

DEPARTMENT OF ECONOMICS  
YALE UNIVERSITY

**ECON 525a. SECOND HALF**  
**“HETEROGENEITY IN MACROECONOMICS”**  
**COURSE SYLLABUS<sup>1</sup>**

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Fall Semester, 2008  
Tuesday: 4.00–6.30  
28 Hillhouse, Rm. B1

**OBJECTIVES:**

Both halves of Econ 525a cover recent research in macroeconomics moving beyond “representative agent” models. The first half considers models that take heterogeneity on the consumer side seriously, this half focuses on models that emphasize heterogeneity on the producer side. Furthermore, the models covered in this part of the course consider heterogeneity and aggregation in DSGE models building up from *infrequent* and *lumpy* adjustment at the micro level. These models have interesting applications for investment, prices, durable consumption, labor demand and inventories.

**ASSIGNMENTS AND EVALUATION:**

1. You will present one or two papers on the material covered in Section IV. You will have 25 minutes to present each paper.
2. There will be two problem sets, but no exam. No consultations among students are allowed when solving the problem sets.
3. A term paper on a topic of your choice related to those discussed in class (only one term paper is required for both halves of the course).

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<sup>1</sup>Last revised: October 12, 2008.

## CONTENTS AND READINGS:

There will be handouts for every lecture. Readings marked \*\* will be covered in detail in class, readings marked \* won't be covered in much detail but are important, so you will benefit from reading (some/most) of them. The remaining references (unstarred) are included for the sake of completeness. Most of the readings with \*\* and \* will be posted on the course site. Readings appear roughly in the order they will be covered.

### **I. Motivation and Basics**

#### **Lectures 1 and 2.**

Classic aggregation and the representative agent paradigm.<sup>2</sup> Evidence on infrequent and lumpy adjustment, and on non-convex adjustment costs, for prices, capital, durables, and employment. To what extent can linear models (e.g., VARs) capture the deep parameters in a model with lumpy microeconomic adjustment? Optimal  $S_s$  policies in discrete and continuous time.

BLUNDELL, R. AND T. STOKER (2005): "Heterogeneity and Aggregation," *J. of Economic Literature*, **93**, 347–91.

\*\*DOMS, M. AND T. DUNNE (1998): "Capital Adjustment Patterns in Manufacturing Plants", *Review of Economic Dynamics*, **1**, 409–429.

\*\*GOURIO, F., AND A. KASHYAP (2007): "Investment Spikes: New Facts and a General Equilibrium Exploration," *Journal of Monetary Economics*.

DAVIS, S., AND J. HALTIWANGER (1999): "Gross Job Flows", in O. Aschenfelter and D. Card (eds), *Handbook of Labor Economics*, vols. 3 and 4, 2711–2805.

BAR-ILAN, A. AND A. BLINDER (1992): "Consumer Durables: Evidence on the Optimality of Doing Nothing," *Journal of Money, Credit and Banking*, **24**, 253–272.

\*\*BILS, M. AND P. KLENOW (2004): "Some Evidence on the Importance of Sticky Prices," *J. of Political Economy*, **112**, 947–985.

\*\*NAKAMURA, E. AND J. STEINSSON (2006): "Five Facts About Prices: A Reevaluation of Menu Cost Models," Harvard University, mimeo.

\*\*RAMEY, V., AND M. SHAPIRO (2001): "Displaced Capital: A Study of Aerospace Plant Closings", *J. of Political Economy*, **109** (5), October 2001, 958-92.

LEVY, D., M. BERGEN, S. DUTTA AND R. VENABLE (1997): "The Magnitude of Menu Costs: Direct Evidence from Large U.S. Supermarket Chains," *Quarterly Journal of Economics*, **112** (3), 791-825.

\*\*CABALLERO, R. AND E. ENGEL (2008): "Missing Aggregate Dynamics: On the Slow Convergence of Lumpy Adjustment Models."

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<sup>2</sup>Since Gianluca covered a lot of related material, this section will be short.

## II. Prices

### Lectures 3, 4, 5 and 6.

Theoretical work by Golosov-Lucas and Midrigan, and empirical work by Bils-Klenow and Nakamura-Steinsson led to a recent wave of research on pricing and non-convex adjustment costs. Nonetheless, important challenges remain. We begin by reviewing the partial equilibrium literature, emphasizing insights that have reemerged in the recent wave of DSGE models. This is followed by a study of distributional dynamics, which is relevant for lumpy adjustment models in general, both in partial and in general equilibrium. Next we turn to general equilibrium models. Finally, we cover recent work relating an imperfect information model by Woodford to non-convex adjustment cost models.

\*\*DHYNE, ALVAREZ, LE BIHAN, VERONESE, DIAS, HOFFMANN, JONKER, LÜNNEMANN, RUMLER AND VILMUNEN (2006): “Price Changes in the Euro Area and the United States: Some Facts from Individual Consumer Price Data”, *J. of Economic Perspectives*, **20**, Spring 2006, 171–192.

\*\*FABIANI, S., M. DRUANT, I. HERNANDO, C. KWAPIL, B. LANDAU, C. LOUPIAS, F. MARTINS, T. MATHA, R. SABBATINI, H. STAHL, AND A. STOKMAN (2006): “The Pricing Behavior of Firms in the Euro Area: New Survey Evidence,” *International Journal of Central Banking*, **2** (3), September, 3–47.

BEWLEY, T. (2007): “Report on an Ongoing Field Study of Pricing as it Relates to Menu Costs”, mimeo, Yale

KLENOW, P. AND O. KRYVTSOV (2005): “State-Dependent or Time-Dependent Pricing: Does It Matter for Recent U.S. Inflation?,” NBER Working Paper No. 11043, January.

\*\*CAPLIN, A. AND D. SPULBER (1987): “Menu Costs and the Neutrality of Money,” *Quarterly Journal of Economics*, **102**, 703–26.

\*\*CAPLIN, A. AND J. LEAHY (1991): “State-Dependent Pricing and the Dynamics of Money and Output,” *Quarterly Journal of Economics*, **106**, 683–708.

\*\*CABALLERO, R. AND E. ENGEL (2007): “Price Stickiness in  $S_s$  Models: New Interpretations of Old Results,” *J. of Monetary Economics*, **54**, 100–121.

DOTSEY, M. R. KING AND A. WOLMAN (1999): “State-dependent pricing and the general equilibrium dynamics of money and output,” *Quarterly Journal of Economics*, **114**, 655–90.

\*\*GOLOSOV, M. AND R.E. LUCAS (2007): “Menu Costs and Phillips Curves,” *J. of Political Economy*, **115** (2), 171–199.

BURSTEIN, A. AND C. HELLWIG (2006): “Prices and Market Shares in a Menu-Cost Model,” mimeo, UCLA.

\*\*MIDRIGAN, V. (2006): “Menu Costs, Multi-product Firms, and Aggregate Fluctuations,” NYU, mimeo.

\*\*KEHOE, P. AND V. MIDRIGAN (2007): “Sales, Clustering of Price Changes, and the Real Effects of Monetary Policy,” mimeo.

CARVALHO, C. (2006): “Heterogeneity in Price Stickiness and the Real Effects of Monetary Shocks,” *Frontiers of Macroeconomics*, **2**(1), Article 1.

NAKAMURA, E. AND J. STEINSSON (2006): “Monetary Non-Neutrality in a Multi-Sector Menu Cost Model,” Harvard University, mimeo.

DANZIGER, L. (1999): “A Dynamic Economy With Costly Price Adjustment,” *American Economic Review*, **89**, 878–901.

\*\*GERTLER, M. AND J. LEAHY (2006): “A Phillips Curve with  $S_s$  Foundations,” mimeo.

MANKIW, N.G. AND R. REIS (2002): “Sticky Information versus Sticky Prices: A Proposal to Replace the New Keynesian Phillips Curve,” *Quarterly Journal of Economics*, **117**, 1295–1328.

MANKIW, N.G. AND R. REIS (2006): “Pervasive Stickiness,” Expanded version, NBER Working Paper No. 12024.

\*\*WOODFORD, M. (2007): “Information-Constrained State-Dependent Pricing,” mimeo.

### III. Investment

#### Lectures 7, 8 and 9.

Investment is arguably the area in macroeconomics where models incorporating lumpy adjustment and heterogeneity have had the highest payoff in terms of improving the ability of dynamic macroeconomic models to match the data.

We first review partial equilibrium investment models with lumpy adjustment. In particular, we study the cautionary effect of uncertainty, increasing hazards and time-varying impulse response functions, uncertainty shocks and an application to 9/11. Next we turn to DSGE models with lumpy capital adjustment, discussing how to define and approximate the equilibrium (here we build on the Krusell-Smith approximation you covered in the first half). We also discuss alternative approaches to calibrating these models and the extent to which they capture time-varying impulse responses present in US aggregate investment series.

\*\*LEAHY, J. AND T. WHITED (1996): “The Effects of Uncertainty on Investment: Some Stylized Facts,” *J. of Money, Credit and Banking*, **28**, 64–83.

\*\*GUISSO, L. AND G. PARIGI (1999): “Investment and Demand Uncertainty,” *Quarterly Journal of Economics*, **114**, 185–227.

\*\*BLOOM, N. BOND, S. AND J. VAN REENEN (2007): “Uncertainty and Investment Dynamics,” *Review of Economic Studies*, **74**, 391–415.

\*\*CABALLERO, R., E. ENGEL AND J. HALTIWANGER (1995): “Plant-Level Adjustments and Aggregate Investment Dynamics”, *Brookings Papers on Economic Activity*, (2), 1–34.

\*\*CABALLERO, R. AND E. ENGEL (1999): “Explaining Investment Dynamics in US Manufacturing: A Generalized ( $S, s$ ) Approach,” *Econometrica*, **67** (4), 741–782.

COOPER, R. J. HALTIWANGER AND L. POWER (1999): “Machine Replacement and the Business Cycle: Lumps and Bumps”, *American Economic Review*, 1999, **89**, 921–946.

- ABEL, A. AND J. EBERLY (2003): “Investment and  $q$  with Fixed Costs: An Empirical Analysis,” mimeo, Wharton and Northwestern.
- \*\*BLOOM, N. (2007): “The Impact of Uncertainty Shocks,” forthcoming in *Econometrica*.
- THOMAS, J. (2001): “Is Lumpy Investment Relevant for the Business Cycle?,” *J. of Political Economy*, **110**, 508–34.
- VERACIERTO, M. (2002): “Plant-Level Irreversible Investment and Equilibrium Business Cycles,” *American Economic Review*, **02**, 181–97.
- \*\*KHAN, A. AND J. THOMAS (2008): “Idiosyncratic Shocks and the Role of Nonconvexities in Plant and Aggregate Investment Dynamics,” *Econometrica*, **76**, 395–436.
- SIM, J. W. (2006): “Irreversible Investment and Option Values in Equilibrium Business Cycle Models”, mimeo.
- BAYER, C. (2006): “Non-convex Factor Adjustments in a Two-Country Real Business Cycle Model”, mimeo.
- \*\*BACHMANN, R. R. CABALLERO AND E. ENGEL (2008): “Aggregate Implications of Lumpy Investment: New Evidence and a DSGE Model”. Mimeo.
- HOUSE, C. (2007): “Fixed Costs and Long-Lived Investments”. Mimeo.

#### IV. Durables

##### Lectures 10, 11 and 12.

Many of the main papers on aggregate implications of lumpy adjustment during the 1990s focused on the consumption of durables. By contrast, the recent wave of DSGE models has focussed mainly on prices and, to a lesser degree, on investment. In this section you will present the main papers on lumpy adjustment and durable consumption, in the hope that some of you will pick up this topic for research.

- GROSSMAN, S. AND G. LAROQUE (1990): “Asset Pricing and Optimal Portfolio Choice in the Presence of Illiquid Durable Consumption Goods,” *Econometrica*, **58**, 25–51.
- CABALLERO, R. (1993): “Durable Goods: An Explanation for their Slow Adjustment,” *J. of Political Economy*, **101**, 351–.
- EBERLY, J. (1994): “Adjustment of Consumer’s Durable Stocks: Evidence from Automobile Purchases”, *Journal of Political Economy*, **102**, 403–436.
- GREENSPAN, A. AND D. COHEN (1999): “Motor Vehicle Stocks, Scrappage and Sales,” *Review of Economics and Statistics*, **81**, 369–383.<sup>3</sup>

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<sup>3</sup>It seems that to become Chair of the Fed you need to have written a paper on lumpy adjustment. Bernanke has a well known 1985 paper in the JME on durable consumption and an AER paper on irreversible investment in 1983.

- ATTANASIO, O. (2000): “Consumer Durables and Inertial Behavior: Estimation and Aggregation of  $sS$  Rules for Automobile Purchases,” *Review of Economic Studies*, **67**, 659–677.
- GABAIX, X. AND D. LAIBSON (2001): “The 6D Bias and the Equity Premium Bias,” in B. Bernanke and K. Rogoff (eds), *NBER Macroeconomics Annual*, 257–311.
- FERNÁNDEZ-VILLAYERDE, J. AND D. KRUEGER (2002): “Consumption and Saving Over the Life Cycle: How Important are Consumer Durables?”, mimeo.
- STACCHETTI, E. AND D. STOLYAROV (2004): “Obsolescence of Durable Goods and Aggregate Fluctuations,” mimeo, NYU and U. of Michigan.
- HOUSE, C. AND J. LEAHY (2004): “An  $sS$  Model with Adverse Selection,” *Journal of Political Economy*, **112**, 581–614.
- BERTOLA, G., L. GUISO AND L. PISTAFERRI (2005): “Uncertainty and Consumer Durables Adjustment,” *Review of Economic Studies*, **72**, 973–1007.
- LEAHY, J. AND J. ZEIRA (2005): “The Timing of Purchases and Aggregate Fluctuations,” *Review of Economic Studies*, **72**, 1127–1151.
- CAPLIN, A. AND J. LEAHY (2006): “Equilibrium in a durable goods market with lumpy adjustment,” *J. of Economic Theory*, **128**, 187–203.
- BARSKY, R., C. HOUSE AND M. KIMBALL (2007): “Sticky-Price Models and Durable Goods,” *American Economic Review*, **97** 3, 984–998.