

# David A. Miller

Dept. of Economics, 9500 Gilman Dr., La Jolla, CA 92093–0508  
E-mail: [d9miller@ucsd.edu](mailto:d9miller@ucsd.edu) | Web page: [dss.ucsd.edu/~d9miller](http://dss.ucsd.edu/~d9miller)  
Office: (858) 822-0632 | Fax: (858) 534–7040

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## Tenure track appointment

- University of California, San Diego, Dept. of Economics: Assistant Professor, 2004–present

## Other positions

- Yale University, Dept. of Economics: Visiting Professor, 2008–2009
- Tellus Institute, Risk Analysis Group, Boston, MA: Research Analyst, 1995–1998

## Education

- Stanford University: Ph.D. in Economics, June 2004  
Dissertation committee: Susan Athey (primary advisor), Ilya Segal, Steven Tadelis
- Harvard University: A.B. in Environmental Science and Public Policy, June 1995  
*Summa cum laude*

## Work in progress

- “Optimal ex post incentive compatible equilibria in repeated games of private information”  
(Under review)

An *ex post perfect public equilibrium* is a perfect public equilibrium that is robust to the possibility that players might observe unmodeled, payoff-irrelevant signals that are correlated with each others’ contemporaneous private information. However, robustness comes at a cost to the players: they typically must burn money to implement efficient outcomes. In two-player repeated allocation games, the players always prefer to give up some allocative efficiency in order to burn less money. When valuations are independent, optimal equilibria often avoid burning money entirely, but when valuations are globally interdependent, optimal equilibria always expect to burn money. Applied to the problem of collusion with hidden costs, these results yield new insights into the phenomenon of price wars.

- “Monitoring with collective memory”

With Kareen Rozen

We propose a model in which teammates promise to complete socially efficient tasks; each task is an activity that a single person must exert costly effort to complete properly, but can be “botched” effortlessly. Each team member has limited capacity to allocate between monitoring and productive tasks. Such resource constraints may arise from limited time, staffing, capital, attention, or, as in our main example, bounded memory. The possibility of completing each task properly is privately observed, and monitoring is imperfect. We find that an optimal contract in this setting is generally “forgiving,” and that players optimally make “empty promises” that they don’t necessarily intend to fulfill. As uncertainty in production and monitoring increases (e.g., due to greater forgetfulness), players optimally make more empty promises and devote more of their resources to monitoring.

- “A theory of disagreement in repeated games with negotiation”

With Joel Watson

We model repeated games with transferable utility and endogenous renegotiation, in which at the beginning of each period the players negotiate over their continuation play. Bargaining is cooperative, and depends on the endogenously generated outside options. We define the concept of *negotiation equilibrium*, in which the players’ agreements are optimal subject to consistency and incentive compatibility constraints. A particular feature of negotiation equilibrium is that it allows for the players to disagree (which we view as a joint deviation), in which case they make no transfers in that period but still take actions that may depend on the history, and then anticipate agreeing again in the next period. This contrasts with renegotiation proofness, which does not allow for disagreement. We identify conditions under which all negotiation equilibria are efficient, as well as conditions under which optimal negotiation equilibria are inefficient. The actions that the players would choose under disagreement are key to supporting high payoffs under agreement.

- “Enforcing cooperation in networked societies”

With S. Nageeb Ali

We endogenize social network formation and social interaction using a model in which players interact bilaterally and repeatedly along costly links. Cooperation is supported by the threat of collective punishment. When the society is homogeneous, the optimal network consists of many separate cliques. Introducing heterogeneity gives rise to more realistic networks, with high clustering, small diameter, and global organization.

## Publications

- “Invention under uncertainty and the threat of ex post entry”

*European Economic Review*, 52(3):387–412, April 2008 (lead article).

This paper proposes a theoretical framework for studying the invention of new products when demand is uncertain. In this framework, under general conditions, the threat of ex post entry by a

competitor can deter invention *ex ante*. Asymmetric market power in the *ex post* market exacerbates the problem. The implications of these general results are examined in a series of examples that represent important markets in the computer industry. The first is a model that shows how an operating system monopolist, by its mere presence, can deter the invention of complements, to its own detriment as well as that of society. The implications of policies such as patent protection, price regulation, and mandatory divestiture are considered. Three additional examples consider the ability of a monopolist in one market to commit to bundling an unrelated product, a pair of horizontally differentiated firms that can add a new feature to their products, and a platform leader that can be challenged in its base market by the supplier of a complementary product.

- “Was there too little entry during the Dot Com Era?”

With Brent Goldfarb and David Kirsch

*Journal of Financial Economics*, 86(1):100–144, October 2007.

Popular press coverage: *The Wall Street Journal* (Lee Gomes, “The Dot-Com Bubble is reconsidered—and maybe relived,” p. B1, November 8, 2006); Inc.com (Leslie Taylor, “The dot-com bust? Not as bad as you think,” <http://www.inc.com/criticalnews/articles/200612/bubble.html>, December 4, 2006).

We present four stylized facts about the Dot Com Era: (1) there was a widespread belief in a “Get Big Fast” business strategy; (2) the increase and decrease in public and private equity investment was most prominent in the internet and information technology sectors; (3) the survival rate of dot com firms is on par or higher than other emerging industries; and (4) firm survival is independent of private equity funding. To connect these findings we offer a herding model that accommodates a divergence between the information and incentives of venture capitalists and their investors. A Get Big Fast belief cascade may have led to overly focused investment in too few internet startups and, as a result, too little entry.

- “Efficiency in repeated trade with hidden valuations”

With Susan Athey

*Theoretical Economics*, 2(3):299–354, September 2007.

We analyze the extent to which efficient trade is possible in an ongoing relationship between impatient agents with hidden valuations (i.i.d. over time), restricting attention to equilibria that satisfy *ex post* incentive constraints in each period. With *ex ante* budget balance, efficient trade can be supported in each period if the discount factor is at least one half. In contrast, when the budget must balance *ex post*, efficiency is not attainable, and furthermore for a wide range of probability distributions over their valuations, the traders can do no better than employing a posted price mechanism in each period. Between these extremes, we consider a “bank” that allows the traders to accumulate budget imbalances over time, but only within a bounded range. We construct non-stationary equilibria that allow traders to receive payoffs that approach efficiency as their discount factor approaches one, while the bank earns exactly zero expected profits. For some probability distributions

there exist equilibria that yield exactly efficient payoffs for the players and zero profits for the bank, but such equilibria require very high discount factors.

- “‘Token’ equilibria in sensor networks with multiple sponsors”

With Sameer Tilak and Tony Fountain

Proceedings of the Workshop on Stochasticity in Distributed Systems (StoDiS’05), San Jose, CA, December 19, 2005.

When two sponsoring organizations, working towards separate goals, employ wireless sensor networks for a finite period of time, it can be efficiency-enhancing for the sponsors to program their sensors to cooperate. But if each sensor privately knows whether it can provide a favor in any particular period, and the sponsors cannot contract on ex post payments, then no favors are performed in any Nash equilibrium. Allowing the sponsors to contract on ex post payments, we construct equilibria based on the exchange of “tokens” that yield significant cooperation and increase expected sponsor payoffs. Increasing the sponsors’ liability is beneficial because it enables them to use more tokens.

## **Fellowships**

- Stanford Institute for Economic Policy Research Dissertation Fellowship, 2003–2004

## **Professional activity**

- Member: American Economic Association, Econometric Society, Game Theory Society
- Referee: *Econometrica*, *American Economic Review*, *Review of Economic Studies*, *Theoretical Economics*, *Games and Economic Behavior*, *Journal of Economic Theory*, *RAND Journal of Economics*, *American Economic Journal: Microeconomics*, *Journal of the European Economic Association*, *Journal of Mathematical Economics*, *Economic Theory*, *International Economic Review*, *Journal of Economics and Management Strategy*, *Review of Economic Dynamics*, *Berkeley Journals in Theoretical Economics*, *Management Science*, *Journal of Industrial Economics*, *International Journal of Industrial Organization*, *Southern Economic Journal*.

## **Presentations**

- TBA  
2010: Bocconi University, Milan (invited); Collegio Carlo Alberto, Turin (invited); Zurich University (invited); European University Institute, Florence (invited).

- “A theory of disagreement in repeated games with renegotiation”  
2009: NBER Organizational Economics Working Group Meeting, Cambridge, MA (invited).  
2008: UCSD; UCLA; Southwest Economic Theory Conference, UCSB; USC; Third World Congress of the Game Theory Society, Northwestern University; Workshop on Recent Advances in Repeated Games, Stony Brook Game Theory Festival; Columbia; Western Ontario; Toronto.
- “Monitoring with collective memory”  
2009: NSF/NBER/CEME Conference on General Equilibrium and Mathematical Economics, UCSD.
- “Enforcing cooperation in networked societies”  
2008: UCSD; Stanford Institute for Theoretical Economics; Annual Meeting of the Society for Economic Dynamics, Cambridge, Massachusetts; Georgetown; USC Marshall; Harvard/MIT; NYU Stern; Yale.
- “A theory of disagreement in repeated games with renegotiation”  
2008: UCSD; UCLA; Southwest Economic Theory Conference, UCSB; USC; Third World Congress of the Game Theory Society, Northwestern University; Workshop on Recent Advances in Repeated Games, Stony Brook Game Theory Festival; Columbia; Western Ontario; Toronto.
- “A short course on repeated games”  
2007: Sungkyunkwan University.
- “Efficiency in repeated trade with hidden valuations”  
2006: Australasian Meetings of the Econometric Society, Alice Springs, Australia; Arizona State.  
2005: UCSD; NBER/NSF Decentralization Conference, University of Illinois at Urbana-Champaign.
- “Four lectures on repeated games with private information”  
2006: Shanghai University of Finance and Economics.
- “The dynamic cost of ex post incentive compatibility”  
2006: University of Melbourne. 2005: Econometric Society World Congress, University College London; USC; UC Riverside; Caltech. 2004: UT Austin; UCSD; Northwestern; Kellogg School of Management; Michigan; Brown; Yale School of Management; Wisconsin; UCLA.
- “Was there too little entry in the Dot Com Era?”  
2006: UCSD.
- “‘Token’ equilibria in sensor networks with multiple sponsors”  
2005: Caltech SISL Workshop.
- “Invention under uncertainty and the threat of ex post entry”  
2005: International Industrial Organization Conference, Georgia Tech.

- “Attainable payoffs in repeated games with private information”  
2005: Southwest Economic Theory Conference, UC Riverside; Stanford Institute for Theoretical Economics. 2004: UCSD.