0.108)
error-correction	ε_N	0.254*	0.244*	0.218*	0.178*
		(0.140)	(0.049)	(0.060)	(0.060)
$ln\, PROF_{-1}$	ς_{N_1}			0.005	0.003
				(0.007)	(0.006)
$ln UNEMP_{-1}$	ς_{N_2}			0.001	0.000
				(0.006)	(0.006)
$\Delta ln\, N_{-1}$	ρ				0.394*
					(0.158)
R^2		0.296	0.921	0.923	0.939
Overall F		4.92*	62.43*	45.12*	48.29*

Note: The total number of observations is 39 with the exception of model (iv) having 38 observations. In this model the lagged endogenous variable is included. Model (i) uses the two-step approach and has the estimates of equation (7) inserted. Standard error between brackets. The superscript * means significant at the 10%-significance level.

Table 2: Decomposing net entry into gross entry E and gross exit X

Variable	$\Delta ln N$	Unrestricted E	Unrestricted X	Unified E	Unified X
Constant	0	-0.003 (0.011)	-0.001 (0.008)	-0.002 (0.006)	-0.002
$\Delta ln L$	0.079	-0.000 (0.127)	0.466* (0.097)	0.296* (0.072)	0.217
$\Delta ln MAN$	-0.169	-0.220* (0.061)	-0.104* (0.046)	-0.249* (0.035)	-0.080
error-correction	0.218	0.399* (0.044)	-0.166* (0.034)	0.391* (0.025)	-0.173
$ln PROF_{-1}$	0.005	0.024* (0.009)	-0.024* (0.007)	0.001 (0.005)	-0.004
$lnUNEMP_{-1}$	0.001	0.012* (0.005)	0.005 (0.004)	0.008* (0.003)	0.007
R^2		0.941	0.741	0.888	0.464

Note: The total number of observations is 13 (1987-1999) for both the entry and exit models. Standard errors between brackets. The superscript * means significant at the 10%-significance level. Model (iii) of Table 1 serves as the basis for the long-term equilibrium equation and net entry equation parameters. The estimation technique of Seemingly Unrelated Regressions (SUR) has been used.