

Holmstrom and Milgrom (1994)

Firms as (Balanced) Incentive
Systems

Firms Take Many Choices

- $V=V(y_1, y_2, y_3, x_1, x_2)$
- BM&S: y_1 ...Leverage
 y_2 ...Debt Maturity
 y_3 ...

 x_1 ...Investment Opportunities
 x_2 ...Regulation

Firms Take Many Choices

- $V=V(y_1, y_2, y_3, x_1, x_2)$
- H&M:
 - y_1 ...Employment vs. Outsourcing
 - y_2 ...High- or Low-Powered Pay
 - y_3 ...Freedom in Work
 - x_1 ...Observability of Effort
 - x_2 ...Complexity of Tasks

Caring about Endogeneity

- Often regressions include endogenous variables on the right-hand side
 - $\text{Cov}(x,e)=0$? Inconsistent/Biased estimates?
- Often regressions do not acknowledge simultaneous choices
 - Direct and Indirect Effects?

H&M 1994

- Supermodularity of $V=V(y_1, y_2, y_3, x_1, x_2)$
 - ensures positive monotone comparative statics,
 - implies positive covariation of exogenous and endogenous variables.
- A problem remains. $\text{Cov}(x_1, x_2)$? Theory does not say anything about dist. of x

H&M 1994

- Supermodularity is not enough to observe systematic patterns in a cross-section
- Check association: for non-decreasing f, g ,

$$\text{cov}[f(x_1, x_2), g(x_1, x_2)] \geq 0$$

H&M

- Association may not be there. (Empirical question).
- If association is not there, controls are required.

Conclusion

- H&M develop an interesting theory that shows why ownership AND high-powered incentive pay AND freedom co-vary in firms. (Several y's, no simultaneous eq's...)
- Empirical implementation, even of simple correlation tests, requires conditions on exogenous distributions.

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