

Self-Employment Status: The Role of State Dependence and Initial Circumstances*

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ABSTRACT. This paper uses British longitudinal data to model self-employment status. In contrast to previous studies, the modelling approach accounts for state-dependence and unexplained heterogeneity effects. The paper concludes that state dependence is an important influence on self-employment choice. Someone self-employed last year is, controlling for observable and unobservable influences, 30 percentage points more likely to be self-employed this year than someone who was in paid employment a year ago. We also find significant individual heterogeneity in the probability of self-employment, with significant explained influences operating through gender, educational attainment, occupation, spouse's self-employment, and parental and educational background. Significant, though quantitatively smaller influences come through initial financial circumstance and current house price movements. Local labour market shocks do not appear significantly to influence self-employment choice. This we conclude that the autoregressive nature of self-employment time-series would appear to be a structural rather than a cyclical phenomenon.

1. Introduction

Self-employment is a mode of economic activity of increasingly popularity. For example, in 1998, over twelve and a half percent of the UK workforce or around 3.5 million workers were in self-employment. Self-employment in the UK has grown by over 70 percent over the past two decades.¹ What determines whether people are observed to be in self-employment rather than employment? Can we find significant explanatory

covariates to explain whether individuals are found to be in self-employment, or it is largely the product of individual heterogeneity, background and inertia? Once individuals have made an initial transition into self-employment, perhaps driven by their educational and parental background, do they have an increased likelihood of remaining in self-employment, becoming "serial entrepreneurs"? Figure 1 charts the time-path of self-employment in the UK since 1959 from under 2 million to a peak in 1989 of nearly 4 million. Evidence of persistence in self-employment is apparent in the result that we cannot reject the null hypothesis that this series is a random walk.² Can economic shocks explain the autoregressive nature of aggregate time-series self-employment data? Or are today's self-employed simply those who were self-employed yesterday, perhaps locked into the state of self-employment through individual inertia, or fuelled on the positive side by a self-employment "learning-curve" effect or on the negative by the erosion of human capital relevant to employment?

This paper uses recent British micro panel data for the period 1991 to 1999, to perform a thorough investigation of these issues. It extends the literature by exploiting a longitudinal data source to mitigate the traditional cross-sectional econometric problem of endogeneity, by exploiting the availability of lagged and prior-dated information to model the "initial conditions" under which an individual might be found in self-employment. The use of longitudinal data allows us to address the issue of unobserved individual heterogeneity and that, already introduced, of duration or state-dependence, both of which cannot be addressed in a cross-sectional approach.

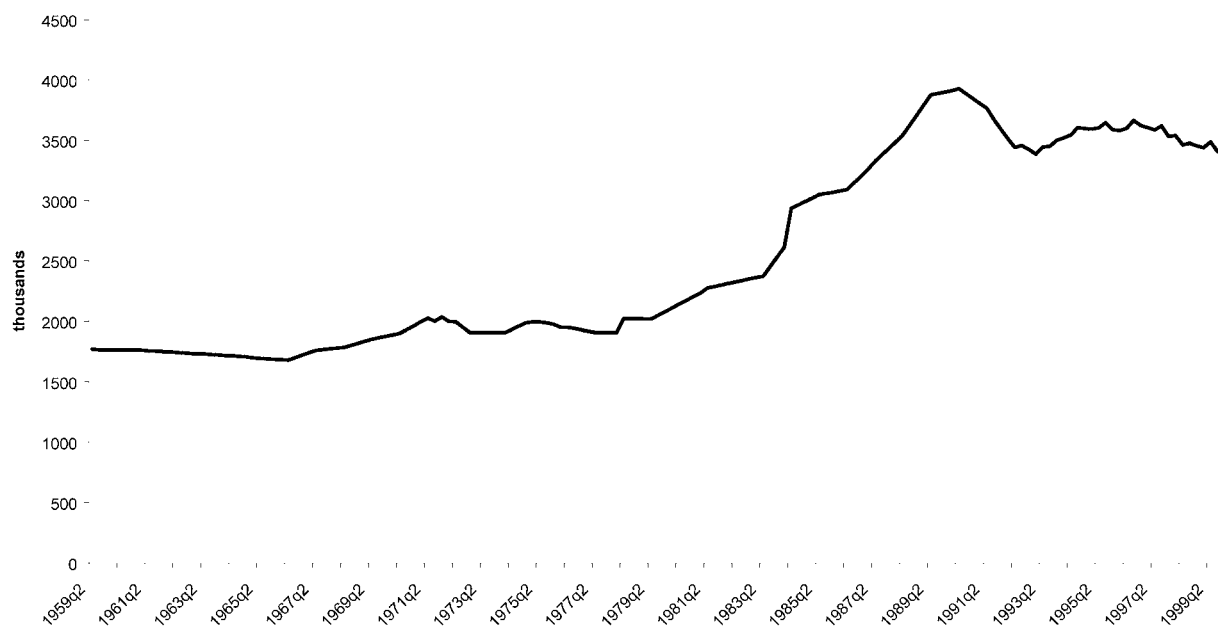
We conclude that inertia is indeed an impor-

Final version accepted on March 6, 2002

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Small Business Economics 22: 67–82, 2004.
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Source: Office for National Statistics Economic Time Series Databank

Figure 1. UK self-employment 1959–1999.

tant influence on self-employment status. Someone who was self-employed last year is, controlling for observable and unobservable influences, up to 30 percentage points more likely to be self-employed this year than someone in paid employment a year ago. In our model unobserved individual heterogeneity accounts for nearly 60 per cent of the unexplained variance in the probability of self-employment, consistent with the view that many of the influences on small business start-ups are idiosyncratic and do not lend themselves easily to economic explanation.³ Significant explained influences operate through gender, educational and parental background. Self-employment is strongly associated with being in a professional or managerial occupation as well in as in an unskilled occupation. Construction workers are significantly more likely to be self-employed. Significant, though quantitatively smaller influences come through housing tenure status and financial wealth. Local economic activity, captured through local unemployment rates, does not appear significantly to influence the probability of self-employment.

The data source employed in the present paper is Waves 1 to 9 of the British Household Panel

Survey (henceforth BHPS), an ongoing survey of around 5000 households with around 5000 economically active individuals therein. Each wave of the survey is conducted annually (in the autumn), allowing us to track self-employment behaviour through a period of volatile economic activity (not least in the housing market, which typically may provide collateral for self-employment start-ups) in the 1990s. The remainder of the paper is structured as follows. Section 2 sets out the context for the study, reviewing previous micro and macro empirical work on participation in self-employment. Section 3 discusses the data source used in the present study. Section 4 sets out the modelling strategy. Section 5 presents estimates of a longitudinal model of the self-employment choice, and investigates the relative importance of dynamic effects, initial conditions and individual heterogeneity. Section 6 presents a discussion of the key results and conclusions.

2. Influences on the self-employment decision

Research to date has pointed to four main influences on the probability of observing an individual

in self-employment.⁴ The first may be broadly described as inherited “entrepreneurial capital”, and focuses on exposure to a small business culture and attitudes to risk. Typically, these “initial condition” effects are captured empirically through parental background variables, such as whether either parent was self-employed. For example, in cross-sectional work using the first wave of the BHPS, Taylor (1996) finds that the probability of being self-employed is positively associated with having a self-employed parent (at age 14). Blanchflower and Oswald (1998) investigate self-employment using a long-term longitudinal survey of the population of those born in Great Britain in a single week in 1958 (the National Child Development Survey). They find a significant positive association with having a father who managed others, or who was a self-employed sole trader. On the question of attitude to risk, they also find some weak association between self-employment and the “acceptance of anxiety”. Many of these influences may inherently defy measurement and so be impossible to capture in a cross-sectional analysis which precludes any correction for unobserved heterogeneity.

A second influence is concerned with the availability of financial capital, and in particular the possible existence of capital constraints acting on small businesses. Small or sole trader businesses generally rely on three sources of finance for start-up and working capital. The first is personal financial wealth, the second inherited wealth (often in the form of housing and other property) and the third is through borrowing obtained using property as collateral. This third is used by many small businesses to obtain loan finance from commercial banks using the sole proprietor’s home as collateral. The greater the equity stake that an individual has in his or her home (or conversely the smaller the outstanding mortgage relative to the estimated current value of the property) then the greater the opportunity to raise finance (or the less binding any potential liquidity constraint).⁵ A number of recent macroeconomic studies of self-employment 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). As Black et al. point out, housing collateral has a potentially direct impact on the success of self-employment

because it influences the default premium set by lending institutions. The size of that premium might therefore depend on the current state of the housing market. However there is a considerable problem of potential endogeneity between self-employment status and financial wealth, which cannot easily be addressed in cross-section. One solution is to examine the impact of windfall gain on self-employment. Blanchflower and Oswald (1998) argue that studying the impact of the receipt of inherited wealth on individual behaviour is “as close as the economist can get to the idealised laboratory experiment”.⁶ The size of inheritances figures prominently in their study, and they find a significant impact on the probability of self-employment status.⁷ A similar conclusion for the effects of windfall gains is reached using BHPS data by Taylor (1999b) and using US micro data by Holtz-Eakin et al. (1994). Lindh and Ohlsson (1996) observe a positive impact on the probability of self-employment of a lottery win in Swedish micro data. However, such windfalls may only be important for a small minority of the self-employed – for the rest it is anticipated, accumulated past savings that are of importance, but may in turn reflect past success in self-employment itself.

A third influence is the availability of human capital. In practice, this is difficult to observe directly, but micro studies generally find some correlation between various types of educational attainment and self-employment status. Cressy (1996) argues that the interpretation of correlation between self-employment status or survival and financial wealth are difficult to interpret (at least in cross-section) because financial wealth is likely to be determined by human capital.⁸ Thus, accumulated human capital may be more likely to be the fundamental determinant of success in self-employment. A substantial number of studies have found that prior business founding experience is an important determinant of small business start-ups (see Westhead and Wright, 1999, in the British context). Cressy (1990) finds, in an econometric model of business start-ups, that the statistical significance of financial variables disappears once variables capturing the human capital of the proprietor (experience and education) are included. On the other hand, recent longitudinal analysis (using early waves of the same BHPS 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, 1999a).⁹

A fourth theme is the influence of macroeconomic activity on inflows into and outflows from self-employment. No clear predictions are possible here 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. Linkages between self-employment changes and macroeconomic activity may be weakened to the extent that self-employment is a persistent state. Self-employment, for some, might be seen as an alternative to (or halfway position towards) unemployment, and therefore the level of self-employment may move counter-cyclically (Storey and Johnson, 1987; Evans and Leighton, 1989). These issues can only be addressed in cross-sectional micro data studies to the extent that sufficient cross-sectional variation in local labour market conditions is available. Longitudinal data is necessary to identify the impact of persistent differences in local economic activity from genuine state-dependence in the self-employment choice.

3. Data

Waves 1 to 9 of the British Household Panel Survey, covering the period 1991 to 1999, provide a rich, longitudinal source of data on the types

of influences on self-employment identified in the previous discussion. Table I summarises the properties of the sample of self-employed through from wave 1 to wave 9. The self-employed constitute between 10.6 and 13.1 per cent of the sample of economically active.¹⁰ There is a marginal increase in the proportion of the self-employed between 1991 and 1993. This is consistent with an increase in self-employment during the early 1990s UK recession. Thereafter the proportion is stable until after 1996 when it appears to start declining. The reduction in the proportion of self-employed towards the end of the period appears to arise because of both a declining inflow rate and a rising outflow rate. A *prima facie* impression of the degree of state-dependence in self-employment is provided in the fifth row of the table. This reveals that between 78 and 85 per cent of the self-employed in any year will have been in self-employment in the previous year. This may reflect state dependence – on the other hand, it may show the effects of a combination of observed and unobserved characteristics that lend towards an individual history of self-employment (initial conditions).

By contrast to this the probability of entering self-employment in any year conditional on not being in self-employment in the previous year is rather small. The probability is in any year around or just below two per cent, whether from not being self-employed (economic activity or inactivity) or from paid employment. Consequently, in any year the determination of the “stock” of self-employed

TABLE I
Sample properties

	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7	Wave 8	Wave 9
Self-employed	706	710	682	667	656	680	698	654	637
% of economically active	12.6	13.1	13.0	12.7	12.6	12.7	11.3	10.9	10.6
Inflow $t - 1$ to t		161	118	124	124	119	114	122	125
Outflow $t - 1$ to t		140	123	117	114	95	132	145	130
Prob(self-employed, self-employed _{$t-1$})		0.779	0.808	0.812	0.812	0.848	0.791	0.778	0.788
Prob(self-employed, not self-employed _{$t-1$})		0.020	0.015	0.016	0.016	0.015	0.014	0.013	0.014
Prob(self-employed, employed _{$t-1$})		0.020	0.017	0.018	0.017	0.019	0.018	0.018	0.019
Self-employed with a spell out of self-employment during previous 12 months		226	223	223	197	193	199	179	179
% of all self-employed		31.8	32.7	33.4	30.0	28.4	28.5	27.3	28.1

is dominated by any state-dependence/initial conditions effect.

In terms of modelling strategy, we face a choice between modelling the participation decision to be in the stock or the inflow transition (or indeed the outflow transition). In common with the bulk of previous work, and because of the rather small numbers of inflows and outflows we opt to model the probability that an individual is found in self-employment rather than any other form of paid economic activity.¹¹ Our dependent variable is therefore a binary variable taking a value of 1 if an individual is observed in self-employment at each annual interview and 0 if engaged in paid employment. We exclude from our sample any individuals not observed in self-employment or paid employment at the point of first interview in 1991. Individuals drop out from the sample if they withdraw from either employment or self-employment into inactivity, i.e. unemployment or withdrawal from the labour force.¹² While it would be preferable to model a three- or four-way status model (self-employment, employment, unemployment, non-participation), such an approach, given that we will use a random effects panel data probit estimation, is computationally impossible. It is clear from Table I that a strictly cross-sectional approach to modelling the stock has the potential to be misleading, overstating observed individual heterogeneity to the detriment of state dependence and unobserved heterogeneity effects.

Table II summarises the characteristics of the employed and self-employed in our BHPS sample at the point of the first wave interview in 1991,¹³ in terms of possible covariates informed by the discussion of the previous section. The self-employed are on average nearly five years older than the employed and much less likely to be female. They are also slightly more likely to be in a marriage/cohabitation relationship and to be members of an ethnic minority. In terms of educational background the self-employed and employed are broadly similar – the self-employed are more likely to have a non-degree higher education qualification (for example a technical qualification such as a Higher National Diploma) and less likely to have been educated only to O-level/GCSE pass standard at age 16.¹⁴ As to occupational status, the self-employed are

clearly more heavily concentrated amongst professionals and the unskilled as well as being more likely to be construction workers. The self-employed are also over three times more likely to have a spouse or cohabiting partner who is also self-employed, and are slightly more likely to have a spouse/partner in employment (and therefore substantially less likely to have an inactive spouse/partner).

A further group of variables in Table II describe housing and wealth status. The self-employed are more likely to be owner-occupiers, and less likely to be renters in the social housing sector. They also have on average have nearly £23,000 more housing wealth¹⁵ than the employed, and have over twice as much monthly investment income. They are also more likely to reside in counties with a less buoyant housing market, as measured by county annual house price change.

The final group of variables in Table II describe pre-sample information about parental, schooling and employment/self-employment background. No information is available in the survey on whether individuals may have had to opportunity to assume the running of a family business. However, we are able to observe that the parental background of the self-employed is different from that of the employed. 21% of the self-employed in 1991 had, at age 14, a self-employed father, compared to only 13% of the employed. Although the proportions are smaller (because women were and still are less likely to be self-employed), there is a similar difference in the self-employment status of the mothers of the self-employed and employed at age 14. Of even greater possible importance is the observation that the self-employed were twice as likely, at age 14, to have had a self-employed father who employed others. As to the type of school attended, the most pronounced difference between the two groups is amongst the small proportion that attended a grammar (state-funded but academically selective) school – the self-employed being twice as likely to have attended such a school. Rather less of the self-employed attended a non-selective (comprehensive) state school. Retrospective questions concerning employment history reveal information about the length of experience each individual has acquired in their current activity (as an employee or as self-employed) up to the point of first interview in

TABLE II
Sample characteristics at wave 1

	Employed N = 4424	Self-employed N = 607
<i>Demographics:</i>		
Age in years	37.4	42.2
% female	50.7	27.2
% married/co-habiting	72.0	81.1
% ethnic minority	3.4	4.0
<i>Educational attainment:</i>		
% degree	10.6	11.4
% other higher education	20.2	23.6
% A-levels	11.8	11.0
% O-levels/GCSEs	25.1	20.4
% CSEs	4.8	3.6
% without school qualifications	27.5	30.0
<i>Occupation/Employment:</i>		
% professional/managerial	19.5	34.9
% skilled/semi-skilled	69.2	13.0
% unskilled	11.3	52.1
% construction	3.4	22.4
% with spouse in employment	58.9	62.9
% with spouse in self-employment	5.7	17.8
County unemployment rate %	8.4	8.2
<i>Housing tenure and wealth:</i>		
% owner-occupation	76.6	81.5
% private sector rental	9.0	9.1
% social sector rental	14.4	9.4
House value £	58,412	81,088
Monthly investment income £	308	665
Owner-occupier county annual house price change %	-0.87	-1.18
<i>Parental, schooling and employment background:</i>		
% had father self-employed	13.1	20.9
% had mother self-employed	4.0	7.6
% had father self-employed employer	7.4	15.0
% had mother self-employed employer	1.6	2.8
% attended fee-paying school	3.5	3.8
% attended grammar school	1.5	3.1
% attended secondary modern/technical school	38.3	39.9
% attended comprehensive or other non-selective school	56.7	53.2
Years of experience up 1991	4.5	7.0

1991. For the self-employed this over 7 years, compared to only 4 years for the employed.

We conclude from this discussion that each of these groups of influences, demographics, educational attainment, occupational and employment status, housing and wealth and parental, schooling and labour market background may correlate with self-employment status. In the next section, we turn to consideration of the formal econometric modelling of self-employment status.

4. Modelling approach

There are two approaches in the literature to modelling self-employment status. The first is a reduced form approach in which the covariates used identify not only any direct influences on status but also act as instruments for the determinants of the earnings differential between self-employment and employment states. This differential might be presumed to exercise strong influence over the self-employment differential.

However only one side of this differential is only ever observed, conditional on the choice between self-employment and employment made by a given individual at a particular point in time. The second approach is to use the reduced form model to generate a Heckman (1979) selectivity correction for the estimation of earnings functions for the employed and self-employed sub-samples. These functions are then used to generate earnings differential predictions for incorporation into a structural choice model.

Given the complications of modelling unobserved heterogeneity in the reduced form equation with potentially correlated earnings heterogeneity, we do not attempt a structural modelling approach. Our approach to the incorporation of state-dependency and unobserved heterogeneity follows that described in Orme (1999) and used in the context of modelling unemployment persistence by Arulampalam et al. (2000). It should be noted that the approach taken here is observationally equivalent to a direct analysis of self-employment durations in which account is made of possible duration dependency. However the present approach avoids the problem of focusing the analysis on the much smaller sample of self-employment spells (Yamaguchi, 1991; Barmby, 1998). The separation of state dependence and unobserved heterogeneity is problematic, and any dynamic panel modelling of a binary decision (such as self-employment status) must be careful to distinguish the two through modelling the “initial conditions” problem (Heckman, 1981b). This arises because typically, in longitudinal data sources, individuals are first observed in a particular state subsequent to the start of the stochastic process that generates the process determining their status. Therefore, someone in self-employment at the point of the first wave interview of the BHPS in 1991 might be so because of a history of self-employment or because of a combination of observed and unobserved characteristics that predisposed them to self-employment as labour-market status. The solution proposed by Orme (1999) is a two-step pseudo-maximum likelihood approach that estimates an initial condition reduced form to provide a selectivity-type correction for a dynamic binary dependent variable panel estimation incorporating unobserved heterogeneity.

Our model of self-employment choice for individual i at time t is:

$$y_{it}^* = \mathbf{x}_{it}'\beta + \gamma y_{it-1} + v_{it}, \quad i = 1, \dots, n \text{ and } t = 2, \dots, T_i \quad (1)$$

where y^* denotes the latent propensity of being found in self-employment, $\mathbf{x}$ are observable covariates affecting the self-employment propensity, β are coefficients and v is an error term. An individual is assumed to be found in self-employment ($y_{it} = 1$) if the latent propensity, y^* , exceeds a threshold, in this case equal to zero. In order to capture any inertia in self-employment status, y^* is also determined by actual self-employment status in the previous period. State dependence in this case arises because past experience has a genuine behavioural impact in the sense that an otherwise identical individual who is self-employed at t is likely to have a different propensity towards self-employment at $t + 1$ compared to someone who is not. It is well known that spurious correlation between y_{it}^* and y_{it-1} can arise because past experience is a proxy for temporally persistent unobservable factors that determine the choice in question, that which Heckman (1981b) terms “spurious state-dependence”. To control for this we must model explicitly any unobserved individual heterogeneity. This is done by decomposing the error term in (1) as:

$$v_{it} = \varepsilon_i + u_{it} \quad (2)$$

where ε_i is an individual-specific unobservable effect and u_{it} is a random error. Estimation of (1) can be undertaken using a random effects probit estimator, assuming that $u_{it} \sim IN(0, \sigma_u^2)$ and $E(u_{it} \mathbf{x}_{it}) = 0$ for all i and t . We also assume $\varepsilon_i \sim IN(0, \sigma_\varepsilon^2)$, but, as explained in Arulampalam et al., we relax the assumption of the independence of ε_i and $\mathbf{x}_{it}$ to avoid omitted variable bias by specifying that ε_i is a linear function of the individual means of the time-varying covariates¹⁶ in $\mathbf{x}$:

$$\varepsilon_i = a_0 + a_1 \bar{\mathbf{x}}_i + \eta_i \quad (3)$$

where $\eta_i \sim IN(0, \sigma_\eta^2)$ and $E(\eta_i \mathbf{x}_{it}) = 0$ and $E(\eta_i u_{it}) = 0$ for all i and t . Equation (1) thus becomes (with the intercepts subsumed together):

$$y_{it}^* = \mathbf{x}_{it}'\beta + \gamma y_{it-1} + a_1 \bar{\mathbf{x}}_i + \eta_i + u_{it}, \quad i = 1, \dots, n \text{ and } t = 2, \dots, T_i. \quad (4)$$

An “initial conditions” problem arises in equation (4) because the start of the sequence of observations of self-employment status for each individual may possibly commence prior to the first wave observation in 1991. Individuals in self-employment in 1991 may be there because a previous history of experience in self-employment or because of observable and unobservable information dated to prior to 1991 (such as personal wealth, educational and parental background). Following Heckman (1991c) a reduced form equation for the 1991 latent self-employment propensity can be written as follows:

$$y_{i1}^* = \lambda' \mathbf{z}_i + \omega_i, \quad (5)$$

where $\mathbf{z}$ are exogenous instrumental variables (including influences in period 1 plus pre-sample background information plus the vector of means, $\bar{\mathbf{x}}_i$), ω_i has variance σ_ω^2 and the correlation of η_i and ω_i is defined as ρ . The 1991 observation on self-employment status, y_{i1} , is assumed independent of u_{it} . To account for non-zero ρ , a linear relationship between the error components of (4) and (5) is assumed:

$$\omega_i = \theta \eta_i + u_{i1}. \quad (6)$$

We assume that η_i and u_{i1} are uncorrelated and u_{i1} is independent of $\mathbf{x}_{it}$ and that $\theta = \rho \sigma_\omega / \sigma_\eta$ and $\text{var}(u_{i1}) = \sigma_\omega^2(1 - \rho^2)$. The “initial conditions” equation now becomes:

$$y_{i1}^* = \lambda' \mathbf{z}_i + \theta \eta_i + u_{i1} \\ i = 1, \dots, n \text{ and } t = 1. \quad (7)$$

Equations (5) and (7) can in principle be estimated jointly by maximum likelihood (Heckman, 1981a, 1981c). However, Orme (1999) proposes a more practical two-step estimator, which in effect requires the estimation of the “initial conditions” probit equation (5). The generalised residuals from this provide a selectivity-type correction to the random effects probit model equation (4). To show the form of the random effects model under this procedure, equation (6) is transformed as:

$$\eta_i = \delta \omega_i + \mu_i \quad (8)$$

where $\delta = \rho \sigma_\eta / \sigma_\omega$ and $\text{var}(u_i) = \sigma_\eta^2(1 - \rho^2)$. Substitution for η_i in equation (4) gives:

$$y_{it}^* = \mathbf{x}_{it}' \beta + \gamma y_{it-1} + a_1 \bar{\mathbf{x}}_i + \delta \omega_i + \mu_i + u_{it}, \\ i = 1, \dots, n \text{ and } t = 2, \dots, T_i. \quad (9)$$

Orme’s procedure involves as a first step the estimation of (5). From this estimation the probit error is obtained and this replaces ω_i in a random effects probit estimation of (9).¹⁷ A formal test of the unimportance of initial conditions in determining self-employment choice is provided by a standard t -test of the significance of δ . The next section presents results of the two-stage estimation of equations (7) and (9).

5. Econometric results of the self-employment choice model

Probit model estimates for self-employment status are reported in Table III. Column (1) presents estimates of a reduced-form model pooling observations across all waves, disregarding any persistence and “initial conditions” effects. Statistically significant correlates with self-employment status are age (modelled through a five segment piecewise linear spline function),¹⁸ gender, educational attainment, occupation, status of the spouse/partner, local unemployment rate (negative), housing tenure and wealth¹⁹ and investment income. Background variables also attract statistically significant coefficients. The probability of self-employment status rises if the mother was self-employed or if the father was a self-employed employer, and falls if the mother was a self-employed employer. The probability of self-employment rises, relative to attendance at a comprehensive school, for grammar school attendance, and falls for fee-paying and secondary modern/technical schools. An increased length of experience acquired in current activity up to 1991 increases the probability of observing self-employment from 1991 onwards.

The first column of Table IV reports the implied marginal effects from these coefficients. So, for example, a woman is, *ceteris paribus*, 6.6 percentage points less likely to be self-employed than a man, and a 1 percentage point increase in the local unemployment rate is associated, *ceteris paribus*, with a 0.18 percentage point reduction in the probability of self-employment.

Column (2) of Table III presents results for the initial conditions equation (equation 7), estimated using the first wave of data. Marginal effects are reported in Table IV, column (2). The results mirror quite closely those obtained for the pooled

TABLE III
Self-employment choice model (dependent variable: Pr[self-employed = 1])

	(1) 1991–1999 Pooled probit	(2) Initial conditions probit	(3) Random effects probit	(4) Random effects probit	(5) Random effects probit
Self-employed $t - 1$			1.685*** (0.073)	1.659*** (0.075)	0.303* (0.161)
<i>Demographics:</i>					
Age < 25	0.044*** (0.011)	0.058* (0.030)	0.020 (0.031)	0.036 (0.031)	–0.015 (0.032)
Age 25 to 35	–0.037** (0.015)	–0.039 (0.039)	–0.028 (0.042)	–0.050 (0.042)	0.011 (0.044)
Age 35 to 45	0.003 (0.009)	–0.030 (0.022)	0.039 (0.028)	0.035 (0.028)	0.016 (0.032)
Age 45 to 55	0.005 (0.009)	0.0027 (0.022)	–0.021 (0.029)	–0.013 (0.030)	–0.018 (0.035)
Age > 55	–0.004 (0.011)	0.039 (0.026)	0.036 (0.035)	0.030 (0.039)	0.028 (0.049)
Female	–0.604*** (0.044)	–0.493*** (0.116)	–0.998*** (0.164)	–0.994*** (0.173)	–0.540*** (0.182)
Married/co-habiting	0.054 (0.041)	0.084 (0.191)	0.244* (0.149)	0.317** (0.157)	0.174 (0.206)
Ethnic minority	0.071* (0.065)	–0.041 (0.156)	0.441** (0.191)	0.290 (0.202)	0.478** (0.224)
<i>Educational attainment:</i>					
Degree	0.235*** (0.045)	0.181 (0.115)	0.610*** (0.143)	0.491*** (0.146)	0.568*** (0.178)
Other higher ed.	0.206*** (0.037)	0.217*** (0.092)	0.518*** (0.114)	0.406*** (0.115)	0.509*** (0.147)
A-levels	0.217*** (0.045)	0.116 (0.111)	0.417*** (0.139)	0.371*** (0.141)	0.577*** (0.172)
O-levels/GCSEs	0.235*** (0.039)	0.108 (0.093)	0.647*** (0.122)	0.564*** (0.124)	0.607*** (0.153)
CSEs	0.086 (0.076)	0.067 (0.171)	0.372 (0.238)	0.283 (0.245)	0.120 (0.295)
<i>Occupation/Employment:</i>					
Professional/ Managerial	0.778*** (0.029)	0.731*** (0.119)	0.611*** (0.085)	0.633*** (0.089)	0.258*** (0.120)
Unskilled	1.783*** (0.032)	1.196*** (0.124)	2.320*** (0.105)	2.421*** (0.110)	2.720*** (0.166)
Construction	0.910*** (0.043)	0.467** (0.230)	0.553*** (0.156)	0.579*** (0.162)	0.208 (0.227)
Male with spouse in employment	–0.083** (0.036)	–0.043 (0.141)	0.007 (0.110)	–0.008 (0.114)	–0.035 (0.153)
Female with spouse in employment	–0.145** (0.054)	0.378* (0.231)	–0.105 (0.183)	–0.164 (0.192)	–0.020 (0.253)
Male with spouse in self-employment	0.890** (0.060)	0.584*** (0.226)	0.669*** (0.200)	0.706*** (0.206)	0.580* (0.334)
Female with spouse in self-employment	0.737** (0.051)	0.135 (0.230)	0.313* (0.183)	0.479** (0.196)	0.339 (0.258)
County rate of unemployment %	–0.017*** (0.005)	0.034 (0.031)	0.007 (0.013)	0.007 (0.014)	–0.009 (0.019)

TABLE III
Continued

	(1) 1991–1999 Pooled probit	(2) Initial conditions probit	(3) Random effects probit	(4) Random effects probit	(5) Random effects probit
<i>Housing and wealth:</i>					
Private sector renter	0.256*** (0.045)	0.092 (0.109)		0.315*** (0.117)	0.536*** (0.139)
Social sector renter	−0.258*** (0.046)	−0.260** (0.107)		−0.278** (0.129)	−0.061 (0.157)
Real house value '0000s	0.015*** (0.002)	−0.001 (0.009)		−0.002 (0.008)	0.011 (0.011)
Real monthly investment income £k	0.038*** (0.006)	0.094*** (0.035)		(0.015) (0.015)	0.009 (0.022)
Owner-occupier × county annual house price change %	0.0028* (0.0015)	−0.0022 (0.0065)	0.0061* (0.0033)	0.0075** (0.0036)	0.0037 (0.0047)
<i>Parental, schooling and employment background:</i>					
Father self-employed	0.036 (0.051)	−0.062 (0.130)			
Mother self-employed	0.373*** (0.063)	0.455*** (0.148)			
Father self-employed employer	0.399*** (0.060)	0.334** (0.153)			
Mother self-employed employer	−0.372*** (0.103)	−0.324 (0.249)			
Fee-paying school	−0.435*** (0.103)	−0.302 (0.280)			
Grammar school	0.756*** (0.127)	0.723** (0.333)			
Secondary mod./tech.	−0.095*** (0.027)	−0.029 (0.067)			
Years of experience up to 1991	0.025*** (0.002)	0.019*** (0.005)			
Intercept	46.96*** (3.475)	33.36*** (9.571)	−4.643*** (0.720)	−5.092*** (0.724)	−3.989*** (0.758)
Generalised residual from initial conditions probit			1.214*** (0.086)	1.231*** (0.087)	0.548*** (0.141)
Rho (proportion of unexplained variance as unobserved heterogeneity)			0.596*** (0.029)	0.583*** (0.031)	0.561*** (0.049)
Log-Likelihood	−7269.5	−1229.1	−2834.3	−2605.8	−1505.5
LR ($\rho = 0$) χ^2 (1)			267.9***	251.7***	88.4***
LR χ^2 (k)	7602.8***	1246.8***			
Wald χ^2 (k)			2364.0***	2177.6***	369.6***
N		5031	4431	4347	3869
NT	30074		26494	25176	21833

Notes: Standard errors in brackets.

* denotes coefficient significant at = 10%, ** at = 5% and *** at = 1%.

Columns (2), (3), (4) and (5) include time-means of time-varying covariates to allow for correlation between time-varying covariates and unobserved heterogeneity.

TABLE IV
Marginal effects on Pr[self-employment]

Covariate	Pooled probit (Table III, col. 1)	Initial conditions (Table III, col. 2)	Random effects (Table III, col. 3)	Random effects (Table III, col. 4)	Random effects (Table III, col. 5)
Self-employed $t - 1$			0.3012	0.2748	0.0199
<i>Demographics:</i>					
Age < 25	0.0047	0.0057	0.0076	0.0133	-0.0018
Age 25 to 35	-0.0040	-0.0038	-0.0032	-0.0053	-0.0005
Age 35 to 45	0.00003	-0.0029	0.0118	0.0079	0.0014
Age 45 to 55	0.0005	0.0002	0.0038	0.0030	-0.0008
Age > 55	-0.0005	0.0038	0.0178	0.0143	0.0026
Female	-0.0657	-0.0483	-0.0690	-0.1936	-0.0315
Married/co-habiting	0.0057	0.0080	0.0233	0.0702	0.0122
Ethnic minority	0.0081	-0.0039	0.0553	0.0687	0.0451
<i>Educational attainment:</i>					
Degree	0.0291	0.0199	0.0812	0.1178	0.0557
Other higher ed.	0.0241	0.0237	0.0667	0.0971	0.0487
A-levels	0.0268	0.0123	0.0518	0.0885	0.0569
O-levels/GCSEs	0.0282	0.0110	0.0521	0.1197	0.0342
CSEs	0.0099	0.0069	0.0454	0.0670	0.0096
<i>Occupation/Employment:</i>					
Professional/managerial	0.1148	0.1020	0.0500	0.1327	0.0173
Unskilled	0.4303	0.2192	0.4566	0.5142	0.4956
Construction	0.1774	0.0640	0.0720	0.1397	0.0174
Male with spouse in employment	-0.0087	-0.0042	0.0008	-0.0019	-0.0027
Female with spouse in employment	-0.0151	0.0421	-0.0106	-0.0370	-0.0015
Male with spouse in self-employment	0.1771	0.0891	0.0908	0.1710	0.0572
Female with spouse in self-employment	0.1299	0.0146	0.0374	0.1150	0.0301
County rate of unemployment %	-0.0018	0.0033	0.0027	0.0028	-0.0011
<i>Housing and wealth:</i>					
Private sector renter	0.0329	0.0096		0.0747	0.0518
Social sector renter	-0.0236	-0.0218		-0.0619	-0.0045
Real house value £10k	0.0016	-0.0001		-0.0007	0.0012
Real monthly investment income £k	0.0041	0.0092		-0.0059	0.0011
Owner-occupier $\times$ county annual house price change %	0.0003	-0.0002	0.0024	0.0028	0.0004
<i>Parental, schooling and employment background:</i>					
Father self-employed	0.0040	-0.0058			
Mother self-employed	0.0527	0.0624			
Father self-employed employer	0.0560	0.0412			
Mother self-employed employer	-0.0299	-0.0244			
Fee-paying school	-0.0339	-0.0234			
Grammar school	0.1396	0.1215			
Secondary mod./tech.	-0.0100	-0.0029			
Years of experience up to 1991	0.0027	0.0018			

Notes: (1) Each marginal effect is computed for a reference case of a married professional with a employed spouse, living in a county with a 7% unemployment rate and 3.1% annual real house price growth. For discrete variables the effect is that of a discrete change.

(2) The random effects model marginal effects are computed using the correction described by Arulampalam (1999).

probit in column (1). Only the coefficient on the first age spine segment is weakly positively significant, suggesting a weak linear relationship only between age and initial self-employment status. Marital status and ethnicity have little or no impact. Educational attainment to non-degree higher level has a positive impact. Other educational effects are no longer significant.

The presence of an employed spouse increases the probability of self-employment for women, but not for men. The presence of a self-employed spouse increases the probability of self-employment for men, but not for women. Self-employment income is likely to be subject to greater temporal volatility than employment income. Consequently, the presence in the household of an employment income will partially smooth the household income stream. Typically, though not in every case, men earn more than their partners, and so this smoothing effect will be of greater relative importance where it is the woman who is self-employed. Self-employment for married women, with partners in full-time employment, may reflect a lifestyle choice that meshes well with child-raising responsibilities due to its greater working hours flexibility. The increased probability of initial self-employment for men where the partner is also self-employed may represent the effect of family business partnership. However, since we do not have information on whether a business is a family one, we are unable to investigate this further.

Social sector renters are significantly less likely to be in initial self-employment relative to owner-occupiers. House value and house price effects are absent, but investment income appears to correlate significantly with initial self-employment status.

Turning to the pre-sample information variables, the results show that parental self-employment background has a significant influence. Father's influence appears to operate through the demonstrational or motivational effect of having employing others, rather than being a self-employed sole-trader. What might this be the case? One possibility is that a child whose father employs others might view self-employment as carrying higher status than one with sole-trader parents. Attendance at a grammar school also has a significant positive impact. The positive

association between on the one hand educational attainment of a more applied, technical nature and on the other schooling in the most academic of state-funded schools, having controlled for occupation, is something of a puzzle but may reflect separate influences on professional and non-professional forms of self-employment. Prior experience has a significant negative impact in the initial condition equation, consistent with settled tenure in a particular state reducing the likelihood of a switch from self-employment.

Turning to the marginal effects, it appears that the quantitatively largest effects on self-employment status are from gender (4.8 percentage points), the various occupation controls, spouse in employment if female (4.2 percentage points), spouse in self-employment if male (8.9 percentage points), mother self-employed (5.3 percentage points), father self-employed employer (5.6 percentage points), and grammar school attendance (12.2 percentage points). An extra £1,000 of monthly investment income raises the probability of self-employment by 0.9 percentage points.

Columns (3), (4) and (5) of Table III report three alternative estimates of the random effects probit model (equation 9), each incorporating state-dependency and initial conditions effects.²⁰ The random effects equations exclude time-invariant pre-sample information observed at Wave 1 on parental background, type of school attended and the length of experience in the current activity up to 1991, as this information is incorporated into the generalised initial conditions residual. Column (3) also excludes variables relating to housing tenure, real house value and monthly investment income on the grounds of the possible endogeneity that arises because individuals may become self-employed because they are wealthy or may be wealthy because they have become self-employed. Column (4) reverses this exclusion.²¹ Column (5) reports estimates obtained from combining all individual-year observations where the status was employment with a sub-sample of individual-year observations on self-employment status. This sub-sample is for those who are self-employed in a particular wave and were either not self-employed in the previous wave or were self-employed in the previous wave but report at least one intervening period of out of self-employment (paid employment, one or

more spells of unemployment or inactivity) between the current interview and the previous wave interview. The purpose of these results is to investigate whether the data reveal a statistically significant “serial entrepreneurship” effect, i.e. are that those who are in self-employment and fail or give up during the next 12 months more likely to be observed again in self-employment 12 months later? Marginal effects for each covariate for the estimates in columns (3), (4) and (5) are reported in Table IV.

The state-dependence (lagged self-employment status) effects in the random effects models, reported in columns (3) and (4), are highly statistically significant.²² In column (5), where we exclude observations that may relate to continuous self-employment spells spanning more than one wave, we find a reduced state-dependence effect. It is nevertheless significant at a level of 6%. A significant positive impact on the probability of self-employment is also found for males, for members of ethnic minorities (in columns (3) and (5)), for those with higher levels of educational attainment, and for professional/managerial, unskilled and construction sector occupational status. For a male, having a spouse in self-employment significantly increases the probability of self-employment. A more weakly determined effect for females is found in columns (3) and (4). There is also some evidence in columns (3) and (4) that a switch to married or cohabiting as a couple status raises the likelihood of self-employment status. We are unable to detect any impact of the state of the local labour market (as captured through a county-level unemployment rate). The positive and negative effects of the level of economic activity on self-employment status discussed earlier may mitigate each other. On the other hand, it may be that the growth in self-employment in the UK is predominantly a structural, rather than a cyclical, phenomenon.²³

The effect of exogenous housing wealth shocks on owner-occupiers is captured in the model through the inclusion of the annual change in the appropriate county level house price.²⁴ This variable has a positive association with the probability of self-employment status, and is statistically significant at a level of 3.5% in column (4) although only at 6% in column (3). A positive effect is consistent with owner-occupiers taking

advantage of a buoyant housing to underwrite the financial commitment that a switch to self-employment entails. Wealth, particular financial wealth, appears to have an initial condition association with self-employment – but in contrast to the conclusions implied by cross-sectional work, the random effects model results suggest that it is not strongly associated with subsequent self-employment status. However housing tenure status is significantly associated with self-employment – private sector renters are significantly more likely to be found in self-employment than owner-occupiers, social sector renters significantly less so. Social renter status is likely to significantly hinder access to financial capital since it typically reduces credit rating.

The coefficient on the generalised residual from the reduced form initial conditions equation is highly statistically significant in all three versions of the random effects model, providing clear rejection of the hypothesis that initial conditions are exogenous to self-employment status. Finally, the reported estimates of ρ , the proportion of the total error variance accounted for by variation in the individual-specific component, μ_i , are in each case statistically significantly different from zero.

The marginal effects reported in Table IV reveal the relative importance of the different influences on self-employment status. In quantitative terms, self-employment status is dominated by the influence of state-dependence, gender, educational attainment and occupational status. Comparison of the fuller state-dependence model (column 4) with the pooled probit (column 1) reveals that a self-employment model that fails to account for state-dependence and unobserved heterogeneity is likely to under-estimate the (negative) impact of being female, the impact of marital status and of being a member of an ethnic minority. It will also over-estimate some effects of occupational status (professional/managerial, construction) and under-estimate others (unskilled). It also under-estimates the impacts of housing tenure status, and of house price shocks.

6. Discussion and conclusions

Our principal conclusion is that self-employment status contains a strong genuine state-dependence or inertia effect. Cross-sectional and temporal

variation in local labour market conditions, by contrast, do not appear to influence significantly self-employment status. In contrast to some previous research, we conclude that labour market shocks cannot account for movements in self-employment and that the growth in self-employment would appear to be a largely structural phenomenon. Controlling for a range of observable and unobservable influences we have found that someone who was self-employed last year is up to 30 percentage points more likely to be self-employed this year than someone who was in paid employment a year ago. Even if they were self-employed a year ago, and that self-employment activity was abandoned at some point during the year, they are still significantly more likely to be currently in self-employment.

A number of not necessarily mutually exclusive explanations for this result suggest themselves. Firstly, it may be the case that many in self-employment find that it suits them (freedom over working hours, the advantages of “being your own boss” etc.). Consequently, they remain self-employed, whether as “serial” entrepreneurs or through staying with the same business venture. Secondly, there may be a strong self-employment learning-curve effect at work, which can be exploited to achieve sustained success in a particular business, or transferred from one form of self-employment activity to another. It is possible that aversion of the higher degree of income risk associated with self-employment is “learnt” rather than acquired through genetic, family or social background. One further possibility is a “relative disadvantage” effect in that the self-employed may become over time less attractive as employees, and so become “locked-in” to self-employment. For some, self-employment might be a transitional state between employment (terminated by lay-off) and unemployment (with investment income derived from redundancy pay-off providing an incentive effect to choose this state). However, if this were a widespread influence on self-employment status then we would not expect to observe such strong state-dependence effects. We would also have expected to find a significant effect from local labour market shocks.

In terms of other influences on self-employment, we find, in common with other studies, that initial conditions are important, especially

educational attainment, school background and a parental background in self-employment (in particular a self-employed mother and a self-employed father who employed others). We find a significant positive influence on self-employment status from financial wealth – operating as an initial condition effect, ruling out the possibility that cross-sectional correlation between self-employment and wealth may simply reflect previous success in self-employment. Current house price shocks also appear to have a significant positive association with self-employment status. Other important influences include occupation, marital status, housing tenure and, particularly for men, a spouse in self-employment. This latter result may point to the importance for men of a second household income to provide risk-spreading, as well as perhaps also spill-over advantages. Finally, our results suggest that over half of the unexplained variance in the probability of choosing self-employment is accounted for as unobserved individual heterogeneity, suggesting that idiosyncratic influences have an important part to play in explaining self-employment status. Further research may continue to identify the exact nature of these.

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 Research Centre on Micro-Social Change 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.

¹ Data from UK Office for National Statistics.

² An ADF (3) statistic (as preferred by the Akaike information criteria) is -0.946 , 95% critical value -2.88 .

³ For further discussion see Reynolds (1997).

⁴ A recent survey of this empirical literature is provided by Le (1999).

⁵ 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 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.

⁶ Strictly speaking we would want the inheritance to be entirely unanticipated, a state of affairs that probably is rarely the case.

⁷ Whilst a significantly positive association is observed, and whilst more of the self-employed in the survey are in receipt

of an inheritance, nevertheless less than 10% of the self-employed were in receipt of an inheritance of greater than £5000 (at 1981 prices) at age 33.

⁸ Of course, in world in which education is, at least partly, privately financed the reverse might also be true.

⁹ Taylor (1999a) presents an empirical model of the transition out of self-employment (a duration model) using the first five waves and lifetime employment history schedules of the BHPS. In the present paper, we model the probability of observing self-employment in the combined sample of self-employed and employed.

¹⁰ Workers in the agricultural sector are excluded from all the analysis because of likely inaccuracies in the recording of income, and because of the specific nature of agricultural land tenure law and inheritance.

¹¹ Modelling of the inflow is undertaken by Holtz-Eakin et al. (1994) and Evans and Leighton (1989). As noted above Taylor (1999a) models the outflow.

¹² Sample attrition rates in the British Household Panel Survey are generally low and certainly comparable to those achieved in other similar household panels. As is typical with household panels the highest attrition rate of individuals was between Waves 1 and 2 (12%). Attrition between Waves 2 and 3 was 7% of the original individuals and subsequently averaged 2.4% of the original sample between waves. In common with nearly all previously published research using this data source, we treat attrition as a random event.

¹³ The sample here is that used for model estimation and is smaller than in Table I due to lack of covariate information, principally on housing wealth and investment income, on a proportion of the economically active.

¹⁴ CSE's were a lower level academic qualification taken at age 16 and were subsumed with the more popular O-level's into a the common GCSE qualification in the late 1980s.

¹⁵ Housing wealth is calculated by reflating historic home purchase price using published regional house price indices (see Henley 1998). For those who are not owner-occupiers housing wealth is assumed to be zero.

¹⁶ Coefficients for non-time-varying elements of $\mathbf{x}$ are set to zero.

¹⁷ As equation (9) stands it contains two individual-specific error component terms, ω_i and μ_i . An assumption that η_i and ω_i are bivariate normal implies that the expectation of μ_i conditional on y_{it} is zero, and that of ω_i conditional on y_{it} can be shown to be equal to the generalised probit residual from the probit estimation of equation (5).

¹⁸ The choice of a piecewise linear spline function allows for greater flexibility in functional form than the more typical quadratic function. Each segment of the function is constrained to join with adjacent segments and the reported coefficients can be interpreted as the marginal effect of an additional year of age in each interval. Greene (2000), pp. 322–325 provides further details on construction and interpretation.

¹⁹ The choice of using gross housing wealth rather than housing wealth net of outstanding mortgage debt is open to question. Net wealth may more accurately reflect the wealth available to the individual as further business capital. On the other hand, the gross value of the individual owner-occupier's home may better reflect the past and present availability of collateral. Any mortgage debt secured on that asset, in the case

of the self-employed, may have already been incurred for business start-up purposes. In practice, the use of gross rather than net wealth yielded models with higher log-likelihood values.

²⁰ Estimation was performed using Stata Release 7, StataCorp (2001). The random effects probit estimator uses a twelve-point quadrature approximation for the likelihood integral.

²¹ The reduced form initial conditions equation associated with column (3) additionally includes the time-means of these variables. This equation is not reported on grounds on space. The sample size in column (4) drops due to missing observations in some year for some individuals on house value and investment income.

²² The lagged self-employment variable was interacted with male and female dummy variables but no difference in state-dependence was found. Note that no restriction on the size of the coefficient is implied in a probit model, as would be the case for stationarity in a time-series model.

²³ Time dummies were added to the model but found not to be jointly significant. Similarly regional dummy variables were also found to be jointly insignificant in both the initial condition reduced form and the random effects equations.

²⁴ The variable is defined as the product of the average annual house price change over the previous 12 months in the county of residence and a binary variable for owner-occupier status. House price data are published on a quarterly basis by Halifax plc (formerly Halifax Building Society).

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