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Business Ownership and Economic Growth in 23 OECD Countries

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Abstract

In the present paper we address the relationship between the extent of business ownership (self-employment) 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 lead to less economic growth? Hypotheses concerning all three issues are formulated setting up a new two-equation model. We find confirmation for the hypothesised effects using a data panel of 23 OECD countries. An important policy implication of our exercises is that low barriers to entry and exit of self-employed/businesses are necessary conditions for the equilibrium seeking mechanisms that are vital for a sound economic development.

Keywords: business ownership, economic growth, entrepreneurship
JEL classification: L16, O12

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1 Introduction

In the present paper we address the relationship between the rate of business ownership (or self-employment) and economic development. Central to our approach is the notion of an “equilibrium” rate of self-employment. Equilibrium rates of self-employment 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 the critical factors to choose 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 Lucas' model by introducing a learning process through which managers acquire the necessary knowledge. More recent contributions include Schmitz (1989), Holmes and Schmitz (1990), De Wit and Van Winden (1991) and Gifford (1993). The equilibrium rate of business ownership depends upon the stage of economic development. This may be due to changes in the aggregate production function (e.g. scale economies) or the criteria of the occupational choice (e.g. degree of risk aversion). Recently, Iyigun and Owen (1998) developed a model explicitly relating the equilibrium rate of self-employment and the stage of economic development.

The variables self-employment and business ownership are used synonymously in the current research. We use a data set covering 23 OECD countries for the period 1976-1996 where business owners (self-employed) are defined as individuals owning a business that is not legally incorporated or owning an incorporated business from which they gain profits as well as a salary.[1] There are various links between the rate of business ownership and economic performance.[2] First, there is empirical and theoretical evidence of the existence of a long-term relation between the rate of business ownership and the stage of economic development. Deviations from this "equilibrium" should be interpreted as misallocation and may lead to adaptations in the number of business owners as well as to lower growth levels. Second, low growth levels may lead to high unemployment levels making self-employment more attractive providing an alternative at low opportunity costs. High unemployment levels may induce people who have a hard time finding work or whose careers are threatened within existing companies to become self-employed. This is an example of economic growth affecting the rate of business owners per labour force.

In short, 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 lead to less economic performance (growth)? All these hypotheses are used setting up a new two-equation model.

[1] For more details on these definitions, see Appendix I.

[2] See Brock and Evans (1986) for an early survey and Acs et al. (1999) for a more recent survey.

Self-employment has received considerable attention from policy makers in European countries. The persistently high unemployment rate coupled with limited economic growth in Europe has triggered a plea by policy makers for rethinking the policy approach that ushered in European prosperity during the post-war era. In two ways globalisation has reduced the ability of the European countries to generate economic growth and create jobs. On the one hand, there is the advent of new competition from low-cost countries in Central and Eastern Europe as well as Asia. On the other hand, the telecommunications and computer revolutions have drastically reduced the cost of shifting not only capital but also information out of the high-cost locations of Europe and into lower-cost locations around the globe. Taken together, these twin forces of globalisation mean that economic activity in a high-cost location is no longer compatible with routinized large-scale operations.

This is why both politicians and scientists have become interested in small businesses recently: labour-intensive economic growth can be achieved by stimulating the small business sector because generally small businesses are labour-intensive. Furthermore, entrepreneurship, in the form of new firms, and intrapreneurship, in the form of new ideas and responsibilities implemented in existing organisations, are essential to creating new economic activity. In modern economies a great variety of organisations is involved in making innovative products. This is the case particularly in newly developed markets like in the ICT sector. The more organisations are active in such markets, the greater the chance that an innovation takes place. Variety and selection play a dominant role in this mechanism. It is deeply embedded in the current European policy approach that creativity, autonomy and independence embedded in self-employment contribute to higher levels of economic activity. Therefore, major funds of governmental institutions and independent donor organisations are being channelled towards young and small firms. The present paper provides evidence that the success of such policies depends upon the phase of economic development.

The paper is set up as follows: in Section 2 a survey is given of the empirical and theoretical literature on the relationship between business ownership and growth. Also some definitional and data questions are covered. Our two-equation model is specified in Section 3 while Section 4 deals with the data set of 23 OECD countries. In Section 5 the empirical results are discussed. Conclusions are drawn in Section 6.

2 Theory

Our study focuses on the number of business owners (self-employed), although occasionally we will refer to entrepreneurs despite the fact that these concepts are not synonymous. The two concepts differ in two ways. *First*, business owners serve many roles and functions. Many researchers distinguish between Schumpeterian (or real) entrepreneurs and managerial business owners (Wennekers and Thurik 1999).[3] Entrepreneurs are a small fraction of the population of business owners. They

[3] In a similar fashion Audretsch and Thurik (1998) distinguish between two types of self-employed: the “shopkeeper” type and the “Schumpeterian” type. In their analysis of how and why entrepreneurship has made important contributions to economic and social life in modern industrialized countries they assume that these two types have different economic roles in their relation

own and direct independent firms that are innovative and "creatively destroy" existing market structures. After realising their goals Schumpeterian entrepreneurs often develop into managerial business owners, but some may again start new ventures or new firms. Managerial business owners are to be found 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. For that one would need profiles of individual business owners. 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. *Second*, 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).

It is inconceivable however that a society where entrepreneurship by self-employment thrives would not generate modern decentralised larger companies. In that sense the rate of self-employment may be a fair indicator of a general level of entrepreneurship in a society, at least in modern economies. Entrepreneurship remains a challenging concept (Amit et al. 1993) and of considerable importance for a country's competitive edge (Porter 1990) and for the functioning and restructuring of markets. That is why sometimes we will refer to entrepreneurship when discussing the determinants of growth.

In this study we use data material of 23 OECD countries including the fifteen countries of the EU-15, Iceland, Norway, Switzerland, Canada, Australia, New Zealand, Japan and U.S. for the period 1976 through 1996. We define the number of self-employed or business owners as including owner-managers of legally incorporated businesses for the whole economy excluding the agricultural sector. See appendix I to this paper for more details.

The impact of economic progress on business ownership

The proportion of the labour 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 non-agricultural U.S. labour 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 this report show that the self-employment rate in the U.S. has continued to rise gradually since then. More recently business ownership increased in several other countries like Australia, Canada, Spain, the Netherlands and the U.K. In this section we present some empirical evidence and discuss the main reasons for a structural or long-term relationship between the self-employment rate and economic development.

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with unemployment. The number of “shopkeepers” is likely to go up if the level of unemployed rises and that same level is expected to go down if the number of “Schumpeterians” increases.

An inverse relationship

A negative relationship between the self-employment rate and economic development was already reported by Kuznets (1971) describing the shift in locus of production from family to firm. A negative correlation of –0.85 between real per capita GDP and the self-employment share is found in Yamada (1996). Schultz reports that "a 1% annual rate of growth in real income per adult is associated with about the same increase in the share of wage earners for men and women, 0.15% and 0.16%, respectively." (Schultz 1990, p. 475). These studies use a large cross-section of countries with a wide variety in the stage of economic development. Bregger (1996) reports a decline of the U.S. self-employment for all industries from 18.5% in 1948 until 8.7% in 1975. The decline is less vehement when agriculture is excluded: from 12.0% in 1948 to 6.9% in 1975. This reduction in the rate of self-employment is representative for that in many Western countries during the most part of this century.

There are many 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 distribution of persons by "managerial" talent this induces marginal entrepreneurs (in this context Lucas refers to managers) to become employees. This pushes up the average size of firms. 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 a stable demand and of seemingly clear advantages of diversification. Audretsch and Thurik (1997) characterise this period as one where stability, continuity and homogeneity were the cornerstones and label it the managed economy. Schaffner (1993) takes a somewhat different and more theoretical 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 risk becoming an entrepreneur as the "safe" professional earnings rise with economic development. See also Kihlstrom and Laffont (1979). Other explanations are from Galbraith (1956) who considered the increase in market concentration to be a consequence of 'countervailing power' and Cohen and Klepper (1996) who see important scale advantages in R&D.

Reversal of the trend

Several authors provide evidence of the 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. Carlsson (1989) provides data on the share of the Fortune 500 companies in total manufacturing. He shows

that this share in total manufacturing employment dropped from 78.7% in 1975 to 72.5% in 1985. In the same period the share of these firms in total shipments dropped from 83.2% to 77.2%. Other sources showing that the growing importance of large business has come to a halt in Western countries include Loveman and Sengenberger (1991), Acs and Audretsch (1993) and Acs et al. (1996).[4]

There are several reasons for the more prominent place of small business and self-employment in Western economies. *First*, the last 25 years of the 20th century may be seen as a period of creative destruction, as described in Schumpeter (1950). 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 (1997 and 1998) stress the effects of globalisation 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 and 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 saying 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. His theory is one of 'dynamic complementarity'. See also Nooteboom (1994).

Third, the increasing incomes and wealth have enabled individuals to consider '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 specialised products. The decrease in diversification as reported by Jovanovic (1993) suggests that large firms have not been capable of entering into such market niches.

Fourth, deregulation movements have swept the world. Phillips (1985) reports that small firms have dominated in both the creation of new businesses and new jobs in deregulated industry sectors in

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

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 by small (start-up) firms in achieving economic growth and development. See Storey and Tether (1998) and OECD (1998).

Fifth, there has been a tendency of large firms to concentrate on 'core competences' (Carlsson 1989). Jovanovic (1993) reports that the 1980s were characterised by corporate spin-offs and divestment. Aiginger and Tichy (1991) blame much of the 'back-to-basics' and downsizing (or right-sizing) tendencies on the opportunistic conglomerate merger wave of the late 1960s.[5]

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 anymore characterised as under-employment or being mom-and-pop establishments, but as a way to achieve a variety of personal goals. Baumol (1990) stressed the importance of entrepreneurship being led into productive channels. Also, as hypothesised in social psychology there is a Maslowian hierarchy of human motivations, with physical needs at the bottom and self-realisation at the top (Maslow 1970). A higher level of prosperity will induce a higher need for self-realisation and thereby may stimulate entrepreneurship.

Finally, the employment share of the services sector has been well documented (Inman 1985) to increase with per capita income.[6] Given the relatively small average firm size and the low entry barriers of most services (barring airlines, shipping and some business services) this creates more possibilities for self-employment.

Obviously, some of these factors may have had a temporary effect only. For example, it is not unlikely for the 'back to core business', outsourcing and deregulation waves to dry up.[7] On the other hand, there are more permanent effects like that of new technologies. We refer again to Freeman and Perez (1988). They claim that in the new techno-economic paradigm (fifth Kondratiev wave) the organisation of firms will be 'networks' of large and small firms. See also Oughton and Whittam (1997) who emphasise the role of external economies of scale when explaining the viability of small firms. Small firms will profit from the new model of flexible specialisation (Piore and Sabel 1984 and Fiegenbaum and Karnani 1991). Moreover, the introduction of new technologies is also positively related to the stage of economic development through necessary skills and other investments. Finally, the increasing variety of demand for specialised goods and services, the increased valuation of self-realisation and the rise of the services sector are also dependent on per capita income.

[5] See also *The Economist*, Jan. 9th 1999, How to make mergers work (pp. 13-14) and How to merge: after the deal (pp. 19-21).

[6] Chenery (1960) provides an early analysis of the relation between sectoral structure and the stage of economic development.

[7] See *The Economist*, June 24th 1995, Big is back (survey).

An equilibrium rate of business ownership

As the extent to which there is a reversal of the trend towards less self-employment is still not quite clear we hypothesize a relationship between the rate of business ownership and per capita income that is either L-shaped or U-shaped.[8] In case of a L-shape it is assumed that the equilibrium business ownership rate continues to decline with the stage of economic development while in case of a U-shaped curve it is assumed that this trend is reversed at higher levels of development. The U-shaped pattern has the direct implication that there is a level of economic development for which the equilibrium business ownership rate is "minimal".

The secular trend is best viewed as a long-term equilibrium rate of business ownership resulting from technological conditions, the demand for goods and services and the supply of potential entrepreneurs. The theoretical viability of an equilibrium rate of self-employment is corroborated by De Wit and Van Winden (1991) using an m-sector, n-group general equilibrium model of self-employment. In this model several of the above determinants are used to determine the equilibrium rate of self-employment. Schmitz (1989) derives the equilibrium fraction of the self-employed in an endogenous growth model. Gifford (1992, 1993 and 1998) develops a model of entrepreneurial attention between maintaining current activities and starting new ones. She derives the proportion of agents choosing a career as innovative entrepreneur, managerial entrepreneur and salaried employee. See also Holmes and Schmitz (1990).

However, many forces may cause the actual number of self-employed (business owners) to differ from the long-term equilibrium rate. Such a "disequilibium" (i.e. deviation from the long term equilibrium) may for example stem from cultural forces and institutional settings (regulation of entry, incentive structures, functioning of the capital market). See Kirzner (1997), Davis and Henrekson (1999) and Henrekson and Johansson (1999).

In a market economy there will be underlying endogenous movements to restore equilibrium. Some examples may illustrate this point. A structurally low number of enterprises such as many Western economies experienced in the late 1970s and early 1980s, has undoubtedly contributed to structural unemployment. A positive influence of unemployment on self-employment has already been demonstrated by several authors such as Storey (1991), Evans and Leighton (1989) and Audretsch and Thurik (1998). 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. The results are interesting especially since the Spanish economy has a higher degree of unemployment and self-employment when compared to the American. The results suggest that the influence of unemployment on business ownership is a common feature across economies.[9]

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

[9] Alba-Ramirez (1994) also notes that legislation aimed to help the jobless start up their own business has been implemented across developed countries and gives the example of the Spanish 1985 law providing lump-sum unemployment insurance to workers willing to become self-employed.

Gradually high unemployment also results in wage moderation helping to restore profitability of private enterprise. Finally, it is likely that a shortage of business ownership induces many policies fostering entrepreneurship, ranging from a lower replacement ratio to better access to financing and competition policies. See OECD (1998). These processes are hard to observe and may therefore be modelled best using an error correction mechanism. Likewise a number of business owners which structurally exceeds the equilibrium rate may be expected to diminish profitability, resulting in higher exit (failure rates) and lower entry, and to induce policies and practices restricting entry.

The effect of business ownership on economic progress

There is some evidence on the relation between size class distributions and economic performance. For instance, see Nickell (1996), Nickell et al. (1997), Gort and Sung (1999) 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 had 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. Audretsch and Thurik (2000) show that self-employment has brought down unemployment for a sample of 23 OECD countries.[12]

Schmitz (1989) derives from an endogenous growth model 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 specialisation 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). In this respect also the work of Eliasson (1995) on economic growth through competitive selection is of relevance.

Another source of evidence on the relation between self-employment and progress is the economic history of the formerly centralised planned economies. A characteristic of these economies was the almost complete absence of small firms (and private ownership of the means of production), and

[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 is defined as the percentage change in the value-of-shipments accounted for by small firms minus the percentage change in the value-of-shipments 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.

this extreme monopolisation constituted one of the major factors leading to the collapse of state s o-cialism (Acs 1996). The development of small enterprises is considered a vital part of the current transition process in Eastern Europe.[13]

In the current paper we assume that deviations between the actual and the equilibrium rate of business ownership will diminish the growth potential of an economy in the short and medium term.[14] A shortage of business owners will diminish competition with detrimental effects for static efficiency and competitiveness of the national economy. Worse still, 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. Moreover, it will result in large numbers of marginal entrepreneurs, absorbing capital and human energy that could have been allocated more productively elsewhere.

3 Model

Our main research object is to examine the interrelationship between business ownership and economic development at the macro level. Therefore, we introduce a model that consists of two 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 the labour income share LIQ_{it}. It reads as follows:

$$(1)\quad E_{it} - E_{i,t-4} = b_0 + b_1\left(E_{i,t-4}^{*} - E_{i,t-4}\right) + b_2 U_{i,t-4} + b_3 LIQ_{i,t-4} + \varepsilon_{1it}$$

The dependent variable is the change in the rate of business ownership over a four-year period. This change is explained from the extent of disequilibrium four years before. In case the equilibrium rate of business ownership lies higher than the actual rate, we expect a rise in the business ownership

[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] 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). Therefore, their model supports our notion that deviations from the level of optimal relative entrepreneurial activity come at a cost of lower economic performance.

rate. The hypothesis is that $b_1 > 0$. Next to this structural effect, we add an additional push and pull factor. Self-employment may be an alternative to being unemployed. Therefore, we expect the rate of unemployment to have a positive effect on the change in the business ownership rate. The hypothesis is that $b_2 > 0$. The share of labour income in total income is an indicator of the return on capital and profit rates. A high labour income share indicates that capital and entrepreneurship are less highly rewarded in comparison to the labour factor than when this share is low. The variable is a 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 labour income share is defined as the share of labour income (including the "calculated" compensation of the self-employed for their labour contribution) in the net national income. The expected sign of the parameter b_3 is negative.

We treat the unemployment rate and labour income share as factors independent of the extent of disequilibrium. For example, if the actual business ownership rate is below the equilibrium rate but at the same time the unemployment rate is low and the labour income share is high, we may find the business ownership rate not to adjust towards equilibrium. In equation (1) a four-year period is chosen for the lags as we do not expect the rate of business ownership to adjust within one or two years. This reflects practical procedures and legal requirements involved in starting a new enterprise.

The second equation of the model relates the extent of economic growth $\Delta ln(Y_{it})$ to the deviation of the actual business ownership rate from the equilibrium rate. The variable Y_{it} is defined as the gross domestic product in purchasing power parities per U.S. dollar in 1990 prices in country *i* and period *t*. We correct for business-cycle effects by including the extent of economic growth in the period before and we correct for catching-up effects by including the level of economic development. This level is measured by $(Y/CAP)_{it}$, the per capita gross domestic product in purchasing power parities per U.S. dollar in 1990 prices. The second equation reads as follows:

$$(2)\quad ln(Y_{it}) - ln(Y_{i,t-4}) = c_0 + c_1 g\left[E^*_{i,t-4} - E_{i,t-4}\right] + c_2\left(ln(Y_{i,t-4}) - ln(Y_{i,t-8})\right) + c_3\left(\frac{Y}{CAP}\right)_{i,t-4} + \varepsilon_{2it}$$

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 (implemented as a log-difference). The first determinant of growth is the deviation of the actual rate of business ownership from the equilibrium rate of business ownership. As explained in a previous section, the deviation variable is expected to have a negative impact on growth. We will consider two alternative penalty functions based on the squared deviation ($g(x) = x^2$) and the absolute deviation ($g(x) = |x|$), respectively.

Next to this deviation variable, lagged growth and the level of per capita income are taken into account as control variables. Using this last variable we capture the convergence hypothesis of countries: countries which are lagging behind in economic development can grow more easily than other countries because they can profit from modern technologies developed in other countries. The expected sign of the parameter c_3 is negative.

The equilibrium business owner rate is assumed to be a function of economic development as measured by $(Y/CAP)_{it}$. This is formally given in equation (3). We expect the function f to be declining for low levels of economic development. For high levels of economic developments it may start to increase again as argued in Section 2, but it may also keep declining further. We have chosen a parametric approach and have used four different equilibrium functions, two of which are U-shaped and two of which are L-shaped. These are given in equations (3a) through (3d).

(3) $$E_{it}^{*} = f\left[\left(\frac{Y}{CAP}\right)_{it}\right]$$

The equilibrium rate of business ownership equals α when the GDP per capita is zero in each of the four equations (3a) through (3d). In equation (3a) the relation between the level of development and the equilibrium rate of business ownership is quadratic. We expect β to be negative as initially economic development is negatively correlated with the business ownership rate. This decline is expected to become smaller over time, so γ is expected to be positive. An important question is whether the minimum of the U-shaped curve (when GDP per capita equals $-\beta/2\gamma$) is reached for a level of economic development which some countries have already surpassed. A clear disadvantage of equation (3a) is that when γ is indeed positive, the business ownership rate is bound to become larger than unity at very high levels of development. However, we are not using the model to predict the equilibrium business ownership rates into the future, but to explain causes and consequences of the rate of business ownership for the levels of economic development observed within our sample. Therefore, we only require that the equilibrium function remains between zero and one for the values of GDP per capita observed. We call equation (3a) the 'quadratic case'. Another U-shaped relation can be found in equation (3b). Again we expect β to be negative and γ to be positive. An important difference between this 'log-quadratic case' and the quadratic case is that the rise of the curve after the minimum has been reached is less steep than the decline before that minimum.

(3a) $$E_{it}^{*} = \alpha + \beta\left(\frac{Y}{CAP}\right)_{it} + \gamma\left(\frac{Y}{CAP}\right)_{it}^{2}$$ Quadratic

(3b) $E_{it}^{*}=\alpha+\beta ln\left(\frac{Y}{CAP}+1\right)_{it}+\gamma ln^{2}\left(\frac{Y}{CAP}+1\right)_{it}$ Log-Quadratic

Equation (3c) gives the first L-shaped equilibrium relation. The equilibrium rate is predicted to decline from α to $\alpha-\beta$ as the level of economic development rises from zero to high levels. We call this equilibrium relation the 'inverse case'. The fourth case, given in equation (3d) is quite similar. The shape of equations (3c) and (3d) may be somewhat different but the difference will be limited given that both curves decline from α to $\alpha-\beta$ and decline relatively fast when the level of development is low compared with more advanced stages of economic development. We call equation (3d) the 'log-inverse case'. We compare the four different equilibrium functions on the basis of the explanatory powers in equations (1) and (2). That is, we compare the extent to which the change in the rate of entrepreneurship and the economic growth rate can be explained from deviations of the actual business ownership rate from the equilibrium business ownership rate.

(3c) $E_{it}^{*}=\alpha-\beta\frac{\left(\frac{Y}{CAP}\right)_{it}}{\left(\frac{Y}{CAP}\right)_{it}+1}$ Inverse

(3d) $E_{it}^{*}=\alpha-\beta\frac{ln\left(\frac{Y}{CAP}+1\right)_{it}}{ln\left(\frac{Y}{CAP}+1\right)_{it}+1}$ Log-Inverse

We use a two-step procedure to estimate the effect of being in disequilibrium on economic growth. That is, we do not take into account the parameter restrictions (of the equilibrium function) across both equations.[15] Equation (3) is first incorporated into equation (1). This allows us to estimate the parameters of the equilibrium function from the error correction process of the actual business ownership rate towards the equilibrium rate. The estimated equilibrium function is then incorporated into equation (2).

When estimating equations (1) and (2), we weight the observations with the population size.[16] We think that large countries (in terms of for example population) such as the U.S. and Japan are more important in establishing the relationship between business ownership and economic growth than

[15] One may also have equation (2) determine E* as a function of economic development. However, this would not provide us with an equilibrium function but with an "optimal" business ownership rate function in the sense of maximizing economic growth. See for example Schmitz (1989) how the "equilibrium" and "socially optimal" rates may differ. In the present analysis we are concerned with the consequences of deviations from the "equilibrium" rate.

[16] We have also used different weighting variables like the number of self-employed and the total real GDP in US dollars. Results were barely affected by the choice of these different weighting variables.

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 model. A technical description of the weighting of observations can be found in appendix II to this paper.

4 Data

We use data material of 23 OECD countries including the fifteen countries of the EU-15, Australia, Canada, Iceland, Japan, New Zealand, Norway, Switzerland and the U.S. Data have been used for the years 1980, 1984, 1988, 1992 and 1996. The total number of observations, therefore, equals 115. The main data sources are the OECD Labor Force Statistics and the OECD National Accounts. A detailed description of the variable definitions can be found in appendix I to this paper. In Table 1 the values are given of four variables in the middle year of our sample, 1988, for all countries.

From Table 1 we see that Greece, Italy and Spain have the highest levels of self-employment (bus i-ness ownership) in 1988: more than 15% of the labour force. The unweighted sample average level of self-employment in 1988 is 10%. The countries with the lowest levels of self-employment in 1988 are Austria, Denmark, Finland, Germany, Luxembourg and Sweden: seven percent or less of the labour force. Looking at the GDP per capita in 1988, we see that the United States, Switzerland and Luxembourg were the most affluent countries while Greece, Ireland, Portugal and Spain were the least affluent countries in the sample. The unemployment rates in 1988 are highest in Ireland and Spain: more than 15% of the labour force. Low unemployment rates are found in Japan, Norway, Sweden, Switzerland, Iceland and Luxembourg: 3% or lower. The average unemployment rate in 1988 is 7%. High values of the labour income share are found in Denmark, Greece and Iceland. In these countries business profitability is relatively low in comparison to average wage earnings of an employee. Countries with a low labour income share in 1988 are the Netherlands, Portugal and New Zealand: LIQ is below 0.775 (sample average in 1988 is 0.83). A country that attracts attention is Greece with a labour income share in 1988 of 1.05. This has to do with the way the LIQ is calculated: self-employed persons obtain an imputed compensation for their labour contribution set equal to the average wage earnings per employee. This is done in order to distinguish business profits from labour compensation for self-employed persons. When the number of self-employed persons is high, the calculation becomes less accurate since the imputed part of 'wage earnings' by the self-employed is higher. Since Greece has the highest self-employment rate, this problem occurs for Greece in particular. However, we can conclude that business profits are low in Greece: according to the LIQ being in excess of one, the average self-employed person has a lower income than the average employee.

Table 1 shows that, in general, the countries with high self-employment rates have a relatively low GDP per capita. An important exception, though, is Italy. Italy combines a high level of self-employment with a normal (near average) level of per capita income. This is unusual: the countries with many self-employed (business owners) are generally in a less advanced stage of economic development (for example Greece and Spain). Roughly, Italy can be divided into two quite different types of 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 for this reason. A closer inspection of the data for Northern and Southern Italy[17] shows that Northern Italy in particular deviates from the expected pattern, i.e., the U-shaped or L-shaped trend of the relative number of business owners set out against per capita income. The number of business owners in Northern Italy is higher than one would expect on the basis of the advanced stage of economic development. Small and medium-sized firms play a bigger role in (Northern) Italian manufacturing than in other industrialised countries. A notable feature of the organisation 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 en Audretsch 1993). It often has a strong family component.

The specific Italian model of extensive small and medium-sized firm production when compared to other countries in similar stages of development may have positive and/or negative effects on economic growth. Many of the Italian firms are highly specialised and are organised 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, however, 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). The data for Southern Italy seem to be in conformity with the general pattern: there is a relatively high level of self-employment but combined with a relatively low value of the GDP per capita.

Table 1 Values of the key variables in 1988

Country	Self-employment[1]	GDP per capita[2]	Unemployment[1]	Labour income share
Austria	0.056	15651	0.053	0.817
Belgium	0.109	15326	0.097	0.802
Denmark	0.062	16263	0.087	0.909
Finland	0.071	15456	0.045	0.869
France	0.098	16421	0.100	0.811
Germany (West)	0.067	17245	0.062	0.805
Greece	0.186	7274	0.060	1.054
Ireland	0.111	9735	0.162	0.836
Italy	0.169	15289	0.110	0.806
Luxembourg	0.068	21103	0.016	0.837
The Netherlands	0.082	14867	0.091	0.773
Portugal	0.145	8424	0.057	0.718

[17] Separate data for North- and South-Italy are obtained from the Eurostat Regions Statistical Yearbook.

Spain	0.156	10886	0.191	0.788
Sweden	0.064	16632	0.016	0.860
United Kingdom	0.100	15590	0.086	0.851
Iceland	0.101	17368	0.006	0.919
Norway	0.088	17301	0.032	0.828
Switzerland	0.082	20133	0.007	0.855
United States	0.116	21543	0.054	0.823
Japan	0.112	16328	0.025	0.854
Canada	0.079	18573	0.077	0.780
Australia	0.123	16154	0.072	0.786
New Zealand	0.136	13532	0.056	0.762

[1] Relative variable: per labour force

[2] Unity: purchasing power parities per U.S. $ at 1990 prices

A further illustration is given in Table 2 where the development of GDP per capita and the number of business owners per labour force for the period 1976 through 1994 is reported for the major industrialised (G7) countries U.S., Japan, Canada, Germany (West part), U.K., France and Italy. Notice that these countries weight heavily in the estimations such that deviations in the pattern of relative number of business owners versus GDP per capita for these countries will influence the parameter estimates considerably.

Table 2 Per capita income and business ownership rate in G7 countries, 1976-1994

Country	Y/CAP 1976[1]	Y/CAP 1994[1]	Self.Emp. 1976[2]	Self.Emp. 1994[2]
U.S.	17242	23123	0.088	0.116
Japan	11087	18655	0.117	0.092
Canada	14281	18453	0.065	0.087
Germany (West part)	13548	18999	0.067	0.076
U.K.	11704	16176	0.076	0.107
France	13174	17577	0.103	0.080
Italy	11245	16618	0.142	0.181

[1] Unity: purchasing power parities per U.S. $ at 1990 prices

[2] Relative variable: per labour force

As can be seen from Table 2, the level of self-employment is much higher in Italy than in the other G7 countries while the per capita income does not deviate considerably. For example, the U.K. has a lower value of the GDP per capita in 1994. The higher level of self-employment in Italy can be explained in part by specific Italian policy stimulating the small business sector. Our conclusion is that the Italian economy has some specific characteristics that are not embedded in our basic model. We will therefore incorporate a dummy for Italy in the first equation.[18]

5 Estimation results

Once we incorporate equation (3) into equation (1) we can estimate the parameters of the equation and of the equilibrium function. As an example we will show it below for the 'quadratic case' of equation (3a). Equation (1') results when we incorporate the quadratic equilibrium function into equation (1). This equation can be estimated using least squares. From the estimates we can derive the estimates of the parameters of the equilibrium function. The way in which we estimate these parameters is given in equation (4). Using the covariance matrix of the least squares estimates of equation (1') the statistical program (TSP 4.2) derives the standard errors for these estimates of the equilibrium function parameters.

$$(1')\quad E_{it} - E_{i,t-4} = a_0 - b_1 E_{i,t-4} + b_2 U_{i,t-4} + b_3 LIQ_{i,t-4} + a_4 \left(\frac{Y}{CAP} \right)_{i,t-4} + a_5 \left(\frac{Y}{CAP} \right)^2_{i,t-4} + \varepsilon_{1it}$$

$$(4)\quad \hat{\alpha} = (a_0 + b_2 \overline{U} + b_3 \overline{LIQ}) / b_1 \qquad \hat{\beta} = a_4 / b_1 \qquad \hat{\gamma} = a_5 / b_1$$

where $\overline{U}$ and $\overline{LIQ}$ stand for the (four year lagged) sample mean of the unemployment rate and the labour income share, respectively. The sample consists of 115 observations: 23 countries times 5 years (1980 through 1996, once every four years, and 1976 through 1992 for the lags).[19] Weighting with the population size (in the year t-4) implies that all variables (including constants and dummies) are multiplied with the square root of the total population. The OLS estimation procedure is then applied to the transformed variables. In this way, larger countries are given a more pronounced influence in determining the parameter estimates than smaller countries. The weighting procedure is explained in detail in appendix II. The estimation results of equations (1) and (2) are given in Table 3.

[18] The incorporation of the dummy implies that an autonomous rise in the *actual number of business owners* has taken place in Italy. This might be the case because of the specific government policies promoting startups. When such an autonomous rise in self-employment takes place, it can have positive and negative effects on economic growth depending on whether or not the initial number of business owners is higher or lower than the equilibrium rate. See Carree et al. (1999) for further discussion of the incorporation of this dummy for Italy.

[19] Notice that for the Y variable (gross domestic product), which has a lag of eight years in equation (2), we also dispose of data for the year 1972.

In Table 3 the four different forms of the equilibrium function (3a) through (3d) are applied each with both the absolute deviation penalty function and the quadratic penalty function. We will first discuss the results for the first equation (1). For each of the four equilibrium forms we find the extent of disequilibrium to significantly affect the change in the rate of business ownership (parameter b_1 is positive). That is, we find evidence of business ownership to adjust towards the level of equilibrium. However, the speed of adjustment is low. Over a four-year period only about 9.4% (quadratic and log-quadratic case) to 5.9% (log-inverse case) of the disequilibrium is adjusted for. In each of the four cases we also find the unemployment rate to significantly affect the change in the rate of business ownership. So, there is evidence for the existence of a push factor into self-employment. We do not find a significant effect of the labour income share although the sign of the effect is consistently negative across the four cases of the equilibrium function.

The log-quadratic case seems to perform best as a description of the equilibrium relation between the level of development and the business ownership rate. The adjusted R-squared is 0.230, somewhat higher than the quadratic case and clearly higher than the inverse and log-inverse cases. The level of GDP per capita at which the log-quadratic curve reaches its minimum is 16,343 U.S. dollars of 1990 per capita. This is slightly less than the amount corresponding to the minimum for the quadratic case (16,991 U.S. dollars). Notably, the hypothesised equilibrium rate of business ownership indeed appears to exist. The estimates for the parameters α, β, and γ differ significantly from zero. Also, the estimated values of β and γ have the predicted signs although the estimated value of α lies above one.

Table 3: Estimation results for the four different equilibrium functions

	Shape of equilibrium function and penalty function							
	Quadratic		Log-Quadratic		Inverse		Log-Inverse	
Parameter	$g(x)=x^2$	$g(x)=\|x\|$	$g(x)=x^2$	$g(x)=\|x\|$	$g(x)=x^2$	$g(x)=\|x\|$	$g(x)=x^2$	$g(x)=\|x\|$
b_1	0.094		0.094		0.063		0.059	
	(2.8)		(2.9)		(2.2)		(2.0)	
b_2	0.081		0.082		0.076		0.076	
	(3.9)		(4.0)		(3.7)		(3.7)	
b_3	-0.009		-0.008		-0.012		-0.011	
	(0.5)		(0.4)		(0.7)		(0.6)	
α	0.432		1.880		1.496		1.116	
	(3.8)		(2.9)		(1.9)		(1.8)	
β	-0.0384		-1.244		1.456		1.335	
	(2.8)		(2.6)		(1.7)		(1.6)	

γ	0.00113		0.218					
	(2.6)		(2.5)					
R^2_{adj}	0.222		**0.230**		0.211		0.205	
LL	-180.39		**-179.80**		-181.78		-182.12	
c_0	0.175	0.205	0.164	0.207	0.178	0.205	0.178	0.197
	(7.0)	(7.7)	(6.6)	(7.8)	(6.5)	(6.6)	(6.5)	(6.4)
c_1	-6.647	-0.816	-3.397	-0.800	-4.564	-0.583	-4.619	-0.504
	(2.2)	(3.6)	(1.5)	(3.7)	(1.9)	(2.6)	(1.9)	(2.3)
c_2	-0.161	-0.214	-0.141	-0.205	-0.167	-0.198	-0.170	-0.188
	(1.7)	(2.3)	(1.5)	(2.2)	(1.7)	(2.1)	(1.8)	(1.9)
c_3	-0.0032	-0.0040	-0.0028	-0.0041	-0.0033	-0.0041	-0.0033	-0.0038
	(2.6)	(3.3)	(2.3)	(3.4)	(2.5)	(3.0)	(2.6)	(2.8)
R^2_{adj}	0.703	0.720	0.698	**0.721**	0.699	0.707	0.700	0.703
LL	-397.93	-394.08	-399.31	**-393.74**	-398.73	-397.07	-398.65	-397.82

Note: Each of the equations is weighted with population size. GDP per capita is measured in thousands U.S. dollars of 1990 per capita. In the first equation for which the results are presented in the top of this table a dummy variable for Italy is incorporated. Absolute t-values between brackets. The highest adjusted R-squared and log likelihood value (LL) are in bold.

Further investigation of the log-quadratic parabola shows that the minimum value is reached of 10.5% for the per capita income level of 16,343 U.S. dollars of 1990. For lower values of GDP per capita (which corresponds to less developed economies), the equilibrium rate of business ownership is considerably higher: for example 28.3% at 6,039 dollars (the lowest value of GDP per capita in our sample for Greece in 1976). For the highest value of GDP per capita in our sample (23,444 dollars for Luxembourg 1992), equilibrium business ownership is 13.1%. 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, the equilibrium rate of business ownership is not properly described by the (log-)quadratic function. This implies that the relation cannot be used for very long term predictions of the rate of business ownership, since the rate would go beyond one eventually.

The hypothesised error-correction process of the number of business owners towards the equilibrium rate is supported for the 'log-quadratic case': parameter b_1 is significantly positive. The speed of adjustment is not high: the deviation from equilibrium at a certain point in time is predicted to decrease with 9 percent in the subsequent period of four years. This corresponds to a 50 percent decrease in a period of 28 years, ceteris paribus. The low value of the speed of adjustment is not surprising: the process of the relative number of business owners converging to the equilibrium number is intrins i-

cally slow because it involves both changes in policies and structural changes of the supply side (setting up enterprises, investments in physical and human capital, divestments, etc.). We note that error-correction should not only be searched for in a change of the actual self-employment rate, but also in a change of the equilibrium rate over time.

The parameter b_2 points to a positive impact of unemployment on self-employment: every percent point rise in the unemployment rate leads to a rise of 0.082 percent point in the self-employment rate in the succeeding four years. This is in accordance with earlier studies: unemployment is a push factor for self-employment (Evans and Leighton 1989 and Storey 1991). The other variable explaining the change in self-employment, the labour income share does not show a significant relation with the change in the self-employment rate.

For the growth equation (2) the following results are found. The absolute deviation penalty function in the 'log-quadratic case' is found to have the highest adjusted R-squared. We will focus our attention to this case. An 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 parameter c_1 is significantly negative. This implies that economies with relatively too many or too few business owners can grow by stimulating scale or by stimulating business ownership (viz. entrepreneurship), respectively. Lagged growth has a negative estimated effect of -0.205, representing cyclical fluctuations: a period of high economic growth is followed by a period with lower growth and vice versa. The per capita income parameter c_3 is estimated to be negative. This might reflect the convergence of countries hypothesis.

Some additional remarks on the deviations E-E* are the following. We find a considerable increase in the value of E-E* for Greece, Ireland, Portugal and Spain in the period 1976 through 1992. These countries were integrated into the European Union during that period and benefited from development programs promoting small and young firms. In total 15 out of 23 countries showed a convergence in the business ownership rate towards the equilibrium rate over the 1976-1992 period in the sense that the absolute difference between the actual and equilibrium rate was higher in 1976 than 16 years later. In 1992 there were seven out of 23 countries which had *too many* self-employed relative to the stage of economic development. The three countries with the highest *positive* deviation from the equilibrium are Italy, Spain and New Zealand. In New Zealand this may be a result of the economic reforms in this country, through which business ownership experienced a big boost in the early eighties. See Evans et al. (1996). The positive deviation is highest for Italy (+0.071). This indicates that the high level of self-employment in Italy is not efficient: it has a relatively large negative impact on economic growth.[20]

Table 4 Impact on economic growth of quadratic and absolute deviation specifications[1]

[20] 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).

Difference	Quadratic c_0 = -3.397	Linear c_0 = -0.800	Ratio
1	0.034	0.800	23.5
2	0.136	1.600	11.8
5	0.849	4.000	4.7
10	3.397	8.000	2.4
20	13.588	16.000	1.2
23.55	18.840	18.840	1.0

[1] Unity: percent points (except last column). The last column shows the ratio of the values for the linear and quadratic case.

Analysing whether the different specifications imply different impacts of deviations from the equilibrium rate we see that in equation (2) for the 'log-quadratic case' with the quadratic impact c_0 = -3.397. In case of the linear (absolute deviation) impact we have that c_0 = -0.800. We can calculate the impact on economic growth of a deviation of one percent point from equilibrium. For $g[x]=x^2$ the negative impact is 3.397 * 0.01^2 = .00034 (.034 percent point), whereas for $g[x]=|x|$ the impact is .800 * .01 = .0080 (.80 percent point). Hence, for a 1% deviation the impact on cumulative growth in the subsequent four years is 23.5 times greater for the linear impact specification than for the quadratic impact specification. Of course, this difference becomes smaller when the deviation increases. See Table 4.

From Table 4, we see that the impact of a deviation of the actual number of business owners from the equilibrium rate is generally greater for the linear type of impact than for the quadratic type of impact. Only when the deviation is in excess of 23.55 percent points, the impact of the quadratic penalty function becomes larger. However, an (absolute) deviation of 23.55 percent point is outside the range of values that we find for the deviation from equilibrium. In general we can say that the negative impact on growth of a deviation is quite large for the linear impact model (0.8 percent point over a four year period for every percent point deviation). Furthermore, we see from Table 3 that the adjusted R-squared is higher for the absolute deviation penalty function than for the quadratic penalty function: 0.721 versus 0.698. This is an indication that the linear impact model is a more appropriate specification than the quadratic impact model.

The results for equation (1) as reported in Table 3 suggest that the equilibrium function is U-shaped in stead of L-shaped. That is, the adjusted R-squared of the quadratic and log-quadratic curves are higher than those for the inverse and log-inverse curves. One way to test for whether the U-shaped

curve performs better than the L-shaped curve is to use a likelihood ratio test procedure. We incorporate both the quadratic elements of equation (3a) and the inverse element of equation (3c) in one equation and test the null hypothesis of the inverse element to have no additional contribution next to the two quadratic elements. The likelihood ratio test statistic is 1.06 which is insignificant at the usual significance levels (1 degree of freedom). We also test the null hypothesis of the two quadratic elements to have no additional contribution next to the inverse element. The likelihood ratio test statistic is 3.85 which is again insignificant (2 degrees of freedom). So, using this procedure we cannot discriminate between the quadratic and inverse case. We did the same for equations (3b) and (3d). The first likelihood ratio test statistic then equals 0.12 which is insignificant (1 degree of freedom). The second likelihood ratio test statistic is 4.76 which is significant at the 10% level (2 degrees of freedom). So, there is some evidence that the equilibrium function (3b) which performs best in terms of adjusted R-squared significantly outperforms the equilibrium function (3d) which performs worst in terms of adjusted R-squared. However, we should take care in our conclusion that the U-shape performs better than the L-shape in general on the basis of likelihood ratio testing.

Figure 1a: Business ownership versus per capita income for G7-countries, 1976-1992

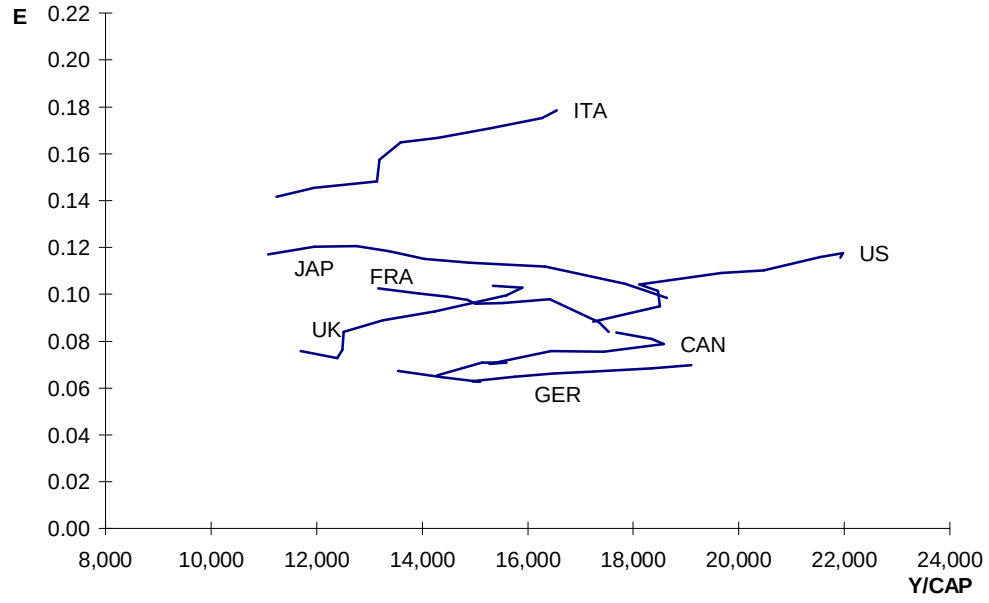
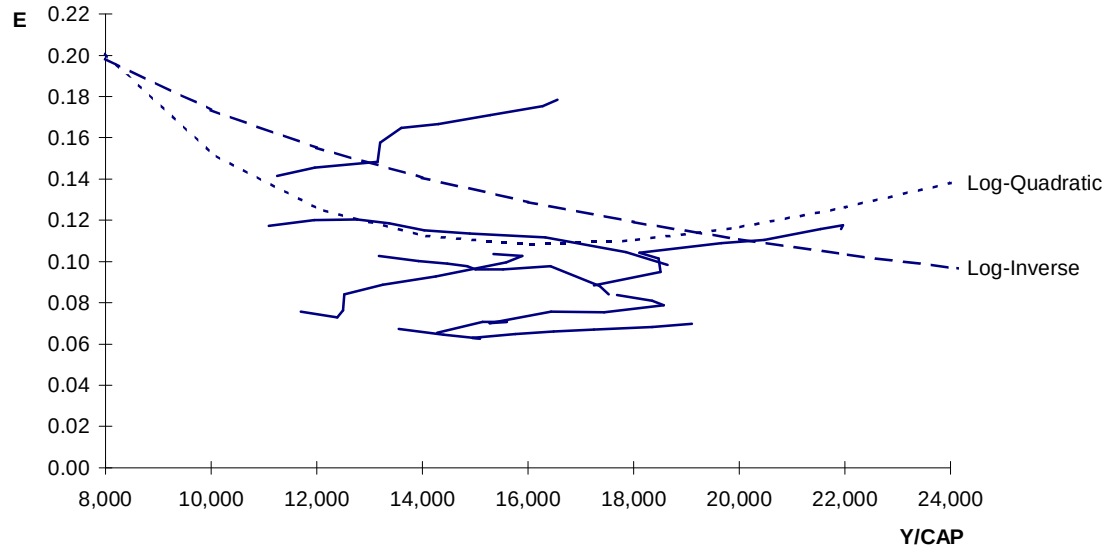


Figure 1b: Business ownership versus per capita income for G7-countries, 1976-1992, with equilibrium functions



We illustrate both a quadratic equilibrium function and a declining equilibrium function in the figures 1a and 1b. In these figures business ownership is set out against per capita income for the major industrialised countries (G7) for the sample period 1976 through 1992. In figure 1b, we have also plotted two estimated equilibrium functions: the “log-quadratic case” and the “log-inverse case”. The other lines in figure 1b are the same as in figure 1a. For ease of presentation, we have not inserted the names of the countries in figure 1b. Notice that business ownership is again a relative variable (per labour force) and that the horizontal axis starts at 8,000 U.S. dollars of 1990 per capita.

We see that, of the G7 countries, only Japan and France show a descending pattern of the relative number of business owners as the GDP per capita rises. In the other countries the number of business owners rises or stays constant when countries reach a higher stage of economic development. From figure 1b we find that there are more G7-countries below the equilibrium curve than above. This may indicate that these countries lag in their economic performance due to too little entrepreneurial ventures or due to their slow pace of transformation from, for example, large scale based medium-tech industries to high-tech industries. We note that the development of the business ownership rate for the largest economy, the U.S. is traced best by the log-quadratic curve. The deviation of the actual rate for the U.S. from the equilibrium rate is relatively small. However, this was to be expected because the U.S. economy has the largest weight in the weighted regression procedure.

6 Conclusions

There are many links between entrepreneurship and the macroeconomy. 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*, whether there is a long-term equilibrium relation

between the number of business owners and the stage of economic development. The relation is hypothesised to be a decreasing function of economic development in that the self-employment rate is high in low-developed economies whereas there is a later phase where mass production and scale economies thrive. A large literature points at a still later phase of economic development where the business ownership rate is increasing again. This phase is characterised by "the reversal of the trend" towards increasing economies of scale and scope. However, it is still unclear to which extent this reversal will be structural. Therefore both a U-shaped as well as an L-shaped equilibrium relation are tested in the present paper. *Second*, whether there exists a correction mechanism when the rate of business ownership is out of equilibrium and how fast this adjustment proceeds. Out of equilibrium situations 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*, 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 of the actual rate of business ownership from the equilibrium rate, unemployment as a push factor and labour income share as a measure of business profitability. The second equation explains economic growth from the deviation of the actual rate of business owne r-ship from the equilibrium rate, lagged economic growth and the per capita income level. The model is tested using a data panel of 23 OECD countries. Attention is paid to the specific role of Italy's twin economy, the penalty structure of an economy in "disequilibrium" and the shape of the long-term equilibrium relation between the number of business owners and the stage of economic development.

Our investigations show that both the U-shaped and the L-shaped relation between the number of business owners and the stage of economic development produce satisfactory results and that a statistical discrimination cannot be made since "the reversal of the trend" is of a recent date only. However, the minimum of the U-shaped equilibrium relation is within the range observations of ec o-nomic development. This minimum is calculated to be a business ownership rate of approximately 10.5 % of the labour force at a per capita income of 16,300 U.S. dollars at 1990 prices. Therefore, the assumption of a U-shaped curve would imply that modern economies are now in a phase where the rate of business ownership is likely to increase structurally. The rate of business ownership is shown 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 too few or too many business owners and both situations lead to lower growth rates. By and large, a five percent point deviation generates a growth loss of between one and four percent (depending upon the particular specification of the penalty function) over a period of four years. In particular, the fact that economic development may be hampered by a number of business owners being too high considering an economy's stage of development may come as a surprise for European politicians who see self-employment as a forceful weapon when fighting unemployment and stagnating growth. Different economic stages call for different development and stimulation programs. Italy may serve as an im-

portant example in that the country has had a strong increase of the already high rate of self-employment compared to countries in similar stages of economic development. This increase is predicted to have frustrated economic growth.

Most countries show a convergence towards the equilibrium rate of business ownership in the period 1976 through 1992. Our model allows for two mechanisms for a disequilibrium between the actual and the equilibrium rate of business ownership to diminish. The first explicit mechanism is that of the actual rate of business ownership to converge to the equilibrium one given the level of economic development. The second implicit one is that of economic development causing the equilibrium level to shift towards its actual rate. The speed of the first explicit error correction mechanism amounts to a half time of almost three decades. An important policy implication of our exercises is that not only that "To induce dynamic entrepreneurial competition we require the fulfilment 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 is safeguarded. See also Acs et al. (1999). Low barriers to entry and exit of entrepreneurs are necessary conditions for the equilibrium seeking mechanisms which are vital in our model of the relation between business ownership and economic growth.

Future research should investigate whether different countries have different equilibrium relations depending upon institutional, industrial and other dimensions and how and to what extent policy measures (are able to) influence this equilibrium. Furthermore, while the present research is fully based upon country-wide composites, sectoral diversity between countries probably plays a role when explaining differences in the equilibrium level of business ownership and differences in the equilibrium restoring mechanism. Having a too low business ownership rate may, for example, indicate that the transition from manufacturing towards services is lagging behind when compared to other countries. This is a different kind of misallocation than having too few entrepreneurship within the sectors themselves. However, for a sectoral based research initiative many data problems have to be resolved.

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Appendix I: Data

The following countries are in the estimation sample (1976-1996):

Austria	Greece	Spain	U.S.
Belgium	Ireland	Sweden	Japan
Denmark	Italy	U.K.	Canada
Finland	Luxembourg	Iceland	Australia
France	Netherlands	Norway	New Zealand
Germany (West)	Portugal	Switzerland	

The variable definitions and main sources are listed below.

1. E: self-employment or business ownership. This variable is defined as the number of self-employed (business owners) per labor force, who in this report are defined to include owners of enterprises that are not legally incorporated as well as owner/managers of incorporated businesses. We use the terms self-employed and business owners interchangeably. For more information on various measures of self-employment, see *The State of Small Business; A report of the president 1986*, Washington: US Government Printing Office, chapter 4.
   Data on the number of self-employed (business owners) are from the OECD Labor Force Statistics 1974-1994 and OECD Labor Force Statistics 1976-1996. Some data were missing however. EIM completed the data by using ratios derived from other variables, which sometimes came from other sources. Furthermore, EIM made a unified data set of self-employed persons, which was necessary as in the OECD statistics the definitions of self-employed were not fully compatible between countries. In some countries self-employed are strictly defined as individuals owning a business that is not legally incorporated. In other countries, owner/managers of an incorporated business who gain profits as well as a salary, are also considered self-employed. Australia, Canada, Denmark, France, Ireland, the Netherlands, New Zealand, Norway, Portugal, Spain and U.S. use the narrow definition, while the other countries apply the broader characterisation. For the countries not following the broader definition, EIM made an estimation of the number of owner/managers by using information derived from statistical bureaus in these countries. Another difference in definition is that in some countries unpaid family workers are included in the data of self-employed as well. The unpaid family workers were eliminated from the data by using ratios derived from other variables or by using other domestic sources. Data on the labor force are also from the OECD Labor Force Statistics 1974-1994 and OECD Labor Force Statistics 1976-1996. Again, some missing data have been filled up from other sources.
2. Y/CAP : 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 Labor Force Statistics 1974-1994, respectively. The GDP is measured in constant prices of 1990. Furthermore, purchasing power parities per US dollar in 1990 prices are used to make the monetary units comparable between countries.
3. U : (standardised) unemployment rate. This variable measures the number of unemployed as a fraction of the total labor force. The labor force is formed by employees, self-employed persons, unpaid family workers, people who work in 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 Labor Force Statistics and the Yearbook of Labor Statistics from the International Labor Office.

4. LIQ : labor income share. The following definition is used. 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 Labor Force Statistics.
5. Y: gross domestic product. This is the same variable as the Y part of the variable Y/CAP (see 2.).

Appendix II: Weighted regressions

Estimation results are obtained by weighting the observations with the number of self-employed. In this appendix the reasons for doing so will be explained. For simplicity we will assume that we have cross-section data (i.e., without 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 more regions than 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:

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

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

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

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

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

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

and where we define the variable $D_{i,j}$ 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 $x_{C,j}$ from (b) back to the regions-level variables $y_{R,i}$ and $x_{R,i}$ from (a), we obtain the following observations for our original model (a) at the regions-level:

Observations for which:

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

.

.

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

Writing the data at the regions-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:

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

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

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

We see that this estimator is different from b^*_{OLS} (a), which we would like to have. The estimator b_{OLS} (b) does not take 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 premultiplying the variables x_C and y_C from (b) with the square root of the number of regions. When we do that the (weighted) least squares estimator b_{WLS} (b) reads as

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

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