

Happiness & Productivity

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Background

- What do we mean by "happiness"? Emotion, mood, state of mind...different for psychologists, but not really for us.
- A good deal of existing work considers the impact of key economic variables on happiness: $H = f(Y, educ, age, etc.)$.
- Little or no work examining the opposite direction: the impact of happiness on key economic variables.
- For this talk we will focus on productivity.
- Our idea in a nutshell: *as individuals becomes happier, this allows them to divert attention away from background worries, and put that attention into work tasks.*

Productivity

- Productivity can be split into two components: effort and ability.
- The impact of happiness on these is not clear:
 - ① Will a happier individual work harder or not? (effort up or down).
 - ② Will a happier individual be more or less focused? (ability up or down).
- For consumers, the impact might be in terms of search and the ability to distinguish products.
- For firms, the impact might be on the quantity and quality of ideas.

Existing Work: Mood

- Isen et al (1978) and Teasdale and Fogarty (1979) show that positive affect improves memory recall
- Isen et al (1978) find that positive affect leads to greater altruistic helping of others. Verified by Kirchsteiger, Rigotti and Rustichini (2006) for gift-exchange.
- Benabou and Tirole (2002) on the interaction between self-deception, malleability of memory, and ability and effort. ["I have done this, says my memory. I cannot have done that, says my pride, remaining inexorable. Finally—memory yields" Friedrich Nietzsche, *Beyond Good and Evil*.]
- Compte and Postlewaite (2004) seeks to identify circumstances in which biased perceptions might increase.

Existing Work: Productivity

- Argyle (1989, 2001) points out that little is understood about how life satisfaction affects productivity, but that there is (mixed) evidence that job satisfaction exhibits modestly positive correlations with measures of worker productivity.
- Wright and Staw (1999) examines the connections between worker affect and supervisors' ratings of workers with mixed results.
- Amabile et al (2005) uncovers evidence that happiness provokes greater creativity.

Existing Work: Productivity (continued)

- Sanna et al (1996) suggests that those individuals in a negative mood put forth a high level of effort (which we refute in our study).
- Baker et al (1997), Boehm and Lyubomirsky (2008), Paterson et al (2004), Steele and Aronson (1995) and Tsai et al (2007) detect influences of emotion and affect upon performance.
- Gneezy and Rustichini (2000) examine the relationship between monetary compensation and performance: increasing the size of monetary compensation raises performance, but they also find that offering no monetary compensation may actually be better motivation than offering some.

Notation

- Let the worker's randomly ability be z , with density function $f(z)$.
- Denote p as a piece-rate level of pay.
- Let e be the energy the worker devotes to solving the tasks at work.
- Let w be the energy the worker devotes to 'worrying'.
- R denotes the worker's psychological resources.

Utility

- Utility = utility from work + utility from worrying
- Maximize $\int u(p, e, h, z) f(z) dz + v(w, h)$ s.t. $R \geq e + w$
- So $Eu_e - v_w = 0$
- Differentiating this one more time shows the sign of $\frac{de^*}{dh}$ is given by the sign of $Eu_{eh} + v_{wh}$.

Functional Forms

- To get some insight into the likely outcome, consider simple forms of these functions.
- Say the person maximizes $u(pe) + v(1 - e) + 2h$
- So, **the optimal work effort, e^* , is independent of the happiness shock, h .**

Concavity Case

- Consider instead the maximand $u(pe + h) + v(1 - e + h)$.
- Now at a turning point $u'(pe + h)p - v'(1 - e + h) = 0$ and so the sign of $\frac{de^*}{dh}$ takes the sign of $u''(pe + h)p - v''(1 - e + h)$.
- After substitution, the sign of the comparative static response of work effort, e , w.r.t. the size of the happiness shock, h , is greater than or equal to zero as $\frac{u''(\cdot)}{u'(\cdot)} - \frac{v''(\cdot)}{v'(\cdot)} \geq 0$.
- So, if the marginal utility of worry declines quickly enough as energy is transferred from working to worrying, then a **positive happiness shock raises productivity, e^*** .

The Bottom Line

- Within utility theory, under quite general assumptions, a shock to happiness may or may not affect productivity: much depends upon parameter values and functional form.
- We then need to go to the data.
- But we need an exogenous shock to happiness and control over other key parameters.
- So we opt to generate our own data using a laboratory experiment.

Inducing Happiness

- The key difficulty is how to 'assign' emotions to people to produce a randomized trial.
- Mood-induction procedures: the best is supposedly audio-visual (Westermann et al, 1996).
- So we used a comedy clip (Bill Bailey) for our key treatment (treatment 1).
- Restricted our laboratory pool to subjects of an English background who had likely been exposed to similar humour before
- Questionnaires seemed to indicate that it did indeed raise happiness.

Measuring Productivity

- Main productivity task previously used in Niederle and Vesterlund (2007), which entails asking subjects to add sequences of five 2-digit numbers under timed conditions.
Example:

31 56 14 44 87

- Comparatively simple but is taxing under pressure.
- It might be thought of as representing in a highly stylized way an iconic white-collar job: both intellectual ability and effort are rewarded.

Controlling for Ability

- Notice that the number of attempts might proxy for effort, while the accuracy of answers might proxy for ability.
- We also require our subjects to undertake GMAT math-style questions:
- For example:

1. Harriet wants to put up fencing around three sides of her rectangular yard and leave a side of 20 feet unfenced. If the yard has an area of 680 square feet, how many feet of fencing does she need?

(a) 34; (b) 40; (c) 68; (d) 88; (e) 102

Controlling for Ability

- GMAT math-style questions also used in Gneezy and Rustichini (2000).
- We supplement this with information in a final questionnaire to allow us to construct a measure of subjects' prior exposure to mathematics.
- The aim was to allow us to control for heterogeneous ability levels, while remaining open for happiness to affect ability too.

Control Treatment: Mood

- The main control treatment identical but for the lack of a clip (treatment 0)
- Second control treatment in which we used a “placebo” clip designed to be neutral with regard to mood, but to take up the same amount of time as the comedy clip.

Control Treatment: Payment

- Standard treatment stressed that a better performance in experiment produced a better payment.
- This was left open in the form of a "performance-related bonus".
- We also ran a control treatment in which we specified the payment reward exactly (£0.25 per correct addition, £0.50 per correct GMAT).

Sessions

- Day 1: session 1 (treatment 0 only), session 2 (treatment 1 only).
- Day 2: session 1 (treatment 0 only), session 2 (treatment 1 only).
- Day 3: session 1 (treatment 1 only), session 2 (treatment 0 only).
- Day 4: session 1 (treatment 1 only), session 2 (treatment 0 only).
- Day 5: session 1 (treatment 1 and explicit payment), session 2 (treatment 0 and placebo clip)
- Day 6: session 1 (treatment 0 and explicit payment), session 2 (treatment 1 and explicit payment)

Time-line

- Subjects enter and are given basic instructions on experimental etiquette.
- Subjects in clip treatment are exposed to a comedy clip for 10 minutes, otherwise not.
- Subjects are given additional instructions, including a statement that their final payment relates to the number of correct answers, and instructed against the use of calculators or similar.

Time-line (continued)

- Subjects move to their networked consoles and undertake the numerical additions for 10 minutes.
- Results are saved and a new task is initiated, with subjects undertaking the GMAT MATH-style test for 5 minutes.
- Results are again saved, and subjects then complete the final questionnaire.
- After the questionnaire has been completed, subjects receive payment as calculated by the central computer.

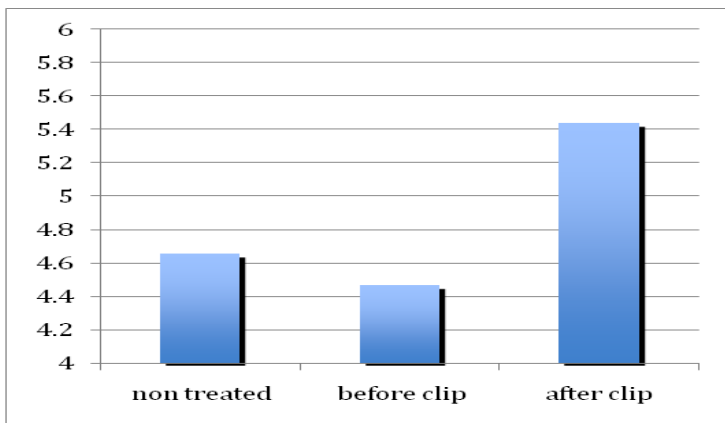
Numbers

- A group of 276 subjects drawn from the University of Warwick participated in the experiment.
- Of these, 182 took part in the main experiment, while the others participated in the control sessions of day 5 and 6 .
- Each took part in only one session.
- The subject pool here was made up of 58% males and 42% females.

Numbers

Main Sessions	Day	Treated	Untreated
	1	24	24
	2	23	20
	3	23	24
	4	24	25
Extra Sessions	5	25	25
	6	23	21

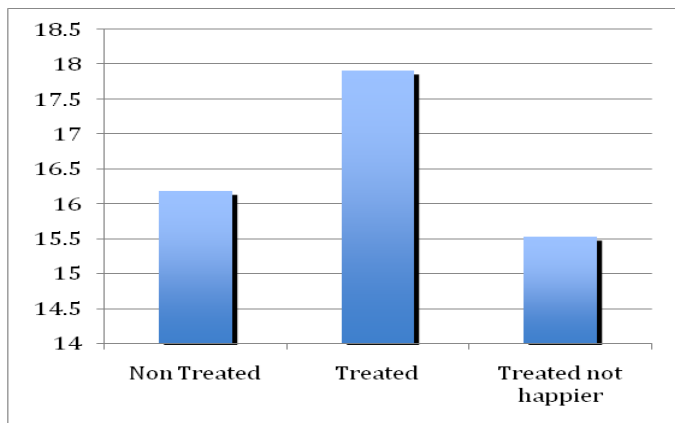
Reported Happiness



Reported Happiness

- Clip successful in increasing the happiness levels of subjects: average reported rise of almost one point (0.98) on the scale of 1 to 7.
- Comparing the ex-post happiness of the treated subjects with that of the non-treated subjects, the average of the former is higher by 0.85 points - using a two-sided t-test, this difference is statistically significant (at the 1% level).
- Note that the level of happiness before the clip for the treated group is not statistically significantly different (the difference is just 0.13) from the happiness of the untreated group (even at the 20% level).

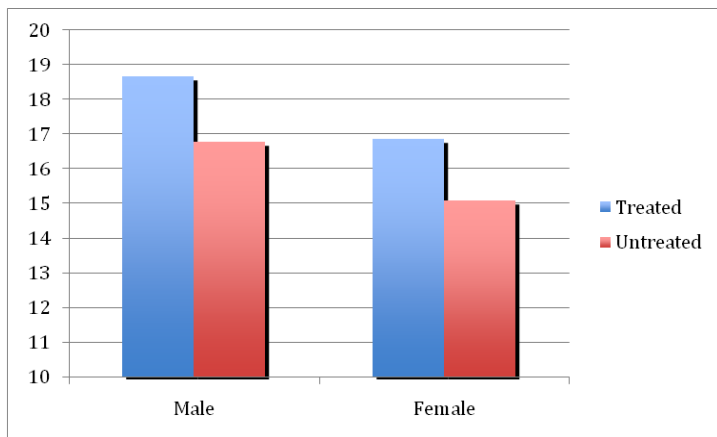
Number of Correct Additions



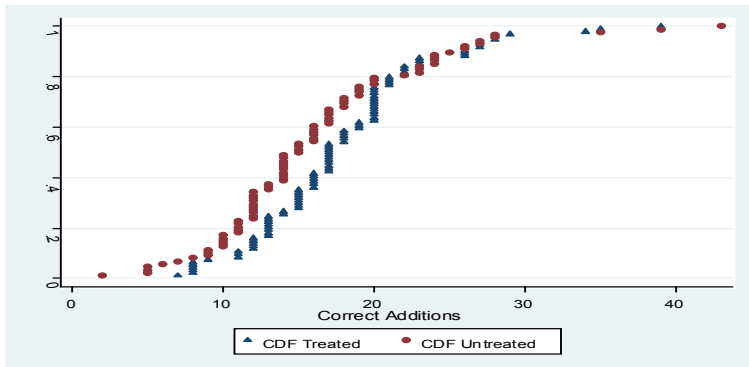
Number of Correct Additions

- The treated group's mean performance is higher by 1.71 additions than the average performance of the untreated group.
- This productivity difference is approximately ten percent.
- It is statistically significantly different from zero (at the 5% level).

Gender



Distribution



Description of Variables

- The number of correct additions is in the allotted ten minutes.
- 'Happiness before' is the self-reported level of happiness (for the treated group before the clip) on a seven point scale. The variable 'happiness after' is the level of happiness after the clip for the treated group. Change in Happiness is the difference between the two.
- GMAT MATH is the number of correct problems solved.
- High-school-grades is an index calculated from the questionnaire based on the ratio of top grades.
- Enjoyment-of-clip is a measure in a range between 1 and 7 of how much subjects said they liked the movie clip.

What Determines Productivity?

	(1)	(2)	(3)
	log(Additions)log(Additions)log(Additions)		
	<i>Treated only</i>		
Treatment	0.118** (0.0548)		
Change-in-Happiness		0.101** (0.0405)	0.0847* (0.0495)
GMAT MATH score	0.104*** (0.0226)	0.100*** (0.0226)	0.0739*** (0.0273)
High School Grades	0.471*** (0.114)	0.477*** (0.114)	0.428*** (0.124)
Male	-0.0257 (0.0609)	-0.0267 (0.0606)	0.00675 (0.0774)
Day 2	-0.0169 (0.0790)	0.000901 (0.0787)	-0.0170 (0.0905)
Day 3	0.0975 (0.0779)	0.106 (0.0776)	0.131 (0.0885)
Day 4	0.0118 (0.0762)	0.00724 (0.0758)	-0.00752 (0.0895)
Constant	2.106*** (0.105)	2.120*** (0.102)	2.244*** (0.126)
Observations	178	178	93
R-squared	0.273	0.280	0.307

Std errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Attempts

Table 5: Determinants of attempts

	(1)	(2)
	Log(Attempt)	Log(Attempts)
Treatment	0.0911** (0.0417)	
Change-in-Happiness		0.0812*** (0.0308)
GMAT MATH score	0.0758*** (0.0172)	0.0733*** (0.0171)
High School Grades	0.372*** (0.0869)	0.377*** (0.0863)
Male	-0.0165 (0.0463)	-0.0170 (0.0460)
Day 2	0.0198 (0.0600)	0.0340 (0.0597)
Day 3	0.133** (0.0592)	0.140** (0.0589)
Day 4	0.0767 (0.0579)	0.0732 (0.0576)
Constant	2.432*** (0.0795)	2.441*** (0.0776)
Observations	178	178
R-squared	0.279	0.288

*** p<0.01, ** p<0.05, * p<0.1 Std errors in parentheses

Precision (ie ratio of correct answers)

	(1)	(2)
	Correct/ Attempt	Correct/ Attempt
Treatment	0.0128 (0.0185)	
Change-in-Happiness		0.0102 (0.0138)
GMAT MATH score	0.0165** (0.00765)	0.0162** (0.00767)
High School Grades	0.0656* (0.0386)	0.0663* (0.0386)
Male	0.00152 (0.0206)	0.00134 (0.0206)
Day 2	-0.0268 (0.0267)	-0.0249 (0.0267)
Day 3	-0.0201 (0.0263)	-0.0192 (0.0263)
Day 4	-0.0507* (0.0258)	-0.0512** (0.0257)
Constant	0.753*** (0.0354)	0.755*** (0.0347)
Observations	178	178
R-squared	0.095	0.096
Std. errors in parentheses *** p<0.01, ** p<0.05, * p<0.1		

Further Results

- The payment rule was not significant (even at 10% level), indicating that piece rate or bonus regime are similarly affected by happiness shocks.
- The placebo was not significant (even at 10% level), confirming Isen et al (1987).

Results Summary

- Little is known by economists about how emotions influence productivity.
- We design a randomized trial:
 - We 'assign' different emotions to different people.
 - Some laboratory subjects have their happiness levels increased.
 - Others, in a control group, do not.

Results Summary (continued)

- A rise in happiness leads to greater productivity in a paid piece-rate task.
- The effect is large, can be replicated, is not a reciprocity response, and is found equally in male and female subsamples.
- It appears from the data that this effect operates through a rise in sheer output rather than in the per-item quality of the laboratory subjects' work: in this white-collar task, workers' effort levels rise while their precision is unaltered.

Implications

- If our results can be shown to generalize, economics needs to pay attention to the influence of emotional states.
- Emotional forces typically been viewed as a dependent variable - this needs to change.
- If happiness boosts productivity, this raises the possibility of self-reinforcing spirals – ones that might operate even at a macroeconomic level.
- Such spirals, if they exist, would be an important propagation mechanism linking short-run shocks into the longer run, and represent an interesting avenue for future research.

Thank You!

- For a copy of the paper please look on **<http://www.warwick.ac.uk/go/dsgroi>** and hit the link to my publications (the paper is in the working paper section).
- My email address is **daniel.sgroi@warwick.ac.uk**, and comments are welcome.
- Many thanks for taking the time to invite me and listen to my presentation.
- If you found it enjoyable it might just make you more productive this afternoon!