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ABSTRACT: This study investigates time allocation decisions of female and male self-employed individuals using a model that distinguishes between preference and productivity effects on the number of working hours in new ventures. To explain the part-time nature of female entrepreneurship we distinguish between gender effects of preference and productivity. Using data of 1247 entrepreneurs we find that women invest less time in the business than men due to a lower productivity, explained by lower endowments of human, social and financial capital.

INTRODUCTION

One of the most intriguing questions in life is why people work. Directly related is the question how much time people spend on working compared to other activities. Time allocation theory explains how and why individuals allocate their scarce time to different activities. Since Becker’s (1965) “A Theory of the Allocation of Time” a substantial amount of research has been done in this area by economists and researchers from other disciplines, focusing on wage or contract labor (Gronau, 1977; Moffitt, 1984; Juster and Stafford, 1991). Far less attention has been paid to the time allocations decisions of employers (or entrepreneurs). Although in entrepreneurship research some studies have investigated time allocation decisions, the focus is usually upon time allocation decisions within the firm (how does the entrepreneur divide his/her time between different tasks such as personnel management, marketing, etc.) rather than between firm activities and other activities (McCarthy et al., 1990; Cooper et al., 1997). Other studies by Lévesque and MacCrimmon (1997) and Lévesque and Schade (2005) have dealt with the question how individuals divide their time between leisure and work.
time – where work time is divided between time spent in the new venture and time spent on a wage job – but do not perform empirical tests explaining time allocation decisions using data from real entrepreneurs\(^1\).

Although studies in the area of time allocation decisions of entrepreneurs are scarce, the distinction between wage-employment and self-employment is an important one because the use of time in these activities is different in at least two respects. First, self-employed individuals tend to spend more time in the market than wage-employed individuals (Carrington et al., 1996; Ajayi-Obe and Parker, 2005)\(^2\). Second, self-employed individuals tend to have greater flexibility of working hours than wage-employed individuals (Wales, 1973).

The present paper aims to apply time allocation model(s) from the existing research on wage labor to the decision world of the employer or entrepreneur. In addition, we take into account relevant aspects of the entrepreneurship literature. Our model explains time investments in new ventures\(^3\) from the preference for work time in the firm, the productivity of this work time – both positively influencing time investments – and other time-consuming activities, including wage-employment, running a second firm, family responsibilities and schooling – all negatively affecting time investments. This is the \textit{first} contribution of the paper, distinguishing between a preference and productivity effect on time investments of entrepreneurs.

The \textit{second} contribution is the investigation of gender differences in the time allocation decision of entrepreneurs. Female entrepreneurs allocate their time in a different way than male entrepreneurs do: they are more likely to work on a part-time basis in the firm (Ajayi-Obe and Parker, 2005; Cliff, 1998; OECD, 1998; Verheul and Thurik, 2001). Although the part-time nature of female entrepreneurship has often been coupled with household and family responsibilities, the lower time investments of women have not been investigated explicitly distinguishing between preference and productivity effects. In other words, this paper aims to explain why women invest less time in the business than men, attributing the lower time investments of women to a lower preference for work
time or a lower productivity per time unit. From the perspective of gender the distinction between a preference and productivity effect is particularly important since merely including gender as a dummy variable in the analysis will not provide new insights into the reasons behind the lower time investments of women in the firm. These insights are important, suggesting (new) routes to stimulate a higher participation of women in entrepreneurial activity in terms of working hours.

Our approach is as follows. To investigate and explain time investments of female and male entrepreneurs in their new ventures in the subsequent section we propose a model that will be tested using data of 1247 entrepreneurs who started a business in 1994. This nonlinear model includes parameters representing the preference for work time versus leisure time \((\alpha)\) and the productivity of work time \((\gamma)\). The preference for work time and productivity of work time are dependent upon a range of factors. Hypotheses for these effects are formulated using explanatory factors derived from the time allocation and entrepreneurship literature, and are subsequently tested by way of nonlinear regression analysis. To test for a direct effect of gender, a linear regression is performed explaining time investments, including gender as a dummy variable, without discriminating between preference and productivity effects. Indirect gender effects (through preferences and productivity) are tested in the nonlinear regression analysis. Hence, the present paper takes a two-step approach. First, a linear model is introduced explaining the number of working hours directly. Because the linear regression analysis does not enable us to distinguish between preference and productivity effects, we use a nonlinear regression analysis to disentangle these two effects on the number of working hours.

Indeed, several gender effects appear. On average male entrepreneurs work longer hours than female entrepreneurs do. We show that this is due to a lower productivity per time unit for women, which can again be attributed to lower endowments of human, financial and social capital.

**THE MODEL**
The variation in the number of working hours across entrepreneurs may reflect differences in the preference for working hours or differences in productivity of work time. We will use a maximizing utility set-up to disentangle these two effects on the number of working hours.

It is assumed that entrepreneurs maximize their utility, \( \max_{\pi(n)} U(\pi(n), N - n) \), where utility \( U \) is positively influenced by expected profit \( \pi \) and leisure time \( N - n \). Expected profit is dependent upon the number of hours worked \( n \), and \( N \) is the total number of hours available per week\(^4\). We use the following (logarithmic) equations for the utility and profit function:

1) Utility function: \( \ln U = \alpha \ln \pi + (1 - \alpha) \ln(N - n) \)

2) Profit function: \( \ln \pi = \delta + \gamma \ln(n) \)

We expect that \( 0 < \alpha < 1 \) and that \( \gamma \) is positive (working more hours results in higher profit). Carree and Verheul (2004) derive from the equations presented above that the nonlinear expression for the optimal number of working hours for entrepreneur \( i \) is as follows: \( n_i = \frac{\alpha_i \gamma_i}{1 - \alpha_i + \alpha_i \gamma_i} N + \beta x_i \), where \( \alpha_i \) is the individual-specific preference for profit versus leisure time, \( \gamma_i \) is the individual-specific productivity of work time\(^5\) and \( x_i \) refers to other (that is, competing) time-consuming activities of an individual. For the purposes of this study we argue that, in addition to investing time in the business, an entrepreneur can spend time outside the business on other (work) activities that limits the time available for running the business. In our analysis we correct for the time an entrepreneur spends on different activities (next to running the business), including wage-employment, family care, running another firm (i.e., portfolio entrepreneurship) and schooling\(^6\). Both an increase in \( \alpha \) and \( \gamma \) lead to a higher utility-maximizing number of working hours. The model can be estimated using nonlinear least squares regression analysis.
The individual-specific preferences ($\alpha$) and productivity ($\gamma$) are influenced by a range of factors. Hence, we make use of proxies for each of the preference and productivity effects. Hypotheses are formulated for effects on preferences (H$\alpha$) and effects on productivity (H$\gamma$). The preference for working in the firm rather than investing time in other activities is likely to be dependent upon the personal situation of the entrepreneur, including the income available from other sources (such as partner income), gender, age, family situation and the attitude towards risk. Hypotheses for the preference for work time are largely based upon the time allocation literature while the productivity of work time is expected to be influenced by human, social and financial capital invested in the firm. Hypotheses for the productivity of work time are largely based upon the entrepreneurship literature. The model we use for the present study – identifying preference and productivity effects as well as gender effects – is presented in Figure 1.

Our model allows for different types of gender effects on time investments. Women may have a different preference for work time than men, leading to a gender difference in time investments. Hence, gender is one of the factors influencing preferences. Also, women may have a different productivity of work leading to a gender difference in time investments. Hence, gender is also one of the factors influencing productivity of work. Below we will call these effects indirect because they run through preference and productivity. Figure 1 assumes that these indirect gender effects are caused by mediation (i.e., other explanatory factors mediate the relationship between gender and preferences or productivity). For example, women may have less entrepreneurial experience, which may negatively influence the productivity of work time (and – in turn – time investments).

ANTECEDENTS OF PREFERENCES AND PRODUCTIVITY
Preference for work time

This section describes the determinants of the preference for work time versus other time uses. Attention is paid to other sources of income, gender, age, family situation (such as whether or not there is a life partner) and risk attitude. Firm-specific factors (such as firm size and sector) are included in the analysis as controls. These latter factors are presented and discussed in the method section.

Revenues and other sources of income

An increase in wage or revenues per hour (in case of self-employment) may lead to an increase or decrease of working hours, depending upon whether the ‘substitution effect’ (i.e., individuals substitute leisure for work when returns to work increase) or the ‘income effect’ (i.e., individuals respond to their higher earnings by consuming more leisure at the expense of working hours) dominates (Blundell and MaCurdy, 1999). In the empirical literature findings are inconclusive. Ajayi-Obe and Parker (2005) show that in response to higher wages both wage-employed and self-employed individuals work fewer hours. However, Biddle and Hamermesh (1990) find that higher wages lead to more market work.

Whereas the substitution effect refers to the productivity of work time, the income effect refers to the preference for work time. To investigate income effects, we do not focus upon revenues from the firm, but upon other income, earned independently of the number of hours invested in the firm (possibly by the spouse). The availability of other income is likely to reduce the preference for working hours (Ajayi-Obe and Parker, 2005). Hypothesis 1 is formulated as follows:

H1: The availability of other income (than that extracted from the business) negatively influences the preference for work time.

Gender, family responsibilities and part-time work

The number of working hours per person has decreased considerably in the last hundred years (Maddison, 1982; 1987). However, we see a divergence in the development of the number of working
hours of men and women. For men working hours have declined, whereas for women they have increased substantially (Killingsworth and Heckman, 1986). Contemporary time allocation decisions also show gender differences. Employment rates (whether measured in terms of number of jobs or hours worked) are still lower for women than for men in most OECD countries (OECD, 2002). Moreover, within any occupation men tend to work longer hours than women (Ajayi-Obe and Parker, 2005). Within self-employment men are more likely to work on a fulltime basis than women (OECD, 1998). The combination of work and family responsibilities tends to be an important motivation for women to engage in self-employment, enabling them to have more flexibility in their use of time (Longstreth et al., 1987). However, the “double assignments” of female entrepreneurs also tends to limit the time they can spend in the business.

It may be argued that gender differences with respect to time investments in the business are largely due to household and childcare activities, preventing women to work fulltime or as many hours as men do. Accordingly, we hypothesize that, when controlled for other time-consuming activities, (including a wage-job, family responsibilities and schooling), there is no gender difference with respect to time invested in the business. Hypothesis 2 is formulated as follows:

H2: When controlled for other time-consuming activities, gender of the entrepreneur does not influence the preference for work time.

Age of the entrepreneur

Time allocation decisions are strongly related to age (Juster and Stafford, 1991). Market work of men is highest between the age of 25 and 44 years old and decreases afterwards (Blinder and Weiss, 1976; Hill, 1985). In general we expect the preference for work time to decrease with age as older people tend to be less ambitious and have a lower endurance. The following hypothesis is formulated:

H3: Age of the entrepreneur has a negative effect on the preference for work time.
**Partner**

Having a partner (whether married or living together) is likely to influence the number of hours invested in the firm. Davidsson and Honig (2003) find that the decision to become an entrepreneur and devote time to the firm is positively influenced by what they refer to as ‘bonding social capital’. Support from the home front is important for entrepreneurial activity. Moreover, although having a partner may imply that time is withdrawn from the firm to invest in the partnership, it also enables the partners to divide household tasks, having more time available that can be invested in the firm. Because women still take on the bulk of household activities, this may be true for male entrepreneurs rather than female entrepreneurs (Brines, 1994; OECD, 2001). Hypothesis 4 is formulated as follows:

H4: Having a partner has a positive effect on the preference for work time.

**Risk attitude**

Individuals with a different attitude towards risk are likely to also differ with respect to the time they invest in the business. Individuals who are not risk averse are expected to ‘go for it’ and put in all of their time and effort in the new venture. Das and Teng (1997, p 73) argue that: “Entrepreneurship is widely regarded as risk taking because it is about greater gains and losses as compared to non-entrepreneurial activities”. Hypothesis 5 is formulated as follows:

H5: A negative attitude towards risk lowers the preference for work time.

**Productivity of work time**

In this section we will discuss the influence of human, social and financial capital on the productivity of work time in new ventures. Firm-specific factors (firm size, sector, innovation, type of firm and outsourcing) are included in the analysis as controls. These factors are presented and discussed in the method section.

*Human capital*
According to human capital theorists (Becker, 1965; Mincer, 1974) knowledge increases the cognitive ability of an individual, resulting in more productive and efficient behavior. Davidsson and Honig (2003) argue that individuals with higher levels of human capital are more self-confident. Human capital has been found to positively influence the performance of entrepreneurial firms (Chandler and Hanks, 1994, 1998; Cooper et al., 1994; Pennings et al., 1998).

Becker (1993) distinguishes between general and specific human capital. Castanias and Helfat (1991; 2001) build on Becker (1993) discriminating between generic, industry-specific and firm-specific skills or knowledge. General human capital influences the extent to which an individual has (had) the opportunity to acquire relevant knowledge, skills and contacts (Cooper et al., 1994). An entrepreneur’s education and experience may enhance learning and increase the problem-solving ability of an individual within a given environment (for example, a firm). Indeed, Gimeno et al. (1997) find that formal education positively influences the economic performance of the venture. Hypothesis 6 is formulated as follows:

H6: Education level of the entrepreneur has a positive influence on the productivity of work time.

According to Cooper et al. (1994) gender can also be seen as a general human capital factor. Like education level, gender “may serve as a proxy for life experiences and access to networks and other resources that bear upon the prospects for success of individual entrepreneurs” (Cooper et al., 1994, p. 376). Although the level of education is largely similar for female and male entrepreneurs (Birley et al., 1987; Fischer et al., 1993), men tend to have higher levels of entrepreneurial experience (Kalleberg and Leicht, 1991; Fischer et al., 1993), financial management experience, and industry experience (Fischer et al., 1993; Verheul and Thurik, 2001). In addition, it has been suggested that women do not have equal access to financial and social capital (Fischer et al., 1993; Moore and Buttnner, 1997). Hence, women may be less productive than men because they have had fewer opportunities to acquire different types of capital. However, when controlling for the difference in levels of human, social and
financial capital (as well as for venture specific characteristics, such as firm size and sector), we do not
expect to find gender differences with respect to productivity of work time. This corresponds with the
work of Collins-Dodd et al. (2004) who report that performance differentials across gender are
negligible when controlled for a range of practice and personal factors. Hypothesis 7 is formulated as
follows:

H7: When controlled for human, social and financial capital, gender of the entrepreneur does not
influence the productivity of work time.

Age of the entrepreneur may also be “picking up some omitted variables measuring the effect of
human capital, such as years of work experience” (Gimeno et al., 1997, p. 772). Younger people often
have had less opportunity to build up relevant work experience. On the other hand, older people tend to
have lower levels of endurance, are less ambitious and less optimistic about future career opportunities.
Hypothesis 8 is formulated as follows:

H8: Age of the entrepreneur has a reversed U-shaped relationship with the productivity of work
time.

Management-specific knowledge of entrepreneurs built up through earlier experiences increases
the probability of pursuing profitable strategies and dealing adequately with management issues
(Cooper et al., 1994). It is important to distinguish between management and entrepreneurial
experience, the latter referring to experience with starting and running a small firm. It has been found
that entrepreneurial experience is an important factor explaining new venture performance, and that
management experience is of less importance (Stuart and Abetti, 1990; Gimeno et al., 1997; Evans and
Leighton, 1989)¹¹. Hypothesis 9 is formulated as follows:

H9: Entrepreneurial experience has a positive influence on the productivity of work time.
Entrepreneurs who have worked in the same industry in the past are likely to have a network of relationships with suppliers, customers and distributors, providing them with support and credibility (Cooper et al., 1994). Industry-specific knowledge has proven to be important for new venture performance (Cooper et al., 1994). Hypothesis 10 is formulated as follows:

H10: Industry experience has a positive influence on the productivity of work time.

Past work experience of the entrepreneur may be relevant for new firm performance, above and beyond industry experience. According to Vesper (1980) entrepreneurs who run firms that are closely related to the activities they did in the past have acquired relevant skills and abilities as well as the appropriate ‘prior mental programming’. Hypothesis 11 is formulated as follows:

H11: The extent to which past work is related to the current activities of the entrepreneur has a positive influence on the productivity of work time.

Financial capital

Financial capital can have a direct effect on productivity through the ability to undertake more capital-intensive or ambitious business strategies and to change courses of actions. Capital-intensive strategies are relatively well protected from imitation and characterized by increased labor productivity. Indirectly, capital investments may enable training and more comprehensive planning, influencing firm performance (Cooper et al., 1994). Cooper and Gimeno-Gascon (1992) report that most studies, investigating the relationship between initial capital and performance, find that higher capital investments lead to a higher performance. Hypothesis 12 is formulated as follows:

H12: The size of the start-up capital has a positive influence on the productivity of work time12.

Social capital

Social capital refers to the access of an individual to various resources (e.g, capital and market access) through interaction with members of a network (Portes, 1998; Bourdieu, 1986). This network
may relate to relationships with family, friends and the community but also to more formal arrangements, such as professional or business networks. Interaction and communication within networks of entrepreneurs may contribute to higher performance of a venture as it enables the exchange of valuable information and other resources. Indeed, Davidsson and Honig (2003) find a strong positive effect of membership of a business network on early stage firm performance. Hypothesis 13 is formulated as follows:

H13: Contact with other entrepreneurs has a positive effect on the productivity of work time.

DATA SAMPLE AND VARIABLE DESCRIPTION

To test the model and hypotheses we use data gathered through a detailed panel survey of the research institute EIM Business and Policy Research, commissioned by the Dutch Ministry of Economic Affairs. A representative sample was drawn of independent new ventures registered in the first quarter of 1994 at the Chamber(s) of Commerce. Only main establishments were selected. The distribution of firms was representative across sector and size class. Agricultural firms and companies extracting minerals; businesses that changed legal form or activity; and relocated firms were excluded. The main themes covered by the survey questions include firm and owner characteristics; finance and investment; bottlenecks; strategy and goals; market and environment; and realization and expectations. Approximately 12,000 firms were approached by telephone to participate in the survey, of which about 3,000 were interested. These firms received a questionnaire by mail. A total of 1938 questionnaires was returned.

The present study uses a sub-sample of 1247 Dutch entrepreneurs (either owners or owner-managers), of whom 915 are male and 332 are female. This sub-sample includes all observations for which information is available for the variables included in the study. The sample characteristics for the sub-sample and for the total sample of 1938 entrepreneurs are practically identical. The female start-up percentage is 27 percent both in the total sample and sub-sample. This is a representative
figure of women starting up firms during the 1990s in the Netherlands. Information is used on the number of hours worked, and the characteristics of the business and the owner(-manager). Because firms were also followed in the subsequent year (1995), information on time allocation and profits one year after start-up is also available.

Next to the factors discussed in the previous section, determining preferences and productivity, in the empirical analysis a number of controls is included. For the explanation of preference for work time the number of employees (as a measure of firm size) and firm sector are included in the analysis. Although the present study focuses upon firm start-ups characterized by no or relatively few employees, it may be argued that in firms with employees the entrepreneur is able to delegate some tasks and responsibilities (Churchill and Lewis, 1983; Cooper et al., 1997).

For the explanation of the productivity of work time the following controls are included: firm size, sector, type of firm, innovation and outsourcing. Although this study focuses on new ventures, in larger start-ups there may be more room for specialization. Service firms are expected to be more labor intensive and characterized by a lower productivity per time unit than manufacturing or production firms. We also take into account the firm status, i.e., whether a business is started from scratch (de novo), a restarted firm or take-over. Firms characterized by a high degree of innovation may be more productive than firms that do not pursue product innovation. Finally, outsourcing may influence productivity as it can be expected that an entrepreneur contracts out those activities that are most time-consuming, with which (s)he has little experience or that do not belong to the core business. In this context outsourcing may lead to a higher productivity per time unit.

Table 1 presents the variables (i.e., dependent; other time-consuming activities; independent variables and controls) included in the present study. In addition to variable descriptions, means and standard deviations are presented. The number of hours work per week \( n \) is categorized from 1 to 7. The maximum number of hours available per week is assumed to be 100 corresponding to a category code of 10. Hence, we fix \( N \) at 10 in the nonlinear regression analysis. The Hours variable has an
average of 3.95, indicating an average number of working hours of about 40 hours a week. The mean value for the Hours variable for female and male entrepreneurs is 3.31 and 4.18, respectively. Hence, on average, we see that men work longer hours than women do.

DISCUSSION OF RESULTS

In Table 2 we present the results of the linear regression analysis, explaining the number of working hours in the firm, and the nonlinear regression analysis, distinguishing between the preference for work time in the firm (\(\alpha\)) and the productivity of time use (\(\gamma\)). The average value of the estimated \(\alpha_i\) and \(\gamma_i\) is 0.37 and 1.44, respectively. The \(\alpha_i\) and \(\gamma_i\) are linear functions of the respective sets of exogenous variables, allowing for testing the hypotheses.

Number of working hours

From the linear regression results in the first column of Table 2 we see that several factors influence the number of working hours in the firm. The (other) time-consuming activities OtherJob and Schooling have a negative effect on the number of hours invested in the firm. In addition, there is some evidence that family responsibilities (FamilyCare) absorb time otherwise invested in the firm. The weak effect of FamilyCare may be explained by the fact that family responsibilities can also come at
the expense of leisure time (instead of work time). The activity OtherFirm does not seem to influence the number of working hours²⁰.

The availability of other income (OtherIncome) negatively influences the number of working hours in the firm. Industry experience (INDexperience), familiarity with earlier activities (Similarity), the amount of start-up capital (StartCapital), networking with other entrepreneurs (Contacts), whether the firm is a take-over, restarted or newly started firm (FirmStatus) and outsourcing of business activities (Outsourcing) all have a positive effect on the number of working hours in the firm. People who are risk averse invest less hours in the business and service firms are also characterized by lower time investments. Even when controlled for side-activities, gender appears to have a negative effect on time invested in the business (i.e., there is a negative direct effect). Women invest less time in the business than men.

Firm size (as measured by the variable Employees) does not influence the number of hours invested in the business. In subsequent sections, dealing with the outcomes of the nonlinear model, we will see, in fact, that firm size has a negative effect on preferences and a positive effect on productivity, explaining the absence of an (overall) effect on the number of working hours. This finding underlines the importance of discriminating between preference and productivity effects when studying time allocation decisions.

Preference for work time

Because the linear analysis does not provide information on whether the influences are preference-or productivity-related, we perform a nonlinear regression analysis testing the hypotheses as presented earlier. From the nonlinear regression results in Table 2 (nonlinear model A) we see that the preference for work time versus other time consumption is determined by several variables. The availability of other income (OtherIncome) has a negative impact on the preference for work time. Hypothesis 1 is supported. It may be argued that the more an entrepreneur is dependent upon the
financial revenues from the firm for subsistence, the higher the preference for investing time in the business.

As hypothesized we find that gender of the entrepreneur does not have a separate effect on the preference for work time. Hypothesis 2 is supported. There is no significant effect of age and having a partner on the preference for work time. Hypotheses 3 and 4 are not supported. In line with Hypothesis 5 we find that people who are risk averse have a lower preference for work time. From Table 2 we see that the number of employees has a negative effect on the preference for work time. It appears that entrepreneurs hire more employees to be able to delegate some tasks and responsibilities and, accordingly, work fewer hours.

**Productivity of work time**

The productivity of work time is explained by human, social and financial capital factors. We find that the level of industry experience of an entrepreneur (INDexperience), the degree to which current activities are related to past work (Similarity), the amount of start-up capital (StartCapital) and contacts with other entrepreneurs (Contacts) all have a positive effect on productivity. Hypotheses 10 to 13 are supported. As proposed in Hypothesis 7 we do not find a separate effect of the gender of the entrepreneur on the productivity of work time. No support is found for effects of Education (Hypothesis 6), Age (Hypothesis 8), and ENTexperience (Hypothesis 9). Moreover, we find that a take-over is characterized by a higher productivity per time unit than firms that are restarted or started from scratch; we find that firms that contract out activities are characterized by a higher productivity than firms that do not engage in outsourcing; and that firms with more employees are characterized by a higher productivity than firms with fewer employees. It seems that more employees enables delegation of activities to those employees who are best qualified for the job.

**Profitability**
The proposed nonlinear model assumes that entrepreneurs are aware of the (degree of) influence of the various factors on their productivity (Carree and Verheul, 2004). The outcomes of the nonlinear model with respect to productivity can be compared to the actual impact. We perform a regression analysis using data on profits one year after start-up (in 1995). Basis for this analysis is the profit equation, \( \ln(\pi) = \delta + \gamma \ln(n) \), as proposed earlier in this study. We test for the influence of all factors – that are included in the nonlinear regression analysis explaining productivity (gamma) – on profits in 1995. Use is made of 548 observations and the number of hours is measured in 1995. Since only a subset of the entrepreneurs answered the profit question one year later, there may be some sample bias. Hence, the results should be interpreted as the relationship between hours and profits in 1995 for surviving firms. Table 2 also includes the nonlinear regression results for this subset of entrepreneurs (nonlinear model B). The results of both nonlinear models are largely equivalent.

The final column in Table 2 presents the results of the profit model, reporting the components of \( \gamma \) in the profit equation. Comparing the outcomes of the nonlinear model (i.e., nonlinear model A) – estimating expectations of profits – with those of the profit equation – estimating actual profits – we see that expectations are not completely fulfilled. Although some factors have a relatively similar impact in both models, we see a difference for others. More specifically, we find that whereas industry experience, contacts with other entrepreneurs and outsourcing have impact in the nonlinear model, their effects disappear for the profit equation. The absence of an effect of industry experience for the profit equation may be attributed to an overestimation of the capacities by entrepreneurs with industry experience, running the risk of being overconfident and not adequately adapting to industry developments. Also, whereas entrepreneurs expect their contacts with other entrepreneurs to be of value, in reality the revenues of networking seem to be negligible. Finally, although entrepreneurs may think that outsourcing is efficient as it enables them to concentrate on the core business, outsourcing also tends to be relatively expensive negatively affecting profits.
On the other hand, we see effects appear in the profit equation that were not present in the nonlinear analysis. The negative effect of Innovation may be related to a high chance of failure of new ideas or a longer time lag than one year between the introduction of an innovation and profitability. Indeed, Timmons (1986) argues that a high failure rate for innovations is rule rather than exception. Including the variables Gender and Services on both the preference and productivity side in the nonlinear model leads to competition between preference and productivity effects, which may explain why the effect of gender and firm sector are negligible in the nonlinear model but turn up in the profit equation. Moreover, the negative gender effect in the profit equation may reflect a difference in ambitions of female and male entrepreneurs, where women are more likely to value quality and pursue other goals that are not directly related to financial performance (Brush, 1992; Rosa et al., 1996; Verheul et al., 2002). Gender effects are further discussed in the subsequent section.

**Gender effects**

We have seen that on average women work fewer hours than men do. The mean value for the Hours variable is 3.31 for women and 4.18 for men (see Table 1). We have also computed average values for women and men for the preference for work time (alpha) and the productivity of work time (gamma). We find that – on average – the preference for work time is similar for women and men (i.e., the average value for $\alpha$ is 0.37 for men and 0.35 for women), and that the productivity of work time is lower for women than for men (i.e., the average value for $\gamma$ is 1.18 for women and 1.53 for men). This is an indication that the lower time investments of women are due to a lower productivity rather than lower preferences.

To further investigate gender effects on time investments, we distinguish between different types of effects. In the linear analysis we tested for a direct effect of gender on time investments, next to a range of other explanatory variables and (other) time-consuming activities. It is striking to see that, even after controlling for other relevant factors, the linear regression results in Table 2 show that
women invest less of their time in the business than men, i.e., there is a negative direct effect of gender of the entrepreneur on the number of hours invested in the business. Direct effects may however be considered residual effects that result because of omitted factors relating to both gender and time investments. Hence, gender may serve as a proxy for the effect of some other underlying factor not included in the analysis. As discussed earlier, a difference in ambitions may be underlying the negative direct gender effect found in the linear analysis.

The nonlinear regression analysis investigates indirect effects of gender on time investments through either preferences or productivity (see Table 2). Hence, can we explain the lower time investments of women in terms of lower preferences or productivity? In conformity with our hypotheses we find that gender has no effect on preferences or productivity. However, the absence of a gender effect may be due to competition between preference and productivity effects (through including the variable Gender on both the preference and productivity side of the nonlinear model). Although not significant we do see that the effect of gender on productivity is larger than that on preferences, suggesting an indirect effect of gender on time investments through productivity rather than through preferences. This would be in accordance with the lower average value of gamma ($\gamma$) for women.

The effect of gender on preferences and productivity is at least to some extent (i.e., partially) mediated by other explanatory variables. We find evidence for mediation effects for both the preference for and the productivity of work time. In the last two columns of Table 1 we have presented the mean values for the (other) explanatory variables for both female and male entrepreneurs. On the basis of comparing these mean values for women and men and using chi-square statistics, we find that – as compared to male entrepreneurs – female entrepreneurs on average are more likely to have other income available, are more risk averse and have smaller firms, while these factors all have a negative impact on the preference for work time. Also, we find that women have less industry experience; their current activities are less likely to be related to past activities; they invest smaller amounts of capital in
the venture; and have less contact with other entrepreneurs, whereas these factors all positively influence the productivity of work time. Hence, the relationship between gender and productivity of work time is mediated by these factors.

To conclude: on average women are characterized by a lower productivity of work time as compared to men, and the relationship between gender and productivity is mediated by several other variables. Women appear to invest less time in the business than men do due to a lower productivity of work time which – in turn – can be explained by a smaller firm size and lower levels of human, social and financial capital.

SUMMARY AND CONCLUSION

Time is an important resource for entrepreneurs in new ventures. There have been few studies – in labor economics or entrepreneurship – investigating time allocation decisions of the self-employed (distinguishing between time invested in the firm and time spend on activities outside the firm). In the present study we make use of a time allocation model, distinguishing between preference and productivity effects, to explain the number of working hours in new ventures of female and male entrepreneurs. The purpose of using this nonlinear approach is to provide insight into underlying effects and factors, information which would not have become available through applying a simple linear analysis.

We find that individuals have a lower preference for work time in the firm if they have other income available; if they are more risk averse; and if they run larger firms. Productivity of time invested in the firm is positively related to industry experience; past experience with related activities; the amount capital invested in the new venture; networking with other entrepreneurs; and firm characteristics, such as firm size, type of firm (i.e., start-up, restarted firm or take-over) and outsourcing.
The present study finds evidence for several gender effects (i.e., direct, indirect, mediation). On average women invest fewer hours in the firm than men do. Also, in the linear analysis we find a negative direct gender effect on working hours, i.e., when controlled for other factors, women work fewer hours than men do. This effect may be a residual effect attributable to omitted variables (such as ambitions, goals). As hypothesized the nonlinear analysis shows an absence of gender effects on preferences or productivity. This finding suggests there is no indirect effect of gender through preferences and productivity on time investments. Instead, the relationship between gender and both preferences and productivity is (partially) mediated by other explanatory factors (e.g. human, social and financial capital, firm size). Combining these findings we conclude that the lower time investments of women can be explained by a lower productivity of work time, which can be attributed to that fact that women have lower levels of human, social and financial capital, and also run smaller firms.

Our data allow for a test whether the outcomes of the time allocation model with respect to productivity correspond with those of the estimation of actual profits one year after start-up. The expectations of entrepreneurs about the factors that influence their productivity do not completely coincide with their actual impact on profits. Influences on the actual level of profits indicate that the most important factors explaining profits include the amount of start-up capital, firm size, (service) sector, innovation and the type of firm. Although in the nonlinear model there is no effect of gender on productivity, we do find a negative gender effect in the profit equation. This divergence in results between the nonlinear time allocation model and the profit model may be the result of competing preference and productivity effects for gender. Incorporating explanatory variables on both the preference and productivity side may lead to insignificant effects. This is a limitation of the nonlinear model approach. However, differences between the time allocation and profit model may also be explained by overestimation and/or overconfidence (e.g. for outsourcing, innovation, industry experience) or a longer time lag between hours invested and profitability.
From a practitioners standpoint it is important to understand why female entrepreneurs invest less time in the new venture. Indeed, the part-time nature of female entrepreneurship witnessed around the world has important implications for the growth and (future) size of the firms run by women and, accordingly, their contribution to (regional) economic growth. By distinguishing between different types of gender effects, the present study provides guidelines for policy makers to stimulate a higher time commitment of women to their firms. The discrimination between preference and productivity effects allows researchers and policy makers to identify whether a more full-time participation of female entrepreneurs should be stimulated by way of promoting the preference of women to invest (more) time in the business or through enhancing the productivity of time invested in female-led firms.

Our analysis suggests that women invest less time in the business than men due to a lower productivity per time unit rather than to a lower preference for work time in the firm. Hence, (local) policy makers should aim at stimulating productivity of time use rather than the preference of women to invest time in the firm. More specifically, they should find ways to increase their human, social and financial capital levels (as these appear to explain the relatively low productivity of work time of female entrepreneurs). This can be done by acknowledging the importance of industry experience for new venture creation and enhancing the industry experience of women, advising them to acquire experience as a wage-employer in a similar sector, or providing relevant industry information to them. Women may also be stimulated to take part in networks where they are able to absorb relevant knowledge and learn from the experiences of established successful entrepreneurs. Finally, the negative direct effect of gender on time investments suggests the need to further investigate underlying mechanisms of this effect, i.e., which factors – related to both time investments and gender – explain this effect? Are these factors, preventing women from devoting more time to entrepreneurship, embedded in socio-economic structures (e.g., persisting traditional gender roles within the labor market and the household) or can they be easily affected by government policy?
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FIGURES AND TABLES

Figure 1: Graphic presentation of the model

- Factors influencing preferences
- Factors influencing productivity
- Time investments
- Other time-consuming activities
- Preference for work time
- Productivity of work time
- Gender
| Variable name | Variable description | Mean | Stdev | Mean (female) | Mean (male) |
|---------------|----------------------|------|-------|--------------|-------------|
| Dependent     |                      |      |       |              |             |
| Hours         | Number of hours invested in the firm in 1994 [1=<10; 2=10-19; 3=20-29; 4=30-39; 5=40-49; 6=50-60; 7=>60] | 3.95 | 2.05  | 3.31         | 4.18        |
| Other time-consuming activities |                      |      |       |              |             |
| OtherIncome   | Do you or your partner have other sources of income? [0=no; 1=yes] | 0.74 | 0.44  | 0.84         | 0.70        |
| OtherJob      | Do you have another (wage) job besides running the business? [0=no; 1=yes] | 0.27 | 0.44  | 0.26         | 0.27        |
| OtherFirm     | Do you run another firm besides running the business? [0=no; 1=yes] | 0.04 | 0.19  | 0.03         | 0.04        |
| FamilyCare    | Do you have family responsibilities besides running the business? [0=no; 1=yes] | 0.10 | 0.30  | 0.29         | 0.03        |
| Schooling     | Do you take schooling besides running the business? [0=no; 1=yes] | 0.06 | 0.24  | 0.10         | 0.05        |
| Independent variables |                      |      |       |              |             |
| Gender        | Are you male or female? [0=Male and 1=female] | 0.27 | 0.44  | 1            | 0           |
| Age           | Age in categories [1=<20; 2=20-24; 3=25-29; 4=30-34; 5=35-39; 6=40-44; 7=45-49; 8=50-54; 9=55-59; 10=>60] | 4.69 | 1.80  | 4.49         | 4.76        |
| Partner       | Do you have a partner? [0=no partner; 1=partner] | 0.81 | 0.39  | 0.85         | 0.80        |
| Risk attitude | To what extent do you like to take risk [1={very high} to 5 {very low}] | 2.21 | 0.80  | 2.31         | 2.17        |
| Education     | What is your highest level of education? [1=average secondary education; 2=higher secondary education; 3=low-level vocational training; 4=Leerlingstelsel*; 5=mid-level vocational training; 6=high-level vocational training, 7=university] | 4.34 | 1.85  | 4.30         | 4.36        |
| ENTexperience | Did you run a business prior to the start-up of this firm? [0=no; 1=yes] | 0.07 | 0.25  | 0.04         | 0.07        |
| INSexperience | What is the degree of industry experience you have? [1 {very weak} to 5 {very strong}] | 3.88 | 0.94  | 3.76         | 3.92        |
| Similarity    | Are your current activities related to past work? [1 {no} to 3 {almost identical}] | 2.02 | 0.77  | 1.84         | 2.08        |
| StartCapital  | What is the total amount of start-up capital? [1=<fl.10.000; 2=fl.10.000-fl.25.000; 3=fl.25.000-fl.50.000; 4=fl.50.000-fl.100.000; 5=fl.100.000-fl.250.000; 6=fl.250.000-fl.500.000; 7=>fl.500.000]** | 2.16 | 1.45  | 1.87         | 2.26        |
| Contacts      | Do you have contacts with other entrepreneurs beyond regular business contacts in networks? [1 {never} to 3 {regularly}] | 1.58 | 0.71  | 1.50         | 1.61        |
| Controls      |                      |      |       |              |             |
| Employees     | How many employees do you have in 1994?*** | 0.35 | 1.56  | 0.16         | 0.42        |
| Service       | Do you run a service firm? [0=no; 1=yes] | 0.50 | 0.50  | 0.56         | 0.47        |
| FirmStatus    | What is your firm’s status? [1=new firm; 2=restart existing firm; 3=take-over] | 1.25 | 0.63  | 1.23         | 1.25        |
| Outsourcing   | Are certain activities within the firm contracted out? [0=no; 1=yes] | 0.45 | 0.50  | 0.41         | 0.46        |
| Innovation    | Are your products/services based upon new technology that has not been used until 3 years ago? [1 {practically not} to 4 {almost completely}] | 1.54 | 0.87  | 1.41         | 1.58        |

* In the ‘Leerlingstelsel’ students go to school for 1 day a week and work during the rest of the week (that is, a minimum of 20 hours); ** StartCapital is measured in Dutch guilders (florin). One guilder is equal to 0.45 Euro; *** The number of employees is measured in terms employees that work fulltime, that is, more than 32 hours per week.
Table 2: Linear and nonlinear regression results explaining working hours

| Variables         | Linear model | Nonlinear model A | Nonlinear model B | Profit |
|-------------------|--------------|-------------------|-------------------|--------|
|                   | Preference   | Productivity      | Preference        | Productivity |        |
| Constant          | 3.064***     | 0.5               | -0.068            | 0.5     | -0.083 | -0.231 |
| OtherIncome       | -0.634***    | -0.063***         |                   | .       |        |        |
| OtherIncome       | -0.634***    | -0.063***         |                   | .       |        |        |
| Gender            | -0.407***    | -0.011            | -1.148            | 0.003   | -0.433* | -0.325*** |
| Age               | -0.002       | -0.006            | 0.014             | -0.018**| -0.049 | 0.013  |
| Gender            | -0.407***    | -0.011            | -1.148            | 0.003   | -0.433* | -0.325*** |
| Age               | -0.002       | -0.006            | 0.014             | -0.018**| -0.049 | 0.013  |
| Age sq            | -0.007       |                   | -0.002            |        |        |        |
| Gender            | -0.407***    | -0.011            | -1.148            | 0.003   | -0.433* | -0.325*** |
| Partner           | 0.123        | 0.013             |                   | 0.017   |        |        |
| Risk attitude     | -0.181***    | -0.017***         |                   | -0.024***|        |        |
| Employees         | 0.016        |                   | -0.012***         | 0.269***| -0.011***| 0.326* | 0.044** |
| Employees         | 0.016        |                   | -0.012***         | 0.269***| -0.011***| 0.326* | 0.044** |
| Services          | -0.492***    | -0.045            | -0.0005           | -0.056* | 0.159  | 0.205** |
| Innovation        | 0.010        | 0.003             |                   |         |        |        |
| FirmStatus        | 0.366***     | 0.275***          |                   | 0.462***| 0.212*** |
| Outsourcing       | 0.415***     |                   | 0.230***          |         |        |        |
| Employees         | 0.415***     |                   | 0.230***          |         |        |        |
| Education         | 0.040        | 0.019             |                   | -0.000  | 0.041* |
| ENTexperience     | 0.185        | 0.111             |                   | -0.029  | -0.198 |
| INDexperience     | 0.148***     | 0.057**           |                   | 0.028   | 0.058 |
| Similarity        | 0.173***     | 0.087**           |                   | 0.109   | 0.105* |
| StartCapital      | 0.281***     | 0.178***          |                   | 0.257***| 0.061** |
| Contacts          | 0.148**      | 0.078***          |                   | 0.096   | 0.024 |
| OtherJob          | -1.273***    | -1.235***         |                   | -1.172***|        |        |
| OtherFirm         | -0.276       | -0.343            |                   | -0.639  |        |        |
| FamilyCare        | -0.316*      | -0.282*           |                   | 0.242   |        |        |
| Schooling         | -0.706***    | -0.718***         |                   | -1.233***|        |        |
| N                 | 1247         | 1247              | 544               | 548     |        |
| R²                | 0.448        | 0.458             | 0.500             | 0.297   |        |

The dependent variable is Hours for the (non)linear models and the logarithm of reported profit in 1995 for the profit model (final column). Unstandardized coefficients are presented. *, ** and *** represent significance at the 0.10, 0.05 and 0.01 levels, respectively (two-sided test). To ensure identification of the nonlinear regression equation, we fix $\alpha_0$ at 0.5. Altering this value does not substantially affect the results.
The parameter $\gamma$ is the hours-elasticity of expected profit and can be interpreted as productivity parameter (Carree and Verheul, 2004).

11. However, studies by Westhead and Wright (1998) and Metzger (2006) show that entrepreneurial experience only has a small or no impact on firm performance.

12. We assume that the search for financial capital and the decision to invest a certain amount of capital in the new venture precedes the time allocation decision (that is, how many hours an entrepreneur invests in the business). However, the size of the start-up capital may to some extent be endogenous in the determination of the number of working hours. It is difficult to correct for this within the context of our nonlinear framework.

13. In this context Davidsson and Honig (2003) refer to bridging social capital based on weak ties. For a discussion of the importance of weak ties in obtaining resources we refer to Granovetter (1973).

14. More detailed information on this survey can be found in van Uxmin and Bais (1996). See also the publication by Gibcus et al. (2006) using the same data set.

15. In 1995 the participants were approached again and a total of 1,007 competed questionnaires was returned, with a response rate of about 58 percent.

16. Crépon et al. (1998) and Klomp and van Leeuwen (2001) show that the share of sales accounted for by innovative products is positively related to productivity.

17. Although it has been argued that firms that engage in outsourcing achieve cost advantages as compared to vertically integrated firms, the empirical evidence is limited (Gilley and Rasheed, 2000).

18. See Bettis et al. (1992), D’Aveni and Ravenscraft (1994), Kotabe (1989), Lei and Hitt (1995) and Quinn (1992).

19. Note that nonlinear model A is based upon 1247 observations and model B on 544 observations (which is the sub-set of observations used in the profit model (presented in the final column).

20. Entrepreneurs with more than one firm may already have taken these additional hours into account when answering the question of how many hours they invest in the business.

21. One year after start-up entrepreneurs were asked about their profit. Positive profits are registered as a categorical variable, consisting of nine categories (i.e., fl.0-10.000; fl.10.000-25.000; fl.25.000-50.000, etc.). We use the mid-point of these classes (i.e., fl.5.000; fl.17.500; fl.37.500, etc.) as an estimate for profit. For entrepreneurs who reported neither profits nor losses, a value of fl.2.500 is used. Entrepreneurs who reported a loss are not incorporated in the data set. According to long-run expectations negative profits can not persist since entrepreneurs would never have started a firm if this were the case. fl. (florin) denotes the Dutch guilder which was equivalent to about 0.45 Euro in the late 1990s.

22. The number of observations in nonlinear model B is 544 instead of 548 because four observations did not have information available on other time-consuming activities.

23. The main exception for the preference side is the effect of age which is now significantly negative. The main exceptions for productivity are the effects of gender (which is significantly negative); industry experience;
similarity of activities and contacts with other entrepreneurs (which are no longer significant). Finally, family
care does not have a significant impact in nonlinear model B.
24 Astebro (2003) also finds that the return to inventions is relatively low (with a median realized return of minus
seven percent), possibly due to inventors being overly optimistic.
25 Note that the results for the subset of 544 entrepreneurs (nonlinear model B) show a significantly negative
gender effect on productivity (at the 10 percent level).
26 See Verheul (2005).
27 Note that in our model we control for the influence of family responsibilities on the time investments of women.
We investigate the determinants of ‘net’ time female and male entrepreneurs invest in their firms, i.e., taking to
account other time-consuming activities.