On the importance of forest assets for micro-firm performance

KATARINA HAUGEN AND URBAN LINDGREN

Business start-ups are on the increase, a development which is accompanied by hopes that these new firms will generate a potential for, e.g., local and regional development and a strengthening of local labour markets as well as the national economy. However, the long-term performance and viability of new firms are often rather poor. This research aims to analyse the importance of access to assets in the form of forest holdings for the performance of Swedish micro-firms. The analyses are based on official register data and fixed-effects panel regression modelling. A hypothesis is that a firm whose owner also possesses forest holdings is more viable thanks to the different resources (in the form of capital from logging or mortgaging, or non-pecuniary other values) the forest holdings may provide, and which possibly contribute to the firm's economic stability and resilience to economic fluctuations. From a general point of view, we find support for the hypothesis that forest assets positively and significantly influence firm performance in terms of earnings before interest and taxes (EBIT), but not in terms of value added. Access to forest assets is never detrimental to firm performance, although it does not have a significant positive effect in all sub-categories of entrepreneurs based on different combinations of age, gender and firm type. Particularly, the economic performance of private firms run by older men benefits from resources stemming from their forest holdings. No significant effects were found for female entrepreneurs or for limited companies. As regards regional variations, firms located outside the metropolitan regions – as compared to those at the top of the urban hierarchy – are likely to perform better, thus indicating that local development may benefit from resource transfers from the forest sector to micro-firms engaged in non-primary activities.

Keywords: micro-firms, firm performance, entrepreneurship, local development, forest ownership, panel regression, Sweden

Katarina Haugen & Urban Lindgren, Department of Geography and Economic History, Umeå University, SE-901 87 Umeå, Sweden. E-mails: katarina.haugen@ geography.umu.se, urban.lindgren@geography.umu.se

Introduction

Entrepreneurship and new business creation are on the increase. More than 60,000 new firms[1] are started in Sweden each year, and the number of annual start-ups has increased since the mid-1990s (Fig. 1). Entrepreneurship is frequently expected to strengthen local labour markets and provide employment as well as local and regional economic development (e.g. Brüderl et al. 1992; Storey 1994; Henderson 2002; van Praag 2003; Reijonen 2008; Holmes et al. 2010), not least in rural areas going through processes of economic, demographic and social change (Labrianidis 2006). Hopes are high that entrepreneurship may constitute a key component of livelihood strategies as well as broaden the scope of the rural economy and strengthen local and regional development (Alsos et al. 2003; Alsos & Carter 2006; Wilson 2010).

However, the flipside of entrepreneurship is that many small businesses fail to 'survive' in the longer term (Holmes et al. 2010; Grande et al. 2011; Brouder & Eriksson 2012). Although the degree of firm survival has increased compared to the late 1990s, nearly a third (32%) of the

new firms started in Sweden in 2005 had discontinued their activities after a few (3) years (Fig. 2). Moreover, for those firms which do survive the critical first few years, their turnover is often insufficient to even provide a livelihood for the owner[2] (Swedish Agency for Growth Analysis 2010). Thus, while 'entry to markets is relatively easy...survival is not' (Esteve-Pérez & Mañez-Castillejo 2008: 231), and accordingly there is a substantial body of research literature which attempts to identify factors which may influence the performance and survival of firms, and to which the present paper aspires to contribute.

This research is underpinned by the idea that a firm's development, and by extension its survival, may be beneficially affected if its owner is also the owner of forest property, because the forest holdings provide access to various resources that can potentially be used within the firm. The aim of this study is to explore the importance of forest assets for the economic performance of micro-firms throughout Sweden. The analyses are focused on micro-firms, defined as companies having up to ten employees. The following research questions are analysed: i) Does the value of the forest assets owned by micro-firm owners boost the performance of their firms?; and ii) How does the importance of forest assets for micro-firm development vary depending on the properties of the firm owners (e.g. sex and age) and of the firms and their context (e.g. firm type, line of business and geographical characteristics)?

Forest ownership may entail several potential benefits[3]. The first and presumably most essential aspect is that it may provide economic values in the form of income from logging or capital from mortgaging which may be used to, e.g., finance investments in the firm. One of the economic objectives of small-scale forest owners is to attain liquidity reserves via their forest hold-
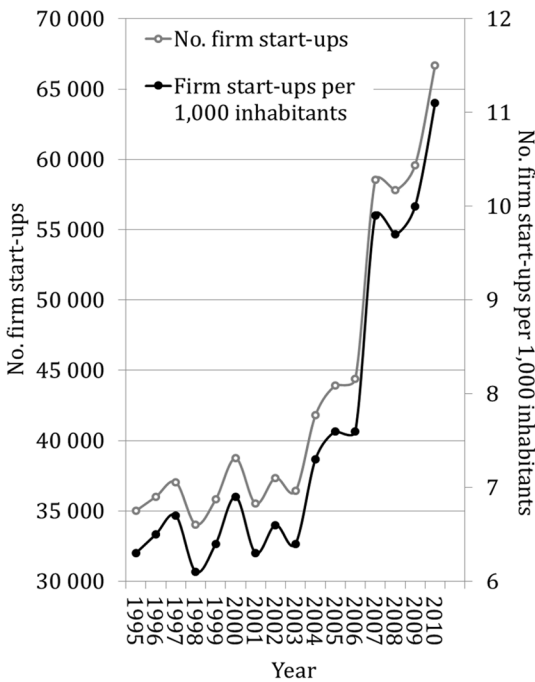

Fig. 1. Total number of firm start-ups and number of firm start-ups per 1,000 inhabitants in Sweden 1995–2010. Source: Swedish Agency for Growth Analysis (2012).
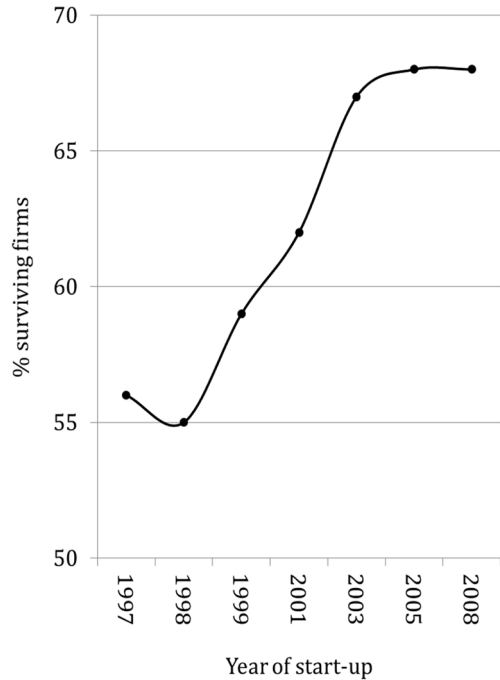

Fig. 2. Share of 'surviving' firms three years after start-up by year of start-up (1997–2008). Source: Swedish Agency for Growth Analysis (2013).

ings (Hugosson & Ingemarson 2003), and investing in one's micro-firm could be one possible way of putting such funds to use. Compared to, for instance, entrepreneurs who rely on private housing mortgages as a means to acquire necessary capital (Storey 1994; Shane 2003) to self-finance business ventures – which incidentally is the most common financial strategy of entrepreneurs (Shane 2003), presumably particularly in the case of the smallest firms, which rarely rely on external funding (Holmes et al. 2010) – forest owners have additional assets that may be used to this end. It is also possible that particularly young firms in the sensitive initial phase after market entry may benefit from the additional financial security forest ownership may generate, potentially giving them a longer life expectancy rather than a short 'mayfly' existence. A more indirect possible benefit of forest ownership is that the income and thus economic security the owners derive from their forest may make them more willing and daring to pursue entrepreneurial ambitions.

Second, forest holdings may provide other – at least partially non-pecuniary – values, as well as access to various types of resources which may support the activities of the firm. These assets may include, e.g., access to land for storing equipment; out-buildings which can be used or let; natural environments; hunting and fishing grounds; leaseholds; building plots; and various natural resources. It is also noteworthy that forest values in a more general sense are multidimensional (Xu & Bengston 1997), encompassing both instrumental values (including economic and/or utilitarian types of values) and non-instrumental values (e.g. aesthetic values, which may be important in, e.g., tourism business ventures). Therefore, even in cases in which the timber production from private forest holdings may not necessarily generate a substantial income for the owners (Törnqvist 1995), it may nevertheless be the case that forest ownership might provide them with other resources. An additional possibility is that forest ownership is associated with aspects of human capital (e.g. knowledge; experience; access to information) and networks of contacts, which may also be valuable for non-forest-related entrepreneurial activities.

In sum, the hypothesis which serves as the point of departure in this research is that different types of assets stemming from forest holdings may provide forest-owning entrepreneurs with a certain financial stability and therefore resilience to economic fluctuations compared to entrepreneurs who cannot rely on these potential additional resources, as well as other non-pecuniary assets of potential value in the running of their firm.

The current research contributes to the knowledge bases of rural development as well as entrepreneurship in several ways. On a broad level it addresses the question of how a key rural resource – the forest – can make a difference for local trade and industry and thereby form an integrated part of feasible endogenous development paths in times of demographic and socio-economic change in rural areas. These issues are internationally relevant, and the results of the present study have the potential to inform debates and research on entrepreneurship and rural development beyond the Swedish borders. More specifically, it is scrutinized whether, and in which situations and contexts, forest resources can function as a constituent of firms' resource bases and boost firm performance. Also, the present paper emphasizes resource transfers from rural to non-rural sectors rather than transfers between related rural (sub-)sectors. This provides novel perspectives on the entrepreneurial activities of forest owners as well as new insights into the importance of a rural resource for non-primary economic activities. Finally, the paper contributes to the rather scarce research on entrepreneurship and firm performance using longitudinal methodological approaches (Korunka et al. 2010).

The outline of the remainder of the paper is as follows. The introductory section is followed by a review of previous research related to the potential for forest owners to use rural resources in business ventures as a rural livelihood strategy; as well as research on the determinants of entrepreneurship, firm performance and firm survival. The literature review serves to contextualize the present empirical study with regard to rural development as well as to provide theoretical anchorage in the literature on entrepreneurship and firm development. Next, the empirical data and methods are described in detail, followed by a section where the results are presented. Finally, the findings are discussed with regard to previous research and potential implications, and conclusions are drawn.

Forest owners, entrepreneurship and rural development

Entrepreneurship in rural areas is frequently considered as a strategy emerging from the need to grapple with negative trends (Alsos & Carter 2006) of demographic and socioeconomic development. It may be a central constituent of adaptation strategies and policies aiming towards multifunctionality and pluriactivity as means for dealing with declining opportunities (Alsos et al. 2003; Alsos & Carter 2006; Wilson 2010) and for generating endogenous development based on non-primary economic activities and new forms of rural livelihoods, sometimes argued to reflect a 'post-production' transition (Mather 2001; Elands & Praestholm 2008). In line with the premises of these policies, entrepreneurship has been found to be mostly positively associated with beneficial local development, as indicated by business tax revenues and the share of social welfare cases in rural communities (Baumgartner et al. 2013). In the case of forest owners, their decision to start a firm may be spurred by, e.g., a wish to make use of their resources – land, buildings, game, road infrastructure etc. – and to contribute to their livelihoods as a way to compensate for a drop in agricultural income and occupation (Lunnan et al. 2006) in the wake of discouraging demographic and socioeconomic trends.

Agricultural resources such as areal resources in the form of forest ownership may primarily be expected to be of importance for the performance of firms whose activities are of similar, i.e. rural, character (Grande et al. 2011); i.e., that farmers transfer resources between their different rural activities. A study of multiple business ownership among Norwegian farmers showed that resource transfers, including knowledge and organizational and physical resources, took place between farm businesses and other business ventures, and this was particularly common when the business on the receiving end was also related to farming. For those firms, transfers stemming from rural resources made a substantial difference for firm performance (Alsos & Carter 2006).

It is perhaps less obvious whether values originating in areal resources such as forest holdings would also be transferred and used to the benefit of firms in different lines of business, i.e.

unrelated to the farm sector. When it comes to forest owners, the literature specifically focusing on self-employed or entrepreneur forest owners is rather scarce, and unsurprisingly mainly focuses on forest-related activities (e.g. Lindroos et al. 2005; Dhubháin et al. 2007). However, this group does not necessarily direct their entrepreneurship efforts towards activities of primary character. Another Norwegian study found that among forest owners who had started firms, the most common business activities were either 'commercialization of hunting and fishing' (23%) or renting out accommodation (cabins), i.e., tourism (20%) (Lunnan et al. 2006: 686, cf. Eikeland & Lie 1999). Hence, forest owners' business ventures may also include a substantial share of other activities such as various service activities, and therefore it is of interest to explore the possibility that resource transfers may also take place to other business ventures than primary production.

Forest owners constitute a heterogeneous group and differ in important ways, as shown in numerous typologies (e.g. Wiersum et al. 2005; Ingemarson et al. 2006; Dhubháin et al. 2007). For instance, their objectives for forest ownership may have different rationales related to goals of production, consumption or recreational values (Dhubháin et al. 2007). Such differences in attitudes and approaches can also be expected to be present among the subgroup of forest owners who are also entrepreneurs, and to potentially affect their chosen courses of action. Moreover, not all forest owners are rural dwellers, and the share of non-resident forest owners – i.e. people who live at a distance from their forest holdings, usually in cities – is increasing (Lindroos et al. 2005, cf. Ziegenspeck et al. 2004; Schraml 2006). The geographical relationship between forest owners and their property – whether they are resident or non-resident owners – tends to be associated with different strategies as regards the use of the forest (Nordlund & Westin 2011). For instance, non-resident owners more often generate outflows of forest revenue away from the local rural context (Karlsson 2007). This geographical perspective also implies that the importance of forest holdings, which constitute a rural resource location-wise, is not restricted to people who themselves live in rural areas or to firms operating in these parts of the country.

Entrepreneurship and the performance and survival of micro-firms

Given the focus of the present empirical study on the importance of areal resources for micro-firm development, a review of the literature on entrepreneurship and firm development is called for. In Sweden as well as more generally (Bartelsman et al. 2005; Cressy 2006; Reijonen & Komppula 2007), small firms dominate in terms of number of firms, although they are much less important in terms of employment numbers. In 2011, micro-firms represented 96% of the total number of Swedish firms, but only accounted for 15% of the total number of firm employees (Statistics Sweden 2012). Development and survival in small firms are often problematic. A general pattern in most markets is that many firms enter and many firms exit each year[5], and most firms that enter or exit are small (Bartelsman et al. 2005). New firms often exit within the first few years following entry (Cefis & Marsili 2005; Cressy 2006). A cross-country comparison comprising ten OECD countries[6] found that 20–40% of new firms failed within the first two years after entry as a result of market selection. After the first seven years, 40–50% were still in business (Bartelsman et al. 2005).

While there is no consensus as regards the specific factors associated with the success (or failure) of firms, due to the complexity of the issue (Simpson et al. 2012), certain broad types of factors can nevertheless be outlined. These can be attributed to realms pertaining to the individual entrepreneur, the firm structure, and the environmental/contextual conditions (Brüderl 1992; Box 2008).

The individual realm: characteristics of the entrepreneur

The characteristics of the individual entrepreneur may be expected to be particularly important in small firms due to the 'omnipresence of the entrepreneur' in all business activities (Reijonen & Komppula 2007: 692, cf. Gray 2002). Their human capital includes both general and specific traits such as age, sex, education, previous work and/or entrepreneurial experience, ethnicity, family (business) background, and marital status (Brüderl et al. 1992; Alsos & Carter 2006; Ucbasaran et al. 2007; Fairlie & Robb 2009; Shaw et al. 2009; Swedish Agency for Growth Analysis 2010). Most entrepreneurs tend to be relatively young adults or in early middle age (Storey 1994). Therefore, they have often accumulated more financial and human capital compared to a younger person (Farrell et al. 2003), but entrepreneurial motivation may also decline with increasing age (Lévesque & Minniti 2006). Sex has been found to interplay both with the propensity of becoming an entrepreneur (e.g. Berglann et al. 2011, who found a lower likelihood of entrepreneurship among women compared to men) and with business outcomes. The common observation that female-owned firms tend to 'underperform' in comparison to male-owned firms (e.g. Fairlie & Robb 2009; Swedish Agency for Growth Analysis 2010) may be at least partially explained, e.g., by different access to resources (Fairlie & Robb 2009; Shaw et al. 2009) or by comparisons being based on measures of success which disproportionally favour male-owned firms (Robb & Watson 2012).

Having a spouse may be beneficial to business development by offering access to financial or other forms of support, labour input (Fairlie & Robb 2009) and risk sharing (Krasniqi 2009), thus suggesting that the immediate social (household) context of the entrepreneur matters (e.g. Jayawarna et al. 2011). Mixed findings have been reported concerning education. For instance, Berglann et al. (2011) found variation across educational lengths and types, although the relationship between educational length and entrepreneurship was not linear. Fairlie and Robb (2009), on the other hand, found that business success increased with higher educational levels. However, the highly educated tend to have access to attractive labour market opportunities and may therefore be less prone to start their own business (Krasniqi 2009). Micro-firm survival has been found to be related to the entrepreneur's experience of work in related lines of business and to having local experience (Brouder & Eriksson 2012, cf. Fairlie & Robb 2009), whereas Alsos and Carter (2006) found previous entrepreneurial experience to be associated with assets as well as liabilities.

Other relevant personal 'traits, motivation and capacity' (Box 2008: 379) include, e.g., the individual's degree of entrepreneurial orientation in terms of 'proactiveness, innovativeness, and risk taking' (Wiklund & Shepherd 2005: 85, cf. e.g. Lévesque & Minniti 2006; Lunnan et al. 2006). Entrepreneurial attitudes, e.g. the ability to recognize potential business opportunities and readiness to take risks, have been found to be associated with

the probability of becoming an entrepreneur (Lunnan et al. 2006, cf. Zhao et al. 2010). Personality dimensions (conscientiousness, openness to experience, emotional stability, and extraversion) positively influence the intention and decision to become an entrepreneur as well as firm performance (Zhao et al. 2010). Entrepreneurs' social skills can also influence firm performance, e.g., through access to information and resources (Baron & Tang 2009).

The structural realm: characteristics of the firm

A second group of factors refers to 'structural' characteristics of the firm, including age, size (current and/or initial) and line of business (Box 2008). Firm age and size are generally positively associated with survival (Bartelsman et al. 2005; Esteve-Pérez & Mañez-Castillejo 2008, cf. Shane 2003), and there are risks associated with newness as well as being a small-size firm[7] (Box 2008). In terms of employee numbers or financial assets (Brüderl et al. 1992) small firms 'exist close to the edge' and are more vulnerable to sudden shocks compared to larger firms (e.g. Hannan et al. 1998: 283, cf. Storey 1994). 'Adolescent' and 'senescent' firms may also be exposed to higher risks compared to mature (but not *too* old) firms which have attained an established market position. The reasons larger firms tend to have better survival prospects than their smaller equivalents include, e.g., a higher likelihood of substantial scale and diversity of business activities (which reduces the firm's vulnerability to market changes) and a higher efficiency and ability to attract financial and human resources (Esteve-Pérez & Mañez-Castillejo 2008). Other factors which may be beneficial to firm performance and survival include innovativeness; post-entry growth rate; belonging to a high-technology line of business (Cefis & Marsili 2005, cf. Georgellis et al. 2000); targeting a specific market niche as opposed to adopting a more generalist strategy; forming strategic alliances with firms already on the market (Shane 2003); and the application of advertising and R&D (research and development) strategies in order to 'develop firm specific assets' (Esteve-Pérez & Mañez-Castillejo 2008: 244).

Access to resources and its importance for firm development is a key issue in the present paper, as well as in the entrepreneurship literature. According to the 'resource-based perspective' (Alsos et al. 2003; Alsos & Carter 2006), firms may develop a competitive advantage through the possession of unique combinations of different resources (Esteve-Pérez & Mañez-Castillejo 2008; Chen et al. 2009; Grande et al. 2011), encompassing both tangible physical resources (e.g., natural resources and financial assets) and intangible human resources (e.g., competence and information networks) (Cefis & Marsili 2005; Grande et al. 2011). Access to financial assets is crucial for both firm entry as well as performance and survival in the short and long term (Binks & Ennew 1996; Headd 2003; Musso & Schiavo 2008; Krasniqi 2009): 'the more own capital is available, the more successful will the small business owner be' (van Praag 2003: 6; cf. Wiklund & Shepherd 2005; Fairlie & Robb 2009) since it provides a protecting buffer and improves the prerequisites for survival, growth and profitability (Shane 2003). According to Korunka et al. (2010), access to financial capital at start-up is the most important determinant of long-term business survival. Firms of small entry size tend to have limited access to resources for coping with initial challenges, and a shortage of resources is a common disadvantage faced by small firms more generally (Malecki 1993). Similarly, young firms are often exposed to risk due to a lack of resources and the absence of an established position (Box 2008). Moreover, access to private financial assets may enable entrepreneurs to avoid relying on mortgages (Åstebro & Bernhardt 2003). Previous research has shown that becoming an entrepreneur was positively associated with family wealth (Berglann et al. 2011), and that firm survival and growth were positively related to the firm owner having received an inheritance (Holtz-Eakin et al. 1994).

The environmental realm: characteristics of the broader context

The contextual or environmental factors largely refer to aspects of the 'economic, political and cultural context' (Shane 2003: 145) such as macro-economic conditions and fluctuations, as well as other prerequisites stemming from the institutional framework. Environmental econom-

ic conditions at the time of firm founding have been found to continue to influence firm development through lasting cohort effects (Box 2008), which may produce enduring heightened or lowered levels of risk throughout the 'lives' of businesses started during a particular period (Box 2008; Holmes et al. 2010) as well as interact with the importance of firm age and size (Wagner 1994). Other contextual factors include changing market conditions due to, e.g., the entry of new firms which alter the competitive structure (Esteve-Pérez & Mañez-Castillejo 2008).

Geographical characteristics of the firm location may also be considered to be part of the contextual realm of factors. For instance, it may be the case that different types of places along an urban-rural continuum are favourable in different phases of firm development processes, e.g., start-up, growth and long-term survival (Renski 2009), or in terms of different aspects of business development (Fairlie & Robb 2009). As regards rural locations more specifically the disadvantages may include, e.g., constraints in terms of limited local demand, isolation from markets, or a lack of infrastructure and services (Renski 2009) or of skilled, specialized labour (Dinis 2006; Baumgartner et al. 2013). The advantages may include lower costs (Renski 2009), for instance, and because firms in rural locations are more likely than urban firms to own their premises they often have better prerequisites with regard to financing (Keeble et al. 1992; Blackburn & Curran 1993). Rural areas may also have specific properties which have the potential to serve as resources for small-scale entrepreneurs. Rural qualities such as 'natural resources', 'tradition and cultural heritage' and 'environment and amenity resources' (Lane & Yoshinaga 1994) may be valuable in the marketing of certain types of products or services, thus providing additional advantages for rural firms (Patterson & Anderson 2003), e.g., within tourism ventures (Lunnan et al. 2006; Daugstad 2008).

In sum, this literature review has served to contextualize the present study in the fields of rural development research as well as entrepreneurship and firm development research. Additionally, it provides theoretical justifications which guide the design of the empirical study in terms of the selection of relevant variables.

Empirical analyses

Data

The data used for the analyses were collected from various registers at Statistics Sweden. Individual-level register data make it possible to combine demographic and socioeconomic attributes as well as information about ownership of firms and forest properties. The ASTRID database, hosted by Umeå University, is a compilation of these registers and possesses longitudinal micro-level attributes linking forests and firms to individuals.

The creation of the dataset started with a selection of firms having between one and ten employees. This category of firms closely resembles the definition of micro-firms by the European Commission (Storey 1994; European Commission 2005). We decided to exclude larger firms because the forest revenue to firm turnover ratio is likely to be very small among this group of forest and firm owners. Of Sweden's 330,000 forest owners (Swedish Forest Agency 2012), the average size of forest property is approximately 35 hectares (Federation of Swedish Farmers 2009), which implies that the average annual yield is just about equivalent to a household's gross monthly income. Thus, for micro-firms, forestry income may make a difference in their operations as a means for investments and other types of resource transfer.

We are particularly interested in the ways economic exchange between forestry and micro-firms takes place from a general point of view. It is known from previous research that there are close connections between firms sprung from diversification strategies at the farm and traditional forestry, although the different economic activities run as separate businesses (e.g. Eikeland & Lie 1999). This category of forestry and micro-firm interaction may certainly be of interest, but it is likely biased towards rural-based firms producing products and services close to core activities of farming. Statistics from our dataset confirm that this is a common symbiosis. As mentioned, it may not come as a surprise that farmers use forest revenues for their broader economic activities, but is it the case that forest assets contributes to micro-firm performance more generally? In order to shed some light on this issue we choose to focus on micro-firms outside the primary sector, deselecting firms registered as involved in forestry, agriculture and fishing activities.

Another relevant distinction between micro-firms is related to the owners' choice of type of company; they may choose different administrative setups for their business organizations. Two dominating types are the private firm and the limited company. In the private firm the owner is personally responsible for potential debts accumulated in the business, and the surplus and deficit of the business activity have to be accounted for in the owner's personal income-tax return. Firm money can be used for private needs, as long as the transactions are accounted for in the books as private loans. Conversely, in the limited company, the owner has no personal responsibility for commitments made by the company. At worst, the owner may lose the share capital (least possible amount 50,000 SEK), but personal assets like the family house, bank balance, market portfolio etc. are protected in cases of bankruptcy. Moreover, this implies that the owner has to make a clear distinction between assets belonging to the company and his/her private finances as it is illegal to use company money for private needs. Based on this discussion, the importance of forest holdings for micro-firm performance may be connected to the registration of the micro-firm: whether it is registered as a private firm or a limited company.

From this point of departure, we sampled micro-firms having one to ten employees in 2003 (approximately 153,000 companies). The database includes links between firms and people, which makes it possible to identify who works in which firm. In the next step, characteristics of the employees were collected. Based on this information, firm ownership was established and a number of necessary attributes of the owner were collected for further data extraction. The identification of ownership was not successful in all cases, causing the sample of firms to be reduced to 71,000. Another prerequisite for inclusion in the sample was that the firm be observable in the dataset during the years after the data extraction base year of 2003; some firms may vanish from the dataset because of acquisitions, mergers and spin-offs. In order to take into account such organizational changes we used Statistics Sweden's 'FAD' (firm and workplace dynamics) register, which made it possible to keep track of firm identity over time (i.e., the organizational identity number in the database refers to the same firm from one year to another). After firms with an unclear 'pedigree' were removed, 29,800 firms remained in the sample. The panel covers the years 2003 to 2008. Some of the firms ceased to exist during this period, which means that we have an unbalanced panel.

After having identified the micro-firms and firm owners, we continued to link additional information from the database to the firms and individuals. In regard to firms, there are data on value added and earnings, and for the firm owners there are various demographic and socioeconomic data. In addition, information about forest properties owned by individuals is also available. This part of the dataset contains variables such as number of hectares of forest land, arable land, marshland etc., and assessed value of these different categories of land. Among these variables, forest land is likely to be the most important factor for determining pecuniary assets because logging generates cash flow that can potentially be used in other economic activities. This is why we use assessed forest value as a key research variable in the analyses.

All in all, the generated panel dataset contains information on firms and their performance indicators together with variables describing firm owners' demographic, socioeconomic and forest property-related characteristics. Many of these variables correspond closely to those mentioned in the firm development literature.

Econometric model

For the analysis of the effects of the value of forest assets on micro-firm performance, we have estimated a number of fixed-effects models that account for endogeneity driven by unobserved heterogeneity and self-selection (Eq. 1). The reason for using fixed-effects panel regressions is that we want to use the estimation results for causal interpretation of the relationship between forest holdings and firm performance. When estimation techniques that operate on cross-sectional data (e.g. OLS) are applied, the obtained results might be biased as a consequence of self-selection. For example, positive estimates of the value of forest assets on performance generated by the OLS model could be the result of a self-selection of successful firm owners with accumulated capital buying forest land as an investment or for taxation reasons. Thus, it would not be possible to interpret the estimation results of the OLS as a causal effect whereby forest assets boost micro-firm performance. However, the fixed-effects model does not solve all problems related to cause-and-effect interpretation. As long as the individual-specific error (v_i)

does not change over time, implying that unobserved characteristics stay the same (e.g. ability, values, routines etc.), the model is not biased by endogeneity. Moreover, the fixed-effects model also rests on the assumption that there is no correlation between x_{it} and ε_{it}. If this is not the case, the fixed-effects model will be biased and other modelling approaches could be considered (e.g. structural equation modelling). However, it can be assumed that most non-observable characteristics of the individual do not change over time, or if they do, that the processes of change are operating at a slow pace (Stern et al. 1999).

$$y_{it} = \beta_1 x_{it} + v_i + \varepsilon_{it} \qquad \text{[Eq. 1]}$$

In the fixed-effects model x_{it} is a matrix of covariates, β_1 is a vector of estimates, v_i is the individual-specific error, and ε_{it} is the idiosyncratic error that varies over time and across individuals.[8]

Dependent and independent variables

Two different groups of models were estimated with two different dependent variables. The performance of micro-firms can be measured in many different ways. One straightforward measure of economic output is value added (Rigby & Essletzbichler 2002), which is a function of labour costs, earnings before interest and taxes (EBIT) and depreciation. Value added is the firm's contribution to the gross domestic product (GDP), and can be viewed as a general input to the national economy and employment. The second dependent variable of performance used in this study, EBIT, is more focused on the firm's ability to make profits and generate earning power. Large and increasing EBIT is a strong indication of profitable and successful companies. Both value added and EBIT are available for all firms in the dataset, which makes it possible to assess the importance of the value of forest assets on micro-firm performance throughout the entire country.

The principal independent variable is an indicator of forest value. By using the tax value of productive forest land, which is correlated with the amount of m³ standing volume, we get an assessment of available assets that the forest owner has at his/her disposal.[9] It should be kept in mind that m³ standing volume says nothing about the age distribution of the stands of the

property, which means that felling must presumably be carried out over a longer period of time, making it virtually impossible to withdraw all assets instantly. This indicator is nevertheless a better proxy for available assets than factors like number of hectares or other types of land use associated with the property.

Aside from the forest assets, a set of additional independent variables is also included in the analyses. These were chosen in order to, based on the information available in the register data, represent to the highest degree possible the three domains of factors previously found to be of importance for firm performance: individual, structural and environmental, as discussed in the literature review.

Concerning the characteristics of the individual entrepreneur, a number of indicators are included in the analyses: age, sex, country of birth, marital status, family composition, level of education, main occupation, income and entrepreneurial experience. Aside from being standard demographical variables, age and sex have also been found in previous studies to interplay with entrepreneurial/firm performance, and may thus be expected to be of importance in themselves or in interaction with other variables. The entrepreneur's level of education is used as an indicator of the human capital of the firm owner. Level of education is categorized as low (compulsory school), mid (secondary school) or high (tertiary). Main occupation and country of birth are both background variables represented by dummy variables (work/other and Sweden/other, respectively). Marital status (dummy variable for married/other) and household composition, in terms of the number of children aged 18 or older in the household, are included as indicators of the family situation and the close social context of the entrepreneur, and of their possibilities to rely on close relations for, e.g., helping out with firm activities or providing support in other ways. Entrepreneurial experience is indicated by the sum of business income from 1990 and onwards. It should also be noted that certain hard-to-measure qualities pertaining to the individual entrepreneur which have been frequently studied in previous research, for instance entrepreneurial orientation and other personality traits, are also implicitly included in the analyses since the chosen method of analysis takes into account such (otherwise omitted) variables, as mentioned earlier.

The structural characteristics of the firm are primarily represented by the line of business in which it is active, according to an official classification. Forest-related lines of business are excluded as a consequence of the above-mentioned sampling criteria. The level of access to financial resources is indicated by the firm owner's income as well as that of the owner's partner, which according to previous research may also benefit business development. Type of firm (private firm or limited company) is also included as a variable.

Chief among the indicators of the environment or context in which the firms operate is a classification by the Swedish Association of Local Authorities and Regions (SALAR 2010) of the Swedish municipalities into different types based on, e.g., economic and demographic conditions. Previous studies have suggested that different geographical environments may interplay with firm development. Another contextual issue, the possible existence of cohort- or generation-related issues pertaining to the firm (e.g. the general economic conditions at the time of firm entry), is accounted for through the method in itself and the inclusion of a time variable (year). Finally, a quota for the extent to which forest estates are located at the owner's residential location or elsewhere is included to account for the possible importance of the location of forest property vis-à-vis residential location.

Descriptive statistics

For most variables, *meta means* are used to summarize the results over the entire study period. These are mean values calculated as indices of the mean values of the different indicators for each respective year in the time series 2000–2008. The distinction between forest-owning and non-forest-owning firm owners is based on a definition of forest owners as persons who own forest land with an assessed value of >0. Hence, a dummy variable is used for descriptive purposes, as opposed to the continuous variable which is used in the subsequent analyses. Unless stated otherwise, the results reported below are statistically significant at least at the p<0.05 level (Chi-square and ANOVA tests) for all years in the panel.[10]

Forest owners constitute a relatively small minority (meta mean 7.6%) of the sample. The meta mean for the average assessed value of the forest holdings is 876,000 SEK (roughly €100,000), 48 hectares for the average areal size of the properties. The value of both variables increases over time. Most of the forest owners are resident on their forest property (meta mean 88% local ownership in terms of both value and area).

Concerning the characteristics (Table 1) of the firm owners, those who are also forest owners are somewhat older than their non-forest-owning counterparts, and also have a higher average number of adult children. Men and native Swedes dominate the sample, particularly among the forest owners. Two-thirds of the firm owners are married (non-significant differences across the groups). Level of education is lower among the forest owners, and work is the dominating type of occupation in both groups. The non-forest owners have higher levels of wage income and overall work-related income. There were no significant differences in entrepreneurial experience in terms of the sum of their business income from 1990 and onwards. Forest owners have substantially higher average capital income, presumably stemming from forest income, and hence also higher disposable income.[11] The forest owners are more oriented towards rural residential environments in their residential characteristics compared to the non-forest owners, who live in urban environments to a greater extent.

As regards the characteristics of the micro-firms (Table 2), there are both similarities and differences in the types of business activities they are engaged in. Commonplace lines of business for firms owned by forest owners and non-forest owners alike are manufacturing, construction, wholesale and retail, transport and communications, and real estate. However, construction and transport activities, for example, are more common among the forest owners' firms, and non-forest owners' firms are more often involved in, e.g., real estate, wholesale and retail, and services. Private firms are by far the most common firm type for forest owners and non-forest owners alike (non-significant differences across the groups). Concerning the performance of the firms, forest owners' firms clearly perform better on several indicators, including net turnover and the dependent variables value added and EBIT. Thus, there are grounds for further exploring the hypothesis concerning the relationship between forest ownership and the economic performance of micro-firms.

Table 1. Characteristics of firm owners by forest ownership status. Meta mean values for the 2000–2008 period and mean age for 2003. Source: ASTRID database.

	Variable	Variable levels (where applicable)	Micro-firm owners according to forest ownership status	
			Forest owners	Non-forest owners
	Mean age in 2003		52.1	50.4
	Sex	Male	91.8%	81.9%
		Female	7.1%	17.5%
M		No data	1.1%	0.6%
e	*Marital status*	Married	65.3%	65.9%
t		Other	34.7%	34.1%
a	*No. children >age 18*		1.5	1.3
	Level of education	Low (primary)	36.6%	27.7%
m		Mid (secondary)	46.1%	48.8%
e		High (tertiary)	16.5%	22.9%
a		Unspecified	0.8%	0.6%
n	*Main occupation*	Work	95.7%	96.1%
s		Other	4.3%	3.9%
	Sum. income 1990- (SEK)		644,270	624,912
2	*Country of birth*	Sweden	99.0%	92.4%
0		Other	1%	7.6%
0	*Residential characteristics*	Metropolitan	2.5%	12.3%
0		Suburban metropolitan	7.9%	20.8%
-		Major cities	23.0%	26.5%
2		Suburbs of major cities	2.4%	3.2%
0		Commuter municipalities	10.7%	8.1%
0		Tourism municipalities	7.7%	4.0%
8		Manufacturing municipalities	18.5%	9.5%
		Sparsely populated municipalities	6.8%	1.7%
		Municipalities in densely populated regions	12.9%	10.2%
		Municipalities in sparsely populated regions	7.7%	3.6%
	Income (SEK)	Disposable income (individual)	324,517	266,231
		Disposable income (individual + partner)	497,504	447,388
		Work-related income	251,783	271,695
		Wage income	197,989	226,286
		Business income	40,924	39,376
		Capital income	129,838	42,910
		Unemployment benefit	308	311
		Early retirement benefit	2,079	1,998
		Income support	4,284	3,998

Results

The results of the statistical analyses are presented in this section. Table 3 shows estimation results from the models on value added and earnings (EBIT) using the full sample of firms. On the basis of previous discussions, there is reason to assume that the importance of the value of forest holdings for firm performance may vary between different types of firms and different owner categories. In order to further explore these potential differences, the model specification exhibited in Table 3 was rerun on a number of sub-samples. Due to space restrictions we focus on the presentation of *Forest value*, which is the principal independent variable of the analysis. In Table 4 the estimates of *Forest value* are displayed for 36 additional models scrutinizing the importance of type of company, sex of the owner and age of the owner for the two chosen firm performance indicators.

Going back to Table 3, it can be concluded that *Forest value* has a positive effect on firm performance only when operationalized as earnings (EBIT). Apparently, the value of forest holdings

Table 2. Characteristics of micro-firms by the owners' forest ownership status. Meta mean values for the 2000–2008 period. Source: ASTRID database.

		Variable	Micro-firms according to owners' forest ownership status	
			Forest owners	**Non-forest owners**
M e t a m e a n s 2 0 0 0 - 2 0 0 8	*Firm type*	Private firm	28.0%	27.9%
		Limited company	72.0%	72.1%
	Line of business	Mining	0.6%	0.1%
		Manufacturing	13.5%	12.8%
		Electricity & water suppl.	0.1%	0.0%
		Construction	25.8%	18.6%
		Wholesale & retail	21.7%	25.3%
		Hotel & restaurants	0.5%	1.7%
		Transport & communications	14.6%	9.7%
		Financial intermediation	0.4%	0.5%
		Real estate	14.7%	20.9%
		Public administration	0.1%	0.1%
		Education	0.4%	0.8%
		Health & social work	2.5%	4.5%
		Other services	2.2%	4.5%
		Primary sector	2.6%	0.2%
		No data	0.2%	0.2%
	Economic performance (SEK)	Earnings before interest and taxes (EBIT)	37,257	27,255
		Value added	154,584	136,354
		Net turnover	467,027	403,049
		Other running revenue	9,241	5,797
		Wage cost	68,306	68,414
		Labour cost	29,201	29,618

does not boost the firms' value added or, indirectly, GDP. However, when performance is defined in terms of a profitability measure (EBIT) it seems that the value of forest holdings may play an important role in the evolution of the firm. In line with the hypothesis, a likely interpretation of the estimation result is that firm owners who own forest estates make use of forest revenues in their micro-firms. The analyses do not reveal the exact ways this resource transfer is done, i.e. whether it is channelled via money transfers from cutting or via other non-pecuniary forest-property benefits.[12]

In regard to the other person-specific covariates[13], it can be concluded that age of the owner (*Age*), number of adult children (*No. children > 18*), experience of running businesses in the past (*Sum. income 1990–*), and education level (*Education*) are those factors that show significant effects on firm performance in terms of either value added or earnings (EBIT). Highly educated firm owners perform better, as do more seasoned firm owners, as measured in age and experience of running firms in the past. Having adult children may also add to firm performance, potentially as a result of family-driven contributions in firm operations.

Concerning line of business, we find no significant differences in firm performance. However, there seem to be clear regional variations between the metropolitan regions and other parts of the country. Both performance indicators show similar patterns by which micro-firms tend to do better outside metropolitan regions. The year dummies mostly exhibit significant estimates, indicating time-specific fluctuations (e.g., changes in the economic situation) that the panel regression can account for.

In Table 4 we turn back to the principal independent variable, *Forest value*, and look more closely at its importance for firm performance. After subdividing the micro-firms according to type of company, we ran two models estimating effects on value added and earnings, respectively. The analyses reveal a distinct difference between businesses registered as private firms and as limited companies. It is only in private firms that forest value has a positive effect on firm performance. The estimates are highly significant ($p < 0.01$) for this group, whereas the corresponding estimates for limited companies indicate p-values far from significant effects.

Table 3. Fixed-effects estimations of firm performance defined as value added and earnings before interest and taxes (EBIT). Cluster-robust standard errors were used. Source: ASTRID database.

Performance indicator	Value added				EBIT	
	Coef.	*P*>t	SS	Coef.	*P*>t	SS
Forest value	0.068	0.118	0.043	**0.081	0.019	0.034
Age	-22.536	0.402	26.874	*-17.076	0.092	10.085
Married	36.751	0.704	96.580	-3.996	0.909	34.862
No. children > 18	**90.745	0.031	41.941	17.225	0.272	15.641
Sum. income 1990-	***0.050	0.001	0.015	***0.014	0.002	0.004
Partner's income	-0.000	0.754	0.000	-0.000	0.358	0.000
Local forest ownership	-35.348	0.790	132.661	-4.635	0.956	83.468
Education						
Primary educ.	59.067	0.760	192.899	283.429	0.156	199.005
Upper secondary educ.	294.270	0.466	402.740	***216.173	0.003	73.229
University educ.	-186.868	0.684	458.477	***229.189	0.002	72.800
Unspecified educ. (ref.)						
Line of business						
Mining	1,810.736	0.280	1,674.055	188.175	0.315	186.941
Manufacturing	-151.509	0.412	184.471	-12.041	0.879	79.312
Electricity & water suppl.	312.413	0.745	959.896	174.015	0.705	458.967
Construction	-166.097	0.221	135.307	-20.125	0.629	41.636
Wholesale & retail	-143.981	0.531	229.706	11.406	0.888	81.111
Hotel & restaurants	621.050	0.386	715.924	276.280	0.150	191.580
Transport & communic.	189.897	0.527	299.868	1.264	0.990	103.598
Financial intermediation	-830.445	0.117	528.143	-224.017	0.361	244.929
Real estate	-1,737.977	0.215	1,398.773	-363.012	0.343	382.412
Public administration	-5.155	0.988	343.940	94.362	0.414	115.293
Education	-510.918	0.241	286.783	-146.083	0.277	134.014
Health & social work	322.239	0.262	286.783	107.315	0.319	107.542
Other services	3,414.919	0.312	3,372.658	995.545	0.270	900.901
Primary sector (ref)						
Municipality type						
Major cities	**-703.084	0.029	320.115	***-992.485	0.000	115.842
Suburbs of major cities	***-1,060.291	0.000	298.126	***-1,036.146	0.000	105.350
Commuter municipalities	***-1,952.051	0.000	278.259	***-1,631.650	0.000	110.774
Tourism municipalities	omitted			omitted		
Manufacturing municip.	***2,729.431	0.000	167.675	**544.649	0.000	131.663
Sparsely pop. municip.	***1,953.245	0.000	139.791	100.597	0.362	110.279
Municip. densely pop. reg.	***2,458.913	0.000	175.265	***373.720	0.005	131.737
Municip. sparsely pop. reg.	***1,907.387	0.000	192.555	***1,113.818	0.000	154.955
Metropolitan regions (ref)						
Year						
2001	**-32.441	0.090	19.066	-2.215	0.856	12.19
2002	Missing data					
2003	23.942	0.656	53.695	**-42.510	0.018	17.899
2004	***-187.713	0.001	54.705	**-49.082	0.020	20.990
2005	***-191.401	0.001	56.347	**-54.374	0.038	26.093
2006	***-187.373	0.001	55.189	-32.082	0.144	21.894
2007	11.823	0.677	28.374	**53.683	0.021	23.090
2008 (ref)						
Constant	914.418	0.447	1,201.790	880.205	0.042	430.060
Observations	11,771			11,771		
R-squared	0.076			0.039		
rho	0.766			0.769		

*** p<0.01 ** p<0.05 * p<0.1

Table 4. Fixed-effects estimations of firm performance defined as value added and earnings before interest and taxes (EBIT) for theoretically justified sub-groups. Same set of covariates as in Table 3, but due to space restrictions only the forest value variable is presented. Cluster-robust standard errors were used. Source: ASTRID database.

	Value added			EBIT		
	Coef.	*P*>t	SS	Coef.	*P*>t	SS
Forest value						
All cases	0.068	0.118	0.043	**0.081	0.019	0.034
Private firm (PF)	***0.149	0.001	0.044	***0.135	0.001	0.039
Limited company (Ltd)	-0.030	0.489	0.044	-0.171	0.513	0.026
PF; men	***0.149	0.001	0.045	***0.136	0.001	0.039
PF; women	0.023	0.895	0.177	0.049	0.621	0.099
Ltd; men	-0.036	0.424	0.044	-0.019	0.470	0.027
Ltd; women	0.023	0.895	0.177	0.199	0.151	0.137
PF; men; aged < 35	0.318	0.366	0.349	-0.015	0.930	0.168
PF; men; aged 35-49	*0.515	0.057	0.269	0.412	0.128	0.270
PF; men; aged ≥ 50	***0.110	0.001	0.032	***0.108	0.000	0.028
PF; women; aged <35	-0.866	0.600	1.564	-2.943	0.759	0.917
PF; women; aged 35-49	-0.067	0.741	0.202	0.127	0.298	0.120
PF; women; aged ≥ 50	0.064	0.802	0.256	-0.069	0.566	0.120
Ltd; men; aged < 35	*0.823	0.060	0.429	**0.420	0.025	0.183
Ltd; men; aged 35-49	-0.049	0.533	0.078	-0.074	0.172	0.054
Ltd; men; aged	-0.039	0.492	0.057	-0.007	0.846	0.038
Ltd; women; aged <35	omitted			omitted		
Ltd; women; aged 35-49	-0.183	0.684	0.445	-0.124	0.769	0.421
Ltd; women; aged ≥ 50	0.188	0.398	0.221	0.098	0.484	0.139

*** $p<0.01$ ** $p<0.05$ * $p<0.1$

This result is in line with what may be anticipated, considering the different regulations affecting the different types of companies. The owner of a private firm cannot make a clear distinction between private money and firm money – everything is intertwined, and the owner is personally responsible for all firm transactions and liabilities. If the private firm gets into financial problems and insolvency, owner assets including forest holdings are at stake. As a consequence, there are potential incentives for the firm owner to use forest revenues in the operation of the private firm. In regard to micro-firms registered as limited companies, however, there are no such incentives since bankruptcy of the limited company does not affect the owner's private economy. Another factor of importance might be that limited companies sometimes have more than one owner. The use of forest revenues in multi-ownership settings may be complicated and disadvantageous for the firm owner in possession of forest holdings. Private firms, on the other hand, are by definition one-owner firms. In cases in which two or more persons want to start up a business in accordance with the regulations of a private firm, it is registered as a limited liability partnership, another category in the data.

In the next step we made yet another subdivision of the micro-firms, carrying out analyses separately for men and for women. According to the literature (see above), women are less likely than men to become entrepreneurs and are also likely to be less successful in these endeavours. There are also gender differences regarding forest management perspectives (Lidestav & Ekström 2000; Nordlund & Westin 2011). Women appear to have a slightly different view of forest ownership whereby other values than cutting revenues are put at the forefront. This means that women are possibly less likely to employ conventional production management routines, and therefore have less money transferable to their micro-firms. The results of the analyses confirm this line of argument,

since we find no significant positive effects of forest ownership on the performance of firms run by women. This result holds for private firms as well as limited companies. In regard to men who run private firms, however, forest value seems to be beneficial to both value added and earnings, which hints at systematic variations related to gender and type of firm.

In the last step of the analysis we also investigated potential differences across combinations of age, sex and type of company. It can be concluded that for women it makes no difference whether they run private firms or limited companies, or whether they are young, middle-aged or old, concerning the connection between forest value and performance. For these groups of firm owners, forest value makes no difference for either earnings (EBIT) or value added, which indicates restricted or non-existent transfer flows of resources between forest holdings and micro-firms. However, for men the patterns are somewhat different and more complicated. In brief, the analyses show positive effects of forest value on firm performance for older men who run private firms and for younger men who run limited companies. The reasons why forest value is important for these groups are probably manifold, but it could be speculated that young firm owners have a greater need of capital than do their older colleagues, who have had more time to accumulate resources. Even though there are certain disadvantages to inserting private money into the limited company, this might be their only option to raise money for investments. Banks sometimes have a tendency to be restrictive in their lending policies towards companies, and this is particularly the case for small and young firms with a non-proven business concept. Nevertheless, forest value also seems to have a positive effect on performance for older men running private firms. It is known from the literature that older men are more prone to take on production-oriented management. This implies that this group is likely to have converted their forest value into liquid assets, which may be easily available for use in their micro-firms.

To conclude, it can also be added that the results clearly show that possessing assets in the form of forest holdings never seems to be a burden for micro-firm owners; there are no significant negative effects in any combination of owners.

Concluding discussion

This research set out to explore the importance of the value of forest holdings owned by entrepreneurs for the economic performance of micro-firms, with a hypothesis that assets stemming from forest ownership benefit firms and provide them with financial stability and resilience to economic fluctuations. The empirical study is based on official register panel data for the period 2002–2008 comprising all Swedish micro-firms operating in non-forestry-related lines of business.

In response to the first research question, the fixed-effects panel regression analyses reveal that there are differences in economic performance between firms depending on the value of the forest holdings owned by the entrepreneur. The value of the forest assets is positively associated with firm earnings, thus supporting the hypothesis and suggesting that there are resource transfers – presumably principally in the form of monetary transfers, but possibly also through other types of non-pecuniary resources – between the entrepreneurs' forest holdings and their firms which can then be used for investing in and boosting the performance of the firms.

Concerning the second research question, we find that the impact of the value of forest assets on the economic performance of micro-firms varies across different categories of entrepreneurs with regard to socioeconomic and demographic characteristics, as well as the properties of the firms. From a somewhat generalized point of view, forest assets are primarily beneficial to private firms run by older men. The connection with firm type can most likely be explained by the strength of the economic connections between private firms and their owners. While no significant effects of forest assets were found for female-headed firms, male-headed firms do benefit from these areal resources. This is possibly related to gender differences in forest valuations and forest management strategies; male forest owners have previously been found to have production-oriented views and strategies and thus to extract more capital from their forest holdings (Lidestav & Ekström 2000; Nordlund & Westin 2011). The results suggest the possibility that these differences are present not only among female forest owners in general, but also among the sub-group who are entrepreneurs as well. These women could be expected to place more emphasis on economic outcomes compared to their non-entrepreneur peers. It may also be the

case that the gendered views of the forest come forth not only regarding forest management but also in women's entrepreneurial endeavours, which may as a consequence be at higher risk of 'underperformance' (e.g. Fairlie & Robb 2009; Swedish Agency for Growth Analysis 2010) and exit compared to firms owned by male forest owners. Another possibility is that the gender divergence stems from differences in terms of processes of acquisition of forest property, ownership structure and social expectations (Lidestav 2010).

Firm performance also benefits from increasing maturity in terms of age or previous experience of running a business on the part of the entrepreneur, and from human capital in the form of high education. The entrepreneur's social/family context also matters, indicating the possibility that support mechanisms based on family ties are in place. These findings are largely in line with previous research reported in the literature concerning, e.g., the importance of the entrepreneur's human and social capital. Concerning geographical differences across firms in different types of municipalities, micro-firms located outside the metropolitan regions tended to perform better. This is relevant from a local and regional development perspective, not least since entrepreneurship may be an important constituent of rural livelihood strategies based on 'multifunctional' approaches which in turn can be one way of strengthening local labour markets and providing employment and economic development in otherwise weak labour markets (e.g. Alsos & Carter 2006; Wilson 2010). The results suggest that forest holdings, by definition a rural resource location-wise, matter most for firm development outside the regions at the top of the urban hierarchy, although not only in sparsely populated areas. Not least considering the increasing share of non-resident forest owners living in cities (e.g. Lindroos et al. 2005, cf. Ziegenspeck et al. 2004; Schraml 2006), it is clear that the importance of the forest – a key rural resource – is not restricted to those who live or operate in the countryside, and there is potentially some risk that resource transfers from the forest to firms engaged in other activities may potentially cause a drainage of resources from rural areas (cf. Karlsson 2007). However, since most forest owners still live in places closer to the rural end of the urban–rural continuum, and presumably also locate their firms in these places to a large extent, there are nevertheless grounds to be more optimistic about the use of forest-related resources for the benefit of rural entrepreneurship and endogenous development.

To summarize, we find substantial support for the hypothesis that resources stemming from forest holdings contribute to the economic performance and development of micro-firms in non-forestry lines of business, thus adding to their chances of long-term survival. The vulnerability of micro-firms is well-established in the research literature, and resources stemming from forest holdings can make an important difference for small-scale entrepreneurs struggling to keep their firms afloat in the challenging context of competition and economic fluctuation. While this is clearly beneficial to the individual firm and entrepreneur, its relevance stretches beyond this scale. From a wider perspective, it improves the prospects for endogenous local and regional development, for instance in rural areas where labour market opportunities may be few and far between. This is also relevant at the macro-economic level, not least since entrepreneurship is frequently identified as an important means of economic development and employment. This study shows that the importance of forest, which as a natural resource is of key importance for the national economy in Sweden, lies not only in its direct forms (i.e. forestry and related activities) but also indirectly in that it provides a way of supporting micro-firms in other lines of business, particularly outside the metropolitan regions. Thus, this study has revealed important connections between areal resources in the form of forest holdings and non-forestry small-scale entrepreneurship in ways which have not previously been explored in empirical research, and which may inform both research and policy in the fields of entrepreneurship and economic development as well as forestry. Moreover, it seems likely that the findings presented here are relevant and applicable beyond the Swedish context, for instance in the other Scandinavian countries and elsewhere where forest land is to a substantial extent owned by small-scale private forest owners and where challenges are posed by the current rural development trends.

A potential path for future research that arises, departing from questions based on the findings that micro-firms benefit from resources stemming from the forest, concerns the forest and perhaps local rural development more generally. What are the potential effects if the forest is used as a 'cash cow' for non-forestry and non-rural business activities, and how does this correspond to the aims

of socially, economically and ecologically sustainable forest management in the long term? The possible scenarios for the possible courses of action of forest owners may include, for instance, a lack of re-investment in the forest when the revenue is used for other purposes, or perhaps an augmented interest and improved management of the forest stemming from the insight that its value can be converted into other types of activities. Also, as to the precise ways the resource transfers between forest holdings and micro-firms take place, this could be explored more in-depth in, e.g., interview studies or survey research whereby the entrepreneurs can be asked directly about their strategies and courses of action.

NOTES

[1] In the official statistics, a 'new' firm is defined as either a newly established firm or a firm which has resumed activity after being non–practicing for a period of at least two years (Swedish Agency for Growth Analysis 2011).

[2] This issue is somewhat related to 'lifestyle entrepreneurs', a concept which refers to entrepreneurs whose aim through their firms is, inter alia, to gain personal independence (cf. Gray 2002) and 'support a desired lifestyle'. Such firms also tend to be small in terms of employees – as opposed to firms owned by 'high–growth entrepreneurs' (Henderson 2002: 49). Thus, entrepreneurs need not necessarily prioritize or strive for firm growth (Greenbank 2001) but rather to sustain a livelihood by way of their business (Reijonen & Komppula 2007).

[3] The present paper investigates the possibility that forest ownership may be advantageous for the performance of firms run by the forest owner. However, it is appropriate to acknowledge that resource transfers between businesses may also be detrimental under certain circumstances (Alsos & Carter 2006), e.g. impairing the firm's ability to recognize business opportunities because of, inter alia, 'core rigidities' and 'reduced experimentation' (Mosakowski 2002).

[4] However, the effect of entrepreneurship is not necessarily on a par with the level of expectations. In a study by Baumgartner et al. (2013), the effect of local entrepreneurship potential on local development was found to be largely positive but modest. Also, in the short and medium term, structural differences between rural communities were found to exert a more substantial influence.

[5] While firm closures need not necessarily be regarded as wholly negative from a macro point of view, but rather as part of the function of a dynamic economy, such occurrences are of course usually interpreted negatively from a micro point of view, i.e. for the individual entrepreneur (Bartelsman et al. 2005; Blackburn & Kovalainen 2009). However, the exit of a firm may also be due to either voluntary or involuntary causes (Headd 2003; van Praag 2003; Cressy 2006), either 'death' or other types of exit such as mergers and acquisitions by other companies (Cefis & Marsili 2005, cf. Storey 1994), the owner's accepting employment elsewhere, retirement or cases in which exiting is part of a conscious strategy. Thus, a substantial part of what may be deemed business failures may in fact be more correctly interpreted as 'positive exits' (Headd 2003).

[6] Sweden was not among these countries.

[7] However, the role of, e.g., size does not necessarily adhere to the straightforwardness of the general pattern. For instance, Holmes et al. (2010) found that while initial size had a positive effect on the survival of small- and medium-sized firms, the effect was the opposite for the smallest micro-firms.

[8] Two types of models can be used for estimating panel data: the fixed-effects estimator and the random-effects estimator (Wooldridge 2003). The underlying assumptions of the random-effects model are that v_i is a random variable and that $Cov(x_{it}, v_i) = 0$. If there is correlation between the covariates and the individual-specific error, random-effects estimates will be biased. We used the Hausmann test to check for differences between the two models. The statistics indicated that the use of random effects is inconsistent, so we decided to use fixed-effects models.

[9] For the year 2002, data on the tax value of forest property are unavailable.

[10] Since significance tests are performed for each year of the panel, separate significance levels are not provided for each variable each year as this would clutter the presentation of results.

[11] The capital income variable is statistically significant for all years in the time series except 2002 and 2008. The disposable income of the individual variable is statistically significant for the years 2001 and 2004–2007. The disposable income of the individual's household variable is statistically significant for the years 2004–2008.

[12] Concerning the explanatory power of the models, low levels of explanatory power are to be expected since micro data opens up for full individual heterogeneity. People can be extremely different compared to one another, something which is effectively hidden in aggregated data where categories are represented by mean values. Therefore, regression models using aggregated data usually show higher levels of explanatory power. Low explanatory power is not a problem as long as the model is not used for projections. In this case we are only interested in the partial effects of covariates, whose reliability is much more related to the significance level of the point estimates.

[13] In Table 3, the gender variable is absent as a result of the specific properties of the fixed effects model. The model cannot estimate time-constant variables simply due to the fact that since these variables do not change over time there is no variation, and since most people remain members of the same sex, gender estimations are impossible.

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