
Stuart Fraser and Francis Greene

WARWICK BUSINESS SCHOOL
UNIVERSITY OF WARWICK

Abstract

 Typically, models of self-employment choice suggest that individuals maximise ex-post utility. However, individuals must chose to enter or stay in self-employment uncertain of their future prospects – they maximise ex-ante utility. This paper develops and applies a structural model of self-employment choice with ex-ante utility maximising behaviour for individuals. The main contribution of this paper, therefore, is to specify the variance function in self-employment utilities. This function is decreasing in experience.

We go on to apply this model to the UK of the 1980s and 1990s. Evidence is found that the growth in self-employment preferences in the 1980s cannot be discounted totally by improving relative earnings. However, we also observe during this period increasing entrepreneurial uncertainty. We interpret this rise as being due to inflows of new ventures, with low survivability, and show that this effect diminishes self-employment growth in the long run.

JEL Classifications: Self-Employment J23; Government Policy, I28; and Discrete Regression and Qualitative Choice Models, C25.

Section 1: Introduction

Very many governments of industrialized economies are interested in encouraging individuals to shift into self-employment. One reason for this is that new entrants are seen as a potential source of employment creation (Birch, 1979; Kirchhoff, 1994; Acs et al, 1999). Another reason is that new entrants bring with them the potential for innovation (Acs and Audretsch, 1990) and productivity gains (Baldwin, 1995).

Over the last twenty years, therefore, there have been sustained attempts to increase self-employment both in the UK (Greene, 2002) and in other comparable OECD countries (Acs et al, 1991). In the UK, the three successive Thatcher administrations of the 1980s (1979-1983, 1983-1987, 1987-1991) sought to shift the take-up of self-employment by providing ‘hard’ (e.g. loan guarantees, grants) and ‘soft’ (e.g. training, advice, mentoring) incentives. The 1980s also witnessed an attempt to create an ‘enterprise culture’ in which individuals were actively encouraged to see self-employment as a viable and valuable career opportunity (Bannock and Peacock, 1989).

One aim of this paper, therefore, is to disentangle the role, if any, of ‘enterprise culture’. This is done by examining the role of relative earnings, policy and lifestyle preferences using a structural probit for self-employment choices for the 1980s and the 1990s.

---

1 We note that previous research (Blanchflower and Oswald, 1990; Robson, 1996) has found no role for ‘enterprise culture’ in during the 1980s. Instead, they suggested that the rise in entrepreneurship in the 1980s was due to macroeconomic forces.
The main contribution, however, of this paper is an explicit analysis of self-employment uncertainty in the structural model. Many estimates (some structural – e.g., Rees and Shah, 1986; Evans and Jovanovic, 1989\(^2\)) of the determinants of the mean function in self-employment choices have appeared in the economics literature but none - to our knowledge - address the issue of the variance function in a systematic fashion. In a probit estimation setting, which is the norm for empirical analysis of self-employment decisions, this omission is a cause for some concern at a purely technical level since it is well known that the homoscedastic probit estimator is biased and inconsistent in the presence of heteroscedasticity (Yatchew and Griliches, 1984). Moreover, there are broader issues at stake relating to analysis of growth in self-employment. Specifically, during a time in which rising self-employment is due to inflows of new ventures\(^3\), such as the UK in the 1980s, our theoretical model predicts aggregate self-employment uncertainty will also be rising. This is because new ventures may have large uncertainty of their future prospects due to lack of relevant experience. In addition, new ventures have low chances of survival relative to older businesses with greater experience (Cressy, 1996).\(^4\) It follows that the 'long-

---

\(^2\) This latter study is the seminal piece on liquidity constraints and entrepreneurship. We should state clearly at the outset that, given the profusion of post Evans and Jovanovic analyses of self-employed liquidity constraints, this paper does not attempt to cover this well trodden ground – at least explicitly. Clearly, however, in our analysis constrained self-employed incomes will lower relative earnings thereby diminishing the chances of self-employment.

\(^3\) Rather than a decrease in the outflow of existing ventures (increased survivability).

\(^4\) Clearly a ‘new’ venture may be undertaken by someone with substantial relevant business experience. The distinction of ‘new’ versus ‘old’ used here is simply shorthand for different levels of relevant experience.
run' growth in self-employment will be lower than the initial rise as many of these new ventures discover, over the course of running their business (Jovanovic, 1982), that their actual prospects are poor and exit self-employment. Here, our notion of the 'long-run' is the time interval, following a variation in the number of self-employed, after which there are no further changes to the age distribution of businesses\(^5\) so that uncertainty is constant.\(^6\) This notion of equilibrium is, accordingly, synonymous with a situation of stationary variance.

Related research on self-employed incomes in the UK (Parker, 1997) indicates that rising inequality in self-employed incomes, during the 1980s, is a result of increased heterogeneity among the self-employed rather than rising numbers of self-employed \textit{per se}. This rising heterogeneity is associated with increased take-up among young people, females and the previously unemployed not to mention an increased range of occupations entered by the self-employed (Meager et al. 1996). Whereas our analysis of incomes is limited to the role they play in self-employment choices, our analysis of uncertainty in these choices, and the predictions stemming from it, is compatible with this related research. In particular, young people, females and the previously unemployed are all groups with typically low business experience which leads us again to our earlier prediction of rising uncertainty in the 1980s.

The remainder of this paper is divided along the following lines. In Section 2, we outline the ways in which enterprise support policy has changed over the last 20 years

\(^5\) A change in the number of self-employed, arising from either an increase in the inflow of new ventures or a decrease in the outflow of existing ventures, will set in motion changes to the age distribution of the self-employed business stock. With increased inflows of new ventures the average business age may fall whereas if outflows are falling the average business age may rise, reflecting increased survivability.

\(^6\) Or, at least, constant conditional on other factors since uncertainty is likely to vary with personal characteristics and demand shocks.
providing the backdrop for our empirical analysis. Our working definition of an 'enterprise culture' is set out in Section 3. In Section 4, we propose a model to explain self-employment preferences. The important feature of this model is the explicit derivation of the variance (uncertainty) function. The propositions (Section 5) and the data sources (Section 6) – primarily the British Social Attitudes Surveys (BSAS) for 1983-1999 – are then subsequently presented. The pecuniary and non-pecuniary determinants of self-employment preferences and the specification of the self-employment variance function are thereafter discussed in Section 7 before we turn in Section 8 to structural heteroscedastic probit equations of self-employment. The final section of the paper discusses the findings and highlights a policy implication of the paper.

Section 2: Policy Background to the 1980s and 1990s

Until the 1980s, self-employment in the UK was largely seen as a marginal activity (Stanworth and Curran, 1973) and the UK small firm sector - as a whole - was seen as lacking vitality (Bolton, 1971) or vibrancy (Boswell, 1973). Indeed prior to the 1980s, policy initiatives towards the small firm sector were limited. For example, Beesley and Wilson (1984) showed that there were only two programmes from 1946-1960. In the 1960s, this increased to thirteen (1961-1970) and then, in the 1970s, on to thirty-three (1971-81). Very many of these schemes sought not to improve access to self-employment or improve its attractiveness but, instead, to provide employment
subsidies for the unemployed or the young.\footnote{For example: Job Creation Programme (October 1975 - December 1977); the Recruitment Subsidy for School Leavers (October 1975 – September 1976); the Work Experience Programme (September 1976 – April 1978); Youth Employment Subsidy (October 1976 – March 1978); Small Firms Employment Subsidy (July 1977 – March 1980); the Special Temporary Employment Programme (April 1978 – March 1981); and the Youth Opportunities Scheme (April 1978 – September 1983).}

In the 1980s, however, the intensity of policy initiative increased markedly: by 1989 there were 103 public policy initiatives directed at the small firm sector (Curran and Blackburn, 2000). Given this number is would be unsurprising if there was not some heterogeneity in terms of objectives. That said, there would appear to be two discernible public policy thrusts throughout the 1980s. First, there was an attempt to increase the number of individuals entering self-employment. To support this, ‘enterprise zones’ were created (1981), the Small Firms Loan Guarantee Scheme (SFLGS) (1981 onwards) and schemes such as the Enterprise Allowance Scheme (EAS) (1982-1991) were set up.\footnote{The EAS provided the unemployed (unemployed for more than 13 weeks – later reduced to 8 weeks) with a payment of £40 a week for a year. Individuals also had to have access to capital of £1,000, work full-time on the business, were between 18-59, be based in Britain and have an idea that was suitable for public support (the last requirement was introduced after a massage parlour was set up in South Wales).}

The second public policy thrust in the 1980s was to shift the non-pecuniary preferences of individuals (Lawson, 1984). To achieve this, a number of schemes were set up: the Technical and Vocational Educational Initiative, ‘Compacts’ between schools and business, the Mini Enterprise in Schools Project, and Youth Training initiatives (e.g. ‘Training for Enterprise’).

In the 1980s, however, enterprise support was not confined solely to public policy. Indeed, what is particularly noteworthy about the period was that it saw the rise of corporate responsibility in the UK. This led to the creation of schemes such as Shell
LiveWIRE, the Prince’s Youth Business Trust (now the Prince’s Trust) and Business in the Community: all of which sought to convert individuals into self-employment (IMS, 1989, 1987; Pilkington, 1984). It is also hard to ignore cultural influences (e.g. films such as Wall Street and comic characters such as ‘Loads-a-Money’ and ‘Del-Boy’).

By the early 1990s, however, it would appear that there was a discernable shift in policy towards self-employment. Partly, this may be because Thatcher left office in 1991. Another reason may have been that the UK’s recession of the early 1990s spelt the end of the euphoric optimism of the late 1980s. Government policy itself towards self-employment also changed in three important ways in the 1990s. First, in the early part of the decade the government moved away from delivering training through a centralised mechanism (the Manpower Services Commission) to the provision of localised support (Business Links and Training and Enterprise Councils) (Deakin and Edwards, 1993). Second, the government also sought to focus upon improving the quality of existing businesses rather than increasing the quantity of businesses through the creation of Business Links (House of Commons Trade and Industry Select Committee, 1996). Third, the government also changed the way it supported ventures. Financial support provided by schemes such as the SFLGS are now in the minority. Attention, instead, has instead shifted to providing support to improve the capabilities and skills of individuals (Straw and Blair, 1991) through changes to education and training (see DTI, 1994, 1996, 1998).

In summary, there were two observable policy imperatives in the 1980s. First, there was an attempt to increase the quantity of existing businesses in the UK economy. The second imperative was to improve the supply of potential entrants into self-
employment. In terms of the 1990s, it is argued that there was a change in focus towards enterprise support. Hence, whilst support was still concentrated upon improving the appeal of self-employment, many of the actual policies in the 1990s were, instead, concentrated upon improving the quality of existing businesses.

Section 3: What is an ‘Enterprise Culture’?

These shifts in policy towards self-employment do not necessarily constitute the creation (1980s) and the maintenance (1990s) of an ‘enterprise culture’. Empirically, at least for the 1980s, there would seem to be little or no evidence to support this: Blanchflower and Oswald (1990), using British Social Attitude Survey (BSAS) data, suggested that there was no underlying trend towards self-employment during the 1980s after controlling for variations in individual characteristics and macroeconomic forces. Similarly, Robson (1996), who analysed quarterly VAT registrations and deregistrations between 1980 and 1990, concluded that an improving macroeconomic environment could explain the rise in the stock of businesses in the 1980s without appealing to an ‘entrepreneurial renaissance’.

Such research, however, fails to specify what is meant by an ‘enterprise culture’ perhaps because the phrase is lost in a nebulous definitional fog (Keat, 1991; Ritchie, 1991; MacDonald and Coffield, 1991; and Deakin and Edwards, 1993). In this paper, however, our aim is to formulate hypotheses to test the role of ‘enterprise culture’ in self-employment choices. As such, we take ‘enterprise culture’ to mean an environment, engendered by, _inter-alia_, policy, the education system, the media and existing entrepreneurs, in which:
alertness to profitable self-employment opportunities is raised\(^9\); exploitation of these opportunities is enabled\(^{10}\); and which validates self-employment as a socially acceptable career choice.

Clearly, on this definition, 'enterprise culture' has both pecuniary ('alertness' and 'enabling') and non-pecuniary ('social validation/acceptability') elements.

**Section 4: Model**

In this section we develop a structural model of self-employment choices prior to empirical testing (see Appendix I for a full derivation of the model). The main purpose of the formal derivation of this model is to derive the variance function for *ex-ante* net self-employment utility which is central to our analysis. There already exist many formal derivations of the mean function (e.g., Rees and Shah, 1986) so this aspect is largely incidental to our derivation although clearly important for the analysis. There are, however, two important distinctions between the model presented in this section and previous models of self-employment choices that are worth clarifying at the outset. These distinctions are:

1) Usually the self-employment criterion is expressed in terms of ex-post utilities (e.g. Rees and Shah, 1986) or incomes (e.g., Evans and Jovanovic, 1989). In our model, individuals are *ex-ante* utility maximizers (which is the source of uncertainty in our model).

2) Rees and Shah (1986) use average (representative) relative earnings in the self-employment criterion whereas we use the individual’s relative earnings (more on earnings in section 7).

---

\(^9\) The contention of alertness is central to entrepreneurship (Kirzner, 1985; Palich and Bagby, 1995; Norton and Moore, 2002). This contention suggests that entrepreneurial types assess opportunities and threats differently from non-entrepreneurs so that the former types perceive arbitrage possibilities where the latter perceive none. Alertness stands in contrast to the contention of risk tolerance that suggests that entrepreneurs have a higher endurance to variable outcomes.

\(^{10}\) Enabled by, for example, the alleviation of human and/or financial capital constraints.
Model outline and assumptions

Our model assumes: i) that (risk-neutral) individuals have two choices in the labour market: to work in wage-employment or, alternatively, self-employment; and ii) that they will work in the sector that maximises their expected utility, where self-employment utility is a function of income and the desire for independence. Accordingly, individuals choose to enter, or stay in, self-employment if their ex-ante net self-employment utility, \( E_{r-1}(s^*) \), is positive. We use `\( E_{r-1}(s) \)` notation to denote expectations with respect to an individual’s pre-investment information set. Strictly speaking, this is an expectation over a Bayesian (subjective) distribution for an individual’s entrepreneurial talent.

The point underlying the second assumption is that individuals irreversibly commit resources to their business despite being uncertain about the outcome of their investments. An important determinant of this outcome is entrepreneurial talent. Hence, if entrepreneurs’ knowledge of their true talent is imperfect, their decision to enter (or stay in) self-employment in the current period requires them to form an expectation of their talent using information available from the previous period. In the spirit of Jovanovic (1982), our model allows entrepreneurs to learn more about their true talent in each period of self-employment. As a result entrepreneurs become increasingly certain of the outcome of their investments over the course of running their business (see Appendix 1).

This result is relevant for our analysis since inflows to and outflows from self-employment may affect not only the volume of businesses but also the composition of the business stock. For example, start-up policies may successfully increase the number of businesses in the short term. However, the policy may also shift the
business age distribution downwards as younger businesses have lower chances of survival the effect of the policy in the long term may be less than the short run impact.\textsuperscript{11} The corollary may also be true: policies designed to enhance the survival rates of businesses (quality policies) may have little effect on the stock of self-employed in the short run but, by lowering the death rate, may help raise the number of self-employed in the long term. We note that Robson (1996) finds that, conditional on a range of macroeconomic variables, VAT registrations and de-registrations are positively correlated which offers some support for the empirical relevance of age distribution effects.\textsuperscript{12}

**Self-employment choices**

In our model $E_{t-1}(s^*)$ is determined by the self-employment to wage-employment income differential which embodies the effects of pecuniary pull and push effects on self-employment choices. In addition, self-employment utilities are affected by non-pecuniary influences. For example increases in personal wealth may increase independence from external sources of finance. Unemployment may also have an important non-pecuniary influence – individuals may prefer the self-esteem provided by self-employment over being unemployed. Finally, we include a linear time trend to capture changes in average non-pecuniary preferences for self-employment over time.

$$E_{t-1}(s^*) = \mu + \alpha(Y^1 - Y^0) + \beta X + \delta t + u^*$$  \hspace{1cm} (1)

\textsuperscript{11} An alternative interpretation is that increased entry raises competitive pressures resulting in more closures but, presumably, leaves behind leaner and fitter businesses.

\textsuperscript{12} Although, as Robson notes, this (contemporaneous) correlation is also consistent with the occurrence of newly registered firms directly displacing existing businesses. He is unable to find statistically significant evidence that lagged registrations increase de-registrations which would less equivocally point to age distribution effects.
where: $Y^1$ and $Y^0$ are ex-post self-employment and wage-employment incomes, respectively; $X$ is a vector of variables which affect non-pecuniary valuations of self-employment (lifestyle preferences/desire for independence) and $t$ is a deterministic time trend. Note that ex-ante net utility is the dependent variable here since individuals’ self-employment choices are made before they observe their income outcomes. However ex-ante income differentials are not observed, so that ex-post quantities appear on the right hand side, which gives rise to $u^*$.  

The strict interpretation of the disturbance term $u^*$ is that it represents an individual’s subjective tendency to over- or under-estimate self-employment utility (optimism). Overly-optimistic individuals will tend to have $u^* > 0$ whereas pessimists will have $u^* < 0$. If we assume subjective outlook does not influence outcomes then $u^*$ is independent of the income differential. In Appendix 1 we show that we may write

$$u^* \sim N\left(0, \sigma_u^2\right)$$

$$\sigma_u^2 = \alpha^2 \left[ \left( \frac{1}{\sigma^2} + \frac{n}{\sigma^2} \right)^{-1} + \sigma^2 \right] f(K^*)^2$$

where: $\alpha$ is the (ex-ante) marginal utility of self-employed income; $\sigma^2$ represents pre start-up uncertainty about entrepreneurial talent; $\sigma^2$ is the variance of firm specific demand shocks; $n$ is the pre-investment age of the venture (this equals zero for start-ups); and $f(K^*)$ is self-employment output under ‘normal’ entrepreneurial

---

13 Nor are ex-ante income differentials estimable with cross sectional data, which is commonly the case in empirical studies of self-employment.

14 This interpretation follows since $u^*$ is the difference between ex-ante and ex-post net self-employment utility where ex-ante utility is formed taking expectations over a subjective distribution for talent.
technology using optimal capital inputs $K^*$.\(^{15}\) The model’s predictions are that $\sigma^2_v$ is increasing in $\sigma^2_y$, $\sigma^2$ and $f(K^*)$ and decreasing in $n$. It seems intuitively clear that self-employment uncertainty should increase with uncertainty about talent, the variability of firm specific shocks and with the level of resources committed to the venture\(^{16}\) whereas uncertainty decreases with business experience. Note that (2) facilitates estimation of the structural model in (1) using a heteroscedastic probit.

**Section 5: Propositions**

Before proceeding to the empirical analysis we formulate some basic testable propositions that differentiate self-employment choices and uncertainty between the 1980s and 1990s. To begin with, we formulate two propositions for the 1980s that draw on the discussion of the pecuniary and non-pecuniary interpretations of this phenomenon set out in section 3.

*Proposition 1a: Self-employment choices are more sensitive to earnings differences between sectors in the 1980s compared to the 1990s.*

*Proposition 1b: Average non-pecuniary self-employment preferences rose systematically in the 1980s and early 1990s (after controlling for observed pecuniary and non-pecuniary effects).*

*Proposition 1a* relates to the alertness contention and can be tested by comparing the income differential coefficients estimated on the 1980s and 1990s sub-samples respectively. *Proposition 1b* pertains to the contention of rising social acceptability of self-employment in the 1980s and will be tested using a deterministic time trend in the structural model. However, given the impossibility of adhering to a rigid

\(^{15}\) The phrase 'normal entrepreneurial technology' is borrowed from Lucas (1978). Specifically, in this instance, $f(K^*)$ represents self-employment output with talent level $\theta = 1$.  

12
interpretation of the coefficient on a time trend, no matter what controls one is able to introduce into the model, we will take any evidence in favour of Proposition 1b as being merely suggestive of a non-pecuniary 'enterprise culture' effect.

Previously, it was argued that changes in the number of self-employed may affect the composition of the business stock as well as the volume of businesses. In particular, during the *quantity* policy period we may expect the typical business age to fall which will give rise to an increase in average self-employment uncertainty. Younger businesses have lower chances of survival so that the long run growth in self-employment rates, during the *quantity* policy period, may be less than the short run growth.\(^{17}\) Conversely, during the *quality* policy period, we may expect the typical business age to increase with the consequence that average self-employment uncertainty will fall. In this case, we expect the long run growth in self-employment rates to exceed the short run growth due to the enhanced survival chances of older businesses. Accordingly, we propose that:

*Proposition 2a:* The variance of self-employment utility increases in the 1980s and falls in the 1990s.


In Appendix 2, we formally distinguish short run from long run self-employment growth rates. The long run growth measures growth in self-employment once all adjustments to the business age distribution have taken place (i.e., it is the growth

\(^{16}\) i.e., the prospect of a higher return, which comes from increasing the size of the investment, comes at a cost of increased absolute uncertainty.

\(^{17}\) The chances of survival are an increasing function of self-employment utility. Therefore as the location of the business age distribution falls, following the inflow of start-ups, average utility and survival chances fall in turn.
associated with a constant average business age). Long run growth lies below (above) short run growth if the location of the business age distribution is falling (rising) toward equilibrium.

**Section 6: Data**

As with Blanchflower and Oswald (1990), we use BSAS data to estimate self-employment choice. The BSAS is an annual survey designed to yield a representative sample of adults, aged 18 or over, living in private households in Britain (south of the Caledonian Canal). The survey began in 1983 and, with the exception of 1988 and 1992, it has used the same set of core questions in each year. The employment status of individuals is ascertained from their response to the question regarding their main economic activity in the previous seven days. To be self-employed, individuals must be working more than ten hours per week, on their own account, and not paying tax through PAYE.

In total, we use 15 surveys covering the years 1983-1999. Figure 1 shows that the self-employment rates for BSAS respondents increased throughout the 1980s in a similar fashion to the Labour Force Survey (LFS) rates. In the 1990s, however, when compared to the LFS rates, it is clear that BSAS respondents were more likely to be in self-employment although it is also clear, as with the LFS rates, that the rate of self-employment has generally plateaued since the late 1980s. Given the marked differences in self-employment rates between BSAS and LFS data from 1990

---

18 We are assuming here that there exists a stationary equilibrium business age distribution.
19 The samples used in our analysis differ from Blanchflower and Oswald’s (1990) in that we do not have access to data on individuals from Northern Ireland.
20 Self-employment status is ascertained in the LFS from the answer to the question ‘were you working as an employee or were you self-employed [reference week]’.
onwards, it would be wise to examine the robustness of any estimates using data from the 1983-1989 periods only.

[Figure 1 about here]

Section 7: Determinants of Self-Employment

The structural model of self-employment choices used in this paper distinguishes pecuniary from non-pecuniary effects (see Rees and Shah, 1986, for the seminal application of structural modeling to self-employment choices). The latter group of effects includes the desire to be one’s own boss (see Blanchflower and Oswald, 1998). Also our model enables us to systematically specify the variance function which previous authors have omitted to do in analysing self-employment decisions. The variables used in the empirical analysis accordingly fall under the following broad headings (all data are sourced from BSAS unless otherwise stated).

Mean function

Pecuniary effects

Self-employment minus wage income differential – The income differential for a self-employed individual is given by the difference between their actual self-employed income and what they would earn in wage employment

\[ y_1 - E(y^0|s = 1). \]
where ‘s’ is a binary indicator which takes the value of unity for the self-employed only. Similarly the income differential for a wage earner is given by the difference between what they would earn in self-employment and what they actually earn in wage-employment

\[ E(Y^1|s = 0) - Y^0. \]

The econometric problem we face is to construct individuals’ counterfactual earnings using BSAS income variables which are recorded as interval data. Single equation ordered probit estimates of earnings on the sub-samples of wage-employed and self-employed would only yield estimates of \( E(Y^0|s = 0) \) and \( E(Y^1|s = 1) \) respectively – the wrong counterfactuals. These estimates would only be valid if career decisions were governed by random selection. Since this is unlikely, we use (heteroscedastic) ordered probits with sample selection to predict the conditional earnings probabilities of the self-employed and wage-employed in wage-employment and self-employment respectively. These estimates of earnings probabilities are then used to construct an earnings differential dummy variable. This dummy variable takes the value of unity if a self-employed (wage-employed) individual’s actual (predicted) income in self-employment exceeds the individual’s predicted (actual) earnings in wage-employment (see Appendix 3 for a full discussion of the construction of these variables and empirical estimates of the income ordered probits with selection).

On the issue of identifying the structural self-employment and earnings equations, we use the following schemes respectively: industry dummies are included in the earnings (and the reduced form self-employment selection) equations but not the

---

21 The expectations operator, used in this section, denotes ‘classical’ expectations with respect to currently available information. It is not to be confused with the ‘\( E_{t-1}(\bullet) \)’ operator used earlier to denote expectations, over a subjective distribution for talent, using information available in the previous period.

22 In which case \( E(Y^0|s = 0) = E(Y^0|s = 1) = E(Y^0) \) and \( E(Y^1|s = 1) = E(Y^1|s = 0) = E(Y^1) \)
structural self-employment equations\textsuperscript{23}; a dummy variable for Asian ethnic status appears in the structural (and reduced form) self-employment equations but not in the earnings equations.\textsuperscript{24}

It is evident that the expected effect of relative earnings on self-employment choices is positive. We note that Rees and Shah (1986) and Taylor (1996) found a positive effect of the income differential on self-employment probabilities. However, as commented in Rees and Shah (1986) and Taylor (1996), this effect is likely to be biased downwards due to unobserved tax advantages in self-employment. In particular self-employment enables certain household expenses to be written off and provides greater opportunities for under-reporting earnings (Pissarides and Weber, 1989; Baker, 1993). Assuming this unobserved effect is roughly constant over individuals\textsuperscript{25}, then the income differential variable will be scaled down and its coefficient will be underestimated. We should note, however, that this bias may be less problematic for our study given the income data are in interval form.\textsuperscript{26}

Non-pecuniary effects

Personal characteristics – Unlike Taylor (1996), Blanchflower and Oswald (1998) and Burke et al (2000), the BSAS does not have ‘desirable job characteristic’ variables to directly measure desire for independence.\textsuperscript{27} In this study we use variables for individuals’ sex (Male), race (Black and Asian), marital status (Married), lack of (minimal) formal education (Left school at 15), age (Age and Age squared), trade

\textsuperscript{23} This is the scheme used by Taylor (1996) to identify his structural self-employment probit.
\textsuperscript{24} Variations in earnings between White and non-White ethnic groupings are measured using solely a dummy variable Black for Afro-Caribbean individuals.
\textsuperscript{25} This assumption is consistent with the Pissarides and Weber and Baker studies.
\textsuperscript{26} Assuming the likelihood of under-reporting an income category is lower than the likelihood of under reporting actual earnings.
\textsuperscript{27} These authors were able to use measures of the importance of being one’s own boss and job security as characteristics of the respondent’s job.
union membership (*Union*) and manual occupational status (*Manual*) as controls for non-pecuniary lifestyle preferences.

*Financial Independence* – Black et al (1996) use housing equity and the regional value of housing to examine the role of collateral in business formations. In this study, we construct a housing wealth variable that is given by the individual’s probability of being a home owner multiplied by the real average regional house price to give an estimate of the individual’s expected housing wealth\(^{28}\) (Data Source: Nationwide Building Society)\(^{29}\). Expected housing wealth is used since home ownership may be endogenous in self-employment decisions. Note that, given we control for earnings differentials (and earnings themselves are a function of wealth – see Appendix 3), the housing wealth variable has a non-pecuniary interpretation in the structural probit. In other words, the ability to self-finance may raise self-employment utility by increasing independence from external sources of equity and/or provide opportunities to pursue non-profit objectives (see Burke et al, 2000).

*Enterprise Support* – The non-pecuniary effects of (observed) enterprise support policies are examined using three (limited) measures: (log) take up of *EAS* (in the 1983-1991 period); (log) real Department for Employment total expenditure on training (*TEE* – in the 1983-1991 period); and (log) real value of lending under the *SFLGS* (1983-1991 and 1993-1999 periods) (Data Source: Department of Employment). These measures are deflated by the population aged 15 to 64 as a proxy for the total working population (Data Source: ONS).

---

\(^{28}\) These predicted probabilities were obtained from reduced form probits for home ownership in which all the exogenous variables (including the industry dummies) appear as explanatory variables. It is outside the scope of this paper to attempt to identify a structural equation for home ownership.

\(^{29}\) www.nationwide.co.uk. These data measure mix adjusted average prices. This adjustment ensures the price series are not biased by changes in, for example, the types of property being sold or property locations. We also calculated the housing wealth variable using data from the leading UK mortgage lender – the Halifax Building Society (www.hbos.plc.com/view/housepriceindex/housepriceindex.asp). Their methodology for constructing price series is similar to that used by the Nationwide. It is unsurprising therefore that the empirical results are unaffected by the version of the housing wealth variable used in the analysis.
Region: We use a set of regional dummies, and regional unemployment rates (Data Source: ONS), to control for regional variations in non-pecuniary preferences for self-employment.

Macroeconomy: Over and above any pecuniary effects, individuals' preferences may be altered by the macroeconomic outlook. Accordingly, we include log real per capita GDP and real interest rates to control for the affect of macroeconomic confidence on non-pecuniary valuations of self-employment (Data Source: ONS).

Trend: Having controlled for the above pecuniary and non-pecuniary effects we examine evidence for underlying growth in aggregate non-pecuniary self-employment preferences using a deterministic time trend. One possible explanation of this trend, during the 1980s, is that it captures rising acceptability of self-employment as a valid career (see Proposition 1b).

Variance function

The theoretical variance function for self-employment utilities is given in equation (2). However, none of the variables which appear in this function are observed in BSAS (or indeed any major survey dataset with, perhaps, the exception of the variable 'business age'). Instead we use the following sets of proxy variables, making predictions about the signs of effects where possible:

Personal characteristics: These include individual’s age, sex, race and marital status and are used to proxy prior uncertainty \( \left( \sigma^{2}_{\theta} \right) \). In particular, we expect the empirical variance function to be decreasing in age reflecting greater stocks of experience among older individuals.
Regional Dummies – These dummies are included to capture regional differences in the variability of demand shocks ($\sigma^2$).

$E(y^1)$, real interest rates (and personal characteristics) – These variables are used to proxy $f(K^*)$ which we can write as $f(K^*) = E(y^1|\theta = 1) + rK^*$ where $r$ is the real interest rate. However $E(y^1|\theta = 1)$ is also unobserved so we proxy it using $E(y^1)$, i.e., the individual’s ‘representative’ level of self-employed income$^{30}$, which may be calculated using the estimates of the marginal income probabilities obtained from the income ordered probit (see Appendix 3). In the absence of liquidity constraints, interior optimum capital may be written $K^* = g(E_{t-1}(\theta), r)$ which is increasing in ex-ante talent ($E_{t-1}(\theta)$) and decreasing in real interest rates (see Appendix 1). As with prior uncertainty about talent (see above), personal characteristics are used to proxy ex-ante talent itself. Due to the fact that the theoretical variance function is increasing in $f(K^*)$ (see section 4), our prior is that the empirical variance function is increasing in $E(y^1)$.

Trend – A trend is included in the variance function to capture changes in average business age over time. Specifically, falling (rising) average business age over the quantity (quality) policy periods is expected to give rise to a rising (falling) trend in variance over these periods – see Proposition 2a and Appendix 2.

The functional form for the variance function is the typically used exponential form,

$$\sigma^2_u = \left[\exp\{\gamma w\}\right]^2$$

(see Harvey, 1976), where $w$, the vector of variance covariates, does not include a constant term. This functional form ensures that a positive variance is estimated.

$^{30}$This is the level of self-employed income we would expect an individual to earn, if randomly selected into self-employment, given the individual’s observed characteristics.
Section 8: Empirical Results

Our starting point is to estimate a group of models that conform to Blanchflower and Oswald’s (1990) original specification\textsuperscript{31}. Table 1 shows that we are able to replicate the key finding of Blanchflower and Oswald (1990): there is no significant trend in self-employment between 1983 and 1989 after taking into account variations in personal and labour market characteristics.

[Table 1 about here]

Our next stage is to develop the empirical analysis in the light of our theoretical model and the distinction we make between \textit{quantity} (1983-1991) versus \textit{quality} (1993-1999) policy periods. In particular, this involves: developing a structural self-employment probit which distinguishes the roles of pecuniary and non-pecuniary influences on self-employment choices; estimating the variance function for self-employment utilities; distinguishing the short run and long run growth in self-employment; and, finally, extending the sample period into the 1990s.

In Table 2, we show the marginal effects from the structural probits for the 1983-1991 and 1993-1999 periods. As expected, in both policy periods higher earnings in self-employment, compared to wage employment, increases the likelihood of self-employment. However, the notable feature is the dramatic difference in the magnitude of the income differential effect between the 1980s and the 1990s. In the 1980s higher earnings in self-employment relative to wage employment increases the
likelihood of self-employment by eighteen percentage points. The same effect in the 1990s is only around 5 percentage points. The greater impact in the 1980s is compatible with the notion of an ‘enterprise culture’ in which individuals are alert and responsive to profitable opportunities in self-employment (Proposition 1a).

Regarding personal characteristics, males have consistently higher non-pecuniary preferences for self-employment throughout the 1980s and 1990s. In contrast, union members have consistently lower relative self-employment utilities. A (non-pecuniary) explanation for this is that union members may have better protected jobs and better working conditions than non-union members which will increase their preferences for wage-employment relative to self-employment. Interestingly there is a sign change in self-employment utilities for married individuals between the 1980s and 1990s: the support of a spouse appears to enhance self-employment preferences in the 1980s but is detrimental to the chances of running one’s own business in the 1990s. Also, Asians have a greater disposition toward self-employment than Whites in the 1990s. This effect may reflect variations in cultural resources, such as family networks and niche markets, between Asians and non-Asians (see Metcalf et al, 1996 and Clarke and Drinkwater, 1998).\textsuperscript{32}

Housing wealth has no impact on non-pecuniary preferences in the 1980s. In contrast, in the 1990s, each 1% increase in housing wealth is associated with a 0.22 percentage point rise in self-employment likelihoods. Interestingly, this suggests that financial independence and/or non-profit objectives have exerted an influence on self-

\textsuperscript{31} We estimated Blanchflower and Oswald’s 6\textsuperscript{th} model as it is the most general in terms of the range of determinants included and the results from it are typical of their other nine models.

\textsuperscript{32} However, interestingly, this effect is not significant in the 1980s. This is surprising since evidence from alternative data sources suggests the self-employment boom in the 1980s was particularly important for non-whites (General Household Survey – Clarke and Drinkwater, 1998; Labour Force Survey – Daly, 1991).
employment preferences during the 1990s, but not in the 1980s. There is evidence that enterprise support affected preferences during the quantity period (SFLGS) which indicates that over and above any pecuniary benefits, individuals derived some reassurance from the availability of 'hard' support.

Regional variations in non-pecuniary valuations of self-employment are apparent in the 1980s only (regional dummies). However, the effect of regional unemployment appears stronger in the 1990s. Even having allowed for pecuniary factors, each one percentage point increase in regional unemployment rates raises self-employment likelihoods by around one percentage point in the 1980s and by about two percentage points in the 1990s. This supports the idea that, particularly in the 1990s, self-employment provides a means of regaining self-esteem for individuals from regions where wage opportunities are limited.

Regarding macroeconomic effects, rising real per capita incomes in the 1983-1991 periods are associated with a rise in self-employment preferences. This may reflect increasing confidence for the success of business ventures as the economy improved in the mid-late 1980s. Conversely, during the 1990s, a 1% rise in real per capita GDP lowers self-employment likelihoods by more than 2 percentage points and a 1 percentage point fall in real interest rates lowers the probability of self-employment by about one and a half percentage points. This pattern of effects may be a result of enhanced wage employment opportunities, as the UK economy recovered from recession, in the mid-late 1990s.

Turning to the trend, we find it to be statistically significant in the 1980s but insignificant in the 1990s. This indicates the existence of a discrete break in
underlying self-employment growth between the *quantity* and *quality* policy periods. In addition, the trend in the 1980s is positive in support of *Proposition 1b* which suggests that self-employment became an increasingly socially acceptable career option during the 1980s. Clearly, however it is impossible to adhere rigidly to this interpretation of the trend so we take this result as being merely suggestive of an ‘enterprise culture’ effect. In any case, to counter arguments that this trend is a statistical artefact of using BSAS data, recalling BSAS self-employment rates track LFS rates closely up to 1989 only, we re-estimated the model for the years 1983-1989. This change does not, however, affect our conclusions about the presence of an underlying trend toward self-employment (results available from the authors on request).

Regarding the variance functions we make the following observations. In the 1980s we see that variance decreases with individual’s age. This supports the role of experience in reducing uncertainty. Also, variance in the *quantity* period increases with the individual’s representative level of self-employed income \(E(Y^1)\), as predicted by the theoretical model. The regional dummies are jointly significant which suggests the presence of regional variations in demand shocks. Finally, the 1980s trend in variance indicates self-employment uncertainty is increasing during this period, which suggests falling average business age, supporting *Proposition 2a*. However, looking at the 1990s variance function, we notice that only \(E(Y^1)\) and marital status are statistically significant (the former effect seemingly having the wrong sign). The trend in variance is falling in the 1990s, in support of *Proposition 2a* (rising average business age), but it is statistically insignificant. Overall, comparing the variance function estimates between the 1980s and 1990s, we note that the variance of self-employment utilities is considerably more stable in the 1990s.
On the issue of Proposition 2b we present estimates of the short run and long run relative trend effects, by year, in Table 3. Firstly, we notice that the (short run) growth effects increase through the 1980s and peak in 1989, accounting for a 27% growth in self-employment in this year. Thereafter the effects decline in 1990 and 1991. This pattern suggests the underlying growth of self-employment follows a sigmoid diffusion path analogous to the spread of an ‘epidemic’ (see Bain, 1964; Bass, 1969; and Stoneman, 1987). Secondly, the long-run (stationary variance) effects are consistently lower than the short run effects reflecting diminished business survivability during quantity policy period. Interestingly, the long run effects increase monotonically in the 1983-1991 periods despite the tail-off in the short run effects. This pattern could be accounted for by improving survival chances at the end of the period. In contrast, during the quality period (1993-1999), neither the short run nor the long-run growth effects are statistically significant. However, the long run estimates are consistently higher than the short run estimates, which is compatible with enhanced survivability during the 1990s. Overall, the estimates in Table 3 are supportive of Proposition 2b which hypothesised that the underlying short run growth in self-employment rates is higher than the long run growth during the 1980s and vice-versa in the 1990s.

33 By ‘diffusion path’ we mean the path which describes the evolution of self-employment probabilities from their pre-enterprise culture level to their post-enterprise culture ‘equilibrium’ level. The inverted ‘U’ shape of the marginal effects, in Table 3, implies the sigmoid shape of this path during the 1983-1991 periods.

34 To expand on this analogy, individuals, ‘at risk’ of entrepreneurship, are ‘infected’ by the ‘epidemic’ of self-employment through channels of, for example, policy, contact with existing entrepreneurs and media images. This leads to an initial rapid rise in ‘infection’ rates followed by a slow-down as less of the non-infected ‘at risk’ population remains.
Section 9: Conclusions

This paper sits squarely within the literature on the factors that promote or hinder self-employment. Typically, this literature has examined the role of money, or lack of it on, self-employment choices. Some studies have even attempted to separately quantify pecuniary and non-pecuniary effects using structural models of self-employment choices (Rees and Shah, 1986). We too use a structural framework, this time with the aim of examining changes over time in the roles of relative earnings, lifestyle preferences, policy and the cultural backdrop on self-employment choices. In addition we provide a systematic analysis of self-employment uncertainty which allows us to specify both the mean and variance functions in the structural self-employment equations.

Our ‘case study’ for analysis is the UK (although we only have data for Great Britain). Some have argued that the 1980s saw the birth of an ‘enterprise culture’ in the UK spurred on by policies aimed at encouraging new venture creation. The early 1990s, however, saw a shift in policy emphasis toward enhancing the growth and survivability of existing businesses.

The estimates of the structural model, from the quantity period, indicate that both relative pecuniary returns and measurable non-pecuniary influences have an important role in determining whether self-employment or wage employment is chosen. It is notable, however, that individuals in the 1980s are much more sensitive to variations in income differences between self- and wage-employment than their 1990s counterparts. This is compatible with an ‘enterprise culture’ in the 1980s in which individuals are alert and highly responsive to profitable opportunities in self-
employment. Also, there remains a significant rising trend in average self-employment preferences during this period, the existence of which may support growing social acceptability for self-employed careers. Importantly, these findings are in contrast to the conclusions of previous studies including Blanchflower and Oswald (1990) and Robson (1996) who put the rise in self-employment in the 1980s purely down to macroeconomic forces. Regarding the variance function for the 1980s, individual’s age significantly lowers uncertainty suggesting age brings with it experience (Cressy, 1996) and insight into prospects (Jovanovic, 1982). During the 1980s, we also observe an upward trend in average self-employment uncertainty. This may reflect changes in the business age distribution toward younger firms due to the inflow of start-ups. The consequence of this shift is that average survival chances falls diminishing the growth in self-employment preferences in the long run.

In contrast, the estimates for the quality period indicate there is no underlying trend in self-employment preferences, having accounted for observed pecuniary and non-pecuniary influences. This supports the existence of a break in the upward movement of average preferences, between the 1980s and 1990s. A desire for financial independence appears to be more important for self-employment choices in the 1990s compared to the 1980s. We also notice a downward trend in self-employment uncertainty in the 1990s that may reflect shifts in the firm age distribution towards older businesses with higher chances of survival. Overall, our estimates of the variance of self-employment utilities suggest that self-employment is a much more stable phenomenon in the 1990s compared to the 1980s.

It is hard to escape the conclusion from our analysis that the legacy of ‘enterprise culture’ was anything other than short lived. Individuals in the 1990s are less
responsive to earnings differentials, compared to the heady days of the 1980s, and underlying growth in self-employment dropped significantly in the 1990s. Of course, the inferences from these observations are not necessarily negative ones. Improving wage opportunities, following the recession of the early 1990s, may explain both observations. However, the policy implication suggested by this analysis is that the long run growth in self-employment in the 1980s could have been greater had a systematic framework of post-start up support been available. Such a framework may have helped offset the adverse consequences of a falling business age distribution on survival. Arguably, current and future policy makers, seeking to promote economic growth through increasing the take-up of self-employment, should heed this lesson.
References


Institute of Manpower Studies (IMS) (1987) *Job Creation Initiatives by Companies*, Brighton, University of Sussex: IMS.


Figure 1: LFS and BSAS Self-Employment Rates in the UK, 1983-1999
Table 1: Blanchflower and Oswald Self-Employment Probits (p-values in parenthesis)\(^1,2\)

<table>
<thead>
<tr>
<th></th>
<th>All Adults, 1983-1989</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>0.590 (0.000)</td>
</tr>
<tr>
<td>Black(^2)</td>
<td>-0.141 (0.459)</td>
</tr>
<tr>
<td>Asian</td>
<td>0.174 (0.267)</td>
</tr>
<tr>
<td>Age</td>
<td>0.049 (0.000)</td>
</tr>
<tr>
<td>Age squared/100</td>
<td>-0.043 (0.000)</td>
</tr>
<tr>
<td>Union</td>
<td>-0.640 (0.000)</td>
</tr>
<tr>
<td>Manual</td>
<td>0.096 (0.026)</td>
</tr>
<tr>
<td>Regional Unemployment</td>
<td>-0.021 (0.204)</td>
</tr>
<tr>
<td>Scotland</td>
<td>0.153 (0.247)</td>
</tr>
<tr>
<td>North West</td>
<td>0.095 (0.452)</td>
</tr>
<tr>
<td>Yorkshire</td>
<td>0.040 (0.764)</td>
</tr>
<tr>
<td>West Midlands</td>
<td>0.033 (0.798)</td>
</tr>
<tr>
<td>East Midlands</td>
<td>0.170 (0.258)</td>
</tr>
<tr>
<td>East Anglia</td>
<td>-0.239 (0.187)</td>
</tr>
<tr>
<td>S West</td>
<td>0.111 (0.469)</td>
</tr>
<tr>
<td>S East</td>
<td>0.001 (0.993)</td>
</tr>
<tr>
<td>Wales</td>
<td>0.426 (0.002)</td>
</tr>
<tr>
<td>Ever Unemployed(^4)</td>
<td>-</td>
</tr>
<tr>
<td>Trend</td>
<td>0.003 (0.871)</td>
</tr>
<tr>
<td>Log Likelihood</td>
<td>-2534.45</td>
</tr>
<tr>
<td>(\chi^2) (p-value)</td>
<td>0.000</td>
</tr>
<tr>
<td>N</td>
<td>7645</td>
</tr>
</tbody>
</table>

Notes:
1. The dependent variable equals one if the individual is self-employed and zero if a wage earner.
2. Survey weights are used in estimation.
3. For the sake of consistency with later tables in this section, our base category for the ‘manual’ work, race and region binary variables are different from those in Blanchflower-Oswald. Our base categories for these variables are non-manual work, white and the North of England respectively.
4. The ‘ever-unemployed’ variable, which is included in the original Blanchflower-Oswald models, had to be dropped here since it perfectly predicted the self-employment variable.
### Table 2: Structural Self-Employment (Heteroscedastic) Probits – Marginal
Effects in Mean function (p-values in parenthesis)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pecuniary effects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Income Differential</td>
<td>0.184 (0.000)</td>
<td>0.047 (0.000)</td>
</tr>
<tr>
<td><strong>Non-pecuniary effects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Personal characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.053 (0.000)</td>
<td>0.138 (0.000)</td>
</tr>
<tr>
<td>Black</td>
<td>-0.023 (0.377)</td>
<td>0.032 (0.423)</td>
</tr>
<tr>
<td>Asian</td>
<td>0.025 (0.324)</td>
<td>0.107 (0.001)</td>
</tr>
<tr>
<td>Married</td>
<td>0.025 (0.014)</td>
<td>-0.058 (0.001)</td>
</tr>
<tr>
<td>Left school at 15</td>
<td>-0.004 (0.635)</td>
<td>0.004 (0.706)</td>
</tr>
<tr>
<td>Age</td>
<td>0.005 (0.000)</td>
<td>0.009 (0.000)</td>
</tr>
<tr>
<td>Age squared/100</td>
<td>-0.004 (0.001)</td>
<td>-0.006 (0.006)</td>
</tr>
<tr>
<td>Union</td>
<td>-0.088 (0.000)</td>
<td>-0.142 (0.000)</td>
</tr>
<tr>
<td>Manual</td>
<td>0.022 (0.046)</td>
<td>0.066 (0.000)</td>
</tr>
<tr>
<td><strong>Financial independence</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(log) Real Housing wealth</td>
<td>-0.011 (0.616)</td>
<td>0.217 (0.000)</td>
</tr>
<tr>
<td><strong>Enterprise Support</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(log) EAS</td>
<td>-0.019 (0.268)</td>
<td>-</td>
</tr>
<tr>
<td>(log) TEE</td>
<td>0.042 (0.412)</td>
<td>-</td>
</tr>
<tr>
<td>(log) SFLGS</td>
<td>0.035 (0.008)</td>
<td>0.008 (0.478)</td>
</tr>
<tr>
<td><strong>Regional</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>0.012 (0.030)</td>
<td>0.020 (0.019)</td>
</tr>
<tr>
<td>Scotland</td>
<td>0.087 (0.099)</td>
<td>0.025 (0.436)</td>
</tr>
<tr>
<td>North West</td>
<td>0.107 (0.144)</td>
<td>-0.002 (0.954)</td>
</tr>
<tr>
<td>Yorkshire and Humberside</td>
<td>0.153 (0.141)</td>
<td>-0.009 (0.750)</td>
</tr>
<tr>
<td>East Midlands</td>
<td>0.241 (0.075)</td>
<td>-0.019 (0.500)</td>
</tr>
<tr>
<td>West Midlands</td>
<td>0.083 (0.153)</td>
<td>0.035 (0.385)</td>
</tr>
<tr>
<td>East Anglia</td>
<td>0.114 (0.243)</td>
<td>0.051 (0.358)</td>
</tr>
<tr>
<td>South West</td>
<td>0.244 (0.067)</td>
<td>0.071 (0.175)</td>
</tr>
<tr>
<td>South East</td>
<td>0.137 (0.018)</td>
<td>-0.031 (0.388)</td>
</tr>
<tr>
<td>Wales</td>
<td>0.200 (0.103)</td>
<td>0.006 (0.839)</td>
</tr>
<tr>
<td><strong>Macroeconomy</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(log) Real per-capita GDP</td>
<td>0.410 (0.069)</td>
<td>-2.333 (0.003)</td>
</tr>
<tr>
<td>Real interest rates</td>
<td>0.003 (0.325)</td>
<td>0.016 (0.031)</td>
</tr>
<tr>
<td><strong>Trend</strong></td>
<td>0.028 (0.023)</td>
<td>0.002 (0.869)</td>
</tr>
<tr>
<td>$\chi^2$ (p-value) – [mean function]</td>
<td>0.000</td>
<td>0.063</td>
</tr>
<tr>
<td><strong>Variance function: $\sigma^2 = [\exp{\gamma w}]^2$</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0.070 (0.494)</td>
<td>-0.039 (0.814)</td>
</tr>
<tr>
<td>Black</td>
<td>-0.009 (0.172)</td>
<td>-0.252 (0.371)</td>
</tr>
<tr>
<td>Married</td>
<td>0.189 (0.013)</td>
<td>0.159 (0.073)</td>
</tr>
<tr>
<td>Age</td>
<td>-0.009 (0.002)</td>
<td>0.003 (0.498)</td>
</tr>
<tr>
<td></td>
<td>Estimate (SE)</td>
<td>Estimate (SE)</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Union</td>
<td>0.153 (0.085)</td>
<td>-0.120 (0.384)</td>
</tr>
<tr>
<td>$E(Y^1)$</td>
<td>0.124 (0.072)</td>
<td>-0.147 (0.002)</td>
</tr>
<tr>
<td>Real interest rates</td>
<td>0.018 (0.309)</td>
<td>0.003 (0.946)</td>
</tr>
<tr>
<td>Trend</td>
<td>0.030 (0.022)</td>
<td>-0.014 (0.478)</td>
</tr>
<tr>
<td><strong>Regional Dummies</strong></td>
<td>9 included; $\chi^2$ (p-value)= 0.003</td>
<td>0 included; $\chi^2$ (p-value)= 0.568</td>
</tr>
<tr>
<td>$\chi^2$ (p-value) – [variance function]</td>
<td>0.000</td>
<td>0.009</td>
</tr>
<tr>
<td>Log-likelihood</td>
<td>-3330.03</td>
<td>-4001.97</td>
</tr>
<tr>
<td>$N$</td>
<td>10458</td>
<td>10055</td>
</tr>
</tbody>
</table>

Notes: Survey weights are used in estimation.
Specifications with year dummies were estimated but a) these dummies were jointly statistically insignificant and b) their inclusion did not materially alter the results.
Table 3: Underlying growth $\frac{1}{\Phi} \frac{\partial \Phi}{\partial t}$ – Short run and long run (stationary variance) growth by year - (p-values in parenthesis)

<table>
<thead>
<tr>
<th>Year(s)</th>
<th>Short run</th>
<th>Long run</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>0.084 (0.020)</td>
<td>0.053 (0.092)</td>
</tr>
<tr>
<td>1984</td>
<td>0.132 (0.022)</td>
<td>0.080 (0.092)</td>
</tr>
<tr>
<td>1985</td>
<td>0.153 (0.024)</td>
<td>0.093 (0.092)</td>
</tr>
<tr>
<td>1986</td>
<td>0.198 (0.027)</td>
<td>0.123 (0.092)</td>
</tr>
<tr>
<td>1987</td>
<td>0.214 (0.030)</td>
<td>0.140 (0.092)</td>
</tr>
<tr>
<td>1989</td>
<td>0.272 (0.037)</td>
<td>0.205 (0.092)</td>
</tr>
<tr>
<td>1990</td>
<td>0.258 (0.040)</td>
<td>0.212 (0.092)</td>
</tr>
<tr>
<td>1991</td>
<td>0.253 (0.045)</td>
<td>0.228 (0.092)</td>
</tr>
<tr>
<td>1983-1991</td>
<td>0.222 (0.031)</td>
<td>0.148 (0.092)</td>
</tr>
<tr>
<td>1993</td>
<td>0.008 (0.881)</td>
<td>0.029 (0.657)</td>
</tr>
<tr>
<td>1994</td>
<td>0.010 (0.875)</td>
<td>0.034 (0.657)</td>
</tr>
<tr>
<td>1995</td>
<td>0.011 (0.870)</td>
<td>0.035 (0.657)</td>
</tr>
<tr>
<td>1996</td>
<td>0.010 (0.864)</td>
<td>0.032 (0.657)</td>
</tr>
<tr>
<td>1997</td>
<td>0.011 (0.858)</td>
<td>0.032 (0.657)</td>
</tr>
<tr>
<td>1998</td>
<td>0.015 (0.853)</td>
<td>0.043 (0.657)</td>
</tr>
<tr>
<td>1999</td>
<td>0.015 (0.847)</td>
<td>0.040 (0.657)</td>
</tr>
<tr>
<td>1993-1999</td>
<td>0.011 (0.864)</td>
<td>0.035 (0.657)</td>
</tr>
</tbody>
</table>
Appendix 1: Model of self-employment choices

In this appendix, we develop our model of self-employment choices. We start out by looking at self-employment income, before turning to the role of learning about entrepreneurial ability in making self-employment investment decisions. From this, the model of self-employment choices follows in terms of a comparison between the expected utility from self-employment and wage employment.

**Self-employment income**

Self-employment income arises as the residual from some productive activity after all factor payments. With $K$ units of physical capital employed in production, self-employment income is given by

$$Y^1 = \eta f(K) - rK$$

where $\eta = \theta + \varepsilon$ and $\theta$ is entrepreneurial talent. $\theta$ is not observed but we assume the start-up entrepreneur uses a normal prior density with known parameters, $\mathcal{N}(\bar{\theta}, \sigma_\theta^2)$, to form initial beliefs about talent. The firm specific demand shocks $\varepsilon$ are distributed as $\mathcal{N}(0, \sigma^2)$ by assumption. We assume the production function, $f(\cdot)$, is twice differentiable and concave.

**Learning about $\theta$**

Entrepreneurs' investment decisions precede the income outcome. Accordingly, entrepreneurs must make the decision to enter, or continue, in self-employment using $E(Y^1|I_{t-1})$ where $I_{t-1}$ is the information set available at time $t-1$. Entrepreneurs must form an expectation of self-employment income since they are unsure of how good they are in business (and luck regarding demand – their best guess on this is that they are neither lucky nor unlucky). When their firms are aged $n = 0$ their expectation is informed solely by their prior beliefs. Conversely, when their firms are aged $n > 0$ their prior density can be combined with sample information $\{\eta_i\}_{i=1}^{t-1}$ (summarised in the conditional density), where $\tau$ denotes the period of entry into self-employment, to form their revised beliefs about $\theta$ (summarised in the posterior density). Since $\sigma^2$ is known and given the normality of the prior and conditional densities, it follows that the posterior density of $\theta$ is normally distributed.

The posterior mean of $\theta$ is given by (see e.g. Greene, 1997, p. 318)

$$E(\theta|\sigma^2, \{\eta_i\}_{i=1}^{t-1}) = W\bar{\theta} + (1 - W)\hat{\theta}_n$$

where

$$W = \left( \frac{1}{\sigma_\theta^2} + \frac{n}{\sigma^2} \right)^{-1} \frac{1}{\sigma_\theta^2} \quad \text{and} \quad \hat{\theta}_n = \frac{1}{n} \sum_{i=t}^{t-1} \eta_i$$

i.e. the posterior mean is a weighted average of the prior and sample (ML) estimates of ability. Very old firms and those with non-informative priors will give 100% weight to the sample estimates. Also the posterior variance is

$$\text{var}(\theta|\sigma^2, \{\eta_i\}_{i=1}^{t-1}) = \left( \frac{1}{\sigma_\theta^2} + \frac{n}{\sigma^2} \right)^{-1}$$
From this expression, it follows that the precision on $\theta$ grows in the course of running the business (Jovanovic, 1982). Hereafter, for notational parsimony, we will denote $E\left(\sigma^2, \{\eta_t, 1_{t=1}\}^\infty_{t=1}\right)$ and $\text{var}\left(\sigma^2, \{\eta_t, 1_{t=1}\}^\infty_{t=1}\right)$ by $E_{t-1}()$ and $\text{var}_{t-1}()$ respectively.

The entrepreneur will make optimal capital input decisions based on expected ability. Using the implicit function theorem these optimal decisions may be characterised as

$$K^* = g(E_{t-1}(\theta), r)$$

with $g_{E_{t-1}(\theta)} > 0$ and $g_r < 0$. This optimal capital input is based on the assumption that entrepreneurs are not liquidity constrained. If entrepreneurs are constrained by lack of finance then $K = h(Z) < K^*$, and self-employed incomes are a function of wealth $Z$ (see Evans and Jovanovic, 1989). In the remainder of this appendix we will take it as given that entrepreneurs’ expected incomes are based on interior optimum solutions for $K^*$.

**Self-employment choice**

The entrepreneur chooses self-employment if $E_{t-1}(s^*) = E_{t-1}(U^1 - U^0) > 0$, where $U^1$ and $U^0$ are utilities in self-employment and wage employment respectively. To develop this expression, firstly we expand ex-ante net income around ex-post net income

$$E_{t-1}(Y^1 - Y^0) = Y^1 - Y^0 + E_{t-1}(Y^1) - Y^1$$

$$= Y^1 - Y^0 + u$$

where we assume there is no uncertainty regarding income from wage employment. Since $E_{t-1}(Y^1)$ is formed using a Bayesian (subjective) distribution for talent, $u$ is interpreted as an individual’s subjective tendency to over- or under-estimate actual self-employed income. That is, an overly optimistic entrepreneur will tend to over-estimate the true income differential ($u > 0$) whereas a pessimist under-estimates income ($u < 0$). However we assume that the outcome is independent of the individual’s optimism – that is, we assume $u$ is independent of $Y^1$. Now we can show $E_{t-1}(u) = 0$,

$$\text{var}_{t-1}(u) = E_{t-1}(u)^2 = E_{t-1}\left(E_{t-1}(Y^1) - Y^1\right)^2 = E_{t-1}\left((E_{t-1}(\theta) - \theta) - \varepsilon f(K^*)\right)^2$$

$$= \left(\frac{1}{\sigma^2_\theta} + \frac{n}{\sigma^2}\right)^{-1} + \sigma^2 f(K^*)^2$$

the last line using the expression for the posterior variance. We note that $\text{var}_{t-1}(u)$ is decreasing in business age.

Utility from self employment is given by $U^1 = V^1(Y^1, X^1)$ and $X^1$ measures non-pecuniary determinants of self-employment utility (lifestyle preferences/desire for independence). We assume $V^1(\cdot)$ is a twice differentiable and concave function. Using a Taylor series expansion to second order of $V^1(Y^1, X^1)$ around $V^1(E_{t-1}(Y^1), X^1)$ we derive

$$V^1(y^1, X^1) = V^1(E_{t-1}(Y^1), X^1) - V^1\left(E_{t-1}(Y^1), X^1\right) + \frac{1}{2} V''\left(E_{t-1}(Y^1), X^1\right) u^2$$
where we use \( V' \) and \( V'' \) to denote \( (\partial / \partial Y) V' \) and \( (\partial^2 / \partial Y^2) V' \) respectively. Accordingly

\[
E_{t-1} \left[ V' (Y^t, X^t) \right] \equiv V' \left( E_{t-1} (Y^t), X^t \right) + \frac{1}{2} V'' \left( E_{t-1} (Y^t), X^t \right) \text{var}_{t-1}(u)
\]

Note that, given concavity, \( E_{t-1} \left[ V' (Y^t, X^t) \right] \leq V' \left( E_{t-1} (Y^t), X^t \right) \) (Jensen’s inequality). Defining \( \lambda = V' \left( E_{t-1} (Y^t), X^t \right) - V' (Y^t, X^t) \) we note that

\[
E_{t-1} (\lambda) = -\frac{1}{2} V'' \left( E_{t-1} (Y^t), X^t \right) \text{var}_{t-1}(u),
\]

\[
\text{var}_{t-1}(\lambda) = E_{t-1} \left[ \lambda - E_{t-1}(\lambda) \right]^2
\]

\[
= E_{t-1} \left[ V' \left( E_{t-1} (Y^t), X^t \right) u - \frac{1}{2} V'' \left( E_{t-1} (Y^t), X^t \right) u^2 + \frac{1}{2} V'' \left( E_{t-1} (Y^t), X^t \right) \text{var}_{t-1}(u) \right]^2
\]

\[
= V' \left( E_{t-1} (Y^t), X^t \right)^2 \text{var}_{t-1}(u)
\]

Now expected net self-employment utility, \( E_{t-1} (s^*) = E_{t-1} \left[ V' (Y^t, X^t) - V^0 (Y^0) \right] \) (which assumes wage employment utility is a function of income only – Blanchflower and Oswald, 1998), may be approximated by

\[
E_{t-1} (s^*) \equiv V' \left( E_{t-1} (Y^t), X^t \right) + \frac{1}{2} V'' \left( E_{t-1} (Y^t), X^t \right) \text{var}_{t-1}(u) - V^0 (Y^0)
\]

However \( E_{t-1} (Y^t) \) is unobserved. Accordingly, by adding and subtracting \( V' (Y^t, X^t) \) on the right hand side of the above equation, and using \( \lambda \), which was defined previously, we may write

\[
E_{t-1} (s^*) \equiv V' \left( Y^t, X^t \right) + \frac{1}{2} V'' \left( E_{t-1} (Y^t), X^t \right) \text{var}_{t-1}(u) - V^0 (Y^0) + \lambda
\]

\[
= V' \left( Y^t, X^t \right) - V^0 (Y^0) + u^*
\]

which is in terms of observed ex-post self-employment income. This is the general form of the model given in equation (1) in the main text. A trend is introduced to the specification to measure changes in average preferences over time (e.g., nonpecuniary ‘enterprise culture’). The particular case given by (1) is arrived at by assuming linearity of \( V' \) and \( V^0 \) (risk neutrality). Using the previously derived results for the first two central moments of \( \lambda \) we also see that

\[
E_{t-1} (u^*) = E_{t-1} \left( \lambda + \frac{1}{2} V'' \left( E_{t-1} (Y^t), X^t \right) \text{var}_{t-1}(u) \right) = 0
\]

\[
\text{var}_{t-1}(u^*) = \text{var}_{t-1}(\lambda)
\]

so that \( u^* \) is heteroscedastic with a variance which is decreasing in business age. Also assuming linearity of \( V' \) and \( V^0 \) then \( u^* = \lambda \). In turn, \( \lambda \) is a linear function of \( E_{t-1} (\theta) - \theta \) and \( \varepsilon \) both of which are normally distributed random variables.

Accordingly \( u^* \) is normally distributed given utility functions are linear. Specifically

\[
u^* \sim N(0, \sigma^2_{u^*})
\]

\[
\sigma^2_{u^*} = a^2 \left[ \left( \frac{1}{\sigma^2_\theta} + \frac{n}{\sigma^2_\varepsilon} \right)^{-1} + \sigma^2 \right] f(K^*)^2
\]

39
where \( a = V^1 (E_{t-1} (Y^1) X^1) \) is the ex-ante marginal utility of self-employed income. Analogously to \( u \) in the instance of incomes, \( u^* \) is interpreted as the individual’s subjective tendency to over- or under-estimate self-employment utility — over-optimistic (pessimistic) entrepreneurs will tend to have positive (negative) \( u^* \). As with \( u \), \( Y^1 \) is independent of \( u^* \) assuming subjective outlook does not affect outcomes.
Appendix 2: Short run and long run effects

Here we show the differential impact of quantity versus quality policies on business age distributions and the consequences of this for short run versus long run growth in self-employment preferences.

Firstly write

\[ \text{var}_{-1}(u^*) = \xi(n) \]

where \( d\xi/dn < 0 \) follows from the results in Appendix 1. It follows that

\[ \frac{d \text{var}_{-1}(u^*)^{1/2}}{dn} = \frac{d\xi}{d\xi^{1/2}} \]

Now \( n = \omega(t) \) where \( n \) is the location of the business age distribution at time \( t \) and we assume that this location varies with time (in the short run). In particular, during the quantity period we may expect the typical business age to be falling \(-dn/dt<0\) whereas during the quality policy period \( dn/dt > 0 \). It follows that

\[ \frac{d \text{var}_{-1}(u^*)^{1/2}}{dt} = \frac{d\xi^{1/2}}{dn} \frac{dn}{dt} \]

will be positive during the quantity policy period and negative during the quality period. This reflects rising self-employment uncertainty during the quantity policy period and falling uncertainty during the quality period.

Now growth in self-employment probabilities over time (underlying growth effect) is given by

\[ \Phi\left( \frac{\nu + \delta t}{\text{var}_{-1}(u^*)^{1/2}} \right)^{-1} \frac{d}{dt} \Phi\left( \frac{\nu + \delta t}{\text{var}_{-1}(u^*)^{1/2}} \right) = \Phi\left( \frac{\nu + \delta t}{\text{var}_{-1}(u^*)^{1/2}} \right)^{-1} \phi\left( \frac{\nu + \delta t}{\text{var}_{-1}(u^*)^{1/2}} \right) \frac{d \text{var}_{-1}(u^*)^{1/2}}{dt} \frac{(\nu + \delta t)}{\text{var}_{-1}(u^*)^{1/2}} \]

where \( \Phi \) and \( \phi \) are, respectively, the distribution and density functions of the standard normal and \( \nu = \mu + \alpha(Y^1 - Y^0) + \beta X \). It is reasonable to assume that

\( \nu + \delta t < 0 \)

since this implies the likelihood of self-employment, \( \Phi\left( (\nu + \delta t) / \text{var}_{-1}(u^*)^{1/2} \right) \), is less than one-half (we know of no economy where this likelihood is anywhere near 50%). Assuming there exists a stationary equilibrium distribution of business ages then, in the long run, \( dn/dt = 0 \). Accordingly, in the long run, the growth in self-employment probabilities is given by

\[ \Phi\left( \frac{\nu + \delta t}{\text{var}_{-1}(u^*)^{1/2}} \right)^{-1} \frac{d}{dt} \Phi\left( \frac{\nu + \delta t}{\text{var}_{-1}(u^*)^{1/2}} \right) = \Phi\left( \frac{\nu + \delta t}{\text{var}_{-1}(u^*)^{1/2}} \right)^{-1} \phi\left( \frac{\nu + \delta t}{\text{var}_{-1}(u^*)^{1/2}} \right) \frac{\delta}{\text{var}_{-1}(u^*)^{1/2}} \]

Clearly this is simply the growth effect with a stationary variance. Now we can compare the short run effect, given in A2.1, with the long run effect A2.2 in quantity versus quality periods. First, the long run growth in the quantity period is less than the short run growth. This follows from the positivity of \( d \text{var}_{-1}(u^*)^{1/2} / dt \) in the
quantity period, the negativity of \( \nu + \delta \) in all periods and a direct comparison of A2.1 and A2.2. Conversely, the long run growth in the quality period is greater than the short run growth. This follows from the negativity of \( d \text{ var}_{\nu}(u^*) \frac{1}{2} / dt \) in the quality period (and the negativity of \( \nu + \delta \) in all periods) and a direct comparison of A2.1 and A2.2.
Appendix 3: Income differential dummy variable and estimates of ordered income probits with selection

In order to construct the income dummy variable we need to predict what a wage earner would earn in self-employment and what a self-employed individual would earn in wage employment states since we do not observe an individual in both states simultaneously. To do this we estimate heteroscedastic ordered probits (the income data are in interval form), with sample selection, for self-employment and wage-employment incomes on the self-employed and wage earner sub-samples respectively. This approach allows for the possibility that individuals select wage/self-employment because they receive above average earnings in their chosen employment (comparative advantage). These ordered probits include as explanatory variables: personal characteristics; wealth (home ownership); regional labour market variables; enterprise support variables; macroeconomic variables (real per capita GDP and interest rates); and industry dummies. The industry dummies are excluded from the structural self-employment probits, reported in Table 2, to identify these probits. In contrast, the earnings ordered probits are identified with an Asian ethnicity dummy variable which enters the structural self-employment probits, but not the earnings equations.

Using the conditional probabilities obtained from the estimated ordered probits we can then construct the counterfactual incomes of self-employed individuals and wage earners in wage employment and self-employment respectively. That is, with \( k = 6 \) income categories (and coding the first category as zero), we may estimate the wage earnings of a self-employed individual as

\[
E(Y^0|s=1) = \text{prob}(Y^0 = 1|s=1) + 2 \times \text{prob}(Y^0 = 2|s=1) + \ldots + (k-1) \times \text{prob}(Y^0 = k-1|s=1)
\]

Similarly estimated self-employment income of a wage earner is given by

\[
E(Y^1|s=0) = \text{prob}(Y^1 = 1|s=0) + 2 \times \text{prob}(Y^1 = 2|s=0) + \ldots + (k-1) \times \text{prob}(Y^1 = k-1|s=0)
\]

The earnings difference variable is then calculated as a dummy variable, equal to unity, if a self-employed (wage-employed) individual’s actual earnings in self-employment (wage-employment) exceed (is less than) their counterfactual earnings in wage employment (self-employment). Note that representative self-employed income \( E(Y^1) \), which enters the variance function of the structural probit (see section 9), may be calculated using the above equation with the conditional probabilities replaced with the marginal probabilities.

What are the relationships between an individual’s counterfactual, representative and sample earnings? The answer to this question will depend on the correlations between career choices and earnings. Denoting latent earnings by \( Y^{\alpha}, i = 0,1 \) and \( \text{prob}(s=1) = \Phi(Z) \), where \( Z \) is the index function from the reduced form self-employment equation, then we may write

\[
E(Y^{\alpha}|s=1) = E(Y^{\alpha}) - \rho_{y^0} \frac{\phi(Z)}{\Phi(Z)}
\]

\[
E(Y^{\alpha}|s=0) = E(Y^{\alpha}) + \rho_{y^0} \frac{\phi(Z)}{1-\Phi(Z)}
\]
If $\rho_{yz}$, the correlation between wage earnings and career choice, is positive then self-employed individuals earn below average earnings in wage employment whereas wage earners earn above average in wage employment - $E(Y^o|s = 1) < E(Y^o) < E(Y^o|s = 0)$ (comparative advantage). Similarly,

$$E(Y^s|s = 0) = E(Y^s) + \rho_{y^s} \cdot \frac{\phi(Z)}{1 - \Phi(Z)}$$

$$E(Y^s|s = 1) = E(Y^s) - \rho_{y^s} \cdot \frac{\phi(Z)}{\Phi(Z)}$$

If $\rho_{y^s}$ is negative then wage earners earn below average incomes in self-employment whereas self-employed individuals earn above average incomes in their chosen careers - $E(Y^s|s = 0) < E(Y^s) < E(Y^s|s = 1)$ (comparative advantage).

The correlation coefficients, which appear in the following table of coefficient estimates from the ordered probits (given in the row denoted ‘ $\rho$ ’), are compatible with comparative advantage. We limit our interpretation of the ordered probits to this particular finding since we have not undertaken the (considerable) additional computational burden of calculating the marginal effects of explanatory variables on cell probabilities. Our justification for this is that the focus of interpretation in this paper is the structural self-employment probit itself.
Table A3.1: Heteroscedastic ordered income probits with selection

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Self-employed</td>
<td>Wage</td>
</tr>
<tr>
<td>Male</td>
<td>1.741 (0.000)</td>
<td>0.663 (0.000)</td>
</tr>
<tr>
<td>Black</td>
<td>-0.417 (0.175)</td>
<td>-0.176 (0.027)</td>
</tr>
<tr>
<td>Married</td>
<td>0.507 (0.003)</td>
<td>0.066 (0.004)</td>
</tr>
<tr>
<td>Left school at 15</td>
<td>-0.161 (0.195)</td>
<td>-0.190 (0.000)</td>
</tr>
<tr>
<td>Age</td>
<td>0.103 (0.000)</td>
<td>0.080 (0.000)</td>
</tr>
<tr>
<td>Age squared/100</td>
<td>-0.125 (0.000)</td>
<td>-0.091 (0.000)</td>
</tr>
<tr>
<td>Union</td>
<td>-0.257 (0.008)</td>
<td>-0.014 (0.288)</td>
</tr>
<tr>
<td>Manual</td>
<td>-1.094 (0.000)</td>
<td>-0.312 (0.000)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wealth (access to capital)</th>
<th>1983-1991</th>
<th>1993-1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real Housing wealth</td>
<td>-0.518 (0.259)</td>
<td>0.055 (0.303)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(log) EAS</td>
<td>-0.148 (0.618)</td>
<td>-0.052 (0.156)</td>
</tr>
<tr>
<td>(log) TEE</td>
<td>0.140 (0.861)</td>
<td>0.187 (0.062)</td>
</tr>
<tr>
<td>(log) SFLGS</td>
<td>-0.221 (0.186)</td>
<td>0.021 (0.332)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unemployment rate</td>
<td>-0.033 (0.627)</td>
<td>0.010 (0.285)</td>
</tr>
<tr>
<td>Scotland</td>
<td>-0.482 (0.169)</td>
<td>0.045 (0.161)</td>
</tr>
<tr>
<td>North West</td>
<td>-0.648 (0.060)</td>
<td>-0.061 (0.057)</td>
</tr>
<tr>
<td>Yorkshire and Humberside</td>
<td>-0.620 (0.106)</td>
<td>-0.050 (0.167)</td>
</tr>
<tr>
<td>East Midlands</td>
<td>-0.557 (0.189)</td>
<td>-0.044 (0.368)</td>
</tr>
<tr>
<td>West Midlands</td>
<td>-0.120 (0.734)</td>
<td>-0.026 (0.462)</td>
</tr>
<tr>
<td>South West</td>
<td>-0.491 (0.300)</td>
<td>-0.050 (0.344)</td>
</tr>
<tr>
<td>South East Wales</td>
<td>0.117 (0.814)</td>
<td>0.135 (0.026)</td>
</tr>
<tr>
<td>Wales</td>
<td>-0.357 (0.345)</td>
<td>-0.091 (0.023)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Real per-capita GDP</td>
<td>-0.303 (0.884)</td>
<td>-0.094 (0.706)</td>
</tr>
<tr>
<td>Real interest rates</td>
<td>3.100 (0.403)</td>
<td>0.163 (0.726)</td>
</tr>
<tr>
<td>Trend</td>
<td>0.210 (0.041)</td>
<td>0.071 (0.000)</td>
</tr>
<tr>
<td>Threshold1</td>
<td>1.623 (0.000)</td>
<td>0.453 (0.000)</td>
</tr>
<tr>
<td>Threshold2</td>
<td>2.435 (0.000)</td>
<td>0.735 (0.000)</td>
</tr>
<tr>
<td>Threshold3</td>
<td>3.844 (0.000)</td>
<td>1.205 (0.000)</td>
</tr>
<tr>
<td>Threshold4</td>
<td>4.126 (0.000)</td>
<td>1.357 (0.000)</td>
</tr>
<tr>
<td>( \rho )</td>
<td>-0.217 (0.000)</td>
<td>0.463 (0.000)</td>
</tr>
<tr>
<td><strong>Variance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trend</td>
<td>0.028 (0.026)</td>
<td>0.011 (0.120)</td>
</tr>
<tr>
<td>Log-likelihood</td>
<td>-3793.755</td>
<td>-8304.207</td>
</tr>
<tr>
<td>( \chi^2 ) (p-value)</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>( N )</td>
<td>1391</td>
<td>9370</td>
</tr>
</tbody>
</table>

Notes:
Survey weights are used in estimation.
Nine industry dummies were also included but are not included in the table to conserve space.
The reduced form self-employment selection equations are not reported to conserve space.
\( \rho \) is the correlation between the disturbances in the income and selection equations.