

Associate Director's Message

Peter Rupert



Before describing the contents of this issue, let me say that we are very pleased to have established relationships with the Tepper School of Business at Carnegie Mellon University and the Southwest Search and Matching Group. These relationships allow us to have ongoing agendas as they will meet regularly throughout the years to come. The conferences we have with the Tepper School of Business are largely based on topics in Macro-Finance. The next meeting will be held at the Upham Hotel in Santa Barbara, September 14-15. The next meeting of the Southwest Search and Matching Group will be held at UCLA on November 10th as it rotates across several schools.

This issue is devoted to describing two conferences that were organized through LAEF, the second conference on health care policy, titled "Health and Mortality" and the third meeting of the Southwest Search and Matching Group.

Given the importance of health care policy in the United States, **Eric French** (Federal Reserve Bank of Chicago), **Gary Hansen** (UCLA), and **Victor Ríos-Rull** (University of Minnesota) organized the agenda that was presented at the Upham Hotel on March 9-10. The goal of the conference was to bring together macroeconomists developing dynamic general equilibrium models that can be used to evaluate health related government policies with those doing descriptive empirical work so that both groups can learn from each other.

The second conference summarized in this newsletter was the third meeting of the Southwest Search and Matching Group, held at the Upham Hotel on March 17, 2012. The group explores many issues that incorporate markets with frictions. The conference series started in 2011 to bring together the growing number of those examining markets with frictions. The Southwest Search and Matching Group is a collaboration of UC Irvine, UC Santa Barbara, UCLA, UC Davis, UC San Diego, and UC Santa Cruz. These are short, one-day meetings with four or five papers presented during the day. The initial meeting of the group was held at UC Irvine in April of 2011. The second meeting was held at UC Santa Cruz in October, 2011. The third meeting was at UC Santa Barbara this past March and was organized by **Guillaume Rocheteau** (UC Irvine) and me. The Southwest Search and Matching Conference meets several times per year. The purpose of the group is to discuss recent work to better understand markets with frictions, providing a unique opportunity for graduate students and newer PhDs to present their work while at the developmental stage. The recent advances in exploring markets with frictions have enabled us to get a better understanding of developments not only in labor markets, but also in housing and financial asset markets.

*The third of our three March 2012 conferences will be summarized in the next issue of **From the Lab**. The "Old and New Ideas about Fiscal Policy" conference was organized by **Daniel Carroll**, Federal Reserve Bank of Cleveland, and **Eric Young**, University of Virginia.*

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Health and Mortality

MARCH 9-10, 2012

VISITING CONFERENCE PARTICIPANTS

R. Anton Braun – *Federal Reserve Bank of Atlanta*

Raquel Fonseca – *RAND Corporation*

Eric French – *Federal Reserve Bank of Chicago*

Gary Hansen – *University of California, Los Angeles*

Minchung Hsu – *Graduate Institute for Policy Studies, Japan*

Karen Kopecky – *Federal Reserve Bank of Atlanta*

Junsang Lee – *Korean Development Institute*

Pierre-Carl Michaud – *RAND Corporation*

Serdar Ozcan – *Federal Reserve Board of Governors*

Svetlana Paschenko – *Uppsala University, Sweden*

Adrian Peralta-Alva – *Federal Reserve Bank of St. Louis*

Josep Pijoan-Mas – *CEMFI, Spain*

Seth Richards-Shubik – *Carnegie Mellon University*

José-Victor Ríos-Rull – *University of Minnesota*

Raul Santaaulàlia-Llopis – *Washington University, St. Louis*

Manuel Santos – *University of Miami*

Ananth Seshadri – *University of Wisconsin, Madison*

Hitoshi Tsujiyama – *University of Minnesota*

Guillaume Vandenbroucke – *University of Southern California*

Motohiro Yogo – *Federal Reserve Bank of Minneapolis*



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The Joint Effects of Social Security and Medicaid on Incentives and Welfare

by Karen Kopecky, R. Anton Braun and Tatyana Koreshkova

Social Security and Medicaid are major insurance programs in the United States, and potentially have large effects on household decisions and welfare over the life cycle. Further, as Kopecky and her co-authors argue, it may be important to think about the interaction of the effects of these programs. Medicaid is designed to insure households against medical expenditure risk. Social Security also provides insurance against these risks, as individuals can use Social Security transfers to pay for medical expenses.

Kopecky and her co-authors study the effects of the Social Security and Medicaid programs using a general equilibrium life-cycle model of household savings and consumption over the life cycle. The model features a good deal of heterogeneity.

Households in the model vary across earnings, health status, marital status, life span, and other parameters. One standard result which holds in the authors' model is that individuals in the model prefer to live in a world without Social Security. One interesting result is that the elimination of Social Security has an important effect on Medicaid. In a world without Social Security, households are much more reliant on the insurance provided by Medicaid.

Households in the model strongly prefer to live in a world with Medicaid. This result is driven by the fact that Medicaid insures households from the very worst shocks. Since households can only insure against medical expenditure risk using a single asset, rather than by using a set of health-contingent assets, households must either forgo large amounts of consumption while young or face substantial risk of very little consumption following a large medical expenditure shock. This result is amplified in a world in which neither Medicaid nor Social Security exists. Of the experiments Kopecky and her co-authors perform, households are worse off in a world with neither Medicaid nor Social Security. One critique of the study is that the authors' results do not provide an accurate estimate of the welfare effect of the policy changes they examine. This is because Kopecky and her co-authors study the effects of these programs on steady state welfare, and therefore do not capture changes in welfare associated with transitions between policy regimes. Kopecky and her co-authors agree, and hope to complete this exercise in order to better understand the effects of Social Security and Medicaid.

Income Inequality and Health Care Expenditures over the Life Cycle

by Serdar Ozcan

Ozcan's study is motivated by the changing relationship between the medical expenditures of the rich and the poor over the life cycle. Early in life, high-income individuals receive more medical care than the poor. Later in life, high- and low-income individuals receive similar amounts of medical care. Further, high-income individuals are much more likely to use preventive medical care than their low-income counterparts. Ozcan argues that differences in health care utilization across income groups for young individuals are likely driven by differences in the use of preventive health care. These differences in preventive care, in turn, may be responsible for differences in life expectancy across high- and low-income individuals. Policy that encourages preventive care for young low-income individuals, then, can have a large effect on mortality.

Ozcan studies this issue using a general equilibrium model in which individuals have two types of health capital: curative and preventive. Curative health capital affects your survival rate today and in the future, and preventive health capital affects your survival rate in the future. One important assumption about both types of health capital in this model is that once health capital is lost, it cannot be recovered. If an individual forgoes preventive health care today, the individual cannot make up for this by purchasing a great deal of preventive health care tomorrow. One conference participant suggested that Ozcan's assumption that health capital investments are irreversible may be important to his results and inconsistent with reality. One suggested way to determine the validity of this assumption is to look at the behavior of people following increases in income. It may be the case, for example, that individuals who move to jobs with higher salaries try to recover lost preventive health capital by utilizing preventive health care.

Ozcan calibrates the model using data on medical expenditures and health insurance from the *Medical Expenditure Panel Survey*. He uses the calibrated model to evaluate two potential policy changes. In his first policy experiment, he simulates the effect of a move toward universal health coverage on longevity and welfare. His second policy experiment simulates the effect of a policy that subsidizes preventive health care. The policy experiments Ozcan simulates lead to substantial welfare increases. The effects of these policies are most pronounced on those individuals in the first and second income quintiles. As a result of policy reform, those people in the first and second income quintiles increase purchases of preventive medical care and live longer lives as a result, without substantially reducing consumption in each period of life. One limitation of these results is that the labor income tax used to finance the policy changes is not distortionary. As a result, Ozcan's results may exaggerate the welfare increases associated with reform.

Health and Welfare in a Life-Cycle Model

by John Carl Scholz and Ananth Seshadri

Scholz and Seshadri analyze the decisions households make regarding consumption and health investment to account for the distribution of medical expenses across households over the life cycle. They ask how Medicare affects wealth and mortality when households are able to modify behavior in response to program incentives. Agents invest in their health, which increases their survival probability, and also provides them with utility. Time is split between work, health investment and leisure. For a household to maintain health, both time and money must be invested. Exogenous earnings and health expenditure shocks induce precautionary savings and health investment. There is a tradeoff between current consumption and future utility from health: the poor may choose a higher standard of living, but a shorter life. In practice, this could correspond to eating fast food and working extra hours instead of going to the gym and cooking meals at home.

Endogenous survival probability and time spent in health investment increases monotonically in income in the model, consistent with empirical regularities. Median net worth across income groups is lower in the model than in the data, while medical expenses are higher in the model than in the data. However, the correlations between the optimal quantities predicted in the model and the data are high, for both net worth and medical expenses. The authors use the model to investigate the effects of removing Medicare. The short-term effects of the removal of Medicare on survival probabilities are negligible, because households have already accumulated assets and health capital with the expectation of Medicare. In the long run, the repeal of Medicare has significant effects, especially for low earners. These households anticipate poor health in retirement due to the inability to invest a lot in health capital. They choose higher consumption earlier in life, and invest less in health, choosing quality of life over length of life. Higher income households self-insure: they save and invest in health.

At the conclusion of the author's presentation, a question arose over the specification of the health production function. Does it work? A conference participant speculated that a Cobb-Douglas functional form might predict that very high earners invest very little time, and instead spend a lot. Sheshadri explained that it depends on the constant in the health production function. This constant varies by marriage/education type. A follow-up question arose: how closely does the ratio of time spent on health investment to the dollar amount spent on health investment match the data? Sheshadri explained that he

and his co-authors are not using time-use data, so they could not make the comparison. Another conference participant wondered how much health expenditures could buy a model agent in terms of longevity. Sheshadri responded that the calibration strategy was to calibrate to the median person, and see what the model could say about everyone. Understanding the marginal extension of life expectancy per dollar spent out-of-pocket is for future research.

A Quantitative Theory of HIV Diffusion

by Rody Manuelli and Santaèulàlia-Llopis

Manuelli and Santaèulàlia-Llopis develop a search model to account for the diffusion of HIV in Africa over time. While some models predict that population loss might improve living standards for survivors, the HIV/AIDS epidemic targets the most productive members of society, inflicting both humanitarian and economic costs. Understanding sexual behavior can help direct both treatment and prevention-oriented policy. The authors allow for endogenous sexual choices to determine who is engaging in risky behavior, and how often. They ask if income heterogeneity accounts for differences in the evolution of the epidemic across regions. The model finds that countries with better matching technologies (roads, trains, bars, etc.) will have higher aggregate HIV prevalence. Since these amenities are more prevalent in richer countries, this might explain the higher infection rates in richer Sub-Saharan African regions.

Agents in the model are heterogeneous with respect to their gender, health status (infected or not), marital status, and utility from sexual contact. All of these characteristics are observable to all agents. Singles find partners at random. A partner could be healthy or infected, so the agent may choose to mate, or to continue searching for a suitable partner. Time until a match depends on the number of single males and single females searching. Healthy agents who choose to couple with infected agents become infected at a gender-specific rate, as females become infected faster than men on average. There is also a gender-specific cost of searching for a partner. The heterogeneity in utility from sex generates two types of healthy agents: those who will partner with any other agent, healthy or infected, and those who will wait longer to pair only with healthy agents. Once matched, the couple will enjoy sexual activities until the partnership ends exogenously, or one of the agents dies. Infected agents die at a faster rate than healthy agents.

The calibrated model is used to explore policy. For example, how does dissemination change when antiretroviral drugs are introduced? The drugs increase the life expectancy of the infected, allowing them to infect more healthy individuals. HIV prevalence and the rate of new infections increases. A preventative policy encouraging condom use was considered. Condom use would reduce the amount of infections per sexual act, but there is a change in sexual behavior. The number of healthy agents who choose to have sex with infected agents increases, so the infection rate does not decrease as much as one might expect.

A conference participant asked if the model took into account migration between countries. There was speculation that high immigration of the young across countries accounts for a lot of the HIV diffusion across Sub-Saharan Africa. Another participant wondered what characteristics define a country in the model. Santaèulàlia-Llopis explained that the model did not take migration into account. The data suggest that the most important factor for HIV infection is the number of

sexual partners. A country in the model is defined by infection rates and other parameters. Discussion arose also over the information structure. Does a person really know right away that he/she is infected? If it takes time to discover infection, an infected agent might behave as a healthy agent. Santaeuàlia-Llopis agreed that timing is important, but the data suggest that people know fairly well whether or not they are infected.

Healthy Life Expectancy: Estimates and Implications for Retirement Age Policy

by David M. Cutler, Ellen Meara and Seth Richards-Shubik

People are living longer, putting strains on Social Security and Medicare programs. Cutler, Meara and Richards-Shubik analyze the implications of increasing the early and normal retirement age for both Social Security payments and Medicare. In practice, the share of labor force participants declines dramatically after age 60. However, the data show little change in health until age 70. If self-reported health condition is a good indication of work capacity, it may be the case that delaying retirement benefits could delay retirement without too many negative welfare implications. However, different demographic groups enter retirement with different health statuses and life expectancies on average. Considering the impact of the policy by sex, education, marital status, geography, and ethnicity group will be important for the welfare analysis. The authors find that some groups, namely the less educated, will be relatively worse off under the new retirement age. However, they also find that even among the groups with the highest disability rates, there is a tremendous potential for working.

The authors consider behavioral trends as a possible cause of mortality differences across groups. To isolate behavioral effects, the authors looked at both the change in the distribution of risk factors and the change in the relative mortality of these risk factors. One might think of separating changes in behavior from changes in technology. Advances in medical treatments, rather than behavior, were found to be responsible for mortality changes. There is a stark correlation between smoking and education, but smoking habits do not account for mortality differences across groups. A conference participant wondered if the way to interpret this result is not that smoking does not explain mortality differences, but that there has not been enough change in smoking behavior over time for comparison. Richards-Shubik agreed: there has not been enough change in smoking behavior weighted by how much smoking affects mortality.

To correctly estimate length of retirement, mortality rates are not enough. The authors consider also how much of the population would be able to work until older age. They use health status reports to back out work capacity for 65 to 69 year-olds. Health status is not a very good predictor for retirement, suggesting that policy rather than health issues may be inducing the traditional retirement age of 62. A conference participant inquired if this might mean that self-reported health status is not a good measure of work capacity. Richards-Shubik responded that he and his co-authors considered objective health measures as well, and found similar results. They found that risk of disability for individuals with any college education is less than half of the risk for those with high school education or less. The number of less educated white males who would be disabled under the simulated policy increases substantially – about 40 percent. Based on health status, labor force participation rates would rise by 15 to 23 percentage points for whites depending on gender and education, and by

5 to 20 percentage points for blacks and Hispanics in the low-education groups. The exception to the pattern of increased labor force participation is for less educated black males, who do not show a significant change. The proportional loss of retirement years is greater for low education groups because they have lower life expectancy. For this reason, an increase in the normal retirement age would reduce the progressivity of the Social Security system.

On the Rise of Health Spending and Longevity

by Raquel Fonseca, Titus Galama, Arie Kapetyn, and Pierre-Carl Michaud

Michaud and his co-authors are motivated by two important trends in the United States. First, medical expenditures have risen dramatically over time as a share of national income, from five percent in 1960 to over 15 percent today. Second, life expectancy has risen from 70 years to over 78 years over the same time period. Common explanations for these phenomena in the literature are changes in technology, health insurance and income. Michaud and his co-authors argue that existing studies largely collect estimates of the effect of one variable, such as income, on medical expenditures or life expectancy one at a time, and add up the effects of various changes to determine the effect of observed changes on observed medical expenditures and life expectancy. The unexplained changes, then, are attributed to unmeasured technological change. The authors argue that this approach implicitly ignores composition effects which could potentially be very important. For example, increases in income may amplify the effect of technological change on medical expenditures or life expectancy.

Michaud and his co-authors study the rise in medical expenditures and longevity using a dynamic stochastic general equilibrium model of the medical decision over the life cycle. The model incorporates the factors driving medical expenditures and life expectancy that are stressed in the literature. In this model, medical expenditures affect health status, which in turn affects earnings, mortality, and contemporaneous utility. The model is calibrated to be consistent with observations of medical expenditures and mortality rates in the *Medical Expenditure Panel Survey*, as well as estimates of price and income elasticities of medical expenditures obtained from existing studies. One conference participant commented that the model used in this study is very rich, and the authors do not use the richness in the data to restrict model parameters. The participant noted that the authors should model things which are capable of delivering relevant information, and that estimates of the income elasticity of medical expenditures likely contain little relevant information.

Michaud and his co-authors find that the key drivers of changes in medical expenditures are changes in health insurance and medical technology, while income changes on their own explain less than 10 percent of the observed medical expenditure increase. The interaction between income, technology, and insurance changes is also important, explaining almost 40 percent of the observed medical expenditure rise. Improvements in medical technology, on their own, also explain more than half of the observed rise in life expectancy at age 50 over this time period. Changes in insurance and income, however, explain less than 10 percent of the observed rise in life expectancy. One interesting implication is that changes in health insurance have had a sizable effect on medical expenditures, but a small effect on life expectancy.

Health and Heterogeneity

by Josep Pijoan-Mas (CEMFI, Spain) and José-Victor Ríos-Rull (University of Minnesota)

Pijoan-Mas and Ríos-Rull study variation in life expectancy across socioeconomic status (hereafter SES). Many existing studies show that there is important variation in mortality rates across various SES groups. When aggregated, these variations generate large differences in life expectancy across SES groups. One problem with existing studies, however, is that when making their calculations, they implicitly assume SES does not change. For some characteristics, such as wealth and marital status, this is inappropriate. Pijoan-Mas and Ríos-Rull use data on SES status, health and mortality for individuals 50 and older from the Health and Retirement Study on how SES characteristics change over life and how mortality depends on SES characteristics in order to paint a more accurate picture of variation in life expectancy across SES groups.

Using this information, Pijoan-Mas and Ríos-Rull measure life expectancy at age 50 for various SES groups, and document that there is large variation in life expectancy across SES groups. For example, individuals with college degrees have 5.8 more years of life expectancy than do high school dropouts. As the authors show, it is important to take movements in SES after age 50 into account when calculating life expectancy. Assuming that wealth quintile does not vary after age 50, for example, leads to an overestimation of life expectancy differences across the top and bottom wealth quintiles by about seven years. One conference participant was concerned that Pijoan-Mas and Ríos-Rull attribute variation in life expectancy to differences in SES characteristics. The authors' goal, as was clarified, is to describe variation in life expectancy across SES and use a model to understand the mechanisms driving the observed variation.

Pijoan-Mas and Ríos-Rull also decompose variation in life expectancy across SES groups at age 50 into variation in health at age 50, variation in the evolution of SES after age 50, and variation in mortality differences unrelated to measured health status. One interesting result is that one-third of the variation in life expectancy at age 50 across education groups is generated by differences in health at age 50, and the remaining two-thirds is generated by differences in health status transition probabilities across education groups. People who graduate from college live longer because they are healthier at age 50, and are more likely to remain healthy as they age. Conditional on health status, however, there is no difference in mortality rates across education groups. The authors hope to better understand the mechanisms driving these phenomena using a model of human capital accumulation in future work.

Quantitative Analysis of Health Insurance Reform: Separating Community Rating from Income Redistribution

by Svetlana Paschenko (Uppsala University) and Ponpoje Porapakkarm (University of Macau)

Paschenko and Porapakkarm study the recently passed Affordable Health Care for America Act. In particular, they are interested in the impact of this reform on the number of individuals without health insurance – the focus of the bill – and on overall welfare. There are two important characteristics of uninsured individuals. Typically, they have low income, and only have access to health insurance through the individual market because it is not offered by their employer. The recently passed bill affects this population by reforming the individual health

insurance market, transferring resources from the healthy to the sick, and through income redistribution, transferring resources from the rich to the poor.

Paschenko and Porapakkarm evaluate the policy change using a dynamic stochastic general equilibrium model of the health insurance decision with heterogeneous agents and medical expenditure shocks. Working age individuals in the model have access to health insurance through their employers if their employers offer employer-sponsored health insurance, through Medicaid if they have high medical expenses or very low income, and through the individual health insurance market. Reform affects this decision by subsidizing premiums in the individual market, forcing insurers to offer community-rated plans, increasing the income threshold for Medicaid eligibility, and fining individuals who do not have health insurance. One conference participant noted that it is important to think carefully about the health shocks that drive medical expenditures and health insurance decisions. If medical expenditures are endogenous, this may have an important impact on the health insurance decision, and therefore on the consequences of reform.

The main result of the authors' study is that the recently passed reform achieves the stated goal of reducing the number of uninsured individuals while substantially increasing welfare. The authors find that policy reform will cut the share of uninsured individuals in half, to less than nine percent. This reduction is driven by an increase in individuals insured in the individual market. Policy also has a substantial effect on welfare. The increase in insured is concentrated among low education individuals, and high education individuals benefit as well. One interesting result is that the welfare improvement is driven by redistributive aspects of reform rather than changes to the individual health insurance market. Reform to the individual health insurance market achieves the stated policy objective of reducing the number of uninsured individuals, but does not substantially affect welfare.

Medicaid Insurance in Old Age

by Mariacristina DeNardi, Eric French and John Bailey Jones

French and his co-authors are motivated by the fact that Medicaid is a huge federal program, with expenditures totaling \$380 billion per year, \$80 billion of which is dedicated to individuals 65 and older. Further, Medicaid finances nursing home care for 70 percent of nursing home residents. There are two pathways to Medicaid reciprocity – medical need due to large medical expenses, and categorical need due to low income during life. To show the importance of thinking about both pathways to reciprocity, French and his co-authors document Medicaid reciprocity by permanent income and age. As the authors show, Medicaid reciprocity tends to be higher for individuals with lower permanent income. This suggests that categorical need is an important pathway to Medicaid. As a result, it should be incorporated into models studying policy reforms related to Medicaid, something which most existing studies do not do.

French and his co-authors explicitly incorporate both pathways to Medicaid in a model with endogenous medical expenditures in order to understand the effect of potential policy reforms on allocations and welfare. In the model, medical expenditures affect contemporaneous utility, but not lifespan. Variation in medical expenditure is driven by shocks to the weight individuals place on utility from medical expenditures. This assumption is in contrast to other papers presented at the

conference, where medical expenditures affect mortality or are completely exogenous.

French and his co-authors consider a model with medical need as the only pathway to Medicaid reciprocity to illustrate the importance of both pathways in studying Medicaid. They estimate this model to match information on medical expenditures and assets for single individuals using data from the Health and Retirement Study. They show that the model does a good job matching asset profiles. The model does a poor job, however, of matching Medicaid reciprocity. The authors conjecture that excluding categorical need as a pathway to Medicaid reciprocity is the reason for this deficiency of the model. If this is true, it is important to carefully model both pathways to Medicaid reciprocity in order to understand phenomena observed in the data, and therefore to understand the effects of policy reforms. The authors plan to incorporate both pathways to Medicaid in future work.

One conference participant suggested that it is possible to match Medicaid reciprocity data in a model with medical need as the only pathway to Medicaid reciprocity. There are many important differences in the model cited by the conference participant, such as exogenous rather than endogenous medical expenditures. It is not clear which model is more appropriate to study the effects of Medicaid.

Health Insurance Reform: The Impact of a Medicare Buy-In

by Gary D. Hansen, Minchung Hsu and Junsang Lee

There are a large number of uninsured individuals in the United States, a fact which has prompted policy intervention in the form of the controversial health care reform bill recently passed by Congress. Hsu and his co-authors attempt to understand the consequences of reform, and of milder versions of reform, on the number of uninsured individuals and on welfare. They consider alternative policy reforms which allow individuals to buy in to Medicare early starting at age 55. In order to effectively implement this policy, premiums for these plans must be subsidized due to adverse selection problems.

To determine the consequences of various policy reforms, Hsu and his co-authors construct a life-cycle general equilibrium model of the health insurance decision. Individuals live for 80 time periods, and can have one of two health statuses, which affects current and future medical expenditures. The authors calibrate the model using data from the Medical Expenditure Panel Survey, and they use the calibrated model to evaluate various policy reforms. In particular, they study the effects of policy with and without age-dependent premiums, and for a variety of levels of the health insurance premium subsidy. Their main result is that allowing individuals to buy in to Medicare at age 55, while providing a 30 percent subsidy on premiums, results in a large reduction in the number of 55-64 year-olds who are uninsured, from 30 percent to five percent, with minimal welfare loss. The young are adversely affected by policy, while older individuals benefit. A smaller subsidy of 20 percent will lead to a much smaller reduction in the number of uninsured individuals. However, an alternative policy which allows for early Medicare buy-in with age-dependent premiums requires only a 17 percent subsidy on premiums to generate similar results.

One conference participant noted that it may be better to study the effects of health insurance reform using a model with more health states. In particular, the participant noted that it may be more valuable to include more health states rather

than many age groups. Including more health states would allow for the inclusion of more severe health risks, events for which insurance is very desirable. This may have important implications for the market for health insurance. As a result, a more detailed description of health status in the model may improve our understanding of the effects of policy affecting the health insurance market. The author acknowledged this, and plans to address this in future work.

Health and Mortality Data: Assessing the Welfare Cost of Household Insurance Choice

by Ralph S.J. Koijen, Stijn Van Nieuwerburgh and Motohiro Yogo

There are a large number of assets in which individuals can invest to insure against medical risk, longevity risk, and to provide bequests for others after death, such as health insurance, annuities and life insurance. These asset profiles can be described using the health delta, which summarizes the degree to which individuals insure against poor health, and the mortality delta, which summarizes the degree to which individuals insure against death.

Yogo and his co-authors seek to understand household choices of health and mortality delta using optimal portfolio choice theory. Individuals in the model choose asset profiles to maximize their expected health-contingent lifetime utility stream plus the utility from leaving a bequest. They calibrate their model to be consistent with average asset profile characteristics observed in data from the Health and Retirement Study. Using the calibrated model, the authors calculate the asset profiles consistent with optimal portfolio choice theory. Then, they determine how close observed choices of health and mortality delta are to being optimal. As a result, they are able to determine the magnitude of the welfare losses associated with variation between observed choices and optimal choices, which are generated by market incompleteness and suboptimal portfolio choice.

Yogo and his co-authors present two main results. First, there is huge variation in asset profiles across individuals. Observed demographic characteristics do not explain this variation. Through the lens of their theory, this implies that there is substantial welfare loss associated with suboptimal portfolio choice. They find that the welfare loss for households in their fifties is 28 percent of lifetime wealth. The authors conjecture that this may be because households do not have the information necessary to choose their portfolios optimally, and those firms selling assets that insure against health and longevity risk should precisely advertise the characteristics of the assets. One conference participant suggested that the authors may be misinterpreting their results. An alternative interpretation of the authors' results is that their model is simply misspecified, and variation in portfolio decisions relative to model predictions is simply generated by phenomena not captured by the model. Yogo agreed that this may be the case.

2012 Southwest Search and Matching

MARCH 17, 2012

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Murat Tasci – *Federal Reserve Bank of Cleveland*

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Pierre-Olivier Weill – *University of California, Los Angeles*

Cathy Zhang – *University of California, Irvine*



Summaries of each of the presentations follow.
Note: speakers are highlighted in author listings.

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Search Frictions and the Labor Wedge

by *Andres Pescatori and Murat Tasci*

Business cycle accounting exercises using the prototypical real business cycle model result in a labor wedge (the proportional gap between the marginal product of labor and the marginal rate of substitution) that is highly variable and pro-cyclical. Chari, Kehoe and McGratten (2007) show that this wedge accounts for a significant proportion of the fluctuations in output at business cycle frequencies. The existence of a wedge in any optimality condition hints towards a misspecification of the model; in this case, a misspecification of the RBC model in relation to the labor market. Of course, every model is intentionally stylized and does not include many of the frictions that exist in the labor market. However, it is still important to understand in which ways the real business cycle model fails. In this vein, Pescatori and Tasci ask to what extent, quantitatively, can search frictions in the style of Mortensen and Pissarides (1994) account for both the size and movements in the labor wedge at business cycle frequencies.

The authors begin with a standard real business cycle model, as in Chari, Kehoe and McGratten (2007). In the baseline setup, without search frictions, households and firms participate in perfectly competitive factor and goods markets. Households choose consumption, savings and hours worked to maximize expected lifetime utility. There is no involuntary unemployment as the labor market perfectly clears. Wedges in the model are equivalent to a tax. The authors incorporate a tax on both investment and labor earnings, where all tax revenue is redistributed to households on a lump-sum basis. The standard equilibrium result holds that the household's marginal rate of substitution between consumption and leisure be equated to the firm's marginal product multiplied by the labor wedge.

Search frictions are then added to the labor market in the style of Andolfatto (1996) and Merz (1995). This introduces both an extensive as well as an intensive margin for labor. Without search frictions, since there is no unemployment, total hours are equated to total employment. The inclusion of these two margins serves as an influence on the measured

labor wedge. Households can now be in two states of the labor market, employed or unemployed, but continue to participate in perfectly competitive capital markets offering complete insurance. Search is random and search frictions are dictated by a standard Cobb-Douglas aggregate matching function whose arguments include job vacancies and effective search effort of the representative household. Upon matching, wages and hours worked are jointly determined through Nash bargaining. As a result of this particular bargaining setup, the equation that determines the relationship between the equilibrium level of the marginal rate of substitution and marginal product of labor (and therefore the labor wedge) does not explicitly include any particular terms related to search frictions. The reason is that all the terms that involve search frictions arise additively and symmetrically in the bargaining solution and therefore cancel each other out in equilibrium. Nash bargaining internalizes search frictions through wages. A view of the bargaining process is that hours are first chosen to maximize the joint surplus, and then wages are determined as a way to split the surplus. The choice of hours, therefore, does not relate to inherent search frictions. A conference participant commented that it would be instructive to generalize the bargaining solution to any Pareto efficient outcome to see if this result still holds.

The labor wedge in the prototypical RBC model differs from the labor wedge in a model that includes search frictions primarily with respect to the measurement of the household's marginal rate of substitution. Since there is always full employment in the prototype model, the marginal rate of substitution is measured as a function of total hours. There is no room to differentiate between the extensive and intensive margin of labor. However, the search framework naturally includes this differentiation, and therefore the marginal rate of substitution only relies on hours per worker. This differentiation is important because the business cycle behavior of hours per worker and employment differs. Fluctuations in employment account for a large fraction of the variance of total hours at business cycle frequencies. Removing employment from the marginal rate of substitution removes a substantial amount of its business cycle fluctuation, and therefore naturally improves the behavior of the labor wedge. When calibrated, the RBC model including search frictions reduces the measured labor wedge by approximately 23 percent. This reduction is entirely due to the change in measurement of the marginal rate of substitution. A conference participant suggested that this framework would make it possible to differentiate between two labor wedges, an extensive wedge and an intensive wedge. Tasci agreed, and added that the labor wedge studied in their paper and in the literature is really intra-temporal and so should only include hours per worker. The other wedge is inter-temporal, relating directly to changes in total employment.

Labor Market Frictions, Firm Growth, and International Trade

by *Pablo Fajgelbaum*

Many investment decisions undertaken by firms involve a large fixed-cost component. A paradigm example is the fixed cost associated with entering into international markets. Exporting requires setting up distribution networks, building facilities overseas, etc. As a result, firms need to be large to

profitably cover these costs and engage in exporting. It is well known from the search and matching literature, however, that firms face many frictions in hiring and expanding their workforces. Particularly relevant to international trade patterns are the cross-country differences in labor market regulations. Evidence suggests that firm-level job flows are lower in countries that have more heavily regulated labor markets. These differences have potentially important implications for the differences in firm growth rates and the firm-size distribution between countries which influences trade patterns. In his paper, Fajgelbaum studies how labor market frictions affect trade, income and welfare through their impact on the fixed cost decisions of firms to export.

The theory builds upon the standard model of search frictions and firm growth in the style of Burdett and Mortensen (1998) to include firm dynamics and trade. Firms are born and die continuously. Surviving firms are able to increase employment slowly by randomly matching with both unemployed and employed workers. Upon meeting unemployed workers, firms make take it or leave it offers and collect all of the rent in creating the match. Upon meeting employed workers, firms compete in a Bertrand-style competition developed by Postel-Vinay and Robin (2003) which implies that higher productivity firms have an advantage in hiring employed workers. In equilibrium, firm size is determined by efficient job-to-job transitions.

Finally, firms face the decision of when to export. Exporting requires setting up new, costly technology that increases revenue per worker. Investment is only profitable when the firm is sufficiently large. The timing of this investment depends on a single trade-off that is slightly altered from the traditional one in the literature. Investing earlier increases output per worker and investment saves on the interest value of the fixed cost of exporting but at the expense of lower output per worker. This is the typical tradeoff seen in many models of international trade. Additionally, the increase in output caused by the investment also increases the value of a match in the labor market. This makes a firm that has invested more competitively in poaching workers from other firms to grow faster.

Using a two-country version of the model, Fajgelbaum analyzes the influence of labor market flexibility (as parameterized through unemployment compensation) on export decisions in a general equilibrium. Higher unemployment compensation leads to a reduction in the age of entry into exporting and increases income per worker and the share of employment in exporting firms. If the two countries are asymmetric in their labor market policies, the country that has higher unemployment compensation will have a larger foreign market and more exporters. At the end of the presentation, a conference participant asked if the role of unemployment insurance, which is similar to a hiring cost, would deliver the same results as a firing cost. Fajgelbaum responded that if firing costs entered in the same marginal fashion as unemployment insurance, their influence on the investment decision would be the same by influencing the relative ease of hiring from employment versus unemployment.

Trading Dynamics with Adverse Selection and Search: Market Freeze, Intervention, and Recovery

by Jonathan Chiu & Thorsten V. Koepl

Chui and Koepl are motivated by the behavior of over-the-counter markets (OTC) during the financial crises of 2008. Compared to centralized markets, OTC markets performed much worse during the financial crises, sometimes trade freezing completely, and prompted large-scale government intervention. The authors characterize these markets as having two unique attributes: 1) trade occurring in a decentralized fashion, often taking time and effort to find a suitable trading partner; and 2) non-standard assets being traded which often have uncertain quality. The authors address how freezes can arise in markets with the presence of trading frictions and asset opaqueness and further asks how these markets react to an outside intervention. To answer these questions, the authors develop a model of trade that combines two environments well developed in the literature, random search and asset pricing under private information.

In the model, agents meet randomly to participate in trade. There exist two types of assets: good assets, that pay a positive dividends, and bad assets (lemons) that yield nothing to the investor. The asset's quality is private information to the owner. In equilibrium, owners of lemons will always wish to sell; however, owners of good assets initially choose to hold the assets but are subject to random valuation shocks that induce them to sell. Upon meeting, buyers make take-it-or-leave-it offers to the seller. Since buyers cannot differentiate between the two types of goods, the equilibrium contract must necessarily be pooling. Allowing for mixed strategies, Chui and Koepl characterize three types of steady state equilibria: two in pure strategy in which either trade occurs or does not occur with certainty and an equilibrium in mixed strategy. The existence of trade in steady state fundamentally relies on the buyer's expected surplus. The surplus can be written as the sum of two effects. The first effect depends on the average quality of assets up for trade in the market. This term is backward-looking and depends on the inflow of sellers that have received a low valuation shock as well as other past trading decisions. The second effect is forward-looking and captures the likelihood of being able to resell the asset in the future.

Information Costs and International Currencies

by Cathy Zhang

Why do some countries adopt, whether officially or unofficially, currencies other than their own as a primary medium of exchange? Historically, several countries in Latin America and the former Soviet Union have widely used US dollars in private transactions although the dollar is not classified as legal tender. In fact, around the world the dollar has taken on the role of an international currency. The focus of this paper is to develop a framework to understand the determinants and consequences of international monetary systems and in particular the emergence of international currencies. To do so, Zhang develops an open economy search theoretic model of competing international currencies. The model features two important aspects that influence decisions about which currency to use in transactions: costly information acquisition and government transaction policies. First, information acquisition costs capture those costs incurred by accepting a currency for payment. This

could include the costs of installing new technologies or learning to use new media of exchange. Information costs serve to break a common indeterminacy in monetary models in which multiple assets are acceptable for trade. Secondly, governments have an influential role in determining which currencies are used in practice by adopting policies that favor certain money.

The model consists of two countries in which agents in each country trade locally and internationally in alternating goods markets. Agents are divided exogenously between sellers and buyers, and sellers are further split between private sellers and government sellers. Buyers are mobile and are randomly allocated to home or foreign goods markets. Sellers of either type are immobile and produce a differentiated domestic good. Government sellers face only the decision of how much of the home good to produce and face an exogenous constraint on which currency is deemed acceptable for payment. In the model, this captures the bias of government transactions policies with respect to the home currency. Private sellers similarly face the decision of how much to produce but also make decisions about which currency to accept; home or foreign. These sellers face uncertainty about the future value of both foreign and domestic currency. A currency's acceptability in trade is only established after costly information is acquired. Since no restrictions are placed on private sellers about which currency to accept, the emergence of a dominant currency is completely endogenous.

Zhang studies the existence of currency regimes in a stationary equilibrium in which output is constant over time. Several regimes are possible given the government's policy. For instance, if the government sellers only accept the domestic currency in trade, then equilibrium exists in which private sellers only accept the domestic currency. The result follows because of information costs. If the government sector is large enough, then buyers will choose to hold only domestic currency. As a result, private sellers are only willing to accept the domestic currency (assumed to be less costly to undertake). However, if the government sector is small enough or government policy is willing to accept both currencies as media of exchange, equilibrium arises in which there can exist an internationally accepted currency. At the end of the presentation, a conference participant asked how the model could give any insight on welfare gains from establishing the Euro. The literature has focused on the welfare gains from increased trade volume, however Zhang suggested this model could deliver welfare gains simply by lowering information costs.

The Aggregate Implications of Mergers and Acquisitions

by Joel M. David

Mergers and acquisitions (M&A) account for a large role in the dynamics of firms and industries in the US. The M&A market is large in the aggregate, averaging five percent of GDP annually. Additionally, M&A account for a large percentage of total capital reallocation among US firms. The goal of the author's paper is to assess the aggregate implications of this form of resource reallocation by developing a dynamic general equilibrium model that includes a well-founded model of M&A. Mergers and acquisitions are a way for firms to quickly expand. However, the process of finding and acquiring a target firm is lengthy and involves many frictions. Markets in which

matching is time-consuming and costly are well characterized by search models, and this is the foundation the M&A market is modeled with in this paper.

David first uses a firm-level data set that includes 58,000 M&A transactions from 1977 to 2009 to establish several empirical regularities about the M&A market. First, the majority of mergers involve a purchase price of the target firm well above its current market value, termed the 'merger premium'. This difference can be viewed as the additional surplus generated by the integration of two firms above the additive surpluses of the firms acting independently. In the data, this premium averages 53 percent. Secondly, there exist key differences between acquiring firms and target firms. Acquirers tend to be larger and more profitable than the firms they target. However, target firms aren't necessarily the smallest or least profitable, but generally come from the middle of the firm size distribution. Finally, approximately 66 percent of all M&A transactions involve acquirers that have acquired firms in the past. Repeat acquisitions are common.

Motivated by these regularities, David introduces a dynamic general equilibrium model of merger activity. The model is populated by a continuum of heterogeneous firms that compete monopolistically in differentiated goods markets. Each firm produces a portfolio of goods, hires labor, and has the ability to interact in a merger market in which it can either buy other firms to expand or sell itself. The merger market is characterized by matching frictions. Firms must pay a fixed search cost in order to seek a merger partner. Firms are then randomly assigned to meetings in which they may either be a target or an acquirer. Upon being matched, firms bargain over the size of the joint surplus of merging. If the size of the surplus is large enough, the firms merge. At the conference, discussion arose as to why it was important to ex ante (randomly) dictate which firm was the target and which the acquirer in matching. A participant commented that it would seem to be efficient for the two meeting firms to decide how to most effectively combine resources by endogenously assigning the role of the acquirer and target. David answered that if firms could ex post decide each other's roles, then the model would never be able to generate smaller firms acquiring larger firms, which occurs 15 percent of the time in the data.

Merging implies two events. First, the acquiring firm incorporates the products of the target firm into its production portfolio and hence immediately increases its scale. Secondly, upon merging, the productivity of the acquirer now evolves as a general function of both its pre-merger productivity and the productivity of the target firm. The form of this merger technology plays an important role in determining the gains from merging, and in general, it can be chosen to resemble several cases from the literature including scale efficiencies, Q-theory, symmetry, and super-modularity. However, David shows that each of these theories by itself is not sufficient to match the salient observations from the above data. Instead, he argues that a general Cobb-Douglas form of the merger technology performs the best in matching the data.

To analyze the effect of M&A on aggregate variables, a calibrated version of the model is compared to one in which the merger market is shut down. As a result, mergers increase aggregate productivity by 31 percent, 24 percent of which comes from redistribution of resources to more productive firms. Additionally, aggregate output increases 31 percent corresponding to productivity increases, and consumption increases 13 percent.



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