Market competition and the effectiveness of incentive pay

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Introduction

Incentive pay is the most common managerial tool in motivating employees (Bloom and Van Reenen, 2011; Gerhart, Rynes and Fulmer, 2009).

Accordingly, its effectiveness has become a core topic for scholars and practitioners. What do we know?

Beyond design, effects of incentive pay depend on:

- Employee characteristics (Cadsby et al., 2007; Delfgaauw et al., 2013, 2014)
- Framing (Hossain and List, 2012)
- Salience (Jeffrey and Admozda, 2009; Englmaier, Roider and Sunde, forthcoming)
- ... other characteristics *within* the firm

What is the role of factors *outside* the firm?

Our study

Does the effectiveness of incentives for non-executive teams depend on the level of product market competition?

A field experiment in a network of 193 bakeries (Friebel et al., 2017).

Treatment: incentive pay for shop assistant in the randomly chosen half.

Our focus: variation in the treatment effect by the intensity of local competition ($\sim$ # bakeries in a 1 km radius).

Findings:

- Large treatment effect (up to 12%, in big towns) under moderate competition (3-4 shops)
- Much lower treatment effects under low or high competition
- Two opposite forces: "business stealing" and "competitor response" effects.

Prior work on competition and incentives

Competition affects (survivor) firm efficiency (Porter, 1990; Bloom and Van Reenen, 2007).

... and influences the adoption and design of incentive schemes (Baggs and de Bettingnies, 2007; Cunat and Guadalupe, 2005; Raith, 2003; Schmidt, 1997).

Our work: how a given incentive scheme will fare under varying local competition.

Why relevant:

- Managerial notion of "fit" between business strategy and environment: surprisingly little about incentives
- Decision re: incentives are firm-wide, but competition is often local
- High-precision, causal evidence on heterogeneity of response to incentives

Theory

Key assumption: local market size is constant, competitive action changes market share.

Competitive action requires costly effort (costs e). Consider 0/1 effort decision.

n competitors, $f(n)$ – market share that can be gained through competitive action, $p(n)$ – probability with which it can be gained.

Sales team exerts effort when $f(n) \cdot p(n) \geq e$.

Both $f(n)$ and $p(n)$ depend on local competition (n) through business stealing and competitor response effects.

Business stealing

Inspiration: Raith (2003). The market gain $f(n)$ increases with competition (Baggs and de Bettingnies, 2007; Vives, 2008).

Example: assume identical competitors, perfect substitution, market size 1.

Then, $f(n) = 1 - \frac{1}{n+1}$.

Competitor response

Competitors may respond in order to (re)gain their market share (Ferrier et al., 1999; Porter, 1980).

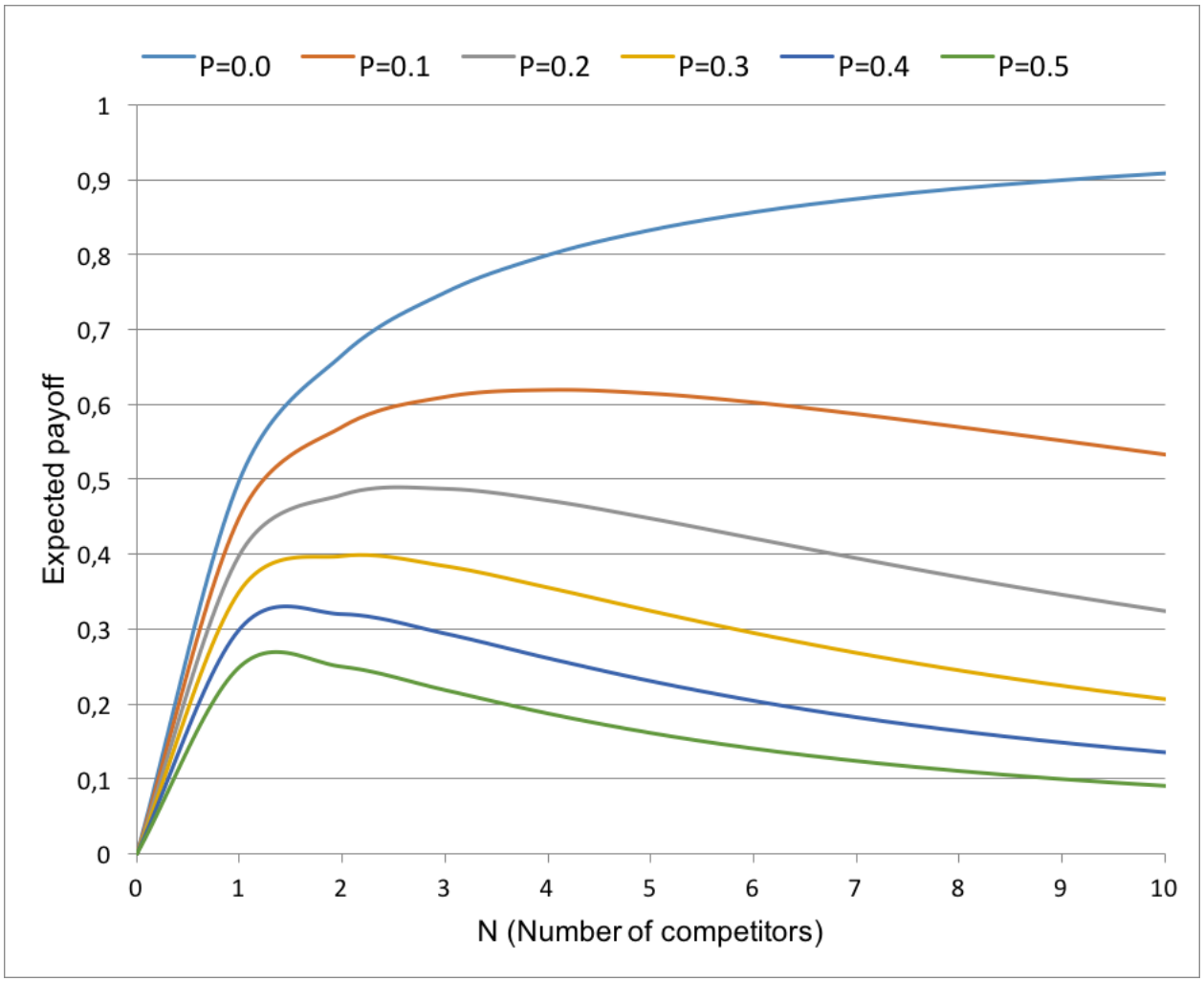
Higher probability of competitor response $=>$ lower market share gain.

Example: assume individual probability of reaction P. Whoever reacts shares the market with "our" firm; those who don't react lose the market.

Then, for each i of n competitors reacting,
$\text{Prob}\,(i \text{ out of } n \text{ react}) = C_i^n P^i (1-P)^n$.

Then, $p(n) \cdot f(n) = \sum_{i=0}^{n} \underbrace{C_i^n P^i (1-P)^n}_{\text{prob reaction}} \cdot \underbrace{\frac{1}{i+1} \cdot \left(1 - \frac{i+1}{n+1}\right)}_{\text{share in market gain}}$

Illustration



Unless no-one reacts ($P = 0$), the gains from competitive action under incentive pay follow an inverted-U pattern.

Study context

Setting from "Team incentives and performance" (Friebel et al., 2017)

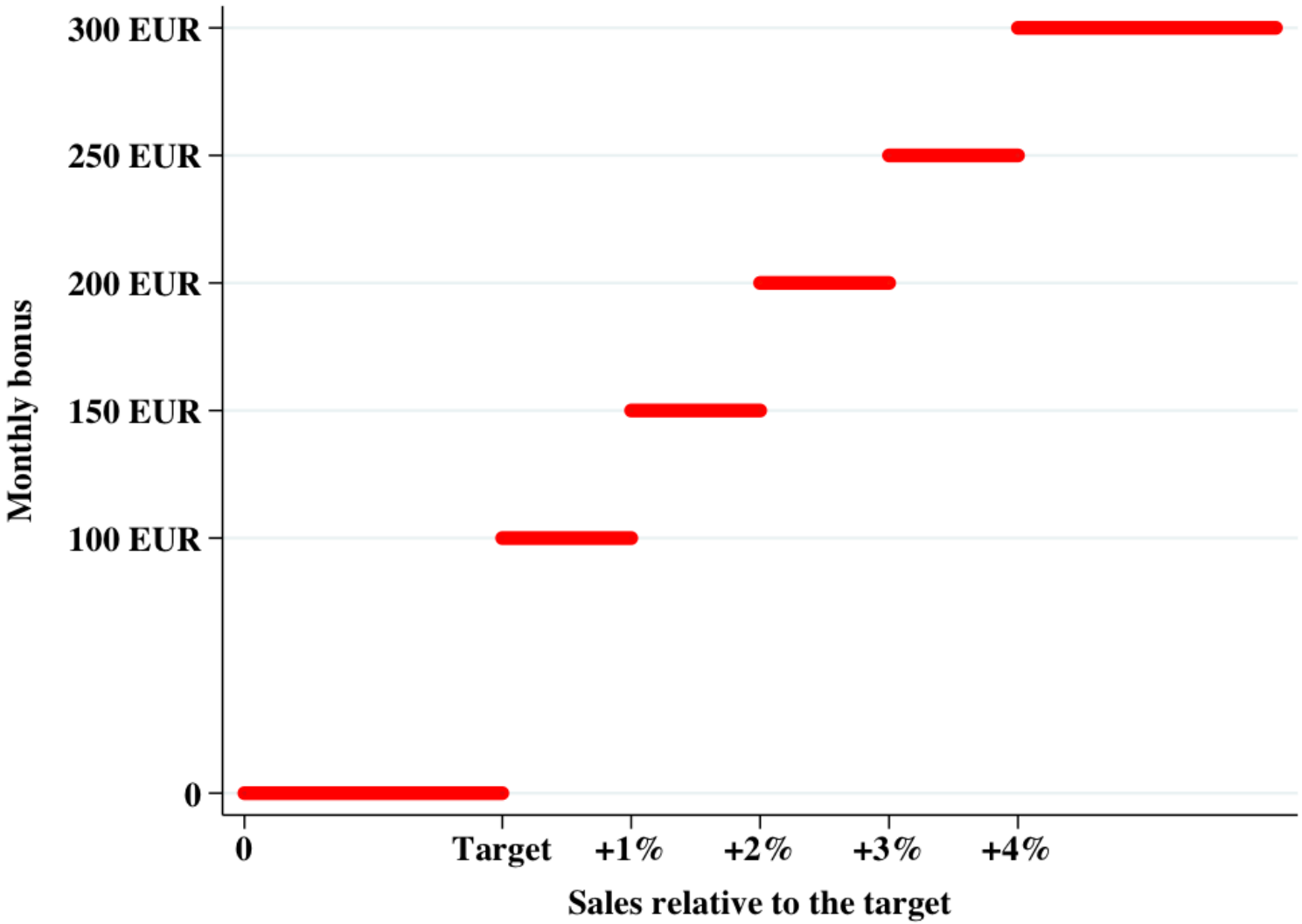
Study firm is a network of 193 bakeries (average headcount 7, mainly part-timers, female, aged 35-40).

A profitable business before Aldi and Lidl ate into the retail bakery market in 2010s.

The firm couldn't win on price, so decided to improve service quality. Hence, incentives for shop sales teams as of April 2014.

As an experiment, incentives were implemented in 97 randomly selected shops, varying in sales, size, location, and local competition.

The incentives scheme for shop sales assistants



Pre-treatment descriptive statistics

	All shops (n=193)	*Control* (n = 96)	*Treatment* (n = 97)	*t-test* p-value
Panel A: Characteristics of the shops				
Mean sales	27,820 (13,094)	27,453 (11,481)	28,194 (14,542)	0.695
Mean sales (in logs)	10.15 (0.40)	10.14 (0.39)	10.15 (0.41)	0.846
Mean # of customer visits	10,079 (3,969)	10,028 (3,921)	10,131 (4,018)	0.856
Mean sales target	28,807 (13,266)	28,488 (11,717)	29,129 (14,663)	0.736
Mean number of employees	7,22 (3.23)	7,28 (3.23)	7,17 (3.22)	0.800
Mean total working time	724.9 (353.1)	724.0 (346.6)	725.8 (359.5)	0,971
Mean age	37.6 (14.0)	37,2 (13.9)	37.9 (14.0)	0,417
Panel B: Characteristics of the shop locations				
Mean Market competition (= # competitors in 1 km radius)	2.67 (2.75)	2.81 (2.88)	2.52 (2.60)	0.462
Mean Market competition from Aldi and Lidl (= # Aldi and Lidl supermarkets in 1 km radius)	0.89 (0.90)	0.89 (0.92)	0.90 (0.87)	0.932
Mean % of large competitors (= #supermarkets / #total competitors, 1 km radius)	0.32 (0.33)	0.31 (0.32)	0.34 (0.34)	0.977
Big town	30.0%	33.3%	26.8%	0.194

Notes: Standard deviations are in parentheses. Last column reports the p-values of the two-sided t-test of equality of the means. For Panels A and B: The data are from January 2012 to March 2014. "Big town" refers to municipalities with more than 100.000 inhabitants.

Estimation procedure

$$ln(sales_{it}) = \sum_{g=1}^{G} \beta_g \cdot treatment_i \cdot after_t \cdot dummy_{ig} +$$

$$+ time_t + shop_i + controls_{it} + error_{it},$$

where g is the competition group.

Competition groups:

- Low: 0-2 competitors (i.e., bakeries) within a 1km radius from the focal shop
- Moderate: 3-4 competitors
- High: 5+ competitors

Pre-treatment descriptive statistics by competition group

	All shops			Shops in big towns		
Level of competition	*Low*	*Moderate*	*High*	*Low*	*Moderate*	*High*
# competitors (in 1 km)	0, 1, 2	3, 4	> 4	0, 1, 2	3, 4	> 4
Treatment shops (in %)	50.8%	50.5%	47.8%	53.9%	40%	45.2%
Mean Sales	28,251	29,194	24,177	31,410	33,665	30,942
	(11,696)	(17,864)	(9,238)	(13,906)	(23,676)	(8,177)
Mean # of Customer Visits	10,167	10,120	9,591	11,697	11,337	12,012
	(4,042)	(4,161)	(3,241)	(5,181)	(4,668)	(3,161)

Notes: Standard deviations are in parentheses. The data are from January 2012 to March 2014. "Big town" refers to municipalities with more than 100,000 inhabitants.

Baseline results

	All shops			Shops in big towns		
Panel A: Log(sales)						
Level of competition:	*Low*	*Moderate*	*High*	*Low*	*Moderate*	*High*
$Treatment_i$*$after_t$	0.005 (0.013)	0.057*** (0.020)	0.015 (0.016)	0.014 (0.028)	0.119*** (0.023)	0.020 (0.023)
p-value of the test for treatment effect equality between competition groups		**0.095**			**0.003**	
Panel B: Log(number of customers)						
$Treatment_i$*$after_t$	0.017 (0.012)	0.040** (0.019)	0.013 (0.016)	0.023 (0.026)	0.101*** (0.021)	0.017 (0.024)
p-value of the test for treatment effect equality between competition groups		**0.480**			**0.016**	
Panel C: Log (sales per customer)						
$Treatment_i$*$after_t$	-0.011** (0.005)	0.017*** (0.006)	0.002 (0.005)	-0.009 (0.009)	0.018* (0.010)	0.003 (0.006)
p-value of the test for treatment effect equality between competition groups		**0.004**			**0.156**	
Controls		YES			YES	
Observations		2426			848	
Shops		188			68	

Largest treatment effect under moderate competition.

Business stealing vs. competitor response

Can we use our data and reduced-form estimation approach to get variation in the probability of individual competitor response (P)?

"Judo economics" (Gelman and Salop, 1983): large competitors are less likely to respond, more likely to accommodate, because the global revenue loss from response will outweigh the local gain.

Aldi and Lidl won't bother to respond:

- Lage businesses
- Store assistants not incentivised
- Bread sales only a small percentage of total

Hence: we should see more business stealing in areas with more Aldi+Lidl's. And we do: larger treatment effects, and increasing with competition.

Treatment effects by competition group and supermarket presence

Panel A: No supermarket competitor (s=0)			
Level of competition:	*Low*	*Medium*	*High*
$Treatment_i * after_t$	0.019 (0.024)	0.048^{+} (0.036)	-0.009 (0.017)
Panel B: moderate supermarket competitor (s=1/3)			
$Treatment_i * after_t$	0.026 (0.032)	0.064^{+} (0.048)	-0.012 (0.023)
Panel C: only supermarket competitor (s=1)			
$Treatment_i * after_t$	-0.015 (0.023)	0.080^{++} (0.050)	0.114^{++} (0.071)
p-value of the test for treatment effect equality in panels A-C		**0.067**	
Observations		2123	

Alternative/additional explanation 1: Efficiency

Shops in high-competition areas may have already been super-efficient before the introduction of incentives – harder to generate extra cash.

High efficiency of shops in competitive areas may also explain the decrease in the treatment effect from moderate to high competition.

Test: back out efficiency estimates from a stochastic frontier model, interact those with the treatment dummy.

Incentives, competition, and efficiency

	All shops			Shops in big towns		
	Panel A: summary of statistics for shop efficiency					
Level of competition:	*Low*	*Moderate*	*High*	*Low*	*Moderate*	*High*
Average shop-level efficiency measure	0.068 (1.044)	-0.108 (1.139)	0.000 (0.769)	0.197 (0.706)	-0.251 (1.210)	-0.036 (1.085)
	Panel B: Average treatment effect on Log(sales)					
$Treatment_i$*$after_t$	-0.001 (0.015)	0.051*** (0.015)	0.016 (0.014)	0.016 (0.032)	0.100*** (0.016)	0.031* (0.017)
$Treatment_i$*$after_t$*$efficiency_i$	0.034 (0.025)	-0.087*** (0.015)	-0.035 (0.22)	0.002 (0.051)	-0.083*** (0.016)	-0.014 (0.016)
shop-level efficiency control		YES			YES	
p-value of the test for treatment effect equality between competition groups		**0.047**			**0.005**	
Controls		YES			YES	
Observations		2425			848	
Shops		187			68	

Treatment effect is weaker in more efficient shops.

However, no relationship between competition and efficiency, so can't explain our findings.

Alternative/additional explanation 2: Sales targets

Recall: bonus is paid upon reaching the sales target, not piece by piece.

All else equal, target level affects effort.

Could be that target levels vary by local competition, thus affecting effort and sales beyond competition.

Test: use historical target achievement rates, interact them with the treatment dummy.

Incentives, competition, and sales targets

	All shops			Shops in big towns		
Panel A: Summary of statistics for frequency of reaching sales target						
Level of competition:	*Low*	*Moderate*	*High*	*Low*	*Moderate*	*High*
frequency of reaching sales target	0.326 (0.263)	0.330 (0.244)	0.374 (0.301)	0.320 (0.276)	0.396 (0.274)	0.397 (0.297)
Panel B: Average treatment effect on Log(sales)						
$Treatment_i$*$after_t$	0.006 (0.013)	0.054*** (0.020)	0.018 (0.018)	-0.008 (0.040)	0.120*** (0.025)	0.017 (0.030)
$Treatment_i$*$after_t$*$frequency_i$	-0.013 (0.013)	0.006 (0.019)	-0.022* (0.012)	-0.030 (0.038)	-0.020 (0.023)	0.001 (0.019)
Frequency of reaching the sales target control		YES			YES	
p-value of the test for treatment effect equality between competition groups		**0.132**			**0.006**	
Controls		YES			YES	
Observations		2398			828	
Shops		183			65	

No difference in target achievement by competition, and no interactions with the treatment dummy.

Conclusion

An inverted-U pattern in the effect of incentives by local competition.

Why: the sum of the "business stealing" and "competitor response" effects working against each other.

Findings robust to additional/alternative explanations.

Contributions:

- First to demonstrate how local competition influences performance effects of incentives.
- Looked at incentives for rank and file employees (75% of papers in top BWL journals do executive pay).
- One of the few field experiments in strategy research.
- Prototypical framework in this paper can be enriched and structurally estimated, which extends it to many more applications.