

Job Creation by the Self-employed: The Roles of Entrepreneurial and Financial Capital*

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ABSTRACT. The paper reports micro-econometric evidence on the factors that influence the ability of the small businesses to create employment. It uses data on self-employment from a British panel survey. In particular it investigates the contributions of financial and entrepreneurial capital to job creation. Housing wealth appears to be significantly associated with small business job creation. It appears to act as an important source of financial collateral. The parental background of the small business owner is also significantly associated with job creation. Successful entrepreneurs are more likely to have had self-employed parents, and in particular parents who employed others. Educational attainment, in particular at degree level, is also important. The preferred model incorporates individual random effects and the significance of these suggests the importance of unobserved latent entrepreneurial ability.

1. Introduction

The transition into self-employment, when successful, can lead on to small and medium sized business creation. What determines how successful the self-employed are in terms of their ability to create jobs for others? This paper uses recent British panel data for the period 1991–1999 to perform an investigation of this question.

There have been a number of recent cross-sectional micro studies of self-employment status and we will review the issues these raise shortly. However previous research on identifying the factors determining the ability of the self-employed to create jobs for others is limited. In fact the majority of the self-employed operate as sole-traders. The transition from sole-trader to employer of others may be a significant one. It involves substantial adjustment costs, notably in having to manage the payment of labour taxes and social insurance contributions, and in having to gain awareness of employment legislation. Nevertheless once that transition is made the self-employed may be an efficient engine for employment creation. Most governments operate a range of schemes to stimulate small business start-ups, and national and regional governments within Britain are no exception in this regard. Schemes that focus specifically on encouraging small businesses to make the transition from sole-trader to employer may be very effective in stimulating job creation.

The present paper focuses on a number of specific influences on self-employment. The first of these is the role of capital assets, particular housing wealth. Since the deregulation of housing finance in the 1980s this has played a growing role in providing financial collateral for small business start-ups in the UK. The second is the issue of parental background, and specifically the example set by parents of not only being self-employed but also an employer of others. In addition to these we also discuss the effects of a range of other demographic influences and local demand conditions.

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The data source used in the paper is the first nine waves of the British Household Panel Survey (BHPS), an ongoing survey of around 5,000 households containing around 5,000 economically active individuals. It covers the period 1991–1999. Section 2 sets out the context for the study. Section 3 discusses the self-employment data in the survey in further detail and describes the empirical approach we adopt. Section 4 presents estimates of a model of job creation by the self-employed. In particular our preferred estimates address the question of the impact of unobserved heterogeneity. Section 5 presents conclusions.

2. Influences on the self-employment activity

Research to date has pointed to four main themes of influence on the level of self-employment activity. The first theme focuses on exposure to entrepreneurial culture and attitudes to risk. In empirical work these are proxied by parental background, such as whether a parent was self-employed, or whether a parent was responsible for managing others (Taylor, 1996; Blanchflower and Oswald, 1998; Henley, 2004). Attitude to risk is very difficult to quantify. Some researchers have attempted to address this through the use of qualitative information on ability to accept anxiety (Blanchflower and Oswald, 1998).

The second theme concerns access to financial capital, encompassing the effects of capital constraints. Small or sole trader businesses generally rely on personal financial wealth, inherited wealth and real estate holdings as a direct source, or collateral for start-up and working capital. Housing wealth is a particularly common source of collateral.¹ Recent macroeconomic studies have established a strong relationship between the state of the housing market and inflows into self-employment (Black et al., 1996; Cowling and Mitchell, 1997). Henley (2004) finds a significant housing market influence in micro data. Housing collateral has a direct impact on the success of self-employment because it influences the default premium set by lending institutions (Black et al., 1996). The size of that premium might therefore depend on the current state of the housing market. Inheritance and windfall gain has been

found in a number of studies to exert a significant influence on self-employment activity (Holtz-Eakin et al., 1994; Lindh and Ohlsson, 1996; Blanchflower and Oswald, 1998; Burke et al., 2000, 2002; Taylor, 2001).

The third theme concerns human capital. Most studies observe some correlation between educational attainment and self-employment status. Accumulated human capital may be a fundamental determinant of success in self-employment, since it may determine non-windfall financial wealth (Cressy, 1996). However recent longitudinal analysis (using the same data source as the present paper) finds little or no evidence for education affecting self-employment survival rates, although some evidence that the length of previous labour market experience may be important (Taylor, 1999).

The fourth theme concerns whether movements in self-employment are driven largely by cyclical or secular factors. Clear predictions about the cyclicity of self-employment are problematic because, while an economic upturn may create increased demand for the goods and services provided by the self-employed, it may also increase the returns to employed alternatives. Furthermore the impact of short-run changes in economic activity on small business activity may be absorbed through changes in hours rather than numbers. However, recent evidence at the individual level suggests a high degree of structural, rather than cyclical, persistence in self-employment (Henley, 2004). Government policy towards self-employment, such as the UK's Enterprise Allowance scheme, may be motivated by the need to offer an alternative to unemployment for displaced employees. So self-employment activity may be counter-cyclical (Storey and Johnson, 1987; Evans and Leighton, 1989).

A key indicator of success in self-employment addressed in both time-series and cross-section work is the size of self-employed earnings relative to those which might otherwise be available from employment. Studies which use aggregated data typically find a strong association between economy-wide self-employment participation rates and the income differential. Cross-sectional micro studies typically estimate sample selectivity-corrected earnings functions for employed and self-employed sub-samples to investigate the conditional earnings differential between the two.² The self-employment-employment income

differential is difficult to measure accurately, because of the different ways in which business expenses are regarded for tax purposes, and because some self-employment income goes unrecorded by the self-employed as it represents informal economic activity. Evidence on job creation by the self-employed is limited to evidence from a British birth cohort study, examining employment by a sample of 33 year olds in self-employment in 1991 (Burke et al., 2000, 2002), and evidence from county-level panel data for Sweden from 1975 to 1995 (Folster, 2000). Both studies suggest that self-employment constitutes an effective vehicle for job creation, and that policies to support self-employment may be a cost-effective way of further job creation.

3. Data and modelling approach

3.1. The data source

The empirical analysis in the remainder of the paper makes use of Waves 1–9 of the BHPS,

covering the period 1991–1999. In contrast to previous work the present paper makes use of individual level data drawn from across the working age range. The BHPS tracks annually an initial stratified random sample of around 5,000 British households (resident south of the Caledonian Canal).³ All individuals within each household are sampled. Follow-on rules establish that all originally sampled household members are tracked, regardless of household formation and deformation. Additional individuals enter the sample if they join households containing members of the original sample.⁴ The panel element to the dataset also allows us to exploit time and cross-sectional variation in local demand conditions, to control for potential endogeneity problems between financial resources and self-employment performance, and to investigate the impact of unobserved heterogeneity on the determinants of job creation. The final row of Table I summarises the rate of self-employment for each of the nine waves.

TABLE I
Rates of self-employment and employment generation by the self-employed

Number of self-employed (percentage)	1991	1992	1993	1994	1995	1996	1997	1998	1999
Employing zero	472 (66.8)	473 (67.0)	461 (65.1)	459 (67.3)	459 (68.0)	463 (66.9)	431 (65.9)	425 (66.7)	413 (63.9)
Employing 1–2	90 (12.7)	103 (14.9)	112 (15.9)	99 (14.5)	86 (12.7)	105 (15.2)	106 (16.2)	97 (15.2)	106 (16.4)
Employing 3–9	84 (12.0)	81 (11.5)	78 (11.0)	66 (9.7)	76 (11.3)	74 (10.7)	61 (9.3)	61 (9.6)	62 (9.6)
Employing 10–24	31 (4.4)	26 (3.7)	27 (3.8)	31 (4.6)	27 (4.0)	21 (3.0)	23 (3.5)	24 (3.8)	22 (3.4)
Employing 25–49	7 (1.0)	11 (1.6)	10 (1.4)	13 (1.9)	4 (0.6)	7 (1.0)	10 (1.5)	7 (1.1)	8 (1.2)
Employing 50–99	3 (0.4)	3 (0.4)	2 (0.3)	3 (0.4)	7 (1.0)	5 (0.7)	4 (0.6)	3 (0.5)	0 (0.0)
Employing 100+	6 (0.9)	5 (0.7)	5 (0.7)	5 (0.7)	2 (0.3)	3 (0.4)	3 (0.5)	3 (0.5)	9 (1.4)
Data not available	13 (1.8)	4 (0.6)	13 (1.8)	6 (0.9)	14 (2.1)	14 (2.0)	16 (2.5)	17 (2.7)	26 (4.0)
Total self-employed	707	706	708	682	675	692	654	637	646
Total self-employed and employed	5,486	5,301	5,196	5,149	5,113	5,243	5,305	5,227	5,250
% Self-employed in total of employed and self-employed	12.9	13.3	13.6	13.2	13.2	13.2	12.3	12.2	12.3

Source: Computed from BHPS Waves 1–9.

Note: The numbers of self-employed include those who report both self-employment and employment. Data refer to sample individuals aged 18–65.

TABLE II
Transitions between employment categories for the self-employed

Year $t-1$	Year t						Total cases
	Employed	Self-employed, employing zero	Self-employed, employing 1–2	Self-employed, employing 3–9	Self-employed, employing 10–24	Self-employed, employing ≥ 25	
Employed	30,455 (98.3)	417 (1.4)	55 (0.2)	26 (0.08)	12 (0.04)	21 (0.07)	30,986 (100.0)
Self-employed employing zero	385 (12.9)	2389 (79.9)	155 (5.2)	47 (1.6)	10 (0.3)	5 (0.2)	2991 (100.0)
Self-employed employing 1–2	38 (5.4)	142 (20.1)	460 (65.2)	62 (8.8)	3 (0.4)	1 (0.1)	706 (100.0)
Self-employed employing 3–9	23 (4.5)	47 (9.2)	65 (12.8)	341 (67.0)	28 (5.5)	5 (1.0)	509 (100.0)
Self-employed employing 10–24	18 (9.9)	7 (3.9)	3 (1.7)	24 (13.2)	120 (65.9)	10 (5.5)	182 (100.0)
Self-employed employing ≥ 25	14 (12.5)	2 (1.8)	1 (0.9)	3 (2.7)	9 (8.0)	83 (74.1)	112 (100.0)
Total cases	30,933 (87.2)	3,004 (8.5)	739 (2.1)	503 (1.4)	182 (0.5)	125 (0.4)	35,486 (100.0)

Source: Calculated from BHPS Waves 1–9.

Note: Row percentages in brackets. Cases omitted where employment category is missing.

The self-employed form between 12.2 and 13.6 per cent of the sample of economically active individuals aged 18–65.⁵ There is a marginal increase in the proportion of those who are self-employed between 1993 and 1994 and a reduction thereafter. This is consistent with some counter-cyclicalities. The total of self-employed and employed reveals that there is net attrition over the duration of the panel. Attrition of the original 1991 sample members is mitigated by new individuals entering the sample under the panel follow-on rules. As with all household panel surveys, however, the representativeness of the sample diminishes over time.

Each wave of the BHPS asks each self-employed individual to report, as a grouped variable, the number of other people that they in turn employ (zero, 1–2, 3–9, 10–24, 25–49, 50–99 or 100+ employees). Table I also summarises this information for each wave. A very small number of the self-employed provide no response. In any year around two-thirds of the self-employed work as sole-traders, and employ no others. However a sizeable minority of the self-employed employ others, particularly within the 1–9 employees ranges. Only very small proportions of the self-employed in the sample employ significant numbers. How-

ever an important caveat to this conclusion is that as small businesses become larger they are more likely to become incorporated as limited companies. Consequently the owners of those businesses become less likely to report themselves as self-employed, and more likely to describe themselves as company directors. Any conclusions that the present study is able to draw about transitions between the higher employment size classes must be taken in the light of this.

3.2. Transition behaviour amongst the self-employed

Table II describes transition behaviour between employment and the various size classes of self-employment between a current and previous wave of the panel. Data are pooled across the eight available wave to wave transitions. The total pooled sample size is reduced from that available in Table I, because the transition analysis must focus on individuals who appear in the panel in two consequent waves. Size classes at or above 25 employees are amalgamated into a single category. Over 98 per cent of those in employment rather than self-employment in any year ($t - 1$) remain in employment in the

following year (t). Only 1.7 per cent in any year make a transition in self-employment. Of those the majority, 1.4 per cent, move from paid employment to sole-trader status (self-employment with zero employees). Of those who are sole-traders in any year ($t-1$) almost 80 per cent remain as sole-traders in the following year. Nearly 13 per cent quit self-employment in favour of paid employment. Only 7.3 per cent of sole-traders make the transition to becoming employers of others. Of these the majority (5.2 per cent) only employ 1 or 2 others. Transitions become more “disperse” amongst those who already employ others in year ($t-1$), with 65–67 per cent of those in the 1–2, 3–9 and 10–24 size categories remaining in the same category from one year to the next. However, most of the movements between categories are into adjacent size categories. So, for example, 20 per cent of those self-employed who employ 1 or 2 employees in year ($t-1$) revert to sole-trader status in the following year.

These transition data suggest an asymmetry in that the self-employed in the lower size categories appear more likely to reduce employment from one year to the next than to increase it. Given the very small numbers of the highest size category conclusions must be guarded. The data show that from those in the highest size category (25 or more employees) in year ($t-1$) nearly three-quarters remain in that category in year (t). However one eighth of these move from being self-employed and employing 25 or more into employment themselves. The data reveal that for eleven of these fourteen cases their subsequent occupation is reported as “general managers”. This seems consistent with a transition from self-employed owner-manager status to that of the manager (on their own behalf) of an incorporated business. Overall the data reveal that self-employment is precarious – almost 11 per cent of self-employed cases revert to employment the following year (478 sample observations from 4,500 ($t-1$) self-employment cases).

3.3. *Econometric modelling of self-employed size category*

For modelling purposes it is useful to assume that each of these i observations of self-employment in

year t represents a price-taking small business. We assume that each business has a production technology of the following form:

$$Y_{it} = Y(L_{it}, K_{it}, H_i), \quad i = 1, \dots, n, \\ t = 1991 - 1999, \quad (1)$$

where Y is output, L is the labour input measured in terms of the number of employees, K is capital and H is the (time-invariant) accumulated entrepreneurial or managerial capital of the small business owner. Assuming that there is no outside return available on entrepreneurial capital, the profit function for each small business is therefore:

$$\Pi_{it} = p_{it} Y(L_{it}, K_{it}, H_i) - r_t K_{it} - w_t L_{it}, \quad (2)$$

where r and w are the rental price of capital and wage rate, respectively. This implies a labour demand relationship that can be written in the following general form:⁶

$$L_{it} = L(K_{it}, H_i, w_t, r_t, p_{it}). \quad (3)$$

This forms the basis of an estimating equation. K_{it} is not directly observed but is proxied by the housing equity and monthly investment income of the business owner.⁷ H_i is captured by a range of variables for demographic factors, including the ethnic, occupational and parental background of the business owner. We do not directly observe w_t , r_t and p_{it} but capture shocks to these through time dummies and a local unemployment rate.

Proxy variables will only imperfectly capture the effect of managerial capital. Previous studies have demonstrated the importance of background and attitude to risk in determining the decision to become self-employed. So, it is likely that the self-employed have an “inherited” or acquired advantage over others in their potential ability to employ others. Those who are in employed occupations may not possess this advantage. Therefore an appropriate method is to model the labour demand of small businesses, conditional on self-employment status.

The fact that our measure of job creation is a grouped variable complicates matters somewhat. Under the assumption that the underlying variable is normally distributed a grouped dependent

variable estimator would be appropriate (Stewart, 1983; Bhat, 1994). However, in the present case the underlying variable is highly skewed and it is more appropriate to treat the modelling problem as one of an ordered choice.⁸

In order to exploit the panel element to our data we assume that the latent employment variable, L^* , is determined by a set of variables, X , according to the following random effects model:

$$L_{it}^* = X_{it}'\beta + \varepsilon_{it} + \sigma_u u_i. \quad (4)$$

L^* is an unobserved index of the ability to employ others. β are coefficients. u_i is the individual-specific error component, normalised here to be distributed as $N(0,1)$. σ_u is the standard deviation of u_i and will be estimated as an ancillary parameter. ε is the stochastic error term. The use of a random effects formulation allows the empirical model to control for unobserved heterogeneity amongst the self-employed in their ability to employ others. Because of the nature of our data source, instead of L^* we observe the categorical variable L where L_{it} takes a value j in the range $j = 0 \dots J$, so that:

$$\begin{aligned} L_{it} &= 0 && \text{if } L_{it}^* \leq 0 \\ &= 1 && \text{if } 0 < L_{it}^* \leq \mu_1 \\ &= 2 && \text{if } \mu_1 < L_{it}^* \leq \mu_2 \\ &\vdots \\ &= J && \text{if } \mu_{J-1} \leq L_{it}^*. \end{aligned}$$

Estimation of the model is by maximum likelihood and entails the estimation of $J-1$ threshold parameters, μ_j . Estimation was performed using LIMDEP version 8.0 (Econometric Software, Inc., 2002).⁹

The absence of continuous data on job creation by the self-employed in the BHPS might appear to be a serious disadvantage. However, the approach set out here allows the marginal effects of individual variables ($\partial(\Pr(L_{it} = j))/\partial X_{it}$) to vary over the job creation data range. This is because we estimate directly the threshold parameters, μ_j , rather than impose linearity across the choice range. In contrast to previously reported linear results (Burke et al., 2000, 2002), we can therefore

investigate whether a particular control variable has a greater marginal impact on the probability of making the transition from sole trader to small employer, than on the probability of, say, transition from small to medium-sized employer.

3.4. Model covariates

Table III lists the covariates which are incorporated into the econometric model for employment size category, as explained above. These include variables to proxy the scale of business capital available to each self-employed individual, to proxy entrepreneurial or managerial capital, as well as other appropriate demographic information and variables to capture the effects of shocks to the relevant price variables. The Table provides information on means and standard deviations for each variable for the self-employed with no employees ("sole-traders") and for the self-employed who have employees ("employers"). For comparison descriptive information is provided on each variable for adults in paid employment (the "employed") in the BHPS sample. The descriptive statistics are for the pooled sample of observations from 1992 (wave 2) to 1999 (wave 9). The sample is restricted to those cases where information on all the listed covariates is available (as well as employment size category dependent variable in the case of the self-employed). Column (5) of the Table provides the level of statistical significance for a t -test of the null hypothesis that the means of each variable are the same for the employed sample and the sole-trader sample. Column (8) provides the same information for a comparison of the means of the sole-trader sample and the employer sample. A full correlation matrix is also provided in Appendix A.

We turn to each group of covariates in turn. The self-employed samples have significantly higher levels of financial resources than the employed sample. Asset variables are expressed in 1995 prices and are lagged 1 year to eliminate possible endogeneity at the modelling stage. (This means, however, that the 1991 data must be lost from the estimation sample.) The sole trader sample has on average over £11,000 more housing equity than the employed. The employers

TABLE III
Descriptive statistics

	Employed		Self-employed, zero employees			Self-employed, non-zero employees		
	(1) Mean	(2) S.D.	(3) Mean	(4) S.D.	(5) H ₀ : (1) = (3)	(6) Mean	(7) S.D.	(8) H ₀ : (3) = (6)
Financial resources								
Housing equity $t - 1$ (£)	30,035	42,481	36,998	53,934	[0.000]	66,617	118,806	[0.000]
Annual investment income $t - 1$ (£)	323	1,147	630	2,211	[0.000]	1,080	3,256	[0.000]
Entrepreneurial capital								
Self-employed parent who had employees	0.142	0.349	0.214	0.411	[0.000]	0.281	0.450	[0.000]
	0.075	0.263	0.127	0.333	[0.000]	0.192	0.394	[0.000]
Human capital								
University or college degree	0.141	0.348	0.119	0.324	[0.003]	0.134	0.341	[0.197]
Other higher education	0.271	0.445	0.267	0.443	[0.707]	0.307	0.461	[0.015]
A-Levels	0.128	0.334	0.128	0.334	[0.964]	0.123	0.329	[0.687]
O-Levels/GCSEs	0.220	0.414	0.204	0.403	[0.079]	0.212	0.409	[0.591]
No qualifications	0.240	0.427	0.281	0.450	[0.000]	0.223	0.416	[0.000]
Completed apprenticeship	0.013	0.113	0.036	0.188	[0.000]	0.035	0.184	[0.804]
Demand influences								
Local unemployment rate (%)	6.765	2.913	6.642	2.830	[0.045]	6.762	2.924	[0.244]
Demographics								
Age	38.7	10.9	42.3	11.0	[0.000]	44.5	9.7	[0.000]
Age squared	1,618.6	880.2	1,907.5	951.0	[0.000]	2,075.6	852.1	[0.000]
Female	0.509	0.500	0.263	0.441	[0.000]	0.269	0.444	[0.716]
Ethnic minority	0.028	0.164	0.034	0.180	[0.100]	0.039	0.193	[0.437]
ILO occupation groups								
Professional/managerial	0.276	0.447	0.325	0.468	[0.000]	0.700	0.458	[0.000]
Technical and associate professional	0.133	0.340	0.123	0.328	[0.149]	0.053	0.224	[0.000]
Clerks	0.190	0.392	0.032	0.176	[0.000]	0.010	0.098	[0.000]
Service, shop and market sales workers	0.146	0.353	0.081	0.273	[0.000]	0.032	0.175	[0.000]
Craft and related skilled	0.091	0.288	0.216	0.412	[0.000]	0.100	0.300	[0.000]
Plant and machine operatives and assemblers	0.075	0.263	0.078	0.269	[0.565]	0.029	0.168	[0.000]
Elementary occupations	0.089	0.284	0.145	0.352	[0.000]	0.077	0.266	[0.000]
Standard Industrial Classification	0.028	0.166	0.265	0.441	[0.000]	0.139	0.346	[0.000]
Construction	0.176	0.381	0.135	0.341	[0.000]	0.347	0.476	[0.000]
Distributive, hotels, restaurants	0.062	0.241	0.074	0.261	[0.020]	0.031	0.173	[0.000]
Transport and communications	0.137	0.344	0.167	0.373	[0.000]	0.188	0.391	[0.125]
Banking, finance, insurance	0.347	0.476	0.244	0.430	[0.000]	0.185	0.388	[0.000]
Other services	0.250	0.433	0.116	0.320	[0.000]	0.110	0.313	[0.625]
Extractive/manufacturing								
Region								
London	0.102	0.302	0.135	0.342	[0.000]	0.086	0.281	[0.000]
South East outside London	0.197	0.398	0.212	0.409	[0.087]	0.243	0.429	[0.040]
South West	0.087	0.281	0.094	0.292	[0.216]	0.093	0.291	[0.942]
East Anglia	0.040	0.196	0.049	0.216	[0.037]	0.063	0.244	[0.074]
East Midlands	0.082	0.275	0.109	0.312	[0.000]	0.086	0.281	[0.037]
West Midlands	0.088	0.284	0.074	0.262	[0.017]	0.082	0.274	[0.423]
North West	0.108	0.311	0.078	0.268	[0.000]	0.106	0.309	[0.005]
Yorkshire and Humberside	0.093	0.290	0.094	0.291	[0.844]	0.076	0.265	[0.072]
North	0.068	0.252	0.035	0.183	[0.000]	0.045	0.207	[0.143]
Wales	0.046	0.209	0.034	0.182	[0.011]	0.060	0.237	[0.001]
Scotland	0.088	0.284	0.086	0.280	[0.650]	0.060	0.237	[0.007]
Part-time self-employed	—	—	0.062	0.241	—	0.024	0.152	[0.000]
Cases		25,911			2,415			1,137

sample has over £24,000 more than the employed. These differences are statistically significant. The same conclusion holds in the case of investment income. Sole-traders have on average nearly twice the level of annual investment income of the employed. The employers in turn have on average more than £500 more than sole-traders. This strongly suggests that the size of a small business is associated positively with financial wealth and with access to collateral in the form of housing wealth.

We proxy what we have termed “entrepreneurial capital” with indicators of parental background. Fourteen per cent of the employed sample had, at the age of 14, a parent who was self-employed. For sole-traders this proportion rises to over 21 per cent and for employers to over 28 per cent. Around half of those parents (7.5 per cent) in the case of the employed were also employers of others. This proportion rises to nearly three-fifths (12.7 per cent) for the sole-traders, and to over two-thirds (19.2 per cent) for the employers. These differences are all statistically significant.

Human capital levels are captured through binary educational attainment variables. These indicate the highest level of academic attainment of each sample respondent. Self-employed sole-traders are significantly less likely to have achieved university or college graduation than the employed (11.9 and 14.1 per cent, respectively). 13.4 of employers are graduates, but this proportion is not significantly different from that for sole-traders. Similarly there is no significant difference in the proportion of employers whose highest attainment was at A-level (age 18 school examination) standard or O-level/GCSE (age 16 school examination) standard compared to sole-traders.¹⁰ However employers are significantly less likely to have none of these qualifications than sole-traders (22.3 per cent compared to 28.1 per cent). Sole-traders in turn are significantly more likely to have no qualifications than employers (28.1 per cent compared to 24.0 per cent). The main difference in educational attainment between sole-traders and employers is that the latter are more likely to have other higher educational qualifications. These qualifications are typically vocational in nature, and obtained in higher education colleges and in former poly-

technic colleges. 30.7 per cent of employers have these qualifications, compared to 26.7 and 27.1 percent of sole-traders and the employed respectively. One further important indicator of human capital is the completion of a vocational apprenticeship. (This is not mutually exclusive of the other indicators of educational attainment.) Research has suggested that apprenticeship training is allied to the acquisition of a broad set of (possibly transferable) skills (Gospel, 1998) and these may encourage entrepreneurship. Although the numbers with completed apprenticeships are low in the sample as a whole, the self-employed (both sole-traders and employers) are nearly three times as likely to have completed one as the employed.

Demand influences on the ability of the self-employed to employ others are captured in the model by a county- and year-specific local unemployment rate. The self-employed in the sample are more concentrated in areas of lower unemployment than the employed. There is no significant difference between sole-traders and employers in the local unemployment rates of their areas of residence.

There are a number of significant demographic differences between the three groups. Firstly sole-traders are on average significantly older than the employed (42.3 years compared to 38.7 years), and employers are in turn even older (44.5 years). The self-employed are also much less likely to be female. Only around a quarter of the sample of the self-employed are female, whereas for the employed the sample is almost equally divided between the sexes. However there is no significant difference between sole-traders and employers in the sample proportion who are women. *Prima facie* this suggests that women do not suffer a disadvantage in the transition from sole-trader to employer. Ethnic minority members form a higher proportion of the self-employed than the employed. However, the differences are not statistically significant.

Finally Table III reports summary information on the occupational, industrial and geographical breakdown of the three groups. Space precludes a full discussion of these categorisations. The occupational groups are broad mutually exclusive categories as defined by the ILO International Standard Classification of Occupations system.

There are a number of significant differences between the employed, sole-traders and employers. Employers are heavily concentrated in professional occupations (70 per cent), and under-represented in the lower “white-collar” and “blue-collar” groups of technical and associate professional occupations, clerks, service workers and plant and machine operatives. The self-employed in general, and employers in particular are under-represented among service and retailing occupations. Sole-traders have above average representation among craft and related skill occupations, and among elementary (“unskilled manual”) occupations. A six-way categorisation of industrial affiliation is used, defined from the UK Standard Industrial Classification. Sole-traders are more concentrated in the construction industry. Employers are more concentrated in the distributive, hotels and restaurants industry, and to a lesser degree in banking, finance and insurance. The regional categorisation used follows the eleven UK “standard” regions within the island of Great Britain. Employers are under-represented in London. This may be a consequence of labour market tightness in the capital city, indicating that small businesses find it more difficult to compete for labour. There are significantly more employers than sole-traders in the South East outside London, East Anglia, the North West and Wales. On the other hand employers are scarcer than sole-traders in the East Midlands, Yorkshire and Humberside and Scotland.

4. Empirical results

Equation (4) was estimated using the covariates described in the previous section. Results are reported in Table IV.¹¹ The estimation sample uses observations from Waves 2 to 9 of the BHPS. The responses to the three highest employment categories are amalgamated to provide a dependent variable with five ordered categories, and thus the model requires the estimation of three threshold parameters. Two sets of estimates are reported: column (1) reports the results of using an ordered probit estimator with no random effects; column (2) reports the same specification with random effects. Our preferred estimates include random effects. The com-

parison is provided in order to assess the extent to which particular covariates capture the impact of unobserved individual heterogeneity, and may not therefore reflect the “true” picture. The explicit inclusion of individual heterogeneity may affect any conclusions about the key determinants of small business employment generation.¹² In the preferred model the estimated standard deviation of the random effects is strongly statistically significantly different from zero, and the log-likelihood value is considerable higher than that of the model without random effects.

4.1. Coefficient estimates

Turning first to the impact of financial resources, we find a positive and statistically significant association between housing equity and employment generation. In fact failure to include random effects in the model appears to bias downwards the size of the estimated coefficient. The possession of housing wealth by the small business owner provides an important direct or indirect source of capital for business growth. The indirect effect would operate through the use of housing wealth as collateral for business finance. However, although significant in the specification without random effects, investment income is not a significant determinant of employment generation in the preferred specification. The insignificance of investment income may point to the conclusion that capital resources, such as housing, are more important as business collateral rather than as a direct source of finance, since if direct sources were important we would expect the self-employed with financial as well as housing wealth to be more likely to employ. Providers of small business finance are typically willing to secure funding on a fixed asset such as housing, but not to advance funds where no mortgage charge is possible.

For what we have termed “entrepreneurial” capital, the results shows that the background of having a self-employed parent is associated with a significantly increased propensity to employ others. In addition to this effect the propensity to employ others is further increased (according to the preferred model) if that parent was an employer of others. These results provide strong

TABLE IV
Employment generation by the self-employed: ordered probit maximum likelihood estimates

	(1) Employment category (Ordered probit)		(2) Employment category (Ordered probit with random effects)	
	Coefficient	Standard error	Coefficient	Standard error
Financial resources				
Housing equity/10000 $t-1$	0.023	0.003***	0.034	0.006***
Annual investment income/100 $t-1$	0.022	0.008**	-0.005	0.016
Entrepreneurial capital:				
Self-employed parent	0.153	0.077**	0.670	0.181***
who had employees	0.150	0.090*	0.682	0.218***
Human capital				
University or college degree	0.225	0.088***	1.270	0.198***
Other higher education	0.304	0.067***	0.570	0.149***
A-Levels	0.261	0.081***	0.685	0.199***
O-Levels/GCSEs	0.295	0.070***	0.242	0.151
(Reference: No qualifications)				
Completed apprenticeship	0.342	0.128***	0.288	0.371
Demand influences				
Local unemployment rate/100	8.029	1.452***	9.101	3.054***
Year (Reference: 1992)				
1993	0.060	0.085	0.152	0.153
1994	0.238	0.089***	0.426	0.150***
1995	0.249	0.094***	0.349	0.155***
1996	0.345	0.099***	0.408	0.175***
1997	0.509	0.114***	0.614	0.201***
1998	0.554	0.118***	0.583	0.230***
1999	0.598	0.122***	0.682	0.218***
> Demographics				
Age/100	11.944	1.697***	22.514	3.854***
(Age/100) squared	-13.686	1.937***	-23.553	4.313***
Female	-0.058	0.056	-0.311	0.130**
Ethnic minority	-0.299	0.121**	-0.127	0.357
ILO occupation groups				
Professional/managerial	0.663	0.083***	0.603	0.125***
Technical and associate professional	-0.311	0.112***	-0.173	0.181
Clerks	-0.213	0.186	0.179	0.386
Service, shop and market sales workers	-0.195	0.136	-0.530	0.204***
Craft and related skilled	-0.158	0.092*	-0.130	0.189
Plant and machine operatives and assemblers	-0.230	0.150	-0.391	0.329
(Reference: Elementary occupations)				
Standard industrial classification				
Construction	-0.419	0.087***	-0.562	0.166***
Distributive, hotels, restaurants	0.119	0.086	0.598	0.143***
Transport and communications	-0.334	0.144**	-0.261	0.362
Banking, finance, insurance	-0.281	0.092***	-0.135	0.142
Other services	-0.166	0.090*	-0.263	0.165
(Reference: Extractive/manufacturing)				
Region				
South East outside London	0.532	0.093***	0.860	0.203***
South West	0.385	0.106***	1.278	0.224***
East Anglia	0.237	0.123**	1.409	0.295***
East Midlands	0.395	0.103***	0.550	0.261***
West Midlands	0.507	0.104***	0.908	0.257***
North West	0.296	0.102***	0.857	0.242***

TABLE IV
continued

Yorkshire and Humberside	0.144	0.104	0.599	0.245***
North	0.366	0.128***	1.327	0.274***
Wales	0.464	0.125***	1.674	0.282***
Scotland	0.210	0.110*	1.037	0.267***
(Base: London)				
Part-time self-employed	-0.456	0.122***	-0.335	0.267
Intercept	-4.561	0.424***	-9.289	0.919***
Threshold parameters:				
μ_1	0.649	0.024***	1.524	0.038***
μ_2	1.309	0.036***	3.172	0.061***
μ_3	1.791	0.049***	4.444	0.075***
σ (standard deviation of random effects)			2.435	0.082***
NT		3552		3,552
N		1011		1,011
Log L		-3109.9		-2,301.3
Chi-squared (45)		878.6***		

Notes: * Denotes coefficient significant at 10%, ** at 5%, *** at 1%.

Source: Computed from BHPS Waves 1-9.

support for the conclusion that parental example and experience are important influences on the ability of the owners of small businesses to generate employment for others.

Educational attainment appears to have an important association with the ability of the self-employed to create jobs. This is particular so for degree graduates. Those with other higher educational qualifications and A-levels create more jobs than the unqualified, although the size of the coefficients, in the preferred model, is smaller than in the case of a degree. University degree courses traditionally provide little or no direct education in entrepreneurship. This is changing in the UK, but typically "entrepreneurship awareness" classes are non-credit bearing. It seems more probable that university success is associated with "soft skills" such as self-reliance, self-confidence and a positive attitude towards risk-taking. These in turn lead to success in the management of small businesses. The possession of an apprenticeship is significantly positively associated with employment generation in the model without random effects. However, this effect is no longer statistically significant in the preferred model, suggesting that the possession of an apprenticeship qualification is correlated with other attributes which are captured by the individual-specific components in the second model.

Local demand conditions are found to be an important influence on employment generation.

The significant positive relationship suggests that competitive pressure in the local labour market exerts a significant influence on job creation by small businesses. As demand for labour in other sectors weakens, small businesses are better able to hire staff of an appropriate quality or at an affordable wage rate. However, overlaid on this local labour market effect, is a strong suggestion from the pattern of year dummy coefficients estimated for the year dummy variables that the economic cycle is important. The period under investigation is one of sustained growth after recession in the early 1990s. *Ceteris paribus*, the generation of employment by the self-employed improves steadily from 1994 onwards, reflecting the economy-wide effects of the improved state of product market demand. The introduction a national minimum wage in the UK in 1999 did not apparently damage the ability of small businesses to create jobs, although we have no means of knowing whether the 1999 coefficient would have been even higher without this policy change.

The creation of employment by the self-employed is related to the age of the business owner. Age is entered in quadratic form. Both the level and squared terms are statistically significant. In the preferred model the self-employed are at the peak of their ability to create jobs at 47.8 years of age. Although we noted no

prima facie difference in the proportions of female sole-traders and employers, the preferred model reveals that the female self-employed create significantly fewer jobs. However, once we control for individual random effects, the ethnic background of the self-employed person is not important.

The remainder of the results reported in Table IV are estimated coefficients for occupational and industrial groupings and for region of residence. Job creation by the self-employed is significantly higher for professional and managerial occupations and significantly lower for service, shop and market sales workers relative to the reference category of elementary (unskilled) occupations. The professional and managerial occupational category includes professionals, such as lawyers, accountants and medical professionals, who typically conduct business through professional partnerships but are defined as self-employed for legal purposes. Job creation is significantly higher in retailing and hospitality industries (distributive, hotels and restaurants) relative to reference category of manufacturing and extractive industries. Such jobs are often low-skilled and therefore low-waged, and so this result should not surprise. Furthermore it may in practice be impractical to rely solely on the labour of the business owner and other family members in the running of a restaurant or small hotel. The self-employed in the construction sector create significantly fewer jobs than the reference category. In the British construction industry the self-employed typically operate as sub-contractors, moving from site to site. The variable nature and intensity of the work may discourage the employment of others by trade sub-contractors. In all UK regions the rate of job creation by the self-employed is higher than in the reference region of London. The South West, East Anglia, the North, Wales and Scotland stand out in particular in this respect. With the exception of East Anglia each of these regions are geographically peripheral and have levels of prosperity below the UK average. Wales in particular has identified low levels of entrepreneurial ability as an economic problem, implementing in strategic response an "Entrepreneurship Action Plan" after the end of this sample period. These results suggest that it may be "initial conditions" such as occupational and industrial structure and

low levels of human capital and housing wealth that contribute to this perception by policymakers, rather than the absence of entrepreneurial spirit in peripheral regions.

Finally, it is important to note that, once individual random effects are introduced, there is no statistically significant evidence that those who are part-time self-employed create fewer jobs than full-time entrepreneurs, other things equal. This is despite the difference observed in the sample proportions of part-time sole-traders and employers.

4.2. Marginal effects

Coefficient estimates in ordered probit models have no direct quantitative interpretation. So for an ordered choice model marginal effects can be calculated to show the effect of a change in a covariate on the cell probabilities. So for each of choices in the ordering a separate marginal effect may be calculated. For the case of the probability ($L_{it} = 0$) each marginal effect has the opposite sign to the estimated coefficient for that covariate. In case where the covariate is binary the marginal effect shows the change in the probability ($L_{it} = j$) for a discrete covariate change (that is from zero to one).

Table V reports estimated marginal effects for each covariate using our preferred random effects estimates. In most cases the absolute size of the marginal effect decreases quickly when moving from the lower (non-zero) to the higher ordered employment categories. This reflects the fact that higher categories have relatively very few sample observations (that is low covariate cell means). So although marginal effects for the higher categories are typically smaller, these may translate into substantial relative impacts on the sample frequencies in these categories. This can be seen by noting the sample frequencies as reported at the top of the table. We discuss these marginal effects, in detail, where they refer to covariates whose coefficients are statistically significant. In all cases these quantitative interpretations are subject to the *ceteris paribus* qualification.

So if a self-employed individual has an extra £10,000 of housing then the probability that they are a sole-trader falls by 0.44 percentage points (cell frequency: 70 per cent), and the probability

TABLE V
Ordered probit marginal effects – random effects model

Sample cell count (frequency)	Prob (L = 0) 2,415 (0.6980)	Prob (L = 1,2) 571 (0.1608)	Prob (L = 3–9) 341 (0.0960)	Prob (L = 10–24) 128 (0.0360)	Prob (L ≥ 25) 97 (0.0273)
Financial resources					
Housing equity/10000 $t-1$	-0.0044	0.0017	0.0016	0.0017	0.0004
Annual investment income/100 $t-1$	0.0006	-0.0002	-0.0002	-0.0001	-0.0001
Entrepreneurial capital					
Self-employed parent	-0.0895	0.0326	0.0329	0.0145	0.0094
who had employees	-0.0921	0.0328	0.0340	0.0153	0.0101
Human capital					
University or college degree	-0.1773	0.0564	0.0657	0.0320	0.0232
Other higher education	-0.0754	0.0281	0.0277	0.0120	0.0076
A-Levels	-0.0928	0.0328	0.0342	0.0155	0.0102
O-Levels/GCSEs	-0.0317	0.0121	0.0116	0.0049	0.0031
Completed apprenticeship	-0.0382	0.0142	0.0140	0.0061	0.0039
Demand influences					
Local unemployment rate/100	-1.1748	0.4588	0.4285	0.1788	0.1087
Year					
1993	-0.0198	0.0076	0.0073	0.0031	0.0019
1994	-0.0568	0.0209	0.0209	0.0092	0.0059
1995	-0.0463	0.0172	0.0170	0.0074	0.0047
1996	-0.0543	0.0200	0.0200	0.0087	0.0056
1997	-0.0828	0.0296	0.0306	0.0137	0.0090
1998	-0.0785	0.0282	0.0289	0.0129	0.0084
1999	-0.0925	0.0327	0.0342	0.0154	0.0102
Demographics					
Age/100	-2.9062	1.1351	1.0600	0.4422	0.2689
(Age/100) squared	3.0404	-1.1874	-1.1090	-0.4626	-0.2813
Female	0.0395	-0.0158	-0.0144	-0.0059	-0.0035
Ethnic minority	0.0161	-0.0064	-0.0059	-0.0024	-0.0014
ILO occupation groups					
Professional/managerial	-0.0782	0.0301	0.0286	0.0121	0.0075
Technical and associate professional	0.0220	-0.0088	-0.0080	-0.0033	-0.0019
Clerks	-0.0235	0.0089	0.0086	0.0037	0.0023
Service, shop and market sales workers	0.0648	-0.0272	-0.0233	-0.0091	-0.0052
Craft and related skilled	0.0166	-0.0066	-0.0060	-0.0025	-0.0015
Plant and machine operatives and assemblers	0.0485	-0.0200	-0.0175	-0.0070	-0.0040
Standard industrial classification					
Construction	0.0699	-0.0286	-0.0252	-0.0101	-0.0059
Distributive, hotels, restaurants	-0.0799	0.0292	0.0294	0.0130	0.0084
Transport and communications	0.0328	-0.0133	-0.0119	-0.0048	-0.0028
Banking, finance, insurance	0.0172	-0.0068	-0.0063	-0.0026	-0.0016
Other services	0.0034	-0.0013	-0.0012	-0.0005	-0.0003
Region					
South East outside London	-0.1160	0.0412	0.0428	0.0193	0.0128
South West	-0.1794	0.0559	0.0665	0.0329	0.0241
East Anglia	-0.2002	0.0589	0.0742	0.0380	0.0290
East Midlands	-0.0740	0.0266	0.0273	0.0122	0.0079
West Midlands	-0.1254	0.0419	0.0465	0.0219	0.0152
North West	-0.1179	0.0399	0.0437	0.0203	0.0139
Yorkshire and Humberside	-0.0810	0.0288	0.0299	0.0134	0.0089
North	-0.1884	0.0560	0.0699	0.0356	0.0269
Wales	-0.2404	0.0652	0.0888	0.0478	0.0387
Scotland (Base: London)	-0.1442	0.0469	0.0535	0.0256	0.0182
Part-time self-employed	0.0417	-0.0171	-0.0151	-0.0060	-0.0035

Source: Computed from estimates reported in Table V (model 2).

Note: In the case of a dummy variable the marginal effect is calculated as $\Pr(L_i = j) - \Pr(L_i = j-1)$.

that they employ 1 or 2 employees rises by 0.17 percentage points (cell frequency: 16 per cent). The estimated marginal effect is of a similar size for the 3–9 and 10–24 categories (cell frequencies: 10 and 4 per cent) but drops to 0.04 percentage points for the 25 or over category (cell frequency: 3 per cent). So although the marginal effect is smaller for the higher categories, the relative impact on the frequency of finding a self-employed individual in these categories is just as high. Roughly speaking, if a small business owner acquires an extra £100,000 of housing wealth, this is associated with an increase of a tenth in the likelihood that the business will be in the higher employment categories.

For parental background the marginal effects reveal that if the self-employed individual had a self-employed parent then the probability that they are a sole-trader falls by nearly 9 percentage points. The probability that the individual is within the 1–2 or 3–9 employee categories increases by over 3 percentage points. The probability of being within the 10–24 category increases by 1.5 percentage points and the probability of being within the 25 or over category increases by nearly 1 percentage point. If that self-employed parent was also an employee of others then each marginal effect is almost doubled in size (the effect is additive on that of having a self-employed parent). So having an employer parent reduces the probability of being a sole-trader by over 18 percentage points, raises the probability of being within the 1–2 or 3–9 employee categories by around 6.5 percentage points, and raises the probability of being within the 10–24 and over 25 categories by 3 and 2 percentage points, respectively. So, a self-employed individual is over a third more likely to employ 1–2 employees if they had an employer parent, and two-thirds more likely to employ 3–9 employees. They are over three-quarters more likely than someone without an employer-parent to employ 10–24 or 25 and over.

Graduation from university or college reduces the probability that a self-employed person is a sole-trader, compared to someone with no qualifications, by nearly 18 percentage points. It raises the probability of employing 1–2 people by 5.6 percentage points and of employing 3–9 employees by 6.6 percentage points. For the two higher

employment categories the marginal effects are 3.2 and 2.3 percentage points, respectively. A similar pattern in the relative size of the marginal effects is found for individuals with highest attainment at non-degree college level and school A-level, although the absolute size of the effects is smaller.

The absolute size of the local unemployment marginal effects is high because the covariate is expressed as a proportion. A one percentage point increase in the local unemployment rate reduces the probability that a self-employed individual will be a sole trader by 1.2 percentage points, and raises the probability of being in the 1–2 or 3–9 employees' categories by over 0.4 percentage points. Marginal effects for the two highest categories are correspondingly 0.18 and 0.11 percentage points, respectively. This suggests that reductions in the "tightness" of local labour markets have a substantial effect on the chances of a small business being in the higher employment categories. The pattern of marginal effects for the year dummy variables reflects that of the coefficient estimates. By 1999 a self-employed individual is over 3 percentage points more likely to employ 1–2 or 3–9 employees than in 1992, 1.5 percentage points more likely to employ 10–24 and 1 percentage point more likely to employ 25 or more. This translates into the conclusion that a small business is a third more likely to be in one of the three highest categories at the end of the period compared to the start, and a fifth more likely to be in the 1–2 employee category.

The significant non-linearity in the relationship between age and employment category complicates interpretation of the marginal effects. They vary as age changes. All marginal effects peak at 47.8 years of age (in absolute size). At this age the marginal effect of becoming one more year older is minus 0.69 percentage points on the probability of being a sole-trader, 0.27 percentage points on the probability of employing 1–2, 0.25 percentage points on the probability of employing 3–9, 0.11 percentage points on the probability of employing 10–24, and 0.06 percentage points on the probability of employing 25 or over. Each of these marginal effects is only three-fifths as large at age 18, but around seven-eighths as large at age 65.¹³ A woman is 4 percentage points more likely to be a sole-trader than a man, around 1.5

percentage points less likely to be employing 1–2 or 3–9 employees, 0.6 percentage points less likely to be employing 10–24 and 0.4 percentage points less likely to be employing 25 or more. Taking into the account the category sample frequencies, women are between a sixth and an eighth less likely to be found in the higher employment categories than men.

We turn now to the occupational, industrial and regional marginal effects. Two broad occupational groups carry coefficients which indicate significant difference from the elementary (unskilled) occupation reference category: professional/managerial and service, shop and market sales workers. A self-employed person in the professional/managerial occupational group is nearly 8 percentage points less likely to be a sole-trader, around 3 percentage points more likely to employ 1–2 or 3–9 employees, 1.2 percentage points more likely to employ 10–24 and 0.8 percentage points more likely to employ 25 or more. Taking account of the relative sample frequencies of the size categories this suggests that the profession/managerial self-employed are between a fifth and a third more likely to be employers (with the largest relative effect for the 10–24 employees category). The marginal effects for the service and shop worker group have the opposite signs. This group are up to a quarter less likely to be employers (again with the largest relative effect for 10–24 employees category). Industrial group coefficients are significant in the case of construction (negative) and distributive, hotels and restaurants (positive). The (absolute) size and pattern of the marginal effects are in both cases similar to those for the professional/managerial occupational group. So the self-employed in construction are roughly a fifth to a third less likely to be employers compared to the manufacturing and extractive industries reference group. The self-employed in the distributive sector are approximately a fifth to a third more likely. As was noted when the model coefficients were discussed, the self-employed in all regions are more likely to be employers compared to those in the London reference region. So, for example, the region where this difference is quantitatively greatest is Wales. Here a self-employed person is 24 percentage points less likely to be a sole trader compared

to an otherwise identical individual in London, 7 percentage points more likely to employ 1–2 others, 9 percentage points more likely to employ 3–9, 5 percentage points more likely to employ 10–24 and 4 percentage points more likely to employ 25 or more. So a self-employed business in Wales is a third less likely to be a sole-trader than one in London. It is approaching a half more likely to employ 1–2. The relative effect then increases over the employment categories to the point where the Welsh small business is close to one and a half times more likely to employ 25 or more.

5. Conclusions and assessment

Self-employment is a numerically important form of economic status in many industrialized economies. Governments are increasingly identifying the small business sector as a potential engine of economic growth. An important indicator of the success of self-employment is the ability of small businesses to create employment for others. However, the identification of factors that may drive the ability of the self-employed to employ others has been the subject of only limited research. Such previous research as is available has focused on the aggregate picture or on a particular age cohort. In this paper we have investigated job creation by the self-employed using a recent longitudinal data source representative of the economically active population in the UK.

The results presented point to the quantitative and qualitative importance of a number of factors in determining the ability of the self-employed to create jobs for others, and on the transition from sole trader to employer. Only one-third of the stock of self-employed at any point in time has made a successful transition from sole trader to employer. Barely 6 or 7 per cent of the self-employed manage to create jobs for 10 or more people. Analysis of transitions between small business size categories has shown that growth may be difficult to achieve. However, it is likely that the true scale of transition to medium sized enterprise is underestimated, because as a successful business start-up grows in size it is more likely to convert to limited company status. Individual- or household-level survey data cannot easily track the scale of this. On

the other hand conventional business surveys may offer little information about the sole-trader origins of economic activity.

We have exploited the use of longitudinal data in the present paper to control for local and aggregate demand influences on job creation. We have also, as a result of using longitudinal data, been able to investigate the potential impact of the unobservable entrepreneurial ability through the explicit modelling of individual heterogeneity. Our results suggest that unobserved heterogeneity is significant in size and failure to control for it may significantly affect the robustness of any conclusions about the quantitative importance of drivers of job creation.

Ceteris paribus the most successful job creators appear to be in middle age and are more likely to be men. They are also more likely to be in professional or managerial occupations. Both financial and entrepreneurial capital appears to exert a statistically significant influence on the transition from sole-trader to small-scale employer and from small-scale to larger employer. Although modest in quantitative terms the effects of housing wealth are statistically significant. Housing appears to provide an important source of collateral for the business finance needed to allow small businesses to grow. The importance of collateral is reinforced by the conclusion that the financial resources of the small business owner do not appear directly to influence ability to create jobs. Typically those self-employed who employ others possess 80 per cent more housing equity than sole traders and this despite being on average only 2 years older. In terms of measurable entrepreneurial capital, we find that having a self-employed parent appears to have a significant demonstration effect on the ability of the self-employed to create jobs. This is reinforced if the parent was also an employer of others. A self-employed person with an employer-parent is three-quarters more likely to be employing 10 or more workers than one whose parent was not an employer. Formal education is also significantly associated with the ability of the self-employed to create jobs for others. The strongest effect is found for those with a university degree. We would suggest that higher education provides "soft skills" such as self-confidence and self-reliance, necessary for the successful development

of a small business. Analyzing the demographic characteristics of the successful self-employed, the results suggest that greater targeting of support for female sole-traders may be necessary to close the gender imbalance among entrepreneurs.

Public policy towards SMEs typically places emphasis on the goal of improving business start-up rates. In our data nearly 11 per cent of the self-employed in any year revert to paid employment the following year. The majority, but by no means all, of these are sole-traders. This illustrates the point that small business ventures are generally risky and often fail. It is likely that policies which aim to improve start-up rates will therefore suffer from considerable deadweight loss. The research presented in this paper points to the importance of targeting SME support policies carefully with the aim of encouraging existing small businesses to grow. Policies aimed at improving "entrepreneurial" capital are likely to be long-term and developmental in nature. They will need to focus on the specific development of human resource management skills, particularly for sole-traders who have not acquired such skills through family background. This suggests a more thoughtfully designed approach than typical approaches aimed broadly at raising "entrepreneurial awareness". Furthermore, although graduates appear to have an advantage as successful entrepreneurs, policies directed at this demographic group may only yield rewards 20 or more years in the future, once graduates develop small businesses from the launch-pad of successful careers in paid employment. Careful development of generic "soft-skills" may be more important in the long-run than graduate SME start-up schemes for potential young entrepreneurs.

However, some more direct conclusions are possible for policy concerning financial capital. For many self-employed, the equity tied up in their own homes would appear to be the principal if not the sole source of collateral for business development. This is certainly not the first study to point to the importance of financial capital, and specifically housing wealth collateral, as a determinant of small business success. Policy makers may be able to short-circuit the need to wait for upturns in the housing market before small business growth can occur. They may also be able to assist entrepreneurs in localities where

the housing market is weak by stepping in to correct capital market imperfections. However, intervention often takes the form of direct provision of intermediate scale investment capital. Loan guarantee schemes for entrepreneurs with low levels of housing wealth may be a cheaper and more effective alternative.

Given the skewness observed in the distribution of housing wealth the influence of financial capital may be very significant for a small proportion of the total stock of entrepreneurs. Volatile housing market activity, such as experienced in the UK and other European countries over the last 15 years, can lead to considerable uncertainty about the future value of collateral and so increase the burden of capital risk premium on the self-employed. On the other hand increased deregulation of housing finance in the UK may have played some role in assisting job creation by the self-employed. In the absence of large-scale government intervention, we can conclude that a stable housing market might be an important precondition for a successful job-creating small-business sector.

Notes

* The British Household Panel Survey data used in this paper were made available through the ESRC Data Archive. The data were originally collected by the ESRC Institute for Social and Economic Research at the University of Essex. Neither the original collector of the data nor the Archive bears any responsibility for the analyses or interpretations presented here. I am grateful to Reza Arabsheibani for helpful comments at a preliminary stage, and to seminar participants at the Welsh Assembly Government, Cardiff.

¹ A number of papers have addressed directly the question of liquidity constraints on self-employment, among them Evans and Jovanovic (1989) and Holtz-Eakin et al. (1994). Both these studies find, using U.S. data, that liquid assets are positively associated with the probability of self-employment, and, in the case of Evans and Jovanovic, that liquid assets are also positively associated with earnings in self-employment.

² See, for example, Rees and Shah (1986).

³ All household are located in Great Britain. Northern Ireland was excluded from the survey until an additional sample of Northern Irish households was recruited in 2000.

⁴ Technical details are provided in Taylor et al. (2003).

⁵ Individuals in the agricultural sector are excluded from the whole analysis because of the rather specific nature of agricultural land tenure law and inheritance, and the

resulting high level of stability in self-employment status. This is consistent with the approach taken in most previous empirical research on self-employment.

⁶ If we assume a Cobb–Douglas form for equation (1) in which a , b , and c are the elasticities of output for labour, capital and entrepreneurial capital, respectively then the optimal employment level would be given by $L_{it}^* = [w_t / (ap_{it}K_{it}^bH_{it}^c)]^{1/(a-1)}$.

⁷ Initial work also included the monthly income of a spouse if one was present in the household, as an additional measure of financial wealth. However, the effect of this variable was found to be insignificant.

⁸ One alternative would be to attempt to remove the skewness through a logarithmic transformation. When attempted this failed to produce maximum likelihood convergence.

⁹ Technical details of the estimation method including the computation of estimated marginal effects are contained in Econometric Software, Inc. (2002), pp. E18–44–E18–46.

¹⁰ GCSE examinations replaced O-levels in the late 1980s. The “no qualifications” reference category includes those with some sub O-level standard examination attainment (certificates of second education (CSEs)).

¹¹ All model estimation was performed using LIMDEP 8.0 (Econometric Software Inc., 2002).

¹² Preliminary research investigated the possibility that the self-employed have a latent or “inherited” advantage in employing others over the employed, by modelling small business employment conditional on the decision of the owner to be self-employed rather than employed. However, for a reasonable model specification (choice of identifying exclusion restrictions) no significant sample selection effect was found.

¹³ A diagram showing how the effects vary over the sample age range is available on request.

Appendix A: Covariate definitions

Housing equity: computed as estimated current house value (historic purchase cost reflatd to current prices using regional/county level house price indices) minus estimated outstanding mortgage principal; deflated to 1995 prices using RPIX.

Annual investment income: annual income from all investment sources deflated to 1995 prices using RPIX.

Self-employed parent: dummy variable = 1 if either parent was self-employed when respondent was 14 years old.

Self-employed parent who had employees: dummy variable = 1 if either parent was self-employed when respondent was 14 and employed others.

Degree: dummy variable = 1 if respondent has university/college degree level academic qualification.

Other higher education: dummy variable = 1 if respondent has other non-degree level higher education qualification.

A-levels: dummy variable = 1 if respondent has one or more A-level examination passes (typically sat at age 18)

O-levels/GCSE's: dummy variable = 1 if respondent has one or more O-level or GCSE examination passes (typically sat at age 16). (GCSEs replaced O-levels in the late 1980s.)

Completed apprenticeship: dummy variable = 1 if respondent completed a recognised apprenticeship at any point in the past.

Local unemployment: unemployment rate in respondent's county of residence during 4th quarter of the year; source Office for National Statistics, *Labour Market Trends*, various issues.

Age: age of respondent at interview in years.

Female: dummy variable = 1 if respondent is female.

Ethnic minority: dummy variable = 1 if respondent reports that they are a member of a minority racial group (Chinese, Asian, African, Afro-Caribbean...)

Professional/managerial; technical and associate professional; clerks; service, shop and market sales workers; craft and related skill; plant and machine operatives: dummy variable = 1 if respondent is in a particular (mutually exclusive) ILO international standard occupational classification category.

Industry: dummy variables = 1 is respondent's economic activity is within particular 1-digit level industrial sector.

Region: dummy variables = 1 if respondent is resident in a particular UK standard region.

TABLE A1
Correlation matrix for covariates

	Housing equity $t - 1$	Annual investment income $t - 1$	Self-employed parent	Who had employees	University or college degree	Other higher education	A-Levels	O-Levels	Completed apprenticeship	Local unemployment rate
Housing equity $t - 1$	1									
Annual investment income $t - 1$	0.098	1								
Self-employed parent	0.072	0.018	1							
Who had employees	0.095	0.022	0.737	1						
University or college degree	0.096	0.090	0.016	0.094	1					
Other higher education	0.017	0.015	0.055	0.061	-0.235	1				
A-Levels	-0.072	0.021	-0.036	-0.044	-0.143	-0.237	1			
O-Levels/GCSEs	-0.021	-0.049	-0.077	-0.099	-0.192	-0.318	-0.194	1		
Completed apprenticeship	-0.004	-0.034	-0.002	-0.047	-0.073	-0.121	-0.074	-0.099	1	
Local unemployment rate	-0.024	-0.026	0.017	0.034	-0.003	-0.057	-0.029	0.009	0.068	1
Age	0.257	0.091	0.015	-0.002	-0.055	0.030	-0.123	-0.050	0.137	-0.039
Age squared	0.258	0.087	0.020	-0.001	-0.061	0.029	-0.120	-0.046	0.140	-0.038
Female	0.040	-0.023	0.027	0.047	0.077	0.014	0.002	-0.058	-0.001	-0.036
Ethnic minority	0.112	-0.002	0.016	0.015	0.090	-0.007	-0.050	0.012	-0.037	0.023
Professional/managerial	0.157	0.104	0.075	0.118	0.260	0.046	-0.035	-0.074	-0.074	0.014
Technical and associate professional	0.005	0.066	-0.034	-0.036	0.028	0.140	0.011	-0.060	-0.035	-0.002
Clerks	0.013	-0.018	0.039	0.041	-0.033	0.014	0.016	-0.041	-0.031	-0.025
Service, shop and market sales worker	-0.050	-0.052	-0.026	-0.017	-0.048	-0.025	0.061	0.023	0.113	0.016
Craft and related skill	-0.066	-0.052	-0.050	-0.097	-0.131	-0.064	-0.012	0.026	0.078	-0.028
Plant and machine operatives	-0.092	-0.039	-0.006	-0.032	-0.094	-0.045	-0.028	0.098	-0.050	-0.027
Construction	-0.096	-0.075	-0.019	-0.053	-0.186	-0.107	0.043	0.037	0.083	0.009
Distributive, hotels, restaurants	0.145	0.048	-0.023	-0.014	-0.092	-0.068	0.013	0.038	-0.038	0.006
Transport and communications	-0.081	-0.035	-0.001	-0.025	-0.084	-0.002	-0.018	0.088	-0.049	-0.049
Banking, finance and insurance	0.105	0.115	0.084	0.123	0.242	0.112	-0.036	-0.093	-0.077	-0.046
Other services	-0.065	-0.017	-0.047	-0.027	0.124	0.076	0.022	-0.069	0.029	0.029
South	0.036	-0.004	0.021	0.003	-0.012	0.029	0.042	-0.017	-0.046	-0.269
East outside London										
South West	-0.001	-0.023	-0.004	-0.000	0.008	-0.037	-0.082	0.070	0.036	-0.081

	Housing equity $t-1$	Annual investment income $t-1$	Self-employed parent	who had employees	University or college degree	Other higher education	A-Levels	O-Levels	Completed apprenticeship	Local unemployment rate
East Anglia	0.158	-0.004	0.054	0.056	-0.078	0.103	-0.004	-0.032	-0.006	-0.074
East Midlands	-0.070	-0.025	0.004	-0.030	-0.067	-0.034	0.035	-0.004	0.049	-0.038
West Midlands	-0.056	-0.046	-0.003	-0.006	-0.022	0.063	-0.046	-0.019	-0.028	0.076
North West	-0.042	0.020	-0.023	0.007	-0.025	-0.070	0.045	-0.002	0.010	0.039
Yorkshire and Humberside	-0.039	0.040	-0.053	-0.037	-0.018	0.014	0.001	0.013	-0.039	0.083
North	-0.044	-0.012	-0.010	0.038	-0.044	0.040	-0.045	0.008	0.080	0.177
Wales	0.120	0.011	-0.022	-0.056	-0.054	0.018	-0.005	0.020	-0.033	0.039
Scotland	-0.079	-0.001	-0.044	-0.028	0.057	-0.075	0.048	0.071	0.006	0.008
Part-time self-employed	-0.044	-0.027	-0.018	-0.033	0.020	-0.013	0.010	-0.037	0.004	-0.032

	Age	Age squared	Female	Ethnic minority	Professional/managerial	Technical and associate professional	Clerks	Service, shop and market sales worker	Craft and related skill	Plant and machine operatives
Age	1									
Age squared	0.991	1								
Female	-0.027	-0.033	1							
Ethnic minority	-0.030	-0.039	-0.039	1						
Professional/managerial	0.099	0.088	0.056	0.029	1					
Technical and associate professional	0.025	0.019	0.026	-0.038	-0.299	1				
Clerks	0.043	0.042	0.212	-0.011	-0.143	-0.053	1			
Service, shop and market sales worker	-0.136	-0.129	0.342	0.030	-0.237	-0.088	-0.042	1		
Craft and related skill	-0.032	-0.020	-0.232	-0.018	-0.418	-0.156	-0.075	-0.124	1	
Plant and machine operatives	-0.027	-0.036	-0.108	0.033	-0.231	-0.086	-0.041	-0.068	-0.121	1
Construction	-0.063	-0.055	-0.296	-0.070	-0.226	-0.169	-0.038	-0.142	0.314	-0.111
Distributive, hotels, restaurants	0.119	0.112	0.040	0.124	0.273	-0.073	-0.044	-0.060	-0.088	-0.101
Transport and communications	0.007	-0.002	-0.125	0.016	-0.164	-0.057	-0.025	-0.052	-0.115	0.704
Banking, finance and insurance	0.086	0.076	0.049	-0.011	0.186	0.163	0.185	-0.109	-0.195	-0.106
Other services	-0.099	-0.093	0.327	-0.037	-0.009	0.161	-0.060	0.392	-0.185	-0.136
South East outside London	0.046	0.041	-0.028	-0.062	-0.017	0.040	-0.046	-0.064	0.019	-0.023
South West	0.030	0.035	-0.001	-0.051	0.039	-0.066	-0.002	0.044	-0.052	0.033
East Anglia	0.080	0.083	-0.001	0.009	0.024	0.070	0.002	-0.027	-0.023	-0.046
East Midlands	-0.043	-0.044	0.015	0.007	-0.082	0.033	0.066	0.005	0.020	0.040
West Midlands	0.024	0.031	0.002	0.094	-0.023	0.024	0.084	0.010	0.015	-0.022
North West	-0.001	-0.003	0.016	0.022	0.061	-0.043	-0.005	0.007	-0.035	0.044
Yorkshire and Humberside	-0.060	-0.058	0.011	-0.000	-0.048	-0.031	-0.005	0.083	-0.011	0.067
North	-0.012	-0.018	0.011	-0.038	-0.003	0.041	-0.013	-0.035	0.003	-0.027

	Wales	Scotland	Part-time self-employed	Construction	Distributive, hotels, restaurants	Transport and communications	Banking, finance and insurance	Other services	South East outside London	South West	East Anglia	East Midlands	West Midlands	North West
	-0.007	-0.086	-0.051	-0.007	-0.007	-0.022	0.005	0.005	-0.010	-0.034	-0.044	0.058	-0.054	
						0.000	-0.044	0.002	-0.044	0.008	0.034	0.002	0.021	
						0.097	0.012	-0.062	-0.003	0.013	0.065	0.001	0.005	
	Construction	Distributive, hotels, restaurants	Transport and communications	Banking, finance and insurance	Other services	South East outside London	South West	East Anglia	East Midlands	West Midlands	North West			
Construction	1													
Distributive, hotels, restaurants	-0.271	1												
Transport and communications	-0.136	-0.127	1											
Banking, finance and insurance	-0.247	-0.231	-0.116	1										
Other services	-0.290	-0.272	-0.136	-0.247	1									
South East outside London	-0.039	0.002	-0.032	0.050	-0.011	1								
South West	0.049	0.018	0.004	-0.036	0.002	-0.172	1							
East Anglia	-0.029	0.070	-0.039	0.033	-0.029	-0.127	-0.077	1						
East Midlands	0.042	-0.026	0.017	-0.027	-0.005	-0.180	-0.108	-0.080	1					
West Midlands	-0.043	-0.016	-0.006	0.021	0.002	-0.154	-0.093	-0.069	-0.097	1				
North West	-0.061	0.103	0.069	-0.060	-0.035	-0.165	-0.099	-0.073	-0.104	-0.089	1			
Yorkshire and Humberside	-0.010	0.024	0.051	-0.051	-0.008	-0.166	-0.100	-0.074	-0.105	-0.090	-0.096			
North	0.006	0.039	-0.019	-0.010	-0.016	-0.106	-0.064	-0.047	-0.067	-0.057	-0.061			
Wales	0.141	-0.009	-0.053	-0.030	-0.037	-0.113	-0.068	-0.050	-0.071	-0.061	-0.065			
Scotland	-0.009	-0.112	0.051	0.025	0.053	-0.155	-0.093	-0.069	-0.097	-0.083	-0.089			
Part-time self-employed	-0.039	-0.041	0.008	-0.044	0.072	-0.035	-0.038	-0.037	0.022	0.036	-0.002			
	Yorkshire and Humberside	North	Wales	Scotland	Part-time self-employed									
Yorkshire and Humberside	1													
North	-0.062	1												
Wales	-0.066	-0.042	1											
Scotland	-0.090	-0.058	-0.061	1										
Part-time self-employed	0.025	-0.005	0.003	0.011	1									

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