Incentives & Development: A Cross-Country Field Experiment

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Firm productivity and incentives across countries

- Firm productivity is a core engine of growth but the drivers of worker productivity in developing countries are largely unknown
- Survey evidence shows a large variation in personnel practices both across and within countries
- The most profitable firms offer pay for performance and firms in less developed countries are less likely to do so
  - Large OB/business sociology/management literature
  - Recent systematic data collection by economists (Bloom and Van Reenen 2010, Bloom, Sadun and Van Reenen 2012).

Two possible explanations

- Evidence is consistent with two observationally equivalent explanations:
  - Response to incentives differs across countries (perhaps as dictated by cultural norms), and firms in LDCs where performance pay is ineffective optimally choose not to use it
  - Response to incentives is stable across countries, but firms in LDCs face external constraints (e.g., labor laws) that prevent them from using it
- Implications are radically different
- Yet we have no evidence that performance pay schemes that have been shown to be effective in Anglo-Saxon countries would work in LDCs
  - Exceptions: teachers in India (Muralidharan and Sundararaman 2011); health promoters in Zambia (Ashraf et al 2012)

Our project

- Design a cross-country field experiment to test whether/how:
  - Workers in LDCs respond to individual and team incentives
  - Response to incentives varies with workers' characteristics
- Combine the precision and rigorous identification of field experiments with the breadth of macro studies
- Seek evidence on characteristics that should drive the response to incentives ex ante

Road map

1. Experimental design
2. Preliminary findings from Ghana, India and the Philippines
3. Considering culture
4. Conclusion

Road map

1. **Experimental design**
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We design an experiment to explicitly test response to common incentives schemes

- Set up identical data entry firms in three developing countries: Ghana, India and the Philippines
- Hire workers who would normally work in data entry, through normal channels, with typical pay levels
- Each worker hired on a two-day contract; can be rehired once
- Randomly assign workers to commonly used incentive contracts
- Six treatments, 100 workers per treatment per country

Set up allows for precise data gathering

- Collect individual characteristics **and test data entry ability**
- Stratify by ability, gender, ethnicity/race

- Performance is measured electronically by keystrokes per hour
- We also collect measures of quality (correct rate) and profits

Our firm in CdO (Philippines)

There are advantages to creating firms expressly for our experiment

- Not subject to market forces
- This gives us flexibility on two key dimensions:
  - Eliminate unobservable variation in firm structure that might be correlated with country traits and performance
  - Implement exactly the same incentive schemes in all countries, even if some schemes in some countries might lead to an economic loss or low-quality output
- In contrast to firms that operate within real product markets, not constrained in choosing treatments among those that can increase profits (Bandiera et al 2011)

There are also some disadvantages

- Contracts are short-term; however, short-term contracts are common in this sector
- Factors that generally affect the response to incentives but are muted in our setting:
  - Career concerns
  - Social connections: key for in- vs out-group concerns
  - Selection (entry/exit)

We consider three "classic" compensation schemes (treatments)

1. Fixed daily wage (control)
2. Individual piece rate (price per keystroke): set so that the median worker earns the same as in treatment 1
3. Team piece rate (price per team keystroke, teams of 4 DEOs): set as above

- Randomization ensures treatments are orthogonal to unobservable determinants of productivity
- First workplace evidence on the comparison between all three treatments in the same setting
  - Literature normally looks at 1 vs. 2, or, more rarely, 1 vs. 3

First we consider all data pooled across countries

- Pooled data:

$$y_{ict} = \alpha IP_i + \beta TP_i + \mathbf{x_i}\gamma + \eta_{\mathbf{ct}} + \eta_{\mathbf{ict}}$$

- Where y_{ict} is the average productivity (key strokes per hour) of worker i in country c at time (month) t over the two day contract
- $\mathbf{x_i}$ is a vector of worker's characteristics including ability
- α and β measure the causal effect of incentives on productivity under the assumption that incentive treatments are orthogonal to η_{ict}
- Identifying assumption can fail because of:
  - Endogenous drop-outs
  - Spillovers
- Neither appear to be relevant in this setting

We consider three further treatments (mechanisms)

1. Low-powered individual piece rate = 1/4 basic piece + fixed component
   - Mimics marginal return to individual effort under team incentives (Nash play)
   - Disentangle whether response to team incentives due to cooperation or individually rational play
2. Individual piece rate + publicly displayed rankings
   - Workers told rankings posted every three hours
   - Assess whether response to incentives is unconditional or depends on observability
3. Team piece rate + publicly displayed rankings
   - Same as above
   - Allows to assess whether (i) facilitating monitoring aids cooperation (ii) individual excellence is more socially accepted when contributing to team's earnings

Contracts and workers

Table 0: Summary Statistics

	Pooled	Ghana	India	Philippines
Experiment details:				
Duration (months)	-	10	11	8
Number of unique workers	1,235	291	545	399
Man hours	21,242	6,036	7,110	8,096
Number of contracts				
of which:				
Flat wage	150	51	49	50
Individual piece rates	297	98	103	96
Team piece rates	303	102	100	101
Individual piece rates + ranking	300	100	103	97
Team piece rates + ranking	302	101	101	100
Low-powered individual piece rates	200	-	103	97
Workers' characteristics				
Gender (=1 if male)*	0.60	0.69	0.75	0.36
	(0.49)	(0.46)	(0.43)	(0.48)
Age	25.62	27.63	26.43	23.13
	(4.56)	(3.67)	(5.01)	(3.48)
Baseline ability*	2.17	2.09	2.17	2.23
	(0.37)	(0.36)	(0.36)	(0.36)
Education (=1 if univ. or more)	0.84	0.97	0.83	0.74
	(0.37)	(0.16)	(0.38)	(0.44)
Data entry experience (=1 if yes)	0.45	0.75	0.48	0.18
	(0.50)	(0.43)	(0.50)	(0.38)
Piece rate experience (=1 if yes)	0.14	0.14	0.09	0.19
	(0.35)	(0.35)	(0.29)	(0.39)

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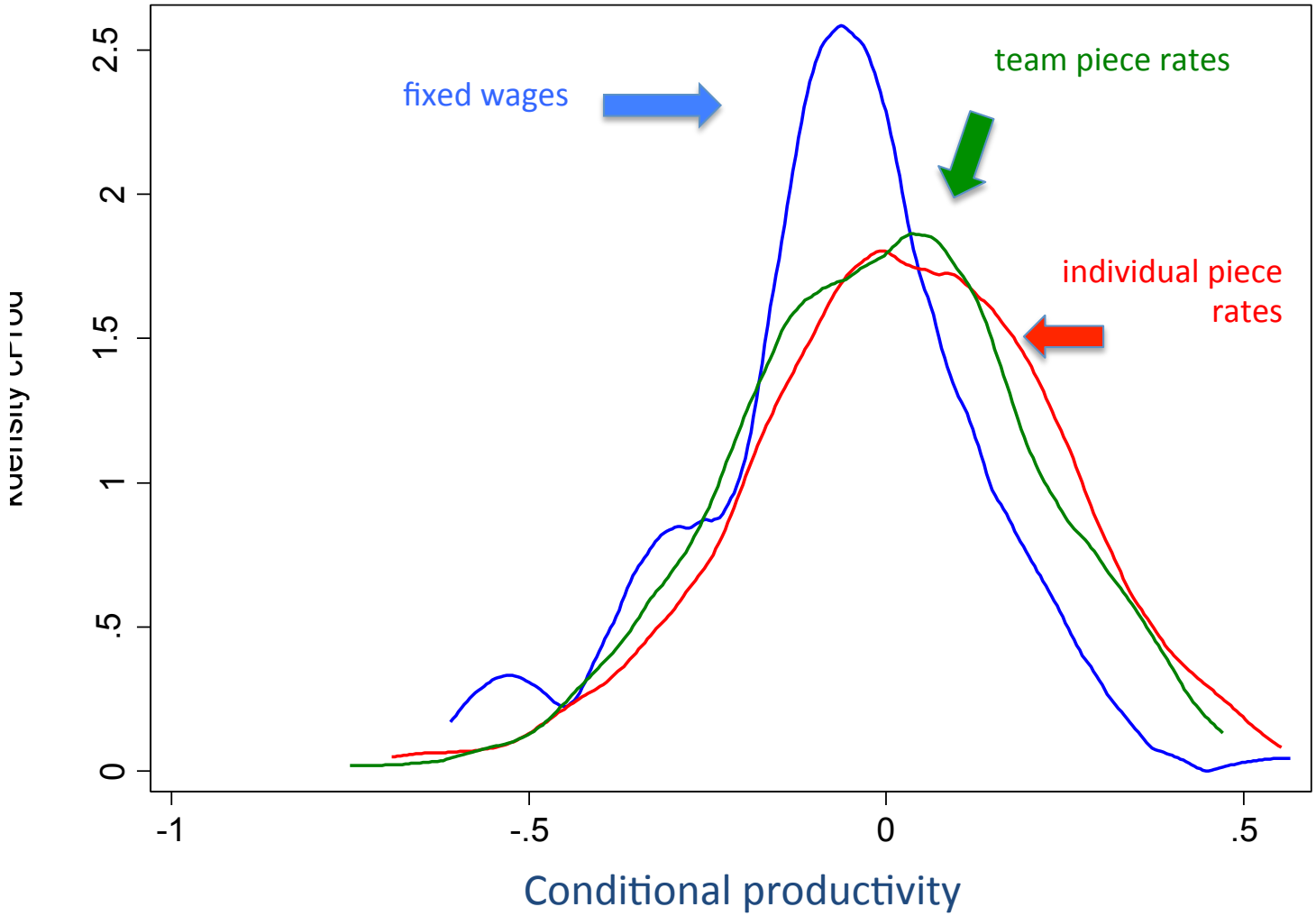
Incentives are effective, on average

Figure 1: Conditional Productivity, by Incentive Scheme



Individual and team incentives are equally effective on average

Table 1: Average treatment effects- Pooled data

	(1) unconditional	(2) (1) + individual controls	(3) (2) +month FE	(4) (3) + survey FE
Individual piece rate	0.0967**	0.139***	0.122***	0.109***
	(0.0464)	(0.0377)	(0.0332)	(0.0219)
Team piece rate	0.107**	0.125***	0.133***	0.0868***
	(0.0462)	(0.0374)	(0.0330)	(0.0219)
N	750	750	750	750
adj. R-sq	0.005	0.355	0.514	0.790

No evidence of cooperation; just low elasticity

Table 1a: Mechanisms

	(4) Baseline	(5) Additional treatments
Individual piece rate	0.109***	0.109***
	(0.0219)	(0.0210)
Team piece rate	0.0868***	0.0860***
	(0.0219)	(0.0210)
Low power individual piece rate		0.0822***
		(0.0235)
Individual piece rate + public ranking		0.117***
		(0.0212)
Team piece rate + public ranking		0.0979***
		(0.0211)
N	750	1552
adj. R-sq	0.790	0.812

- No cooperation: response to team incentives is identical to response to individual incentives with same power
- Low elasticity: response to individual incentives is the same despite considerable difference in power

Public ranking does not affect response to incentives

- Consistent with finding that response to team incentives not driven by cooperation
  - Monitoring should facilitate cooperation
- Ranking might be more effective in settings where workers have long-run interactions (through peer effects)
- Results suggests that workers are not motivated by "impressing" their temporary colleagues

Significant differences in responses across countries

Table 3: Non-parametric culture

	(1) baseline-pooled	(2) Ghana	(3) India	(4) Philippines
Ghana: Individual piece rate	0.0260	0.0172		
	(0.0439)	(0.0425)		
India: Individual piece rate	0.184***		0.191***	
	(0.0409)		(0.0480)	
Phi: Individual piece rate	0.129***			0.131***
	(0.0391)			(0.0317)
Ghana: Team piece rate	0.0103	0.00244		
	(0.0452)	(0.0434)		
India: Team piece rate	0.160***		0.157***	
	(0.0389)		(0.0459)	
Phi: Team piece rate	0.0851**			0.0890***
	(0.0415)			(0.0337)
N	750	251	252	247
adj. R-sq	0.793	0.593	0.800	0.523

Mechanisms appear to be country specific

- Low elasticity to piece rates throughout
- Weak evidence of free-riding in highest IDV country (India)
  - Productivity under team pay lower than under low individual piece
- More interestingly:
  - Public rankings strengthen the effect of individual incentives in India
  - Public rankings weaken the effect of individual incentives in the Philippines

We find significant variation at the country level

Table 4: Mechanisms, country-specific

	(1) all treatments	(2) ipr, tpr, modIpr	(3) tpr+rank	(4) ipr+rank
Ghana:				
Individual piece rate	0.0322			0.0314
	(0.0417)			(0.0434)
Individual piece +ranking	0.0385			0.0479
	(0.0428)			(0.0457)
Low power individual piece rate	NA			
	NA			
Team piece rate	0.0162		0.00847	
	(0.0422)		(0.0422)	
Team piece+ranking	0.0442		0.0313	
	(0.0426)		(0.0428)	
India:				
Individual piece rate	0.172***	0.180***		0.163***
	(0.0381)	(0.0400)		(0.0414)
Individual piece +ranking	0.221***			0.209***
	(0.0389)			(0.0430)
Low power individual piece rate	0.173***	0.202***		
	(0.0422)	(0.0453)		
Team piece rate	0.146***	0.158***	0.153***	
	(0.0371)	(0.0385)	(0.0366)	
Team piece+ranking	0.169***		0.185***	
	(0.0389)		(0.0399)	
Philippines:				
Individual piece rate	0.124***	0.123***		0.108***
	(0.0370)	(0.0387)		(0.0390)
Individual piece +ranking	0.0761**			0.0627
	(0.0384)			(0.0413)
Low power individual piece rate	0.0911**	0.0952**		
	(0.0392)	(0.0421)		
Team piece rate	0.0737*	0.0831**	0.0882**	
	(0.0383)	(0.0405)	(0.0405)	
Team piece+ranking	0.0660*		0.0860**	
	(0.0384)		(0.0405)	
N	1552	699	755	747
adj. R-sq	0.814	0.841	0.814	0.804

Country-specific responses: Little effect in Ghana

Table 4: Mechanisms, Ghana

	(1) all treatments	(2) ipr, tpr, modIpr	(3) tpr+rank	(4) ipr+rank
Ghana:				
Individual piece rate	0.0322			0.0314
	(0.0417)			(0.0434)
Individual piece +ranking	0.0385			0.0479
	(0.0428)			(0.0457)
Low power individual piece rate	NA			
	NA			
Team piece rate	0.0162		0.00847	
	(0.0422)		(0.0422)	
Team piece+ranking	0.0442		0.0313	
	(0.0426)		(0.0428)	

Country-specific responses: Effects in India are similar to developed country results

Table 4: Mechanisms, India

	(1) all treatments	(2) ipr, tpr, modIpr	(3) tpr+rank	(4) ipr+rank
India:				
Individual piece rate	0.172***	0.180***		0.163***
	(0.0381)	(0.0400)		(0.0414)
Individual piece +ranking	0.221***			0.209***
	(0.0389)			(0.0430)
Low power individual piece rate	0.173***	0.202***		
	(0.0422)	(0.0453)		
Team piece rate	0.146***	0.158***	0.153***	
	(0.0371)	(0.0385)	(0.0366)	
Team piece+ranking	0.169***		0.185***	
	(0.0389)		(0.0399)	

Country-specific responses: Effects in Philippines about half conventional norms

Table 4: Mechanisms, Philippines

	(1) all treatments	(2) ipr, tpr, modIpr	(3) tpr+rank	(4) ipr+rank
Philippines:				
Individual piece rate	0.124***	0.123***		0.108***
	(0.0370)	(0.0387)		(0.0390)
Individual piece +ranking	0.0761**			0.0627
	(0.0384)			(0.0413)
Low power individual piece rate	0.0911**	0.0952**		
	(0.0392)	(0.0421)		
Team piece rate	0.0737*	0.0831**	0.0882**	
	(0.0383)	(0.0405)	(0.0405)	
Team piece+ranking	0.0660*		0.0860**	
	(0.0384)		(0.0405)	
N	1552	699	755	747
adj. R-sq	0.814	0.841	0.814	0.804

There may be a tradeoff between quantity and quality

- High powered individual incentives (with and without rank) decrease quality in India (where incentives are most effective at increasing productivity)
- Overall effect on adjusted productivity still positive and significantly different from zero in India and the Philippines
- Preliminary profit analysis (setting mistakes to -1) reveals all pay for performance schemes are profitable in India
    - Not obvious as wage bill increases and quality decreases (Freeman and Kleinart, J Ind Rel 2005)

Table 5: Quality

	correct rate	adjusted productivity
Individual piece rate	-0.00487	0.129***
	(0.00298)	(0.0250)
Individual piece +ranking	-0.00787**	0.120***
	(0.00307)	(0.0258)
Low power individual piece rate	-0.00419	0.122***
	(0.00348)	(0.0292)
Team piece rate	-0.00365	0.0951***
	(0.00301)	(0.0253)
Team piece+ranking	-0.00403	0.104***
	(0.00307)	(0.0258)
N	1583	1583
adj. R-sq	0.483	0.800

Quantity vs. Quality

Table 5: Quality, by Country

	correct rate	adjusted productivity
Ghana:		
Individual piece rate	-0.00137	0.0284
	(0.00559)	(0.0468)
Individual piece +ranking	-0.00586	0.0368
	(0.00577)	(0.0483)
Low power individual piece rate		
Team piece rate	0.00123	0.0195
	(0.00567)	(0.0475)
Team piece+ranking	-0.00263	0.0396
	(0.00574)	(0.0481)
India:		
Individual piece rate	-0.00971*	0.219***
	(0.00504)	(0.0422)
Individual piece +ranking	-0.0112**	0.254***
	(0.00516)	(0.0432)
Low power individual piece rate	-0.00506	0.204***
	(0.00559)	(0.0468)
Team piece rate	-0.00381	0.185***
	(0.00491)	(0.0411)
Team piece+ranking	-0.00405	0.191***
	(0.00514)	(0.0430)
Philippines:		
Individual piece rate	-0.00308	0.119***
	(0.00497)	(0.0416)
Individual piece +ranking	-0.00639	0.0495
	(0.00515)	(0.0431)
Low power individual piece rate	-0.00600	0.0914**
	(0.00526)	(0.0441)
Team piece rate	-0.00816	0.0523
	(0.00516)	(0.0432)
Team piece+ranking	-0.00523	0.0614
	(0.00517)	(0.0433)
N	1583	1583
adj. R-sq	0.482	0.801

Road map

1. Experimental design
2. Preliminary findings from Ghana, India and the Philippines
3. **Considering culture**
4. Conclusion

Culture and the response to incentives

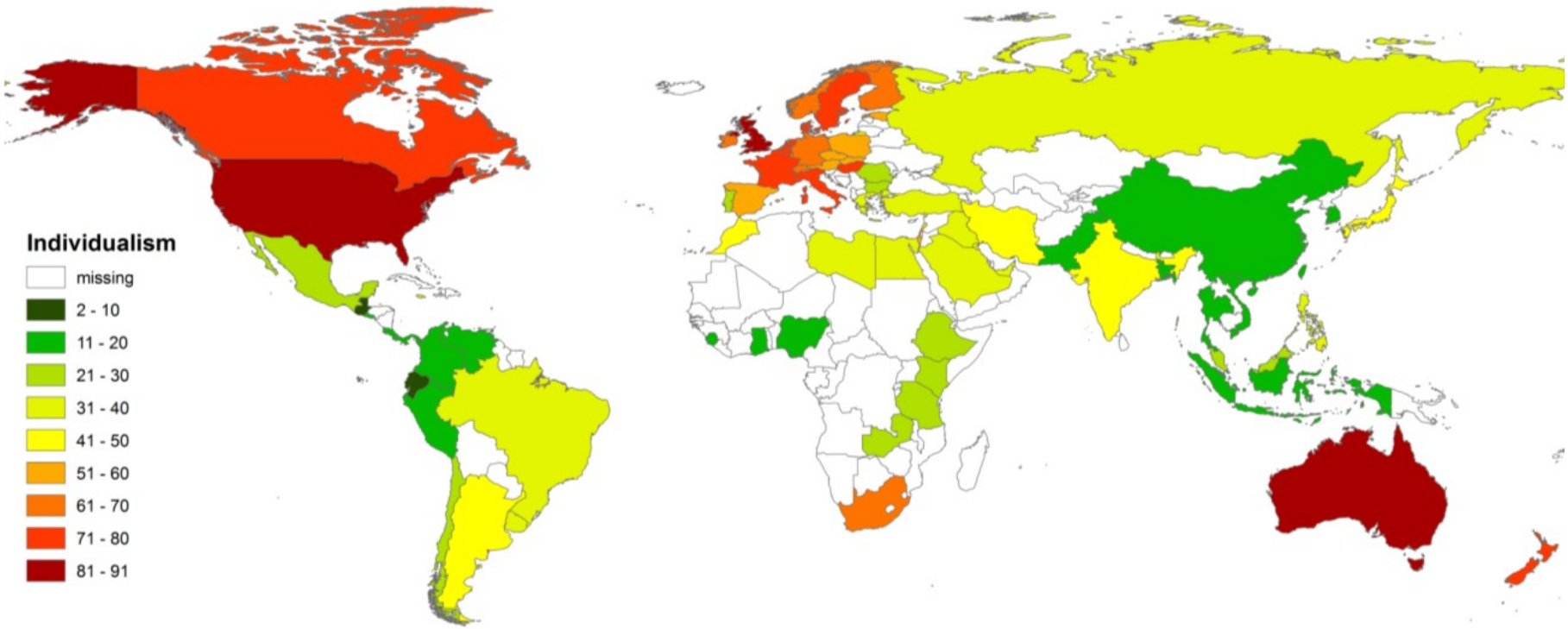
- Why might results differ across individuals or countries?
- Natural candidate: "individualism", i.e., the extent to which society awards status to personal achievements that make individuals stand out
- Performance incentives reward individual/group performance
  - Potentially exacerbating ability differences
- Response to incentives should depend on whether "standing out" is desirable

Measuring culture

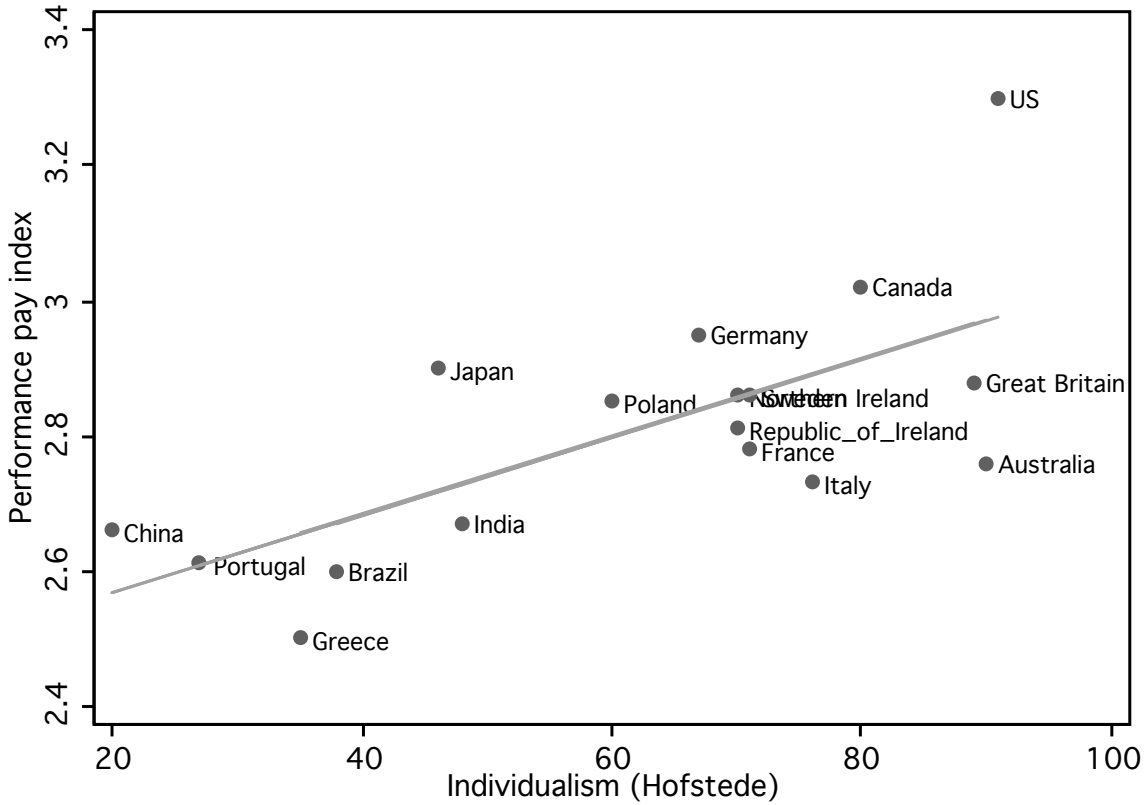
- Anecdotal/qualitative evidence
  - Parable of the crabs in the Philippines
  - Discouraging individual success in Africa (Platteau 2000, Baland et al 2007, Comola and Fafchamps 2010)
- Established measure of individualism from Hofstede's (2001) survey of 70k+ IBM employees in over 80 countries
- Hofstede's measures are well known and used widely in other social sciences and psychology, and have been validated by several other studies

Individualism scores across countries

Figure 1. Hofstede's (2001) measure of individualism.



Cross-country evidence supports the idea that pay for performance is more widely used in countries with high individualism



- Strong correlation between the Hofstede measures of individualism and the Bloom & Van Reenen index for the prevalence of performance pay

Culture has long been linked to economic outcomes

- An old idea (Weber 1905)
- An emerging theoretical literature (Bisin and Verdier 10)
- A large cross-country literature focusing on religion/ethnicity or "trust" measures (Guiso et al JEP 07, Tabellini JEEA 10)

Closer to us:

- Individualism and long-run growth (Gorodnichenko and Roland 11)
- "Power distance" and the organization of firms (Bloom et al 12)
- Management literature showing correlation between "individualism" and personnel practices (Schuler and Rogovsky JIBS 98, Tosi and Greckhamer 04)

The OB literature provides intriguing evidence

- Using data from 176 subsidiaries of a US multinational firm across 18 countries, Newman and Nollen (96) show that performance is higher where managerial practices are a "good fit" for local culture
  - E.g., individual rewards in individualistic countries
- Consistent with the hypothesis that agents in different countries react differently to the same personnel policies
- But policy choice is obviously endogenous in this setting

We assess the relationship between culture and the response to incentives

We estimate:

$$y_{ict} = \alpha_1 IP_i + \beta_1 TP_i + \alpha_2 IP_i \times IDV_c + \beta_2 TP_i \times IDV_c + \mathbf{x_i}\gamma + \eta_{\mathbf{ct}} + \eta_{\mathbf{ict}}$$

- where IDV_c is country c's individualism level $H_0 : \alpha_2 = \beta_2 = 0$, namely the response to incentives is the same across countries
- To account for different workforce composition in different countries we include a rich set of incentive$\times$worker characteristics interactions
- To allow mechanisms to differ across countries, we interact the three further treatments with our measure of culture

Response is stronger when IDV is higher

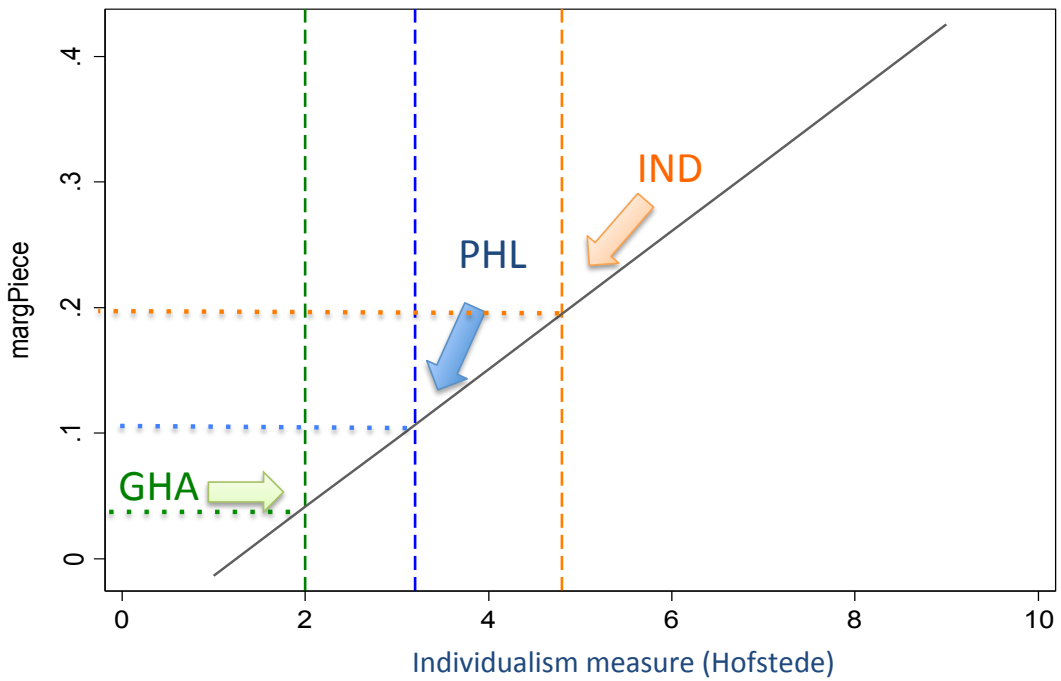
Table 2: Culture and individuals

	(1)	(2)	(3)	(4)	(5)
interaction variable:	culture	piece power	gender	ability	experience
Individual piece rate	-0.0684	-0.0329	-0.0816	-0.0823	-0.0491
	(0.0755)	(0.172)	(0.0783)	(0.0753)	(0.0832)
Individual piece rate X Individualism	0.0549***	0.0531**	0.0536**	0.0603***	0.0532**
	(0.0211)	(0.0220)	(0.0212)	(0.0221)	(0.0215)
Team piece rate	-0.0881	-0.236	-0.0866	-0.113	-0.103
	(0.0764)	(0.163)	(0.0792)	(0.0767)	(0.0848)
Team piece rate X Individualism	0.0523**	0.0453**	0.0523**	0.0544**	0.0540**
	(0.0209)	(0.0220)	(0.0210)	(0.0215)	(0.0213)
Individual piece rate X piece power		-0.0314			
		(0.152)			
Team piece rate X piece power		0.134			
		(0.145)			
Individual piece rate X male dummy			0.0290		
			(0.0446)		
Team piece rate X male dummy			-0.00157		
			(0.0443)		
Individual piece rate X high ability dummy				-0.0140	
				(0.0461)	
Team piece rate X high ability dummy				0.0278	
				(0.0451)	
Individual piece rate X experience with data entry					-0.0295
					(0.0462)
Team piece rate X experience with data entry					0.0174
					(0.0465)
N	750	750	750	750	750
adj. R-sq	0.793	0.791	0.793	0.795	0.793

Response is stronger when IDV is higher

- Effect size in highest IDV country (India) similar to estimates from field experiments in UK and Canada (20%)
- Effect size in lowest IDV country (Ghana) very close to zero.

Figure 2:Marginal effect of individual piece rate, by culture



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Summary

- Findings are consistent with the hypothesis that the response to incentives is shaped by local culture
  - Performance pay is more effective in countries that score high on the individualism dimension
- Estimated responses from India (18-22%) are in line with most of the previous field evidence from individualistic countries
- Estimated responses from Ghana (3-4%) are in line with field evidence from Zambia (Ashraf et al 2012)

Agenda

- Estimate model of individual production/effort decisions
- Analyze intraday behavior to identify specific mechanisms

- Replicate the experiment in other countries
- For countries where financial incentives appear to be effective, identify obstacles to adoption
- For countries where financial incentives appear not to be effective, identify alternative motivation schemes:
  - Social recognition
  - Discretion, "task ownership"
  - Feedback