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Title: Do individuals' risk and time preferences predict entrepreneurial choice?

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Abstract: *Objectives:* This study seeks to estimate whether individuals' risk and time preferences are predictive of self employment status and entry. *Prior Work:* The low risk aversion of those who are self employed is well established in theory and empirical evidence, there is less evidence however on whether risk seeking in existing employees predicts future self employment entry and virtually no empirical research on the links between time preference and self employment. *Approach:* This study uses a quantitative approach by estimating a series of statistical models that estimate the relationship between an individuals' risk and time preferences and whether they are (or subsequently become) self employed using a national longitudinal dataset. *Results:* We find that the self employed are more likely to have low risk aversion. When restricting our analysis to those who are initially employees we find that , low risk aversion combined with a preference for short term gains are most predictive of a transition into self employment. *Implications and Value:* This study informs the general question as to whether entrepreneurship is linked to personality traits with new evidence on the link between risk and time preference and self employment entry, in doing so it points towards attitudes toward risk and time preference that need to be encouraged if entrepreneurship is to be developed within countries and firms.

1 Introduction

In the standard 'neo-classical' model in economics, entrepreneurship is crucial to the model of economic growth in capitalist economies. Individuals setting up businesses outside of existing firms generates competitive pressure and provides an outlet for innovation that may be stifled by large organisations. Both these effects tend to result in lower costs of production and new goods and services being brought to the market, with the overall effect being increased output and well-being. At the firm level it has been recognised that harnessing the innovative power of entrepreneurial behaviour is important in maintaining market position and obtaining future growth (Antoncic and Hisrich, 2001). Yet entrepreneurship is one of the most elusive and least understood forms of economic behaviour (Eboli, 1997) and we position this paper to determine if risk and time preferences of individuals may help us to understand entrepreneurship better. The literature concerning the drivers of entrepreneurial behaviour is advancing apace yet much more is fully required to explain why people become entrepreneurs, Grieco (2007) reveals that the International Social Survey Programme in 1999 demonstrates that over 50% of people surveyed wish to be an entrepreneurs but only around 15% of those surveyed are self-employed.

Thus understanding the motivations and predictors of the decision to become an entrepreneur is important for both public policy and management practice. Research in this area is commonly hampered by the fact that few people do actually become entrepreneurs, rendering many datasets unsuitable for research in this area (due to and leading to a reliance on qualitative studies of successful entrepreneurs. Such an approach risks the 'selection on the dependent variable' problem, whereby traits are associated with entrepreneurship that may be equally present in those who do not become entrepreneurs. By using a large scale dataset, this study avoids this problem and is one of a limited number of studies that quantitatively distinguishes between entrepreneurs and non-entrepreneurs. It is worth noting at this stage that we use self employment as a proxy for entrepreneurship – this is

not ideal but given data restrictions and the lack of a definition of an entrepreneur that allows the categorisation of individuals, it is a proxy that is commonly used in the entrepreneurship literature (see Bjuggren et al, 2012 for a review of this).

This research investigates whether there is a relationship between individuals' risk and time preferences and their entry into self-employment. An individual's risk preference typically measures the extent to which an individual prefers certain rewards compared to uncertain yet larger rewards; an individual's time preference typically measures whether they prefer an immediate reward or a larger, but deferred reward. The research questions considered are:

RQ1: Whether those that are self-employed have different risk and time preferences from employees.

RQ2: Whether initial risk and time preferences can predict an individuals' movement from being an employee to being self-employed.

RQ3: Whether changes in risk and time preferences can predict an individuals' movement from being an employee to being self-employed.

2 Existing Literature

2.1 Theory of entrepreneurial choice, risk and time preferences

Douglas and Shepherd (1999) provide a widely cited economic model of the entrepreneurial choice. In this model the satisfaction gained from a job is not limited to merely financial concerns but also from the required work effort, the level of worker independence, and, crucially the individuals' risk aversion. Thus, all other things equal, a worker with lower levels of risk aversion will face stronger incentives to select self employment as the rational choice. The result of this is that the workforce will sort itself into employees and the self employed based on personal preference, i.e. those that are more risk averse will become employed and those who are more comfortable with risk will become entrepreneurs (Kihlstrom & Laffont, 1979).

2.2 Empirical evidence on entrepreneurial choice and risk and time preferences

Empirically, and in line with the theoretical predictions, it is now well established that those who are self-employed tend to be less risk averse than those who are employees (e.g. see Caliendo et al, 2006). A problem with this conclusion is that it is usually based on cross sectional designs, such that there is the risk that observed differences between the self employed and the employed are due to confounding unobserved influences, such as parental wealth. In addition there is the possibility of reverse causation; Eisenhour (1995) suggests that many studies do not adequately define the causal direction and that it is in fact successful entrepreneurial activity which creates future reduced risk aversion, and hence the creation of serial entrepreneurs. This idea is supported by recent research that finds that risk preferences are influenced by external events: (Hanoaka et al, 2015) finds that exposure to the 2011 Great East Japan Earthquake increased risk tolerance and Gorlitz and Tamm (2015) find that the birth of a child increases risk aversion.

Despite these challenges a couple of papers have attempted to estimate a *causal* relationship between risk attitudes and entrepreneurship:

- Brown et al (2011) take a similar approach to this paper and use US panel data to test whether existing risk preferences of employees are predictive of future self employment entry, finding that such a link has some, if limited, support.

- A novel approach to find whether risk preferences rather than the potentially confounding influence of parental self employment predict self employment entry is implemented by Skriabikova et al (2014). In this study, self employment amongst Ukrainians is analysed and strong evidence of a link between risk preferences and self employment is found. The authors can rule out parental influence given that the survey respondents were born under communism when self employment was virtually non-existent.

Another empirical approach has tested for whether risk preferences during childhood and adolescence are predictive of future entrepreneurial behaviour, an approach that would concur with the idea that entrepreneurs are born rather than made (“Personal Traits Theory” – see Simpeh, 2011):

- Blanchflower and Oswald, (1998) find that childhood measures of risk preference are not associated with future self employment;
- Recent research has found that risky *behaviour* during adolescence is predictive of future entrepreneurial activity (Levine and Rubenstein, 2013).

There is very little research on the relationship between *time* preference and the entrepreneurial decision. Petrakis (2007) uses the country as the unit of analysis and finds that *countries* with populations with aggregate tendencies towards risk seeking combined with time preferences orientated toward immediate reward tend to have higher entrepreneurial metrics. There are no studies that use individual level time preference data to estimate a relationship with entrepreneurship, though research has found that those with a preference for deferred rewards have more favourable labour market outcomes and better health (Golsteyn et al, 2013).

3 Methodology and data

3.1 Data

3.1.1 Dataset Description

This study uses the Wealth and Assets Survey (WAS) conducted by the Office for National Statistics. It is a longitudinal dataset that initially sampled c.30,000 households in the UK between June 2006 and June 2008 (Wave 1) and returned to the original respondents in June 2008-June 2010 (Wave 2) and June 2010-June 2012 (Wave 3).

The official rationale for this survey was based around the lack of data on household *wealth* as opposed to the widely available data on household *income*. Of most relevance to this study however is that this dataset is unique in that it not only measures individuals' employment status over time, but also their risk and time preferences at each wave. As far as the authors are aware it is the only dataset available that collects data on both risk and time preferences and employment transitions in a longitudinal fashion. It is the longitudinal nature of the data that allows us to go beyond the cross sectional approach in

3.1.2 Sample selection.

This study concerns itself with both static and dynamic relationships between self employment and risk and time preferences. As such the full WAS sample is restricted to those cases where there is a full record across the 3 waves for all variables included and further restricted to those in employment to distinguish between self employment entry and actual entry into the labour market. These sample restrictions leave 15,932 individuals for analysis . When the sample is restricted down to those that are initially employees (to test the factors around self employment entry) for the analysis of research questions 1 and 2, this becomes 14,074 individuals.

As a technical aside, to account for the household nature of the survey, standard errors are clustered at the household level to avoid spurious accuracy from multiple individuals living in the same households though this would appear to make little change to the results. Also, as this study attempts to ascertain relationships in the data rather than make generalizable estimates of, say, the prevalence of particular risk preferences, the analysis has been conducted without weighting. However where possible the weighted results were obtained (using the cross sectional weight supplied with the dataset) and differ little from the unweighted analysis presented here.

3.1.3 Risk and time preferences

The risk preference question asked in the WAS was:

“What would you choose if given the choice between a guaranteed payment of one thousand pounds and a one in five chance of winning ten thousand?”

We label the former choice as ‘risk averse’ and the latter choice as ‘risk seeking’

Time preference question asked in the WAS was:

“Would you prefer £1,000 today or £1,100 next year?”

We label the former choice as ‘present orientated’ and the latter choice as ‘future orientated’.

From these variables we can then create four risk and time preference types by crossing the two variables within an individual, these four categories are as follows:

Risk Averse-Present Orientated = "AP"

Risk Averse-Future Orientated = "AF"

Risk Seeking-Present Orientated = "SP"

Risk Seeking - Future Orientated = "SF"

Recall that WAS respondents are surveyed 3 times over 4 years such that risk and time preferences may vary within an individual over this period.

3.2 Modelling

3.2.1 Regression specification

The basic specification for all the models tests is the logistic regression model. This type of regression model estimates the parameters that affect whether the dependent variable is 1 of two states. In the case of this study, the dependent variable is whether an individual is self employed or not. The reported results are 'odds ratios', that is, how much more likely a variable makes an individual self employed; an odds ratio of 1 means that the variable has no effect on whether the individual is or becomes self employed. As a further example if a given risk and time preference has an odds ratio of 1.1 (0.9) this implies that the risk and time preference is associated with a 10% greater (less) chance that an individual will be self employed. The models for each research question are as follows:

RQ1: Do those that are self-employed have different risk and time preferences from employees?

$$\ln[p_1/(1-p_1)] = \alpha + \gamma_1(AF_1) + \gamma_2(SP_1) + \gamma_3(SF_1) + \beta(\text{CONTROLS})_1 + e \quad (1.1)$$

Where:

p_1 = the probability of being self employed in Wave 1.

AF_1 , SP_1 and SF_1 are binary variables indicating which risk and time preferences and individual has as measured at Wave 1 (see section 3.1.3. for the definitions of the risk and time preference types)

CONTROLS are selected control variables, justified further below.

α , γ and β are parameters to be estimated and e is an error term.

This model tests whether as at Wave 1, those who were self employed had different risk and time preferences to employees after controlling for other factors. The estimates of the effect of risk and time preference are estimated in reference to an individual with AP risk and time preferences.

RQ2: Do risk and time preferences predict an individuals' movement from being an employee to being self-employed?

$$\ln[p_3/(1-p_3)] = \alpha + \gamma_1(AF_1) + \gamma_2(SP_1) + \gamma_3(SF_1) + \beta(\text{CONTROLS}_1) + e \quad (1.2)$$

The model is defined as per equation 1.1, apart from the fact that this time the model is restricted to those who were employees in wave 1, and the model estimates the influences on the probability of self employment in wave 3 (p_3); it tests whether initial risk and time preferences are related to a transition from employment in wave 1 to self employment in wave 3.

RQ2: Do changes in risk and time preferences predict an individuals' subsequent movement from being an employee to being self-employed?

Four similar models are estimated to answer this research question:

$$\ln[p_3/(1-p_3)] = \alpha + \gamma_1(AF_2) + \gamma_2(SP_2) + \gamma_3(SF_2) + \beta(\text{CONTROLS}_1) + e \quad (1.3a)$$

$$\ln[p_3/(1-p_3)] = \alpha + \gamma_1(AP_2) + \gamma_2(SP_2) + \gamma_3(SF_2) + \beta(\text{CONTROLS}_1) + e \quad (1.3b)$$

$$\ln[p_3/(1-p_3)] = \alpha + \gamma_1(AP_2) + \gamma_2(AF_2) + \gamma_3(SF_2) + \beta(\text{CONTROLS}_1) + e \quad (1.3c)$$

$$\ln[p_3/(1-p_3)] = \alpha + \gamma_1(AP_2) + \gamma_2(AF_2) + \gamma_3(SP_2) + \beta(\text{CONTROLS}_1) + e \quad (1.3d)$$

This specification alters equation 1.2. by first measuring risk and time preferences as at wave 2, but also by estimating the equation four times, one estimation for each of the risk and time preference types as per wave 1. For example, the first estimation will restrict the sample to only those who were AP in Wave 1 (equation 1.3a), the second estimation will restrict the sample to only those who were AF in Wave 1 (equation 1.3b) and so on for SP and SF. In each specification the reference group for the effects of risk and time preference are those whose risk and time preferences are stable – e.g. for equation 1.3c where the sample is restricted to wave 1 SP individuals, the estimated effects of the risk and time preferences types on the likelihood of being self employed are estimated in comparison to individuals with SP risk preference in wave 2.

This formulation allows us to test whether, conditional on a particular initial risk and time preference, a change in the risk and time preference of an individual precedes entry into self employment in the subsequent wave.

3.2.2 Choice of controls

The mitigate against the possibility that the relationships found between risk and time preferences and self employment are simply the result of other variables that relate to both, a number of variables are included in the models to control for any such confounding factors. These variables have been divided into 3 groups:

Group 1: Personal Characteristics

Age

Sex

Group 2: Financial and household Characteristics

Wealth (in deciles)

Whether received an inheritance in the last 5 years

Has dependent children

Group 3: Labour market variables

Educational qualifications

Occupational Classification (SOC 2010)

The choice of these factors was driven in part by data availability and the Blanchflower and Oswald (1998) study. Judgement was used to reduce the number of control variables down to manageable size.

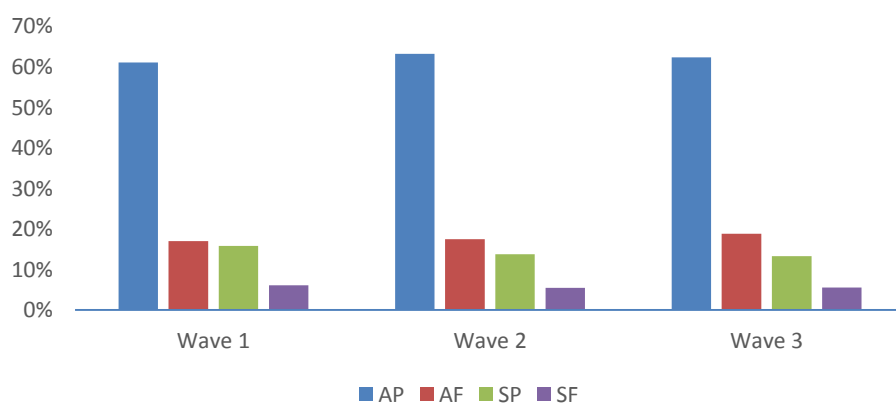
4 Results

4.1 Descriptive statistics

4.1.1 Levels of self-employment

The proportion of all workers who are self employed in the sample as at Wave 1 of the WAS is 11.66% this compares to the average over the data collection period (June 2006 – Jun 2008) of 13.01% (Source ONS). This proportion climbs to 13.02% in wave 3 with the corresponding ONS figure being 14.00%.

Chart 4.1. Risk and time preferences in overall sample, by survey wave.



Risk and time preferences, though apparently stable in aggregate are less so at the individual level; 31% of individuals in the sample change risk and/or time preference between wave 1 and wave 3. The tendency across the data collection period tend toward more to risk aversion and present orientation, this may be an effect of economic recession or the ageing of the sample; with the data available it is not possible to ascertain the cause.

4.1.2 Control variables

Table 4.1. shows the summary statistics of the control variables used

Variable	Categories	Proportion in sample
Sex		
	<i>Male</i>	47%
	<i>Female</i>	53%
Age		
	<i>16 to 24</i>	1%
	<i>25 to 44</i>	24%
	<i>45 to 64</i>	41%
	<i>65 to 74</i>	21%
	<i>75 and over</i>	13%
Education		
	<i>Degree level</i>	24%

	<i>Below degree level</i>	56%
	<i>No qualifications</i>	20%
Occupation		
	<i>Managers, directors and senior officials</i>	10%
	<i>Professional occupations</i>	20%
	<i>Associate professional and technical occupations</i>	12%
	<i>Administrative and secretarial occupations</i>	14%
	<i>Skilled trades occupations</i>	10%
	<i>Caring, leisure and other service occupations</i>	8%
	<i>Sales and customer service occupations</i>	7%
	<i>Process, plant and machine operatives</i>	8%
	<i>Elementary occupations</i>	11%
Dependent Children?		
	Yes	25%
Received Inheritance		
	Yes	12%
	N=	15,932

It is noted that the proportion of females in the sample is greater than the proportion of males.

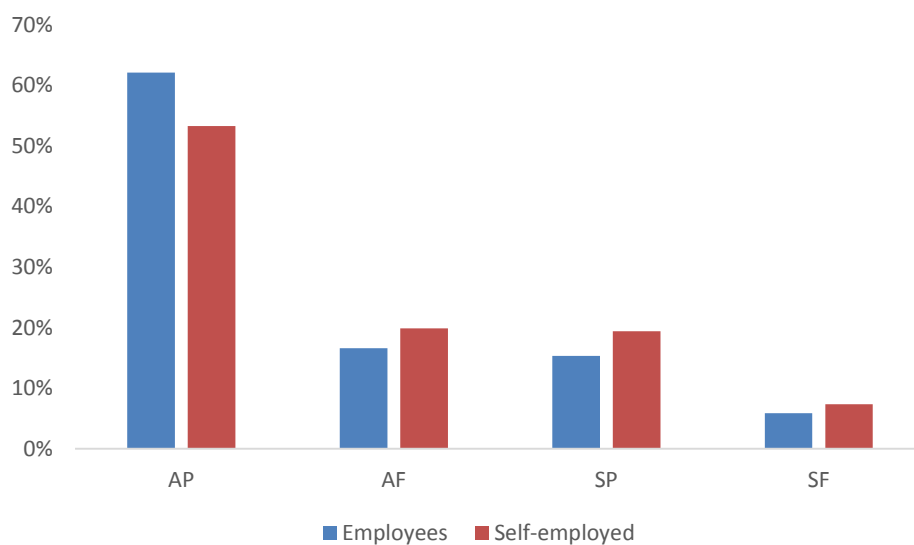
Weighting for the actual gender workforce split (53:47) yields identical results to those presented.

4.2 RQ1: Analysis

4.2.1 Bivariate relationships

The starting point for the analysis is to test whether the self employed have different risk and time preferences to employees (RQ1). This is a static analysis in that it is just concerned with whether those who were self employed as at wave 1 have, on aggregate, different proportions of risk and time preferences to those that were employees at this time.

Chart 4.2. Risk and time preferences, employees vs self employed as at Wave 1.



It is clear that there is not a substantial difference in the overall risk and time preference profile between employees and the self employed; over half of both groups are categorised as AP (Risk Averse, Present Orientated). However there is a greater tendency toward both risk seeking and future orientation amongst the self employed, with the risk seeking preferences being the most disproportionate (the self employed are 20%, 27% and 25% more likely to be in groups AF, SP and SF respectively). The difference in risk and time preferences between employees and the self employed displayed in chart 1.2 are statistically significant ($\chi^2 = 54.02$, $p < 0.0001$).

4.2.2 Logistic Regression model

The results of the logistic regression model as specified in equation 1.2. are shown in table 4.2. The model is built up sequentially, initially starting with a model with no controls and then adding control variable in groups 1 then group 2 and group 3 (see section 3.2.2. for a description of the variables that comprise these groups).

Table 4.2. Odds ratios of risk and time preferences for static self employment model

	No controls	+Group 1 Controls	+Group 2 Controls	+Group 3 Controls
AF	1.397***	1.285***	1.165**	1.173**
	(5.13)	(3.78)	(2.26)	(2.30)
SP	1.477***	1.371***	1.276***	1.229***
	(5.91)	(4.70)	(3.59)	(2.97)
SF	1.456***	1.245**	1.077	1.065
	(3.83)	(2.20)	(0.73)	(0.61)

*p-value<0.1 ; **p-value<0.05 ; ***p-value<0.01. Note: Reference group = AP

The results of model (1) shown in table 4.2 reflect the results shown in chart 1.2., that the self employed are less likely to be in the AP group than the employed (note the full regression results are in Appendix A). Notable is the decrease in magnitude and precision of the estimates as additional controls are added, highlighting the fact that risk and time preferences are strongly related to the control variables amongst individuals which in turn are also related to self employment status. Indeed

in the full model (4) those with SF risk and time preferences are not statistically more likely to be self employed compared to the AP type once the control variables are taken account of, despite this initially appearing to be a strong determining factor. Further analysis revealed that much of the bivariate (i.e. unconditional) relationship between SF type and self employment appears to be explained by wealth and, to a lesser extent, age. The full model leaves a slightly puzzling result; AF and SP types are both more likely to be self employed, yet they do not share common risk or time preferences. This apparent anomaly may simply be a manifestation of the different motivation and pathways taken toward self employment or a missing influential control variable.

4.3 RQ2: Analysis

The preceding analysis considers on whether the self employed differ from employees on the basis of risk and time preferences. This has two major weaknesses: the first is, as has been established, there may be confounding variables which, if not controlled for, give rise to spurious relationships; the second is that being self employed may result in a tendency towards altering risk preferences. A more sophisticated approach is to consider whether initial (Wave 1) risk and time preferences *for employees* are predictive of whether an individual becomes self employed at the end of the data collection period (Wave 3) – i.e. self employment entry. This approach therefore necessitates a restriction of the sample to those who were employees in Wave 1.

The results of testing this approach by estimating the parameters in equation 1.2. are shown as Odds ratios in table 4.3. (Full regression results in Appendix B).

Table 4.3. Odds ratios of risk and time preferences for self employment entry model

	No controls	+Group 1 Controls	+Group 2 Controls	+Group 3 Controls
AF	1.368**	1.225	1.100	1.033
	(2.27)	(1.46)	(0.68)	(0.23)
SP	1.569***	1.433***	1.330**	1.309*
	(3.33)	(2.64)	(2.07)	(1.95)
SF	1.568**	1.346	1.132	1.066
	(2.26)	(1.48)	(0.61)	(0.31)

*p-value<0.1 ; **p-value<0.05 ; ***p-value<0.01

As before the association between self employment and SF disappears as control variables are added; this time the same thing also happens for AF. Only SP appears to retain some relationship with self employment entry, with the odds ratio in the fully controlled model changing by a small amount from the uncontrolled model and with statistical significance marginally outside the conventional 5% limit ($p=0.051$). This indicates that future entry into self employment is predicted most strongly (once other factors have been accounted for) by an individual being SP type. This result concurs with the majority of studies described in section 2.1 and section 2.2 that all argue that low risk aversion is predictive of future self employment entry and contradicts the idea put forward by Eisenhour (1995) that the relationship between risk preferences and entrepreneurship is driven by those preferences being a result of entrepreneurial choice. This finding however also extends the existing evidence (e.g. Brown et al , 2011) as it suggests that risk seeking on its own is not sufficient to predict self employment entry; it is the combination of risk seeking and present orientation that predicts self employment entry.

4.4 RQ3: Analysis

The next step in the analysis is to test whether *changes* in an individual's time and risk preferences may be predictive of a subsequent entry into self employment. Using the approach outlined in section 3.2.1, the odds ratios that derive from the estimated parameters of equation 1.3a-1.3d are shown in table 4.4.

Table 4.4. Odds ratio effect of change in risk and time preferences on subsequent self employment entry.

		1.3a	1.3b	1.3c	1.3d
		Wave 1=AP	Wave 1=AF	Wave 1=SP	Wave 1=SF
Risk and time preference in Wave 2					
	AP	-	0.987	0.945	0.240**
		-	(-0.05)	(-0.21)	(-2.20)
	AF	0.682	-	0.799	0.568
		(-1.62)	-	(-0.52)	(-1.09)
	SP	1.475*	0.540	-	0.344*
		(1.86)	(-1.00)	-	(-1.79)
	SF	1.415	1.271	1.146	-
		(0.96)	(0.55)	(0.33)	-

*p-value<0.1 ; **p-value<0.05 ; ***p-value<0.01

The only change at conventional 5% statistical significance level is from SF to AP. In this case, this change is associated with a much *lower* chance of entering self employment than for individuals remaining SF from waves 1 to 2.

Other changes in risk and time preferences that predict a transition or otherwise into self employment at a lower level of statistical significance are from AP to SP ($p=0.063$), the odds ratio on this change (1.475) is similar to that from AP to SF (1.415), suggesting that changes in risk (rather than time) preference may precede a switch into self employment. Finally changes from SF to SP are associated with a lower chance of entry into self employment compared to individual with stable risk and time SF respectively ($p=0.074$) – a result that slightly contradicts the idea that self employment entry is determined in part by present orientation.

Overall the evidence for predicting self employment entry based on preceding changes in risk and time preferences is not particularly strong (likely affected by the small numbers with changing risk and time preferences and self employment status). The results here do however suggest that individuals whose initial state is AP yet become more risk seeking have a heightened chance of becoming self employed in future periods. It should be noted however that a limitation of this particular analysis is that, as has been established by Hanoaka et al (2015) and Gorlitz and Tamm (2015), risk preferences are responsive to external events, and it may be that such events are driving the observed relationships in this analysis.

5 Conclusion

This study has used a large dataset to estimate whether self employment and self employment entry are associated with risk and time preferences. We split the sample into 4 risk and time preference 'types': risk averse-present orientated (AP); risk averse-future orientated (AF); risk seeking-present orientated (SP) and risk seeking-future orientated (SF).

We find that, using simple static bivariate analysis, the self employed do appear on average to be more likely to be risk seeking and future orientated. However we also show using logistic regression that these relationships appear contaminated by confounders, with personal wealth in particular being associated with risk preference, time preference and being self employed. Once identified confounders are controlled for we find that two 'opposite groups', AF and SP are disproportionately more likely to be self employed than the AF and SF groups, in the static sense.

To test for dynamic relationships we restrict the sample to those who are initially employees, we then estimated whether initial risk and time preferences were predictive of future entry into self employment some 4 years later. In this case we found that only the SP group were disproportionately likely to enter self employment and that this result remained despite the addition of controls. Weak and inconclusive evidence is found in our analysis of whether changes in risk and time preferences over the sample period are associated with self employment entry.

Broadly consistent across these results is the tendency of those with SP risk and time preferences to become self employed. This is perhaps crudely expressed as the idea that the entrepreneurial choice stems out of both utility from risk taking but also the impatience for immediate rewards. Interestingly these finding at the individual level mirror the findings of Petrakis (2007) who measured the relationship between risk and time preferences and entrepreneurship using country level aggregates.

The results are limited to the extent that the methods employed here cannot give causal estimates (although the dynamic results for RQ2 are consistent with a causal explanation), furthermore the measurement of risk and time preferences is problematic using the crude binary variable approaches outlined here. That said the clarity of the results does suggest that there is a basis for future research on the question posed in this study. Such research might investigate whether the results can be replicated in other datasets. A different future avenue of research might test interventions that attempt to influence risk and time preference to observe whether this is related to future entrepreneurial choice.

Understanding entrepreneurial choice is crucial to help inform decision making in business and in government around innovation and economic growth, this study contributes to better understanding this emerging research area.

References

Antoncic, B and Hisrich, R (2001) Intrapreneurship: Construct refinement and cross-cultural validation, *Journal of Business Venturing*, 16(5),pp495-527

Blanchflower, D and Oswald, A, (1998), What Makes an Entrepreneur?, *Journal of Labor Economics*, 16, issue 1, p. 26-60,

Bjuggren, C-M and Johansson, D and Stenkula, M (2012) Using Self-Employment as Proxy for Entrepreneurship: Some Empirical Caveats. *International Journal of Entrepreneurship and Small Business*, 17(3), pp290-303

Brockhaus, R.H. (1980), "Risk taking propensity of entrepreneurs", *Academy of Management Journal*, 23,509-520.

Brown, S. , Dietrich,M., Ortiz-Nuñez, A., Taylor, K. (2011) Self-employment and attitudes towards risk: Timing and unobserved heterogeneity, *Journal of Economic Psychology*, 32(3), pp425-453

Casson, M. (2003). *The Entrepreneur. An Economic Theory. Second Edition*. Northampton: Edward Elgar Publishing.

Chamley, C. (1983). Entrepreneurial abilities and liabilities in a model of self-selection. *Bell Journal of Economics*, 14(1), 70-80.

Cromie, S. (2000), "Assessing entrepreneurial inclination: Some approaches empirical evidence", *European Journal of Work and Organizational Psychology*, 9, 1, 7-30.

Douglas, E and Shepherd, D (1999) Entrepreneurship as a utility maximizing response, *Journal of Business Venturing*, 15(3), pp231-251

Eisenhauer, J.G. (1995), "The entrepreneurial decision: economic theory and empirical evidence", *Entrepreneurship theory & practice*. Retrieved from www.allbusiness.com

Golsteyn, B. H.H., Grönqvist, H. and Lindahl, L. (2014), Adolescent Time Preferences Predict Lifetime Outcomes. *The Economic Journal*, 124: F739–F761

Grieco, D. (2007). *The entrepreneurial decision: Theories, determinants and constraints*. Libero Istituto Universitario Carlo Cattaneo.

Hanaoka, C. & Shigeoka, H. & Watanabe, Y. (2015) Risk Preferences Change? Evidence from Panel Data before and after the Great East Japan Earthquake , NBER Working Paper No. 21400

Kihlstrom, R. E., & Laffont, J. J. (1979). A general equilibrium entrepreneurial theory of firm formation based on risk aversion. *The Journal of Political Economy*, 719-748.

Kirzner, I. M., & Institute of Economic Affairs. (1997). *How markets work: Disequilibrium, entrepreneurship and discovery*. London: Institute of Economic Affairs.

Knight, F. H. 1921. ***Risk, uncertainty and profit***. Washington, DC: Beard Books.

Landstrom, H. (1998). *The Roots of Entrepreneurship Research*, Conference proceedings, Lyon, France, November 26-27.

Levine, R and Rubenstein, Y (2013) Smart and Illicit: Who Becomes an Entrepreneur and Do They Earn More?, *NBER Working Papers, Number 19276*

Milgrom, P. and Roberts, J. (1992). *Economia, Organizzazione a Management*. Bologna: Il Mulino.

Mohar, Y .M.S, Singh, J & Kishore, K. (2007), "Relationship Between psychological characteristics and entrepreneurial inclination: A Case Study of Students at University Tun Abdul Razak", *Journal of Asia Entrepreneurship and Sustainability*, 8. ProQuest Information and Learning Publishers

Petrakis, P. (2007) The effects of risk and time on entrepreneurship, *International Entrepreneurship and Management Journal*, 3(3), pp277-291

Robinson, P.B., Stimpson, D.V., Huefner, J.C., & Hunt, H.K. (1991), "An attitude approach to the prediction of entrepreneurship", *Entrepreneurship Theory and Practice*, 15 (4)13-32.

Rotter, J. (1966), "Generalised expectancies for internal versus external control reinforcements", *Psychological Monographs*, 80, Whole No.609.

Skriabikova, O., Dohmen, T., Kriechel, B. (2014) New Evidence on the Relationship between Risk Attitudes and Self-Employment, IZA Discussion Papers, No. 8354

Schumpeter, J. A. (1942). *Capitalism, socialism and democracy*. New York: Harper Torchbooks.

Shaver, K.G & Scott, L.R. (1991), "Person, process, choice: the psychology of new venture creation", *Entrepreneurship Theory & Practice*, 16, 23-45.

Simpeh, K. (2011). Entrepreneurship theories and Empirical research: A Summary Review of the Literature. *European Journal of Business and Management*.

Appendix A

		(1)	(2)	(3)	(4)
Risk and Time Preference	AF	1.397***	1.285***	1.165*	1.173*
		(5.13)	(3.78)	(2.26)	(2.30)
	SP	1.477***	1.371***	1.276***	1.229**
		(5.91)	(4.70)	(3.59)	(2.97)
	SF	1.456***	1.245*	1.077	1.065
		(3.83)	(2.20)	(0.73)	(0.61)
Age	25 to 44		5.896*	5.026*	4.505*
			(2.48)	(2.25)	(2.09)
	45 to 64		11.28***	8.336**	7.340**
			(3.40)	(2.97)	(2.78)
	65 to 74		11.87***	9.095**	8.153**
			(3.46)	(3.09)	(2.92)
	75 and over		9.140**	7.493**	6.489**
			(3.09)	(2.81)	(2.60)
Sex	Male		2.261***	2.248***	1.466***
			(15.55)	(15.33)	(6.43)
Wealth Decile	Decile 2			1.178	1.195
				(0.89)	(0.95)
	Decile 3			1.323	1.306
				(1.61)	(1.50)
	Decile 4			1.492*	1.421*
				(2.38)	(2.04)

	Decile 5			1.541**	1.491*
				(2.60)	(2.34)
	Decile 6			1.542**	1.490*
				(2.64)	(2.36)
	Decile 7			1.803***	1.787***
				(3.66)	(3.49)
	Decile 8			1.945***	1.966***
				(4.17)	(4.08)
	Decile 9			2.151***	2.295***
				(4.85)	(4.99)
	Decile 10			2.807***	2.851***
				(6.61)	(6.28)
Dependent Children?	Yes			0.777***	0.807**
				(-3.58)	(-2.98)
Received Inheritance	Yes			1.128	1.150
				(1.61)	(1.84)
Education	Below Degree Level				0.930
					(-1.03)
	No Qualifications				1.035
					(0.36)
Occupation (SOC 2010)	Professional occupations				0.472***
					(-8.47)
	Associate professional and technical occupations				0.700***
					(-3.90)

	Administrative and secretarial occupations				0.221***
					(-12.02)
	Skilled trades occupations				1.733***
					(6.14)
	Caring, leisure and other service occupations				0.581***
					(-4.33)
	Sales and customer service occupations				0.279***
					(-7.81)
	Process, plant and machine operatives				0.463***
					(-6.33)
	Elementary occupations				0.321***
					(-8.53)
	N	15932	15932	15923	15923
	t statistics in parentheses				
	= " * p<0.05 ** p<0.01 *** p<0.001 "				

Appendix B

		(1)	(2)	(3)	(4)
Risk and Time Preference					
	AF	1.368*	1.225	1.100	1.033
		(2.27)	(1.46)	(0.68)	(0.23)

	SP	1.569***	1.433**	1.330*	1.309
		(3.33)	(2.64)	(2.07)	(1.95)
	SF	1.568*	1.346	1.132	1.066
		(2.26)	(1.48)	(0.61)	(0.31)
Age	25 to 44		1.080	0.906	0.798
			(0.18)	(-0.23)	(-0.52)
	45 to 64		0.822	0.572	0.574
			(-0.46)	(-1.30)	(-1.28)
	65 to 74		0.307**	0.223**	0.242**
			(-2.63)	(-3.28)	(-3.07)
	75 and over		0.108***	0.0864***	0.0948***
			(-4.07)	(-4.43)	(-4.22)
Sex	Male		1.716***	1.740***	1.524***
			(5.11)	(5.19)	(3.60)
Wealth Decile	Decile 2			0.908	0.884
				(-0.31)	(-0.39)
	Decile 3			1.255	1.136
				(0.81)	(0.45)
	Decile 4			1.376	1.227
				(1.16)	(0.74)
	Decile 5			1.012	0.878
				(0.04)	(-0.43)
	Decile 6			1.229	1.035
				(0.72)	(0.12)

	Decile 7			1.319	1.072
				(0.97)	(0.24)
	Decile 8			1.732*	1.369
				(1.98)	(1.09)
	Decile 9			2.124**	1.580
				(2.77)	(1.60)
	Decile 10			3.355***	2.304**
				(4.55)	(2.92)
Dependent Children?					
	Yes			0.715**	0.736*
				(-2.76)	(-2.54)
Received Inheritance	Yes			0.894	0.885
				(-0.68)	(-0.74)
Education					
	Below Degree Level				0.687**
					(-2.86)
	No Qualifications				0.501**
					(-2.88)
Occupation (SOC 2010)	Professional occupations				0.841
					(-0.97)
	Associate professional and technical occupations				0.988
					(-0.07)

	Administrative and secretarial occupations				0.603*
					(-2.18)
	Skilled trades occupations				1.071
					(0.29)
	Caring, leisure and other service occupations				0.846
					(-0.64)
	Sales and customer service occupations				0.710
					(-1.23)
	Process, plant and machine operatives				0.766
					(-0.99)
	Elementary occupations				0.735
					(-1.16)
	N	14074	14074	14067	14067
	t statistics in parentheses				

	="* p<0.05 **			
	p<0.01 ***			
	p<0.001"			