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July 2015

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ABSTRACT

The Power of (Non) Positive Thinking: Self-Employed Pessimists Earn More than Optimists*

Developing further the accumulating evidence that self-employment attracts optimists, this paper investigates the relationship between earnings and prior optimism. It finds that self-employed optimists earn less than self-employed realists. Amongst employees, optimists earn more. These results are consistent with biased expectations leading to entry errors. As a test of validity, we find that amongst the married, future divorcees have higher financial expectations but their realisations are no worse, suggesting our optimism measure captures an intrinsic psychological trait associated with rash decisions.

JEL Classification: D84, M13

Keywords: financial optimism, expectations, self-employment

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“What wild imaginations one forms where dear self is concerned! How sure to be mistaken!”

Jane Austen

“The first principle is that you must not fool yourself and you are the easiest person to fool.”

Richard P. Feynman

1. Introduction

Self-employment tends to attract optimists, as various studies find.¹ Optimists downplay the possibility of unfavourable events occurring, and their self-belief leads them to think they can cope should they arise. Overestimating returns in self-employment does not of itself imply selection on optimism. Optimists will also overestimate their returns in paid employment, so their occupational choice may not be affected. Nevertheless, the uncertainty surrounding business start-ups and the sense of self-determination generated imply the scope to exaggerate prospects is greatest in self-employment. Along these lines, Dawson et al. (2014) find that optimism, measured as financial forecast error, increases on becoming self-employed.

There is also evidence that the economic return to self-employment is low. According to Hamilton (2000), the median self-employed worker earns less than they would in self-employment. Similarly, Moskowitz and Vissing-Jorgenson (2002) find that the return on the equity invested in private businesses is not high enough to compensate for the risk involved. Willingness to accept lower returns may be the result of non-pecuniary benefits of self-employment such as autonomy. Tax evasion and avoidance opportunities may also reduce reported or actual earnings. There is an option value in becoming self-employed so rational experimentation could also account for low earnings. This paper looks at the role of

¹ For example Arabsheibani et al. (2000), Cassar (2010), Puri and Robinson (2013) and Dawson et al. (2014).

optimism. If entrants overestimate the returns to self-employment, they will tend to start businesses with low expected returns, objectively evaluated.²

In outline, our methodology is as follows. Errors in forecasting earnings in prior salaried employment are correlated with subsequent self-employment earnings, controlling for observables and past wages. Earnings in self-employment are declining in optimism, a pattern that cannot be generated by temporary or permanent income shocks experienced as an employee.

The selection effect of optimism evidently does not apply to those who never enter self-employment. For this group, the relation between past optimism and future earnings should be different. If expectations are rational, optimism measured as financial forecast error, is the consequence of unlucky income realisations. Amongst individuals with the same earnings history, it is, therefore, those with the highest forecast, the optimists, who have the greatest underlying earning power. Prior optimism is therefore positively correlated with subsequent earnings. In practice, measured optimists comprise both the unlucky and the biased. For employees, only the former effect impinges on earnings while for the self-employed, both effects potentially apply. In our data, the earnings of employees are increasing in measured optimism, while those of the self-employed are decreasing, indicating the importance of selection effects.³

The two papers closest to ours are Hvide and Panos (2013) and Hamilton, Papageorge and Pande (2014). Both look at how aspects of preferences affect entry into self-employment

² The reasoning is that of de Meza and Southey (1996) and Camerer and Lovello (1999) and in essence the same argument as applied by Malmendier and Tate (2008) to explain why optimistic CEOs are more likely to make value-destroying acquisitions. Åstebro (2010) finds the returns to independent inventors are below those of equally risky investments but cannot directly link this to optimism. It is possible but implausible that selection effects may increase earnings. For it may draw in more risk-averse types with higher yielding opportunities.

³ Intrinsic optimism may have real effects, such as influencing the boss to pay more, but these effects will already be present in prior employee earnings, controlling for which eliminates the effect.

and subsequent earnings. In Hvide and Panos, the taste parameter is risk preference, proxied by stock market participation and personal leverage. According to the reduced form estimates, risk tolerance encourages entry but depresses earnings. The interpretation is that more risk tolerant types accept lower expected return projects, a selection effect. Hamilton, Papageorge and Pande study the effect of the "big five" personality traits. Personality potentially affects relative earning power in paid and self-employment as well as relative non-pecuniary attraction. To identify these selection and treatment effects, a structural model is estimated using simulated maximum likelihood. Openness to new experience is found to make self-employment more attractive but lowers its expected financial returns. According to the model, the sign of selection and treatment effects on earnings is the same. Both of these papers involve rational expectations. In our case, it is the effects of forecast bias that are measured, and therefore results have welfare implications.

The next section sets out the analytical issues. Section 3 describes the data and discusses the implementation of the method. Results follow in Section 4. As a test of the robustness of the optimism effect on project selection, Section 5 shows optimists are more likely to divorce. Finally, brief conclusions are drawn.

2. Past Optimism and Future Earnings: Theory

Optimism, in this paper is measured as financial forecast error. This has the advantage of directly concerning the relevant bias, but as earnings are a component of optimism, care must be taken to ensure that any relationship is not purely mechanical. Measured optimism may arise for two reasons. Optimism due to unlucky income realisations will be associated with higher future earnings if the shock is transitory or no change if the shock is permanent. Forecast error may also be due to systematic bias, as a large psychological literature suggests

(Weinstein, 1980). If setting up a business gives more scope for optimism than continuing as an employee, then, as proposed by de Meza and Southey (1996), optimists tend to opt into self-employment. Evidence that the self-employed are more optimistic than employees is provided by, *inter alia*, Arabsheibani et al. (2001), Puri and Robinson (2007, 2013) Åstebro, Jeffrey, and Adomdza (2007). Dawson et al. (2014) show that optimism predates self-employment but is increased by self-employment. If optimistic self-selection occurs, a further implication is that self-employed optimists will tend to earn less than self-employed pessimists, controlling for earnings in paid-employment.

This section presents the simplest model that provides a basis for the empirical work. Begin by assuming that everyone in the workforce starts as an employee. At the end of each period they are presented with a selection of self-employment opportunities and either take the most attractive or remain in their current job. Once this decision is taken, they forecast their next period income. Individual i 's forecast at $t-1$ of their income at t is

$$forecast_{it} = rational\ expectation_{it} + O_i \quad (1)$$

where O_i is *intrinsic* optimism, a psychological tendency to over estimate expected returns. This propensity is initially assumed uncorrelated with true earning power. There is heterogeneous bias, but forecasts are nevertheless grounded on rational expectations. Those with the highest forecasts tend to have the highest rational expectation and so do best.

Realised earnings are

$$earnings_{it} = rational\ expectation_{it} + \varepsilon_{it} + p_{it} \quad (2)$$

where ε_{it} is a transitory income shock and p_{it} is a permanent shock. Measured optimism, as distinct from intrinsic optimism, is

$$measuredoptimism_{it} = forecast_{it} - earnings_{it} = O_i - \varepsilon_{it} - p_{it} \quad (3)$$

From (1), (2) and (3) and assuming that rationally expected earnings only differ in each period by the shock to permanent income,

$$\begin{aligned} \text{earnings}_{it} &= \text{rational expectation}_{it-1} + \varepsilon_{it} + p_{it} + p_{it-1} \\ &= \text{earnings}_{it-1} + \text{measuredoptimism}_{it-1} - O_i + \varepsilon_{it} + p_{it} \end{aligned} \quad (4)$$

The wage equation (4) is the basis for empirical estimation. Realised earnings are observable, as is measured optimism. Intrinsic optimism is not observable, but as it is a component of measured optimism with opposite sign to its direct appearance in the equation, its magnitude has no influence on earnings. The same is true of permanent shocks.⁴ However, past optimism is decreasing in lagged transitory shocks, which do not otherwise appear in (4). The first proposition is thus:

For employees, future earnings are increasing in past measured optimism.

Consider next those moving into self-employed in period t . For simplicity ignore non-pecuniary aspects of occupational choice, so entry occurs if subjectively estimated expected earnings in the best available prospect exceed the expected wage. This requires,

$$\text{prospect rational expectation}_{it} > \text{rational expectation}_{it-1} + O_i(1 - g) \quad (5)$$

where $g > 1$ reflects the greater opportunities for optimism to inflate prospective self-employment earnings than employee earnings. The higher is intrinsic optimism, the lower is the entry threshold into self-employment, implying the mean *premium* on acceptable opportunities is decreasing in optimism, say $(\alpha - zO_i)$, where $\alpha, z > 0$. It follows that

$$\begin{aligned} \text{selfemployed earnings}_{it} \\ = (\alpha - zO_i) + \text{rational expectation}_{it-1} + p_{it-1} + p_{it} + e_{it} \end{aligned} \quad (6)$$

As $\text{measuredoptimism}_{it-1} = O_i - \varepsilon_{it-1} - p_{it-1}$,

⁴ As in Gervais and O'Dean (2001), it may take time to adjust to a negative permanent shock during which time optimism prevails.

$$\begin{aligned}
& \textit{selfemployed earnings}_{it} \\
& = (\alpha - zO_i) + \textit{employee earnings}_{it-1} - O_i \\
& + \textit{measured optimism}_{it-1} + p_{it} + \epsilon_{it} \quad (7)
\end{aligned}$$

where ϵ_{it} is an error term reflecting that realised earnings in self-employment will differ from expected earnings. For the self-employed, higher *intrinsic* optimism is associated with lower earnings because of the addition of the first term on the RHS of (7).⁵ A permanent income shock to employee earnings affects lagged earnings and optimism in exactly offsetting ways in (7). Such shocks may lead to entry into self-employment but cannot explain the relation between past optimism and earnings within self-employment. **To the extent that higher measured optimism when an employee is due to intrinsic psychology, it is associated with lower self-employment earnings. If measured optimism is attributable to transitory random income shocks, it will be accompanied by higher self-employment earnings. Employee optimism resulting from permanent income shocks is uncorrelated with self-employment earnings.**

From (4) and (7), higher prior optimism depresses the earnings of the self-employed more than of employees. If the entry effect is sufficiently large, it may be that in self-employment optimism has a negative effect on earnings.⁶

The analysis has so far assumed that intrinsic optimism does not have a direct performance effect on earnings. This is not obvious. For example, as noted by Trivers (2000), optimism may have evolved positively to influence others. The best way to convince others of your competence is really to believe it yourself. For paid employment, the target is most

⁵ Hvide (2002) assumes optimism evolves to secure bargaining advantages and Brunnermeier and Parker (2005) assume individuals choose to be optimistic to savour the anticipation of success even if success is thereby made less likely. Neither explanation directly accounts for heterogeneity of beliefs.

⁶ If prior optimism is measured over a number of periods and there is some learning, then controlling for performance permanent shocks imply lower expectations creating a tendency for a positive association between optimism and subsequent earnings.

obviously the boss, but could include customers or suppliers. On this view, intrinsic optimists really do perform better. The rational expectation is therefore increasing in intrinsic optimism. There is a potential paradox here. If a high forecast is fully self-fulfilling, it is not optimistic in our sense. The approach taken here is that individuals are biased relative to the real effects attributable to their bias. Past evidence of how well an individual did is the basis for future expectations, even if these realisations are themselves influenced by optimism. For those remaining in paid-employment, the forecast is therefore still given by (1), so (4) is unchanged. In self-employment, there is no boss to lobby for a pay rise and the owner is likely responsible for more key operating decisions for which an unbiased evaluation of alternatives is the best approach. As well as entering business ownership inappropriately, optimists are then worse at running their businesses. The mean return of objectively acceptable projects, α , is thus decreasing in optimism. If those switching into self-employment do not realise this performance effect, they will overestimate expected returns from entry by even more, implying a higher z . The form of (7) is unchanged, but unrecognised performance effects of optimism will augment its negative effect on earnings.

It is possible to make some headway in teasing out the selection channel. The reason is that the effect of selection on entry opportunity disappears when optimism takes extreme values. Therefore, if optimism still has a negative effect on self-employment earnings at these values, it must be due to an operating effect.

Consider a collection of individuals differing only in their intrinsic optimism. Each is presented with a random self-employment opportunity, accepting it if its expected income is believed to exceed a common threshold. More optimistic individuals are willing to accept

objectively worse opportunities. As a function of intrinsic optimism, O , expected self-employment earnings are;

$$\bar{s}(O) = \frac{\int_{s^*}^{s^h} f(s) s ds}{\int_{s^*}^{s^h} f(s) ds}$$

where $f(s)$ is the density of the distribution of the *expected* earnings of self-employment opportunities, objectively evaluated, with upper support s^h . The expected earnings cut off is $s^*(O)$, $s^{*'}(O) < 0$.

$$\frac{d\bar{s}}{dO} = \frac{f(s^*)}{\int_{s^*}^{s^h} f(s) ds} \left[\frac{\int_{s^*}^{s^h} f(s) s ds}{\int_{s^*}^{s^h} f(s) ds} - s^* \right] s^{*'}(O) \leq 0 \quad (8)$$

The signing follows as the first term in the square brackets, average earnings of acceptable projects, is a weighted sum of terms greater than s^* .

The selection effects of optimism on earnings vary according to where measured. Consider the most extreme optimists. Their acceptance threshold is low. As s falls to the lower support, the square bracketed term in (8) tends to a finite value, the mean of s less the lower support. If the pdf of s tends to zero as the lower support is approached, the first term multiplying the square bracket therefore tends to zero. Thus the selection effect of optimism disappears for extreme optimists.

At the other end of the scale, hardly any projects are acceptable, so the first term in the square brackets of (8) tends to s^* as optimism falls. It is though multiplied by a term that tends to infinity as s^h is approached. There is no definite conclusion concerning whether selection effects weaken at extreme pessimism. Table 1 shows a discrete example where selection effects are weaker for the more extreme pessimists.

Table 1: Extreme pessimism and selection

s^*	10	9	8	7	6	5	4
Entry	1	2	5	10	15	18	19
\bar{s}	10	9.5	8.6	7.8	7.2	6.83	6.65
$\Delta\bar{s}/\Delta s$		0.5	0.9	0.8	0.6	0.39	0.18

Extreme measured optimism must involve extreme intrinsic optimism and at these points the slope of self-employed earnings will be driven by transitory shocks.

The effects of selection on entry opportunity only apply when optimism is close to its highest level and probably also when optimism is close to its lowest level. So at extremes of optimism self-employment income will be increasing in measured optimism.

Selection effects will not be equally strong at all percentiles of the distribution. All businesses can fail due to bad luck. Once a business is in financial distress, there is little to distinguish those with good *ex ante* prospects from weak.⁷ When good projects perform to their capability, the returns of the good prospects much exceed those in the weak. So it is at higher percentiles that optimism will have its greatest impact. To illustrate, suppose everyone is risk neutral, has the same intrinsic abilities, and there are no permanent income shocks. Initially, all are in paid-employment. Each period, earnings in paid employment are an independent draw from a uniform distribution with support $[L, H]$. At the end of the first period, some individuals identify a self-employment opportunity. This requires that capital must be installed, prior to the realisation of stochastic demand. It is reasonable to assume that access to capital is increasing in collateral availability and in other random factors. Due to moral hazard associated with default, borrowing never exceeds the level chosen by an individual able to self-finance. Those entering self-employment consequently install the maximum capital that a lender will permit. There are two levels of investment. With low

⁷ By analogy, smoking predicts lung cancer but, once cancer is in its later stages, past smoking no longer predicts outcomes.

capital stock, the distribution of net returns has support $[L^*, H^*]$, $L^* < L$, $H^* > H$, $L^* + H^* < L + H$. This prospect is riskier than paid-employment and as it has lower mean, is less attractive to a realist. With high capital installed, the support of self-employment returns is $[L^* - a, H^* + b]$, $a, b > 0$, $L^* - a + H^* + b > L + H$. Net returns in good states are boosted, but with low demand the business is overcapitalised and after loan repayment, net returns are reduced.⁸ Expected net returns are however higher for the better-capitalised business.

At the end of the first period, each person with a self-employment option selects it or else draws from the paid distribution again. Realists only enter self-employment if they have access to high capital. Everyone has equal ability, but half the population are intrinsic optimists. As discussed in the Introduction, it is plausible that bias is greater in assessing returns in self-employment. If optimism is sufficiently great, self-employment is chosen even when capital is low.⁹ Note further that for well-capitalised self-employment, earnings at percentile $P/100$ are $s_h = P(H^* - L^*) + P(a + b) + L^* - a$ and for low-capitalised entry are, $s_l = P(H^* - L^*) + L^*$. So, $s_h - s_l = P(b + a) + a$.

Measured at a given percentile, the better-capitalised project always has higher returns, and the gap is increasing in the percentile. This property also applies to the comparison of optimists, who undertake both high and low capitalised self-employment, with realists who only undertake the latter.¹⁰

⁸ For the full results, what matters is that higher capital increases the variance of returns. This could be because returns increase by the same proportion in every state. Lower returns in the worst states are not required.

⁹ Even if in some sense optimism is the same in all domains, results still go through. Specifically, for optimists, the lowest $100\lambda\%$ of outcomes are believed to have negligible chance of occurring, but above this level the distribution is uniform. This applies even to returns in paid employment. Relative to paid employment, optimism raises expected self-employment returns by $\lambda [(L^* + H^*) - (L + H)]$

¹⁰ These effects are stronger still if there is a third period in which all revert to paid employment except the high earning self-employed

Controlling for earnings as an employee, the selection effect will be greater at higher earnings percentiles.

To summarise, for those continuing as employees and controlling for past earnings, the correlation between past optimism and future earnings will be positive. For the self-employed, the rational expectations effect will be offset by a selection effect that may be strong enough to create a negative correlation. These effects apply most clearly at higher earning percentiles and intermediate levels of optimism. Were it possible to instrument for intrinsic optimism the model implies that there would be no effects on those who never choose self-employment while the effect on the future self-employed would be larger than our estimates.

3. Data source and method

3.1. BHPS survey and survey instrument

The data used for analysis are taken from the British Household Panel Survey (BHPS). This is a nationally representative longitudinal survey that began in 1991, funded by the UK Economic and Social Research Council as a national and international multi-purpose research resource. A stratified random cluster sample of households was drawn from the population of British household postal addresses in Great Britain, and tracked annually thereafter.¹¹ The questionnaire instrument includes a household schedule and a lengthy individual schedule that is completed separately by all adult household members present at each wave. This individual schedule covers a range of topics including demographic

¹¹ The far north of Scotland is excluded because of the prohibitive sampling costs. The original survey excludes Northern Ireland. Booster samples for Wales and Scotland recruited in 1999 and a sample for Northern Ireland recruited in 2001 are excluded from the analysis.

characteristics, economic activity and finances. The original sample of 5000 households (comprising approximately 12000 individuals) was recruited in 1991. Follow-on rules establish the tracking of newly forming households involving originally enumerated household members. The present analysis uses the full 18 annual waves available from 1991 to 2008.¹²

The sample used for the subsequent analysis is restricted to the original BHPS sample covering Great Britain and to those individuals who are either in paid employment or self-employed. Self-employed is defined here as self-identified self-employed business ownership. This definition matches with UK taxation status, where the self-employed are required registering as responsible for own income tax payment, rather than being taxed through deductions made by an employer (“pay-as-you-earn”). The indicator is further refined from a questionnaire item asking whether the self-employed is a sole-trader, owner or part-owner of a business, as distinct from a freelancer or subcontractor. The latter are excluded from the definition of self-employed business owners and are dropped from the subsequent analysis. Approximately 80% of the self-employed are business owners.¹³

3.2. The optimism measure

¹² Sample attrition rates in the BHPS 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, attrition is assumed to be a random event. From 2009 onwards the BHPS sample has been merged into a much larger new longitudinal household study with further widening of scope, including biosocial analysis.

¹³ A transition into self-employed business ownership is defined to have occurred if an individual’s full-time or main economic status changes to that state. A small number of transitions into part-time self-employment alongside full-time or part-time paid employment are excluded from the *futures* group. We also delete all people that currently in paid-employment and were previously in the panel defined as self-employed. Therefore we control for multiple entries into self-employment for the *futures* group.

The optimism measure is constructed from two questions on financial expectations and realizations, asked of all individuals in each year. The first is:

“Looking ahead, how do you think you yourself will be financially a year from now; better than you are now, worse than you are now, or about the same?”

Individuals who gave a valid response at year t are then matched with their self-reported financial realisation at year $t+1$, obtained from the second question:

“Would you say that you yourself are better off, worse off or about the same financially than you were a year ago?”

The approach of Section 2 must be adapted to the categorical nature of the forecast and realisation data. The survey instrument asks for cardinal responses to both questions on three-point scales. One way to construct optimism from data of this type is to follow Das and van Soest (1997), Arabsheibani et al. (2000), Souleles (2004) and construct a five-point measure of forecast error, defined as the difference between the financial forecast (of $t+1$) at t , minus the financial realization at $t+1$. As optimism involves outcomes, to use it to explain outcomes there must be no overlap in the periods covered by dependent and independent variables. For those who will become self-employed (*futures*), the optimism estimate is computed over their period in prior paid employment. For those who never become self-employed (*nevers*), it is computed over for the first half of the available periods in paid-employment (specifically, the next highest integer to the midpoint). The year prior to transition is excluded as the forecast may not have anticipated the switch to self-employment and there may be unusual shocks.

One objection to this method is that the cardinalization of the error is potentially ambiguous. For example, forecasting *better* and achieving *same* is treated as equivalent to forecasting *same* and achieving *worse*. Although the five-point scale is commonly used, there is no fundamental defence of the procedure beyond saying it represents a convenient mapping from continuous but unobserved underlying forecasts and realizations. If the specification is wrong, it will make it harder to find optimism effects. At the second-stage, when the optimism measure is used to explain earnings, a cubic in optimism is estimated so as to allow effects to be very flexible in form.

Another potential criticism of the method is that, to the extent expectations are not rational, measured optimism will proxy for low underlying earning power and, therefore, be directly correlated with low earnings in the future. A negative association between optimism and earnings may simply reflect this effect rather than the influence of optimism on entry. To eliminate this possibility, when estimating the effect of optimism on earnings, two controls are included. The first is a fixed-effect estimate of earnings in paid-employment and the second a fixed-effect measure of categorical realisations in paid-employment. Thus, the effect of past optimism on future earnings is compared for individuals with the same earnings history, closing off the poor performance channel as the explanation of optimism effects. Were this mechanism still somehow to apply, it would generate a more negative effect for the never self-employed, but in fact we find positive effects there.

Although the categorical nature of the data is a drawback, the panel feature is an advantage allowing more precision in identifying intrinsic optimism. Averaged over a number of periods, the noise in the optimism measure will be diminished. To utilise this property, a linear fixed-effect regression is estimated

$$M_{it} = \mathbf{X}_{it}'\boldsymbol{\beta} + z_i^1 + \varepsilon_{it} \quad (9)$$

where M_{it} is the forecast error by individual i at time t . \mathbf{X} is a vector of time-varying demographic and other person specific characteristics of individual i , and z_i^1 is the individual fixed-effect coefficient. The individual fixed effects extracted from equation (9), \hat{z}_i^1 , provide estimates of intrinsic optimism net of any environmental influences.

Descriptive statistics for the two sample groups, *futures* and *nevers* are in Table A1, with the corresponding full estimates of the optimism equation (equation 9) provided in Table A2. In total, there are 3138 *futures* observations from 618 individuals, so optimism is on average constructed from 5.1 observations per individual. For *nevers* there are 28,830 observations from 7367 individuals with optimism derived from an average of 3.9 waves per person. The average financial forecasts of *futures* exceed those of *nevers*, but average realizations are only marginally lower for *futures*. The forecast error is in the optimistic direction for both groups but *futures* are more optimistic than *nevers*.¹⁴ The rest of the empirical investigation tests whether this prior optimism is correlated with subsequent earnings in self-employment for *futures* and paid-employment for *nevers*.

3.3 Earnings

The gross monthly self-employment earnings of the 559 *futures* once transitioned into self-employed business ownership is computed from responses to two questions:

- How much net profit did you make from your share of the business or practice?
- How much did you earn (before tax) in the last twelve months or the most recent period for which you have figures?

¹⁴ *Nevers* are identified as never being self-employed during the sample period. Some may enter self-employment later, in which case the tendency is to under record the extent of the optimism difference with *futures*.

The first question is asked of those individuals who draw up profit and loss accounts (approximately 80% of all *futures*) and the second for those who do not. From this information, the BHPS data release provides a derived construction of gross monthly earnings. To allow for any systematic difference in measurement error between the two response types, in the self-employment regressions a dummy is included for whether the measure is based on accounts. Self-employed individuals who are recorded as making a loss are coded with zero earnings meaning that the variable is left-hand censored. For this and other reasons described shortly quantile regressions are run. For *nevers*, gross monthly earnings are measured from payments of wages/salaries. Section 1 of Table 2 displays the distribution of gross monthly earnings for those in self-employment and those never becoming self-employed. Inspection of the percentiles of the earnings distribution reveals that the paid-employed have a relative advantage at the lower end, but at the very top end of the distribution the self-employed have a relative advantage. This earnings pattern will appeal to optimists.

3.4 Final-Stage Equations

The estimation of the effect of optimism on performance is implemented via separate second-stage regression equations for the two groups:

$$E_{it} = \sum_{j=1}^3 \alpha_j \text{optimism}_i^j + \beta \text{pastearnings}_i + \lambda \text{pastrealizations}_i + \mathbf{X}'_{it} \boldsymbol{\delta} + \varepsilon_{it} \quad (10)$$

where E_{it} is gross monthly earnings, either for the self-employed business owner or for *nevers* over the second half of their employment period. For individual i , optimism_i is the fixed effect from the first-stage optimism equation, pastearnings_i is the fixed-effect from an earnings equation estimated over the same period for which optimism is estimated, and $\text{pastrealizations}_i$ from a similar categorical realization equation. The relationship between performance and *optimism* is allowed to take a cubic form in order to investigate the

possibility of non-linearity discussed earlier and simulated in Table 1. To emphasise, there is no overlap in the periods over which the first-stage variables and E_{it} are measured. As discussed below, additional demographic and other personal control variables are in \mathbf{X} , including hours of work, with estimated coefficients δ .

By construction, the optimism measure, the fixed effects from equation (9), will tend to be negatively correlated with contemporaneous realizations and, to the extent that shocks are permanent, with future realizations and income. If optimism has a negative effect on earnings, it may seem that this is because optimism is merely an inverse proxy for earning power. This is not an issue since the earnings equation controls for prior realizations. The optimism effect is not due to extrapolation from past performance.¹⁵ Moreover, within the BHPS the categorical realization variable is not the only measure of earnings power available, there is also the self-reported wage. This should be a better measure than the realizations variable that concerns an individual's overall financial situation and not just their earnings from earlier paid-employment. The procedure is, therefore, to estimate a fixed effect log of hourly wages equations (Table A3 in the Appendix) for individuals in all paid employment periods for which optimism is measured. The individual fixed effect is then extracted and used as a further control in the self-employed earnings equations (10) to proxy for intrinsic earnings ability. These fixed effects are noisy estimates of an individual's intrinsic earnings ability and it is, therefore, possible that realizations also have something to contribute to the estimation of earning power. As noted, the individual fixed effects from a linear fixed-effect realization equation is included as a further control in the self-employed gross monthly earning equation (Table A4 in the Appendix). That this procedure succeeds in removing mechanical effects is indicated by the relation between optimism and earnings

¹⁵ The greater the extent to which past realizations are due to permanent shocks, the lower might expectations be and thus lower optimism implies worse performance contrary to the self-employment finding.

being positive for the *nevers*. This is consistent with recorded optimism sometimes reflecting bad luck. Individuals made rational forecasts but realisations were low by chance. These individuals should do better in the future due to mean reversion. For *futures* this effect may still be present but now the effect of intrinsic optimism on entry more than offsets the rational expectations effect.

Section 2 of Table 2 summarises the descriptive statistics for a set of control covariates that are used in the subsequent gross monthly earnings equations for our two samples. It is of note that the self-employed who were *futures* in the first stage are much more likely to be male, reflecting the lower proportion of women amongst the stock of self-employed in the UK. The self-employed are less likely to hold university/college degrees than *nevers* but are more likely to have dependent children, to be home owners and married. Just over 18% of self-employed respondents report leaving compulsory schooling with no formal qualifications compared to 16% of the employed. Home ownership and wealth has also been found to be correlated with self-employment activity, through their role in providing financial capital and relaxing liquidity constraints (Black, de Meza and Jeffreys, 1996, Hurst and Lusardi, 2004; Henley, 2007). As noted, high levels of home ownership are reported by the self-employed, with approximately 69% reporting a mortgage debt on their property. Labour market experience is captured through the inclusion of an employment tenure variable in quadratic form.¹⁶ On average *futures* have nearly 4 years of employment tenure and *nevers* 5.7 years. For the self-employed, prior experience may, however, be provided indirectly through parental role models (Fairlie and Robb, 2007; Colombier and Masclet, 2008). Parental business ownership experience is include as a control. Over three-quarters did not have a self-employed parent, with 22% reporting that one or both parents

¹⁶ Computed in the usual manner as age minus approximate years of pre-school and schooling.

were self-employed. The self-employed also work just over 9 hours longer per week than *nevers*.

4. Results

This section reports separate multivariate regressions of the form of (10) showing the relationship between gross monthly earnings and optimism for *futures* and *nevers*. Quantile regressions are estimated because the preceding theoretical discussion points to an optimism-earnings relationship that varies across the earnings distribution, with optimism effects more apparent at higher outcomes. Moreover, as noted, gross monthly earnings of the self-employed are left-censored at zero. Quantile regression methods will provide results that are robust to this data feature.

Key coefficients for the second-stage regressions are reported in Table 3 (the full tables are in the Appendix, A5a and A5b). The table reports standard errors which are asymptotically valid under heteroscedasticity and which are clustered in order to control for multiple observations per individual (see Machado and Santos Silva, 2000; Machado and Santos Silva, 2011; Machado et al., 2014).¹⁷

Figure 1 plots the estimated relationships between intrinsic optimism and earnings from (8) for selected percentiles. Mean optimism is standardised to zero. On this scale, the rational expectation forecast (zero mean error) is -0.25 for the self-employed. The plotted range of optimism covers 97% of observations. For the self-employed, linear and quadratic

¹⁷ An alternative is to bootstrap.

functional forms are rejected in favour of more flexible cubics.¹⁸ The upper plots are shown how the fitted values of earnings vary with optimism for the self-employed (cubics) and employees (linear). In the lower part of the figure, the slope of the self-employment earnings function with respect to optimism is plotted with associated confidence intervals. As suggested by the theory, the higher the percentile, the greater the relative earnings of the self-employed.

The main finding is that for the self-employed, except at the belief extremes, greater intrinsic optimism is associated with lower earnings. At high quantiles, effects are highly significant. They are also large. The most optimistic of the self-employed earn some 25% less than the least optimistic, measured at their respective 75th earnings percentiles. For employees, the relationship is reversed. Higher intrinsic optimism is associated with increased earnings. These results are consistent with expectations involving both rational and psychological elements. To the extent that the optimism measure captures temporary negative income shocks, it will be associated with improved subsequent performance. This is likely to be the main effect in paid employment. To the extent that measured optimism reflects systematic psychological bias, entry errors arise, imparting a negative relationship between optimism and self-employment.¹⁹ The self-employment finding might also reflect that optimists are relatively less successful at running businesses than as employees. This though should be revealed at belief extremes where selection effects do not apply, and it is here that the negative effect disappears. Optimism does not seem to have differential effects on operating performance.

¹⁸ Results are similar if the relationship is estimated as piecewise linear.

¹⁹ Including graduate/optimism interaction does not yield significant coefficients suggesting optimism effects are not restricted to the unsophisticated.

Full estimates from the quantile regressions are reported in Table A5a and A5b for *futures* and for *nevers*, respectively, with results provided for the 25th, 50th, 75th, 90th and 95th percentiles of the self-employed and employee earnings distributions. Turning firstly and briefly to the control variables, there is a positive association between earnings and age, although the effect decelerates.²⁰ Being male boosts second-stage income of both *futures* and *nevers*, with this effect increasing at higher percentiles of the earnings distributions. As gender is part of the first-stage earnings fixed effects, these coefficients indicate that gender plays a greater role as careers progress. Possession of a university (degree) qualification is associated with higher subsequent earnings for both groups, but this effect is only statistically significant at the 95th percentile of the earnings distribution for *futures*. Formal qualifications may be less salient for success in starting a business. Finally, the proxy for earnings power in prior employment is strongly and positively associated with subsequent earnings. This effect is not statistically significant at the 25th percentile for *futures*, suggesting that once businesses are in the “emergency room” provenance does not matter. This provides further support to the proposition that optimism effects only appear at higher quantiles.

Although earnings in paid employment are generally found to be over reported relative to those in self-employment (Astebo and Chen (2014), Hurst, Li and Pugsley (2014)) it is nevertheless of interest to see how much of the measured difference is due to intrinsic optimism. The most straightforward way to accomplish this is to run separate earnings regressions for the two groups, with the intrinsic optimism variable put on a common basis by means of a pooled first-stage regression. Computing the difference in the contribution of mean optimism in the two earnings equations, 10.6% of the mean difference in income is due to intrinsic optimism.

²⁰ Age and other time varying variables may affect optimism. Entering such variables at both stages nets out there contribution via the optimism channel.

5. Optimism, Divorce and Smoking

If the financial optimism measure captures an innate psychological trait, then it should be correlated with other aspects of behaviour. As a test for validity, results are provided for a context involving rather similar issues - the relationship between optimism and future divorce.

Viewed from the perspective of search theory, marriage has something in common with entry into self-employment. The issue is to decide when a sufficiently good prospect has arrived. The optimism perspective is captured by the adage “Marry in haste, repent at leisure”. Optimists overestimate match quality, eventually realise that the marriage is a mistake, and are therefore more likely to divorce.²¹ To test this, the optimism of the married, measured as the five-point difference between forecast and realisation, is regressed on a dummy for will be divorced in the future. The results are the first column of Table A6. Divorce is highly significant, but as it stands, it could be argued that the effect is due to unlucky negative income shocks triggering divorce rather than intrinsic optimism. To counter this, two further equations are estimated. One examines whether people who are currently married but will divorce in the future have higher expectations than those who do not divorce. A parallel equation examines whether future divorcees have worse realisations. The difference in the two future marital states is tested for statistical significance to determine whether future divorcees are more optimistic. The two-equation procedure makes it possible to reject the negative shock interpretation.

²¹ Optimists might overrate their own attractiveness and therefore wait longer to get married. Nevertheless, matches based on one party overestimating their worth are also likely to be unsatisfactory and therefore more likely to terminate.

Column 2 of Table A6 presents the expectation equation. The main issue is to determine whether those who will divorce in the future have higher prior expectations. To this end, the first row is the coefficient on a dummy variable for future-divorcee status. Divorce itself has repercussions on income and may therefore affect expectations. A series of dummies is introduced to take these effects into account. There are dummies for year before divorce and year of divorce and for divorced status. Similarly, there is a dummy for year of remarriage should this occur and for remarried status. Future-divorcees have significantly higher expectations, as shown in the coefficient estimate being significant at the 1% level. So an optimism effect cannot just be the result of income collapse. The final element is to check that an intrinsic optimism is present and not merely explained by income shocks post-divorce. Column 3 provides the realisation equation that matches the expectation equation. Future-divorcees earn slightly more than non-divorcees, but the difference is not significant. The dummy coefficient in the expectation equation is greater than that in the realisation equation, significant at the 1% level. So it can be concluded that prior intrinsic optimism is associated with divorce.

As a further validity check these equations also reveal that smokers have very significantly higher financial optimism. Although increased smoking is associated with lower income at a marginal level of significance, optimism is not just the result of low income. Heavy smokers also have significantly higher expectations than those who do not smoke, given the same observables. Financial optimists tend to assume the worst will not happen. This psychology appears to transfer to the consequences of smoking. This suggests that the optimism measure does at least partially capture a psychological trait.

6. Conclusion

This paper finds that optimism measured prior to entry is associated with lower earnings in self-employment. For employees, greater optimism is associated with higher subsequent earnings. These results are in line with two features of expectations. An intrinsic optimistic bias leads to mistaken entry into self-employment while prior measured optimism due to bad luck is correlated with higher earnings. The inclusion of past earnings as a control means the results are not the consequence of permanent income shocks leading individuals to try a different employment mode. The negative correlation between optimism and self-employment earnings could be a treatment rather than a selection effect. Optimism may directly affect performance in ways that are absent in salaried employment. Perhaps the self-employed have more discretion than employees and therefore it is more important that their decisions are based on a realistic appraisal of alternatives. There are three reasons for doubting that treatment effects are responsible for the findings. First, the implication that bias lowers productivity is that realists would do best, but self-employed pessimists earn more than realists. Second, at the extremes of optimism and pessimism, where theoretically the selection effect does not operate, optimism effects are the same as in paid employment. Finally, if entrants knew that optimism is a disadvantage in self-employment, employees would on average be more optimistic than the self-employed, contrary to the evidence.

The results of this paper are relevant to the question of whether becoming self-employed increases or decreases financial well-being. Levine and Rubinstein (2013) have recently cast some doubt on whether all forms of self-employment diminish earnings. They distinguish between business types. The owners of incorporated businesses, shown to be most likely to be engaged in true entrepreneurial activity, on average experience a boost average income, gross of the cost of self-finance. It is starting an unincorporated businesses that is

associated with a decline in income. Even for the incorporated, these findings do not preclude an optimism effect. If those setting up incorporated businesses are realistic, risk-neutral and non-pecuniary aspects are unimportant, the only acceptable opportunities yield expected returns at least as high as employee earnings. Starting an incorporated business, therefore, raises expected income. Risk aversion and the unmeasured cost of self-finance further augment the tendency for the income of the owners of incorporated businesses to exceed that of observationally identical employees.²² As it is not easy to determine by how much more the income of owners of incorporated businesses should on average exceed that of comparable employees, a positive difference does not preclude optimism leading to excess entry.

This paper estimates the equilibrium relationship between self-employment earnings and prior optimism rather than the equilibrium earnings difference between the self-employed and employees. The negative correlation between optimism and self-employment earnings suggests that at least some business entry is the result of mistaken expectations. There will also exist pessimists who do not enter but would have done had they been more realistic. This too is an error, though of the opposite kind.

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²² Non-pecuniary benefits of self-employment, as in Hurst and Pugsley (2010) work in the direction of lowering the equilibrium income of business owners; likewise the effect of rational experimentation as in Jovanovic (1982).

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Table 2: Descriptive statistics

Section 1		<i>Self-Employed</i>		<i>Paid-Employed</i>	
Gross monthly earnings (in £)					
Mean		1381.48		1733.92	
25 th percentile		291.67		958.75	
50 th percentile		833.33		1499.15	
75 th percentile		1583.33		2208.33	
90 th percentile		3031.00		3097.38	
95 th percentile		4583.33		3788.92	
Section 2		<i>Self-Employed</i>		<i>Paid-Employed</i>	
Variable	Description	Mean	<i>Std. Dev.</i>	Mean	<i>Std. Dev.</i>
Whether Draws up Profit/Loss Accounts:					
Draws up accounts		0.823		-	
Does not draw up accounts	<i>(reference category)</i>	0.089		-	
Not yet but will be		0.089		-	
Paid-Employment Performance Controls:					
Pastearnings		0.024	0.740	0.006	0.376
Pastrealizations		-0.003	0.631	-0.005	0.799
Health:					
Health-excellent		0.267		0.250	
Health-good		0.496		0.509	
Health-other	<i>(reference category)</i>	0.237		0.241	
Demographics:					
Age (years)		42.48	10.01	42.36	10.58
Age ²		1905.1	862.3	1906.0	898.3
Male		0.686		0.482	
Marital Status and Household Composition:					
Single, never married	<i>(reference category)</i>	0.100		0.135	
Widowed/divorced/separated		0.060		0.090	
Married/cohabiting, partner employed		0.690		0.661	
Married/cohabiting, partner not employed		0.150		0.113	
Number of dependent children in household		0.824	1.063	0.622	0.916
Educational attainment:					
University/college degree		0.157		0.181	
Vocational college qualification		0.087		0.078	
A-levels		0.261		0.216	
O-levels/GCSEs		0.314		0.363	

No qualifications	<i>(reference category)</i>	0.181		0.163	
<i>Housing tenure:</i>					
Outright owner		0.183		0.173	
Own with mortgage		0.693		0.678	
Private sector rental		0.075		0.068	
Social sector rental	<i>(reference category)</i>	0.048		0.081	
<i>Parental background at age 14:</i>					
Both parents self-employed		0.034		0.012	
Father self-employed		0.159		0.103	
Mother self-employed		0.029		0.021	
Neither parent self-employed	<i>(reference category)</i>	0.778		0.864	
<i>Labour Market Characteristics:</i>					
Job tenure (years)		3.98	4.64	5.68	6.56
Job tenure ²		37.33	98.94	75.30	168.38
Usual hours worked per week		43.73	16.41	34.56	9.59
Usual hours worked per week ²		2181.4	1522.1	1286.6	643.6
Holding a second job		0.095		0.072	
N		1964 (559 individuals)		25537 (6057 individuals)	

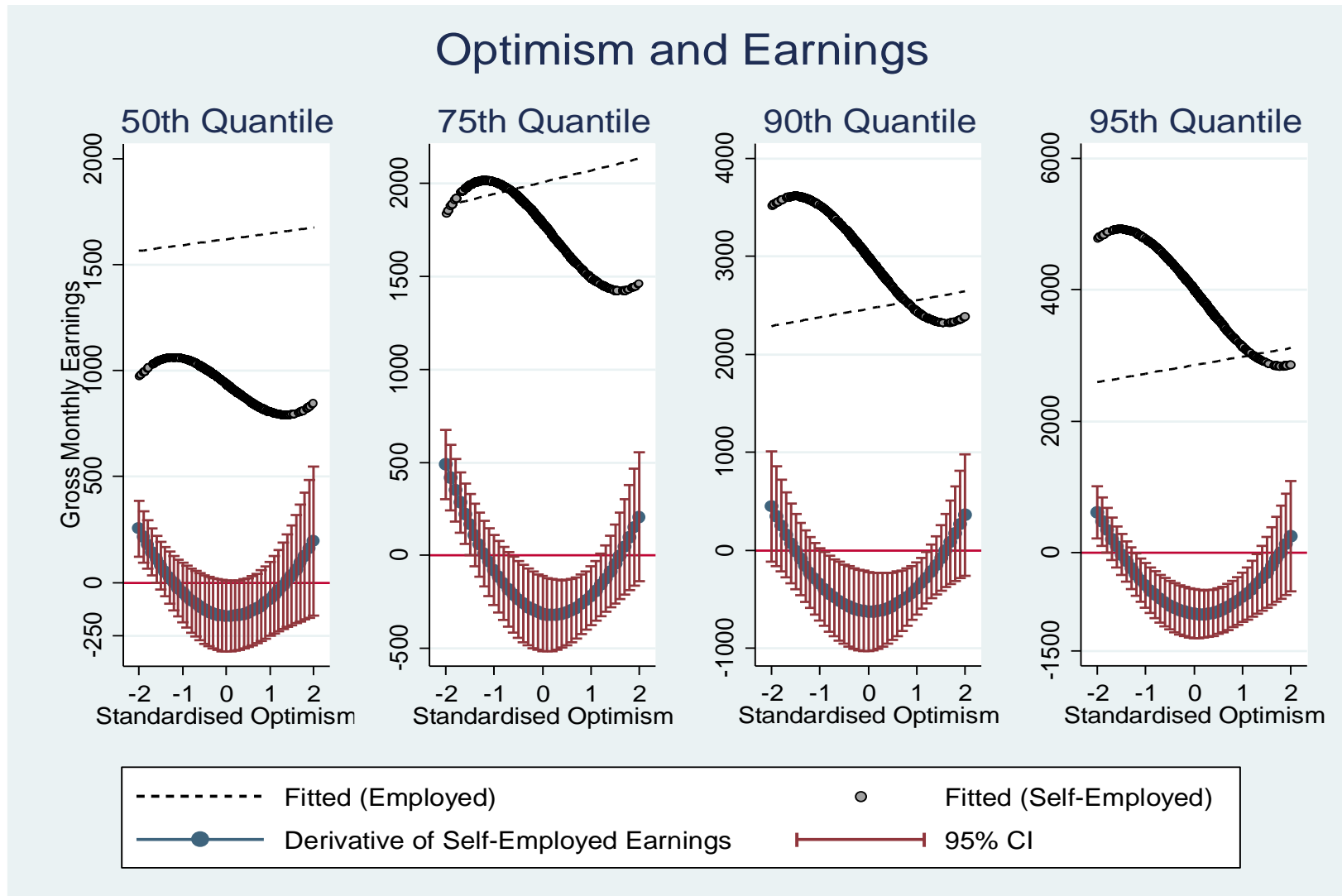
Source: authors' tabulations from BHPS 1991-2008

Table 3: Derivatives of gross monthly earnings with respect to optimism

Gross Monthly Earnings Quantile	Standardised Optimism Scale ($\mu = 0$ and $\sigma = 1$)												
	-2 Extreme Pessimism	-1.5	-1	-0.75	-0.5	-0.25	0	+0.25	+0.5	+0.75	+1	+1.5	+2 Extreme Optimism
<i>Self-Employed</i>													
25 th	64.0 (62.6)	51.2 (48.7)	39.1 (55.2)	33.4 (59.7)	27.8 (63.3)	22.3 (65.4)	17.1 (66.1)	12.1 (65.9)	7.2 (65.7)	2.5 (66.9)	-2.0 (71.2)	-10.5 (94.3)	-18.2 (138.3)
50 th	254.7*** (67.4)	79.9 (57.4)	-47.1 (71.3)	-92.7 (78.0)	-126.3 (82.7)	-148.0* (85.0)	-157.7* (85.3)	-155.4* (84.2)	-141.2* (83.1)	-115.0 (83.9)	-76.9 (89.2)	35.3 (120.3)	195.3 (179.5)
75 th	489.5*** (95.1)	164.9** (83.5)	-77.1 (95.8)	-167.1 (101.7)	-236.3** (105.1)	-285.0*** (105.4)	-312.9*** (102.4)	-320.2*** (96.7)	-306.8*** (89.3)	-272.7*** (82.6)	-218.0*** (80.6)	-46.4 (107.5)	207.8 (176.7)
90 th	450.2 (286.8)	-11.6 (195.2)	-344.6* (188.4)	-462.9** (198.4)	-548.9*** (207.1)	-602.8*** (210.4)	-624.4*** (206.4)	-613.9*** (194.7)	-571.1*** (176.0)	-496.2*** (153.4)	-389.1*** (135.0)	-78.2 (168.9)	361.4 (316.4)
95 th	611.7*** (202.0)	-29.6 (157.7)	-500.9*** (172.1)	-672.7*** (182.7)	-801.9*** (189.7)	-888.7*** (191.8)	-932.8*** (189.1)	-934.5*** (183.1)	-893.6*** (177.5)	-810.2*** (177.9)	-684.2*** (191.6)	-304.7 (275.2)	245.1 (428.5)
<i>Paid-Employed</i>													
25 th	29.8** (11.7)	29.8** (11.7)	29.8** (11.7)	29.8** (11.7)	29.8** (11.7)	29.8** (11.7)	29.8** (11.7)	29.8** (11.7)	29.8** (11.7)	29.8** (11.7)	29.8** (11.7)	29.8** (11.7)	29.8** (11.7)
50 th	27.4** (13.0)	27.4** (13.0)	27.4** (13.0)	27.4** (13.0)	27.4** (13.0)	27.4** (13.0)	27.4** (13.0)	27.4** (13.0)	27.4** (13.0)	27.4** (13.0)	27.4** (13.0)	27.4** (13.0)	27.4** (13.0)
75 th	63.5*** (20.2)	63.5*** (20.2)	63.5*** (20.2)	63.5*** (20.2)	63.5*** (20.2)	63.5*** (20.2)	63.5*** (20.2)	63.5*** (20.2)	63.5*** (20.2)	63.5*** (20.2)	63.5*** (20.2)	63.5*** (20.2)	63.5*** (20.2)
90 th	87.9** (35.8)	87.9** (35.8)	87.9** (35.8)	87.9** (35.8)	87.9** (35.8)	87.9** (35.8)	87.9** (35.8)	87.9** (35.8)	87.9** (35.8)	87.9** (35.8)	87.9** (35.8)	87.9** (35.8)	87.9** (35.8)
95 th	129.6*** (43.5)	129.6*** (43.5)	129.6*** (43.5)	129.6*** (43.5)	129.6*** (43.5)	129.6*** (43.5)	129.6*** (43.5)	129.6*** (43.5)	129.6*** (43.5)	129.6*** (43.5)	129.6*** (43.5)	129.6*** (43.5)	129.6*** (43.5)

Note: All regressions are estimated using the Stata command “qreg2” by Machado and Santos Silva (2011). Standard errors are clustered by individual and are asymptotically robust to heteroskedasticity. All regressions include the standard list of covariates included in Table 2 as well as a set of region of residence, year and one-digit standard industrial classification dummy variables. * indicates significance level (p-value) below 0.10, ** below 0.05 and *** below 0.01.

Figure 1: Estimated relationships between optimism and earnings



APPENDIX:

Table A1: Descriptive statistics

Variable	Description	<i>Futures</i>		<i>Nevers</i>	
		Mean	<i>Std. Dev.</i>	Mean	<i>Std. Dev.</i>
<i>Financial forecasts and realizations</i>					
<i>Financial forecast (t):</i>					
Better off	<i>Reference category</i>	0.415	0.493	0.385	0.487
Same		0.495	0.500	0.517	0.500
Worse off		0.091	0.287	0.098	0.297
3 point scale (<i>Dependent Variable</i>)	-1 if individual financial forecast 'worse off', 0 if 'same' and 1 if 'better off' at <i>t</i>	0.324	0.633	0.287	0.633
<i>Financial realization (t+1):</i>					
Better off	<i>Reference category</i>	0.381	0.486	0.380	0.485
Same		0.392	0.488	0.401	0.490
Worse off		0.226	0.418	0.220	0.414
3 point scale (<i>Dependent Variable</i>)	-1 if individual realised 'worse off', 0 if 'same' and 1 if 'better off' at <i>t+1</i>	0.155	0.764	0.160	0.757
<i>Financial realization (t):</i>					
Better off	<i>Reference category</i>	0.407	0.491	0.401	0.490
Same		0.366	0.482	0.380	0.485
Worse off		0.227	0.419	0.219	0.414
3 point scale	-1 if individual realised 'worse off', 0 if 'same' and 1 if 'better off' at <i>t</i>	0.181	0.775	0.182	0.766
<i>Forecast error:</i>					
5 point scale (<i>Dependent Variable</i>)	Range from -2 to +2 (Forecast <i>t</i> minus Realization <i>t+1</i>)	0.169	0.871	0.127	0.849
<i>Demographics:</i>					
Age	Years	35.52	10.02	34.84	10.53
Age ²		1361.79	739.16	1324.42	767.72
Male		0.634	0.482	0.492	0.500
<i>Marital Status and Household Composition:</i>					
Single, never married	<i>Reference category</i>	0.206	0.405	0.229	0.420
Widowed/divorced/separated		0.055	0.228	0.063	0.243
Married/cohabiting partner		0.607	0.488	0.611	0.488

employed				
Married/cohabiting partner				
not employed	0.131	0.338	0.097	0.297
Number of dependent children in household	0.707	0.983	0.708	0.968
<i>Educational Attainment:</i>				
University/college degree	0.175	0.380	0.157	0.364
Vocational college qualification	0.088	0.283	0.076	0.265
A-level	0.268	0.443	0.210	0.408
O-levels/GCSEs	0.315	0.465	0.382	0.486
No qualifications	<i>Reference category</i>	0.154	0.361	0.175
<i>Housing Tenure:</i>				
Outright owner	0.100	0.300	0.102	0.303
Own with mortgage	0.736	0.441	0.695	0.460
Private sector rental	0.089	0.285	0.092	0.289
Social sector rental	<i>Reference category</i>	0.075	0.263	0.111
N		3138	28830	
		(618 individuals)	(7367 individuals)	

Source: authors' tabulations from BHPS 1991-2008

Table A2: Fixed effect optimism equations

Dependent Variable	(1) <i>Futures</i>		(2) <i>Nevers</i>	
	Forecast Error		Forecast Error	
Variable	Coefficients	Robust Standard Errors	Coefficients	Robust Standard Errors
<i>Demographics</i>				
Age	-0.002	0.079	-0.026	0.028
Age ² /100	0.041	0.036	-0.020	0.016
<i>Marital Status and Household Composition (Reference: Single, never married)</i>				
Widowed/divorced/separated	-0.145	0.149	-0.052	0.059
Married/cohabiting-partner employed	0.023	0.107	-0.002	0.036
Married/cohabiting-partner not employed	-0.100	0.128	0.001	0.044
Number of dependent children in household	0.009	0.037	0.042***	0.015
<i>Educational Attainment (Reference: No qualifications)</i>				
University/college degree	-0.391	0.365	0.130	0.153
Vocational college qualification	-0.570	0.357	0.024	0.145
A-level	-0.843***	0.302	-0.003	0.111
O-levels/GCSEs	-0.734**	0.324	0.054	0.114
<i>Housing Tenure (Reference: Social sector rental)</i>				
Outright owner	-0.186	0.183	0.085	0.056
Own with mortgage	-0.150	0.155	0.117***	0.044
Private sector rental	-0.127	0.168	0.124**	0.050
<i>Financial Realizations time t (reference category: 'worse')</i>				
'Better'	-0.024	0.053	0.159***	0.017
'Same'	-0.103*	0.055	0.013	0.017
<i>Region dummies included</i>	<i>Yes</i>		<i>Yes</i>	
<i>Year dummies included</i>	<i>Yes</i>		<i>Yes</i>	
Observations	3138 (618 Individuals)		28830 (7367 Individuals)	
F Test	1.69***		7.13***	

Notes: All regressions are clustered by individual and include year and region of residence dummy variables (coefficients not reported). * indicates significance level (p-value) below 0.10, ** below 0.05 and *** below 0.01.

Table A3: Fixed effect log hourly real wage equations

Dependent Variable Variable	(1) <i>Futures</i>		(2) <i>Nevers</i>	
	Log Hourly Real Wage		Log Hourly Real Wage	
	Coefficients	Robust Standard Errors	Coefficients	Robust Standard Errors
<i>Demographics</i>				
Age	0.031	0.024	0.076***	0.008
Age ² /100	-0.093***	0.016	-0.104***	0.005
<i>Marital Status and Household Composition (Reference: Single, never married)</i>				
Widowed/divorced/separated	0.136**	0.069	0.031*	0.017
Married/cohabiting-partner employed	0.109**	0.049	0.048***	0.011
Married/cohabiting-partner not employed	0.100*	0.054	0.064***	0.013
Number of dependent children in household	-0.023	0.015	-0.021***	0.005
<i>Health (Reference: Health-other)</i>				
Health-excellent	0.004	0.024	0.000	0.007
Health-good	0.005	0.018	0.002	0.005
<i>Educational Attainment (Reference: No qualifications)</i>				
University/college degree	0.063	0.126	0.177***	0.054
Vocational college qualification	0.157	0.127	0.091*	0.050
A-level	0.094	0.133	0.065	0.043
O-levels/GCSEs	-0.041	0.106	-0.006	0.040
<i>Labour Market Characteristics</i>				
Union covered, member	0.082**	0.032	0.064***	0.011
Union covered, non member	0.035	0.028	0.013	0.009
Holding a second job	-0.053*	0.031	-0.018**	0.009
Job tenure	0.001	0.004	0.000	0.001
Job tenure ² /100	0.008	0.017	0.004	0.005
Manager / supervisor	0.035*	0.021	0.042***	0.006
Promotion opportunities available	-0.025	0.019	0.007	0.005
Pay includes bonus / profit share	0.021	0.021	0.033***	0.005
Employer provided pension available	0.079***	0.030	0.070***	0.008
Pay includes annual rises	-0.019	0.016	0.018***	0.005
Shift worker	0.058	0.043	0.014	0.010
Seasonal/Agency				
Temping/Casual contract	0.029	0.056	-0.026	0.018
Fixed-term contact	-0.020	0.062	-0.008	0.016
<i>Flexibility in job location (Reference: work at employers' premises)</i>				
Work from home	0.168	0.183	0.120**	0.046
Other work location	0.063*	0.033	0.005	0.010
Work needs travelling	0.036	0.030	0.022*	0.011
<i>Occupation (Reference: Other)</i>				

Managers & Administrators	0.158***	0.052	0.111***	0.017
Professional	0.185***	0.060	0.129***	0.019
Associate Professional & Technical	0.097*	0.056	0.092***	0.018
Clerical & Secretarial	0.145**	0.063	0.041**	0.017
Craft & Related	0.067	0.052	0.043**	0.018
Personal & Protective Service	0.011	0.075	-0.018	0.018
Sales	0.022	0.067	-0.004	0.019
Plant & Machine Operatives	0.063	0.049	0.034*	0.018
Employing Sector (Reference: Private Firm)				
Civil Service	-0.017	0.052	-0.011	0.021
Local Government	0.005	0.066	0.031*	0.018
Other Public	-0.035	0.062	-0.005	0.016
Non-Profit	0.002	0.128	-0.004	0.023
One-digit level industry (Reference: Agriculture & Fishing)				
Mining & Quarrying	0.141	0.120	0.134**	0.053
Manufacturing	0.142	0.101	0.046	0.033
Electricity, Gas & Water	0.059	0.145	0.093*	0.049
Construction	0.174	0.123	0.026	0.035
Wholesale & Retail Trade	0.035	0.097	-0.024	0.033
Hotels & Restaurants	-0.021	0.121	-0.076**	0.035
Transport, Storage & Communication	0.020	0.106	0.011	0.035
Financial Intermediation	0.089	0.111	0.044	0.037
Real Estate & Business Activities	0.117	0.108	0.042	0.032
Public Administration & Defence	0.323***	0.119	0.037	0.033
Education	0.161	0.109	0.022	0.038
Health & Social Work	0.036	0.132	-0.031	0.034
Social & Personal Services	-0.018	0.111	-0.013	0.035
Private Households & Extra-Territorial Organizations	0.151	0.100	0.044	0.041
Firm Size -Number of Co-workers (Reference: Over 500)				
1-9	-0.042	0.035	-0.073***	0.011
10-24	0.019	0.038	-0.054***	0.010
25-49	0.034	0.042	-0.046***	0.010
50-99	0.034	0.037	-0.027***	0.010
100-199	0.005	0.034	-0.018*	0.009
200-499	0.015	0.027	-0.007	0.008
Region dummies included	Yes		Yes	
Year dummies included	Yes		Yes	
Observations	3321		33070	
	(708 Individuals)		(9010 Individuals)	
F Test	11.33***		44.90***	

Note: All regressions are clustered by individual and include year and region of residence dummy variables (coefficients not reported). * indicates significance level (p-value) below 0.10, ** below 0.05 and *** below 0.01

Table A4: Fixed effect realization $t+1$ equations

Dependent Variable	(1) <i>Futures</i>		(2) <i>Nevers</i>	
	Realization $t+1$		Realization $t+1$	
Variable	Coefficients	Robust Standard Errors	Coefficients	Robust Standard Errors
<i>Demographics</i>				
Age	-0.050	0.060	-0.004	0.024
Age ² /100	0.041	0.000	0.063***	0.014
<i>Marital Status and Household Composition (Reference: Single, never married)</i>				
Widowed/divorced/separated	0.059	0.134	0.060	0.051
Married/cohabiting-partner employed	-0.029	0.097	0.017	0.032
Married/cohabiting-partner not employed	0.099	0.112	0.052	0.039
Number of dependent children in household	0.042	0.031	0.004	0.013
<i>Educational Attainment (Reference: No qualifications)</i>				
University/college degree	0.292	0.310	0.001	0.133
Vocational college qualification	0.441	0.318	0.019	0.121
A-level	0.722***	0.258	-0.005	0.104
O-levels/GCSEs	0.522*	0.284	0.006	0.107
<i>Housing Tenure (Reference: Social sector rental)</i>				
Outright owner	0.268*	0.152	-0.174***	0.048
Own with mortgage	0.223*	0.122	-0.123***	0.038
Private sector rental	0.124	0.124	-0.078*	0.043
<i>Financial Realizations time t (reference category: 'worse')</i>				
'Better'	-0.013	0.045	-0.132***	0.014
'Same'	0.007	0.045	-0.075***	0.014
<i>Region dummies included</i>	<i>Yes</i>		<i>Yes</i>	
<i>Year dummies included</i>	<i>Yes</i>		<i>Yes</i>	
Observations	3138 (618 Individuals)		28830 (7367 Individuals)	
F Test	11.08***		6.16***	

Notes: All regressions are clustered by individual and include year and region of residence dummy variables (coefficients not reported). * indicates significance level (p-value) below 0.10, ** below 0.05 and *** below 0.01.

Table A5a: Quantile regression for gross monthly self-employed earnings

Dependent Variable	Gross Monthly Self-Employed Earnings									
	Quantile	25 th		50 th		75 th		90 th		95 th
Variable	Coef.	Robust S.E's	Coef.	Robust S.E's	Coef.	Robust S.E's	Coef.	Robust S.E's	Coef.	Robust S.E's
Optimism	17.108	66.098	-157.664*	85.314	-312.906***	102.446	-624.416***	206.413	-932.845***	189.083
Optimism ²	-10.287	18.044	-7.432	22.688	-35.215	23.932	-11.108	45.878	-45.836	51.498
Optimism ³	0.483	8.820	31.890***	11.439	55.128***	13.701	85.852***	32.143	113.437***	28.345
<i>Whether Draws up Profit/Loss Accounts (Reference: Does not draw up accounts)</i>										
Draws up accounts	-87.088	63.173	-121.734	98.702	-153.885	131.408	90.164	271.944	157.357	197.058
Not yet but will be	200.946**	81.787	280.394**	118.723	301.063	196.279	531.459	396.377	421.091	430.695
<i>FE Paid-Employment Performance Controls</i>										
Pastearnings	14.457	76.510	196.449**	89.858	552.457***	139.633	1112.131***	259.818	1315.997***	299.575
Pastrealizations	10.600	72.407	35.989	84.087	104.002	104.927	94.301	176.844	-13.174	280.327
<i>Health (Reference: Health-other)</i>										
Health-excellent	5.869	77.471	59.016	77.447	-0.050	107.120	-20.674	228.662	-84.559	281.246
Health-good	53.421	57.224	17.659	68.291	36.104	89.710	200.249	184.199	217.613	230.933
<i>Demographics</i>										
Age	-0.777	20.413	15.688	26.923	64.872	43.672	187.537**	77.239	203.104**	88.472
Age ²	-0.063	0.240	-0.489	0.336	-1.357**	0.531	-3.286***	0.993	-3.710***	1.071
Male	129.697**	61.975	224.774**	97.735	367.045***	117.781	483.088*	268.576	810.362***	217.503
<i>Marital Status and Household Composition (Reference: Single, never married)</i>										
Widowed/divorced										
/separated	-44.334	131.121	-110.470	160.501	-434.870*	251.053	-1065.953*	607.408	-1484.861**	585.634
Married/cohabiting										
-partner employed	-118.796	85.379	24.892	141.725	-290.916	228.637	-177.744	639.459	-613.487	549.696
Married/cohabiting										
-partner not employed	-60.550	111.735	150.903	160.206	-71.625	254.241	501.086	826.337	26.183	701.986
Number of	0.037	29.992	-40.772	40.863	-64.643	50.531	-249.129**	114.289	-232.469	160.088

dependent children
in household

Educational Attainment

University	-92.491	101.393	81.862	161.724	245.142	239.636	900.873	655.111	1167.829*	648.943
HND/HNC	-72.990	110.502	46.872	142.385	-27.647	288.311	973.143*	530.374	1275.453**	641.730
A-level	-134.067*	78.416	-128.214	107.718	-141.719	194.589	329.287	296.964	346.044	251.386
O-levels/GCSEs	-114.892	87.803	10.096	112.658	-129.921	197.030	391.807	302.997	591.680*	333.823

Housing Tenure (Reference: Social sector rental)

Outright owner	-8.712	108.759	53.531	120.779	471.425**	190.698	867.062*	510.599	1488.626***	448.763
Own with mortgage	58.112	94.585	66.653	103.877	444.697***	134.014	392.714	331.786	472.711*	241.495
Private sector rental	-121.721	124.093	-161.816	186.740	304.746	198.382	105.313	376.181	42.180	382.405

Parental background (Reference: Neither Parent Self-Employed)

Both parents self-employed	-134.909	97.994	-230.251	154.687	-527.802***	200.238	-765.779	491.811	-700.522*	416.022
Father self-employed	94.688	81.026	85.294	113.417	184.346	160.728	10.409	291.690	146.319	355.009
Mother self-employed	-213.075	161.801	-195.914	173.858	-667.111***	142.714	-1184.706***	319.948	-1556.145***	337.350

Labour Market Characteristics:

Job tenure	62.410***	12.199	81.464***	14.452	128.813***	20.632	127.816***	48.734	89.774**	43.411
Job tenure ²	-2.295***	0.499	-2.578***	0.532	-4.672***	0.843	-4.951***	1.566	-4.484***	1.421
Usual hours worked per week	7.227*	4.012	25.336***	5.725	40.211***	8.122	40.822***	11.599	34.843**	13.604
Usual hours worked per week ²	-0.067*	0.040	-0.242***	0.057	-0.384***	0.075	-0.356***	0.105	-0.294**	0.135
Holds a second job	70.796	60.951	-20.579	79.256	-91.249	106.188	-331.452	208.114	-300.005	272.338

One-digit industry

<i>dummies</i>	<i>Yes</i>		<i>Yes</i>		<i>Yes</i>		<i>Yes</i>		<i>Yes</i>	
<i>Region dummies</i>	<i>Yes</i>		<i>Yes</i>		<i>Yes</i>		<i>Yes</i>		<i>Yes</i>	
<i>Year dummies</i>	<i>Yes</i>		<i>Yes</i>		<i>Yes</i>		<i>Yes</i>		<i>Yes</i>	

F test of optimism					
linearity¶	0.24	6.82***	19.14***	4.00**	16.93***
Pseudo R ²	0.044	0.095	0.111	0.112	0.097
N			1964		
			(559 Individuals)		

Note: All regressions are estimated using the stata command “qreg2” by Machado and Santos Silva (2011). Standard errors are clustered by individual and are asymptotically robust to heteroskedasticity. All regressions include year, region of residence and one-digit standard industrial classification dummy variables (coefficients not reported). * indicates significance level (p-value) below 0.10, ** below 0.05 and *** below 0.01. ¶ Test of coefficients for optimism² and optimism³ jointly = 0.

Table A5b: Quantile regression for gross monthly employee earnings

Dependent Variable	Gross Monthly Paid-Employed Earnings									
	Quantile	25 th		50 th		75 th		90 th		95 th
Variable	Coef.	Robust S.E's	Coef.	Robust S.E's	Coef.	Robust S.E's	Coef.	Robust S.E's	Coef.	Robust S.E's
Optimism	29.788**	11.688	27.404**	13.011	63.470***	20.203	87.910**	35.799	129.642***	43.496
Optimism ²	-	-	-	-	-	-	-	-	-	-
Optimism ³	-	-	-	-	-	-	-	-	-	-
<i>Whether Draws up Profit/Loss Accounts (Reference: no accounts)</i>										
Draws up accounts	-	-	-	-	-	-	-	-	-	-
Not yet but will be	-	-	-	-	-	-	-	-	-	-
<i>Financial Expectations Paid-Employment Performance Controls</i>										
Pastearnings	959.101***	28.783	1198.286***	29.735	1421.931***	46.302	1592.305***	65.221	1752.905***	86.143
Pastrealizations	74.010***	14.936	89.730***	18.115	174.447***	27.778	240.531***	41.678	324.475***	57.821
<i>Health (Reference: Health-other)</i>										
Health-excellent	38.453***	12.395	42.019***	14.924	46.160**	20.594	76.295**	32.447	171.119***	66.287
Health-good	12.294	9.166	13.497	10.875	21.656	15.821	25.922	23.234	31.870	33.814
<i>Demographics</i>										
Age	77.042***	3.815	94.668***	4.905	112.261***	6.415	128.506***	10.692	127.813***	14.676
Age ²	-0.960***	0.047	-1.166***	0.059	-1.352***	0.078	-1.513***	0.133	-1.475***	0.184
Male	97.216***	13.308	159.145***	16.622	193.710***	25.226	202.599***	35.661	236.889***	56.017
<i>Marital Status and Household Composition (Reference: Single, never married)</i>										
Widowed/divorced/ separated	55.403***	19.317	42.159	27.317	30.718	38.632	40.775	60.991	64.361	81.792
Married/cohabiting -partner employed	74.363***	15.510	83.447***	21.698	49.241	30.520	-16.116	43.927	-23.550	68.646
Married/cohabiting -partner not employed	106.645***	20.792	117.719***	27.955	146.376***	42.235	193.972**	78.393	243.125**	113.374
No. of dependent	-28.893***	7.567	-31.319***	8.796	-9.830	11.404	3.779	19.917	16.830	28.004

children in
household

Educational Attainment

University	505.498***	25.783	647.004***	31.778	784.456***	48.089	955.217***	76.691	1103.901***	110.411
HND/HNC	241.417***	27.963	293.457***	33.486	322.821***	48.920	388.949***	74.438	508.793***	128.719
A-level	104.598***	16.075	101.434***	20.307	83.171***	31.845	111.620***	42.593	132.704**	64.169
O-levels/GCSEs	0.364	13.551	-5.743	17.156	-59.197**	26.804	-67.838*	36.450	-46.732	47.073

Housing Tenure (Reference: Social sector rental)

Outright owner	0.525	18.647	-33.981	21.625	-14.017	31.573	51.858	46.277	31.254	84.166
Own with mortgage	36.979**	15.683	10.064	18.927	10.827	27.784	10.800	37.814	-1.524	63.843
Private sector rental	-29.619	22.790	-46.563*	26.622	-30.869	40.427	-24.283	50.065	-57.907	79.917

Parental background (Reference: Neither Parent Self-Employed)

Both parents self-employed	-41.268	62.815	-2.729	52.385	4.170	79.729	151.854	204.385	160.001*	96.034
Father self-employed	-12.729	17.994	-0.282	21.791	21.950	33.061	55.602	60.251	63.370	64.778
Mother self-employed	2.049	42.534	16.076	42.187	-18.665	58.233	-92.072	86.041	61.898	290.733

Labour Market Characteristics:

Job tenure	4.158***	1.568	-2.074	1.784	-6.343**	3.029	-14.353***	4.590	-23.802***	8.451
Job tenure ²	-0.055	0.052	0.046	0.057	0.105	0.114	0.222	0.166	0.521	0.374
Usual hours worked per week	56.414***	2.931	42.324***	3.032	23.031***	7.042	1.282	5.030	-26.075***	6.077
Usual hours worked per week ²	-0.356***	0.042	-0.145***	0.049	0.153	0.126	0.509***	0.088	0.984***	0.096
Holds a second job	-41.639**	20.376	-55.584**	21.561	-76.580***	24.392	-100.220**	40.103	-120.485**	57.430

One-digit industry

<i>dummies</i>	<i>Yes</i>		<i>Yes</i>		<i>Yes</i>		<i>Yes</i>		<i>Yes</i>	
Region dummies	<i>Yes</i>		<i>Yes</i>		<i>Yes</i>		<i>Yes</i>		<i>Yes</i>	
Year dummies	<i>Yes</i>		<i>Yes</i>		<i>Yes</i>		<i>Yes</i>		<i>Yes</i>	

Pseudo R ²	0.577	0.587	0.588	0.573	0.553
N	25537 (6057 Individuals)				

Note: All regressions are estimated using the stata command “qreg2” by Machado and Santos Silva (2011). Standard errors are clustered by individual and are asymptotically robust to heteroskedasticity. All regressions include year, region of residence and one-digit standard industrial classification dummy variables (coefficients not reported). * indicates significance level (p-value) below 0.10, ** below 0.05 and *** below 0.01.

Table A6: Ordered probit regression for forecast error, expectations and realizations

Dependent Variable	Forecast Error		Expectation t		Realization $t+1$	
	Coefficients	Robust Standard Errors	Coefficients	Robust Standard Errors	Coefficients	Robust Standard Errors
Variable						
Future Divorcee	0.103***	0.033	0.158***	0.050	0.001	0.038
Year of divorce	0.141	0.155	-0.192	0.148	-0.341**	0.166
Divorced	0.087***	0.025	0.099***	0.037	-0.026	0.027
Year of ReMarriage	-0.056	0.130	0.298*	0.157	0.325**	0.156
Re-Married	0.063	0.051	0.062	0.054	-0.031	0.047
Smoker (Number of Cigarettes)	0.005***	0.001	0.006***	0.001	-0.001*	0.001
Demographics						
Age	-0.007	0.006	-0.042***	0.007	-0.028***	0.006
Age ² /100	0.000	0.000	0.000***	0.000	0.000***	0.000
Male	0.034**	0.013	0.040**	0.018	-0.009	0.014
Employment Status (Reference: Employee)						
Self-Employed	0.126***	0.022	0.207***	0.031	0.012	0.023
Household Composition						
Number of dependent children in household	0.022***	0.007	0.011	0.009	-0.019***	0.007
Educational Attainment (Reference: No qualifications)						
University/college degree	-0.125***	0.023	-0.040	0.032	0.120***	0.025
Vocational college qualification	-0.043	0.028	0.044	0.039	0.085***	0.030
A-level	-0.018	0.020	-0.008	0.029	0.012	0.022
O-levels/GCSEs	0.001	0.018	0.018	0.025	0.011	0.019
Housing Tenure (Reference: Social sector rental)						
Outright owner	-0.086***	0.029	-0.207***	0.038	-0.058**	0.030
Own with mortgage	-0.035	0.025	-0.052	0.032	0.001	0.026
Private sector rental	-0.015	0.037	-0.018	0.048	0.004	0.039
Financial Realizations time t (reference category: 'worse')						
'Better'	-0.337***	0.017	0.464***	0.023	0.790***	0.020
'Same'	-0.301***	0.015	-0.009	0.020	0.365***	0.017

	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
<i>Region dummies included</i>			
<i>Year dummies included</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Observations		41289 (5676 Individuals)	
Log Likelihood	-48832.91	-35064.03	-41274.16
chi ²	1099.35***	1937.49***	2823.81***
Pseudo R ²	0.014	0.044	0.046

Notes: All regressions are clustered by individual and include year and region of residence dummy variables (coefficients not reported). * indicates significance level (p-value) below 0.10, ** below 0.05 and *** below 0.01.