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FROM THE LAB

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conference held in Queenstown, New Zealand November 2018

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conference held April 2019

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Director's Message

Finn Kydland

This issue of *From the Lab* illustrates the sense in which we at LAEF are interested in co-operating with other institutions, including foreign ones, in the interest of scientific progress. The issue contains summaries of the presentations at two conferences. One took place in Queenstown, New Zealand, as part of the Australasian Macroeconomics Workshop. Thanks to the joint initiative of LAEF's Associate Director, Peter Rupert, in co-operation primarily with Benoit Julien at University of New South Wales in Sydney, we have been represented for a few years at that workshop in the form of a LAEF Day for which we're in charge of the program, added to the overall program for the workshop.

The second conference took place in Santa Barbara, as we were in charge this year of a conference that has come to be known as HULM: Housing-Urban-Labor-Macro. This conference typically takes place once a year at different locations. It began in 2009 as an effort to bring together researchers from different areas of economics to study the interplay of house prices, housing, mobility, wages, and the macroeconomy. We were especially pleased to support the conference's spirit of collaboration across fields for advanced study of housing related topics. We especially thank Morris Davis, Rutgers University, and Carlos Garriga, Federal Reserve Bank of St. Louis, for their efforts in putting together the program for the conference.

Finally, as the long-time reader of *From the Lab* may recall, I have instituted the tradition of once a year providing a list of the international events, such as keynote speeches and public lectures, in which I have participated. Peter Rupert as well does a considerable amount of speaking at various events, but tends to concentrate more on the local economy, meaning California and especially Santa Barbara and surrounding counties, in part through his leadership of UCSB's Economic Forecast Project.

Here's my list of activities for the period July 1, 2018, to June 30, 2019:

Keynote Speeches and Public Lectures

July 4: Keynote, 25th Global Finance Conference, Paris

July 6: Keynote, Circular Economy and Innovation Summit, Madrid

Sep. 4: Public lecture, NHH Norwegian School of Economics, Bergen

Sep. 10: Public lecture, Central Bank of Montenegro, Podgorica

Sep. 15: Keynote, 3rd China Economic Forum, Yesanpo, Hebei Province

Sep. 16: Speech to the incoming students, Peking University

Sep. 16: Lecture to faculty, Peking University

Sep. 20: Keynote, Global Digital Economy Summit, Shijiazhuang, China

Oct. 18: Keynote, China International Forum on Industrial Finance, Jinan

Oct. 28–Nov. 1: Attended and delivered lecture at World Laureate Forum, Shanghai

Nov. 5–6: Public lecture and panel discussion, Nobel Perspectives Live! London, U.K.

Nov. 29: Keynote, Annual Workshop of the Australasian Macroeconomics Society, Queenstown, New Zealand

Dec. 14: Keynote, RIDGE Forum, Montevideo

Dec. 26: Keynote, Peking University Public-Private Partnership Conference, Beijing

Mar. 1–16: Speaking trip to Laos, Malaysia, and Indonesia organized by International Peace Foundation

Mar. 4: Keynote speech and dialogue, Asian Strategy and Leadership Institute, Sunway University, Kuala Lumpur, Malaysia

Mar. 6: Keynote speech, dialogue, and conferment of honorary degree, Bandung Institute of Technology, Bandung, Indonesia

Mar. 8: Keynote speech and dialogue, Bank of Indonesia, Jakarta

Mar. 8: Keynote speech and dialogue, Binus University, Jakarta

Mar. 12: Keynote speech and dialogue, Souphanouvong University, Luang Prabang, Laos

Mar. 14: Keynote speech and dialogue, National University of Laos, Vientiane

June 12: Keynote, Global New Economy Conference, Shanghai

June 26: Keynote, Nanjing Tech Week, Nanjing, China

June 27: Keynote, Jiangning Exhibition Center, Nanjing

Panels and Committees

Jan. 21: Oslo Business for Peace Award, selection-committee meeting, London

May 22: Nobel Prize Dialogue: The Future of Ageing, Madrid; panels on "Living in an Ageing Society" and "How should we live?"

June 3–4: Premios Jaime I (prestigious Spanish prize), selection-committee meeting for Economics prize; Valencia

Educational Activities of Note

July 10–12: XXIII Workshop on Dynamic Macroeconomics, Vigo, Spain; opportunity for PhD students to present their research for feedback from at least half-a-dozen professors

5th Workshop of the Australasian Macroeconomics Society and LAEF

November 28–30, 2018

Martin Berka – Massey University
Richard Blaikie – University of Otago
Christine Braun – European University Institute
Elena Capatina – Australian National University
Karsten O. Chipeniuk – Reserve Bank of New Zealand
Mohammed Davoodalhosseini – Bank of Canada
Begona Dominguez – University of Queensland
Nicola Fuchs-Schundeln – University of Frankfurt
Alfred Guender – University of Canterbury
Jinji Hao – Victoria University of Wellington
Ayse Imrohoroglu – University of Southern California
Ozer Karagedikli – Reserve Bank of New Zealand
Finn Kydland – University of California, Santa Barbara
Qingyin Ma – Australian National University
Jakob B. Madsen – Monash University
Sephorah Mangin – Australian National University
Michelle Rendall – Monash University
Thijs van Rens – University of Warwick
Adam Richardson – Reserve Bank of New Zealand
Peter E. Robertson – University of Western Australia
Peter Rupert – University of California, Santa Barbara
Karam Shaar – New Zealand Treasury
Robert Shimer – University of Chicago
Citrad Slavik – CERGE-EI
Christie Smith – Reserve Bank of New Zealand
Harald Uhlig – University of Chicago
Murat Ungor – University of Otago
Lawrence Uren – University of Melbourne
Dennis Wesselbaum – University of Otago
Benjamin Wong – Monash University
Fang Yao – Reserve Bank of New Zealand
Yao Yao – Victoria University of Wellington
Yu Zhu – Bank of Canada

Selective Hiring and Welfare Analysis in Labor Market Models

Christian Merkl and **Thijs van Rens**

Assessing the welfare implications of policies in models depends critically on the structure of the environment itself. Since realistic features can often be intractable, a key challenge arises in constructing pragmatic models to assess policies. In unemployment policy, one such challenge concerns the role of ex ante heterogeneity of workers. One common approach is to assume that workers are initially indistinguishable and ex post differences arise from random events and experiences. These initial conditions potentially limit the costs associated with unemployment in assuming that all workers are subject to the same labor market risks.

Merkl & van Rens propose a framework that addresses the issue above, facilitating as an application the study of optimal unemployment insurance. They study how selective hiring—as opposed to random hiring—affects the distribution of unemployment risk and how this translates into aggregate welfare. If hiring is perfectly selective, workers who are profitable for firms can always find work, while those who are not never do. These unemployable workers consume less and thus have a high marginal utility of consumption. In a world with perfectly random hiring, however, more hiring takes place because every worker can find a job. This is to say that unemployment costs are higher when hiring is selective. The authors also consider scenarios where hiring protocol is partial: neither perfectly selective nor random. Here, the unequal distribution of unemployment arising from selection can be offset by the hiring externality when it is random. They find that this offsetting externality is quantitatively small, giving a role for government to insure workers against unemployment risk.

Unlike most models, the authors construct an environment without search frictions (though it is isomorphic to the standard search model). Ex ante heterogeneity is captured by differences in training costs which affect how profitable a worker is to a firm. Since there are no differences between workers after training, the profitability of a worker for a firm is driven entirely by this up-front cost to training, affecting Nash-bargained wages. Selective versus random hiring is controlled by how transitory an individual's hiring costs are. If this hiring cost changes each period, then they are purely "match-specific" and hiring is random. If they are permanent, individuals differ innately and therefore hiring is selective. Partially random and selective hiring is modelled as a temporal correlation of these training costs for a worker; that is, there is a transitory and permanent component to these costs. Interestingly, markets are assumed to be complete, so workers may insure against all income shocks, though cannot perfectly insure against all aggregate shocks because these assets are held in zero net supply.

The model is then used to show that the cyclical properties of labor market aggregates are similar between random and selective hiring and that these also fall in line with the findings of the standard search model. Importantly, however, welfare considerations are much different because of how unemployment risk is spread across the population of workers. Because of this, there is a potential role for the government to rectify the potentiality of some workers having very high marginal utility of consumption. The authors think of this in the context of the provision of unemployment benefits and, using a standard Ramsey problem formulation, show that the welfare maximizing level of unemployment benefits is higher as the degree of selectivity is increased.

A conference participant raised concern about not modeling the value of leisure. That is, if always-unemployable workers received some value of leisure, the measured benefits of unemployment insurance transfers could be much smaller. The presenter noted that such a feature could be accommodated, but that the results would be similar. Regarding the model formulation, another participant pointed out that drawing the transitory component of training costs was itself costless, so workers should just continually draw until the minimum was achieved, thereby eliminating the random aspect of hiring. The presenter noted the issue, but also noted that limiting the ability to re-sample would solve it.

Efficiency in Search and Matching Models: A Generalized Hosios Condition

Julian Benoit and **Sephorah Mangin**

The assessment of efficient allocations is often of first-order concern in economics. In the context of search and matching models, the "Hosios condition" summarizes the conditions under which entry into the market is, in fact, efficient. It states that entry is efficient when the entering agent's share of the joint surplus exactly equals the elasticity of the matching function with respect to the agent. For example, in search models of the labor market, it advises when vacancy creation (i.e. firm entry) is efficient. Continuing with the labor-market example, the condition ensures that market entrants appropriately internalize the externality placed on other searchers by decreasing their likelihood of being matched with a worker.

Though the Hosios condition is applicable in many situations, a key departure arises when the expected output of a match depends on the ratio of searching agents on either side of the market. This happens, for example, when meetings are multilateral or if there are sequential markets where actions in the first market affect outcomes in the second. Here, there is the possibility that search externalities are internalized, but not output externalities.

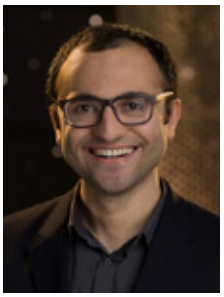
Mangin & Julien explore environments like this and develop a generalized version of the Hosios condition that accounts for these externalities. In doing so, they provide a way to nest and contextualize various types of models in one framework, facilitating a better understanding of constrained efficiency in environments with search and matching frictions. The authors begin with a simple example of job search with risk-neutral agents searching for jobs through multilateral meetings with firms. The counting process for the number of firms a worker meets is assumed to be Poisson in labor-market tightness (the number of vacant jobs per searcher). When a worker meets these multiple firms, a meeting-specific productivity is drawn for each firm. Under usual wage-setting assumptions (Nash bargaining or auctions), the firm that the worker chooses to accept is the firm with the highest draw. Here we can see the output externality: if the number of vacant jobs per worker is large, the number of firms that a worker meets increases and the probability that a worker gets a relatively high match-specific draw increases.

In the above example the output externality is positive for workers. If more firms enter, output and wages increase. However, as firms enter, the probability that an individual firm finds a worker decreases. If firms know that they will be adequately compensated should a match form, an efficient number of vacancies can be achieved. Hypothesizing a social planner constrained by the search frictions in this environment, the authors derive a condition that maximizes welfare. This condition neatly separates the restriction on surplus sharing in terms of a search externality and an output externality. The former is the canonical Hosios condition; the latter is the elasticity of the surplus with respect to firm entry.

A conference participant questioned the generality of this new condition. What if, for example, the cost of posting a vacancy depended on the market tightness? The presenter noted that the discussed "generality" of this new proposed condition is specific to the extension of output depending on market tightness, though a similar procedure could be undertaken to "generalize the generalized Hosios condition."

Constrained Efficiency with Adverse Selection and Directed Search

Mohammad Davoodalhosseini



The issue of adverse selection is prevalent in many economic applications. In over-the-counter markets, for example, one side of the market may possess private information about the assets that they are looking to sell. In the additional presence of search frictions, equilibrium assessment and efficiency may be challenging. There are multiple distinct concepts of equilibrium. One notion is that of constrained efficiency. This is a class of equilibria wherein agent welfare is maximized (for example by a social planner), subject to the search frictions in the environment. Another concerns the "first best" allocation. This is the allocation that would maximize welfare if information were complete. When informational completeness is relaxed, knowing how—in welfare terms—the resulting equilibria relate to the constrained efficient allocation is of interest. It is often the case that decentralized equilibria in models with search and information frictions do not achieve constrained efficiency. The key question here is whether a planner can intervene in markets to improve the welfare of agents who individually do not internalize externalities on other agents.

Davoodalhosseini explores this general question using a mechanism design approach. Subject to the constraints of the model environment, is a given equilibrium socially efficient? And what is the best possible allocation that this planner can achieve? The author constructs a model of directed search similar in concept to that of Guerrieri, Shimer, and Wright (2010). An endogenous measure of buyers looks to buy an asset from a fixed population of heterogeneous sellers who possess private information about the asset they are selling. Trading occurs through decentralized, bilateral meetings, where search frictions dictate the probability a buyer and a seller are matched. A social planner, subject to these search frictions, chooses submarkets to assign to buyers and sellers to maximize their expected ex-ante payoff.

The author finds that, first, the planner can achieve strictly higher welfare than any decentralized equilibrium that does not achieve the first-best outcome (i.e. when there is private information). Under some mild conditions, this planner can completely undo the inefficiencies associated with adverse selection arising from informational frictions. In other words, there is a role for intervention to rectify inefficiencies of markets. The important mechanism that advises this outcome is the ability for redistributive taxation to be incentive compatible. That is, some types of agents are taxed to subsidize others, and that agents are incentivized to truthfully reveal their types. In the market equilibrium, individual entrants do not internalize the externalities they place on the payoffs of other agents. By appropriately taxing the entrants, the planner can transfer the proceeds to parties negatively affected by the choice to enter.

In discussing the theoretical construction of the model, conference participants noted the difficulty of following the abstractions of the environment absent a concrete example. As a result, there was confusion over the choice sets of agents in the model, and thus over its implications to specific examples. One participant questioned the contract space of agents. That is, were there contracts between parties wherein some degree of screening could be accomplished, eliminating at least part of the issue of adverse selection? The presenter explained that such contracts were not considered, and that the model is constructed to produce these costs.

Decomposing Match Efficiency and Aggregate Vacancies

Christine Braun

The U.S. labor force has undergone dramatic changes over time. For example, the share of college-educated workers has more than tripled since 1940. Keeping this in mind, the predominant modeling apparatus for labor markets uses search frictions to help explain the existence and pattern of unemployment in equilibrium. That is, it reconciles how jobless individuals can be willing and able to work at the same time firms are looking to hire them. Within this paradigm, fluctuations in the observed rates at which firms and workers connect can describe and highlight the extent of the frictions in the labor market. With this knowledge, researchers are enabled to explore the implications—and potentially the causes—of these frictions. When considering the compositional changes in the U.S. labor market, what happens to the calculation of such frictions?

The author considers this question by setting out to decompose these labor market friction measures by education group—though the findings also apply to other demographic characteristics. A key novelty relates to how the proposed methods circumvent limitations of data. To understand how, first note that these measures are ultimately calculated as a wedge called match efficiency. Operationally, this residual is calculated by assuming some structure on the matching process (a Cobb-Douglas matching function) that relates the number of unemployed workers and vacant job positions into the number of hires. The residual is then calculated as the wedge necessary to reconcile differences in the predicted rate of matching and the observed rate. Next, this procedure is typically carried out on aggregate data, using aggregate unemployment and vacancies. When thinking about applying this procedure at a less aggregated level, a problem arises, as vacancies by education group are difficult to observe. While unemployment and job-finding probabilities can be readily calculated using the traditional data sources, it is not clear what the number of vacancies are.

The author uses a simple model of the labor market with disjoint submarkets distinguished by the education level of the workers (and firms looking to hire them). Those who are unemployed search for work in their submarket, and the probability with which they find jobs is governed by the usual constant-returns-to-scale matching function, where the elasticity of the job-finding probability with respect to the labor-market tightness is the same across these submarkets. Aggregate productivity is stochastic, is common to all submarkets, and affects the vacancy posting behavior of firms (described by a free-entry condition).

To back out the vacancy series for the various education groups, the author estimates them using a Kalman filter. For intuition, the first step teases out a relationship between observed variables and uses the structure of the model described above. The procedure seeks to minimize the error of the model in generating data to match what is observed. With these parameter estimates, the model is applied to data disaggregated by education. To pin down differences in vacancies from match efficiency, some additional restrictions are placed on the interrelationships of these residuals by group (by assuming a maximum of two structural breaks). Finally, the series are fed through the filter to produce the time series. Using this output, the author finds that the distribution of vacancies across education groups had the largest contribution to changes in aggregate match efficiency.

One conference participant questioned the assumption of risk-neutrality of vacancy posting firms. This, for example, could affect the entry behavior over time that currently is not being captured. The presenter noted that the method uses a first-difference approach, and that this was unlikely to be a major factor. Another participant noted that introducing some persistence to vacancy posting (moving away from free entry) might also have large implications for the generated series. Another attendee noted that, instead of "back-casting" vacancies to years prior to 2000, one could just use the College Board's Help Wanted Index as an additional measurement equation. The presenter noted that these suggestions could be accommodated.

The Welfare Effects of Trade with Labor Market Risk

Omid Mousavi and **Lawrence Uren**

Conventional economic wisdom suggests that the potential welfare gains from trade for small, open economies are positive. Though there are winners and losers, aggregated gains are such that transfers exist that can make all better off. The environments with which this topic is studied usually assume no uncertainty and those agents are risk-neutral. The authors ask what happens to welfare assessments when these assumptions are loosened. They propose a framework where workers are risk-averse, face uncertain labor-market outcomes, and then assess the consequences of free trade relative to autarky. They come up with a set of conditions under which free trade improves welfare and, importantly, when it may decrease.

Their model is a simple stochastic endowment economy where worker-consumers have preferences over two types of goods. These workers are assigned to work in two sectors which produce these goods and, in any given period, may be employed or unemployed. Labor market frictions are assumed to be of the search variety: unemployed workers have a probability of finding a job that depends on the number of vacant firms and unemployed workers. These possible changes make one's future labor income uncertain. With curvature in the utility function, this also gives rise to fluctuations in marginal utility over time. These agents may neither borrow nor save and therefore consume their wage income. In autarky, the price for each type of agent's labor is set so that markets clear. When opened to trade with the global economy, prices are taken to be exogenous.

When trade is made possible, relative prices change, allowing the economy to shift resources to produce the more valuable good. Second, workers substitute toward products that become relatively cheaper. This is the traditional channel for gains from trade: comparative advantage. Workers producing the good whose relative price decreases, however, may be worse off. The authors show that the appropriate compensating transfer is proportional to the ratio of the agents' marginal utility when employed to the marginal utility when unemployed. For workers who are unemployed in the sector that is hurt by trade at the time of integration, the marginal utility of consumption can be very high and the requisite amount of transfers might exceed the influx of real goods into the economy.

A conference participant raised a concern about the mobility of labor between the two sectors. As treated in the model, workers cannot change sectors after the economy is opened to trade. This might artificially raise the costs of trade for workers in less productive sectors, and the negative welfare implications might not hold if there was some degree of adjustment. Others were concerned that, though the model was dynamic, there were no dynamic decisions being made by workers. Workers could not accumulate assets to (at least partially) insure against labor market risk—a motive ubiquitous to situations with risk aversion. Finally, referencing the thought-experiment whereby transfers exist such that all workers are made better off by trade, it was asked if the opposite were true. That is, is it possible for there to exist a transfer from the losers to the winners of trade to stop trade altogether? Could "losing" workers mitigate their losses by transferring to "winners"? The presenter noted that, while they had not specifically explored this idea, he suspected the notion might be possible under certain conditions.

High Wage Workers Work for High Wage Firms

Katarina Borovickova and **Robert Shimer**

Sorting is ubiquitous in many economic contexts: individuals with certain characteristics typically marry others with those same characteristics; high-income households typically live in certain neighborhoods; high-ranked universities generally admit the most qualified students. An ongoing debate studies whether these patterns extend to the labor market. Following Abowd, Kramarz, & Margolis (1999) (AKM), many have found that the correlation between workers' fixed characteristics and the firms they work for is near zero, suggesting that there is not much sorting in employment. Further, these findings have been used to motivate analyses of the labor market without sorting between workers and firms.

Borovickova & Shimer revisit this question, arguing that the "no-sorting" conclusion is ill-advised. They propose a new, more accurate measure of the extent of labor market sorting and apply it to Austrian data. This new measure finds a reasonably high correlation of (unobserved) worker types and their employers between 0.4 and 0.6. The key distinction between the two approaches, and why they yield different answers, relates to a known issue with the fixed effects estimators used by AKM and others. The authors show that the AKM approach produces a correlation near zero for this Austrian dataset.

The major departure between Borovickova & Shimer's sorting measures concerns how an agent's "type" is determined. They propose and use the log wage a worker expects in an employment relationship and the log wage a firm expects to pay an employee. This differs from the fixed effects measure in AKM, but is shown to be conceptually equivalent if there is no issue of measurement. That is, any differences between the two approaches when applied to a particular setting exist because of limitations of data, and not on the fundamental, underlying theory. Such limitations arise when using real data because it is often the case that there are small numbers of conditionally independent wage observations for workers and firms. Since the wage of a worker-firm pair is highly autocorrelated, the authors treat the appropriate unit of observation at the match level.

Addressing the issue of small numbers of conditionally independent observations, the authors calculate the correlation between worker and firm types without actually calculating an individual agent's type. Their approach assumes a joint distribution of matched worker and firm types with finite first and second moments. Variance decomposition then recovers these moments, where the identifying assumption is that each worker (and firm) has at least two observations of a received wage that is independently and identically distributed given the type. The authors explain that this method is similar in spirit to random effects, though there are no needed distributional assumptions on the joint distribution aside from the existence of first and second moments.

Using various theoretical models to help filter the Austrian data to produce independent and identically distributed observations, Borovickova & Shimer estimate a correlation between worker and firm types in the range of 0.4 to 0.6. A conference participant asked what, precisely, is driving this finding of correlation in contrast to the AKM results. The presenter noted that with data limitations, interpreting fixed effects can sometimes yield nonsense. Though in theory the estimates are consistent in the limit, with finite histories for a finite set of workers and firms, the many estimated fixed effects are noisy estimates for true worker and firm types.

Housing-Urban-Labor-Macro

April 3–4 , 2019

Henning Bohn – UC Santa Barbara
Morris Davis – Rutgers University
Anthony DeFusco – Northwestern University
Matt Delventhal – Claremont McKenna College
Alessandra Fogli – Federal Reserve Bank of Minneapolis
Carlos Garriga – Federal Reserve Bank of St. Louis
Elisa Giannone – Pennsylvania State University
Jonathan Halket – Stanford University
Finn Kydland – UC Santa Barbara
Kurt Mitman – Institute for International Economics Studies, Stockholm
Charlie Nathanson – Northwestern University
Lee Ohanian – UC Los Angeles
Stephen L. Ross – University of Connecticut
Peter Rupert – UC Santa Barbara
Martin Schneider – Stanford University
Athena Tsouderou – IE School of Business, Madrid
Selale Tuzel – University of Southern California

No Job, No Money, No Refi: Frictions to Refinancing in a Recession

Anthony A. DeFusco and John Mondragon

The aim of this paper is to measure the impacts of previously overlooked market frictions on refinancing behavior during an economic recession. In response to the decline of the mortgage industry during the Great Recession, the Federal Housing Administration (FHA) revised the Streamline Refinance (SLR) program in late 2009. Under the revised program, borrowers with negative equity had to both pay upfront, out-of-pocket closing costs and document their employment status. A refinancing of debt by households was hampered by these frictions, which put a break on some policy interventions designed to reduce the severity of recessions. Exploiting the policy-induced discontinuity, the authors quantify the effects of these constraints on refinancing behavior during recession. Based on the findings, this study claims that cyclical variations in these constraints may have an impact on both the aggregate and distributional consequences of monetary policy.

The authors motivate their research question by pointing to the change in refinance rates following the policy shift. The difference in refinancing behaviors of FHA borrowers, while flexibly controlling for a set of observable covariates and time trends, identifies the overall average effects of the frictions. According to the results of this event-study approach, refinancing probability dropped when these new constraints took effect. The major concern with this empirical strategy is that it cannot separate out the differences in probability that would have occurred even without the policy change. The authors adopt a difference-in-differences estimation strategy and compare average change in refinance rates between FHA and conventional, unsubsidized mortgages over time. They estimate that in response to the policy shift, FHA borrowers experienced 0.7 percentage point decrease in refinancing probability compared with the conventional mortgage markets.

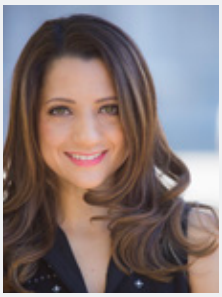
One participant asked whether the effects of frictions on FHA refinance rates can be generalized to the whole population. The presenter noted that FHA borrowers, comprising 20 percent of the entire market, are different from regular borrowers in the sense that most of them are located in the lower tail of the income distribution of home buyers and are first-time buyers. The presenter claimed that some of the results from the study can be understood as a potential upper bound on the importance of refinancing for non-FHA borrowers.

In order to investigate the effects of the two frictions separately, the paper uses a triple difference estimator. The authors compare FHA refinance rates to conventional loans, following newly adopted rules as the unemployment probability increases. Their estimate shows that a percentage point increase in the county-level unemployment rate decreases the monthly FHA refinance rate by about 0.05 percentage point relative to conventional markets after the income document requirements. In addition, the authors isolate the effect of upfront, out-of-pocket closing cost on FHA refinance probability using the same empirical strategy. The estimate suggests that the FHA refinance rate decreased at least by 0.5 percentage point compared with the conventional loans following the new out-of-pocket cost.

One conference attendee pointed out that the estimated effect of requiring employment status documentation might be exaggerated because of loss of income during recession, potentially one of the main factors limiting refinancing behavior, and one that would not show up in the unemployment rate, thereby overstating the result. The author clarified that they were looking at the sensitivity of refinancing rates relative to local unemployment rates, acknowledging that there could be better scaling of the measure.

The Dynamic Effects of Investors in Housing Markets

Carlos Garriga, Pedro Gete, and **Athena Tsouderou**



It is widely recognized that the Federal Reserve's quantitative easing program induced institutional investors to take on more risk. Less well known is to what extent this pushed institutional investors toward the housing market and what dynamic effects this had on housing affordability. This paper explores who the major players were, in terms of volume of home purchases, and what effects they had on the equilibrium outcome. The authors find that institutional investors, defined as legal entities who are either LLC's, LP's, or Trusts, played a significant role in the recovery years following 2009.

Since the author's main goal is to document the causal impact of investor participation in the housing market on overall home prices, a simple regression would be riddled with bias both from simultaneity and omitted variables. The paper uses an instrumental variables strategy to isolate the effects of investors' share of total home purchases, measured in dollars, on log home price index at the metropolitan statistical area level.

The first instrument is meant to capture the exposure of a metropolitan statistical area to risk-free investment opportunities. To capture this, the authors used the average share of value of deposits over total income of the top earners in a metropolitan statistical area, where top earners are people that had total income larger than $100,000 in their tax returns. The second instrument is meant to measure a metropolitan area's overall investment savviness. The authors use the average ratio of business income to total income of the top earners in a metropolitan area. Both instruments are then multiplied by the Federal Funds Rate.

The results from the cross-sectional and fixed-effects panel regressions indicate that investors had a much larger impact on home prices within the lower third of the home value distribution than the upper third. This is especially true if a metropolitan area has a disproportionately higher share of small institutional investors, defined as investors with total value of home purchases below the 25th percentile. Though this could be interpreted to mean that investors negatively impacted less wealthy home buyers, it can also mean that investors helped recover the value of less wealthy homeowners.

Interestingly, the estimated dynamic effects show that after an investor makes its purchase there is positive price growth, but only for up to two years on average. After that, prices are shown to decrease. This is consistent with the literature documenting the effect of home flippers (who buy and sell quickly). This result captures the general equilibrium effects of an increase in housing supply, which largely benefited lower valued homes and the less wealthy homeowners. The authors also show that there was a very significant drop in the probability of flipping a house by investors after the recession, which further contributes toward the recovery.

The End of the American Dream? Inequality and Segregation in US Cities

Alessandra Fogli and Veronica Guerrieri

The authors study how residential segregation by income within US cities affects the rise in income inequality. To measure segregation and inequality, they use the dissimilarity index and the Gini coefficient. Using U.S. Census tract data, the authors find that there is a positive correlation between segregation and inequality in 1980 data. They also find that changes in segregation and changes in inequality between 1980 and 2000 show a positive correlation across space. The authors find that intergenerational mobility is higher in less segregated residential areas. The probabilities of staying in the lowest quartile between generations are 47% and 40% in high- and low- segregation metropolitan areas, respectively.

The authors contribute to the literature by introducing a general equilibrium overlapping generation model, providing an intensive measure of segregation caused by the presence of heterogeneity in ability. The model features human capital accumulation and residential choice. Parents care about both their consumption and their children's future wage. Children's wages depend on an ability shock, education, the neighborhood of their upbringing, and their parents' wages. Local spillover effects result in sorting in equilibrium: children with wealthier parents and higher ability become more educated and live in a neighborhood with higher average human capital.

For numerical analysis, the authors calibrate the steady state of the model to the U.S. economy in 1980 and then perform several counterfactual exercises. Fixing the levels of the spillover at the steady state values, the authors compare the effects of an unexpected, one-time shock to the skill premium on inequality, segregation, and intergenerational mobility, over time, to the benchmark equilibrium. The authors find that the local spillover contributes to 20% and 29% of the increase in inequality in the short and long run, respectively. They also find that the spillover contributes to 18% and 15% of the increase in segregation in the short and long run, and 12% and 18% of the decrease in intergenerational mobility in the short and long run. The authors show that the higher rental price of housing in the neighborhood with higher local spillover accounts for 30% of the increase in the relative spillover.

A participant asked about the precise channel of a local spillover. The author answered that they did not specify it, but that there could be a variety of mechanisms. An audience member questioned whether more spending on the rental costs of housing would lead to lower investment in children's education, and another asked whether changes in wage would dominate changes in ability. The author replied that all they know is the realized local spillover as a whole.

Skill-Biased Technical Change and Regional Convergence

Elisa Giannone

The author documents that at the regional level, between 1940 and 1980, wages in poorer U.S. cities grew faster than wages in richer cities by 1.4 percentage points a year. This wage convergence ended in 1980, and from 1980 to 2010 wages grew at similar rates in cities of different income levels. Specifically, after 1990, the correlation between college ratio and skill premium is positive across cities.

The paper links regional wage convergence and national demand for skills. Specifically, the author finds that wage convergence ceased only among high-skill workers, while wage convergence rates for low-skill workers did not decline at all. This finding is consistent with demand shocks like Skill-Biased Technical Change (SBTC) that favor high-skill workers.

The paper quantifies the contribution of SBTC to the end of cross-city wage convergence within the U.S. in the last 30 years. The author develops and estimates a dynamic spatial equilibrium model that analyzes the causes of regional wage convergence and divergence. The model is motivated by novel empirical regularities regarding the evolution of the skill premium and by migration patterns by skill over time and across space in the last 70 years.

The author finds that the model successfully matches the trends in wages among high-skill workers, as well as the increase in spatial wage dispersion. Moreover, the model also reproduces features of the data on quantities such as the evolution of the skill ratio in the last 70 years. Finally, the counterfactual analysis suggests that SBTC explains the vast majority (approximately 80%) of the decline of regional convergence between 1980 and 2010.

The interactions of SBTC and agglomeration economies imply that more educated locations have larger skill premium. High- and low-skill workers have some degree of complementarity, so agglomeration effects raise the wages of all the workers. The differential increase in the wages of high-skill workers makes the migration patterns for high- and low-skill workers diverge: high-skill workers migrate to educated cities more than do low-skill workers. Migration has a twofold effect. First, the more workers migrate to a location, the marginal productivity of each will decrease, and hence, the returns will decrease. Second, when more high-skill workers move to a location, productivity goes up because of agglomeration effects, raising the wages of all the workers, but especially the wages of the high-skill workers.

One audience member asked whether some of the changes after 1980 are driven by the baby boom generation entering the labor force, and bringing with them higher human capital. The author notes that the shift in the trend is persistent and unlikely to be caused by a one-time shock. Another audience member suggested that it could be that several cities drive the skill-biased technical change and then spread the change to other places, as opposed to a national aggregate shock. The author noted that it would be interesting to explore the idea, which would potentially amplify the effect.

Trickle-down Housing Economics

Charles Nathanson

Conventional economic thought suggests increasing the housing supply as the most efficient way to curb rising housing costs. Many in the policy sphere criticize this solution as too simple, citing the fact that most new development is luxury housing and unlikely to drive down prices for lower-income residents. This paper examines the effectiveness of luxury development in stemming out-migration of lower-income, uneducated households from expensive urban areas.

The paper uses a static model featuring a system of cities, each populated by price-taking rentiers. Housing units in each city vary by quality, with an exogenous city supply of housing and endogenous city-specific housing prices. Households can be one of two education types: high or low. They also differ in labor endowment and have idiosyncratic city preferences. The paper focuses on outcomes from new construction in two theoretical cases – a system of cities with zero potential out-migration and perfectly divisible housing and a system of cities with the potential for out-migration and indivisible housing.

When housing units are perfectly divisible, households can pick and choose different units with varying qualities, and in equilibrium prices are determined by the total quality of housing in the city. In the indivisible case, households can pick only one unit of housing, and in equilibrium housing prices are determined by income-based sorting. A change of one unit of additional housing then impacts overall welfare through several channels: migration responses, changes in wages, changes in amenities, and changes in housing prices.

The author measures these changes for the Boston metro area in 2016 using microdata from the American Community Survey on education, income, home value, monthly rent, and construction year. The author conducts two construction experiments: building new housing at the 20th percentile, corresponding to a monthly rent of $1,000, and building new housing at the 80th percentile, corresponding to a monthly rent of $3,500. Each of the experiments changes the housing stock by 0.45%.

The paper establishes that for a city with no potential out-migration and with perfectly divisible housing units, building solely luxury development is optimal in increasing welfare for both rich and poor. However, in a city with indivisible housing and the potential for out-migration, luxury development is only half as effective as low-quality construction. Low-quality construction also makes high-income, high-education residents worse off in the open city model, due to decreases in

amenity levels.

The author ended the presentation with a discussion over what would constitute "optimal" construction in Boston's case. The author states that Boston could end welfare losses with 1.4% growth in the stock of housing, consisting of a higher proportion of low-quality units than what was actually built.

One question from the audience was whether it is feasible in Boston for developers to build at the 20th percentile, given construction and permitting costs. One suggestion for an extension regarding this inquiry was to compare how much subsidy is needed for 20th percentile housing to take place, and how much profit is made with 80th percentile housing. The idea would be to create a lump-sum transfer that would amplify the welfare gains of lower income people from development.

The Returns to Ability and Experience in High School Labor Markets: Revisiting Evidence on Employer Learning and Statistical Discrimination

Xizi Li and **Stephen L. Ross**

This paper uses the National Longitudinal Survey of Youth (NLSY79) to examine the relationship between ability and wages over time for low-education workers. More specifically, this paper extends the models of Altonji and Pierret (2001) and Arcidiacono, Bayer, Hizmo (2010) to include both ability, as measured by the Armed Forces Qualification Test (AFQT), and square of ability.

Their findings suggest that wages increase with AFQT score for low-ability workers but decline with AFQT score for high-ability workers, or workers with above-average test scores. However, as these high-ability workers get older and gain experience, the negative effect of the AFQT score for above average test scores diminishes, and a positive, monotonic relationship eventually develops. These results are consistent across the available waves of the NLSY79 data, as well as data from the NLSY 1997.

The authors conjecture that these results are evidence that high-skill workers who do not attend college accept lower-paying jobs initially in order to build skills over time. These high-ability workers eventually earn a premium for their ability after 5-10 years of experience, depending on the model. The authors support this hypothesis by showing that these non-college, high-skill workers are more likely to select initial occupations that provide training.

A recurring question from the audience touched on the profiles of these high-ability, non-college-educated workers. Why did these individuals not attend school? The presenter conjectured that these workers can be thought of as "lemons," or individuals that performed poorly or shirked schoolwork in high school but matured over time. Others asked about various aspects of AFQT scores, including whether it had a cultural bias, and if these scores were ever shared with potential employers.

The authors provide several robustness checks to their results. First, they control for an additional measure of non-cognitive ability, as well as sibling wage. Second, the authors estimate the models separately by race. They find that the nonlinear relationship is very robust for the white subsample, while the squared term is smaller and statistically insignificant for the black subsample.

If high-skill workers choose lower-paying jobs initially in order to build skills, do they switch occupations over time in a way that grants them higher wages? The authors find that as AFQT rises, people with more experience change occupations more. The presenter admitted that the authors had not calculated the skill requirements of the occupations that these high-skill workers eventually move to. Doing so could further validate the idea that high-skill workers initially accept jobs that offer training opportunities.

Houses and Families across Countries

Alessandra Peter, Monika Piazzesi, and **Martin Schneider**

The author presents a model of household formation, savings, and housing. This model builds on a standard model of tenure choice, low productivity of renting, and a collateral constraint. In the model, cohabitation is viewed as an informal rental and credit market. Using data from the Household Finance and Consumption Survey (HFSCS), a survey of information on the assets, liabilities, income, and consumption of European households, the authors identify two forces for higher home ownership across countries: weaker rental markets and stronger credit markets.

Presenting evidence from the HFCS data, the author shows that across European countries there is significant heterogeneity in the number of adults living with parents, as well as in the ages of the adults living with parents. A conference participant asked whether a couple with five kids living at home is counted in the data the same way as a couple with one kid living at home. The presenter responded, yes: the data is simply a percent of households with children living with parents. Regressing expenditure share on household characteristics, the author shows that single households spend a significantly higher share of total expenditures on rent, across countries and age groups. We also see that log savings and income do not have a significant relationship with rental share of expenditures.

To evaluate the results found in the regressions, the authors develop a model of household formation. The model consists of three periods of life: young, middle, and old. Young people have middle-aged parents. Individual income is low when young, high in middle age, and zero in old age. The agent type captures the anticipated evolution of life, including whether an individual is single or in a couple, whether an individual is a parent, along with income and parents' incomes. A conference participant commented that the data seemed to suggest that there are actually four periods: young, middle without children, middle with children, and old. The presenter replied that this would be an interesting addition to the model, but that they were trying to keep the model as simple as possible. In the model, an individual can choose whether to own or rent and whether to cohabitate if the individual is single and young. There are competitive credit, housing, and rental markets. A conference participant asked whether markets clear in terms of prices or in terms of quantities. The presenter replied that people take the price of houses as given. Single young individuals make a take-it-or-leave-it offer to parents for joint choices of consumption, housing, tenure, and savings.

The model shows that, within country, couples own more than singles, and owners save more than renters. It also shows that the young and poor rent or live with parents, young couples own more than singles, and cohabitation households save less than old couples without children. Across countries, the model shows that in countries with weaker rental markets, owners save more and cohabitate more, and in countries with stronger credit there is less savings by owners and less cohabitation. As examples of the forces at play in the model, in Italy there is high cohabitation, consistent with bad rental markets, and in Finland there is low cohabitation, consistent with good credit markets. The author concludes that this model can help explain the differences in home ownership rates across European countries.

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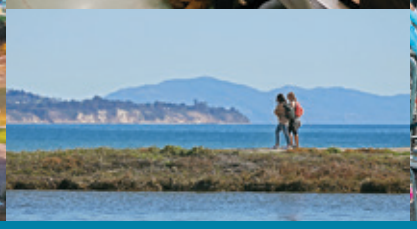

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