Managerial Accounting Research: Making People Out of Machines

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CIMA

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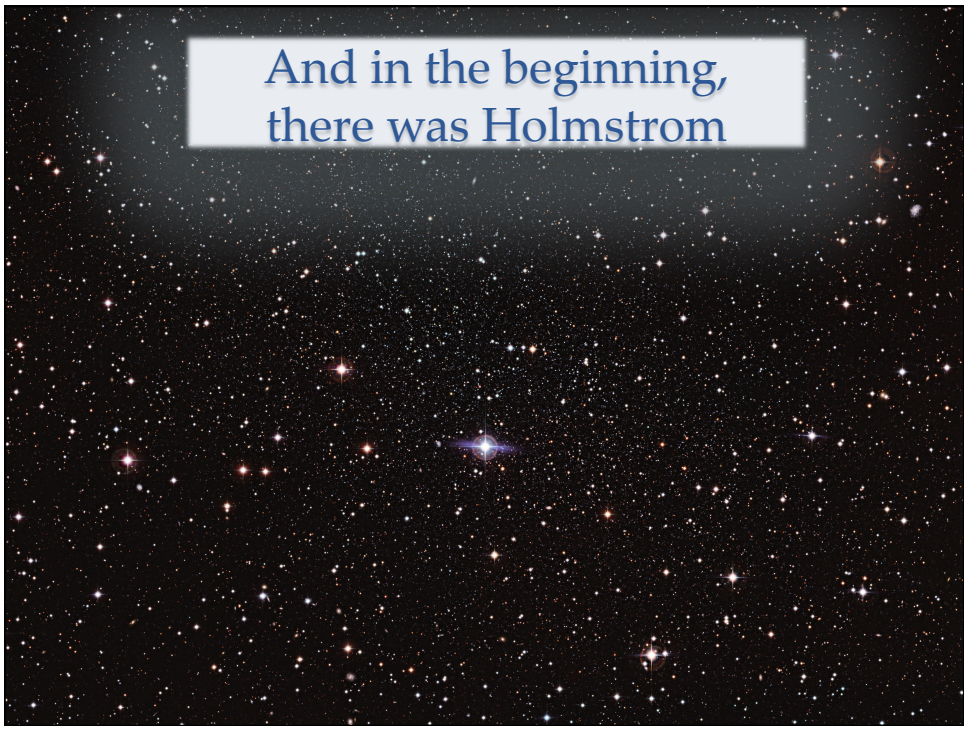
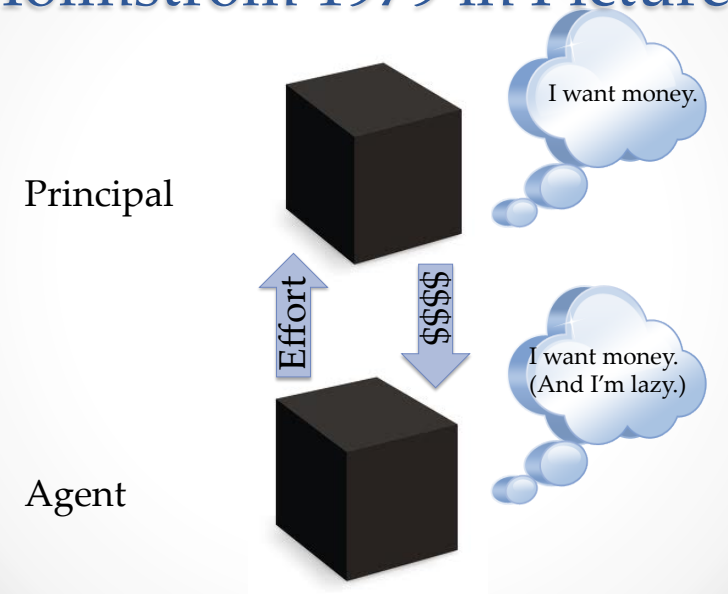


Agency Theory (ala Holmstrom 1979)

". . . a principal-agent relationship, where the agent privately takes an action $a \in A \subseteq \Re$, A being the set of all possible actions, and a together with a random state of nature θ, determines a monetary outcome or payoff $x = x(a,\theta)$. The problem is to determine how this payoff should be shared optimally between the principal and the agent. The principal's utility function is $G(w)$, defined over wealth alone, and the agent's utility function is $H(w,a)$, defined over wealth and action."

Holmstrom 1979 in Pictures



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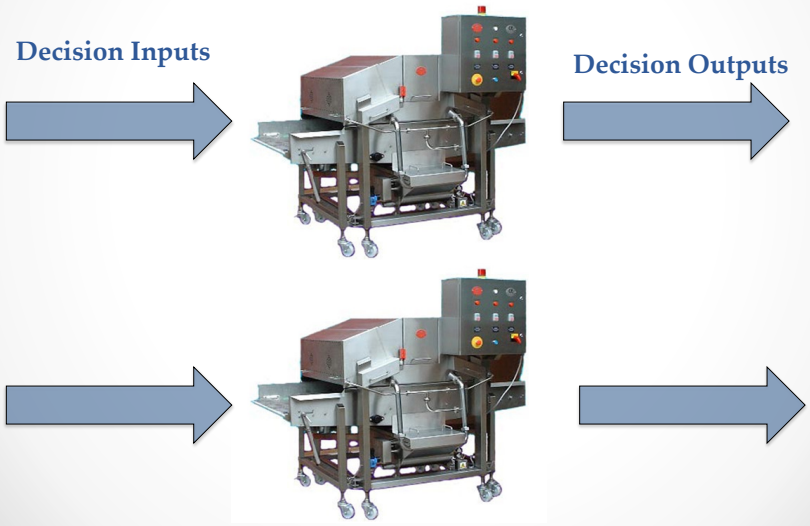

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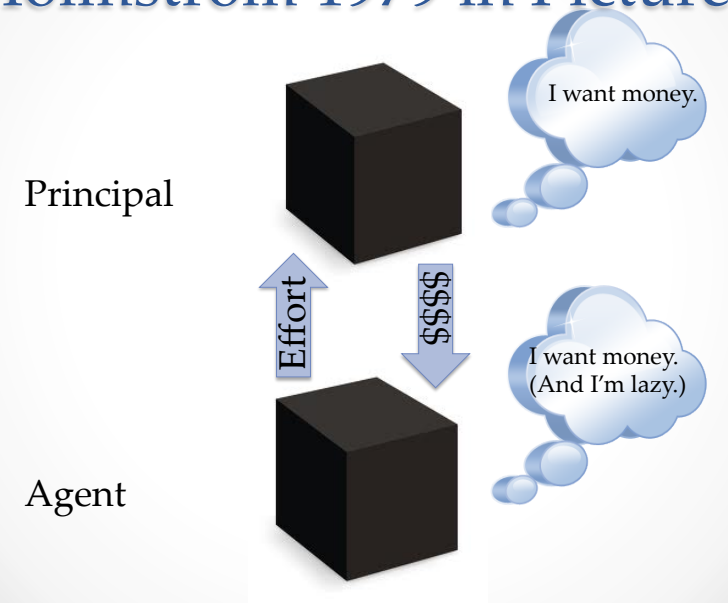
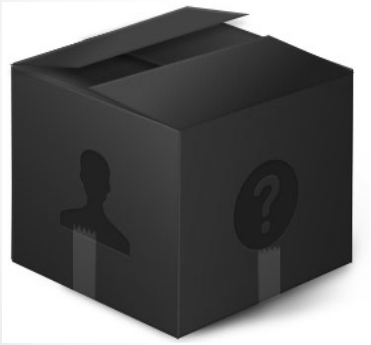


Simple but Powerful

- Informativeness Principal (Holmstrom 1979).
- Optimal performance measure weighting (e.g., Feltham & Xie 1994).
- Capital rationing (Antle & Eppen 1985).
- Decentralization & cost-based transfer-pricing (e.g., Vaysman 1996).
- Non-financial performance measures(Dikolli, 2001).
- etc.
- etc.
- etc.

But They Could Do More



http://www.tedgoas.com/content/1.blog/6.hiring-and-the-black-box/_hdr/black-box.jpg

Tying Empirical Research (more directly) to Analytic Models

- Start with the discipline, organization, and framework of the model.
- Open one or more black boxes.
- Goal: A more coherent body of literature.

Caveats

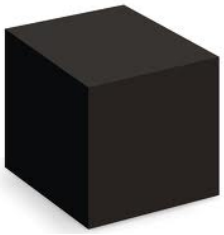
- I don't want to bash analytic modelers.
- I don't want to turn you into a modeler.
- I do want to appeal to you as a consumer of models.
- I do want to demonstrate the potential usefulness of models to inspire empirical research.
- Experimentation vs. Other Empiricism

Three Examples

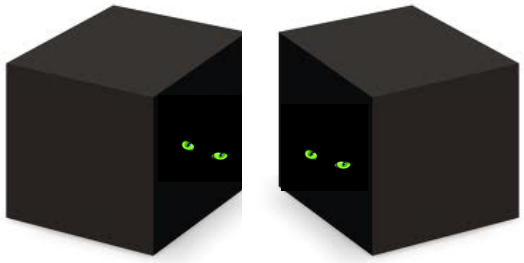
- Taking the Agent out of the Black Box
  - Monitoring Peers
  - Working on Two Things at Once
- Taking the Principal out of the Black Box
  - Weighting multiple performance measures

Taking the Agent Out of the Black Box: Monitoring Peers

Principal



Agents



Two Analytic Solutions

- Vertical (e.g., Ma, 1988, *RES*)
  - Each agent observes the other agent's action and reports it to the principal, who disciplines bad behavior.
- Horizontal (e.g. Arya, Fellingham, Glover, 1997, *JAE*)
  - Agents discipline one another.
- Real world?
  - 360 evals & self-managed teams.

Agency Theory Predictions

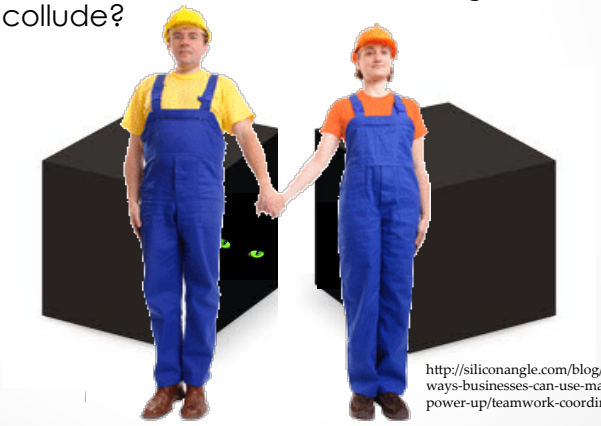
- Vertical
  - Incentives are created to induce agents to report truthfully.
  - Therefore, both agents choose optimal effort levels.
- Horizontal
  - Agents are compensated based on group outcomes.
  - Therefore, agents punish each other for shirking.
  - Therefore, both agents choose optimal effort levels.

Technically Speaking

- Vertical
  - Truthful reporting and working hard is a unique subgame perfect Nash equilibrium.
  - But collusion (both shirking & lying for each other) is Pareto dominant.
  - Collusion likely won't be stable.
- Horizontal
  - Punishing and working hard is a Pareto dominant Nash equilibrium.
- Bottom Line
  - If collusion is a significant problem, horizontal will work better.

A Technical Insight to Motivate Empirical Research

- The empiricist in me asks:
  - What are the conditions under which agents will stably collude?



http://siliconangle.com/blog/2012/07/05/3-ways-businesses-can-use-maps-coordinate-to-power-up/teamwork-coordination

Social Identity

Insight from Empirical Study (and bringing in a little psych)

- Towry 2003 (*TAR*)
  - The relative effectiveness of horizontal vs. vertical incentive systems depends on the level of "team identity."
  - As team identity increases, horizontal systems become relatively more effective at inducing effort.

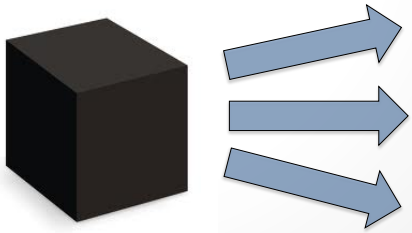
Symbiosis

- What did the models do for me?
  - Provided a framework for organizing thinking.
  - Brought order to real-world observations.
    - 360 evals and self-managed teams as alternate control mechanisms?
- How did the empirical study contribute?
  - Helped to distinguish among alternate analytic solution concepts.

Taking the Agent Out of the Black Box: Working on More than One Thing

Principal

Agent



The Analytic Solution

- "Partial Incentives" will reduce performance on unrewarded tasks.
- Thus, flat-wage contracts can be preferable (e.g., Holmstrom & Milgrom, 1991, *JLEO*).

Questioning an Assumption

- "Partial Incentives" will reduce performance on unrewarded tasks.
- Why Question It?
- The empiricist in me asks:
  - What are the conditions under which partial incentives will reduce performance on the unrewarded task?

Reconciling Model with Evidence

- Multiple tasks vs. multiple dimensions?
  - Model
  - Evidence
- Why would that matter?

Timing!

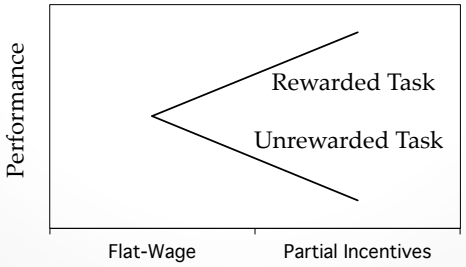
Brain Activation

- Incentives on one task light up the brain.
- This activation can "spill over" to other tasks."
- Activation improves performance (on both tasks).

www.dapla.org

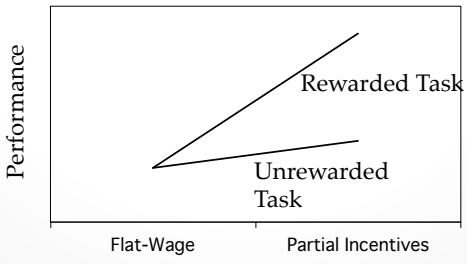
Insight from Empirical Study (and bringing in a little neuroscience)

- Hecht, Tafkov, Towry 2012 (*CAR*)
  - Yes, partial incentives increase the disparity in performance.



Insight from Empirical Study (and bringing in a little neuroscience)

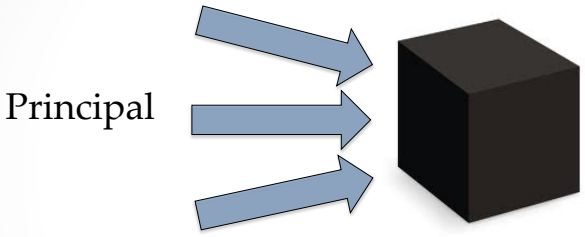
- Hecht, Tafkov, Towry 2012 (*CAR*)
  - Yes, partial incentives increase the disparity in performance.
  - BUT. . . when tasks are simultaneous, partial incentives can increase performance on unrewarded tasks.



Symbiosis

- What did the model do for me?
  - Formalized / clarified intuition.
  - Provided a benchmark against which to compare empirical results.
- How did the empirical study contribute?
  - Identified a "boundary condition" for analytic prediction.
  - Helped explain "disconnect" between two literatures.

Taking the Principal Out of the Black Box:
Weighting Multiple Performance Measures



The Analytic Solution

- Contracting weights are a function of the measure's attributes (e.g., congruence and precision, Feltham and Xie, 1994, *TAR*).
  - These attributes are known ex *ante*.
  - Therefore, weights are determined ex *ante*.

Questioning an Assumption

- "Weights are determined ex *ante*."
- Why question it?
- The empiricist in me asks:
  - Would ex *ante* vs. ex *post* weighting make a difference?

Why would timing matter?

- Long-term goal of performance-based compensation: motivation.
- Short-term focus may be different, depending on timing.
  - Framing.
    - *Ex ante*: Motivational frame => congruence.
    - *Ex post*: Evaluative frame => precision.

Insight from Empirical Study (and bringing in a little behavioral econ)

- Deason, Hecht, Tayler, Towry (Working Paper)
  - Weight on congruent measures is higher in *ex ante* weighting decisions.
  - Weight on precise measures is higher in *ex post* weighting decisions.

Symbiosis

- What did the models do for me?
  - Provided a framework for organizing thinking.
  - Formed the "backbone" of the theory.
    - Congruence & precision.
- How did the empirical study contribute?
  - Helped identify an important factor missing from the model.
  - Helped assess the reasonableness of model assumptions.

Symbiosis Summary

- Models bring a lot to the table.
  - Providing a framework for organizing thinking.
  - Bringing order to real-world observations.
  - Formalizing intuition / clarifying thoughts.
  - Providing a benchmark against which to compare empirical results.

They force discipline & precision in thinking.

Symbiosis Summary

- So does empiricism.
  - Helping to distinguish among alternate analytic solution concepts.
  - Identifying boundary conditions.
  - Building a bridge between analytic predictions and what we have observed.
  - Assessing the reasonableness of model assumptions.

What Does It Take?

- Do you have to understand the math?
  - No!
- Do you have to understand the econ?
  - Yes.
  - But the economic intuition isn't too complicated.
  - Basic "set up" is always the same.
- Does this advice apply to other theories (e.g., transaction cost economics)?
  - Yes.
  - But there is not as rich a selection of models to start with.

Take-Aways

- Go ahead – dive in!
- Analytic Models based on Agency Theory can teach us SO MUCH.
  - But only so much.
  - Bring in a little something.
- Transform those black boxes (those machines) into human beings and see how much more we can learn!

Thank you!