DRAFT FOR AEA CONFERENCE, JANUARY 2017

PERSONALITY TRAITS AND PERFORMANCE CONTRACTS: EVIDENCE FROM A FIELD EXPERIMENT AMONG MATERNITY CARE PROVIDERS IN INDIA

Katherine Donato, Grant Miller, Manoj Mohanan,
Yulya Truskinovsky, and Marcos Vera-Hernández*

A rapidly growing literature documents that the quality of service delivery in many developing countries – particularly in health and education – is poor (Chaudhury et al. 2006, Das and Hammer 2014, Das, Holla, et al. 2016, Mohanan et al. 2015). Among the large number of interventions aiming to improve service quality, three distinct types of approaches have emerged. The first, and most traditional, emphasizes improving provider skills (through training, for example) and increasing resources available to them (Das, Chowdhury, et al. 2016). A second approach emphasizes increasing and redirecting effort among *existing* service providers. This approach, focused on aligning incentives within principal-agent frameworks, has received considerable recent attention in economics and emphasizes the use of overt incentives (Ashraf, Bandiera, and Jack 2014, Banerjee, Glennerster, and Duflo 2008, Björkman and Svensson 2009, Deserranno 2016). In contrast to the second, the third approach instead emphasizes *selecting* workers and service providers with desirable attributes related to good performance (a common practice in industrial psychology, for example) (Ashraf, Bandiera, and Lee 2016, Dal Bó, Finan, and Rossi 2013, Finan, Olken, and Pande 2015). Little is known about how the second and third interact. In this paper, we study how agents respond to performance incentives according to

*Donato: Department of Health Policy, Harvard University, Cambridge, MA 02138; Miller: SCID, CHPPOR, SIEPR Stanford University & NBER, Palo Alto, CA; Mohanan: Sanford School of Public Policy, Duke University, Durham NC 27705; Truskinovsky: Center for Population and Development Studies, Harvard University, Cambridge, MA 02138; Vera-Hernández: Department of Economics, University College London & IFS, London. Correspondence to: manoj.mohanan@duke.edu

personality traits – with potentially important implications for both approaches. In doing so, we use data from a field experiment in which maternity care providers in rural India were offered financial incentives for improving maternal and neonatal health outcomes.

I. Background

The use of performance incentives in health care systems in developing countries is widespread (see Finan, Olken, and Pande (2015) and Miller and Babiarz (2014) for reviews). In a broader project studying performance incentives among maternity care providers in India, we randomly assigned providers to either an incentive or a control group. Incentive group providers achieved post-partum hemorrhage (PPH) rates – the leading cause of maternal mortality worldwide – that were 20 percent lower than those in the control group (Mohanan et al. 2016).

Personality traits – defined as patterns of thoughts, feelings, and behavior that predict how individuals respond to circumstances (Roberts 2009) – have drawn attention from economists because of their potential as stable traits that influence performance directly (Almlund et al. 2011, Bowles, Gintis, and Osborne 2001, Cubel et al. 2016). For example, studies of labor market outcomes and school performance find that personality traits can be important predictors of performance (Borghans et al. 2008, Heckman et al. 2006, Heckman and Rubinstein 2001).

A canonical approach to measurement of personality traits is the "Big Five" factor model. [i] Among these five, we focus on Conscientiousness and Neuroticism because previous literature has found them to be consistently correlated with educational and labor market outcomes (Borghans et al. 2008) as well as performance in an experimental setting such as productivity on cognitive tests (Cubel et al. 2016). Conscientiousness is associated with dependability, organization skills, perseverance, and achievement oriented thinking. Neuroticism – the

converse of emotional stability – is associated with anxiety, worry, anger, and insecurity. With recent evidence showing that personality traits play a role in the performance of health service providers (Callen et al. 2015), we explore how behavioral response to financial incentives interact with these two key traits.

II. Experiment, Data and Methods

Our field experiment, conducted in Karnataka, India, tested the effectiveness of performance incentives offered to solo-practice obstetric providers to improve maternal and child health outcomes (post-partum hemorrhage (PPH), sepsis, pre-eclampsia, and neonatal mortality) among the provider's patients. We focus on 53 providers randomized to incentive contracts based on health outcomes and 44 control group providers. Both types of providers received guidelines of the World Health Organization (WHO) and Government of India for best practices in maternity care, signed agreements to participate in the study, and were informed about data collection procedures. The contracts in the performance incentive arm also specified payments for achieving low rates of adverse health outcomes. For further details of the overall study design, data collection protocols, timelines, and results, see Mohanan et al (2016).

We collected survey data both from women delivering babies with participating providers and from providers themselves. Each new mother was surveyed within approximately two weeks of birth, providing information about childbirth, obstetric history, and maternal and neonatal health. Our provider surveys included measures of hospital infrastructure, as well as provider characteristics (education, training, and experience – and the Big Five personality inventory).[ii]

We estimate the effect of incentive contracts on PPH and how they vary by personality traits using the following general estimating equation:

$$PPH_{ip} = \alpha + \beta T_p + \delta P_p + \lambda T_p \times P_p + \theta X_p + \gamma Z_i + s_d + \lambda_e + u_{ip}, \qquad (1)$$

where PPH_{ip} is an indicator of PPH incidence for woman i who received care from provider p, $T_p$is an incentive group indicator, P_p is the score of a personality trait (conscientiousness or neuroticism), Z_i is a vector of time-invariant maternal characteristics (including age, education status, religion, and birth history), X_p is a vector of provider characteristics and s_d and λ_e represent district and enumerator fixed effects. The key parameters of interest are the λs for interactions between performance incentives and the two key personality traits (conscientiousness and neuroticism).

III. Results

Table 1 shows provider attributes in each of the two experiment arms. Our simple randomization of providers into incentive and control arms appears to have produced a balanced sample.

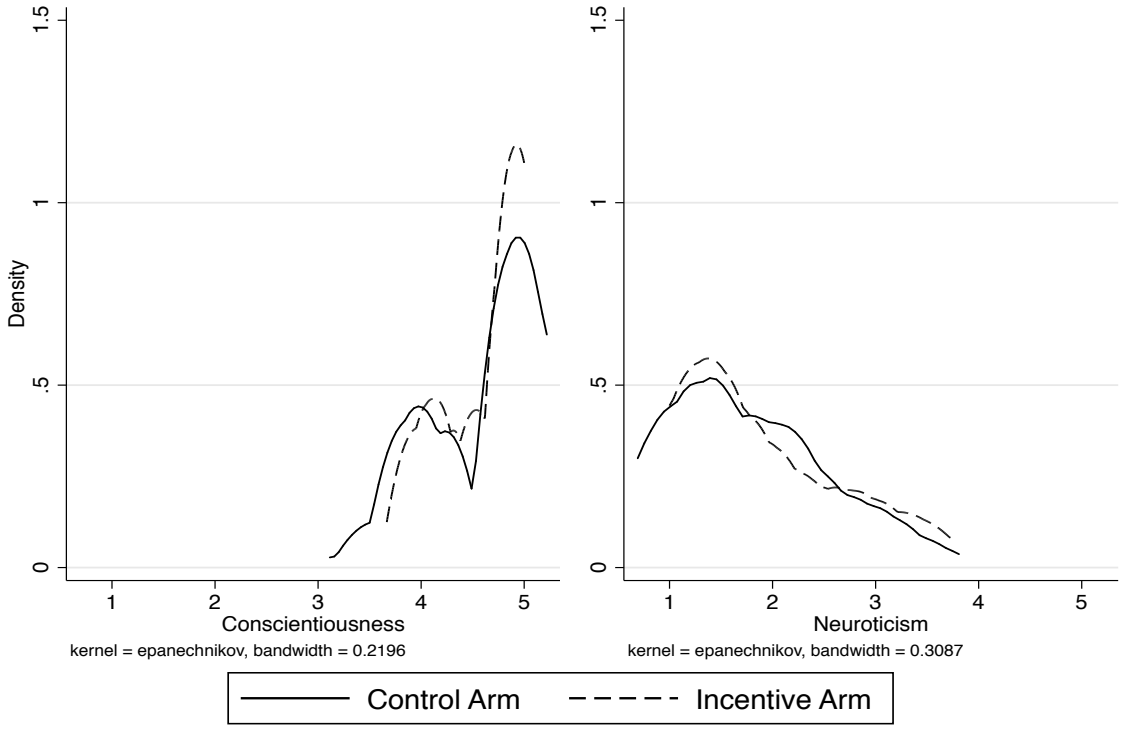
Table 1: Provider Descriptive Statistics

Provider Characteristics	Control Arm	Incentive Arm	Test of Equality (p-value)
Female provider (%)	0.55	0.02	0.850
	(0.50)	(0.09)	
MBBS (%)	0.20	-0.04	0.550
	(0.41)	(0.07)	
BAMS (%)	0.14	-0.04	0.510
	(0.35)	(0.07)	
Other qualification (%)	0.07	-0.03	0.330
	(0.25)	(0.03)	
Years practicing (mean)	18.89	1.71	0.370
	(11.04)	(1.89)	
Years clinic operating (mean)	16.52	3.23	0.130
	(11.24)	(2.14)	
Conscientiousness	4.58	0.03	0.710
	(0.52)	(0.08)	
Neuroticism	1.77	0.00	0.990
	(0.73)	(0.13)	
N	44	53	

Notes: Provider characteristics are self-reported and measured through interviews with the provider or with a staff member. Rows 2-4 refer to provider training: MBBS plus is a Bachelor of Medicine degree with a specialization such as obstetrics, MBBS is a Bachelor of Medicine degree with no additional specialization, BAMS is a degree in Ayurveda medicine. Standard deviations are reported in parentheses. P-values in the final column are associated with F-tests of joint equality across the three study groups.

Figure 1 then shows the distribution of conscientiousness and neuroticism among providers in the control and incentive contract arms. Most providers exhibit high levels of conscientiousness and low levels of neuroticism – and the distribution of each is heavily skewed.

Figure 1: Distribution of Conscientiousness and Neuroticism Among Control and Treatment Providers



Note: Providers in incentive arm received output-based contracts that rewarded improvements in maternal health outcomes

Table 2 shows estimates obtained by estimating regression (1). Because the outcome is individual mother's incidence of PPH, an adverse health outcome, negative estimates reflect better provider performance. The first column shows that more conscientious providers perform better. The coefficients for the incentive contract variable and its interaction with

conscientiousness are statistically different from zero implying that the beneficial effect of the incentive is weaker among more conscientiousness providers (who, absent incentives) do relatively better).

Table 2: Interaction Between Performance Incentives and Personality Traits

	PPH	
Panel A: Regression Results	(1)	(2)
Incentive	-1.133***	-0.255***
	(0.284)	(0.079)
Conscientiousness	-0.193***	
	(0.057)	
Conscientiousness X Incentive	0.231***	
	(0.063)	
Neuroticism		-0.0329
		(0.039)
Neuroticism X Incentive		0.0997**
		(0.048)
Panel B: Linear Combination Results	Conscientiousness	Neuroticism
Treatment + interaction at 25th percentile	-0.133***	-0.13***
	(0.032)	(0.032)
Treatment + interaction at mean	-0.063**	-0.074**
	(0.032)	(0.031)
Treatment + interaction at 75th percentile	0.021	-0.031
	(0.045)	(0.044)
N	1993	1993
R-sq	0.297	0.296
Dep Var Mean	0.364	

* p<0.10 ** p<0.05 *** p<0.01

Notes: Standard errors in parentheses. Both columns include provider and patient level controls as well as district and enumerator fixed effects. Conscientiousness and Neuroticism are measured through provider surveys. 25th and 75th percentiles: (Conscientiousness: 4.3 and 5) and (Neuroticism: 1.25 and 2.25)

To help interpret estimates from our regressions, we also report differences between the 25th and 75th percentiles of conscientiousness: For providers in the 25th percentile of conscientiousness (scoring 4.3 out of 5), the incentive contract decreases the PPH risk by 13.3

percentage points, whilst it is not statistically significant for those in the 75th percentile (scoring 5 out of 5). At mean levels, the incentive contract reduces PPH risk by 6.25 percentage points.

The second column then considers neuroticism and its interaction with the incentive contract. Although some studies report that neuroticism is associated with poor performance, we do not observe this association in our sample of health care providers (column 2 of Table 2). However, performance gains with incentives are amplified among more emotionally stable providers (those with low values of the neuroticism scores). For providers in the 25th percentile of neuroticism (scoring 1.25 out of 5), the incentive contract decreases the PPH risk by 13 percentage points, whilst it is not statistically significant for those in the 75th percentile with scores of 2.25. At mean levels of neuroticism, the incentive contract reduces PPH risk by 7.44 percentage points.

We find that neurotic providers, who have higher levels of anxiety and insecurity, do not improve their performance with incentive contracts. This finding is consistent with the "choking under pressure" hypothesis, according to which individuals' performance deteriorate because the over-arousal and distraction that comes with high stakes departs significantly from the optimal (Ariely et al. 2009, Baumeister 1984, Yu 2015). We hypothesize that more neurotic providers might be more prone to this increased arousal. This could help to reconcile the experimental laboratory evidence, which finds evidence of "choking" with less supportive results emanating from professional sports, as only individuals who are resilient to "choking" probably select into these activities (Prendergast 2011).

IV. Conclusion

This paper presents evidence that how the impact of performance incentives varies with key personality traits consistently also found to be predictive of good performance

(conscientiousness and neuroticism). Focusing on maternity care performance and maternal health outcomes, we find that the beneficial effect of performance incentives is dampened among more conscientious providers. We also find that the effectiveness of performance incentives is magnified among providers with lower levels of neuroticism (higher levels of emotional stability). Among the most neurotic providers in our sample the potential gains due to incentive is completely undone – a result consistent with the "choking" hypothesis. Finally, our results contribute to a growing body of empirical research on the importance of worker selection (Ashraf, Bandiera, and Lee 2016, Dal Bó, Finan, and Rossi 2013, Deserranno 2016), suggesting that selection strategies must be deliberate about the work environments and embedded incentives in which they are being used – and could be improved with further tailoring of the personality traits that they target.

References

Almlund, Mathilde, Angela Lee Duckworth, James J. Heckman, et al. 2011. "Personality Psychology and Economics." *National Bureau of Economic Research Working Paper Series* 16822 (February).

Ariely, Dan, Uri Gneezy, George Loewenstein, et al. 2009. "Large Stakes and Big Mistakes." *The Review of Economic Studies* 76 (2):451-469. doi: 10.1111/j.1467-937X.2009.00534.x.

Ashraf, Nava, Oriana Bandiera, and B. Kelsey Jack. 2014. "No margin, no mission? A field experiment on incentives for public service delivery." *Journal of Public Economics* 120:1-17.

Ashraf, Nava, Oriana Bandiera, and Scott S. Lee. 2016. Do–gooders and Go–getters: Selection and Performance in Public Service Delivery. In *LSE Working Paper Series*.

Banerjee, Abhijit V., Rachel Glennerster, and Esther Duflo. 2008. "Putting a Band-Aid on a Corpse: Incentives for Nurses in the Indian Public Health Care System." *Journal of the European Economic Association* 6 (2-3):487-500. doi: 10.1162/JEEA.2008.6.2-3.487.

Baumeister, Roy F. 1984. "Choking Under Pressure: Self-Consciousness and Paradoxical Effects of Incentives on Skillful Performance." *Journal of Personality and Social Psychology* 46 (3):610–620.

Björkman, Martina, and Jakob Svensson. 2009. "Power to the People: Evidence from a Randomized Field Experiment on Community-Based Monitoring in Uganda." *The Quarterly Journal of Economics* 124 (2):735-769. doi: 10.1162/qjec.2009.124.2.735.

Borghans, Lex, Angela Lee Duckworth, James J. Heckman, et al. 2008. "The Economics and Psychology of Personality Traits." *Journal of Human Resources* 43 (4):972-1059. doi: 10.3368/jhr.43.4.972.

Bowles, Samuel, Herbert Gintis, and Melissa Osborne. 2001. "Incentive-Enhancing Preferences: Personality, Behavior, and Earnings." *The American Economic Review* 91 (2):155-158.

Callen, Michael, Saad Gulzar, Ali Hasanain, et al. 2015. "Personalities and Public Sector Performance: Evidence from a Health Experiment in Pakistan." *National Bureau of Economic Research Working Paper Series* 21180 (May).

Chaudhury, Nazmul, Jeffrey Hammer, Michael Kremer, et al. 2006. "Missing in Action: Teacher and Health Worker Absence in Developing Countries." *The Journal of Economic Perspectives* 20 (1):91-116.

Cubel, Maria, Ana Nuevo-Chiquero, Santiago Sanchez-Pages, et al. 2016. "Do Personality Traits Affect Productivity? Evidence from the Laboratory." *The Economic Journal* 126 (592):654–81. doi: doi:10.1111/ecoj.12373.

Dal Bó, Ernesto, Frederico Finan, and Martín A. Rossi. 2013. "Strengthening State Capabilities: The Role of Financial Incentives in the Call to Public Service*." *The Quarterly Journal of Economics* 128 (3):1169-1218. doi: 10.1093/qje/qjt008.

Das, Jishnu, Abhijit Chowdhury, Reshmaan Hussam, et al. 2016. "The impact of training informal health care providers in India: A randomized controlled trial." *Science* 354 (6308). doi: 10.1126/science.aaf7384.

Das, Jishnu, and Jeffery Hammer. 2014. "Quality of Primary Care in Low-Income Countries." *Annual Review of Economics*:41.

Das, Jishnu, Alaka Holla, Aakash Mohpal, et al. 2016. "Quality and Accountability in Healthcare Delivery: Audit Evidence from Primary Care Providers in India." *American Economic Review* 106 (12):3765-99.

Deserranno, Erika. 2016. Financial Incentives as Signals: Experimental Evidence from the Recruitment of Village Promoters in Uganda. In *Working Paper Series*: Northwestern University,.

Finan, Frederico, Benjamin A. Olken, and Rohini Pande. 2015. The Personnel Economics of the State. NBER Working Paper No. 21825.

Frankenberg, Elizabeth, Cecep Sumantri, and Duncan Thomas. 2016. Study of the Tsunami Aftermath and Recovery (STAR). http://stardata.org/index.html.

Heckman, James J., and Yona Rubinstein. 2001. "The Importance of Noncognitive Skills: Lessons from the GED Testing Program." *American Economic Review* 91 (2):145-149. doi: doi: 10.1257/aer.91.2.145.

Heckman, James, xa, J, et al. 2006. "The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior." *Journal of Labor Economics* 24 (3):411-482. doi: 10.1086/504455.

Mohanan, Manoj, Grant Miller, Katherine Donato, et al. 2016. The Cost of Asymmetric Information in Performance Contracts: Experimental Evidence on Input- and Output-based Contracts for Maternal and Child Health care in India. In *Unpublished Manuscript*.

Mohanan, Manoj, Marcos Vera-Hernandez, Veena Das, et al. 2015. "The know-do gap in quality of health care for childhood diarrhea and pneumonia in rural India." *JAMA Pediatrics* 169 (4):349-57.

Prendergast, Canice. 2011. "What have we learnt about pay for performance?: Geary Lecture winter 2010." *Economic and Social Review* 42 (2):113-134.

Rammstedt, Beatrice, and Oliver P. John. 2007. "Measuring personality in one minute or less: A 10-item short version of the Big Five Inventory in English and German." *Journal of Research in Personality* 41 (1):203-212. doi: http://dx.doi.org/10.1016/j.jrp.2006.02.001.

Roberts, Brent W. 2009. "Back to the Future: Personality and Assessment and Personality Development." *Journal of research in personality* 43 (2):137-145. doi: 10.1016/j.jrp.2008.12.015.

Yu, Rongjun. 2015. "Choking under pressure: the neuropsychological mechanisms of incentive-induced performance decrements." *Frontiers in Behavioral Neuroscience* 9:19. doi: 10.3389/fnbeh.2015.00019.

Acknowledgements and footnotes

We are grateful to 3ie and DFID-India for funding this research (Grant # OW2:205). <TO BE ADDED – individuals to acknowledge and seminar audiences.>

[i] See Almlund et al. (2011) for an excellent summary of Big Five personality traits and applications in recent economics literature. Other traits are: Extraversion is associated with sociability, talkativeness, ambition and assertiveness. Agreeableness is associated with good-naturedness, cooperation, courtesy, and trust. Openness to experience, which is the least well-understood dimension, is associated with curiosity, imagination, and broadmindedness.

[ii] We interviewed providers using a shortened version of the full Big Five Inventory (BFI), the BFI10 (Rammstedt and John 2007), and also included additional questions from a 12-adjective instrument that was piloted and tested in the Study of the Tsunami Aftermath and Recovery (STAR) project (Frankenberg, Sumantri, and Thomas 2016).