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Performance Pay, Risk Attitudes and Job Satisfaction

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Performance Pay, Risk Attitudes and Job Satisfaction

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Abstract

We present a sorting model in which workers with greater ability and greater risk tolerance move into performance pay jobs and contrast it with the classic agency model of performance pay. Estimates from the German Socio-Economic Panel confirm testable implications drawn from our sorting model. First, prior to controlling for earnings, workers in performance pay jobs have higher job satisfaction, a proxy for on-the-job utility. Second, after controlling for the higher earnings associated with performance pay, the job satisfaction of those in performance pay jobs is the same as those not in such jobs. Third, those workers in performance pay jobs who have greater risk tolerance routinely report greater job satisfaction. While these findings support the sorting model, they would not be suggested by the classic agency model.

JEL: D80, J24, J28, J33, M52.

Keywords: Performance Pay, Worker Heterogeneity, Ability, Risk Preferences, Sorting.

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1. Introduction

Performance pay has been shown to increase worker productivity, effort and earnings (Booth and Frank 1999, Lazear 2000, Oettinger 2001, Paarsch & Shearer 2000, Parent 1999, Shearer 2004). However, its effect on job satisfaction remains less clear. Greater earnings increase worker satisfaction but performance pay also increases effort that workers dislike and earnings variations that reduce the utility of risk averse workers. Yet, if workers are heterogeneous, performance pay can induce self-sorting by both ability and risk preference. The consequence of such sorting is that the anticipated negative influences of increased effort and risk may be ameliorated by observing those workers with the greatest ability and least risk aversion receiving the higher earnings associated with performance pay.

Lazear (1986) and Booth and Frank (1999) have developed models of performance pay and sorting that assume workers are heterogeneous with respect to their abilities.[1] We extend those models to account for different risk attitudes across workers. We model and then test a sorting process which predicts that the more able and more risk tolerant sort themselves into performance pay schemes and that their on-the-job utility will be greater than those who remain on time rates. Moreover, the two critical sorting dimensions interact. Capturing the rent on ability requires sorting into the performance pay sector and among those sorting into performance pay, workers with the greatest risk tolerance will receive the greatest on-the-job utility.[2] Among those remaining in the time rate sector, there should be no relationship between risk tolerance and utility. Finally, the model presents ambiguous predictions as to whether or not workers on performance pay will continue to receive greater utility once the positive influence of higher earnings is removed. However, the positive relationship between risk tolerance and utility for those on performance pay remains independent of the influence of higher earnings.

The empirical testing exploits a unique question in the German Socio-Economic Panel (GSEOP) that has been shown to successfully identify risk tolerance. Using job satisfaction as an indicator for on-the-job utility, we confirm that performance pay emerges as a positive determinant of job satisfaction. Moreover, among those receiving performance pay, greater risk tolerance is associated with greater satisfaction whereas risk tolerance plays no role in job satisfaction among those on time rates. Finally, holding earnings constant in the job satisfaction estimations causes the coefficient on performance pay to move to statistical insignificance suggesting equal satisfaction in the two sectors. In contrast, controlling for earnings doesn't change the positive link between risk tolerance and job satisfaction.

These findings fit the predictions of our sorting model but are not easily reconciled with the typical agency model. In such a model, the principal trades-off the increased effort associated with performance pay with the earnings premiums required to compensate risk averse agents (e.g., Holmstrom and Milgrom 1987, Gibbons 1998). The principal faces a reservation utility constraint among agents that implies that the on-the-job utility of agents receiving performance pay equals that of agents on time rates. This constraint implies that performance pay should not influence job satisfaction and that after earnings are controlled for, job satisfaction should be lower in the performance pay sector. Moreover, the typical agency model predicts that there should be no relationship between risk attitude and job satisfaction in the performance pay sector. If a worker has a lower degree of risk aversion, the employer reduces the earnings premium that compensates for the disutility of bearing an income risk. Only if earnings are controlled for, a positive link should emerge between risk attitude and satisfaction.

The next section sets the context by briefly examining past research and isolating our area of interest and value added. The third section details our extension of the sorting model in which workers sort on both ability and risk preferences. It draws the predictions and testable hypotheses. The fourth section presents our data and basic methodology while the fifth section presents the empirical results. A sixth section discusses robustness and a final section draws conclusions and suggests avenues for future research.

2. Past Research: Setting the Context

In the last decade economists have dramatically increased the number of studies estimating the determinants of job satisfaction. At the start of the 1980s Bartel (1981) found only a handful of studies of job satisfaction by economists but more than 3500 by other social scientists. Yet, Hamermesh (2004) emphasizes that the recent entry of economists into the field will not bring value if it only means examining new explanatory variables with greater statistical sophistication. Instead, he calls for economists to use job satisfaction measures to test theoretical predictions about worker behaviour and/or labor market functioning. In taking this call seriously, we note that at its best job satisfaction approaches a measure of on-the-job utility. As Hamermesh (2001, p. 2) puts it job satisfaction is the only measure "that might be viewed as reflecting how (workers) react to the entire panoply of job characteristics" and as such "it can be viewed as a single metric that allows the worker to compare the current job to other labor market opportunities."

We make use of job satisfaction to differentiate two polar models of performance pay. The classic model of agency involves the trade-off between incentives and insurance viewing the risk imposed by performance pay as the major factor that constrains its use (Prendergast 2000). While the firm can increase effort through performance pay, it must compensate risk averse workers for the greater earnings risk. In designing performance pay, competition in the labor market generates a reservation utility constraint that the firm builds into its optimization. By implication, on-the-job utility is identical between those workers receiving performance pay and those receiving time rates and, as a consequence, job satisfaction should be identical.

The alternative sorting model assumes that competition between firms drives economic profits to zero. Firms use performance pay to cause more able workers to sort into performance pay schemes (Lazear 1986, Booth and Frank 1999). Thus, in the classic windshield study half of the productivity increase associated with initiating a piece rate came from more productive workers being attracted into the scheme (Lazear 2000). Similarly, Sorensen and Grytten (2003) find that fully a third of the productivity increase associated with performance pay among Norwegian physicians is due to sorting. Further, Curme and Stefanec (2007) show that those workers on performance pay have higher ability (AFQT scores), higher self-esteem and less fatalistic attitudes than do those on time rates.[3] This is critical as Bowles et al. (2001) show that each of these characteristics correlate with higher effort and greater earnings. Experiments confirm that those with greater risk tolerance, higher ability and more confidence tend to choose a performance pay scheme in the laboratory (Dohmen and Falk 2006). In this strand of literature, workers who sort into performance pay capture a rent associated with their ability.

We add to the self-sorting model by reintroducing issues of risk. Yet, in the flavour of the sorting model, we allow for heterogenous risk preferences. Thus, we reproduce the result that the more able sort into performance pay but match this with the prediction that the more risk tolerant also sort into performance pay. This expectation has recently received empirical support by Cadsby et al. (2007). Using a real-effort laboratory experiment, they show that more risk-averse individuals are less likely to select pay for performance. Similarly, Bellemare and Shearer (2006) find in a field experiment that workers on piece rates in a tree-planting firm exhibit higher risk tolerance than individuals representing broader populations. More generally Grund and Sliwka (2006) use the GSOEP to confirm that greater risk tolerance stands as a positive determinant of receiving performance pay. However, they assume a standard agency model to explain their finding and do not examine the link between performance pay, risk tolerance and job satisfaction.[4]

While we are the first to use job satisfaction as a critical variable in distinguishing between sorting and agency models, we are not the first to examine performance pay schemes as a determinant of job satisfaction. Researchers in human resource management recognize that the structure, transparency and perceived fairness of a performance pay scheme will influence measures of job satisfaction (Miceli and Mulvey 2000 and Brown 2001). Moreover, it has been thought that workers prefer employment environments that reward their productivity and that such environments are associated with increased worker optimism and satisfaction (Brown and Sessions 2003). In addition, a few empirical studies by economists estimate the direct link between performance pay and job satisfaction. Drago et al. (1992) use Australian data to confirm that the use of individual and group bonuses are a positive determinant of job satisfaction even after controlling for earnings. Heywood and Wei (2006) examine US data finding that while performance pay in general tends to be associated with increased satisfaction, it is not uniform across the variety of types of performance pay. McCausland et al. (2005) uses data from the British Household Panel Study (BHPS) showing that the influence of performance pay tends to increase satisfaction for the more highly paid but lower it for the less highly paid. Both Green and Heywood (2007) and Pouliaks and Theodossiou (2007) use the BHPS to control for individual fixed effects with the former finding a positive influence for performance pay while the latter tends to find an insignificant influence.

Thus, the scant past literature has already produced positive, negative and insignificant coefficients. Importantly, none of these previous studies isolate the role played by including or excluding the wage (they tend simply to control for it without comment) or examine the interaction of performance pay with risk attitudes. And none considers the examination of performance pay as a wedge to contrast the implications of the classic agency model from those of the sorting model. In the next section we isolate the fundamental testable hypothesizes that emerge from our augmented sorting model.

3. Theory

3.1 The Model

We extend the models of performance pay and self-sorting (Lazear 1986 and Booth and Frank 1999) to account for the income risk associated with performance pay and allow for different risk attitudes across workers. We imagine two sectors, performance pay (P) and time rate (T) and assume that competition in product and labor markets drives firms' expected profits to zero.

A worker's output is given by $q = v + b$ with $v = ae + \varepsilon$. Effort is denoted by e with $e \in \{0,1\}$ and is ultimately considered a simple dichotomous decision of whether or not to exert effort. The impact of effort on output depends on ability a. Workers have heterogeneous abilities distributed uniformly over the interval $[0,\overline{a}]$. The variable ε reflects that worker performance is subject to random influences distributed with mean zero and variance σ^2.[5] Finally, b denotes base skills identical for all workers.

The base skills as well as the mean and the variance of the random influences are common knowledge and each worker knows his or her ability a. Workers choose between jobs in the performance pay sector and in the time rate sector. After choosing a job, the worker decides on a level of effort e. Employers cannot observe a, e and ε. However, employers in the performance pay sector monitor employee performance q (or alternatively v). Identifying individual worker performance involves a fixed cost m that is ultimately shifted to the worker because of the zero profit constraint. The worker's remuneration in the performance pay sector thus equals his or her output q minus the monitoring cost: $w_P = v + b - m$. There is no monitoring in the time rate sector and each worker receives risk-free earnings w_T.

We assume expected worker utility can be expressed by a mean-variance utility function:

$$EU = E[w] - C(e) - 0.5rVar[w]. \tag{1}$$

where $C(e)$ denotes the disutility of effort with $C(0) = 0$ and $C(1) = c$ $(c > 0)$. Risk preference r is uniformly distributed over $[\underline{r}, \bar{r}]$ with $\underline{r} < 0$ and $\bar{r} > 0$. Thus, a risk neutral worker ($r = 0$) is not affected by the income risk associated with performance pay. Income risk lowers the utility of risk averse workers ($r > 0$) and increases the utility of risk loving workers ($r < 0$).

3.2 Self-Sorting and Effort Choice

As workers in the time rate sector have no incentive to exert effort. Hence, each worker's expected output is equal to the base productivity b. The zero profit condition implies that the straight salary reflects this base productivity. Thus, a worker's utility in the time rate sector is:

$$U_T = w_T = b. \tag{2}$$

If a worker chooses a job in the performance pay sector, he or she maximizes expected utility by the choice of effort. If $a \geq c$ $(a < c)$, the worker chooses $e = 1$ $(e = 0)$. Hence, maximum expected utility of a worker with a given ability and risk attitude is:

$$EU_P = \begin{cases} b - m - 0.5r\sigma^2 \text{ if } a < c, \\ \\ a + b - m - c - 0.5r\sigma^2 \text{ if } a \geq c. \end{cases} \quad (3)$$

A worker chooses a job in the performance pay sector (time rate sector) if $EU_P \geq U_T$ ($EU_P < U_T$). We identify two self-sorting equilibria. The first is characterized by $m + 0.5\underline{r}\sigma^2 > 0$ and $m + c + 0.5\bar{r}\sigma^2 \leq \bar{a}$. In this equilibrium, for each risk attitude some workers sort themselves into the time rate sector while others prefer the performance pay sector. Workers in the performance pay sector always exert effort ($e = 1$). The ability of a worker indifferent to sector, $EU_P = U_T$, can be written as a function of his or her risk attitude:

$$a^*(r) = m + c + 0.5r\sigma^2, \quad (4)$$

where a^* increases in r. As show in Figure 1, workers with abilities and risk attitudes lying above the a^* line have higher expected utility in the performance pay sector. Workers with abilities and risk attitudes below the line have higher utility in the time rate sector.

A second and more general equilibrium results if $m + 0.5\underline{r}\sigma^2 < 0$ and $c < \bar{a} < m + c + 0.5\bar{r}\sigma^2$. As shown in Figure 2, now very risk loving workers all sort themselves into the performance pay sector and very risk averse workers all sort themselves into the time rate sector. Let us define:

$$r' = -2m/\sigma^2, \quad (5)$$

$$r'' = 2(\bar{a} - m - c)/\sigma^2. \quad (6)$$

Risk loving workers with risk attitudes $r \leq r'$ sort themselves into the performance pay sector regardless of their abilities. However, ability plays a role in the effort choice of those workers. If $r \leq r'$ and $a \leq c$ ($a > c$), workers prefer a job in the performance pay sector and choose the effort level $e = 0$ ($e = 1$). Risk averse workers with risk attitudes $r \geq r''$ sort into the time rate sector regardless of their abilities. Finally, if a worker's risk attitude is characterized by $r' < r < r''$, the sector choice depends on his or her ability. If a worker with given r, has ability greater (smaller) than $a^*(r)$ from (4), he or she prefers the performance pay sector (time rate sector).

3.3 Testable Implications of the Model

While the focus of the analysis is the equilibrium shown in Figure 2, the propositions hold for other cases, e.g. that shown in Figure 1. Considering workers with a given risk preference and taking (3) into account, the average expected utility in the performance pay sector is:

$$\overline{EU}_P(r) = \begin{cases} \int_0^c (b - m - 0.5r\sigma^2) f(a)da + \int_c^{\bar{a}} (a + b - m - c - 0.5r\sigma^2) f(a)da & \text{if } \underline{r} \le r \le r', \\ \frac{1}{1 - F[a^*(r)]} \int_{a^*(r)}^{\bar{a}} (a + b - m - c - 0.5r\sigma^2) f(a)da & \text{if } r' < r < r''. \end{cases} \quad (7)$$

Taking (4) and the uniform distribution of a, we obtain:

$$\overline{EU}_P(r) = \begin{cases} 0.5\frac{(\bar{a} - c)^2}{\bar{a}} + b - m - 0.5r\sigma^2 & \text{if } \underline{r} \le r \le r', \\ 0.5(\bar{a} - m - c - 0.5r\sigma^2) + b & \text{if } r' < r < r''. \end{cases} \quad (8)$$

Using (5) and (6) and the distribution of r, we derive the average expected utility in the performance pay sector over all relevant risk attitudes:

$$\begin{aligned} \overline{\overline{EU}}_P &= \frac{1}{F(r'')}\left\{\int_{\underline{r}}^{r'}\left[0.5\frac{(\bar{a}-c)^2}{\bar{a}} + b - m - 0.5r\sigma^2\right]f(r)dr + \int_{r'}^{r''}\left[b + 0.5(\bar{a} - m - c - 0.5r\sigma^2)\right]f(r)dr\right\} \\ &= b + \frac{1}{2(r''-\underline{r})}\left\{\left[\frac{(\bar{a}-c)^2}{\bar{a}} + 0.5(r'-\underline{r})\sigma^2\right](r'-\underline{r}) + 0.5(\bar{a}-c)(r''-r')\right\}. \end{aligned} \quad (9)$$

The following proposition compares average expected utility across sectors.

Proposition 1. The average expected utility is higher in the performance pay sector than in the time rate sector.

The proof of Proposition 1 is presented in the Appendix and reflects two (partially overlapping) types of sorting. First, it reflects the rents of workers with high abilities sorting themselves into the performance pay sector that rewards ability. Second, it reflects the more risk loving workers' utility of receiving a wage that is subject to random influences. Hence, the sorting model yields a prediction that sharply contrasts with the assumption made in standard principal-agent analyses that there should be no relationship between performance pay and worker utility.

As the wage is fixed in the time rate sector, worker utility obviously does not depend on risk preferences in this sector. In contrast, for the performance pay sector we obtain from (8):

$$\partial \overline{EU}_P(r)/\partial r = \begin{cases} -0.5\sigma^2 & \text{if } \underline{r} \le r \le r', \\ -0.25\sigma^2 & \text{if } r' < r < r''. \end{cases} \tag{10}$$

Workers in the performance pay sector realize a smaller rent if they have a higher degree of risk aversion. This immediately yields the following proposition.

Proposition 2. Greater the risk aversion is associated with lower expected utility in the performance pay sector but utility in the time rate sector does not depend on risk attitudes.

The proposition reflects that workers with greater risk aversion benefit less from working in the performance pay sector all else equal. Workers in the performance pay sector receive a rent that decreases in the degree of risk aversion. This also contrasts with results from the standard agency models that assume that if the agent is characterized by a higher degree of risk aversion, the principal adjusts the agent's wage such that the agent still receives his or her reservation utility. Hence, the classic agency model predicts no relationship between risk attitude and utility even if workers receive a performance payment.

As much of the benefit from performance pay flows from more able workers earning higher wages, we now consider the utility differences across sectors holding earnings constant.

Proposition 3. If wages are netted out, average expected utility in the performance pay sector may be higher, lower or the same as in the time rate sector.

The proof of Proposition 3 is in the Appendix but the notice that the difference between sectors now depends only on the effort difference and the risk difference. If workers in the performance pay sector are risk averse, they will suffer both the disutility of effort and the disutility resulting from the 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. This proposition can also be contrasted with the implications of the classic agency model. In that model earnings compensate agents for their disutility of effort and for their disutility of income risk. As workers are typically assumed to be risk averse, a clear negative relationship between performance pay and utility emerges after controlling for the compensating wages. Our approach takes into account that at least some workers may be risk-loving implying an ambiguous relationship between performance pay and utility after controlling for earnings.

Finally, the following proposition considers the relationship between risk attitude and job satisfaction when wages are netted out.

Proposition 4. Even if wages are netted out, greater risk aversion is associated with lower *average expected utility in the performance pay sector. Worker utility in the time rate sector remains independent of risk attitudes.*

The proof of Proposition 4 is again in the Appendix. Critically, while our model predicts a negative association between risk aversion and utility regardless of whether or not earnings are controlled for, the classic agency model predicts a negative association *only* after controlling for wages. This follows because the principal sets the wage to compensate the agent for the disutilty of risk. Thus, only when the influence of this compensating wage is removed (held constant) will the negative relationship between risk aversion and utility be revealed.

Our empirical strategy to test the propositions is as follows: Proposition 1 corresponds to a job satisfaction regression that includes performance pay as an explanatory variable but no control for earnings, while Proposition 3 can be examined by estimating job satisfaction after accounting for earnings. Propositions 2 and 4 suggest separate job satisfaction estimations for workers receiving time rates and performance pay – again with and without controls for wages.

4. Data and Methodology

We draw our data from the 2004 wave of the German Socio-Economic Panel. This is the only year to ask the unique question on risk preference and to include information on performance appraisals. We limit our sample to West German private sector workers under the age of 60. This reflects the usual retirement age and our concern that the private sector is more likely to have the competitive markets associated with the sorting model.[6] We exclude workers of foreign nationality and also those in fishing, forestry and agriculture.[7] The resulting sample consists of all 3724 observations for which information is available.

The indicator of performance pay is built up from a two stage question asking first if the worker is subject to a performance appraisal and secondly, whether that performance appraisal has consequences for his or her earnings. If both questions are answered affirmatively, we consider the worker subject to a performance pay scheme. We recognize that this identifies both workers who receive variable pay tied to performance such as a bonus and also workers who have a growth in their based pay rate tied to performance (Milkovich and Widgor 1991). This is the same variable constructed by Grund and Sliwka (2006) and serves as broad definition of performance pay. Thus, while slightly more than 25 percent of GSOEP workers identify themselves as subject to performance pay, this can be compared with the incidence of individual performance pay in the US National Longitudinal Survey for the late 1980s of just above 20 percent (Geddes and Heywood 2003).

The job satisfaction indicator is a fairly standard measure of overall satisfaction that ranges from 0 low to 10 high.[8] As the number of workers giving very low evaluations is extremely small we combine category 0 and category 1. The resulting ten point scale forms the dependent variable to be fit through ordered probit to a cumulative normal distribution. The unique measure of risk also reflects a scale from 0 to 10. Higher scores are more willing to take risks. Critically, this measure has been validated by Dohmen et al. (2005) who demonstrate it is very highly correlated with actual risk taking in lottery experiments. Thus, as Grund and Sliwka (2006 p. 6) put it "(f)or the first time, it is therefore possible to analyse the link between individual risk aversion and performance based pay with field data." While they confirm a link between risk preferences and performance pay, they do not examine job satisfaction.

Table 1 lists the definitions for all variables. Table 2 shows the distribution of the job satisfaction variable ranging from 1 (lowest) to 10 (highest). Workers in the sample are quite satisfied. Nearly 50 percent report job satisfaction of 8 or higher on the 10 point scale. The distribution of risk tolerance shown in Table 2 is more symmetric. The mode and the median are at the value of 5 out of the scale ranging from 0 (not at all willing to take risks) to 10 (very willing to take risks). Table 3 breaks down the sample statistics by pay scheme. It confirms that those who receive performance pay are disproportionately male, tend to work in larger firms, work between five and six hours more a week and earn substantially more.[9] They also report slightly higher job satisfaction on average and higher risk tolerance on average. At issue is whether that slightly higher job satisfaction remains in the face of controls and whether it becomes negative after controlling for income as the classic agency theory would predict.

We initially estimate a fairly stripped down job satisfaction equation. The parsimony reflects our desire to keep earnings and major individual specific earnings determinants out of the initial equation. Additional stages will add the earnings measure and then a full set of controls. We will reproduce this three step procedure including at each stage the measure of risk tolerance. Finally, we will reproduce the procedure limiting our sample to those earning performance pay. In this way we will be able to provide empirical evidence on the four hypotheses outlined in the previous section.

5. Empirical Results

Table 4 outlines our procedure using the initial parsimonious equation and then augmenting it first with earnings and then with other earnings determinants. The estimation involves the simultaneous determination of the nine cut–points but they are suppressed to save space. The results confirm that working in larger firms is associated with lower satisfaction and that the inability to work the desired hours is also associated with significantly lower satisfaction. The controls for age and gender do not emerge as significant. Importantly, the presence of performance pay is associated with significantly higher job satisfaction. The marginal effects computed at means indicate that workers with performance pay are 3.7 percentage points more likely to report one of the three highest job satisfaction categories. This represents a substantial influence. Indeed, the marginal effect of performance pay on satisfaction equals in magnitude (although the opposite in sign) that of a 7 hours per week gap between actual and desired hours.

While modest additions or substractions of controls leave the basic performance pay result in tact, it is immediately eliminated by the single control for earnings. This estimation is shown in column 2 and reveals that higher earnings stand as a crucial determinant of overall job satisfaction. Critically, the addition of the earnings variable cuts the size of the coefficient on performance pay to roughly a third of its previous size and drops it well below statistical significance. We take this as evidence in accord with both Propositions 1 and 3 from our augmented sorting model. Excluding the earnings measure, workers earning performance pay tend to report higher job satisfaction but after holding income constant their job satisfaction is insignificantly different from those not on performance pay.

The final column in Table 4 adds other relevant controls that might influence job satisfaction including earnings determinants (education and tenure). The basic story remains unchanged. The coefficient on performance pay shrinks again but remains positive and far from significance. Thus, despite a reasonably comprehensive set of controls, the job satisfaction of performance pay workers equals that of other workers even when holding their earnings equal. This would seem consistent with a rent being earned by the workers in the performance pay sector as we know they are actually have greater earnings. More pointedly, the prediction of the classic agency model would be that once earnings are held constant, those in the performance pay sector should have lower job satisfaction as they must face additional risk. In the sorting model, this prediction is offset by the greater ability and greater risk tolerance of those earning performance pay and by the absence of the reservation utility constraint.

Table 5 repeats the presentation just outlined but includes the measure of risk tolerance. The parsimonious estimation suggests that both performance pay and greater risk tolerance independently determine job satisfaction. The coefficient on performance pay retains the same size and statistical significance as it did in the equation without the measure of risk tolerance. Those earning performance pay report greater job satisfaction. At the same time those workers with a greater risk tolerance also appear to report a somewhat higher job satisfaction. The second column adds the earnings measure to the estimation again eliminating the size and significance of the coefficient on performance pay. At the same time, the coefficient on risk tolerance shrinks (albeit not as dramatically) and it also drops below typical measures of significance. The full estimation merely reinforces these results. Thus, both of the supposed sorting dimensions present a similar picture.

Yet, the model presumes that those not on performance pay face no earnings risk and, as a consequence, differences in risk preference should not directly influence satisfaction. As made clear by Proposition 2, risk tolerance matters only for those actually facing earnings risk. Tables 6 and 7 directly examine this by reproducing the regressions of job satisfaction on risk tolerance but doing so separately for those workers receiving and not receiving performance pay. The results strongly support Proposition 2 with a very large and positive coefficient on the risk tolerance among those receiving performance pay (Table 6) but indicating no role played by risk tolerance for those not receiving performance pay (Table 7). In terms of marginal effects, a one point increase in risk tolerance increases the probability of reporting one of the three highest job satisfaction categories by 2.3 percentage points among those receiving performance pay.

To test Proposition 4, we add earnings to the basic specifications of Table 6 and 7. The results confirm the theoretical expectation with the positive association between risk tolerance and job satisfaction remaining for those on performance pay but absent for those not on performance pay. Adding further controls does not change the pattern of results. The results of column 2 or 3 in Table 6 can be used to understand the quantitative significance of risk tolerance in the performance pay sector. The ratio of the marginal effects of risk tolerance and earnings is about 0.7, indicating that an increase in risk tolerance of 1 point in the performance pay sector yields job satisfaction equivalent to 700 Euros of monthly gross earnings, a very sizable effect.

6. Robustness and Criticism of the Cross-sectional Approach

A potential concern with our empirical results is their reliance on cross-sectional estimates. This reliance is necessitated by the availability of the performance pay indicator in only a single wave of the GSEOP. Even if such data existed, our fundamental theory of sorting differs from the classic sorting associated with panel data techniques. For instance, our model argues that workers with greater ability capture a rent in the performance pay sector. This differs from a contention that performance pay is associated with a rent for *any* worker. Typical panel estimates with worker fixed effects could test the second claim by holding constant unmeasured ability. Yet, holding ability constant would wash out much of what interests us as our model focuses on the difference between those with high and low ability. Yet, even if the cross-section estimates remain relevant, we can emphasize the differences between our sorting model and the classic agency model by considering the consequences of holding ability constant.

In the classic agency model, the firm pays a wage premium to workers to compensate for greater risk. As stressed, if this wage is held constant, the greater risk should result in workers on performance pay being less satisfied, having lower utility. Our inability to find this result empirically might incorrectly result if performance pay is associated with unmeasured ability and if unmeasured ability is associated with greater satisfaction. In this view, the more able are simply more satisfied in either sector (they don't capture a return on ability in only one sector) but are disproportionately in the performance pay sector generating an upward bias in the cross-sectional estimate. Absent this bias, we would uncover the negative influence of performance pay on satisfaction stressed by the agency model. While we cannot directly test this without variation in the critical variables over time, we do undertake a variety of related tests and find little evidence of such a bias.

As a first robustness check, we simply add additional variables that might proxy ability. To our most complete specification in Table 4 we add indicators of health status, height (and height interacted with gender) and the education of the respondent's mother. The coefficient on performance pay remains positive but insignificant as it did in Table 4. As a second check, we conjecture that if the worker fixed effects that emerge from a panel estimate of wages control for the influence of unmeasured ability, those effects are likely to be very highly correlated with the influence of unmeasured ability that would emerge from a panel estimate of job satisfaction. Thus, we use all waves of the GSEOP from 1984 – 2005 estimating an unbalanced fixed effects panel wage equation.[10] Rather than being interested in the estimated coefficients of the wage determinants, we retain the actual fixed effects as they capture the worker specific component thought to include unmeasured ability. This new variable of the worker fixed effects from the wage equation is returned to the ultimate equation in Table 4. The coefficient on performance pay remains positive but insignificant. These two estimates are shown in the first two columns of Table 8 and we note that adding simultaneously the augmented controls and worker earnings fixed effect does not change this picture. Thus, despite our best attempts, we find no evidence that performance pay is associated with diminished utility as suggested by the agency model.

The one persistent significant result remains that the more risk tolerant are more satisfied but only among those receiving performance pay. This we took as evidence that the risk tolerant receive a rent when sorting into performance pay jobs. Again, this might be criticized if one felt that risk tolerance reflected unmeasured ability and the more able are more satisfied. While such a criticism might also call for worker fixed effect estimates, we note that this supposed relationship does not hold in the time rate sector. In that sector, variations in risk tolerance do not correlate with job satisfaction. Thus, the criticism would need to be that risk tolerance reflects unmeasured ability but largely in the performance pay sector. Be that as it may, we institute our set of robustness checks on the performance pay subsample. We first add the additional controls that may directly proxy ability in our initial and most complete specifications from Table 6. As columns 3 and 4 of Table 8 show, this does not change the positive and significant coefficient on the risk tolerance measure. We next recover the worker specific fixed effect from a panel wage estimate and add it as a control. Again, it does not change the pattern of results as shown in columns 5 and 6 of Table 8. We note that simultaneously including both the augmented controls and the fixed effects also fails to dislodge the significant positive coefficient on the risk tolerance measure. Finally, we note that the same set of robustness checks leave the coefficient on the risk tolerance measure far from significant in the time rate sector (the point estimates are essentially zero).

As a consequence, we remain confident that a difference exists in the role that risk attitude plays in determining job satisfaction in the two sectors. They play no role in the time rate sector but greater risk tolerance is associated with higher satisfaction in the performance pay sector. Critically, this remains true in the same series of robustness checks that do not include the earnings measure. In sum, our checks continue to conform to the implications of the sorting model rather than the agency model.

7. Conclusions

This study uses job satisfaction as a measure of on-the-job utility in order to contrast a sorting model from the classic agency model. In the latter, the workers retain no rents. The additional earnings they receive from performance pay exactly offsets the utility lost from being subject to earnings risk and from exerting effort. Thus, workers should receive the same utility in each sector and after controlling for earnings, those receiving performance pay should have lower utility. Instead, our empirical results suggest higher job satisfaction for those receiving performance pay both in the simple comparisons and the parsimonious regressions. Once earnings, and ultimately many other controls, are included, this advantage becomes insignificantly different from zero. In none of our estimations, can we find lower job satisfaction for those receiving performance pay despite the use of many, many controls. These results accord with our sorting model in which the more able and more risk tolerant capture rents.

We also isolate the role of risk tolerance in the sorting model. The model predicts that it should matter only among those receiving performance pay and should do so with or without controlling for earnings. Indeed, we confirm this prediction using the unique risk tolerance variable. Greater risk tolerance is a strong positive determinant of job satisfaction among those receiving performance pay but plays no role among those not receiving performance pay.

We recognize that contrasting the classic agency model with the sorting model leaves excluded alternative models that could predict a relationship between performance pay and job satisfaction. First, the agency model can be amended in various ways to suggest that performance pay workers retain a rent. Perhaps first among these amendments is the limited liability assumption. Interestingly, performance pay in face of a limited liability constraint has implications similar to those analyzed in the efficiency wage literature (Foster and Wan 1984, Laffont and Martimort 2002: pp. 174-5, Jirjahn 2006). Workers queue for jobs in which they can receive a rent while employers will be reluctant to invest in creating such jobs. On the other hand, other theories have suggested that performance pay should be associated with lower utility. Thus, workers may care not only about their own earnings but the implications of the greater earnings disparity associated with performance pay (Kennedy 1995). This disparity can be sufficient to lower both morale and productivity. Alternatively, MacCausland et al. (2005) suggest that workers may see performance pay as form of control and that the resulting loss of autonomy lowers utility. While lower moral and loss of autonomy may happen in some circumstances, our results find no support for the general contention that performance pay is associated with lower job satisfaction but instead that the higher earnings bring higher job satisfaction to those on performance pay. Again, even holding earnings constant, performance pay is associated with roughly similar job satisfaction as other forms of payment.

Appendix

Proof of Proposition 1

If r lies in the interval (r', r''), workers with the same risk attitude sort partially in the time rate and partially in the performance pay sector. Hence, we compare average expected utility for a given risk attitude. Average expected utility in the time rate sector follows immediately from (2):

$$\overline{\overline{EU}}_T = \overline{EU}_T(r) = U_T = b\,. \tag{A.1}$$

Taking (8) and (A.1) into account, we obtain:

$$\overline{EU}_P(r) - \overline{EU}_T(r) = 0.5(\bar{a} - m - c - 0.5r\sigma^2)\,. \tag{A.2}$$

From (6) it follows that this difference is positive if $r < r''$. Thus average expected utility is higher in the performance pay sector for each given r lying in the interval (r', r'').

Comparing average expected utility over all risk attitudes using (9) and (A.1) yields:

$$\overline{\overline{EU}}_P - \overline{\overline{EU}}_T = \frac{1}{2(r''-\underline{r})}\Big\{ \Big[\frac{(\bar{a}-c)^2}{\bar{a}} + 0.5(r'-\underline{r})\sigma^2\Big](r'-\underline{r}) + 0.5(\bar{a}-c)(r''-r') \Big\}. \tag{A.3}$$

As $\bar{a} - c > 0$, $r''-r' > 0$, $r''-\underline{r} > 0$ and $r'-\underline{r} > 0$, the difference in (A.3) is positive.

Proof of Proposition 3

For the performance pay sector, define expected utility net of wages as $EV_P = EU_P - E(w_P)$. Taking (3) into account, we obtain:

$$EV_P = \begin{cases} -0.5r\sigma^2 \text{ if } a < c, \\ \\ -c - 0.5r\sigma^2 \text{ if } a \geq c. \end{cases} \tag{A.4}$$

Considering workers with a given risk preference, the average expected utility net of wages is:

$$\overline{EV}_P(r) = \begin{cases} \int_0^c (-0.5r\sigma^2) f(a)da + \int_c^{\bar{a}} (-c-0.5r\sigma^2) f(a)da & \text{if } \underline{r} \le r \le r', \\ \frac{1}{1-F[a^*(r)]} \int_{a^*(r)}^{\bar{a}} (-c-0.5r\sigma^2) f(a)da & \text{if } r' < r < r''. \end{cases} \quad \text{(A.5)}$$

Taking (4) and the uniform distribution of a into account, this yields:

$$\overline{EV}_P(r) = \begin{cases} -c \cdot \frac{\bar{a}-c}{\bar{a}} - 0.5r\sigma^2 & \text{if } \underline{r} \le r \le r', \\ -c - 0.5r\sigma^2 & \text{if } r' < r < r''. \end{cases} \quad \text{(A.6)}$$

From the uniform distribution of r, we can calculate for the performance pay sector average expected utility net of wages over all relevant risk attitudes:

$$\begin{aligned} \overline{\overline{EV}}_P &= \frac{1}{F(r'')} \left\{ \int_{\underline{r}}^{r'} \left[-c \cdot \frac{\bar{a}-c}{\bar{a}} - 0.5r\sigma^2 \right] f(r)dr + \int_{r'}^{r''} \left[-c - 0.5r\sigma^2 \right] f(r)dr \right\} \\ &= \frac{1}{r''-\underline{r}} \left\{ -c \cdot \frac{(r''-\underline{r})\bar{a} - (r'-\underline{r})c}{\bar{a}} - 0.5\sigma^2 \left[(r'')^2 - (\underline{r})^2 \right] \right\}. \end{aligned} \quad \text{(A.7)}$$

Netting out wages in the time rate sector yields

$$V_T = U_T - w_T = 0. \quad \text{(A.8)}$$

To prove Proposition 3, we thus have to show that average expected utility in the performance pay sector may be positive, zero or negative after netting out wages.

If r lies in the interval (r', r''), workers with the same risk attitude sort partially in the time rate and partially in the performance pay sector. Hence, we can compare average expected utility for a given risk attitude. From (A.6) it follows that $\overline{EV}_P(r) \ge 0$ if $c \le -0.5r\sigma^2$ and $\overline{EV}_P(r) < 0$ if $c > -0.5r\sigma^2$.

Furthermore, we can compare average expected utility net of wages over all risk attitudes. Noting that $\bar{a} > c$ and $r'' > r'$ it follows that $-c[(r''-\underline{r})\bar{a} - (r'-\underline{r})c]/\bar{a} < 0$. Hence, if risk averse workers dominate the performance pay sector, i.e. $r'' > -\underline{r}$, (A.7) clearly implies $\overline{\overline{EV}}_P < 0$. However, if risk loving workers dominate the performance pay sector, i.e. $r'' \leq -\underline{r}$, then depending on the parameters $\overline{\overline{EV}}_P$ may be positive, negative or equal to zero.

Proof of Proposition 4.

From (A.8) it follows that $\partial V_T / \partial r = 0$ and from (A.6) it follows that $\partial \overline{EV}_P(r) / \partial r = -0.5\sigma^2$ if $\underline{r} \leq r \leq r''$.

Table 1: Variable Definitions (German Socio-Economic Panel, 2004 Wave)

Job Satisfaction	Overall satisfaction on the job coded from 1 (lowest) to 10 (highest); the orginal category 0 is merged with 1
Performance Pay	Dummy = 1 if the worker faces a regular appraisal that has consequences for his or her earnings
Risk Tolerance	Coded from 0 (not at all willing to take risks) to 10 (very willing to take risks)
Wage	Monthly gross earnings in thousands of Euros
Size 1	Dummy = 1 if worker is in firm with 20 to 200 employees
Size 2	Dummy =1 if worker is in firm with 201 to 2000 employees
Size 3	Dummy = 1 if worker is in firm with more than 2000 employees
Age	Age in years of the worker
Age Squared	Age in years of the worker squared
Education	Years of schooling
Tenure	Number of years with the current employer
Male	Dummy = 1 if the worker is male
Hours Gap	Absolute difference between actual and desired working time
Actual hours	Actual weekly working hours
Occupation Dummies	5 dummy variables created from 3 levels of skill hierarchy for blue collar workers and 3 levels of skill hierarchy from white collar workers
Industry Dummies	7 broad 1 digit controls for industrial sector

Table 2: Distributions of Job Satisfaction and of Risk Tolerance

	Job Satisfaction (Percent)	Risk Tolerance (Percent)
0		3.76
1	1.18	3.03
2	2.12	9.24
3	3.33	12.54
4	3.76	11.57
5	11.41	22.37
6	10.9	12.76
7	19.36	15.09
8	27.15	7.22
9	13.24	1.91
10	7.55	0.51
Total	100	100

N = 3724

Table 3: Sample Means and Standard Deviations

Variables	Performance Pay = 0	Performance Pay = 1
Job Satisfaction	6.97 (1.99)	7.11 (1.87)
Risk Tolerance	4.70 (2.05)	5.07 (2.02)
Firm Size 1	.315 (.464)	.185 (.389)
Firm Size 2	.181 (.385)	.278 (.449)
Firm Size 3	.154 (.360)	.475 (.499)
Age	40.5 (9.66)	40.6 (9.08)
Age Squared	1734 (779)	1735 (742)
Male	.526 (.499)	.704 (.457)
Hours Gap	5.72 (6.97)	6.06 (6.99)
Wage	2.41 (1.78)	3.84 (2.22)
Actual Hours	36.9 (12.7)	42.5 (9.67)
Education	12.1 (2.38)	13.3 (2.82)
Tenure	9.39 (8.61)	11.3 (9.65)
N	2780	944

Table 4: Basic Results: Performance Pay and Job Satisfaction

Variables	1	2	3
Performance pay	.0924** [.037] (2.25)	.0275 [.011] (0.66)	.0135 [.0054] (0.32)
Firm Size 1	-.1091** [-.043] (2.32)	-.1469** [-.058] (3.11)	-.1372** [-.055] (2.82)
Firm Size 2	-.0731 [-.029] (1.40)	-.1318** [-.052] (2.48)	-.1141** [-.045] (2.05)
Firm Size 3	-.1209** [-.048] (2.36)	-.2056** [-.081] (3.89)	-.1647** [-.065] (2.89)
Age	.0106 [.0042] (0.77)	.0029 [.001] (0.21)	-.0004 [-.0002] (0.03)
Age Squared	-.0002 [-.0001] (1.10)	-.0001 [-.0001] (0.77)	-.0001 [-.00003] (0.41)
Male	.0248 [.0099] (0.71)	-.0954** [-.038] (2.43)	-.0784* [-.0312] (1.67)
Hours Gap	-.0128** [-.0051] (4.39)	-.0168** [-.0067] (6.26)	-.0161** [-.0064] (5.65)
Wage		.0824** [.0328] (7.47)	.0775** [.031] (5.47)
Actual Hours			-.0027 [-.0011] (1.33)
Education			-.0329** [-.013] (3.79)
Tenure			-.0070** [-.0028] (2.97)
Occupational Controls	No	No	Yes
Industrial Controls	No	No	Yes
Chi-squared	39.3**	99.8**	142.8**
N	3724	3724	3724

T-statistics are in parentheses and marginal effects are in square brackets. Marginal effects are calculated at the means on the probability of answering one of the three highest satisfaction categories. **Statistically significant at the five percent level; *at the ten percent level.

Table 5: Results with Risk Preference: Performance Pay and Job Satisfaction

Variables	1	2	3
Performance pay	.0902** [.036] (2.20)	.0268 [.011] (0.65)	.0131 [.005] (0.31)
Risk Tolerance	.0156* [.006] (1.77)	.112 [.005] (1.26)	.0092 [.004] (1.03)
Firm Size 1	-.1121** [-.045] (2.38)	-.1486** [-.059] (3.15)	-.1387** [-.055] (2.85)
Firm Size 2	-.0766 [-.031] (1.47)	-.1335** [-.053] (2.52)	-.1160** [-.046] (2.09)
Firm Size 3	-.1251** [-.050] (2.45)	-.2075** [-.082] (3.93)	-.1660** [-.066] (2.92)
Age	.0125 [.005] (0.90)	.0043 [.00.2] (0.31)	-.0009 [.0003] (0.06)
Age Squared	-.0002 [-.0001] (1.21)	-.0001 [-.0001] (0.85)	-.0001 [-.00003] (0.48)
Male	.0117 [.005] (0.32)	-.1034** [-.041] (2.61)	-.0864* [-.034] (1.82)
Hours Gap	-.0132** [-.005] (4.52)	-.0170** [-.007] (6.34)	-.0162** [-.007] (5.70)
Wage		.0814** [.032] (7.33)	.0769** [.031] (5.41)
Actual Hours			-.0027 [-.001] (1.32)
Education			-.0327** [-1.3] (3.78)
Tenure			-.0069** [-0.3] (2.93)
Occupational Controls	No	No	Yes
Industrial Controls	No	No	Yes
Chi-squared	43.0**	101.3**	144.7**
N	3724	3724	3724

T-statistics are in parentheses and marginal effects are in square brackets. Marginal effects are calculated at the means on the probability of answering one of the three highest satisfaction categories. **Statistically significant at the five percent level; *at the ten percent level.

Table 6: Results Limited to Those with Performance Pay: Risk and Job Satisfaction

Variables	1	2	3
Risk Tolerance	.0628** [.025] (3.37)	.0559** [.022] (2.97)	.0587** [.023] (3.09)
Firm Size 1	-.0387 [-.016] (0.23)	-.1231 [-.049] (0.74)	-.1288 [-.051] (0.79)
Firm Size 2	.1711 [.068] (1.07)	.0864 [.034] (0.54)	.1076 [.043] (0.67)
Firm Size 3	.068 [.027] (0.44)	-.061 [-.024] (0.38)	-.0673 [-.027] (0.42)
Age	-.0361 [-.014] (1.15)	-.0555* [-.022] (1.75)	-.0611* [-.024] (1.92)
Age Squared	.0003 [.0001] (0.77)	.0005 [.0002] (1.23)	.0005 [.0002] (1.35)
Male	.0004 [.0002] (0.01)	-.1195 [-.048] (1.40)	-.1110 [-.044] (1.18)
Hours Gap	-.0061 [-.002] (1.00)	-.0123** [-.005] (2.29)	-.0098* [-.004] (1.82)
Wage		.0831** [.033] (3.88)	0.0825** [.033] (3.19)
Actual Hours			-.0113** [-.005] (2.47)
Education			-.0181 [-.007] (1.13)
Tenure			.0007 [.0003] (0.15)
Occupational Controls	No	No	Yes
Industrial Controls	No	No	Yes
Chi-squared	28.4**	46.2**	75.58**
N	944	944	944

T-statistics are in parentheses and marginal effects are in square brackets. Marginal effects are calculated at the means on the probability of answering one of the three highest satisfaction categories. **Statistically significant at the five percent level; *at the ten percent level.

Table 7: Results Limited to Those without Performance Pay: Risk and Job Satisfaction

Variables	1	2	3
Risk Tolerance	.0028 [.001] (0.28)	-.0001 [-.0004] (0.10)	-.0041 [-.0016] (0.40)
Firm Size 1	-.0989** [-.039] (2.01)	-.1341** [-.053] (2.71)	-.1273** [-.050] (2.47)
Firm Size 2	-.1071* [-.043] (1.86)	-.1705** [-.067] (2.88)	-.1498** [-.059] (2.42)
Firm Size 3	-.1484** [-.059] (2.56)	-.2222** [-.087] (3.75)	-.1734** [-.068] (2.72)
Age	.0208 [.008] (1.35)	.0149 [.006] (0.96)	.0133 [.005] (0.83)
Age Squared	-.0003 [-.0001] (1.51)	-.0002 [-.0001] (1.31)	-.0002 [-.0001] (1.03)
Male	-.0168 [.007] (0.68)	-.0998** [-.040] (2.24)	-.0829 [-.033] (1.48)
Hours Gap	-.0152** [-.006] (4.68)	-.0184** [-.007] (5.97)	-.0180** [-.007] (5.54)
Wage		.08419** [.034] (6.60)	.0792** [.032] (4.81)
Actual Hours			-.0011 [-.0004] (0.50)
Education			-.0367** [-.015] (3.55)
Tenure			-.0087** [-.004] (3.14)
Occupational Controls	No	No	Yes
Industrial Controls	No	No	Yes
Chi-squared	34.7**	78.8**	112.03**
N	2780	2780	2780

T-statistics are in parentheses and marginal effects are in square brackets. Marginal effects are calculated at the means on the probability of answering one of the three highest satisfaction categories. **Statistically significant at the five percent level; *at the ten percent level.

Table 8: Robustness Checks

	1	2	3	4	5	6
	Full Sample		Performance Pay Subsample			
Performance Pay	0.036 (0.70)	0.005 (0.12)				
Risk Tolerance			0.050** (2.63)	0.049** (2.45)	0.054** (2.84)	0.053** (2.79)
Bad Health	-0.355** (8.45)		-0.430** (8.95)	-0.414** (8.28)		
Body Height	-0.003 (0.13)		-0.014 (1.27)	-0.14 (1.26)		
Body Height x Male	0.003 (0.506)		0.023* (1.77)	0.020 (1.54)		
Mother's Education	-.0044 (0.98)		-0.109 (1.42)	-0.141** (1.70)		
Wage Fixed Effect		-0.185** (2.76)			0.363** (3.52)	-0.011 (0.07)
Actual Wage	0.070** (4.67)	0.102** (6.01)		0.072** (2.67)		0.087** (2.56)
Additional Controls	Yes	Yes	No	Yes	No	Yes
Occupations	Yes	Yes	No	Yes	No	Yes
Industries	Yes	Yes	No	Yes	No	Yes
N	3419	3608	883	930	883	930

Notes: Each estimation includes the set of controls identified in column one of Table 4. The "additional controls" are those added in column three of Table 4.
**Statistically significant at the five percent level; *at the ten percent level.

Figure 1: $m + 0.5\underline{r}\sigma^2 > 0$ and $m + c + 0.5\bar{r}\sigma^2 \le \bar{a}$

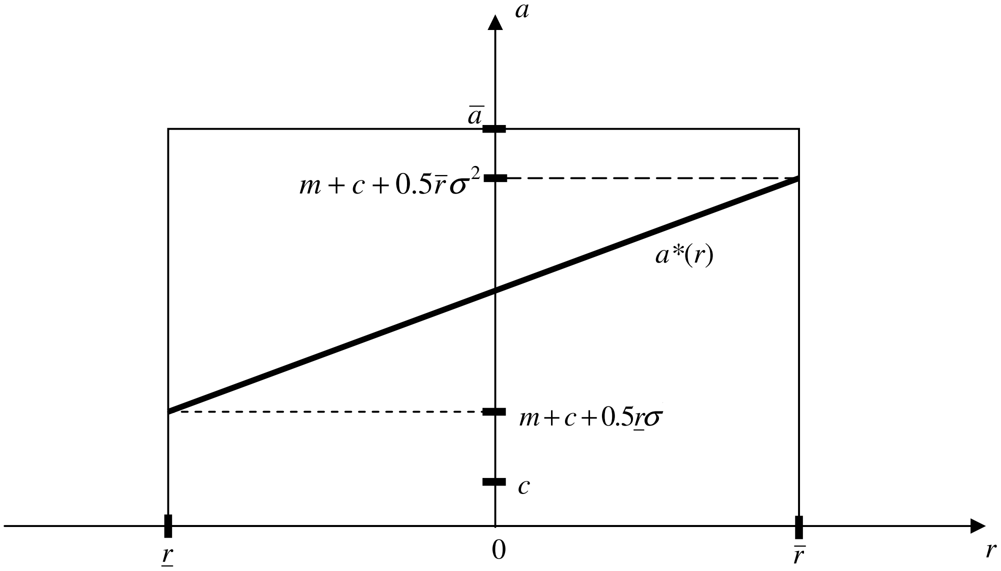
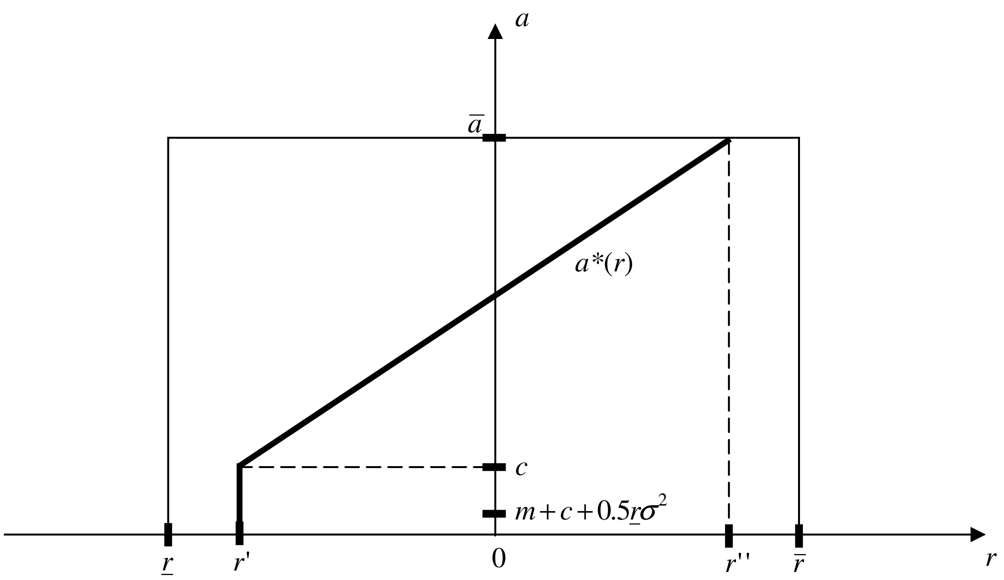


Figure 2: $m + 0.5\underline{r}\sigma^2 < 0$ and $c < \overline{a} < m + c + 0.5\overline{r}\sigma^2$



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Endnotes

[1] Moen and Rosen (2005) provide a theoretical analysis showing that a rat race between firms for talented workers can lead to excessive use of performance pay.

[2] Indeed, the US business press suggests that workers searching for a job and sure of their ability can increase the odds of getting the job by negotiating a higher proportion of incentive pay to base pay (Fisher 2004).

[3] Such results present a contrast to the notion that extrinsic reward crowd out intrinsic motivation and lower worker self-esteem (Frey 1993, Benabou and Tirole 2003).

[4] Similarly, Serfes (2005) and Wright (2004) use the classic agency model to develop Ackerberg and Botticini's (2002) hypothesis that less risk averse managers are hired by firms operating in more risky environments. Wright (2004) notes that in the matching equilibrium less risk-averse workers receive a rent if manager type and firm type are unobservable.

[5] Milgrom and Roberts (1992: pp. 207-8) distinguish between three types of random influences. First, markets and production technology are sources of randomness. Second, the worker's ability to perform can itself be subject to random influences such as weather or health problems. Third, the measurement of performance can be a source of randomness. This is especially true when subjective performance appraisals depend on superiors' idiosyncratic perceptions (for a review see Heywood and Jirjahn 2006). More dramatically, the superior's prejudices and personal preferences toward subordinates may enter the process (Prendergast and Topel 1996).

[6] However, as a check of robustness we also performed the regressions including public sector employees. The pattern of results did not change.

[7] We excluded workers in fishing, forestry and agriculture as there are almost no workers in these sectors receiving performance pay. As a check of robustness, we included observations

from fishing, forestry and agriculture in the regressions. The pattern of results did not change.

[8] The wording of the job satisfaction question in the GSOEP questionnaire is: "How satisfied are you with your job? Please answer by using the following scale where 0 means 'totally unhappy' and 10 means 'totally happy'".

[9] While Goldin (1986) argues women will be disproportionately paid by piece rates, Geddes and Heywood (2003) show that piece rates are the anomaly and that women are less likely to be paid commissions or bonuses.

[10] The explanatory variables include hours, tenure (linear and squared), fulltime and part-time experience (linear and squared), firm size, full-time dummy, occupational dummies, industry dummies and detailed education measures. The estimate is available upon request.