The Influence of Performance Pay on Alcohol and Drug Use

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Presentation to Memorial University, Fall 2018

Outline

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Research question

- Is performance pay associated with higher rates of alcohol and drug use among young workers in representative US survey data?
- If yes, does this association persist in the face of controlling for worker (and firm) heterogeneity?
- If yes, is the association of an important size?

Research results

- In a representative sample of younger working Americans, the likelihood of using alcohol, marijuana and hard drugs are significantly higher among those receiving performance pay.

- While varying with substance, use by those with performance pay is approximately 1/3rd larger.

- This survives our best attempts to control for heterogeneity in workers and work/firm match.

Motivation

- Performance pay that emphasizes output has been well know to increase productivity (Lazear 2000, Banker et al. 1996, Haley 2003, Jones et al. 2010, Gielen et al. 2010, Heywood et al. 2011).

- Performance pay also attracts talent (Lazear 2000, Cadsby et al. 2007, Dohmen and Falk 2011 and Shaw 2015).

Motivation

- Performance pay may also create unintended costs. These include reduced product quality, reduced maintenance, wasted materials and failure to share valuable information (Freeman and Kleiner 2005). Prominent among these costs, since Adam Smith's discussion of piece rates is the risk of *reduced worker health*.

- Performance pay increases the reward for greater exertion, taking fewer breaks, the taking of greater risks, and working too fast or to the point of exhaustion. (DeVaro and Heywood 2017)

Motivation

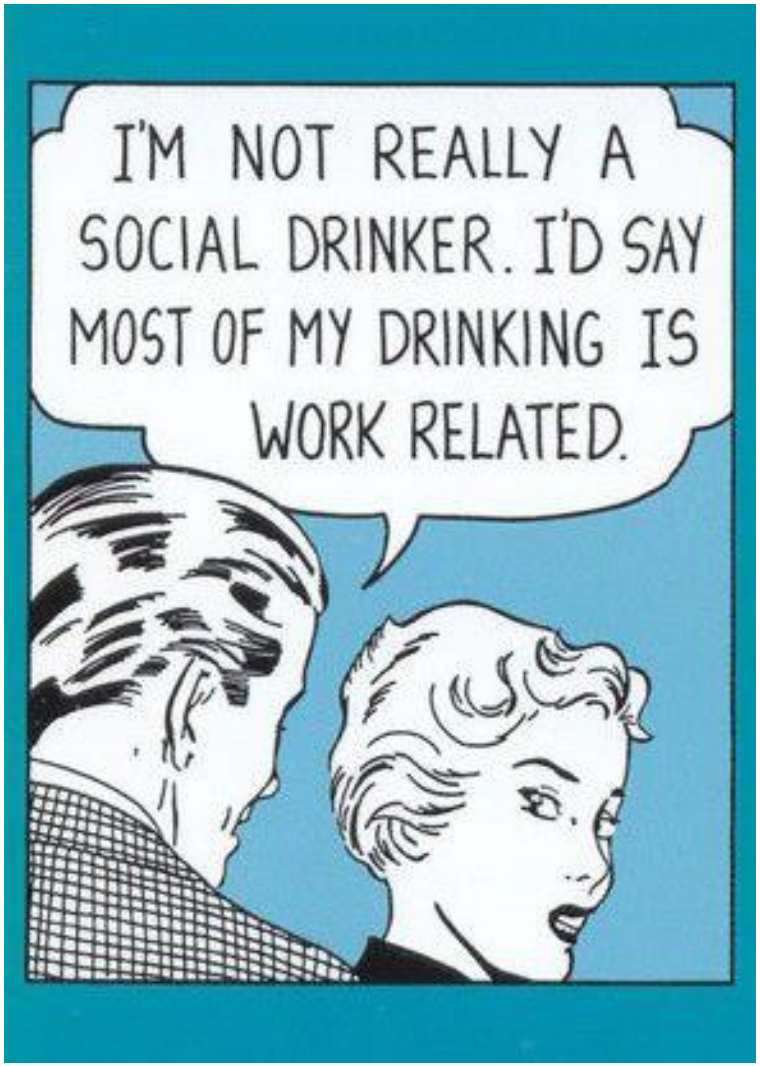
- While an increasing body of research examines the link between worker health and performance pay, the link to substance use has not be examined.
- This seems surprising as substance use has been explicitly seen as a coping mechanism for workplace stress by the medical profession (Grunberg et al. 1998, Frone 1999, 2008 Carney et al. 2000).
- The social costs associated with substance use are enormous. The CDC estimates that lost earnings, diminished productivity, health expenditures and crime costs exceed $442 billion per year

Hypothesis

- Performance pay increases stress at work by generating income uncertainty and incentives to expend greater effort and spend longer hours.

- This stress is reflected in the spillover coping mechanism of greater substance use.

A spillover from work



Not necessarily at work

Background on Performance Pay and Health

1. Occupational Health Studies of Piece Rates: A steel plant, fertilizer workers, loggers, tree trimers, US truck drivers (heart stress test results and injuries suggest worse health)

2. Economists examining injury rates: Bender et al. (2012) use the European Working Conditions Survey, Artz and Heywood (2015) use the 1979 NSLY and DeVaro and Heywood (2017) use various waves of the WERS (UK worker-firm matched data). All show elevated risk of workplace injury.

Background on Performance Pay and Health

1. Economists examining broader measures of health in survey data: Foster and Rosenzweig (1984) worse physical health measures for agricultural piece rate workers; Davis (2016) self-reported measures of both physical and *emotional* health in a large survey of workers in 109 Vietnamese garment factories; Bender and Theodossiou (2014) show a larger hazard of falling out of good self-reported heath (using a broad measure of performance pay) and also isolate the role of self-reported anxiety/stress.
2. Economists conducting experiments: Cadsby et al. (2016) demonstrate that performance pay increases stress among risk averse individuals; Allen et al. (2017) those earning performance pay experience higher self-reported stress and higher cortisol hormone levels.

The study closest to ours

Dahl and Pierce (2018) take for granted the link between stressful work and coping through substances. They also assume that performance pay increases stress. They examine the relationship between performance pay and prescription drug use in the Netherlands using administrative data. SSRI use is positively associated with performance pay.

The association is strongest for those above age 50 and strongest for men.

Data and Approach

- National Longitudinal Survey of Youth 1997 (NLSY). Age 16-21 in the 1997. We use waves from 2002 to 2011.

- We use self-reported measures of alcohol and drug use. These are binary responses indicating whether individuals consumed marijuana (pot/weed) or alcohol in the last 30 days, and whether individuals used any "drugs like cocaine, crack, heroin, or crystal meth, or any other substance not prescribed by a doctor, in order to get high or achieve an altered state since the date of the last interview" (roughly one year in the past).

- Use of alcohol, 66.3%, of marijuana, 16.8%, and of cocaine, 4.6%.

Data and Approach

- The NLSY contains five forms of compensation other than a simple time rate of pay: tips, commissions, bonuses, incentive pay and a very small “other” category. It is not made clear whether these are individual or group oriented nor is it made clear whether bonuses and incentive pay are objectively set (by formula) or determined by the subjective judgement of a supervisor.
- We group these together with 21% of the sample receiving performance pay.

Data and Approach

We take seriously the concern of sorting. Performance pay sorts on ability and risk preferences and so does substance use. Thus, one could anticipate a non-causal association.

Our contribution is largely an attempt to examine this concern.

1. Include proxies of ability and preference.
2. Control for worker specific effects
3. Control for work-employer match specific effects

Results (logit)

	Marijuana	Cocaine	Alcohol
Performance pay	0.0346***	0.015***	0.072***
	(6.288)	(4.999)	(11.259)
	{1.287}	{1.351}	{1.449}
Female	-0.057***	-0.010**	-0.0458***
	(-7.283)	(-2.496)	(-5.543)
Black	-0.019**	-0.071***	-0.146***
	(-2.128)	(-10.664)	(-17.582)
Hispanic	-0.047***	-0.019***	-0.056***
	(-4.674)	(-3.562)	(-5.945)
Age	-0.005**	-0.002	0.005**
	(-2.176)	(-1.260)	(2.084)
Married	-0.131***	-0.049***	-0.112***
	(-14.704)	(-9.112)	(-14.408)
Education	-0.006***	-0.001	0.027***
	(-4.090)	(-1.563)	(17.272)
Hours	-4.5×10^{-4}**	-1.2×10^{-4}	9.1×10^{-4}***
	(-2.549)	(-1.184)	(3.968)
Health insurance	-0.043***	-0.015***	0.010*
	(-8.419)	(-5.588)	(1.699)
Occupations (19)	Yes	Yes	Yes
Industries (18)	Yes	Yes	Yes
Regions (4)	Yes	Yes	Yes
Years / waves (10)	Yes	Yes	Yes
Constant	0.112	-1.476**	-1.430***
	(0.251)	(-2.109)	(-4.102)
Observations	62,425	61,673	62,425

Results 2 (logit)

	Marijuana	Cocaine	Alcohol
Performance pay	0.033***	0.011***	0.065***
	(5.206)	(3.375)	(8.796)
	{1.274}	{1.265}	{1.413}
Hours	$-3.2x10^{-4}$	$-4.6x10^{-5}$	0.001***
	(-1.579)	(-0.412)	(4.280)
Log hourly wages	-0.001	-0.005**	0.039***
	(-0.245)	(-2.082)	(7.705)
ASVAB	0.041***	0.018***	0.058***
	(8.274)	(7.055)	(10.841)
Risk	0.024***	0.011***	0.023***
	(5.543)	(4.685)	(5.308)
Occupations (19)	Yes	Yes	Yes
Industries (18)	Yes	Yes	Yes
Regions (4)	Yes	Yes	Yes
Years / waves (10)	Yes	Yes	Yes
Constant	-0.741	-2.535***	-2.278***
	(-1.405)	(-3.144)	(-5.360)
Observations	46927	46475	46927

Results 3 (fe logit)

	Worker Fixed Effects			Worker in Employer Fixed Effects		
	Marijuana	Cocaine	Alcohol	Marijuana	Cocaine	Alcohol
Performance pay	1.158***	1.207**	1.122***	1.290***	1.258*	1.134**
	-3.123	-2.573	-3.049	-3.260	-1.810	-2.071
Age	0.933	1.037	0.983	0.982	0.953	1.101
	(-1.064)	-0.322	(-0.334)	(-0.170)	(-0.282)	-1.317
Married	0.582***	0.519***	0.661***	0.673***	0.614**	0.697***
	(-6.841)	(-4.901)	(-8.064)	(-2.792)	(-2.221)	(-4.549)
Education	0.988	0.976	1.098***	0.990	0.971	1.003
	(-0.639)	(-0.833)	-6.832	(-0.289)	(-0.667)	-0.137
Hours	0.998	1.005*	1.005***	1.001	1.012*	1.001
	(-0.992)	-1.901	-3.707	-0.182	-1.797	-0.586
Health insurance	0.995	0.900	0.841***	0.734***	0.999	0.780***
	-0.464	(-1.536)	(-4.986)	(-3.919)	(-0.008)	(-4.372)
Log hourly wages	0.833***	1.005	1.108***	1.025	0.941	1.058
	(-4.047)	-0.100	-3.957	-0.425	(-0.593)	-1.145
Occupations (19)	Yes	Yes	Yes	Yes	Yes	Yes
Industries (18)	Yes	Yes	Yes	Yes	Yes	Yes
Regions (4)	Yes	Yes	Yes	Yes	Yes	Yes
Years / waves (10)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,442	9,947	38,976	8,140	3,411	16,809

Results 4 (fe Poisson)

Appendix A2: Worker fixed effects Poisson estimations: frequency of use

	Marijuana	**Cocaine**	**Alcohol**
	(1)	**(2)**	**(3)**
Performance pay	0.083***	0.197*	0.041***
	(3.095)	(1.956)	(3.230)
Age	-0.144***	0.255	-0.028
	(-3.512)	(1.444)	(-1.471)
Married	-0.249***	-0.595***	-0.154***
	(-4.497)	(-3.218)	(-7.470)
Education	-0.001	0.029	0.030***
	(-0.097)	(0.498)	(5.343)
Hours	-0.000	-0.000	0.002***
	(-0.417)	(-0.042)	(3.647)
Health insurance	-0.042	-0.144	-0.040***
	(-1.612)	(-1.278)	(-2.990)
Log hourly wages	0.032*	-0.063	0.017*
	(1.844)	(-0.905)	(1.751)
Occupations (19)	Yes	Yes	Yes
Industries (18)	Yes	Yes	Yes
Regions (4)	Yes	Yes	Yes
Years / waves (9)	Yes	Yes	Yes
Observations	21,676	8,982	54,886

Notes: Heteroskedasticity robust standard errors are clustered at the individual level. Column (2) estimates exclude workers using cocaine more often than every workday (407 observations). t-statistics are in parentheses. ***, ** and * represent statistical significance at the 1%, 5% and 10% levels, respectively.

Results 5 (logit with proxies)

	Marijuana			
	White		Nonwhite	
	Women	Men	Women	Men
Performance pay	0.037***	0.040***	0.032**	-0.007
	(3.715)	(3.545)	(2.304)	(-0.474)
	{1.373}	{1.297}	{1.364}	{0.954}
Marijuana proportion	0.149	0.211	0.112	0.188
Performance pay proportion	0.238	0.217	0.188	0.198
Observations	12,633	13,447	11,003	9,824

	Cocaine			
	White		Nonwhite	
	Women	Men	Women	Men
Performance pay	0.014**	0.015**	0.011	-0.006
	(2.428)	(2.513)	(1.408)	(-0.908)
	{1.337}	{1.288}	{1.531}	{0.842}
Cocaine proportion	0.053	0.066	0.023	0.038
Performance pay proportion	0.239	0.218	0.188	0.199
Observations	12,482	13,321	10,748	9,598

	Alcohol			
	White		Nonwhite	
	Women	Men	Women	Men
Performance pay	0.082***	0.051***	0.080***	0.034**
	(6.339)	(3.998)	(4.678)	(2.013)
	{1.575}	{1.337}	{1.438}	{1.175}
Alcohol proportion	0.724	0.756	0.550	0.625
Performance pay proportion	0.238	0.217	0.188	0.198
Observations	12,633	13,447	11,023	9,824

Results 6 (logit with proxies)

	Depression (aggregate)			Depression (individual)		
	Marijuana	Cocaine	Alcohol	Marijuana	Cocaine	Alcohol
Performance pay	1.307***	1.255***	1.371***	1.307***	1.259***	1.370***
	(-4.71)	(-2.647)	(-6.494)	(-4.713)	(-2.633)	(-6.501)
Depression	1.229***	1.344***	1.010***			
	(-13.40)	(-13.29)	(-6.911)			
Nervous				1.242***	1.287***	1.134***
				(-5.591)	(-4.302)	(-3.931)
Blue				1.322***	1.438***	1.144***
				(-7.051)**	(-5.567)	(-3.937)
In-the-dumps				1.114***	1.310***	1.016
			-	(-2.461)	(-4.229)	(-0.429)
Occupations (19)	Yes	Yes	Yes	Yes	Yes	Yes
Industries (18)	Yes	Yes	Yes	Yes	Yes	Yes
Regions (4)	Yes	Yes	Yes	Yes	Yes	Yes
Years / waves (10)	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,906	22,741	22,906	22,906	22,741	22,906

A Further Robustness Test

We removed those who work in bars and restaurants on the assumption that they are disproportionately paid tips and have easy access to alcohol (and other substances?)

The progression of proxies, individual fe and employer match fe remain largely unchanged with significance for all three substance uses.

An Interesting Hint

If one divides the sample by employer provided health insurance, those with insurance have smaller responses to performance pay and significantly so for alcohol use.

This hints (obliquely) at the possible substitution of prescribed drugs and substance use.

Summary of Results

- Substance use is greater by those on performance pay
- Best efforts to account for sorting by ability or risk preferences does not change this
- This does not seem to be driven by depressive characteristics
- It is far less obvious (or is even absent) for Nonwhite men

Potential Implications

- What appears to be a return on increased productivity may, in part, be a compensating differential for workplace stress.

- To the extent the costs of substance use are not captured inside the employment relationship, there may be a rationale for either/or regulating the application of performance pay and increasing access to medical care.