DEPARTMENT OF ECONOMICS
YALE UNIVERSITY
Eduardo Engel

ECON 526b. FIRST HALF
"HETEROGENEITY IN MACROECONOMICS"
COURSE SYLLABUS[1]

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Fall Semester, 2011
Meeting times: Mon and Wed. 9.00.
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OVERVIEW:

This half of Econ 526b covers models with heterogeneous agents, moving beyond standard "representative agent" models used in macro.[2] We focus on models that consider the aggregation of infrequent and lumpy microeconomic behavior, with applications to aggregate dynamics of inflation, investment, employment, consumer durable, money demand and inventories.[3]

ASSIGNMENTS AND EVALUATION FOR THIS HALF:

1. Each student will present one paper related to the material covered in the course.

2. There will be two or three problem sets, but no exam. No consultations among students are allowed when solving the problem sets.

3. Students will write a referee report on a recent papers.

4. 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 Econ 526b).

CONTENTS AND READINGS:

There will be handouts for most lectures. Readings marked ** will be covered in detail in class, readings marked * won't be covered in detail but are important, so you will benefit from reading (some/most) of them. The remaining references (unstarred) are included for 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. Introduction and Motivation

Classic aggregation and the representative agent paradigm. Evidence on infrequent and lumpy adjustment, and on non-convex adjustment costs, for prices, capital, durables, employment, money holdings. Calvo pricing model with heterogeneous price-setters. To what extent can linear models (e.g., VARs) capture the deep parameters in a model with lumpy microeconomic adjustment?

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[1]Last revised: January 13, 2013.

[2] While the emphasis varies, many of the tools and themes are common with the material covered by Krusell in 525a.

[3]The techniques we study are also useful to study other problems where heterogeneous agents play a central role, such as the dynamics of the wealth distribution.

*CAPLIN, A. AND J. LEAHY (2010): "Economic Theory and the World of Practice: A Celebration of the (s,s) Model," *J. of Economic Perspectives*, Winter 2010.

STOKER, T. (1986): "Simple Tests of Distributional Effects on Macroeconomic Equations," *Journal of Political Economy*, **94**, 763–795.

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.

LEVY, D. AND A.T.YOUNG (2004): ""The Real Thing": Nominal Price Rigidity of the Nickle Coke. 1886-1959," *J. of Money, Credit and Banking*, **36**, 765-799.

**KLENOW, P. AND B. MALIN (2010): "Microeconomic Evidence on Price-Setting," in *Handbook of Monetary Economics*, B.Friemdan and M.Woodford (eds), vol. 3, ch. 6, 231-284, Elsevier.

*NAKAMURA, E. AND J. STEINSSON (2006): "Five Facts About Prices: A Reevaluation of Menu Cost Models," *Quarterly Journal of Economics*, (2008), **123** (4), 1405–1464.

GOLDBERG, P. AND R. HELLERSTEIN (2009): "How Rigid are Producer Prices?", 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.

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

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

*DHYNE, ALVAREZ, LE BIHAN, VERONESE, DIAS, HOFFMANN, JONKER, LÜNNEMANN, RUMLER AND VIL-MUNEN (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. (2011): "Thoughts on pricing." Mimeo, Yale

AGUIAR, M. AND E. HURST (2005): "Consumption versus Expenditures," *J. of Political Economy*, 919–948.

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.

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.

*ANDERSON, E.T., AND D.I. SIMESTER (2010): "Price Stickiness and Customer Antagonism," *Quarterly Journal of Economics*, May 2010.

NAKAMURA, E. (2008) :"Pass-Through in Retail and Wholesale," *American Economic Review*, 430–437.

PELTZMAN, S. (2000): "Prices Rise Faster than They Fall," *J. of Political Economy*, 466–502.

EICHENBAUM, M., N. JAIMOVICH AND S. REBELO (2011): "Reference Prices, Costs, and Nominal Rigidities." *American Economic Review*, 101(1): 23462.

BERGER, D., R. CABALLERO AND E. ENGEL (2011): "Lumpy Microeconomic Adjustment, Large Idiosyncratic Shocks and Missing Aggregate Dynamics." Mimeo.

II. Microeconomic Policies

Optimal policies with non-convex adjustment costs. We will cover both classic results (fixed adjustment costs or fixed + proportional), stochastic adjustment costs and recent papers that combine non-convex adjustment costs with costs of acquiring information.

SAINT PAUL, G. (2005): "Some Evolutionary Foundations for Price Level Rigidity,'" *American Economic Review*.

HARRISON, J.M., T. SELLKE AND A.J. TAYLOR (1983): "Instantaneous Control of Brownian Motion," *Mathematics of Operations Research* , **8**: 439–453.

*STOKEY, N. (2008): *The Economics of Inaction: Stochastic Control Models with Fixed Costs*, Princeton University Press.

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

*ABEL, A., J. EBERLY AND S. PANAGEAS (2007): "Optimal Inattention to the Stock Market," *American Economic Review P&P*.

**ABEL, A., J. EBERLY AND S. PANAGEAS (2009): "Optimal Inattention to the Stock Market with Information Costs and Transaction Costs," mimeo, 2009.

**ALVAREZ, F., F. LIPPI AND L. PACIELLO (2010): "Optimal price setting with observation and menu costs," mimeo.

**BONOMO, M., C. CARVALHO AND R. GARCIA (2010): "State-Dependent Pricing Under Infrequent Information," mimeo, 2010.

*ALVAREZ, F. AND F. LIPPI (2009): Financial Innovation and the Financial Demand for Cash," *Econometrica*, **77**: 363–402.

*ALVAREZ, F., F. LIPPPI AND L. GUISO (2010): "Durable consumption and asset management with transaction and observation costs," *American Economic Review*, **102**, 2272–2300.

III. Prices

Theoretical work by Golosov-Lucas, Midrigan and others, and empirical work by Bils-Klenow, Nakamura-Steinsson and others, led to a recent wave of research on pricing and non-convex adjustment costs. Nonetheless, important challenges remain. We briefly review the partial equilibrium literature, emphasizing insights that have reemerged in the recent wave of DSGE models. This is followed by a lecture on distributional dynamics, which are at the essence of models with heterogeneity. Here we explore these dynamics in the context of models of inflation based on lumpy price adjustment, but the insights we obtain are of interest in many other contexts. Next we turn to DSGE models. Finally, we cover recent developments that combine incomplete information models with non-convex adjustment costs.

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 *Ss* Models: New Interpretations of Old Results," *J. of Monetary Economics*, **54**, 100–121.

COSTAIN, J. AND A. NAKOV (2011): "Distributional dynamics under smoothly state-dependent pricing," *J. of Monetary Economics*, **58**, 646–665.

GAGNON, E., D. LÓPOEZ-SALIDO AND N. VINCENT (2012): "Individual Price Adjustment Along the Extensive Margin," In *NBER Macroeconomics Annual 2012*. D.Acemoglu and M.Woodford (eds).

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.

MIDRIGAN, V. (2011): "Menu Costs, Multi-product Firms, and Aggregate Fluctuations," *Econometrica*, **79** (4) 1139–1180.

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

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 (2008): "A Phillips Curve with *Ss* Foundations," *J. of Political Economy*, **116**, 3, 533572, Jun 2008.

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. (2009): "Information-Constrained State-Dependent Pricing," *J. of Monetary Economics*.

VELDKAMP, L. (2011): *Information Choice in Macroeconomics and Finance*, Princeton University Press.

COIBION, O. AND Y. GORODNICHENKO (2011): "Strategic Interaction Among Heterogeneous Price-Setters in an Estimated DSGE Model," *Review of Economics and Statistics*, **93** 7 920–940. Also NBER WP No. 14323.

KRUSELL, P. AND A. SMITH (1998): "Income and Wealth Heterogeneity in the Macroeconomy," *J. of Political Economy*, 867–896.

GORODNICHENKO, Y. (2010): "Endogenous information, menu costs and inflation persistence."

MIDRIGAN (2010): "Is Firm Pricing State or Time-Dependent? Evidence from US Manufacturing," *Review of Economics and Statistics*, 92(3): 643–656.

BILS, M., P. KLENOW AND B. MALIN (2011): "Reset Price Inflation and the Impact of Monetary Policy Shocks," forthcoming in the *American Economic Review*.

*GUIMARAES, B. AND N. SHEEDY (2009): "Sales and Monetary Policy," *American Economic Review*.

*MACKOWIAK, B., E. MOENCH AND M. WIEDERHOLT (2009): "Sectoral Price Data and Models of Price Setting," mimeo.

*CHEVALIER, J. AND A. KASHYAP (2010): "Best Prices," mimeo.

**VAVRA, J. (2012): "Inflation Dynamics and Time-Varying Volatility: New Evidence and an *Ss* Interpretation", mimeo.

KLESHCHELSKI, I. AND N. VINCENT (2009): "Market share and price rigidity," *J. of Monetary Economics*, 2009.

ZHANG, F. (2011): "Rational Inattention in Uncertain Business Cycles." Mimeo. Ohio State University.

IV. Factor Markets

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. Finally, we cover recent work linking the firm/plant size distribution to inefficient allocation of resources, with quantifiable implications for aggregate productivity. This literature still is at the stage where assumptions are stronger and models simpler than they need to be if the conclusions are to guide economic policy. But this line of research holds lots of potential. From a policy perspective, disentangling the extent to which suboptimal allocation reflects regulations and other distortions, and to what an extent it is due to real costs of adjusting factors of production across firms, is of paramount importance and ties in nicely with the material covered in the course.

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

GUISO, 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," *Econometrica*, May.

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: "Aggregate Implications of Lumpy Investment: New Evidence and a DSGE Model". Forthcomming in *AEJ–Macroeconomics*.

*BLOOM, N., N. JAIMOVICH AND M. FLOETTATO (2009): "Real Uncertain Business Cycles," mimeo.

*GOURIO, F. AND L. RUDANKO (2011): "Customer Capital." Mimeo.

HOPENHAYN, H. (1992): "Entry, Exit, and Firm Dynamics in Long Run Equilibrium," *Econometrica*, **60, 1127–1150.

(**)HOPENHAYN, H. AND R. ROGERSON (1993): "Job Turnover and Policy Evaluation: A General Equilibrium Analysis," *J. of Political Economy*, **101**, 915-938.

HURST, E. AND B. PUGSLEY (2011): "Understanding Small Business Heterogeneity." Mimeo.

*SYVERSON, C. (2011): "What determines productivity," *J. of Economic Literature*, **49**(2) 329-365.

ALFARO, L., A. CHARLTON AND F. KANCZUK (2009): "Plant Size Distribution and Cross-Country Income Differences," NBER.

*BARTELSMAN, E., J. HALTIWANGER AND S. SCARPETTA (2009): "Measuring and Analyzing Cross-Country Differences in Firm Dynamics," in *Producer Dynammics: New Evidence from Micro Data*, Ed., T. Dunne, J.B. Jensen and M.B. Roberts, Chicago: Chicago University Press for NBER.

HOPENHAYN, H. AND A. NEUMEYER (2008): "Productivity and Distortions," mimeo.

RESTUCCIA, D. AND R. ROGERSON (2008): "Policy Distortions and Aggregate Productivity with Heterogeneous Establishments," *Review of Economic Dynamics*, **11, 707-20.

HSIEH, C. AND P. KLENOW (2009): "Misallocation and Manufacturing TFP," *Quarterly Journal of Economics*, **124 1403–1448.

*FOSTER, L., J. HALTIWANGER, AND C. SYVERSON (2008): "Reallocation, Firm Turnover and Efficiency: Selection on Productivity or Profitability," *American Economic Review*.

MIDRIGAN, V. AND D. XU (2009): "Accounting for Plant Level Misallocation," Mimeo.

MIDRIGAN, V. AND D. XU (2010): "Finance and Misallocation: Evidence from plant level data," NBER Working Paper No. 15647.

V. Student Presentations