

ECON 38001 / BUSF 33942-01
Winter Quarter 2019, First Half
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There is tremendous heterogeneity across firms at the micro level; even within narrowly defined sectors, firms vary a lot in their productivity, investment, hiring, and other variables. This part of the course is designed to introduce you to these facts and assess their implications for macroeconomic outcomes. We will emphasize the interaction between empirical evidence – which tells us how firms behave – and quantitative, heterogeneous agent macro models – which tells us how to map that behavior into macroeconomic outcomes. A key question throughout the course is: how does firm heterogeneity change our understanding of the dynamics of aggregate variables, relative to the predictions of representative agent models? We will discuss two broad answers to this question:

1. The dynamics of aggregate variables depend on the entire distribution of heterogeneous firms, which cannot be captured in a representative agent framework.
2. Cross-sectional or panel micro data provides direct evidence on how firms make decisions, and therefore provide valuable information for estimating model parameters not included in aggregate time series data.

To do research in this area you should be comfortable both with doing empirical work in micro data and in quantitative modeling. I will assign two homework exercises to introduce you to both of these skills. In the first assignment (due January 18th), you will use Compustat microdata to estimate firms' productivity and how it is related to the firms' decisions. In the second assignment (due February 1st), you will numerically solve a simple investment model and compare the model's prediction for the relationship between investment and productivity to that you found in the data.

The course is organized in five different topics plus one short review topic of representative agent macroeconomics. I have compiled a list of readings for each topic, some of which we will cover in class and others which are for your own reference. Before the lecture for each topic, I ask that you:

1. Read the papers with the **Required Reading** marker. Starting in the second lecture, I will randomly call on a registered student to lead an informal, five minute summary of the paper. Be prepared to explain: (1) the main question of the paper, (2) the paper's answer to the question, (3) how they arrived at that answer, and (4) how it contributes to the existing literature.
2. Starting in the third lecture, we will have students formally present papers with the **Presentations** marker. The length of the presentations will be 30-45 minutes, depending on the number of registered students in the course (not all students will present in my half; others will present in Rohan's half). See the presentation guidelines on my website for details on how to make a successful presentation. Students not presenting should still read the paper carefully and be prepared to have an informed discussion.
3. Skim the other papers if you are interested.

Topic 0: Course Introduction and Representative Agent Macroeconomics

Before diving into the role of firm heterogeneity in understanding aggregate dynamics, we must first establish the representative agent benchmark.

Real Business Cycles and Indivisible Labor

In class, we will carefully go through the specification and calibration of the real business cycle model, and discuss the key economic forces the model captures. We will also discuss how indivisible labor implies that micro-level labor supply elasticities may be very different from macro-level elasticities.

- **Required Reading:** King, Thomas and Sergio Rebelo (1999), “Resuscitating Real Business Cycles,” *Handbook of Macroeconomics*.
- Rogerson, Richard (1988), “Indivisible Labor, Lotteries, and Equilibrium,” *Journal of Monetary Economics*.
- Chang, Yongsung and Sun-Bin Kim (2006), “From Individual to Aggregate Labor Supply: A Quantitative Analysis Based on a Heterogeneous Agent Macroeconomy,” *International Economic Review*.
- Rogerson, Richard and Johanna Wallenius (2008), “Micro and Macro Elasticities in a Life Cycle Model with Taxes,” *Journal of Economic Theory*.

New Keynesian Models

Although we will not have time to discuss it, interested students should also look into the New Keynesian DSGE literature, which introduces complicated frictions into the real business cycle model and often formally estimates models using likelihood-based econometrics.

- Christiano, Lawrence, Martin Eichenbaum, and Charles Evans (2005), “Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy,” *Journal of Political Economy*.
- Smets, Frank and Rafael Wouters (2007), “Shocks and Frictions in US Business Cycles: A Bayesian DSGE Approach,” *American Economic Review*.
- Altig, David, Lawrence Christiano, Martin Eichenbaum, and Jesper Linde (2011), “Firm-specific Capital, Nominal Rigidities, and the Business Cycle,” *Review of Economic Dynamics*.

Topic 1: Productivity Dispersion, Aggregation, and Misallocation

At face value, the representative agent assumption says that there is only one firm in the economy which loosely corresponds to an “average” firm in the data.

Productivity, Churning, and Heterogeneity

In this topic, we will first discuss empirically that firms differ greatly along a key dimension: productivity.

- **Required Reading:** Syverson, Chad (2011), “What Determines Productivity?” *Journal of Economic Literature*.
- **Required Reading:** Castro, Rui, Gian Luca Clementi, and Yoonsoo Lee, “Cross-Sectional Variation in the Volatility of Plant-Level Idiosyncratic Shocks,” *Journal of Industrial Economics*.
- Bartlesman, Eric and Mark Doms (2000), “Understanding Productivity: Lessons from Longitudinal Microdata,” *Journal of Economic Literature*.
- Foster, Lucia, John Haltiwanger, and Chad Syverson (2008), “Reallocation, Firm Turnover, and Efficiency: Selection on Productivity or Profitability?,” *American Economic Review*.
- Decker, Ryan, John Haltiwanger, Ron Jarmin, and Javier Miranda (2014), “The Secular Decline in Business Dynamism in the U.S.,” working paper.
- Foster, Lucia, John Haltiwanger, and Chad Syverson (2015), “The Slow Growth of New Plants: Learning about Demand?,” *Economica*.

“Misallocation” and Reduced-Form Frictions to Factor Choices

The fact that firms are heterogeneous is not enough to allow us to conclude that representative agent models are not useful: we will see in class that if there are no frictions to firms adjusting inputs, the dynamics of aggregate variables behave as if there is a representative firm, even if at the micro-level firms in fact are heterogeneous over productivity. We will then discuss a literature that argues there are many such frictions, and that they can be captured using a reduced-form measure of “misallocation.” This literature generally finds that these reduced-form frictions matter a lot for determining aggregate outcomes. For the rest of the class, we will discuss various structural models which can account for part of these reduced-form frictions.

- **Required Reading:** Hsieh, Chang-Tai and Pete Klenow (2009), “Misallocation and Manufacturing TFP in China and India,” *Quarterly Journal of Economics*. [NB: some formulae in the published paper are incorrect and corrected [here](#).]
- Restuccia and Rogerson (2008), “Policy Distortions and Aggregate Productivity with Heterogeneous Establishments,” *Review of Economic Dynamics*.
- Kehrig, Matthias and Nicolas Vincent (2016), “Do Firms Mitigate or Magnify Capital Misallocation? Evidence from Plant-Level Data,” working paper.

Topic 2: Capital Investment and Adjustment Costs

The first structural friction that we will discuss is adjustment costs to firms’ capital accumulation.

Empirics and Basic Investment Theory

We will begin by discussing the empirical patterns of firm-level investment decisions. In order to do this, we will need to briefly review user cost and q theory approaches to investment, since a lot of the older papers in the literature are built around those models. Many of the papers we read will use tax policy as a source of variation in the cost of capital.

- Hassett, Kevin and Glenn Hubbard (2002), “Tax Policy and Business Investment,” *Handbook of Public Economics*.
- Doms, Mark and Timothy Dunne (1998), “Capital Adjustment Patterns in Manufacturing Plants,” *Review of Economic Dynamics*.
- **Required Reading:** Zwick, Eric and James Mahon (2016), “Tax Policy and Heterogeneous Investment Behavior,” forthcoming in *The American Economic Review*.

Partial Equilibrium Investment Models

Having established some basic facts about investment, we will then move to studying what those facts tell us about the structure of the investment problem faced by firms.

- Caballero, Ricardo, Eduardo Engel, and John Haltiwanger (1995), “Plant-Level Adjustment and Aggregate Investment Dynamics,” *Brookings Papers on Economic Activity*.
- Cooper, Russell and John Haltiwanger (2008), “On the Nature of Capital Adjustment Costs,” *Review of Economic Studies*.
- **Required Reading:** Asker, John, Allan Collard-Wexler, and Jan De Loecker (2014), “Dynamic Inputs and Resource (Mis)Allocation,” *Journal of Political Economy*.

Aggregate Implications of Fixed Costs

The partial equilibrium literature typically finds that fixed costs are important in accounting for the lumpiness of investment at the micro level. We will then assess the implications of these models for aggregate investment dynamics.

- Caballero, Ricardo and Eduardo Engel (1999), “Explaining Investment Dynamics in U.S. Manufacturing: A Generalized (S,s) Approach,” *Econometrica*.
- **Required Reading:** Khan, Aubhik and Julia Thomas (2008), “Idiosyncratic Shocks and the Role of Nonconvexities in Plant and Aggregate investment Dynamics,” *Econometrica*.
- Gourio, Francois and Anil Kashyap (2007), “Investment Spikes: New Facts and a General Equilibrium Exploration,” *Journal of Monetary Economics*.
- Bachmann, Ruediger, Ricardo Caballero, and Edouardo Engel (2013), “Aggregate Implications of Lumpy Investment: New Evidence and a DSGE Model,” *American Economic Journal: Macroeconomics*.

- Winberry, Thomas (2018), “Lumpy Investment, Business Cycles, and Stimulus Policy,” working paper.
- Cooper, Russell and Johnathan Willis (2014), “Discounting: Investment Sensitivity and Aggregate Implications,” working paper. [[Available here](#)]

Solving Heterogeneous Firm Macro Models

In order to discuss the aggregate implications in a general equilibrium environment, we will also have to briefly think about how to compute the equilibria of models which feature heterogeneity. The main challenge is that the entire distribution of firms is a relevant state variable for the economy. The distribution is typically an infinite-dimensional object whose dynamics must satisfy a complicated fixed point problem: each firms’ decision depends on the expectations of the evolution of the distribution, and the evolution of the distribution depends on firms’ decisions.

- Terry, Stephen (2015), “Alternative Methods for Solving Heterogeneous Firm Models,” working paper.
- Winberry, Thomas (2018), “A Method for Solving and Estimating Heterogeneous Agent Macro Models,” working paper

Topic 3: Financial Frictions

The third topic that we will discuss is financial frictions. Although we will mainly focus on the implications of financial frictions on investment, there are parallel literatures studying the implications of financial frictions on hiring and pricing decisions.

Empirical Evidence

We will begin our discussion of financial frictions by giving an overview of the empirical literature on how financial variables affect investment (and other) firm-level decisions. Many of the older empirical papers were concerned with showing clear evidence that financial constraints affect firms’ decisions. Since the financial crisis, however, a number of recent papers are concerned with studying how the effect particular macroeconomic shocks depend on firms’ financial positions.

- Gilchrist, Simon and Charles Himmelberg (1995), “Evidence on the Role of Cash Flow for Investment,” *Journal of Monetary Economics*.
- Gertler, Simon and Mark Gertler (1994), “Monetary Policy, Business Cycles, and the Behavior of Small Manufacturing Firms,” *The Quarterly Journal of Economics*.
- **Required Reading:** Josh Rauh (2007), “Investment and Financing Constraints: Evidence from the Funding of Corporate Pension Plans,” *Journal of Finance*

- **Presentation:** Chodorow-Reich, Gabriel (2013), “Unemployment Effects of Credit Market Disruptions: Firm-Level Evidence from the 2008-2009 Financial Crisis,” *The Quarterly Journal of Economics*
- Chaney, Thomas, David Sraer, and David Thesmar (2012), “The Collateral Channel: How Real Estate Shocks Affect Corporate Investment,” *The American Economic Review*
- **Required Reading:** Crouzet, Nicolas and Neil Mehrotra (2017), “Small and Large Firms Over the Business Cycle,” *Working paper*.

Business Cycle Implications of Financial Frictions

After reviewing the empirical evidence, we will incorporate financial frictions into the benchmark Khan and Thomas (2008) heterogeneous firm model and study aggregate business cycle outcomes.

- **Required Reading:** Khan, Aubhik and Julia Thomas (2013), “Credit Shocks and Aggregate Fluctuations in an Economy with Production Heterogeneity,” *Journal of Political Economy*
- Ottonello, Pablo and Thomas Winberry (2018), “Financial Heterogeneity and the Investment Channel of Monetary Policy,” *Working paper*
- **Presentation:** Gopinath, Gita, Sebnem Kalemli-Ozcan, Loukas Karabarbounis, and Carolina Villegas-Sanchez (2017), “Capital Allocation and Productivity in South Europe,” *The Quarterly Journal of Economics*
- Gilchrist, Simon, Raphael Schoenle, Jae Sim, and Egon Zakrajsek (2016), “Inflation Dynamics During the Financial Crisis,” *The American Economic Review*

Representative Agent Business Cycle Models with Financial Frictions

Although we will not discuss representative firm models with financial constraints in our class, there are a number of such models.

- Kiyotaki, Nobuhiro and John Moore (1997), “Credit Cycles,” *Journal of Political Economy*
- Bernanke, Ben, Mark Gertler, and Simon Gilchrist (1999), “The Financial Accelerator in a Quantitative Business Cycle Framework,” *Handbook of Macroeconomics*
- Jermann, Urban and Vincenzo Quadrini (2012), “Macroeconomic Effects of Financial Shocks,” *The American Economic Review*

Models for Development

There is also a sizeable literature studying how financial constraints affect development. The following paper is a good introduction to this literature.

- Buera, Francisco, Joseph Kaboski, and Yongseok Shin (2011), “Finance and Development: A Tale of Two Sectors,” *The American Economic Review*

Topic 4: Entry, Exit, and the Lifecycles of Firms

The fourth topic that we will discuss is the lifecycle of firms. In a model without any frictions to firm growth, new entrants would immediately grow to their optimal scale. However, in the data, the growth process takes many years. The literature on firm lifecycles studies potential frictions in this process and to what extent they can account for the growth patterns of firms.

The Classics

These two papers are among the first modern empirical and theoretical studies of firm dynamics. Hopenhayn’s model forms the backbone of the heterogeneous firm models we have studied in class so far.

- Dunne, Timothy, Mark Roberts, and Larry Samuelson (1989), “The Growth and Failure of US Manufacturing Plants,” *The Quarterly Journal of Economics*
- Hopenhayn, Hugo (1992), “Entry, Exit, and Firm Dynamics in Long Run Equilibrium,” *Econometrica*

Capital Adjustment Costs

One strand of literature studies whether capital adjustment costs can quantitatively account for lifecycle growth dynamics among firms.

- **Required Reading:** Clementi, Gian Luca and Berardino Palazzo (2016), “Entry, Exit, Firm Dynamics, and Aggregate Fluctuations,” *AEJ: Macro*

Accumulating Customers

Another strand of literature studies whether the process of accumulating customers can account for prolonged growth dynamics among firms.

- Gourio, Francois and Leena Rudanko (2014), “Customer Capital,” *Review of Economic Studies*
- **Presentation:** Foster, Lucia, John Haltiwanger, and Chad Syverson (2016), “The Slow Growth of New Plants: Learning About Demand?,” *Economica*
- Moreira, Sara (2016), “Firm Dynamics, Persistent Effects of Entry Conditions, and Business Cycles,” *Working Paper*

Declining Entry over Time

- **Presentation:** Karahan, Fatih, Ben Pugsley, and Aysegul Sahin, “Demographic Origins of the Startup Deficit” (2018)

Topic 5: Trends in Concentration, Competition, and Markups

The last topic that we will discuss is a new literature studying trends in market concentration, competition, and markups.

Declining Dynamism

- Decker, Ryan, John Haltiwanger, Ron Jarmin, and Javier Miranda (2014), “The Secular Decline in Business Dynamism in the U.S.,” *Working Paper*
- Decker, Ryan, John Haltiwanger, Ron Jarmin, and Javier Miranda (2016), “Changing Business Dynamism: Volatility of Shocks vs. Responsiveness to Shocks,” *Working Paper*

Markups

- De Loecker, Jan and Frederic Warzynski (2012), “Markups and Firm-Level Export Status,” *American Economic Review*
- **Presentation:** De Locker, Jan, Jan Eeckhout, and Gabriel Unger (2018), “The Rise of Market Power and the Macroeconomic Implications,” *Working paper*

Competition and Investment

- Gutierrez, German and Thomas Phillipon (2017), “Declining Dynamism and Investment in the U.S.,” *NBER WP 23583*

Labor Share

- Karabarbounis, Loukas and Brent Neiman (2013), “The Global Decline of the Labor Share,” *Quarterly Journal of Economics*
- Autor, David, David Dorn, Lawrence Katz, Christina Patterson, and John Van Reenan (2017), “The Fall of the Labor Share and the Rise of Superstar Firms,” *Working Paper*
- **Presentation:** Kehrig, Matthias and Nicolas Vincent, “The Micro-Level Anatomy of the Labor Share Decline” (2018), *Working paper*