Economic Development and business Ownership: An Analysis Using Data of 23 OECD Countries in the Period 1976-1996

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ABSTRACT. In the present paper we address the relationship between business ownership and economic development. We will focus upon three issues. First, how is the equilibrium rate of business ownership related to the stage of economic development? Second, what is the speed of convergence towards the equilibrium rate when the rate of business ownership is out-of-equilibrium? Third, to what extent does deviating from the equilibrium rate of business ownership hamper economic growth? Hypotheses concerning all three issues are formulated in the framework of a new two-equation model. We find confirmation for the hypothesized economic growth penalty on deviations from the equilibrium rate of business ownership using a data panel of 23 OECD countries. An important policy implication of our exercises is that low barriers to entry and exit of businesses are necessary conditions for the equilibrium seeking mechanisms that are vital for a sound economic development.

1. Introduction

Joseph Schumpeter's contribution to our understanding of the mechanisms of technological progress and economic development is widely recognized. In *The Theory of Economic Development* he emphasizes the role of the entrepreneur as prime cause of economic development. He describes how the innovating entrepreneur challenges incumbent firms by introducing new inventions that make current technologies and products obsolete. This process of *creative destruction* is the main characteristic of what has been called the Schumpeter Mark I regime. In *Capitalism, Socialism and Democracy*, Schumpeter focuses on innovative activities by large and established firms. He describes how large firms outperform their smaller counterparts in the innovation and appropriation process through a strong positive feedback loop from innovation to increased R&D activities. This process of *creative accumulation* is the main characteristic of what has been called the Schumpeter Mark II regime.

The extent to which either of the two Schumpeterian technological regimes prevails in a certain period and industry varies. It may depend upon the nature of knowledge required to innovate, the opportunities of appropriability, the degree of scale (dis)economies, the institutional environment, the importance of absorptive capacity, demand variety, etc. Industries in a Schumpeter Mark II regime are likely to develop a more concentrated market structure in contrast to industries in a Schumpeter Mark I regime where small firms will proliferate.

Most of the 20th century can be described as a period of accumulation. From the Second Industrial Revolution till the 1970s the large firm share was on the rise in most industries and the economy as a whole. It was the period of "scale and scope" (Chandler, 1990). It was the era of the hierarchical industrial firm growing progressively larger through exploiting economies of scale and

Final version accepted on February 1, 2001

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Small Business Economics **19**: 271–290, 2002.

scope in areas like production, distribution, marketing and R&D. The conglomerate merger wave of the late 1960s seemed to have set the case. The period has the characteristics of the Schumpeter Mark II regime. However, from the 1970s onwards times have changed. There is ample evidence that the share of small businesses in manufacturing in Western economies has started to rise (Acs and Audretsch, 1993; Thurik, 1999). Large firms have been downsizing and restructuring in order to concentrate on "core business" again. In the meantime the entrepreneur has risen from the dead. High-technology innovative small firms have come at the forefront of technological development in many (new) industries. Piore and Sabel (1984) claim that an "Industrial Divide" has taken place. Jensen (1993, p. 835) considers it the period of the "Third Industrial Revolution". The last quarter of the 20th century may therefore be characterized as a period of creative destruction in the sense of the Schumpeter Mark I regime. Audretsch and Thurik (2001) refer to a change from "a managed to an entrepreneurial economy".

In the present paper we discuss why this change happened and what its consequences have been for economic progress and the rate of business ownership. We develop a model relating the regime switch to economic development and present empirical evidence. In Section 2 we discuss a variety of theoretical considerations on the relation between business ownership rates and economic development. It is followed by Section 3 where we present our two-equation model. The first equation explains the change in the business ownership rate while the second equation explains economic growth. The notion of an equilibrium business ownership rate, being a function of the level of economic development, is crucial in the analysis. In Section 4 we present the data of 23 OECD countries and in Section 5 we present the estimation results. The final section is used for discussion.

2. Theory

In this section we will discuss how business ownership rates and economic development are interrelated. We will pay attention to the role that the "Schumpeterian regime switch" has played in this relationship. We discuss the pre-1970s era of declining self-employment rates and the period thereafter in which the rates have risen in most Western economies. Next we discuss how the business ownership rate at the economy-wide level can be used to determine the extent of structural transformation.

The first three quarters of the 20th century can be characterized as a period of declining small firm presence in most industries. In many Western countries and industries this decline has ended and even reversed. Many old and large firms have been losing ground to their small, new and more entrepreneurial counterparts. It suggests a switch from a (more) Schumpeter Mark II type of regime towards a (more) Schumpeter Mark I type of regime. Audretsch and Thurik (2001) label this as a regime switch from "a managed to an entrepreneurial economy". We note that the regime labels are rough approximations as the industrial landscape shows a far too great variety to claim that in each and every industry one of the Schumpeter regimes is prevailing. A further complication is that business ownership and entrepreneurship are not synonymous for at least two reasons (see also Amit et al., 1993).

First, entrepreneurial energy is not limited to self-employed individuals. Large companies promote "intrapreneurship" within business units to achieve more flexibility and innovativeness (Stopford and Baden-Fuller, 1994). Second, business owners serve many roles and functions. Many researchers distinguish between Schumpeterian (or real) entrepreneurs and managerial business owners (Wennekers and Thurik, 1999). Entrepreneurs are a small fraction of the business owners. They own and direct independent firms that are innovative and "creatively destroy" existing market structures. After realizing their goals Schumpeterian entrepreneurs often develop into managerial business owners, but some may start new ventures. Managerial business owners dominate in the large majority of small firms. They include many franchisees, shopkeepers and people in professional occupations. They belong to what Kirchhoff (1996) calls "the economic core". Occasionally, entrepreneurial ventures grow out of them. In an empirical context it is difficult to discriminate between managerial business owners and entrepreneurs. Profiles of individual business owners would be required. Moreover, the

discrimination is a theoretical one since most business owners are neither pure "Schumpeterians" nor pure "shopkeepers" but share the attitudes associated with these extremes in a varying degree (Audretsch and Thurik, 1998).

Despite these conceptual problems we argue that the secular trend of the business ownership rate declining and afterwards starting to rise again presents a fair indication of the general development of the level of entrepreneurship, at least in modern economies. It shows how the (secular) decline of "mom-and-pop" businesses in traditional sectors like retailing and craft has tended to become compensated for by a rise in new ventures in services and high-tech industries in the period from the 1970s onwards.

The impact of economic development on business ownership

The proportion of the labor force that is self-employed has decreased in most Western countries until the mid-1970s. Since then the self-employment rate has started to rise again in several of these economies. Blau (1987) observes that the proportions of both male and female self-employed in the nonagricultural U.S. labor force declined during most of this century. He also observes that this decline bottomed out in the early 1970s and started to rise until at least 1982. The data used in the present paper show that the business ownership rate in the U.S. has continued to rise in the 1980s while stabilizing in the 1990s.[1] More recently business ownership increased in several other countries as well. We will first discuss the period of decline of business ownership (Mark II regime) followed by a discussion of the period of reversal of this trend (Mark I regime).

Decline of business ownership

Several authors (Kuznets, 1971; Schultz, 1990; Yamada, 1996) have reported a negative relationship between economic development and the business ownership (self-employment) rate. Their studies use a large cross-section of countries with a wide variety in the stage of economic development.

There are a series of reasons for the decline of self-employment, and of small business presence in general. Lucas (1978) shows how rising real wages may raise the opportunity cost of self-employment relative to the return. Given an underlying "managerial" talent distribution this induces marginal entrepreneurs (in this context Lucas refers to managers) to become employees. This pushes up the average size of firms. Schaffner (1993) takes a different approach. She points out that "over the course of economic development the advantages firm owners derive from being less risk averse (better diversified) than self-employed producers are likely to rise relative to the disadvantages caused by the costliness of circumventing asymmetric information problems" (p. 435). Iyigun and Owen (1998) develop a model implying that economic development is associated with a decline in the number of entrepreneurs relative to the total number of employees. They argue that fewer individuals are willing to run the risk associated with becoming an entrepreneur as the "safe" professional earnings rise with economic development.

Chandler (1990) stresses the importance of investment in production, distribution, and management needed to exploit economies of scale and scope during the period after the second industrial revolution of the second half of the 19th century. It was a period of relatively well-defined technological trajectories, of stable demand and of seemingly clear advantages of diversification.[2]

Reversal of the trend

Several authors have provided evidence of a reversal of the trend towards less self-employment. Acs et al. (1994) report that of 23 OECD-countries, 15 experienced an increase in the self-employment rate during the 1970s and 1980s. They show that the weighted average of the self-employment rate in OECD-countries rose slightly from 8.4% in 1978 to 8.9% in 1987. Closely related to the development of the self-employment rate is the development of small business presence in general. Some of the other sources showing that the growing importance of large business has come to a halt in Western countries include Carlsson (1989), Loveman and Sengenberger (1991), Acs and Audretsch (1993), Acs (1996) and Thurik (1999).[3]

There are several reasons for the revival of small business and self-employment in Western economies.[4] First, the last 25 years of the 20th century may be seen as a period of creative destruction. Piore and Sabel (1984) use the term "Industrial Divide", Jensen (1993) prefers the term "Third Industrial Revolution", while Freeman and Perez (1988) talk about the transition from the fourth to the fifth Kondratiev wave. Audretsch and Thurik (2000) stress the effects of globalization and the information revolution leading to the demise of the comparative advantage of Europe in many of the traditional industries, such as machine tools, metalworking, textiles and automobile production. The most obvious evidence is the emergence of new industries like the software and biotechnology industries. Small firms play an important role in these new industries. Acs and Audretsch (1987) provide empirical evidence that small firms have a relative innovative advantage over their larger counterparts in such highly innovative industries. Evidence for the comparative advantage of small firms in inventing radically new products is also given in Prusa and Schmitz (1991) and Rothwell (1983, 1984).

Second, new technologies have reduced the importance of scale economies in many sectors. Small technology-based firms started to challenge large companies that still had every confidence in mass production techniques (Carlsson, 1989). Meredith (1987) argues that small firms are just as well, or better, equipped to implement technological advances and predicts the factory of the future to be a small factory. Jensen argues that "It is far less valuable for people to be in the same geographical location to work together effectively, and this is encouraging smaller, more efficient, entrepreneurial organizing units that cooperate through technology" (Jensen, 1993, p. 842). This is supported by Jovanovic claiming that: "recent advances in information technology have made market-based coordination cheaper relative to internal coordination and have partially caused the recent decline in firm size and diversification" (Jovanovic, 1993, p. 221). Others, like Rothwell (1983, 1984), stress that large and small firms complement and succeed each other in the innovation and diffusion process. See also Nooteboom (1994) for an account of this concept of "dynamic complementarity".

Third, deregulation and privatization movements have swept the world. In countries like Australia, Finland, Italy and Sweden there have been strong tendencies to deregulate and privatise (OECD, 1995, pp. 39–49). Phillips (1985) reports that small firms have dominated in both the creation of new businesses and new jobs in deregulated industry sectors in the U.S. in the early 1980s. This confirms some preliminary empirical evidence as provided by Shepherd (1982). Governments have also begun to acknowledge and promote the vital role of small (start-up) firms in achieving economic growth and development. See Storey and Tether (1998), OECD (1998) and EIM/ENSR (1994, 1996).

Fourth, there has been a tendency of large firms to concentrate on "core competences" (Carlsson, 1989). Jovanovic (1993) reports that the 1980s were characterized by corporate spin-offs and divestment. Aiginger and Tichy (1991) blame much of the "back-to-basics" and downsizing (or rightsizing) tendencies on the opportunistic conglomerate merger wave of the late 1960s.

Fifth, the increasing incomes and wealth have enabled individuals to strive for "higher" needs. As a result the demand for variety increases (Jackson, 1984). Cross-cultural influences have also enlarged the demand for variety. Small firms are often the most obvious suppliers of new and specialized products. The decrease in diversification as reported by Jovanovic (1993) suggests that large firms have not been capable of entering into such market niches.

Sixth, self-employment is more highly valued as an occupational choice than before. Roughly one out of four young U.S. workers pursue self-employment according to Schiller and Crewson (1997). Kirchhoff (1996) argues that self-employment is not characterized anymore as underemployment or as mom-and-pop establishments, but as a way to achieve a variety of personal goals. Also, as hypothesized in the social psychology there is a Maslowian hierarchy of human motivations, with physical needs at the bottom and self-realization at the top (Maslow, 1970). A higher level of prosperity will induce a higher need for self-realization and may stimulate entrepreneurship.[5]

Finally, the employment share of the services sector has been well documented to increase with

per capita income (Inman, 1985). Given the relatively small average firm size of most services (barring airlines, shipping and some business and financial services) this creates more opportunities for business ownership.

Obviously, some of these factors may have a temporary effect only. For example, it is not unlikely for the outsourcing and deregulation waves to dry up. On the other hand, there are more permanent effects like the impact of new technologies. We refer again to Freeman and Perez (1988). They claim that in the new techno-economic paradigm (fifth Kondratiev wave) the organization of firms will be "networks" of large and small firms. See also Oughton and Whittam (1997) who emphasize the role of external economies of scale when explaining the viability of small firms. Moreover, the introduction of these new technologies is also positively related to the stage of economic development because they cannot be made effective without the necessary skills and other investments. This structural influence of economic development is reinforced by the increasing variety of demand for specialized goods and services and the enhanced valuation of self-realization which are also dependent on the level of prosperity.

An equilibrium rate of business ownership

In the present paper we investigate whether countries that deviate from the "equilibrium" business ownership rate for comparable levels of economic development suffer in terms of economic growth.[6] For this we develop an error-correction model to determine the "equilibrium" rate of business ownership as a function of GDP per capita. The notion of "equilibrium" appears more akin to neo-classical economic theory than to a Schumpeterian framework. However, in our empirical application the "equilibrium" concerns the labor market and not the product market.

Equilibrium rates of self-employment in the neo-classical framework can be derived by making assumptions about (1) the aggregate production function combining the efforts of business owners and wage-employed individuals and (2) their rational occupational choice between self- and wage-employment. Differences in the assumptions about which factors influence the choice for self-employment lead to different equilibrium models. Two early contributions are Lucas (1978) and Kihlstrom and Laffont (1979). Lucas assumes individuals to have different managerial abilities while Kihlstrom and Laffont assume individuals to differ with respect to their risk attitudes. Calvo and Wellisz (1980) extend the Lucas model by introducing a learning process through which managers acquire the necessary knowledge. In a recent paper, Peretto (1999) presents a model in which "development and growth are subsequent stages of the process of structural transformation that economies undergo as they advance from poverty to affluence" (p. 390). This model as well as related models (see for example Lloyd-Ellis and Bernhardt, 2000) suggest that the stage of economic development is the driving force of "equilibrium".

We hypothesize an "equilibrium" relationship between the rate of business ownership and per capita income that is U-shaped.[7] The U-shaped pattern has the property that there is a level of economic development with a "minimum" business ownership rate.[8] Many forces may cause the actual number of business owners to deviate from the long-term equilibrium rate. Such a "disequilibium" may result from cultural forces, institutional settings (regulation of entry, incentive structures, functioning of the capital market) and economic forces (unemployment, profitability of private enterprise). See Kirzner (1997), Davis and Henrekson (1999) and Henrekson and Johansson (1999).

There are several forces in market economies that contribute to a process of adapting towards the equilibrium. An example may illustrate this. A high labor income share and a structurally low number of enterprises have contributed to structural unemployment in the late 1970s and 1980s in many Western economies. Such high levels of unemployment may have various consequences. First, unemployment may have a direct effect on self-employment, as unemployed are claimed to be more likely to become self-employed than employees. See for instance Storey (1991) and Evans and Leighton (1989).[9] Second, structural unemployment gradually results in wage moderation helping to restore profitability of private enterprise (lower labor income share). In addition, a perceived shortage of business ownership will

induce policies fostering entrepreneurship, ranging from better access to financing to competition policies. See OECD (1998). The overall impact of these equilibrating processes are hard to observe directly and may therefore be modelled best using an error correction mechanism.

The effect of business ownership on economic growth

There is some evidence on the relation between size class distributions and economic performance. For instance, see Nickell (1996), Nickell et al. (1997) and Lever and Nieuwenhuijsen (1999) who present evidence that competition, as measured by increased number of competitors, has a positive effect on the rate of total factor productivity growth.[10] Carree and Thurik (1998, 1999) show that the share of small firms in manufacturing industries in European countries has a positive effect on the industry output growth. Thurik (1996) reports that the excess growth of small firms[11] has had a positive influence on percentage change in gross national product for a sample of 16 European countries in the period 1988 through 1993.[12]

A theoretical endogenous growth model was developed by Schmitz (1989). His model predicts that an increase of the proportion of entrepreneurs in the working force leads to an increase in long-run economic growth. See also Holmes and Schmitz (1990) who develop a model of entrepreneurship in the spirit of T. W. Schultz. They show how specialization in managerial tasks and entrepreneurship – responding to opportunities for creating new products and production processes – may affect economic development. Finally, some evidence of a well-established historical (long-term) relationship between fluctuations in entrepreneurship and the rise and fall of nations has been assembled by Wennekers and Thurik (1999). Also the work of Eliasson (1995) on economic growth through competitive selection is of relevance. He shows (for the Swedish economy) how a lack of industry dynamics affects economic progress not so much on the short term but very strongly so on the long term (from about two decades on).

Another source of evidence on the relation between self-employment and progress is the economic history of the formerly centralized planned economies. A characteristic of these economies was the almost complete absence of small firms (and private ownership of the means of production), and this extreme monopolization constituted one of the major factors leading to the collapse of state socialism (Acs, 1996). The development of small enterprises is considered a vital part of the current transition process in Eastern Europe.[13]

In the present paper we investigate whether deviations between the actual and the equilibrium rate of business ownership will diminish the growth potential of an economy in the medium term. A shortage of business owners is likely to diminish competition with detrimental effects for static efficiency and competitiveness of the national economy. It will also diminish variety, learning and selection and thereby harm dynamic efficiency (innovation). On the other hand, a glut of self-employment will cause the average scale of operations to remain below optimum. It will result in large numbers of marginal entrepreneurs, absorbing capital and human energy that could have been allocated more productively elsewhere.

Iyigun and Owen (1998) show in a dynamic model with two types of human capital (professional and entrepreneurial) that a misallocation of the existing human capital stock between professional and entrepreneurial activities may occur. The nature of the inefficiency, however, is not clear-cut. There may be too much entrepreneurship or too little, depending on how entrepreneurial and professional skills contribute to the level of technology. They find that "a more efficient ratio of professional and entrepreneurial skills will raise the steady state of technology, the wages paid to human capital providers, and therefore, the economy's human capital stock" (p. 457). Their model supports our notion that deviations from the level of "equilibrium" entrepreneurial activity come at a cost of lower economic performance. See also Peretto (1999) who derives a hump-shaped relation between the number of firms and returns to investment and R&D.

3. Model

The object of this section is to develop a model of the interrelationship between business owner-

ship and economic development at the macro level. The model consists of two main equations. The first equation deals with the causes of changes in the rate of business ownership whereas the second deals with its consequences. From the first equation we derive the equilibrium rate of business ownership as a function of the stage of economic development. In the second equation we estimate the effect on economic growth of deviating from this equilibrium rate.

The first equation of the model relates the change in the rate of business ownership E_{it} in country i in year t to the extent to which this rate deviated from the equilibrium rate E^*_{it}, to the unemployment rate U_{it} and to the labor income share LIQ_{it}. The second equation of the model relates the extent of economic growth to the (absolute) deviation of the actual business ownership rate from the equilibrium rate. Economic growth is measured as the relative change in the variable YCAP_{it}, the per capita gross domestic product in purchasing power parities per U.S. dollar in 1990 prices in country i and period t. We correct for catching-up effects by including the level of economic development. The equations use the notation $\Delta_4 X_t = X_t - X_{t-4}$. The third equation presents the equation relating the equilibrium business ownership rate to the level of economic development. It is assumed to be a quadratic function of $\ln(YCAP_{\mathrm{it}} + 1)$.[14] The model reads as follows:

$$\Delta_4 \mathrm{E}_{it} = b_1(E^*_{i,\,t-4} - E_{i,\,t-4}) + b_2(U_{i,\,t-6} - \overline{U}) + b_3(\mathrm{LIQ}_{i,\,t-6} - \overline{\mathrm{LIQ}}) + \varepsilon_{1it}, \quad (1)$$

$$\frac{\Delta_4 \mathrm{YCAP}_{it}}{\mathrm{YCAP}_{i,\,t-4}} = c_0 + c_1 |E^*_{i,\,t-4} - E_{i,\,t-4}| + c_2 \mathrm{YCAP}_{i,\,t-4} + \varepsilon_{2it}, \quad (2)$$

$$E^*_{it} = \alpha + \beta \ln(\mathrm{YCAP}_{it} + 1) + \gamma \ln^2(\mathrm{YCAP}_{it} + 1). \quad (3)$$

The symbols stand for the following variables:

E: number of business owners per labor force;
E^*: equilibrium number of business owners per labor force;
YCAP: per capita GDP in purchasing power parities per U.S. $ in 1990 prices;
U: unemployment rate;
$\overline{U}$: sample average of unemployment rate;
LIQ: labor income share;
$\overline{\mathrm{LIQ}}$: sample average of labor income share;
ε_1, ε_2: disturbance terms in equations (1) and (2), respectively.

Business ownership

In Equation (1), the variable to be explained is the growth in the number of business owners per labor force in a period of four years. The first explanatory variable in the equation, which has the parameter b_1 assigned to it, is an error correction variable describing the difference between the equilibrium and the actual rate of business ownership at the start of the period. The parameter b_1 is expected to have a positive sign. In this version of our model the equilibrium function is U-shaped with respect to per capita income (Equation (3) has a quadratic form). Because the parabola should first drop and then rise, we expect the parameter γ to be positive and the parameter β to be negative. In case of absence of economic development ($\mathrm{YCAP}_{it} = 0$) the equilibrium function equals α. Since the relative number of business owners cannot be negative or in excess of one, the parameter α should lie between zero and one.

As a second explanatory variable we use lagged unemployment acting as a push factor for business ownership.[15] The expected sign of the parameter b_2 is positive. We choose a lag of six years instead of four for this variable because mental preparation, practical procedures and legal requirements are involved in starting a new enterprise.

As a third explanatory variable we use labor income share. This variable is a pragmatic proxy for the earning differentials between expected profits of business owners and wage earnings. We assume that a relatively high business profitability (as compared to wage earnings) acts as a pull factor for business ownership. The labor income share is defined as the share of labor income (including the "calculated" compensation of the self-employed for their labor contribution) in the net national income. The expected sign of the parameter b_3 is negative. As with the unemployment variable, a time lag has been included.

Economic growth

In Equation (2), the variable to be explained is economic growth in a four-year period, measured as the relative change in gross domestic product per capita. The first determinant of growth is the (absolute) deviation of the actual number of self-employed (business owners) from the equilibrium rate of business ownership at the start of the period. As explained in a previous section, the deviation variable is expected to have a negative impact on growth.[16]

Next to this deviation variable, we use the level of per capita income at the start of the period as a control variable. It allows to correct for the convergence hypothesis of countries: countries which are lagging behind in economic development grow more easily than other countries because they can profit from modern technologies developed in other countries. The expected sign of the parameter c_2 is negative.

4. Data and estimation technique

We use data of 23 OECD countries including the fifteen countries of the EU-15, Australia, Canada, Iceland, Japan, New Zealand, Norway, Switzerland and the U.S. and for the period 1976 through 1996.[17] Data are made available for the even years only. The main data sources are the *OECD Labour Force Statistics* and the *OECD National Accounts*. In Table I some summary statistics values are given for the first and last year of the sample and the mid year 1988 (due to lags only the period 1980–1996 will be used in the estimation procedure).

From Table I we see that Australia, Greece and

TABLE I
Summary statistics for the 23 OECD countries

Country	E_{1976}	E_{1988}	E_{1996}	YCAP_{1988}	E^*_{1988}
Austria	0.077	0.069	0.074	15,651	0.112
Belgium	0.098	0.109	0.119	15,326	0.113
Denmark	0.081	0.056	0.064	16,263	0.110
Finland	0.059	0.076	0.080	15,456	0.112
France	0.105	0.099	0.088	16,421	0.110
Germany (West)	0.070	0.070	0.082	17,245	0.109
Greece	0.179	0.186	0.196	7,274	0.180
Ireland	0.074	0.091	0.100	9,735	0.145
Italy	0.142	0.169	0.183	15,289	0.113
Luxembourg	0.093	0.075	0.062	21,103	0.107
The Netherlands	0.092	0.082	0.102	14,867	0.114
Portugal	0.110	0.116	0.160	8,424	0.161
Spain	0.109	0.122	0.130	10,886	0.135
Sweden	0.068	0.064	0.081	16,632	0.110
United Kingdom	0.074	0.101	0.109	15,590	0.112
Iceland	0.099	0.101	0.130	17,368	0.109
Norway	0.089	0.084	0.071	17,301	0.109
Switzerland	0.069	0.071	0.085	20,133	0.107
United States	0.081	0.107	0.104	21,543	0.107
Japan	0.126	0.123	0.101	16,328	0.110
Canada	0.078	0.106	0.128	18,573	0.107
Australia	0.147	0.164	0.154	16,154	0.111
New Zealand	0.098	0.116	0.133	13,532	0.119
Average	0.096	0.102	0.110	15,526	0.118

Note: The business ownership rates E are per labor force. The business ownership figures are exclusive of the business owners in the agricultural sector. The unit of GDP per capita (YCAP) is purchasing power parities per U.S. $ at 1990 prices. In the last column the estimated equilibrium business ownership rates for 1988 are given, using the estimates of α, β and γ from the "Two yearly" case from Table III. Germany refers to West-Germany for 1976 and 1988. This business ownership data set is referred to as COMPENDIA 2000.1.

Italy have the highest levels of self-employment (business ownership) in 1988: more than 15% of the labor force. The unweighted sample average level of self-employment in that year is 10%. The countries with the lowest levels of self-employment in 1988 are Denmark and Sweden: six percent of the labor force. Looking at the GDP per capita in 1988, we see that the United States, Switzerland and Luxembourg are the most affluent countries while Greece, Ireland, Portugal and Spain are the least affluent countries in the sample. The unemployment rates are not given in the table but they were highest in the 1980s in Ireland and Spain. Low unemployment rates were found in Japan, Norway, Sweden, Switzerland, Iceland and Luxembourg in that period.

Variables and sources

The variable definitions and their main sources are given below.

E: Self-employment or business ownership. This variable is defined as the number of business owners (in all sectors excluding the agricultural sector), expressed as a fraction of the labor force. Data sources include the OECD Labour Force Statistics 1976–1996 and 1978–1998. EIM completed the missing data by using ratios derived from various other sources. Furthermore, EIM made a unified data set of business owners as the definitions of business owners or self-employed (we use these terms interchangeably) in the OECD statistics are not fully compatible between countries. In some countries business owners are defined as individuals owning a business that is not legally incorporated. In other countries, owner/managers of an incorporated business (OMIBs) who enjoy profits as well as a salary are considered owners too. There are also countries who classify a part of the OMIBs as self-employed and another part as employee. This results from a different set-up of labor force surveys in different countries.[18] By and large, Australia, Japan, Norway and U.S. use a narrow business ownership definition (excluding OMIBs or excluding most OMIBs), while the other countries apply a broader characterization (including OMIBs or including most OMIBs). Business owners in the present report are defined to include OMIBs. For the countries not following this definition, EIM made an estimation of the number of OMIBs using information derived from *The European Observatory for SMEs* (KPMG/ENSR, 2000), or using information from domestic sources for the non-European countries.[19] Another difference in definition is that for some countries unpaid family workers are included in the self-employment data as well, mostly for early years. For these years, the unpaid family workers were removed from the data by using ratios from more recent years for which separate data on unpaid family workers *are* available. Finally, for countries where important unclarified trend breaks occur, these trend breaks were corrected for. Data on the labor force are also from the OECD Labour Force Statistics. Again, some missing data have been filled up from various other sources.[20]

YCAP: Gross domestic product per capita. The underlying variables gross domestic product and total population are from OECD National Accounts 1960–1996, Detailed Tables, and from the OECD Labour Force Statistics 1976–1996 and 1978–1998, respectively. GDP is measured in constant prices. Furthermore, purchasing power parities of 1990 are used to make the monetary units comparable between countries.

U: (standardized) unemployment rate. This variable measures the number of unemployed as a fraction of the total labor force. The labor force consists of employees, self-employed persons, unpaid family workers, people employed by the Army and unemployed persons. The main source for this variable is *OECD Main Economic Indicators*. Some missing data on the number of unemployed have been filled up with help of data from the OECD Labour Force Statistics and the *Yearbook of Labour Statistics* from the International Labour Office.

LIQ: labor income share. Total compensation of employees is multiplied by (total employment/number of employees) to correct for the imputed wage income for the self-employed persons. Next, the number obtained is divided by total income (compensation of employees plus other income). The data on the separate variables are from the OECD National Accounts 1960–1996, Detailed Tables. Some missing data have been filled up with help of data from the OECD Labour Force Statistics.

When estimating the model, we weight the

observations with population. We consider larger countries such as the U.S. and Japan to be more important in establishing the relationship between business ownership and economic growth than small countries. When the data of, for example, Luxembourg or Iceland would call for a different relation, we would not want this to have a big impact on the estimation results.

5. Estimation results

To estimate the model (1)–(3) we substitute equation (3) into equation (1):

$$\Delta_4 E_{it} = a_0 - b_1 E_{i,t-4} + b_2 U_{i,t-6} + b_3 \mathrm{LIQ}_{i,t-6} + a_4 \ln(\mathrm{YCAP}_{i,t-4} + 1) + a_5 \ln^2(\mathrm{YCAP}_{i,t-4} + 1) + \varepsilon_{1it} \quad (4)$$

We apply (weighted) least squares to this equation and then find estimates for the equilibrium relation parameters through:

$$\hat{\alpha} = \frac{a_0 + b_2 \overline{U} + b_3 \overline{\mathrm{LIQ}}}{b_1}, \qquad \hat{\beta} = \frac{a_4}{b_1}, \qquad \hat{\gamma} = \frac{a_5}{b_1}. \quad (5)$$

These coefficients are substituted into Equation (3) so that we can calculate E^*. This variable is incorporated into Equation (2). This equation is then also estimated using (weighted) least squares.

We consider two samples. The first is the "Two yearly" case in which data for all the even years are used (1980, 1982, 1984, 1986, 1988, 1990, 1992, 1994 and 1996). The total number of observations then equals 207. As an alternative we use the "Four yearly" case in which data for the years 1980, 1984, 1988, 1992 and 1996 are used. The total number of observations then equals 115. The reason for removing observations from the sample is that the observation periods for two consecutive even years overlap. This may lead to a downward bias in the estimated standard errors of the coefficients.

Weighting with population (in the year t-4) implies that all variables (including constants and dummies) are multiplied with the square root of population before the least squares procedure is run. A more detailed description of the weighting of observations can be found in the Appendix to this paper.

The estimation results of model (1)–(5) are given in Table II.

From Table II we see that most coefficients are significant with the expected signs: unemployment has a positive effect on self-employment and the effect of labor income share is negative (coeffi-

TABLE II
Estimation results of model (1)–(5)

Parameter	Two yearly	Four yearly	Parameter	Two yearly	Four yearly
a_0	0.049	0.038	α	0.538	0.254
	(1.1)	(0.6)		(0.6)	(0.2)
b_1	0.050	0.049	β	–0.127	0.104
	(2.8)	(1.8)		(0.2)	(0.1)
b_2	0.066	0.057	γ	–0.004	–0.050
	(4.5)	(2.8)		(0.0)	(0.3)
b_3	–0.030	–0.034	c_0	0.222	0.205
	(2.2)	(1.8)		(7.5)	(5.6)
a_4	–0.006	0.005	c_1	–0.488	–0.349
	(0.2)	(0.1)		(3.0)	(1.9)
a_5	–0.000	–0.002	c_2	–0.008	–0.007
	(0.0)	(0.3)		(5.3)	(3.8)
R_1^2	0.224	0.197	R_2^2	0.504	0.569
N	207	115	N	207	115

Note: Absolute t-values are between brackets.

cients b_2 and b_3, respectively). Furthermore, the hypothesized error-correction process and the negative impact on growth of deviating from equilibrium also seem to be supported: coefficients b_1 and c_1 are significantly positive and negative, respectively. The speed of adjustment is low: 5%. However, the results on the error-correction process and the growth penalty should be interpreted with caution, since the estimated equilibrium relation between the business ownership rate and per capita income appears not well determined: coefficients α, β and γ have very low *t*-values.

Special position of Italy

The low *t*-values for the equilibrium relation coefficients may be caused by the existence of certain (large) countries with specific developments in the business ownership rate not covered by our model. This could influence the estimates towards implausible results. The country we suspect may deviate most from the other countries is Italy. Looking at Table I, we see that Italy combines a high level of self-employment with a near average level of per capita income. This is not in accordance with what we would expect: the countries with a high rate of self-employment (business ownership) are generally in a less advanced stage of economic development (for example Greece). Italy can be divided in two different economies: a well-developed economy (Northern Italy) and a less developed economy (Southern Italy or the Mezzogiorno). Italy might not fit well in our model because it basically consists of two different economies. A closer inspection of the data for Northern and Southern Italy[21] shows that Northern Italy in particular deviates from the expected pattern, i.e., the U-shaped trend of the relative number of business owners set out against per capita income. Here, a high self-employment rate is combined with a relatively high value of GDP per capita. Small and medium-sized firms seem to play a bigger role in (Northern) Italian manufacturing than in other industrialized countries.[22] A notable feature of the organization of Italian small and medium-sized firm production is its high geographical concentration in small areas or industrial districts (Piore and Sabel, 1984). The geographical distribution also shows that the majority of small and medium-sized manufacturing firms is located in Northern and Central Italy (Acs and Audretsch, 1993). They often have a strong family component.

The Italian model of extensive small and medium-sized firm production differs from that in other countries in similar stages of development. It may have positive and/or negative effects on economic growth. Many of the Italian firms are highly specialized and are organized on a flexible basis, so as to meet specific customer needs, and produce well designed and fashionable goods, aimed at the richest segments of the market. Another characteristic of the Italian model is that Italian R&D expenditures as a percentage of GNP are by far the lowest among the largest OECD-countries. They amount to only half of that in Germany, the U.S. and Japan over a long period (Klomp and Pronk, 1998, p. 167). Hence, the number of business owners in Northern Italy is higher than one would expect on the basis of the advanced stage of economic development. The data for Southern Italy seem to be in conformity with the general pattern: there is also a high level of self-employment but combined with a low value of the GDP per capita.

Looking again at the Italian data in Table I, we see that Italy not only has a relatively high self-employment rate but also that self-employment in Italy continues to rise. Therefore we suspect that the hypothesized error-correction process does not apply to the Italian economy. We approach this problem by introducing a dummy variable D_{ITA} that is 1 for the Italian observations and 0 elsewhere. That is, we have the error term in Equation (1) equal to $\varepsilon_{1it} = a_{0,\,\mathrm{ITA}} D_{\mathrm{ITA}} + \eta_{it}$.

The estimation results of the model including the "Italy-dummy" are given in Table III.

We see that the *t*-values of the estimated coefficients of the hypothesized U-shape of the equilibrium rate of business ownership in Table III are higher than those presented in Table II. Also, the coefficients are in accordance with our expectations. The estimates of β and γ have the predicted signs and that of α lies between zero and one. However, the *t*-values of β and γ are still not high. This is not surprising, considering the high correlation between the linear and the quadratic $\ln(\mathrm{YCAP}_{it} + 1)$ variables. Indeed, the Wald test for the hypothesis that β and γ are jointly zero is

TABLE III
Estimation results of model (1)–(5), including dummy for Italy in (4)

Parameter	Two yearly	Four yearly	Parameter	Two yearly	Four yearly
a_0	0.109	0.098	α	0.863	0.743
	(2.5)	(1.5)		(2.5)	(1.5)
b_1	0.120	0.120	β	–0.494	–0.398
	(5.4)	(3.6)		(2.0)	(1.1)
b_2	0.063	0.055	γ	0.081	0.062
	(4.5)	(2.8)		(1.7)	(0.9)
b_3	–0.011	–0.014	c_0	0.182	0.183
	(0.8)	(0.7)		(8.9)	(7.6)
a_4	–0.059	–0.048	c_1	–0.571	–0.576
	(1.9)	(1.0)		(2.7)	(2.4)
a_5	0.010	0.007	c_2	–0.006	–0.006
	(1.6)	(0.9)		(5.3)	(4.5)
$a_{0,\,ITA}$	0.011	0.011			
	(4.9)	(3.4)			
P-value of Wald test on $\beta = \gamma = 0$				0.002	0.042
Minimum value of E^* at $-\beta/2\gamma$				3.06	3.22
				(12.5)	(5.2)
R_1^2	0.307	0.274	R_2^2	0.500	0.575
N	207	115	N	207	115

Note: Absolute t-values are between brackets.

rejected. Furthermore, an analysis of $-\beta/2\gamma$ (which is the minimum of the parabola in terms of $\ln(YCAP_{it} + 1)$) shows that this expression does have a high t-value, implying that the log-quadratic specification performs reasonably well. Further investigation of the parabola shows that for the "Two yearly" case the minimum value is reached for a level of per capita income of 20,398 U.S. dollar (in purchasing power parities) at 1990 prices. The minimum level of equilibrium business ownership is 10.7% of the labor force. In Figure 1 we show the equilibrium curve and the actual data for the G7-countries. In this figure also the (YCAP; E) combinations for the "out-of-sample" years 1972, 1974 and 1998 are incorporated. For the "Four yearly" case the value of the minimum is 0.103 and it is attained at a level of 23,930 U.S. dollar. We will concentrate on the results of the "Two yearly" case as they are similar to the "Four yearly" one.

The last column of Table I presents the equilibrium business ownership rates in the year 1988. Greece has the highest equilibrium rate, 0.180. Most of the countries are close to the minimum of the curve, though. The two richest countries, Luxembourg and the United States, have an equilibrium rate which is close to the minimum of the curve. These countries have reached a level of per capita income in 1988 which just exceeds the GDP per capita level at which the equilibrium rate reaches its minimum. For the interpretation of this parabola describing the equilibrium rate of business ownership given a certain stage of economic development, it should be noted that the relation is based upon a limited range of values of GDP per capita. For values of per capita income far outside our sample range – for example less developed countries or GDP per capita levels twice as high as attained in the richest countries in our sample – the equilibrium rate of business ownership may not be described properly by the quadratic function. Furthermore, U-shaped equilibrium functions cannot be distinguished from L-shaped functions in a statistical sense, because the majority of the GDP per capita values in our sample lie below the level associated with the minimum of the parabola.

As before, we find that the hypothesized error-

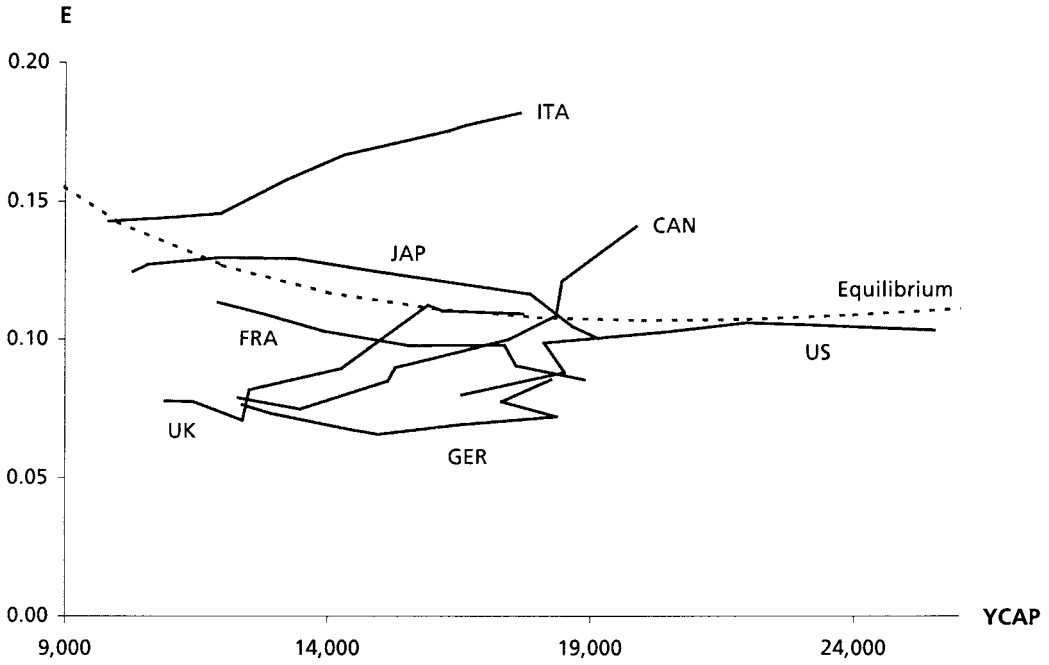

Figure 1. The actual and equilibrium rate of business ownership for G7-countries, 1972–1998.

correction process of the number of business owners towards the equilibrium rate is supported: the estimate of b_1 is significantly positive. The speed of adjustment is not high: the deviation from equilibrium at a certain point in time decreases with 12 percent in a period of four years. The low value of the speed of adjustment is not surprising. The convergence process of the actual business ownership rate towards the equilibrium rate is intrinsically slow because it involves structural changes on the supply side (setting up enterprises, investments in physical and human capital, divestments, etc.) as well as cultural and institutional changes. Note that the estimate of b_1 is higher than in Table II, in which the "Italy-dummy" was excluded from the model. It shows that Italy is an exception to the general pattern of the business ownership rate adjusting towards the equilibrium level. The lack of error-correction for Italian self-employment is also clear from Figure 1.[23]

The estimate of b_2 points at a positive impact of unemployment on self-employment: every percent point rise in the unemployment rate leads to a rise of 0.06 percent point in the self-employment rate in the succeeding six years. This is in accordance with evidence in some earlier studies: unemployment is a push factor for self-employment. The other variable explaining the change in self-employment, the labor income share, has the expected effect: the estimate of b_3 is negative. The effect is insignificant, though. This means that we fail to find evidence for our variable of business profitability to act as a pull factor for business ownership. The remaining variable in the business ownership equation, the "Italy-dummy", shows a significant positive coefficient. The rate of business ownership in Italy rises faster *ceteris paribus* than in other countries.

Another important characteristic of the estimation results is the deviation of the actual number of business owners from the equilibrium rate having a negative impact on economic growth: the estimate of c_1 is significantly negative.[24] This implies that economies with a business ownership rate below the equilibrium may benefit from stimulating new start-ups. In case this rate exceeds the equilibrium, it suggests that there are important impediments to growth for small and medium-sized enterprises. In the growth equation, the per capita income parameter c_2 is estimated to be negative. This might reflect the convergence of countries hypothesis. However, it may also be a

within (regression-to-the-mean) effect: a higher value of GDP per capita in a certain year leads to a smaller economic growth in the subsequent period. Finally, the constant term c_0 is positive.

A comparison of the third and sixth column of Table I shows that in 1988 most countries had too few self-employed relative to the equilibrium value. An obvious exception is Italy. It indicates that the high level of self-employment in Italy is not efficient: it has a relatively large negative impact on economic growth.[25] Another exception is Australia. But as opposed to Italy, Australia moved in the direction of equilibrium between 1988 and 1996, as can be seen from the fourth column of Table I. Countries which experienced very low business ownership rates compared to the equilibrium include the Scandinavian countries. These economies are chacterized by a large public sector, relatively low entry and exit rates and high taxes. Eliasson (1995) and Braunerhjelm and Carlsson (1999) blame part of Sweden's relatively bad economic performance in the 1980s on limited private initiative and a lack of structural adjustment. Another country with a relatively low business ownership rate is Germany. In Figure 1 it is shown that, at least until recently, Germany has failed to restructure where for example the United Kingdom has. Klodt (1990) blames (West) German industrial policy for repressing structural change in supporting large-scale industries with subsidies. An important reason for the lack of a vibrant sector of new firms and industries in Germany up till the mid 1990s has been the high barriers to innovative activity (Audretsch, 2000). An example of important economic reforms transforming an economy from a regulated one to a market-orientated one with increasing business ownership rates is New Zealand (see e.g. Evans et al., 1996). Carlsson (1996) shows the strong increase in the number of firms as a result of the reforms, certainly when compared to countries like Sweden. After a painful transition period the New Zealand's reforms appear to ultimately have generated economic growth (McMillan, 1998; and Silverstone et al., 1996). The data in Table I suggest that, indeed, business ownership rates were below equilibrium values for New Zealand before the start of the reforms in 1984. The increase in business ownership rates has been fierce in the period thereafter and may be "overshooting", making some "shake-out" of newly entered entrepreneurs likely.

6. Discussion

Business ownership has received considerable attention from policy makers in European countries. The high unemployment rate coupled with limited economic growth in Europe has triggered a plea by policy makers for rethinking the policy approach that fostered prosperity during the post-war era. In two ways globalization has reduced the ability of the European countries to generate economic growth and create jobs. On the one hand the advent of new competition from low-cost countries in Asia and Central and Eastern Europe has flooded the EU markets. On the other hand, the telecommunications and computer revolutions have drastically reduced the cost of shifting capital and information out of the high-cost locations of Europe and into lower-cost locations around the globe (Audretsch and Thurik, 2000).

It is deeply embedded in the current European policy approach that the creativity and independence of the self-employed contribute to higher levels of economic activity. In modern economies a great variety of organizations is involved in making innovative products. This is the case particularly in niche markets like in the ICT sector. The more organizations are active in such markets, the greater the chance that an innovation takes place. Variety and selection play a dominant role in this mechanism. Therefore, major funds of governmental institutions and independent donor organizations are being channeled towards young and small firms. The present paper aims at achieving some first insights into whether such policies are justified in different phases of economic development.

We seek to explain the interrelationship between economic progress and the size class structure of firms. The present paper zooms in on one specific linkage: that between the number of business owners and economic development. Three aspects of this linkage are investigated. First, we investigate whether there is a long-term equilibrium relation between the number of business owners and the stage of economic development. This conjecture arises from analysing empirical and theoretical work in this area. The

relation is hypothesized to initially be a decreasing function of economic development in that the self-employment rate is high in low-developed economies whereas more highly developed countries where mass production and scale economies thrive have lower self-employment rates. A large literature points at a still later phase of economic development where the business ownership rate is increasing again. This phase is characterized by "the reversal of the trend" towards increasing economies of scale and scope. Therefore we formulate the equilibrium business ownership to have a U-shaped relation with respect to economic development. Second, we investigate whether there is a correction mechanism when the rate of business ownership is out of equilibrium and compute the speed of convergence. Deviations from equilibrium can occur due to exogenous shocks and institutional divergences, for instance, because "government regulation of market activity is likely to obstruct and frustrate the spontaneous, corrective forces of entrepreneurial adjustments" (Kirzner, 1997, p. 81). Third, we investigate whether deviating from the equilibrium rate of business ownership leads to lower economic growth. The three aspects are tested using a two-equation model. The first equation explains the growth of the number of business owners using the deviation between the actual and the equilibrium rate of business ownership, unemployment as a push factor and the labor income share as a measure of business profitability. The second equation explains economic growth using the deviation between the actual and the equilibrium rate of business ownership, and the per capita income level. The model is tested using a data panel of 23 OECD countries.

We find evidence for a long-term equilibrium relation between economic development and business ownership. However, U-shaped equilibrium functions cannot be distinguished from L-shaped functions in a statistical sense. In fact, the large majority of countries has levels of economic development smaller than that at which the U-curve reaches its "minimum", making the "equilibrium function" largely L-shaped.

We find evidence for an error correction mechanism between the actual rate of business ownership and the equilibrium rate. Lagged unemployment appears to be a significant push factor of business ownership. Italy plays an exceptional role in our sample of 23 OECD countries in that there appears to be an additional autonomous increase of the rate of self-employment which may have frustrated economic growth.

The rate of business ownership is found to influence economic growth through deviations from the equilibrium rate. This result supports the view that size distribution differences across countries matter when explaining economic performance (Davis and Henrekson, 1999). As a consequence, economies can have both too few or too many business owners and both situations can lead to a growth penalty. By and large, a five percent point deviation implies a growth loss of three percent over a period of four years.

An important policy implication of our exercises is not only that "To induce dynamic entrepreneurial competition we require the fulfillment of only one condition: guaranteeing free entrepreneurial entry into any market where profit opportunities may be perceived to exist" (Kirzner, 1997, p. 74), but also that exit free of stigma and financial burdens has to be safeguarded. See also Acs et al. (1999). Low barriers to entry and exit of business owners are a necessary condition for the equilibrium seeking mechanisms which are vital in our model of the relation between business ownership and economic development.

The results presented in this study should be interpreted with caution. The very concept of the economy-wide rate of business ownership entails several difficulties of interpretation. For example, it is impossible to make the rates perfectly statistically comparable across countries. In addition, the composition of the rates are unclear: high-tech start-ups are indistinguishable from old mom-and-pop businesses in the retail sector (with the same number of employees). Nevertheless, we argue that this paper may provide a good starting point for a promising line of research. As an important issue we mention that while the present research is based upon country-wide composites, sectoral diversity between countries probably plays a role when explaining differences in equilibrium situation and differences in the equilibrium restoring mechanism.

Acknowledgements

The authors are grateful to an anonymous referee for helpful comments on an earlier draft. Martin Carree is grateful to the Royal Netherlands Academy of Arts and Sciences (KNAW) for financial support. Earlier versions of this paper have been read at the EARIE conference (Turin, 1999), the AEA meetings (Boston, 2000), the Jönköping international workshop (Jönköping, 2000), the Tinbergen Institute (Rotterdam, 2000) and at the Young Economists' Conference (Oxford, 2000).

Appendix: Weighted regressions

Estimation results are obtained by weighting the observations with the number of inhabitants. In this appendix we provide the rationale. For simplicity we consider the case of cross sectional data (i.e. no time dimension).

Suppose that there are N regions in L countries with $L << N$. In our case, L would be 23 because we have 23 countries in our data set. We assume that these N regions are all of the same size. Thus, for example, the U.S. would have many regions the size of Luxembourg. If we would dispose of data per region, we would propose the following model for a linear relationship between two variables x and y:

$$y_{R,i} = \beta x_{R,i} + \varepsilon_{R,i}, \quad i = 1, \ldots, N \text{ (regions)}. \qquad \text{(a)}$$

The subscript R is used to denote that the data are assumed to be available at the regional level. The OLS-estimator of β in (a) is then

$$b_{\mathrm{OLS}}(\mathrm{a}) = \frac{\sum_{i=1}^{N} x_{R,i} y_{R,i}}{\sum_{i=1}^{N} x_{R,i} x_{R,i}}.$$

However, we have data at the aggregated level of countries and not at the level of regions. Given our assumption that the regions are equally large, we write the model with the variables x and y at the country level (subscript C) as

$$y_{C,j} = \beta x_{C,j} + \varepsilon_{C,j}, \quad j = 1, \ldots, L \text{ (countries), with} \qquad \text{(b)}$$

$$y_{C,j} = \frac{\sum_{D_{i,j}=1} y_{R,i}}{N_j} \quad \text{and} \quad x_{C,j} = \frac{\sum_{D_{i,j}=1} x_{R,i}}{N_j}.$$

The variable $D_{i,j}$ is defined as follows: $D_{i,j} = 1$ if region i lies in country j and 0 otherwise. Furthermore, N_j denotes the number of regions in country j ($\sum_{j=1}^{L} N_j = N$). Hence, we assume that the variables x and y at the country-level can be written as the averages of the variables over the regions of the country. When we translate these country-level variables $y_{C,j}$ and $x_{C,j}$ in (b) back to the regional level variables $y_{R,i}$ and $x_{R,i}$ in (a), we obtain the following observations for our original model (a) at the regional level:

Observations for which:

$D_{i,1} = 1$: $\quad y^*_{R,i} = y_{C,1} \quad x^*_{R,i} = x_{C,1} \quad (N_1$ observations)

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.

$D_{i,L} = 1$: $\quad y^*_{R,i} = y_{C,L} \quad x^*_{R,i} = x_{C,L} \quad (N_L$ observations)

Writing the data at the regional level in this manner, it is implicitly assumed that *within* countries, the various regions are identical. With these observations, the OLS-estimator can be written as:

$$b^*_{\mathrm{OLS}}(\mathrm{a}) = \frac{\sum_{i=1}^{N} x^*_{R,i} y^*_{R,i}}{\sum_{i=1}^{N} x^*_{R,i} x^*_{R,i}} = \frac{\sum_{j=1}^{L} N_j x_{C,j} y_{C,j}}{\sum_{j=1}^{L} N_j x_{C,j} x_{C,j}}.$$

Thus, here it is assumed that there are N observations where for every observation (region) within a country, the variables have identical values. However, we have only L observations and then the OLS-estimator of β from (b) reads as

$$b_{\mathrm{OLS}}(\mathrm{b}) = \frac{\sum_{j=1}^{L} x_{C,j} y_{C,j}}{\sum_{j=1}^{L} x_{C,j} x_{C,j}}.$$

We see that this estimator is different from $b^*_{\mathrm{OLS}}(\mathrm{a})$, which we would like to have. The estimator $b_{\mathrm{OLS}}(\mathrm{b})$ does not take into account that different countries have different numbers of regions, or stated differently, that the various countries are not equally large. Therefore, we weight the observations by pre-multiplying the variables x_C and y_C from (b) with the square root of the number of regions. The (weighted) least squares estimator $b_{\mathrm{WLS}}(\mathrm{b})$ reads as

$$b_{\mathrm{WLS}}(\mathrm{b}) = \frac{\sum_{j=1}^{L} \sqrt{N_j} x_{C,j} \sqrt{N_j} y_{C,j}}{\sum_{j=1}^{L} \sqrt{N_j} x_{C,j} \sqrt{N_j} x_{C,j}}.$$

We see that the WLS-estimator of (b) is exactly the same as the OLS-estimator of (a), $b^*_{\mathrm{OLS}}(\mathrm{a})$. Clearly, we do not know the number of regions per country. We use the population size as a proxy.

Notes

[1] There is considerable controversy about the number of U.S. self-employed. Publications which deal with various issues on estimating the actual number of business owners in the U.S. include Fain (1980), Bregger (1996), Dennis (1997) and Chapter 3 of *The State of Small Business; a Report of the President 1996*, Washington: U.S. Government Printing Office. Most controversy is about measuring the number of incorporated self-employed. In the present paper we basically follow the approach taken by USSBA (2000), p. 5, in which the number of incorporated self-employed is estimated by the number of *employer firms*.

[2] Audretsch and Thurik (2001) characterize this period as one where stability, continuity and homogeneity were the cornerstones and label it the managed economy.

[3] See also the various editions of *The European Observatory for SMEs* that provide an account of the state of small business in Europe, for instance EIM/ENSR (1997).

[4] Brock and Evans (1986) were the first to provide an elaborate overview.

[5] Entrepreneurial energy as such may not suffice for economic progress. Baumol (1990) stressed the importance of entrepreneurship being led into productive channels.

[6] Small deviations are unlikely to have much impact. See e.g. Simon (1991, pp. 41–42): "organization size and degree of integration, and the boundaries between organizations and markets, are determined by rather subtle forces. The wide range of organizational arrangements observable in the world suggests that the equilibrium between these two alternatives may often be almost neutral, with the level highly contingent on a system's history".

[7] Schultz (1990) reports having found statistical evidence for a quadratic relationship between the share of wage earners and the stage of economic development.

[8] In case the "minimum" is reached at a level of per capita income exceeding those attained in the data set, the relation can be better described as L-shaped.

[9] Alba-Ramirez (1994) shows that for both Spain and the U.S. the duration of unemployment increases the probability of becoming self-employed. His analysis suggests that the effect of unemployment duration on the probability of becoming self-employed is not very different for the two countries, albeit stronger for the U.S. The results are interesting especially since the Spanish economy has a higher degree of unemployment and self-employment when compared to the American economy. The results suggest that the influence of unemployment on business ownership is a common feature across economies. Alba-Ramirez also notes that legislation aimed to help the jobless starting up their own businesses has been implemented across developed countries and provides the example of the Spanish 1985 law giving lump-sum unemployment insurance to workers becoming self-employed.

[10] Acs et al. (1999) point at differences in competition and entrepreneurship when comparing the more successful U.S. economy to that of Europe and Japan.

[11] The excess growth of small firms in that study is defined as the percentage change in the value-of-shipments accounted for by small firms minus that accounted for by large firms.

[12] A subset of small firms which are assumed to improve economic performance are the so-called New Technology-Based Firms (NTBFs). Many of the businesses can be found on Science Parks of which the number in many countries has increased strongly during the 1980s and 1990s. Storey and Tether (1998) show that most of the NTBFs are, in fact, small firms. They report the average number of employees to be around 20 both in France and the U.K. The two countries were the first in Europe (in 1969) to establish science parks (Cambridge Science Park in the U.K. and Sophia Antipolis in France). They claim that Italy serves as an example of lagging behind in the establishment of "advanced" science parks and relate this to the relatively low proportion of university research that is financed by the Italian private sector.

[13] See for example Russia's Shatalin Plan, which "is built on the assumption that society needs small enterprises to orient production to the needs of every person, to fight the dictatorship of monopolies in consumer and production markets, and to create a favourable environment for quick introduction of new scientific and technological ideas" (Nolan, 1995, p. 82).

[14] In Carree et al. (2000) we compare four different specifications of the relationship between the equilibrium business ownership rate and GDP per capita, based upon an earlier version of our business ownership dataset (COMPENDIA 1999; in the present paper we use COMPENDIA 2000.1, see Section 4). The log-quadratic specification adopted in the present paper was found to outperform the other specifications in terms of goodness of fit, although not by much. The estimates of the error-correction parameter b_1 and the growth penalty parameter c_1 did not differ much between the four specifications.

[15] Audretsch and Thurik (1998), in an earlier empirical investigation for 23 OECD countries find a positive effect of the (lagged) change of unemployment on the change of the self-employment rate.

[16] In Carree et al. (2000) we consider an alternative penalty function based on the squared instead of the absolute deviation. For each of the shapes of the equilibrium function the absolute deviation penalty structure outperformed the squared deviation case.

[17] For the unemployment rate and the labor income share we also use data of 1974.

[18] This topic is dealt with in Chapter 5 of *OECD Employment Outlook June 2000*.

[19] For the United States, sources include The State of Small Business; a Report of the President 1996.

[20] Contact André van Stel for further information about these business ownership data (ast@eim.nl). The data set is referred to as COMPENDIA 2000.1.

[21] Separate data for Northern and Southern Italy are obtained from *Eurostat Regions Statistical Yearbook*.

[22] The size of newly established firms in Italy is very small in comparison with the size of incumbent firms (see Santarelli and Sterlacchini, 1994).

[23] We have also run a regression of equation (4) with dummy-variables included for *all* countries in the sample. We found the error-correction effect to increase to 0.20 and the growth penalty to become insignificant (t-value below unity). Because one possible interpretation of such a regression is that every country has its own unique equilibrium level, these results are not surprising. However, this type of country-specific equilibrium levels is not the focus of this study, since we are investigating a "universal" equilibrium function which should be valid for all countries. Indeed, as we described earlier, we do not even interpret the "Italy-dummy" as reflecting a country-specific equilibrium. Instead, we interpret it as an autonomous additional rise in the number of business owners, not necessarily favouring economic growth.

[24] We do not include country-specific dummies in Eq. (2). However, when including such dummies the coefficient of c_1 remains negative and the value of the estimate barely changes, both in the "Two yearly" case and the "Four yearly" case. This is also found for both cases when the "Italy-dummy" in the first equation is excluded (as in Table II). Likelihood ratio test statistics testing whether or not to include country-specific dummies in equation (2) have values between 34.0 and 46.5

for the four cases of Table II and III. These values are close to the critical values at 5% (33.9) and 1% (40.3).

[25] In Italy, research and development expenditures are by far the lowest among the largest OECD countries as a percentage of gross national product. This is in line with the idea that when there are too many business owners, the scale advantages in research and development are not utilized. See Cohen and Klepper (1996).

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