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ABSTRACT

Performance Pay and Alcohol Use in Germany

We study the link between performance pay and alcohol use in Germany, a country with mandated health insurance. Previous research from the US argues that alcohol use as a form of "self-medication" may be a natural response to the stress and uncertainty of performance pay when many workers do not have access to health insurance. We find that the likelihood of consuming each of four types of alcohol (beer, wine, spirits, and mixed drinks) is higher for those receiving performance pay even controlling for a long list of economic, social and personality characteristics and in sensible IV estimates. We also show that the total number of types of alcohol consumed is larger for those receiving performance pay. We conclude that even in the face of mandated health insurance, the link found in the US persists in Germany.

JEL Classification: I12, J33
Keywords: performance pay, alcohol, stress

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1. Introduction

Survey and experimental evidence show that performance pay increases firm performance by attracting more talented workers and inducing higher worker effort (Bandiera et al. 2005; Banker et al. 1996; Cadsby et al. 2007; Dohmen and Falk 2011; Gielen et al. 2010; Heywood et al. 2011; Jirjahn 2016; Lazear 2000; Paarsch and Shearer 2000, Shaw 2015, Shearer 2004). Yet, performance pay also creates unintended costs including reduced product quality and maintenance, less cooperative helping effort, and failure to share valuable information (Freeman and Kleiner 2005). In Adam Smith's (1776) discussion of piece rates, he argued that performance pay also incentivizes workers to risk their health. Not surprisingly, a growing number of recent studies examine the health consequences of performance pay as we will review. Far less studied is the hypothesis that performance pay increases alcohol use. This neglect persists despite medical evidence that work stress increases alcohol use and that performance pay generates work stress.

We use German survey evidence to confirm that performance pay associates strongly with an increased probability of consuming each of four alcohol types: beer, wine, spirits, and mixed drinks. This persists despite inclusion of a large set of relevant control variables. We control for risk tolerance and a series of additional personality traits and economic preferences that influence both sorting into performance pay and alcohol use. We control for an income effect in which performance pay increases income and so alcohol usage. We also account for other sources of work stress, a host of demographic characteristics, region, and industry. Importantly, the associations also persist in a series of plausible IV estimations taking the potential endogeneity of performance pay into account.

Our study is among the first to examine the relationship between performance pay and alcohol use and the only one we are aware of outside the United States. In the United States there exists particular concern that the widespread absence of health insurance could be a cause of "self-medication" and so alcohol use (Artz et al. 2021). Thus, evidence from Germany, a country with mandated health insurance, represents an important expansion. It shows that performance pay increases the likelihood of such "self-medication" even when health insurance is available.

The evidence is timely given a broad trend towards performance pay (Lemieux et al, 2009), evidence that it may be particularly common in Germany (Jirjahn 2002), and extensive concern about the social cost of alcohol use.

Alcohol abuse disrupts families, workplaces and communities and creates substantial societal costs. Consumption in Germany is declining but remains well above the EU average with as many as 3 million Germans having an "alcoholic disorder" and generating 57.04 billion Euros per year in excess economic costs (DHS German Center for Addiction Issues 2020). Excess consumption generates 39 Billion Euros per year of expenditures from the German Statutory Health Insurance Fund and Pension Fund and is associated with an average loss of 7 years in life expectancy (Effertz et al. 2017). Indeed, 4.4 percent of all deaths in Germany in 2012 were attributable to alcohol (OECD 2015).

Employers broadly recognize these costs and absorb some of them in increased absence and lower on the job performance (Thørrisen et al. 2019). They may try to penalize risky alcohol use and provide programs connecting workers with treatment (McGurie and Ruhm 1993). Yet, the costs associated with alcohol use may not be prominent when setting compensation and many of the costs will be borne not by employers but by families, communities, and governments.

The finding that performance pay associates with alcohol use has at least three implications. First, the benefits to firms of increased productivity and better talent may be partially offset by costs associated with alcohol use. Second, because firms do not bear the full cost, public intervention to monitor and perhaps even regulate the use or intensity of performance pay could be warranted. Third, the increased earnings associated with performance pay (Seiler 1984; Parent 1999; Pekkarinen and Ridell 2008; Green and Heywood 2016) may partially reflect a compensating differential for stress and the risks of alcohol use.

We suggest that the balancing of benefits and costs of performance pay should include its association with alcohol use. The fact that those on performance pay have elevated alcohol use does not necessarily make the typical worker or firm worse off from using performance pay.[1] Instead, like the other unintended consequences, this elevation is one part of an overall evaluation of the welfare consequences of performance pay.

The next section sets the context by summarizing the empirical evidence on the relationship between performance pay and worker health. We stress studies that examine longer-term health and stress. Section 3 presents the data and variables. Section 4 provides our empirical results confirming the link between performance pay and alcohol use. The final section concludes.

2. Motivation and Previous Research

2.1 Performance Pay and Health

The initial literature emphasized that performance pay (and especially piece rates) could increase workplace accidents.[2] Thus, piece rates are associated with higher accident rates for Swedish loggers (Sundstroem-Frisk 1984), Canadian tree cutters (Toupin et al. 2007) and workers in India's fertilizer industry (Saha et al. 2004). US truck drivers are more likely to violate safety laws and be in an accident when paid by the mile rather than by

the hour (Monaco and Williams 2000). Freeman and Kleiner (2005) provide evidence from a US shoe manufacturing firm that piece rates are associated with higher worker compensation costs reflecting more workplace injuries. Others move beyond case studies with broad survey data to demonstrate a positive link between performance pay and accidents. Bender et al. (2012) show that piece rates increase the risk of workplace injury in the European Working Conditions Survey. Artz and Heywood (2015) find that US blue-collar workers have an increased risk of workplace injury when their pay is based on output.

However, the health consequences of performance pay appear to go far beyond an increased risk of workplace accidents. Foster and Rosenzweig (1984) show that piece rate agricultural workers expend effort to the point that it worsens their physical health. Frick et al. (2013) show increased sickness absence after a German steel firm introduced production bonuses. DeVaro and Heywood (2017) show greater sickness absence and physical ailments (repetitive stress injuries and bone/joint ailments) among UK workers at firms using performance pay. Davis (2016) examines health among Vietnamese garment workers and reports that working for piece rates provided the most consistent and important variable negatively affecting *emotional* health. Bender and Theodossiou (2014) demonstrate British workers receiving performance pay (including bonuses, commissions and other more common white-collar performance pay) face a larger hazard both of falling out of good self-reported health and moving into a state of anxiety. Cadsby et al. (2016) use laboratory experiments to demonstrate that performance pay increases reported stress among the risk averse. Allan et al. (2017, 2020) demonstrate that those receiving performance pay have objectively higher stress as measured by cortisol hormone levels. Dahl and Pierce (2019) use Dutch administrative records to demonstrate that the adoption of performance pay by an employer generates a four to six percent

increase in the usage of prescribed anti-anxiety drugs and anti-depressants by workers. They conclude that performance pay induces stress and anxiety that harms mental health and leads to increased prescriptions.

2.2 Performance Pay and Alcohol Consumption

To summarize, previous research has shown that performance pay generates increased exertion and speed, the taking of fewer breaks, the taking of greater risks, working to exhaustion, and higher work stress. As emphasized by the medical literature, increased pressure and stress at work likely spills over to alcohol use at home (Grunberg et al. 1998).[3] The stress happens not only within the work role but also from trying to integrate work and family roles (Frone 1999). The medical literature identifies alcohol use as a coping mechanism associated with negative work stress as well as related home events (Carney et al. 2000). Specifically, Frone (2008) confirms two work stressors, work overload and job/pay insecurity. Dee (2001) examines work stress, confirming that higher unemployment rates increase alcohol use even for the employed.

Against this background it is straightforward to hypothesize that alcohol use should increase in response to the stress, risk, earnings insecurity, time conflict and workload associated with performance pay. However, econometric studies examining the association between performance pay and alcohol use are rare. One exception is a study by Artz et al. (2021). They note that a large share of US private industry workers do not have health insurance and so the easy access to doctors and pharmaceutical prescriptions. Thus, they suggest the connection between work stress and alcohol (and illicit drugs) may be particularly strong in the US and in their sample of younger and less likely insured workers. While they cannot distinguish between types of alcohol, their worker fixed effect estimates demonstrate that the probability of alcohol use increases with performance pay.

Moreover, health insurance is associated with lower use of alcohol and serves to moderate the influence of performance pay.

We examine German evidence on the association between performance pay and alcohol use for the first time. The absence of health insurance prominent in the US examination will not be an issue in our sample. Germany is a country with mandated health insurance. Thus, we can examine if there is an association between performance pay and alcohol use even when health insurance is available. We have access to only a single cross-section but can distinguish four types of alcohol: beer, wine, spirits, and mixed drinks. Typically abuse comes with markedly different amounts of these four types as the alcohol in 12 ounces of beer, typically equals that of 5 ounces of wine and 1.5 ounces of spirits (Harvard Medical School, 2014). We provide evidence that each of these is associated with performance pay despite a usually strong set of control variables that capture important worker and job characteristics including personality, overall job satisfaction, earnings and much more. The pattern also persists in a series of plausible IV exercises. We also show that the number of types of alcohol consumed is positively associated with performance pay.

3. Data and Variables

3.1 Dataset

We draw our data from the SOEP (Goebel et al. 2019). The SOEP is a large representative longitudinal survey of private households in Germany. Routine socio-economic and demographic questions are asked annually in the interviews. Different 'special' topic questions appear in specific waves. For the empirical analysis, we use data from the 2008 wave as it contains information on both performance pay and the type of alcohol consumed. We focus on employees aged 22 to 59 years. This reflects the typical working age population in Germany. We exclude apprentices and marginally employed

individuals (monthly earnings of below 450 Euros) who are unlikely to face a choice of sorting into performance pay. After retaining observations for which full information is available, the analysis uses data from 5,065 employees.

3.2 Performance Pay

Our indicator of performance-related pay is built from a two-stage question asking first if the employee is subject to regular and formalized performance appraisals by a superior. The underlying question is: "Is your own performance regularly assessed by a superior as part of a formalized procedure?" Second, if the employee answers in the affirmative, he or she is asked whether the performance appraisal has consequences for his or her earnings; i.e., consequences for monthly gross wage, annual bonus, future wage growth and/or potential promotion. Building from Cornelissen et al. (2011) and Grund and Sliwka (2010), we use a broad indicator of performance-related pay. The dummy variable for performance pay is equal to 1 if an employee is subject to performance appraisal and the performance appraisal has any consequences for the employee's earnings. In our sample, 26.8 percent of the employees identify themselves as subject to performance pay.

3.3 Alcohol Consumption

The dependent variables are based on the question "How often do you drink the following alcoholic beverages?" The survey lists four types of alcohol: (1) Beer (2) Wine or champagne (3) Spirits (hard liquor, brandy etc.) (4) Mixed drinks (alcopops, cocktails etc.). For each type of alcohol, interviewees respond on a four-point Likert scale with the categories "never", "seldom", "occasionally" and "regularly".

Thus, like most other studies on substance use our examination is based on self-reported measures of alcohol consumption. This gives rise to the issue of a possible self-reporting bias (Hoyt and Chaloupka 1994). The overall reliability and consistency of self-

reported measures of substance use have typically proven very high (O'Malley et al. 1983, Simons et al. 2015). Nonetheless to reduce the risk of any self-reporting bias, we define dummy variables for the use of alcohol. For each type of alcoholic beverage, the respective dummy variable is equal to 1 if the person drinks that type of alcohol seldom, occasionally or regularly. The dummy equals 0 if the person never drinks the respective type of alcohol. A person may underreport the frequency of alcohol consumption, but is less likely to misreport whether or not he or she drinks alcohol.

In addition to the issue of reporting bias, the medical advice on drinking is clear. The Harvard Medical School advises its patients "If you don't drink, don't start. The risks that come with drinking alcohol very frequently outweigh the benefits" (Harvard Medical School, 2014). Thus, while we initially focus on the single dummy dependent variables for each type of alcohol use, in extensions we also add up the dummies and consider the number of alcohol types consumed.

Table 1 provides descriptive statistics on alcohol use for employees with and without performance pay. For each type of alcoholic beverage, the share of employees drinking that type of alcohol is significantly larger for those receiving performance pay than for those not receiving performance pay. The share of employees drinking wine or spirits is 7 percentage points higher and the share of those drinking beer or mixed drinks is 5 percentage points higher among those receiving performance pay. Significant differences can also be found if we consider the average number of alcohol types consumed. The average number of alcohol types is about 10 percent higher for employees subject to performance pay. The descriptive statistics can be seen as a first indication that performance pay is indeed associated with increased alcohol consumption. At issue is now whether this also holds in multivariate analyses that account for other factors influencing alcohol consumption.

3.4 Control Variables

Performance pay has been shown to involve a self-sorting process of employees along multiple dimensions of the employees' personal characteristics (Dohmen and Falk 2011).[4] These characteristics may also play a role in alcohol consumption. Thus, in order to isolate the influence of performance pay it is important to control for a broad set of other determinants of alcohol consumption.

As shown in Table 2, the dataset provides a rich set of control variables. This allows us to account for a series of economic preferences (Becker et al. 2012). We include indicators of positive and negative reciprocity to account for social preferences (Dohmen et al. 2009) and a variable for the worker's patience to control for time preferences. Furthermore, risk preferences are captured by an experimentally validated indicator of risk tolerance measuring the willingness to take risk on an eleven-point Likert scale that ranges from "not at all willing to take risks" to "very willing to take risks" (Dohmen et al. 2011). Risk tolerant workers are more likely to sort into performance pay (Bandiera et al. 2015; Cornelissen et al. 2011; Grund and Sliwka 2010). This follows naturally as performance pay entails an increased earnings risk for workers. At the same time, there is a well-established link between risk preferences and alcohol use (Lundborg and Lindgren 2002; Blondel et al. 2007; Dave and Saffer 2008).

We also control for classical psychological personality traits by including variables for the Big Five (conscientiousness, extraversion, agreeableness, openness and neuroticism). The Big Five model is one of the most widely shared taxonomy of personality traits with predictive power for a series of life outcomes including labor market performance, health (Almlund et al. 2011) and also alcohol consumption (Turianoa et al. 2012). Moreover, we include a variable for locus of control capturing the extent to which a person thinks his or her action causes the consequences he or she

encounters. Persons with a more internal locus of control believe that their own actions determine outcomes whereas persons with a more external locus believe that outcomes are determined by luck, fate or the actions of others. An internal locus of control is an important non-cognitive skill that has been shown to have a strong influence on labor market success (Bowles et al. 2001; Cobb-Clark 2015) and the sorting into performance pay (Curme and Stefanec 2007; Heywood et al. 2017). It has also been shown that individuals with an internal locus are more likely to make long-term investments in personal health (Cobb-Clark et al. 2014). However, the influence on alcohol consumption appears to be ambiguous. On the one hand, investments in long-term health may involve reduced alcohol consumption (Chiteji 2010). On the other hand, persons with an internal locus of control may tend to underestimate the future risks of alcohol use resulting in an increased consumption (Caliendo and Hennecke 2020).

A series of variables capture the worker's socio-economic characteristics. We control for the worker's education, age, gender, and migration background. The family situation is accounted for by variables for marital status, number of children and presence of very young children. We control for regional influences on alcohol consumption and also take into account if the worker is disabled.

Moreover, we control for the worker's monthly earnings. Previous research has shown that workers on performance pay receive higher earnings (Booth and Frank 1999; Green and Heywood 2016; Heywood and O'Halloran 2005; Heywood and Parent 2012; Jirjahn and Stephan 2004; Parent 1999; Pekkarinen and Riddell 2008; Seiler 1984). By controlling for earnings, we rule out that a possible link between performance pay and alcohol use simply reflects an income effect. We also account for the worker's general financial situation by including a dummy equal to 1 if the worker is concerned about his or her economic situation.[5]

Work-related factors are also likely to play a role in alcohol consumption. We include variables for job insecurity, job satisfaction, actual working hours, and the discrepancy between actual and desired working hours. Finally, we control for public sector employees and include six industry and ten two-digit occupation dummies.

4. Results

4.1 Alcohol Use

Table 3 provides the initial estimates. The determinants of using the four types of alcohol are estimated by using a multivariate probit model. This model is a generalization of the bivariate model. Similar to a bivariate model, the multivariate model allows for correlated error terms between the various probit equations. To account for a possible correlation of the error terms, the equations are jointly estimated by maximum simulated likelihood (Capellari and Jenkins 2003). The estimates show that all correlations of the error terms are significantly positive. This suggests that there are unobserved factors influencing the use of the four types of alcohol in the same direction.

Many of the control variable emerge as important statistical determinants. As anticipated, those with greater risk tolerance are more likely to consume each type of alcohol. The influences of the other economic preferences and personality traits are less uniform, but they also clearly play a role. Those with an internal locus of control are more likely to consume alcohol supporting the notion that they may underestimate the future risks of alcohol. The extraverted, the more open and the emotionally less stable are more likely to consume alcohol while the conscientious and the agreeable are less likely to consume alcohol. Negative reciprocity is a positive and positive reciprocity a negative covariate of alcohol consumption. There is also some evidence that patience is associated with lower likelihood of consuming alcohol. Among the demographic controls, more educated workers, and those married or with partners are each more likely to consume

alcohol. Disabled workers, immigrants and those with more children are less likely to consume alcohol. Gender shows a mixed pattern and helps highlight the differences across types of alcohol. Men are more likely to consume beer and spirits, but women are more likely to consume wine and cocktails. The influence of age also depends on the type of alcohol. Older workers are more likely to drink beer and wine, but are less likely to consume spirits and mixed drinks. Work related variables that emerge as statistically significant include that those with higher incomes are more likely to consume alcohol (confirmation of the income effect) and that those with greater working hours are less likely to consume alcohol. Depending on the type of alcohol, the estimates also indicate that public sector employees and employees with higher job satisfaction have a lower likelihood of consuming alcohol.

The critical indicator of performance pay tells a convincing story with three of the four coefficients in harmony. While the regression does not show a statistically significant influence on the likelihood of consuming beer, performance pay emerges as a significantly positive determinant of drinking wine, drinking spirits, and drinking cocktails. The influence on these three types of alcohol is also quantitatively noticeable. The average marginal effects show that performance pay is associated with between a 3 and 4 percentage point increase in the likelihood of drinking cocktails, drinking spirits, and drinking wine. Thus, our initial estimates indicate the potential for a reasonable amount of "self-medication." The results conform to the hypothesis that the increased pressure and stress associated with performance pay can lead workers to consume alcohol.

We recognize that these results may suffer from endogeneity of the performance pay variable. There may be unobserved factors correlated with both performance pay and alcohol use. These unobserved factors could result in an omitted variable bias resulting in an overestimation or underestimation of the influence of performance pay. We examine

possible endogeneity of performance pay by estimating a recursive multivariate probit model (Balia and Jones 2008, Jones 2007). This model is an extension of the recursive bivariate model (Greene 1998). In principle, identification of the recursive probit model is ensured by its inherent nonlinearity (Wilde 2000). However, to avoid identification that relies solely on the functional form, exclusion restrictions are usually imposed to improve identification.

Finding convincing exclusion restrictions is always a matter of debate. Just-identifying exclusion restrictions are based on assumptions that cannot be formally tested (Heckman 2000, Keane 2010). They can only be justified by reasoning and an appeal to intuition. Hence, attempts to account for endogeneity should be largely viewed as exploratory and perhaps best seen as robustness tests. Here we follow an instrumental variable (IV) strategy based on aggregation (for examples see Bilanakos et al. 2018; Cornelissen et al. 2011; Fisman and Svensson 2007; Lai and Ng 2004; Lee 2004; Machin and Wadhwani 1991, Woessman and West 2006 among others). We use the share of workers receiving performance pay calculated for 228 detailed 4-digit occupations as instrument. When calculating the share of those receiving performance pay for each worker's occupation, we exclude the own contribution of the respective worker to that share. The share of workers receiving performance pay reflects the general propensity within a narrowly defined occupation that workers are on performance pay. For example, a high share of workers receiving performance pay within an occupation may indicate that worker output can be easily monitored for that occupation. This, in turn, increases the individual worker's probability of receiving performance pay (Bayo-Moriones et al. 2013).[6]

The validity of the instrument requires that the share of workers with performance pay in the detailed occupation has no direct influence on the individual worker's use of

alcohol. Importantly, the validity of an instrument can depend on the control variables included (Angrist and Pischke 2009: chapter 4.5.2). An instrument may be not valid per se, but may be valid only after conditioning on covariates. The dataset enables us to include a rich set of controls. In particular note that our instrument allows us to still include the ten broadly defined two-digit occupation dummies. Our control variables capture important aspects of the working conditions increasing confidence in the validity of the instrument. Thus, to the extent that we control for critical working conditions, we do not expect a direct influence of the instrument, but only an indirect influence through the individual worker's likelihood of receiving performance pay.

Table 4 provides the key results of the recursive multivariate probit regression. The determinants of alcohol use are simultaneously estimated with the determinants of receiving performance pay. The estimation shows that our instrumental variable is significantly associated with performance pay. The share of workers on performance pay within an occupation is a positive determinant of an individual worker's probability of receiving performance pay.

The error term of the performance pay equation is significantly correlated with three out of the four error terms of the alcohol equations. Thus, the hypothesis of exogeneity is rejected and the performance pay variable has to be considered as endogenous in these equations. The correlations between the error term of the performance pay equation and the error terms of alcohol equations are negative.

These negative correlations of the error terms imply that the estimated effects of performance pay on the use of the various types of alcohol are stronger in the recursive model than the in the simple multivariate probit. In the beer equation, performance pay now takes a significantly positive coefficient and so is a significant statistical determinant of consuming each of the four types of alcohol. The average marginal effects reveal that

performance pay is associated with a 6.5 percentage point increase in the likelihood of consuming beer up to a 14.7 percentage point increase in the likelihood of consuming spirits. Thus, the basic point is that we can confirm the link between performance pay and alcohol consumption even when accounting for the endogeneity of performance pay. The estimated influence of performance pay is even more sizable when taking the issue of endogeneity into account. Finally, we note the continued positive correlations across the error terms of alcohol types.

4.2 Number of Alcohol Types Consumed

In a further step, we consider the number of the different alcohol types consumed as a measure of an intensive margin. Table 5 shows the results of an OLS regression and a Poisson model that accounts for the count data nature of the dependent variable, zero to four.[7] Both methods yield very similar results.

Many of the control variables continue to show a role matching that in the individual consumption estimates. This holds for economic preferences, personality traits, migration background, education, disability, presence of children, earnings, public sector employment, job satisfaction, and working hours. A couple of the controls play a different role in the number of alcohol types consumed. Older workers consume fewer types of alcohol perhaps as a period of experimentation ends. Finally, men clearly consume more types of alcohol than women.

Most, importantly in our context, the results from both the OLS and the Poisson regression indicate that those receiving performance pay consume more types of alcohol. Specifically, those receiving performance pay consume a statistically significant but small additional .08 types of alcohol.

Table 6 shows a series of regressions addressing the issue of endogeneity in the context of this intensive margin. In each regression, we again use the share of workers on

performance pay within an occupation as an instrument. In all models, the instrument emerges as a significantly positive determinant of receiving performance pay. Column (1) shows the results of a two-stage least squares (2SLS) regression. In this regression, identification is solely ensured through the exclusion restriction, but not through distributional assumptions. In the first stage, the determinants of performance pay are estimated by a linear probability model. As shown by the Cragg-Donald and the Anderson-Rubin test statistics, the hypothesis of a weak instrument is rejected. In the second stage, the predicted value of performance pay is included in the regression explaining the number of alcohol types consumed. The Durbin-Wu-Hausman test on endogenous regressors rejects the hypothesis that performance pay is exogenous. Most importantly, this step confirms a significantly positive influence of performance pay on the number of alcohol types consumed. The estimated influence is even much more sizable when taking the endogeneity of performance pay into account. The estimate is close to one-half of an additional type of alcohol. This is substantial as the mean number of types consumed is about 2 and one-half. Thus, this can be viewed as a roughly 20 percent increase.

In column (2), we use a treatment effects model (Maddala 1983; Vella and Verbeek 1999) as performance pay is a dummy variable. A probit for the determinants of receiving performance pay and the linear equation for the determinants of the number of alcohol types are jointly estimated by using maximum likelihood. A likelihood ratio test of independent equations rejects the hypothesis of exogeneity. There is a significantly negative correlation, rho, between the error terms in both equations. The negative correlation of the error terms implies that the estimated effect of performance pay is biased downward in the OLS regression of Table 5. Thus, taking the endogeneity of performance pay into account, the treatment effects model reveals an even stronger

influence of performance pay on the number of types of alcohol consumed. Interestingly, the size of the influence of performance pay remains about one-half additional type of alcohol.

In column (3), we present results of an IV Poisson regression (Wooldridge 2010). The regression is based on a control function approach. In the first stage, we estimate the determinants of receiving performance pay. In the second stage, we include the residuals obtained from that estimation in the count data regression on the determinants of the number of alcohol types. The variable for the residual takes a significantly negative coefficient. Thus, the hypothesis of exogeneity is also rejected in this regression. Taking the endogeneity into account, the estimation shows a stronger influence of performance pay than the Poisson regression of Table 5. The estimated size remains around one-half of one type of alcohol virtually identical to the estimated size using the other estimation methods that control for endogeneity.

5. Conclusions

Performance pay can improve profits to the firm and earnings to the worker by aligning their interests. Yet, performance pay can also create secondary consequences that impact both firms and workers. These secondary consequences can become especially important when they impact families, friends and society that are external to the employment relationship. If performance pay causes additional alcohol use, it may generate exactly such externalities.

Performance pay creates inherent earnings uncertainty. It also creates incentives to exert effort, take risks and work longer. This uncertainty, exhaustion, stress, and risk has been thought to result in the coping behavior of drinking alcohol. Our test of the hypothesis that performance pay is associated with alcohol use takes on importance because of its setting in Germany. The previous study by Artz et al. (2021) on the subject

emphasizes that "self-medication" becomes a substitute for medical intervention where many workers do not have health insurance and, hence, do not have easy access to medical intervention. Indeed, Artz et al. found a strong link among younger, disproportionately uninsured workers, in the United States. We explore whether the pattern differs substantially in Germany with its universally mandated health insurance.

Our study for Germany confirms that the likelihood of drinking four types of alcohol is greater among those on performance pay. This holds true even after controlling for a particularly long list of economic, social and personality controls and presenting sensible instrumental variable estimates. We also show that those receiving performance pay drink a larger number of types of alcohol. Thus, the provision of mandated health insurance appears insufficient to eliminate the link between performance pay and drinking. This leaves open the possible need for further intervention into the ways in which workers respond the stress from performance pay.

Finally, we recognize that not all alcohol consumption brings negative consequences. Similarly, we do not suggest that an influence of performance pay on alcohol consumption is sufficient to argue against the use of performance pay. Instead, we simply suggest that any balancing of benefit and harm should likely include the elevated stress and use of alcohol together with the recognition that this use can have negative consequences for health, families, and society.

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Table 1: Definitions and Descriptive Statistics of the Dependent Variables

Variable	*Definition*	*(1)* *No performance pay* *Mean* *(Std. dev.)*	*(2)* *Performance pay* *Mean* *(Std. dev.)*	*(3)* *Difference* *(t-statistic)*
Beer	Dummy equals 1 if the worker consumes beer.	0.724 (0.447)	0.774 (0.419)	-0.050 (3.58)***
Wine	Dummy equals 1 if the worker consumes wine or champagne.	0.796 (0.403)	0.865 (0.342)	-0.069 (5.58)***
Spirits	Dummy equals 1 if the worker consumes spirits (hard liquor, brandy etc.).	0.527 (0.499)	0.602 (0.490)	-0.075 (4.74)***
Mixed drinks	Dummy equals 1 if the worker consumes mixed drinks (alcopops, cocktails etc.).	0.332 (0.471)	0.383 (0.486)	-0.051 (3.40)***
Number of types of alcohol	Number of the different types of alcohol (beer, wine, spirits, mixed drinks) the worker consumes.	2.379 (1.182)	2.623 (1.098)	-0.244 (6.64)***
N		3709	1356	5065

Use of multiple types of alcohol is possible. ***Statistically significant at the 1% level.

Table 2: Definitions and Descriptive Statistics of the Explanatory Variables

Variable	*Definition (mean, std. dev.)*
Performance pay	Dummy equals 1 if the worker faces a regular performance appraisal that has consequences for his or her earnings (0.2677, 0.443).
Performance pay share by occupation	The share of workers receiving performance pay calculated for 228 detailed four-digit occupations excluding the worker's own contribution to the share (0.2681, 0.204).
Risk tolerance	Score of risk tolerance. The interviewee answers the question: "Are you generally willing to take risks or do you try to avoid taking risks?" on an eleven-point Likert scale. The scale ranges from 0 "not at all willing to take risks" to 10 "very willing to take risks" (4.596, 2.159).
Locus of control	Score of locus of control constructed from adding up nine items measured on a seven-point Likert scale ranging from 1 "disagree completely" to 7 "agree completely". The sum of items is divided by 9. The items are "How my life takes course is dependent on me", "Success is gained through hard work", "Inborn abilities are more important than any efforts one can make", "Compared to others, I have not achieved what I deserve", "What one achieves in life is, in the first instance, a question of destiny or luck", "I often experience that others have a controlling influence over my life", "When I encounter difficulties in my life, I often doubt my own abilities", "The opportunities that I have in life are determined by the social conditions" and "I have little control over things that happen in my life". Items 4–9 are recoded in inverse order before adding up. The sum of items is divided by 9. (4.92, 0.714).
Conscientiousness	Score of conscientiousness constructed from adding up three survey items measured on a seven-point Likert scale ranging from 1 "does not apply to me at all" to 7 "applies to me perfectly". The sum of items is divided by 3. The items are: I see myself as someone who… "does a thorough job", "does things effectively and efficiently", "tends to be lazy". The last item was recoded in inverse order before adding up. (5.898, 0.87).
Extraversion	Score of extraversion constructed from adding up three survey items measured on a seven-point Likert scale ranging from 1 "does not apply to me at all" to 7 "applies to me perfectly". The sum of items is divided by 3. The items are: I see myself as someone who… "is communicative", "is sociable", "is reserved". The last item was recoded in inverse order before adding up. (4.776, 1.143).
Agreeableness	Score of agreeableness constructed from adding up three survey items measured on a seven-point Likert scale ranging from 1 "does not apply to me at all" to 7 "applies to me perfectly". The sum of items is divided by 3. The items are: I see myself as someone who… "is sometimes somewhat rude to others", "has a forgiving nature", "is considerate and kind to others". The first item was recoded in inverse order before adding up. (5.277, 0.963).
Openness	Score of openness constructed from adding up three survey items measured on a seven-point Likert scale ranging from 1 "does not apply to me at all" to 7 "applies to me perfectly". The sum of items is divided by 3. The items are: I see myself as someone who… "is original ", values artistic experiences", "has an active imagination". (4.384, 1.139).
Neuroticism	Score of neuroticism constructed from adding up three survey items measured on a seven-point Likert scale ranging from 1 "does not apply to me at all" to 7 "applies to me perfectly". The sum of items is divided by 3. The items are: I see myself as someone who… "worries a lot", "gets nervous easily", "deals well with stress". The last item was recoded in inverse order before adding up. (3.71, 1.186).
Positive reciprocity	Score of positive reciprocity constructed from adding up three survey items measured on a seven-point Likert scale ranging from 1 "does not apply to me at all" to 7 "applies to me perfectly". The sum of the three items is divided by 3. The items are "If someone does me a favor, I am prepared to return it", "I go out of my way to help somebody who has been kind to me before", "I am ready to undergo personal costs to help somebody who helped me before". (5.841, 0.86).
Negative reciprocity	Score of negative reciprocity constructed from adding up three survey items measured on a seven-point Likert scale ranging from 1 "does not apply to me at all" to 7 "applies to me perfectly". The sum of the three items is divided by 3. The items are "If I suffer a serious wrong, I will take revenge as soon as possible, no matter what the cost", "If somebody puts

	me in a difficult position, I will do the same to him/her", "If somebody offends me, I will offend him/her back". (3.093, 1.373).
Patience	Score of patience. The interviewee answers the question "How would you describe yourself: Are you generally an impatient person, or someone who always shows great patience?" on an eleven-point Likert. The scale ranges from 0 "very impatient" to 10 "very patient". (6.031, 2.281).
Financial insecurity	Dummy equals 1 if the workers is somewhat concerned or very concerned about his or her own economic situation (0.720, 0.449).
Job insecurity	Dummy equals 1 if the worker is somewhat concerned or very concerned about his or her job security (0.527, 0.499).
Migration background	Dummy equals 1 if the worker is a first-generation or second-generation immigrant (0.116, 0.32).
Male worker	Dummy equals 1 if the worker is a man (0.543, 0.498).
Age 31–40	Dummy equals 1 if the worker is aged 31–40 years (0.254, 0.436).
Age 41–50	Dummy equals 1 if the worker is aged 41–50 years (0.364, 0.481).
Age 51–59	Dummy equals 1 if the worker is aged 51–59 years (0.256, 0.437).
Education	The worker's years of education ranging from 7 to 18 years (12.94, 2.678).
Married	Dummy equals 1 if the worker is married (0.636, 0.481).
Unmarried	Dummy equals 1 if the worker has a partner, but is not married (0.213, 0.41).
Disabled	Dummy equals 1 if the worker is disabled (0.05, 0.217).
Young child	Dummy equals 1 if the worker has a child under 2 years (0.019, 0.135).
Number of children	Number of children under 16 years in the household (0.587, 0.876).
Public sector	Dummy equals 1 if the worker is employed in the public sector (0.306, 0.461).
Job satisfaction	Overall job satisfaction scored on an eleven-point Likert scale ranging from 0 "totally unsatisfied" to 10 "totally satisfied" (6.958, 1.903).
Hours gap	Absolute difference between actual working hours per week and desired working hours per week (6.44, 6.96).
Working hours	The number of weekly hours the worker actually works including possible over-time (40.73, 9.925).
Log of income	Natural log of net income received last month (7.353, 0.544).
East Germany	Dummy equals 1 if the worker resides in one of the federal states located in East Germany (Berlin, Brandenburg, Mecklenburg-West Pomerania, Saxony, Saxony-Anhalt, Thuringia) (0.27, 0.444).
Southern West Germany	Dummy equals 1 if the worker resides in one of the Southern federal states located in West Germany (Bavaria, Baden-Wuerttemberg) (0.263, 0.44).
Northern West Germany	Dummy equals 1 if the worker resides in one of the Northern federal states located in West Germany (Schleswig-Holstein, Hamburg, Lower Saxony, Bremen) (0.137, 0.344).
Industry dummies	Six broad industry dummies.
Occupation dummies	Ten broad two-digit occupation dummies.

N = 5065. For the performance pay share by occupation the number of observations is equal to 5036.

Table 3: Determinants of Alcohol Use

	(1) *Beer*	*(2)* *Wine*	*(3)* *Spirits*	*(4)* *Mixed drinks*
Performance pay	-0.043 [-0.012] (0.84)	0.155 [0.037] (2.90)***	0.094 [0.034] (2.07)**	0.100 [0.032] (2.14)**
Risk tolerance	0.017 [0.005] (1.74)*	0.035 [0.008] (3.36)***	0.016 [0.006] (1.71)*	0.027 [0.009] (2.78)***
Locus of control	0.084 [0.022] (2.67)***	-0.006 [-0.002] (-0.20)	0.094 [0.034] (3.28)***	0.013 [0.004] (0.42)
Conscientiousness	-0.042 [-0.012] (1.64)	-0.021 [-0.005] (0.80)	-0.108 [-0.040] (4.60)***	-0.115 [-0.036] (4.80)***
Extraversion	0.038 [0.010] (1.88)*	0.005 [0.001] (0.24)	0.053 [0.019] (2.95)***	0.041 [0.013] (2.19)**
Agreeableness	-0.058 [-0.016] (2.42)**	-0.005 [-0.001] (0.22)	-0.031 [-0.011] (1.41)	-0.013 [-0.004] (0.57)
Openness	0.018 [0.005] (0.91)	0.077 [0.018] (3.67)***	0.005 [0.002] (0.30)	0.010 [0.003] (0.55)
Neuroticism	-0.015 [-0.004] (0.79)	0.020 [0.005] (1.00)	0.029 [0.011] (1.67)*	0.006 [0.002] (0.33)
Positive reciprocity	-0.029 [-0.008] (1.20)	-0.020 [-0.005] (0.79)	-0.042 [-0.015] (1.90)*	-0.013 [-0.004] (0.58)
Negative reciprocity	0.008 [0.002] (0.53)	0.009 [0.002] (0.58)	0.025 [0.009] (1.69)*	0.053 [0.017] (3.48)***
Patience	-0.013 [-0.003] (1.30)	0.007 [0.002] (0.64)	-0.017 [-0.006] (1.96)**	0.005 [0.001] (0.51)
Financial insecurity	-0.004 [-0.001] (0.07)	-0.017 [-0.004] (0.30)	0.082 [0.030] (1.74)*	0.078 [0.025] (1.57)
Job insecurity	0.009 [0.002] (0.18)	0.005 [0.001] (0.10)	0.043 [0.016] (1.00)	0.062 [0.020] (1.36)
Migration background	-0.433 [-0.128] (6.48)***	-0.247 [-0.065] (3.68)***	-0.274 [-0.101] (4.47)***	-0.292 [-0.090] (4.41)***
Male worker	1.114 [0.331] (19.56)***	-0.333 [-0.080] (5.64)***	0.467 [0.175] (9.47)***	-0.198 [-0.064] (3.83)***
Age: 31–40	0.071 [0.019] (0.96)	0.008 [0.002] (0.11)	-0.165 [-0.061] (2.42)**	-0.585 [-0.169] (8.45)***
Age: 41–50	0.159 [0.043] (2.17)**	0.179 [0.043] (2.40)**	-0.058 [-0.021] (0.87)	-0.964 [-0.285] (13.90)***
Age: 51–59	0.163 [0.044] (2.04)**	0.238 [0.055] (2.86)***	-0.127 [-0.047] (1.74)*	-1.327 [-0.360] (17.00)***
Education	0.046 [0.013] (4.09)***	0.059 [0.014] (4.89)***	0.024 [0.009] (2.47)**	0.001 [0.0003] (0.08)
Married	-0.064 [-0.017] (1.01)	0.198 [0.049] (3.12)***	0.163 [0.059] (2.90)***	-0.065 [-0.021] (1.09)
Unmarried	0.029 [0.008] (0.42)	0.198 [0.046] (2.84)***	0.199 [0.073] (3.23)***	0.124 [0.041] (1.93)*
Disabled	-0.183 [-0.052] (1.93)*	-0.170 [-0.044] (1.75)*	-0.410 [-0.151] (4.78)***	-0.206 [-0.064] (2.11)**
Young child	0.045 [0.012] (0.27)	-0.154 [-0.040] (1.03)	-0.134 [-0.049] (0.94)	-0.302 [-0.091] (-2.03)**
Number of children	0.015 [0.004] (0.51)	-0.002 [0.000] (0.06)	-0.128 [-0.047] (5.12)***	-0.077 [-0.025] (2.91)***
Public sector	0.019 [0.005] (0.34)	-0.100 [-0.025] (1.62)	-0.066 [-0.024] (1.26)	-0.104 [-0.033] (1.86)*

Job satisfaction	-0.024 [-0.007] (2.08)**	-0.002 [-0.0004] (0.15)	-0.012 [-0.005] (1.18)	-0.014 [-0.004] (1.26)
Hours gap	0.001 [0.0003] (0.32)	0.005 [0.001] (1.46)	0.001 [0.0003] (0.29)	0.002 [0.001] (0.62)
Working hours	-0.007 [-0.002] (2.34)**	-0.009 [-0.002] (2.74)***	-0.006 [-0.002] (2.09)**	-0.006 [-0.002] (2.18)**
Log of income	0.012 [0.003] (0.20)	0.161 [0.036] (2.50)**	0.061 [0.022] (1.09)	0.119 [0.039] (1.98)**
East Germany	-0.265 [-0.075] (4.80)***	0.280 [0.065] (4.72)***	0.147 [0.053] (2.89)***	0.150 [0.049] (2.79)***
Southern West Germany	-0.044 [-0.012] (0.79)	0.322 [0.073] (5.66)***	0.172 [0.063] (3.55)***	0.032 [0.010] (0.63)
Northern West Germany	-0.030 [-0.008] (0.45)	0.076 [0.018] (1.15)	0.205 [0.074] (3.47)***	0.172 [0.057] (2.81)***
Constant	-0.077 (0.15)	-1.403 (2.62)***	-0.751 (1.61)	-0.250 (0.51)
Industry dummies	Included	Included	Included	Included
Occupation dummies	Included	Included	Included	Included
Log likelihood	-10089.42			
Correlation of error terms				
Wine	0.571 (24.86)***	---	---	---
Spirits	0.493 (23.16)***	0.517 (23.41)***	---	---
Mixed drinks	0.244 (9.19)***	0.308 (11.40)***	0.412 (19.13)***	---
N	5065			

Method: Multivariate Probit. The table shows the estimated coefficients. *Z*-statistics in parentheses are based on robust standard errors. Average marginal effects are in square brackets. * Statistically significant at the 10% level; ** at the 5% level; *** at the 1% level.

Table 4: Determinants of Alcohol Use; the Issue of Endogeneity

	(1) *Beer*	*(2)* *Wine*	*(3)* *Spirits*	*(4)* *Mixed drinks*	*(5)* *Performance pay*
Performance pay	0.244 [0.065] (1.88)*	0.312 [0.071] (2.60)***	0.406 [0.147] (2.74)***	0.340 [0.113] (2.34)**	---
Performance pay share by occupation	---	---	---	---	1.445 [0.456] (11.89)***
Log likelihood	-12448.365				
Correlation of error terms					
Performance pay	-0.174 (2.40)**	-0.108 (1.63)	-0.200 (2.34)**	-0.150 (1.80)*	---
Wine	0.567 (24.05)***	---	---	---	---
Spirits	0.494 (22.77)***	0.510 (22.39)***	---	---	---
Mixed drinks	0.225 (8.34)***	0.325 (11.80)***	0.414 (18.33)***	---	---
N	5036				

Method: Recursive Multivariate Probit. The table shows the estimated coefficients. *Z*-statistics in parentheses are based on robust standard errors. Average marginal effects are in square brackets.* Statistically significant at the 10% level; ** at the 5% level; *** at the 1% level. Control variables are included, but suppressed to save space.

Table 5: Determinants of the Number of Types of Alcohol

	(1) *OLS*	*(2)* *Poisson*
Performance pay	0.083 (2.18)**	0.031 [0.075] (2.04)**
Risk tolerance	0.027 (3.42)***	0.011 [0.028] (3.43)***
Locus of control	0.058 (2.34)**	0.024 [0.059] (2.37)**
Conscientiousness	-0.093 (4.63)***	-0.038 [-0.092] (4.70)***
Extraversion	0.044 (2.82)***	0.018 [0.045] (2.84)***
Agreeableness	-0.038 (2.03)**	-0.016 [-0.039] (2.08)**
Openness	0.031 (2.02)**	0.014 [0.034] (2.15)**
Neuroticism	0.011 (0.72)	0.004 [0.011] (0.70)
Positive reciprocity	-0.031 (1.62)	-0.013 [-0.032] (1.67)*
Negative reciprocity	0.029 (2.35)**	0.012 [0.029] (2.33)**
Patience	-0.007 (0.92)	-0.003 [-0.007] (0.93)
Financial insecurity	0.056 (1.40)	0.023 [0.057] (1.44)
Job insecurity	0.034 (0.92)	0.014 [0.035] (0.94)
Migration background	-0.390 (6.99)***	-0.178 [-0.435] (6.69)***
Male worker	0.357 (8.41)***	0.147 [0.359] (8.42)***
Age: 31–40	-0.254 (4.10)***	-0.102 [-0.248] (4.32)***
Age: 41–50	-0.289 (4.75)***	-0.116 [-0.283] (4.95)***
Age: 51–59	-0.413 (6.35)***	-0.170 [-0.415] (6.60)***
Education	0.036 (4.33)***	0.015 [0.036] (4.42)***
Married	0.067 (1.34)	0.029 [0.070] (1.35)
Unmarried	0.175 (3.19)***	0.069 [0.169] (3.15)***
Disabled	-0.315 (4.35)***	-0.143 [-0.350] (4.10)***
Young child	-0.206 (1.61)	-0.080 [-0.197] (1.52)
Number of children	-0.074 (3.48)***	-0.030 [-0.073] (3.38)***
Public sector	-0.085 (1.88)*	-0.035 [-0.084] (1.82)*

Job satisfaction	-0.016 (1.72)*	-0.007 [-0.016] (1.78)*
Hours gap	0.003 (1.11)	0.001 [0.003] (1.23)
Working hours	-0.009 (3.63)***	-0.004 [-0.009] (3.75)***
Log of income	0.100 (2.11)**	0.046 [0.112] (2.29)**
East Germany	0.087 (1.98)**	0.038 [0.094] (2.13)**
Southern West Germany	0.141 (3.44)***	0.058 [0.142] (3.44)***
Northern West Germany	0.143 (2.83)***	0.059 [0.143] (2.87)***
Constant	1.477 (3.67)***	0.442 (2.63)***
Industry dummies	Included	Included
Occupation dummies	Included	Included
R^2 / Pseudo R^2	0.1177	0.0199
Pearson goodness-of-fit χ^2	---	2605.9
Deviance goodness-of-fit χ^2	---	3417.6
N	5065	5065

The table indicates the estimated coefficients. *T*-statistics (column 1) and *z*-statistics (column 2) in parentheses are based on robust standard errors. Average marginal effects are in square brackets. *Statistically significant at the 10% level; ** at the 5% level; *** at the 1% level.

Table 6: Determinants of the Number of Types of Alcohol; the Issue of Endogeneity

	(1) *2SLS*	*(2)* *Treatment effects model; ML*	*(3)* *IV Poisson model*
	Number of types of alcohol		
Performance pay	0.510 (2.67)***	0.471 (4.07)***	0.185 [0.453] (2.32)**
First-stage residual	---	---	-0.166 (2.02)**
	Performance pay		
Performance pay share by occupation	0.474 (12.29)***	1.440 (12.05)***	0.474 (12.35)***
Cragg-Donald Wald F	189.11	---	189.11
Anderson-Rubin test statistic	7.16***	---	7.16***
Durbin Wu-Hausman χ^2	4.866**	---	4.866**
Correlation of error terms	---	-0.215 (-3.67)***	---
χ^2 (LR test of independent equations)	---	7.01***	---
N	5036	5036	5036

The table shows the estimated coefficients. *T*-statistics (column 1) and *z*-statistics (columns 2 and 3) in parentheses are based on robust standard errors. Average marginal effects are in square brackets. **Statistically significant at the 5% level; *** at the 1% level. Control variables are included, but suppressed to save space.

Endnotes

[1] Indeed, UK evidence suggests that workers job satisfaction is higher on average when receiving performance pay (Green and Heywood 2008).

[2] See also the survey by Johannson et al. (2010).

[3] The medical literature on stress argues that constant chronic stress is both psychologically and physically damaging (Rohleder 2014).

[4] See Cornelissen et al. (2011), Heywood et al. (2017) and Jirjahn and Mohrenweiser (2019) for theoretical models of performance pay and multi-dimensional sorting.

[5] The broad measure of financial insecurity may capture things like the level of debt that could be important in controlling for sorting into both performance pay and drinking. Yet, we recognize that it could also possibly reflect the earnings uncertainty associated with performance. To be careful we reran all estimates removing this control. It made no noticeable difference in the pattern of results.

[6] It is easier to identify performance for salespeople or drill press operators than for an assembly line operator. The aggregated measure then indicates greater scope for provision in the first occupations than in the latter.

[7] The Pearson goodness-of-fit χ^2 and the deviance goodness-of-fit χ^2 suggest the usage of the Poisson model instead of the negative binomial model.