

Spring 2019

413-3 Information, Coordination, and Market Design

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Short Presentation

This course has two parts. The first part focuses on mechanism and information design, with special attention to dynamic problems. It introduces various techniques (envelope theorems for stochastic dynamic problems, ratcheting, renegotiation-proofness, type-dependent participation constraints, dynamic VCG mechanisms, dynamic profit-maximizing mechanisms, competing principals) and then shows how to apply the techniques to concrete problems, including the design of platforms and matching protocols. The second part focuses on coordination under dispersed information. After covering the key theoretical underpinning in the global-games literature, it shows how to apply the techniques to various coordination settings including bank runs, currency attacks, stress-test design, and the adoption of technologies in markets with network effects.

Evaluation is by problem sets and a final project.

Schedule

Monday and Wednesday, 1.30-3.20PM

All sessions will take place in KGG 3301 (Economics Dept. 3rd floor)

Reading List

The references below are way more exhaustive than what will be covered in class. They are meant to provide students with useful information about related research topics.

PART 1: MECHANISM DESIGN

1.0: General references for the theory of contracts and mechanism design

Bolton P. and M. Dewatripont, *Contract Theory*, Cambridge, MA: MIT Press, 2005 (B&D).

Laffont, J.-J., and D. Martimort (2002), *The Theory of Incentives: The Principal-Agent Model*, Princeton University Press. (L&M)

Laffont, J.-J. and J. Tirole (1993), *A Theory of Incentives in Procurement and Regulation*. Cambridge: MIT Press. (L&T)

Mas-Collel, A., M. Whinston, and J. Green (1995), *Microeconomic Theory*, Oxford University Press.

Salanie, B. (1997), *The Economics of Contracts: A Primer*, MIT Press.

Borges, T. (2014), *An Introduction to the Theory of Mechanism Design*, Oxford University Press

Gerhkov, A. and B. Moldovanu (2015), *Dynamic Allocation and Pricing*, MIT Press

1.1 Static mechanism design (single agent)

Pavan: Lecture Notes

B&D, Chapter 2

L&M, Chapters 2+3

L&T, Chapter 1

Baron, D., and R. Myerson (1982), "Regulating a Monopolist with Unknown Costs," *Econometrica*, 50:911-930.

Clarke, F. (1989), "Methods of Dynamic and Nonsmooth Optimization," Society for Industrial and Applied Mathematics, Philadelphia, PA.

Garcia, D. (2005), "Monotonicity in Direct Revelation Mechanisms," *Economics Letters*, 88(1), 21.26.

Gomes, R. and A. Pavan, (2016), "Many-to-Many Matching and Price Discrimination," *Theoretical Economics*, 1005–1052.

Gomes, R. and A. Pavan, (2019), "Price Customization and Targeting in Matching Markets," mimeo Northwestern University and TSE.

Guesnerie, R. and J.-J. Laffont (1984), "A Complete Solution to a Class of Principal-Agent Problems with an Application to the Control of a Self-Managed Firm," *Journal of Public Economics*, 25, 329-369.

Laffont, J.-J., and J. Tirole (1986), "Using Cost Observations to Regulate Firms," *Journal of Political Economy*, 94:614-41.

Maskin, E., and J. Riley (1984), "Monopoly with Incomplete Information," *Rand Journal of Economics*, 15:171-96.

Milgrom, P., and I. Segal (2002), "Envelope Theorems for Arbitrary Choice Sets," *Econometrica*, 70(2), 583.601.

Strausz, R. (2003), "Deterministic Mechanisms and the Revelation Principle," *Economic Letters* 79, 333-337.

Strausz, R. (2006), "Deterministic versus Stochastic Mechanisms in Principal-Agent Models," *Journal of Economic Theory*, 127(1), 306-314.

Topkis, D. M. (1998), "Supermodularity and Complementarity," Princeton University Press.

1.2. Dynamic mechanism Design

Pavan: Lecture Notes

B&D, Chapter 9

L&T, Chapters 9 and 10.

Akan, M. B. Ata and J. Dana (2014). "Incoming Demand with Private Uncertainty," mimeo, Northeastern University

Akan, M. B. Ata and J. Dana, (2015). "Revenue Management with Sequential Screening," *Journal of Economic Theory*, 159(B) 728-774

Athey, S., and I. Segal (2013), "An Efficient Dynamic Mechanism," *Econometrica*, 81, 2463-2485.

Athey, S., and I. Segal (2007), "Designing Efficient Mechanisms for Dynamic Bilateral Trading Games" *American Economic Review Papers and Proceedings*, 2007

Baron, D. and D. Besanko, (1984), "Regulation and Information in a Continuing Relationship," *Information Economics and Policy*, 1 447-470.

Baron, D. and D. Besanko, (1987), "Commitment and fairness in a dynamic regulatory relationship," *Review of Economic Studies*, 54, 413-436.

Battaglini, M. (2005), "Long-Term Contracting with Markovian Consumers," *American Economic Review*, Vol. 95, n.3, 637-658.

Battaglini, M. (2007), "Optimality and Renegotiation in Dynamic Contracting," *Games and Economic Behavior*, 60(2), 213-246.

Battaglini, M. and S. Coate (2008), "Pareto Efficient Income Taxation with Stochastic Abilities," *Journal of Public Economics*, 92(3-4), 844-868.

Battaglini, M. and R. Lamba (2019), "'Optimal Dynamic Contracting: the First-Order Approach and Beyond'," *Theoretical Economics*, forthcoming.

Bergemann, D., and J. Välimäki (2010), "The Dynamic Pivot Mechanism," *Econometrica*, 78(2), 771-789.

Bergemann, D., and P. Strack (2015), "Dynamic Revenue Maximization: A Continuous Time Approach," *Journal of Economic Theory* 159, 819–853. 821

Bergemann, D. and A. Wambach (2015), "Sequential Information Disclosure in Auctions," *Journal of Economic Theory*, 159, 1074–1095.

- Bester, H. and R. Strausz, (2001), “Imperfect Commitment and the Revelation Principle: The Single Agent Case”, *Econometrica*, 69(4), 1077-1098.
- Boleslavsky, R. and M. Said (2013). “Progressive Screening: Long-term Contracting with a Privately Known Stochastic Process,” *Review of Economic Studies*, 80, 1-34.
- Board, S. (2008), "Durable-goods monopoly with varying demand," *Review of Economic Studies*, 75(2) 391-413.
- Board and Skrzypacz (2015) “Revenue Management with Forward-looking Buyers,” *Journal of Political Economy*, 124(4).
- Chassang, S. (2013) “Calibrated Incentive Contracts,” *Econometrica*. 81, 1935-1971.
- Courty, P. and H. Li, (2000), “Sequential Screening,” *Review of Economic Studies*, 67, 697-717.
- Deb, R. and M. Said (2015), “Dynamic Screening with Limited Commitment,” *Journal of Economic Theory*, 159(B), 891-928.
- Dewatripont, M. (1989), “Renegotiation and Information Revelation over Time: The Case of Optimal Labor Contracts,” *Quarterly Journal of Economics*, 104: 589-619.
- Dewatripont, M. and Maskin, E. (1990), “Contract Renegotiation in Models of Asymmetric Information,” *European Economic Review*, 34(2-3): 311-321.
- Dewatripont, M. and Maskin, E. (1995), “Credit and Efficiency in Centralized and Decentralized Economies,” *Review of Economic Studies* 62(4), 541-555.
- Doepke, M., and R. Townsend, “Dynamic Mechanism Design with Hidden Income and Hidden Actions,” (2006), *Journal of Economic Theory*, 126(1), 235-285.
- Doval, L. and V. Skreta (2018), “Mechanism Design with Limited Commitment”, mimeo, Caltech.
- Ely, J., Hinnosaar, T. and D. Garrett (2017) “Overbooking” *Journal of the European Economic Association*, 15(6), 1258–1301
- Eso, P. and B. Szentes, (2007), “Optimal Information Disclosure in Auctions and the Handicap Auction,” *Review of Economic Studies*, 74(3), 705-731.
- Eso, P. and B. Szentes, (2017) “Dynamic Contracting with Adverse Selection: An Irrelevance Theorem,” *Theoretical Economics* 12, 109–139
- Farinha Luz, Vitor (2014). “Dynamic Competitive Insurance,” mimeo University of British Columbia.
- Farhi, Emmanuel and Ivan Werning (2013). “Insurance and Taxation over the Life Cycle,” *Review of Economic Studies*, 80, 596-635.
- Fershtman, D. and A. Pavan (2017). “Pandora Auctions: Dynamic Matching with Unknown Preferences,” *American Economic Review Papers and Proceedings*.
- Fershtman, D. and A. Pavan (2019a). “Matching Auctions,” mimeo Northwestern University.
- Fershtman, D. and A. Pavan (2019b). “Searching for Arms,” mimeo Northwestern University.

- Freixas, X., R. Guesnerie, and J. Tirole (1985), "Planning under Incomplete Information and the Ratchet Effect," *Review of Economic Studies*, 52:173-92.
- Garrett, D. (2016), "Intertemporal price discrimination: dynamic arrivals and changing values," *American Economic Review*, 106, 3275-3299
- Garrett, D. (2017), "Dynamic Mechanism Design: Dynamic Arrivals and Changing Values," *Games and Economic Behavior*, 104, 595-612.
- Garrett, D. and A. Pavan (2015), "Dynamic Managerial Compensation: A Variational Approach," *Journal of Economic Theory*.
- Garrett, D. and A. Pavan (2012), "Managerial Turnout in a Changing World," *Journal of Political Economy*, 120-5, 979-925.
- Garrett, D., A. Pavan, J. Toikka (2019), "Robust Predictions of Dynamic Screening" mimeo Northwestern University.
- Georgiadis, G. and B. Szentes (2018), "Optimal Monitoring Design," mimeo Northwestern and LSE.
- Gershkov, A. and B. Moldovanu, (2009), "Dynamic revenue maximization with heterogenous objects: A mechanism design approach," *American Economic Journal: Microeconomics*, 1(2): 168-198.
- Gershkov, A., and B. Moldovanu (2008): Efficient Sequential Assignment with Incomplete Information," mimeo, University of Bonn. *Games and Economic Behavior*, 68, 144-154.
- Gershkov, A. and M. Perry, (2012), "Dynamic contracts with moral hazard and adverse selection". *Review of Economic Studies*, 79 (1), pp. 268-306.
- Golov, M., M. Troshkin and A. Tsyvinski (2016). "Redistribution and Social Insurance" *American Economic Review*, 106(2): 359–386
- Guo, Y. and J. Horner (2016), "Dynamic Mechanisms without Money," mimeo, NU and Yale
- Halac, M., N. Kartik, and Q. Liu (2016). "Optimal Contracts for Experimentation," *Review of Economic Studies*, 83, 1040–1091
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- Kapicka, M. (2013), "Efficient Allocations in Dynamic Private Information Economies with Persistent Shocks: A First Order Approach," *Review of Economic Studies*, 80, 1027-1054.
- Kakade, S., Lobel, I. and H. Nazerzadeh, (2013), "Optimal Dynamic Mechanism Design and the Virtual Pivot Mechanism," *Operations Research*, 61, 837-854.
- Kostadinov, R. (2018), "Renegotiation of Long-Term Contracts as Part of an Implicit Agreement," mimeo, New York University.

- Kraehmer D. and R. Strautz, (2015) “Ex-Post Information Rents and Disclosure in Sequential Screening” *Review of Economic Studies* 78, 1015–1041.
- Kraehmer D. and E. Kovac (2016) “Optimal Sequential Delegation,” *Journal of Economic Theory* 163, 849-888.
- Krasikov I., and R. Lamba, (2019), “A theory of dynamic contracting with financial constraints,” mimeo Penn State University.
- Krasikov, I., R. Lamba and T. Mettral, (2019), “Of Restarts and Shutdowns: Dynamic Contracts With Unequal Discounting,” mimeo Penn State University.
- Kruse, T. and P. Strack (2015), “Optimal Stopping with Private Information,” *Journal of Economic Theory*. Pages 702-727
- Kwon, (2014). “Dynamic Moral Hazard with Persistent States,” mimeo, UCL.
- Laffont, J.-J. and J. Tirole (1988), “The Dynamics of Incentive Contracts,” *Econometrica*, 56(5): 1153-1175.
- Laffont, J.-J. and J. Tirole (1990), “Adverse Selection and Renegotiation in Procurement,” *Review of Economic Studies*, 57: 597-625.
- Li, Anqi (2013) “Selling Storable Goods to a Dynamic Population of Buyers: A Dynamic Mechanism Design Approach,” mimeo, University of Pennsylvania.
- Li, H. and X. Shi, (2017) “Discriminatory Information Disclosure” *American Economic Review* 107(11), 3363-3387.
- Liu, H. (2018) “Efficient Dynamic Mechanisms in Interdependent Valuation Environment: The Role of Contingent Transfers” *Theoretical Economics* 13, 795–829
- Maestri, L. (2017) “Dynamic Contracting with Adverse Selection and Renegotiation,” *Journal of Economic Theory*, 171, 136-173
- Makris, M. and A. Pavan (2018). “Taxation under Learning-by-Doing” mimeo, Northwestern University
- Makris, M. and A. Pavan (2018). “Wedge Dynamics with Endogenous Private Information: a General Recursive Characterization,” mimeo. Northwestern University.
- Miao, J. and Y. Zhang. (2015). “A Duality Approach to Continuous-Time Contracting Problems with Limited Commitment” ,¹¹ *Journal of Economic Theory*, 159, 929-988.
- Pavan, A. (2007), “Long-term Contracting in a Changing World,” mimeo, Northwestern University.
- Pavan, A. (2017), “Dynamic Mechanism Design: Robustness and Endogenous Types” in *Advances in Economics and Econometrics*, 11th World Congress of Econometric Society, 2017, Vol 1, 1-62, Cambridge University Press
- Pavan, A., I. Segal, and J. Toikka (2014). “Dynamic Mechanism Design: A Myersonian Approach” *Econometrica*. 82, 601-653.
- Penta, A. (2015) “Robust Dynamic Implementation,” *Journal of Economic Theory*, Vol.160, 280-316.

- Rahman, D. (2010) "Dynamic Implementation," mimeo. University of Minnesota.
- Tchisty, A. (2016), "Security Design with Correlated Hidden Cash Flows: The Optimality of Performance Pricing," Mimeo, NYU Stern.
- Thomas, J. and Worrall, T. (1990), "Income Fluctuation and Asymmetric Information: An example of a Repeated Principal-Agent Problem," *Journal of Economic Theory*, 51, 367-390.
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- Sannikov, Y, (2014). "Moral Hazard and Long Run Incentives," mimeo, Stanford GSB.
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- Stantcheva, S. (2017). "Optimal Taxation and Human Capital Policies over the Life Cycle," *Journal of Political Economy*, 125(6), 1931-1990.
- Strulovici, B. (2017). "Contract Negotiation and the Coase Conjecture: A Strategic Foundation for Renegotiation-Proof Contracts," *Econometrica*, 85(2), 585-616
- Strulovici, B. and M. Szydlowski (2015). "On the Smoothness of Value Functions and the Existence of Optimal Strategies," *Journal of Economic Theory*, 159 (PB), 1016-1055.
- Sugaya, T. and A. Wolitzky, (2018), "Revelation Principle in Multistage Games," mimeo MIT and Stanford/
- Weng, X. (2015). "Dynamic Pricing in the Presence of Individual Learning," *Journal of Economic Theory*, 155, 262-299,
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- Zhang, H. (2008) "Solving an Infinite-Horizon Adverse Selection Model Through Finite Policy Graphs," *Mathematics of Operations Research*, 60, 850-864.

1.3: Bilateral contracting in multilateral settings

B&D, Section 13.3 and 13.4.

1.3.1: Simultaneous common agency

Pavan: Lecture Notes

Bernheim, B. D. and M. Whinston (1985), "Common Marketing Agency as a Device for Facilitating Collusion," *RAND Journal of Economics* (16), pp. 269-81.

Bernheim, B. D. and M. Whinston (1986), "Menu Auctions, Resource Allocation, and Economic Influence," *Quarterly Journal of Economics* (101), pp. 1-31.

Bernheim, B. D. and M. Whinston (1986), "Common Agency," *Econometrica*, 54(4): 923-42.

Bernheim, B. D. and M. Whinston, (1998) "Exclusive Dealing," *Journal of Political Economy* (106), 64-103.

Chiesa, G. and V. Denicolo', (2009) "Trading with a Common Agent under complete Information: A Characterization of Nash Equilibria," *Journal of Economic Theory* (144), 296-311.

Dixit, A., G. Grossman and E. Helpman (1997), "Common agency and coordination: General theory and application to government policymaking," *Journal of Political Economy*, 105(4), August, 752-769.

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Kahn, C. and D. Mookherjee, (1998) "Competition and incentives with nonexclusive contracts," *Rand Journal of Economics*, 29, pp. 443-465.

Martimort, D. (1992), "Multi-Principaux avec Sélection Adverse," *Annales d'Economie et de Statistique*, 28:1-38.

Martimort, D. (1996), "Exclusive Dealing, Common Agency, and Multiprincipals Incentive Theory," *Rand Journal of Economics*, 27:1-31.

Martimort, D. and V. Dequiedt (2015), Vertical Contracting with Informational Opportunism," *American Economic Review*, 105, 2141-2182.

Martimort, D. and H. Moreira, (2010), "Common Agency and Public Good Provision under Asymmetric Information," *Theoretical Economics*, 5, 159-213.

Martimort, D. and L. Stole (2009), "Selecting Equilibria in Common Agency Games," *Journal of Economic Theory*, vol. 144, n. 2, 604-634.

Martimort, D. and L. Stole (2009), "Market Participation under Delegated and Intrinsic Common Agency Games," mimeo Toulouse School of Economics

1.3.2: Competing mechanisms

Pavan: Lecture Notes

- Jackson, M. and S. Wilke (2005), "Endogenous Games and Mechanisms: Side Payments Among Players," *Review of Economic Studies* **72**: 543-66.
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- Martimort, D. and L. Stole, (2001), "Common Agency Equilibria with Discrete Mechanisms and Discrete Types," mimeo University of Chicago GSB.
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- Peters, M. (2001), "Common Agency and the Revelation Principle," *Econometrica*, 69, 1349-1372.
- Peters, M. (2003), "Negotiations versus take-it-or-leave-it in common agency," *Journal of Economic Theory*, Volume 111(1), Pages 88-109
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- Peters, M. (2014), "Reciprocal Contracting," *Journal of Economic Theory*, 158, 102-126.
- Peters, M. and C. Troncoso-Valverde, "A folk theorem for competing mechanisms," *Journal of Economic Theory*, 148(3), 953-973.
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- Szentes, B. "Contractible Contracts in Common Agency Problems," *Review of Economic Studies*, 2015(82), 391-422.

1.3.4: Sequential and dynamic common agency

- Bergemann, D. and J. Valimaki (2003), "Dynamic Common Agency," *Journal of Economic Theory* **111**: 23-48.
- Pavan and Calzolari (2009): "Sequential Contracting with Multiple Principals," *Journal of Economic Theory*, 144(2), 503-531.
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- Prat A. and A. Rustichini, (1998), "Sequential Common Agency", mimeo LSE.

1.3.5: Extensions: Offer Games and Multiple Agents

- Bikhchandani, S. and J.W. Mamer, "Competitive Equilibrium in an Exchange Economy with Indivisibilities," *Journal of Economic Theory* 74, 385-413.
- Caillaud, B., B. Jullien and P. Picard (1995) "Competing Vertical Structures: Precommitment and Renegotiation," *Econometrica*, 63, pp. 621-646.
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PART 2: COORDINATION UNDER INCOMPLETE INFORMATION

2.0: Coordination and higher order uncertainty

- Baliga, Sandeep and Stephen Morris: "Coordination, Spillovers and Cheap-Talk," *Journal of Economic Theory* (2002), 105(2), 450-468.
- Binmore, Ken and Larry Samuelson: "Coordinated Action in the Electronic Mail Game," *Games and Economic Behavior* (2001), 35, 6-30.
- Kajii, Atsushi and Stephen Morris: "Common p -Belief: the General Case," *Games and Economic Behavior* (1997), 18, 73-82.
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Morris Stephen: “*Coordination, Communication and Common Knowledge: A Retrospective on the Electronic Game*,” *Oxford Review of Economic Policy* (2002) 18(4), 433-44.

Morris Stephen and Hyun Song Shin: “*Approximate Common Knowledge and Co-ordination: Recent Lessons from Game Theory*,” *Journal of Logic, Language and Information* (1997), 6, 171-190.

Morris Stephen, Andrew Postlewaite and Hyun Song Shin: “*Depth of Knowledge and the Effect of Higher Order Uncertainty*,” *Economic Theory* (1995), 6, 453-467.

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Shin Hyun Song and Tim Williamson: “*How Much Common Belief is Necessary for a Convention?*” *Games and Economic Behavior* (1996), 13, 252-268.

Jakub Steiner and Jozsef Sakovics (2012) “*Who Matters in Coordination Problems*,” *American Economic Review*, 102, 3439-3461. 82

Takashi, Ui, “*Bayesian Potentials and Information Structures: Team Decision Problems Revisited*,” (2004) w.p. Yokohama national University.

Yildiz, Muhamet, and Jonathan Weinstein: “*A Structure Theorem for Rationalizability with Applications to Robust Predictions of Refinements*,” (2007), *Econometrica*, 75, 365-400.

2.1: Equilibrium selection in static games

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Carlsson Hans, and Eric van Damme: “*Global Games and Equilibrium Selection*,” *Econometrica* (1993), 61, 989-1018.

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Carlsson Hans and Mattias Ganslandt: “*Noisy Equilibrium Selection in Coordination Games*,” *Economics Letters* (1998), 60, 23-34.

Frankel, David, Stephen Morris, and Ady Pauzner: “*Equilibrium Selection in Global Games with Strategic Complementarities*,” *Journal of Economic Theory* (2003), 108, 1-44.

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Hellwig, Christian: “*Public Information, Private Information and the Multiplicity of Equilibria in Coordination Games*,” *Journal of Economic Theory*, (2002), 107, 191-222.

Milgrom Paul and John Roberts: “*Rationalizability, Learning, and Equilibrium in*

Games with Strategic Complementarities,” *Econometrica* (1990) 58, 1255-1277.

Morris Stephen and Hyun Song Shin: “*Unique Equilibrium in a Model of Self-Fulfilling Currency Attacks*,” *American Economic Review*, (1998), 88 587-97.

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Morris Stephen and Hyun Song Shin, and Muhammet Yildiz: “*Common Belief Foundations of Global Games*,” (2017), *Journal of Economic Theory*.

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2.2: Global games with endogenous information

Angeletos George-Marios, Christian Hellwig, and Alessandro Pavan: “*Signaling in a Global Game: Coordination and Policy Traps*,” (2006), *Journal of Political Economy*, Vol. 114, No. 3.

Angeletos George-Marios and Alessandro Pavan: “*Selection-free Predictions in Global Game with Endogenous Information and Multiple Equilibria*” (2013), *Theoretical Economics*, 883-938.

Angeletos George-Marios, and Ivan Werning: “*Crises and Prices: Information Aggregation, Multiplicity, and Volatility*,” (2006), *American Economic Review*, Vol. 96, No. 5.

Corsetti, Giancarlo, Amil Dasgupta, Stephen Morris, and Hyun Song Shin: “*Does One Soros Make a Difference? The Role of a Large Trader in Currency Crises*,” *Review of Economic Studies*, (2003) 71, 87-114

Edmond, Chris: “*Information Manipulation, Coordination and Regime Change*,” (2005), working paper, NYU Stern.

Gaballo, Gaetano (2012) “*Private Uncertainty and Multiplicity*,” mimeo, Banque De France

Hellwig, Christian, Mukherji Arijit, and Aleh Tsyvinski: “*Self-fulfilling Currency Crises: The Role of Interest Rates*,” (2006), *American Economic Review*, Vol. 96, No. 5.

Inostroza, N. and A. Pavan, (2017) “*Persuasion in Global Games with Application to Stress Testing*,” mimeo, Northwestern University.

Morris Stephen and Hyun Song Shin: “*Endogenous Public Signals and Coordination*,” (2006), w.p. Princeton University.

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