

# Heterogeneous Agents and Macroeconomics

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**Objective.** This course studies economies with household heterogeneity, with a special focus on the life cycle dimension. We will start by a detailed revision of the basic Bewley-Imrohoroglu-Huggett-Aiyagari framework and the empirical work behind the measurement of labor market risk. Then, we will discuss recent papers studying topics like wealth inequality, consumption insurance, or saving of the old.

**Requirements.** Before taking the course you need to understand three things: (1) dynamic programming, (2) a little bit of measure theory and (3) Markov chains. There are several references to refresh the basics of dynamic programming: a simple one is (Ljungqvist and Sargent 2004, chapter 3). Obviously, the most complete source is Stokey, Lucas, and Prescott (1989). Its first chapter is a very easy help. All the measure theory you need to know for this course is contained in some short notes I will provide to you. But if you want more you can check (Stokey, Lucas, and Prescott 1989, chapter 7) or even better Royden (1988). For Markov chains, a good reference is Ljungqvist and Sargent (2004, chapter 2) and I will also give you some notes. A very comprehensive treatment can be found in Stokey, Lucas, and Prescott (1989, chapter 8).

**Structure.** The course consists of 8 sessions, lasting two and a half hours each and split during two weeks.

**Books and references.** There is no basic textbook for this course and most of the material comes from papers and chapters of different books. I list the basic references for each part in the next pages.

**Evaluation.** There will be a take-home exam. This exam will be based on some paper that the students will need to analyze.

**Syllabus.** In the next pages I detail the contents of the course. This is a preliminary syllabus, with detailed papers to be covered during the second week still subject to change.

## Part I. The Heterogeneous Households Model.

Estimated duration: 3 theory sessions

1. Why do we need Heterogeneous Agents models?  
Díaz-Giménez, Glover, and Ríos-Rull (2011), Krueger, Perri, Pistaferri, and Violante (2010) and Heathcote, Perri, and Violante (2010).
2. The Bewley-Imrohoroglu-Huggett-Aiyagari framework.  
Huggett (1993), Aiyagari (1994) and Dávila, Hong, Krusell, and Ríos-Rull (2007). For a textbook exposition see (Ljungqvist and Sargent 2004, chapters 16 and 17).
3. Solving the model in the computer (very brief).
4. Complete markets  
Ljungqvist and Sargent (2004, chapter 8).
5. Endogeneous labor decisions.  
Pijoan-Mas (2006), Heathcote, Storesletten, and Violante (2010)
6. Life cycle.  
Huggett (1996)

## Part II. Labour Market Uncertainty: Characterizing Labor Earnings.

Estimated duration: 1 session

1. The standard income process and the evolution of earnings inequality  
Storesletten, Telmer, and Yaron (2004), Storesletten, Telmer, and Yaron (2001), Heathcote, Storesletten, and Violante (2010)
2. Heterogeneous income profiles  
Guvenen (2009), Guvenen (2007) and Guvenen and Smith (2014)
3. Endogenous earnings  
Huggett, Ventura, and Yaron (2011)
4. Non-linear earnings processes  
Arellano, Blundell, and Bonhomme (2017), Guvenen, Karahan, Ozkan, and Song (2015)

**Part III. Topics.**

Estimated duration: 4 theory sessions

## 1. Consumption responses to income shocks

- Transitory and permanent shocks: Blundell, Pistaferri, and Preston (2008), Kaplan and Violante (2010)
- Tax rebates and wealthy hand-to-mouth: Johnson, Parker, and Souleles (2006), Kaplan and Violante (2014)
- Using consumption responses to learn about earnings shocks: Guvenen and Smith (2014)

## 2. Wealth inequality

- Public transfers: Hubbard, Skinner, and Zeldes (1995)
- Entrepreneurship: Cagetti and De Nardi (2006)
- Non-linear shocks: Castañeda, Díaz-Giménez, and Ríos-Rull (2003) and De Nardi, Fella, and Paz-Pardo (2016)

## 3. Savings of the old

- Medical expenses: De Nardi, French, and Jones (2010) and Nakajima and Telyukova (2015)
- Long term care risk: Kopecky and Koreshkova (2014), Ameriks, Briggs, Caplin, Shapiro, and Tonetti (2015), Bueren (2017)

## References

- AIYAGARI, S. R. (1994): “Uninsured Idiosyncratic Risk, and Aggregate Saving,” *Quarterly Journal of Economics*, 109(3), 659–684.
- AMERIKS, J., J. BRIGGS, A. CAPLIN, M. SHAPIRO, AND C. TONETTI (2015): “Long-Term Care Utility and Late in Life Saving,” Mimeo.
- ARELLANO, M., R. BLUNDELL, AND S. BONHOMME (2017): “Earnings and Consumption Dynamics: A Nonlinear Panel Data Framework,” *Econometrica*, 85(3), 693–734.
- BLUNDELL, R., L. PISTAFERRI, AND I. PRESTON (2008): “Consumption Inequality and Partial Insurance,” *American Economic Review*, 98(5), 1887–1921.
- BUEREN, J. (2017): “Long-Term Care Needs: Implication for Savings, Welfare and Public Policy,” Mimeo, Cemfi.
- CAGETTI, M., AND M. DE NARDI (2006): “Entrepreneurship, Frictions, and Wealth,” *Journal of Political Economy*, 114(5), 835–869.
- CASTAÑEDA, A., J. DÍAZ-GIMÉNEZ, AND J.-V. RÍOS-RULL (2003): “Accounting for U.S. Earnings and Wealth Inequality,” *Journal of Political Economy*, 111(4), 818–857.
- DÁVILA, J., H. HONG, P. KRUSELL, AND V. RÍOS-RULL (2007): “Constrained Efficiency in the Neoclassical Growth Model with Uninsurable Idiosyncratic Shocks,” Mimeo.
- DE NARDI, M., G. FELLA, AND G. PAZ-PARDO (2016): “The Implications of Richer Earnings Dynamics for Consumption and Wealth,” NBER Working Paper 21917.
- DE NARDI, M., E. FRENCH, AND J. JONES (2010): “Why Do The Elderly Save? The Role Of Medical Expenses,” *Journal of Political Economy*, 118(1), 39–75.
- DÍAZ-GIMÉNEZ, J., A. GLOVER, AND J.-V. RÍOS-RULL (2011): “Facts on the Distributions of Earnings, Income, and Wealth in the United States: 2007 Update,” *Federal Reserve Bank of Minneapolis Quarterly Review*, 34(1), 2–31.
- GUVENEN, F. (2007): “Learning Your Earning: Are Labor Income Shocks Really Very Persistent?,” *American Economic Review*, 97(3), 687–712.
- (2009): “An Empirical Investigation of Labor Income Processes,” *Review of Economic Dynamics*, 12(1), 58–79.
- GUVENEN, F., F. KARAHAN, S. OZKAN, AND J. SONG (2015): “What Do Data on Millions of U.S. Workers Reveal about Life-Cycle Earnings Risk?,” NBER Working Paper 20913.
- GUVENEN, F., AND A. SMITH (2014): “Inferring Labor Income Risk and Partial Insurance from Economic Choices,” *Econometrica*, 6(82), 2085–2129.

- HEATHCOTE, J., F. PERRI, AND G. VIOLANTE (2010): “Unequal We Stand: An Empirical Analysis of Economic Inequality in the United States, 1967- 2006,” *Review of Economic Dynamics*, 1(13), 15–51.
- HEATHCOTE, J., K. STORESLETTEN, AND G. VIOLANTE (2010): “The Macroeconomic Implications of Rising Wage Inequality in the United States,” *Journal of Political Economy*, 118(4), 681–722.
- HUBBARD, G., J. SKINNER, AND S. ZELDES (1995): “Precautionary Savings and Social Insurance,” *Journal of Political Economy*, 103(2), 366–399.
- HUGGETT, M. (1993): “The Risk Free Rate in Heterogeneous-Agents, Incomplete Insurance Economies,” *Journal of Economic Dynamics and Control*, 17(5/6), 953–970.
- (1996): “Wealth Distribution in Life-Cycle Economies,” *Journal of Monetary Economics*, 38(3), 469–494.
- HUGGETT, M., G. VENTURA, AND A. YARON (2011): “Sources of Lifetime Inequality,” *American Economic Review*, 101(7), 2923–2954.
- JOHNSON, D., J. PARKER, AND N. SOULELES (2006): “Household Expenditure and the Income Tax Rebates of 2001,” *American Economic Review*, 96(5), 1589–1610.
- KAPLAN, G., AND G. VIOLANTE (2010): “How Much Consumption Insurance Beyond Self-Insurance?,” *American Economic Journal: Macroeconomics*, 2(4), 53–87.
- (2014): “A Model of the Consumption Response to Fiscal Stimulus Payments,” *Econometrica*, 4(82), 1199–1239.
- KOPECKY, K., AND T. KORESHKOVA (2014): “The Impact of Medical and Nursing Home Expenses on Savings,” *American Economic Journal: Macroeconomics*, 6, 29–72.
- KRUEGER, D., F. PERRI, L. PISTAFERRI, AND G. VIOLANTE (2010): “Cross Sectional Facts for Macroeconomists,” *Review of Economic Dynamics*, 13(1), 1–14.
- LJUNGQVIST, L., AND T. SARGENT (2004): *Recursive Macroeconomic Theory*. The MIT Press, Cambridge, Massachusetts, Second Edition.
- NAKAJIMA, M., AND I. TELYUKOVA (2015): “Medical Expenses and Saving in Retirement: The Case of U.S. and Sweden,” Mimeo.
- PIJOAN-MAS, J. (2006): “Precautionary Savings or Working Longer Hours?,” *Review of Economic Dynamics*, 9(2), 326–352.
- ROYDEN, H. (1988): *Real Analysis*. Prentice Hall, Third Edition.

STOKEY, N. L., R. E. LUCAS, AND E. C. PRESCOTT (1989): *Recursive Methods in Economic Dynamics*. Harvard University Press.

STORESLETTEN, K., C. TELMER, AND A. YARON (2001): “How Important Are Idiosyncratic Shocks? Evidence from Labor Supply,” *American Economic Review Papers and Proceedings*, 91(2), 413–17.

——— (2004): “Consumption and Risk Sharing over the Life Cycle,” *Journal of Monetary Economics*, 51(3), 609–633.