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14-03

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Workers' Risk Attitude and Financial Participation

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May 10, 2014

Abstract

The French "2010 Household Wealth Survey" includes an experimental module that makes it possible to measure risk aversion in an objective manner. Using this survey, we analyse workers' attitudes towards financial participation with respect to their attitudes towards risk.

Key words: Risk aversion, financial participation.
JEL codes: J33, M52, J54.

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I. Introduction

Financial participation is a key managerial tool for firms and has motivated a substantial body of literature. The documented determinants of financial participation include workers' risk attitudes [Kurtulus et al. (2011)]. Financial participation, irrespective of the design of such a programme, always includes a random component and is therefore risky. For instance, according to [Amar (2010)], the amount of financial participation-related premiums distributed in France in 2008 represented a 7% decrease relative to 2007.

Economic theory predicts that the less risk adverse the worker is, the more he/she will be attracted by financial participation. Moreover, firms prefer workers with low levels of risk aversion, all things being equal, because these workers can be paid a smaller risk premium.

Our paper is devoted to an analysis of the relationship between workers' attitudes towards risk and financial participation. This issue has been studied in the literature, not only with respect to financial participation but also for the general case of contingent pay. [Cable and Judge (1994)], using an experimental data set and three self-reported risk aversion scales (developed by [Slovic (1972)], [Drankoski and Judge (1992)]) to demonstrate that risk aversion is inversely correlated with the likelihood that individuals will select contingent-pay over fixed-pay. [Cadsby et al. (2007)], using an experimental data set and an objective measure of risk aversion, obtain the same result. [Kurtulus et al. (2011)] use an NBER-sponsored survey of approximately 40000 workers and reach the same result. However, the latter study employed a self-reported risk aversion scale.

The purpose of our paper is to complete the work of [Kurtulus et al. (2011)] by using both an official database and an objective measure of risk aversion. This is made possible by the existence of an official French statistical database called "Enquête Patrimoine", which includes a risk measurement component. Risk is objectively measured by making workers choose between a series of lotteries. Using a utility-free definition of risk attitudes, a worker will be risk averse if he chooses to have an amount $a > 0$ with certainty instead of playing a risky lottery L with an expected value that is strictly greater than a.

The remainder of the paper is organised as follows. Section 1 includes a brief literature review on the theoretical relationship between risk attitudes and financial participation. In section 2, we present the database and the main variables. Section 3 addresses the empirical tests, and finally, section 4 concludes.

II. What does theory say about financial participation and attitudes towards risk?

The standard economic theory on profit sharing inaugurated by [Weitzman (1984)] predicts that a profit-sharing system can be expected to increase a worker's effort relative to that under a fixed wage system. Because the worker has a stake in the outcome, he will devote greater effort and produce more output. This result has given rise to an abundant body of theoretical and empirical literature (see [Weitzman and Kruse (1990)] for a survey). However, all of these simple models omit certain aspects of reality, as they abstract from risk-bearing issues associated with financial participation that may expose workers to considerable income fluctuations that they would find undesirable [1].

[1] [Weitzman (1980)] derives a formula for the optimal mix of a base wage and profit sharing, which is typically a complicated function that is inversely related to the degree of risk aversion. However, he concludes that explicitly

[Blanchflower and Oswald (1987)] argue that Weitzman's theory and the other models that focus on this topic fail to address the problem of risk allocation between workers and the firm in profit-sharing schemes, although empirical evidence suggests that firms' and employees' attitudes towards obviously constitute an important element in the formation of financial participation schemes. In a deterministic context, linking a worker's pay to his output is sensible because it will encourage the optimal level of effort, but what will the outcome be in the presence of risk? Intuitively, a higher degree of financial participation relative to a fixed base wage will elicit greater effort from the worker but will also expose him to greater risk. For example, [Estrin et al. (1987)] or [Pissarides (1987)] note that financial participation (e.g., profit sharing) would expose workers to considerable income fluctuations, which they would not desire, and give rise to a disincentive effect on worker effort.

This issue has been extensively examined in the theoretical literature under the heading of the well-known "Principal-Agent" or "Employer-Employee" problem. A basic assumption in most theoretical models is that the worker is risk averse, deriving greater utility from a fixed wage than from a variable wage of equal expected value ([Holmstrom (1979)], [Milgrom and Roberts (1992)]). Focusing on the risk imposed by performance pay, the classic agency model involves a trade-off between incentives and insurance ([Prendergast (2000)], [Holt and Laury (2002)]). While the firm can increase effort through performance pay, it must compensate risk-averse workers for the greater earnings risk such that the agent still receives his reservation utility. Thus, the classic agency model predicts that no relationship exists between risk attitudes and utility, even if workers receive a performance payment. However, workers who are highly risk averse will prefer to have lower compensation risk compared with those who are less risk averse. Therefore, an alignment of risk preferences and compensation risk is likely to lead to improved utility.

Based on these facts, it has been worthwhile to develop a theoretical framework that incorporates the risk attitudes of firms and workers into Weitzman's share economy to apply it and thus shed light on the role of sharing schemes in the presence of income fluctuations.

The efficiency wage theory ([Chang (2006)]) and sorting models literature ([Cornelissen et al. (2011)]) have recently pursued this approach. [Chang (2006)] establishes a theoretical model that combines remuneration from financial participation schemes and the shirking-type of efficiency wage theory proposed by [Shapiro and Stiglitz (1984)]. Departing from the usual efficiency wage model, it allows both employees and the firm to be risk averse (see [Hart (1983)]), and employees exert effort according to the compensation they receive and the risk costs that they incur. Accordingly, firms can unilaterally set base wages and sharing coefficients to induce worker effort and diversify risks. Based on this model, [Chang (2006)] finds that the risk attitudes of firms and workers are the crucial elements in determining the workers' effort and the firms' choice of payment method. Specifically, if firms are risk neutral and workers are more risk averse, the fixed-wage system will prevail. Second, a higher sharing coefficient (the ratio of financial participation to an employee's total wage) is not necessarily a sufficient motivator to increase work effort, particularly when employees are more risk averse, because even if it creates a stronger incentive effect, it also exposes employees to a greater amount of income risk. Third, if firms are risk averse and workers are risk neutral, firms facing greater output fluctuation will increase their sharing ratio to diversify the risk among their

modelling risk considerations does not per se eliminate the argument for profit sharing, though it likely entails a reduction in the degree of profit sharing to reduce the worker's exposure to risk. More important, he demonstrates that under standard assumptions, it is quite difficult to derive a corner solution in which the efficient pay contract involves only fixed wages and no profit sharing.

workers but will decrease the base wage. If the firm is risk neutral and workers are risk averse, increased output fluctuations will increase the fixed base wage but have an ambiguous effect on the sharing coefficient.

While [Shapiro and Stiglitz (1984)] focuses on the relationship between the firm's and worker's risk tolerance, [Cornelissen et al. (2011)] extends the sorting models of [Lazear (1986)] and [Booth and Franck (1999)] by considering two sectors (a performance pay sector and a time rate sector) to account for the income risk associated with performance pay and allow for different risk attitudes across workers and abilities. While standard agency analyses are limited to risk-averse workers, their model allows for the presence of risk-neutral and risk-loving workers. [Levine and Tyson (1990)] have noted that because firms employing financial participation schemes will pay varying wages, risk-averse workers will tend to leave them for employment in other firms. In addition, assuming that financial participation replaces a share of basic wages, in a recession, remuneration in a financial participation firm may fall below that of its non-financial-participation competitors - which will tend to have greater recourse to lay-offs, redundancies and short-time work. The financial participation firm may then run the risk of losing its best staff to other firms, at which the levels of pay are temporarily higher. However, it is unclear how important this argument will be in practice.

[Levine and Tyson (1990)] predicts, first, that the more able and risk tolerant workers will sort themselves into performance pay schemes to capture rents and thereby increase their on-the-job satisfaction. Second, workers with greater risk aversion benefit to a lesser extent from working in the performance pay sector, all else being equal. If workers in the performance pay sector are risk averse, they will suffer from both a disutility of effort and a disutility resulting from income risk. If workers in the performance pay sector are risk loving, two opposing components remain, namely the disutility of effort and the utility of having an uncertain income. Thus workers in the performance pay sector receive a rent that decreases in their degree of risk aversion. These results obviously contrast with the classic agency model in which employers offer earnings that precisely compensate agents for their disutility of effort and their disutility of income risk. Because workers are typically assumed to be risk averse, a clear, negative relationship between performance pay and utility emerges after controlling for compensating earnings. Our approach accounts for the possibility that at least some workers may be risk loving (or at least less risk averse than others), implying an ambiguous relationship between performance pay and utility after controlling for earnings.

III. The Database and the main variables

I. The database

We use a survey called *"Enquête Patrimoine 2010"* (*"2010 Household Wealth Survey"*) designed by the French National Institute of Statistics (INSEE). This survey is administered every six years, and its purpose is to describe the wealth structure of French households (e.g., real estate, financial and professional assets, intangible assets)[2]. The survey size is approximately 15 006 households and 35 729 individuals.

However, the *"2010 Household Wealth Survey"* also includes three sub-samples, respectively devoted to consumption habits, risk attitudes and immaterial wealth. In this paper, we consider the sub-sample measuring risk attitudes. Note that the survey assesses risk attitudes

[2]http://www.insee.fr/en/methodes/default.asp?page=sources/ope-enquete-patrimoine.htm

in an objective manner through an experimental device. Namely, the individual reveals his attitude towards risk through his choice between lotteries $L1$ and $L2$, $L3$ and $L1$ and $L4$ and $L1$, where $L1 = (w, 1)$ is the degenerate lottery of obtaining his current wage w with certainty and $L2 = (2w, 0.5; \frac{2}{3}w, 0.5)$ is the lottery that awards twice the current wage of the individual with probability 0.5 and two-thirds of the current wage with probability 0.5, $L3 = (2w, 0.5; \frac{1}{2}w, 0.5)$, $L4 = (2w, 0.5; \frac{4}{5}w, 0.5)$.

The choices are sequential, and the individuals are first asked to choose between $L1$ and $L2$. Then, only individuals who chose $L2$ over $L1$ are asked to choose between $L3$ and $L1$. Individuals who chose $L1$ over $L2$ are asked to choose between $L1$ and $L4$. As $L1$ is a degenerate lottery, its certainty equivalent is equal to its mathematical expectation $E(L1) = w$. As a consequence, if we assume a Von-Neuman and Morgenstern setting, then individuals who choose $L1$ over $L2$ are more risk averse than individuals who choose $L2$ over $L1$. In other words, $L1$ is the least risky lottery, followed by $L4$, then $L2$ and, finally, $L3$ (the most risky).

The sub-sample on risk attitude measurement initially includes 4960 individuals. However, we restrict our attention to the 430 individuals who are (1) active; (2) full-time workers with permanent contracts; (3) employed in the private sector (agriculture and artisanal handicrafts are excluded); (4) not self-employed; (5) not managers; and (6) between 18 and 55 years old.

II. The main variables

Our dependent variable is a binary variable denoted "*FPART*" that is equal to 1 if the employee reported having a financial participation device (profit sharing, employee stock and ownership plan-ESOP) and 0 otherwise. The risk attitude variable (denoted "*RACCEPT*") is constructed based on the individuals' choices between the abovementioned lotteries. It takes the value 1 if the individual rejects both $L2$ and $L4$; *RACCEPT* = 2 if the individual does not choose $L2$ but chooses $L4$; *RACCEPT* = 3 if the individual chooses $L2$ but does not choose $L3$; and *RACCEPT* = 4 if the individual chooses both $L2$ and $L3$. Thus, the higher *RACCEPT* is, the less risk averse the individual is.

Because an individual's risk attitudes may depend on his wealth, we add wealth as a control variable. Finally, as explanatory variables, we consider the worker's gender, age, geographic zone, whether the worker is single and the number of dependent children.

Table 1 provides a complete definition of our variables, while tables 3 and 2 present a brief statistical summary of each variable.

Table 1: *Definition of Variables*

Variable	Description
FPART	Binary variable = 1 if the individual holds *FP* and 0 otherwise.
RACCEPT	Risk attitude variable. Takes four values, from 1 to 4. the lower the value, the less risk averse the individual.
LNETWEALTH	(log) Total net wealth in Euros (total gross wealth minus debts).
AGE	Continuous variable. Age of the individual.
SEX	Binary variable = 1 if female and 0 otherwise.
NOTSINGLE	Binary variable = 1 if the individual is not single and 0 otherwise.
NDEPCHILD	Number of dependent children.
DEPCHILD	Binary variable = 1 if the number of dependent children (NDEPCHILD) is > 0 and 0 otherwise.
GEOZONE	Binary variable = 1 the individual lives in Paris or the Paris region and 0 otherwise.

Table 2: *Summary Statistics for Real-Valued Variables*

Variable	Mean	Std Dev	Min	Max
RACCEPT	1,67	0,93	1	4
LNETWEALTH	10,20	4,62	-10,19	15,41
AGE	40,32	9,01	18	55
NDEPCHILD	1.01	1,09	0	6

Table 3: *Summary Statistics for Categorical Variables*

Variable	Values	Frequency	Percent	Variable	Values	Frequency	Percent
RACCEPT	1	255	59,3	*NDEPCHILD*	0	183	42,56
	2	88	20,47		1	112	26,05
	3	61	14,19		2	94	21,86
	4	26	6,05		3	34	7,91
FPART	0	286	66,51		4	4	0,93
	1	144	33,49		5	2	0,47
SEX	0	247	57,44		6	1	0,23
	1	183	42,56	*DEPCHILD*	0	183	42,56
NOTSINGLE	0	114	26,51		1	247	57,44
	1	316	73,49	*GEOZONE*	0	314	73,02
					1	116	26,98

IV. Empirical tests

Recall that economic theory predicts that the less risk averse an individual is, the more likely he is to accept financial participation. We apply two methods to assess this prediction.

I. Classification Tree Method

The first method permits us to check for the existence of a link between financial participation and risk attitudes. Specifically, we construct a classification tree for the variable *FPART* with respect to the abovementioned explanatory variables: risk attitude, net wealth, age, sex, whether the worker is single, the number of dependent children and the geographic zone. Recall that a classification tree, sometimes called a decision tree, is a (non-parametric)

supervised learning method.

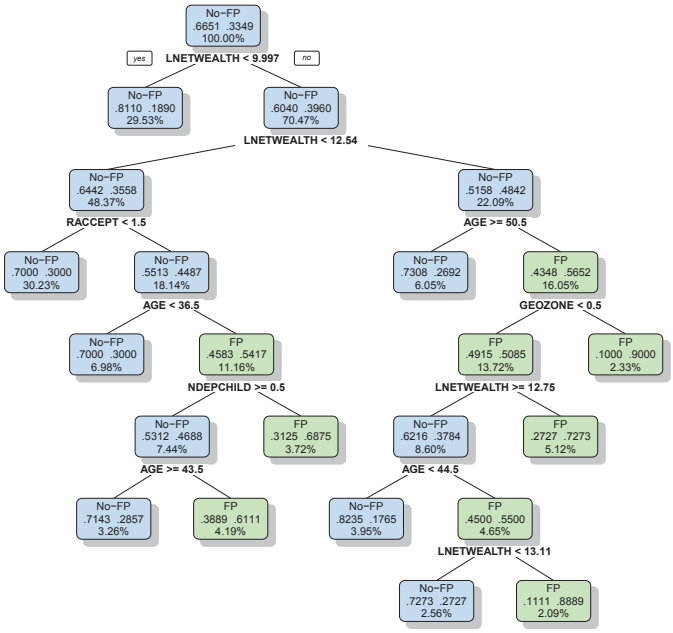

Figure 1: *Decision tree of having financial participation*

According to the decision tree, the first variable that explains the division of our sample into two parts with respect to whether a worker is compensated through financial participation (*FPART*=1 or 0) is net wealth. The next variable is the risk attitude variable (*RACCEPT*). Specifically, there are two branches that are, respectively, applicable to 22% and 48% of our sample:

- For individuals whose net wealth is higher than 278 392.5€, risk attitudes do not play a role in the decision of whether to accept financial participation.
- For individuals whose net wealth is between 21 971.5€ and 278 392.5€, risk attitudes play a role in the decision of whether to accept financial participation. For instance, according to the decision tree, highly risk-averse individuals (*RACCEPT* = 1) whose net wealth is between 21 971.5€ and 278 392.5€ do not accept financial participation, whatever their other socio-demographic characteristics.

II. Logistic Regression Model

In the second method, we employ a *logistic regression model* (because the outcome variable *FPART* is binary). Specifically,

$$FPART = \begin{cases} 1 & \text{if } FPART^* = X'\beta + \varepsilon > 0 \\ 0 & \text{otherwise} \end{cases}$$

where $FPART^*$ is a latent variable and X and β are the matrix of explanatory variables and the vector of regression coefficients:

$$\begin{aligned} X &= (RACCEPT, LNETWEALTH, AGE, SEX, NOTSINGLE, DEPCHILD, GEOZONE)' \\ \beta &= (\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7)' \end{aligned}$$

The results of the logistic regression of *FPART* are presented in table 4.

Table 4: *Logistic Regression of the variable FPART*

Analysis of Estimates					
Parameter	*Reference Modality*	*Estimate*	*Standard Error*	*Wald Chi-Square*	*Pr>KhiSq*
Intercept		-3,073***	0,630	23,784	<0,0001
RACCEPT		0,264**	0,113	5,479	0,019
LNETWEALTH		0,090**	0,036	6,176	0,013
AGE		0,020	0,013	2,537	0,111
SEX	0	-0,089	0,108	0,681	0,409
NOTSINGLE	0	0,152	0,133	1,296	0,255
DEPCHILD	0	-0,038	0,113	0,113	0,737
GEOZONE	0	-0,168	0,125	1,814	0,178
Wald Score	20,852		**AIC**	550,322	
			Number of Observations		430

$* : p < 0.1 \quad ** : p < 0.05 \quad *** : p < 0.01$

Note that *RACCEPT* has a positive effect on *FPART*. In other words (and in accordance with economic theory and [Kurtulus et al. (2011)]), the less risk averse an individual is, the more likely he is to agree to financial participation.

Net wealth (*LNETWEALTH*) also has a positive and significant effect on the probability of accepting financial participation. No other explanatory variables have a significant effect.

V. Conclusion

The implementation of financial participation schemes (profit sharing, ESOP) within firms depends on the workers' attitudes towards risk. The less risk adverse the worker is, the more likely it is that he/she will be attracted by financial participation. Moreover, firms will prefer workers with low levels of risk aversion, all things being equal, because they will pay the workers a lower risk premium. The purpose of this article is to test the link between workers' attitudes towards risk and financial participation, using an original French data set that provides us with an objective measure of risk aversion. Our paper contributes to the literature by asserting that attitudes towards risk are a key determinant of workers attitudes towards financial participation. This issue is important because economic theory predicts that firms that implementing financial participation schemes will prefer to hire workers with low levels of risk aversion to pay a lower risk premium. Thus, it may be the case that financial participation could be biased against some types of individuals. For instance, according to some studies [Agnew et al. (2008)], women are more risk adverse than men. As a consequence, *ceteris paribus*, by hiring individuals with low levels of risk aversion, firms may hire more men than women.

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