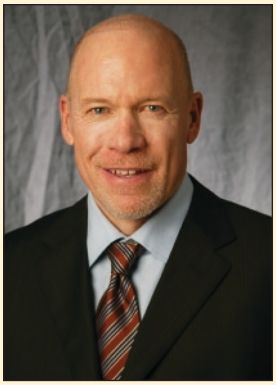
From the Lab

LABORATORY FOR AGGREGATE ECONOMICS AND FINANCE — SUMMER 2007

UNIVERSITY OF CALIFORNIA, SANTA BARBARA — Vol. 1, No. 2

Director's Message

The bulk of this second issue of *From the Lab* reports on the most recent conference arranged by LAEF, entitled "Households, Gender, and Fertility: Macroeconomic Perspectives." The breadth of topics discussed illustrates the complexity underlying the changes to gender-based demographics over the last century. As examples, the introduction of infant formula freed women to join the labor force (Albanesi). Information regarding the adverse effects of working mothers evolves over time as part of an intergenerational learning process (both Fernandez and Fogli). The increasing returns to human capital investments in daughters leads to fathers' desiring more civil rights for women (Doepke and Tertilt). Differences in total factor productivity and tax rates may account for most of the differences in fertility across countries (Seshadri). The U.S. baby boom was a result of the older generation of women continuing to work after the conclusion of World War II, crowding out younger women, who chose to have children instead (Doepke). The gains from taxation reform may depend upon both the labor-force participation of women and the gender gap in wages (Ventura). More generally, the conference provided an opportunity to consider these varied results as part of a singular narrative about the evolution of gender roles in the macroeconomy.



Peter Rupert

We are delighted to announce the addition of Peter Rupert as Associate Director of LAEF and Professor of Economics at UCSB. Peter joins the Economics faculty from the Federal Reserve Bank of Cleveland where he was a Senior Research Advisor. He has held several teaching positions, including Professor of Economics and Canada Research Chair at the University of Western Ontario. Peter earned his Ph.D. from the University of Rochester. His areas of specialization include macroeconomics, monetary economics, labor and family economics. Among his most notable publications are "Time-to-build and Household Production," with Paul Gomme and Finn Kydland, published in the *Journal of Political Economy*; "What Accounts for the Decline in Crime?," with Ayse Imrohoroglu and Antonio Merlo, published in the *International Economic Review*; and "Homework in Labor Economics: Household Production and Intertemporal Substitution," with Richard Rogerson and Randall Wright, published in the *Journal of Monetary Economics*.

Peter's role at LAEF will be to strengthen its overall mission, as laid out in the last issue of "From the Lab." In particular, he will help to identify pressing questions or anomalies or puzzles for focus in our key activities, which include:

- Workshops in which about ten scholars from anywhere in the world spend one-to-two weeks. During that period, the participants will make occasional presentations, but the focus will be on working on aspects of the issue at hand while in residence.
- Extremely focused two-to-three-day conferences with five or six presentations per day.
- An environment in which two or three researchers (one of whom could be from UCSB) get together for up to a month or more (in some cases, possibly as part of a sabbatical) to work on a particular question or issue.

Our next conference, "Latin America's Total Factor Productivity Puzzle," takes place September 20-22, 2007. Conference proceedings will be featured in the next newsletter.

LABORATORY FOR AGGREGATE ECONOMICS AND FINANCE

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Households, Gender and Fertility: Macroeconomic Perspectives

May 3-5, 2007

The Laboratory for Aggregate Economics and Finance (LAEF) sponsored a conference entitled "Households, Gender and Fertility: Macroeconomic Perspectives" May 3-5, 2007 on the UCSB campus. Stefania Albanesi of Columbia University was the academic coordinator of the event.

The conference was designed to provide a forum for researchers doing applied and theoretical work on households, gender and fertility from a macroeconomic perspective. Research that has incorporated these elements in general equilibrium models has shown that they can have potentially large effects on aggregate economic outcomes. Examples of the questions investigated in this growing literature are: the effect of cultural attitudes and geography on female labor force participation; the determinants of international fertility differences; the macroeconomic consequences of progress in medical technologies related to motherhood and in contraceptive technologies; the effect of divorce laws on household bargaining; the link between education, fertility and women's wages; the effect of labor market policies, wealth and marriage on labor supply by gender; and the link between women's rights and economic development.

The conference began with a kick-off dinner on May 3, and was followed by two full days of presentations on the UCSB campus. Luncheons and a formal dinner with the UCSB Chancellor were also included in the conference schedule.

Visiting participants at the conference were:

Stefania Albanesi, *Columbia University*

Matthias Doepke, *UCLA*

Raquel Fernandez, *New York University*

Alessandra Fogli, *New York University and Federal Reserve Bank of Minneapolis*

Moshe Hazan, *Hebrew University*

Murat Iyigun, *University of Colorado*

John Knowles, *University of Pennsylvania*

Maurizio Mazzocco, *UCLA*

Diego Restuccia, *University of Toronto*

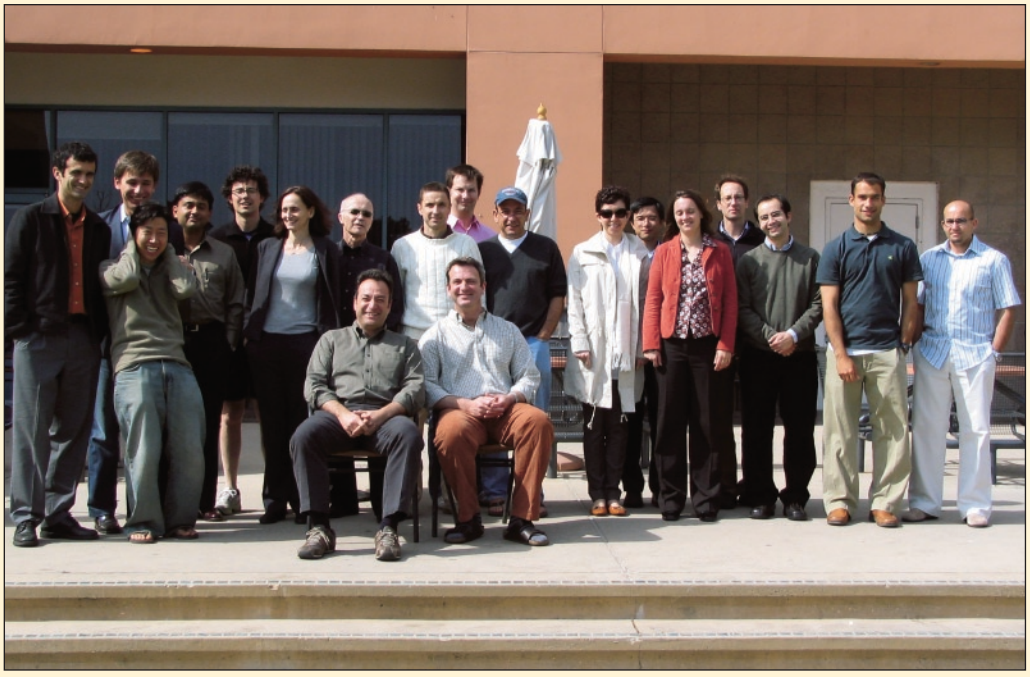
Víctor Ríos-Rull, *University of Pennsylvania*

Peter Rupert, *Federal Reserve Bank of Cleveland*

Ananth Seshadri, *University of Wisconsin, Madison*

Michèle Tertilt, *Stanford University*

Gustavo Ventura, *University of Iowa*



Conference participants gather at a morning break.

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

MAY 4, 2007

Session One
FEMALE PARTICIPATION OVER TIME AND ACROSS SPACE

Culture as Learning: The Evolution of Female Labor Force Participation over a Century
Raquel Fernandez

Nature or Nurture? Learning and Female Labor Force Dynamics
Alessandra Fogli and Laura Veldkamp

Session Two
TECHNOLOGY AND WOMEN'S PARTICIPATION

Gender Roles and Technological Progress
Stefania Albanesi and Claudia Olivetti

Why Are Married Men Working So Much?
John Knowles

Session Three
FERTILITY AND GENDER IN DEVELOPMENT

Women's Liberation: What Was in It for Men?
Matthias Doepke and **Michèle Tertilt**

Explaining International Fertility Differences
Rodolfo Manuelli and **Ananth Seshadri**

MAY 5, 2007

Session One
MARRIAGE AND ECONOMIC DECISIONS

Public Goods, Transferable Utility and Divorce Laws
P.A. Chiappori, **Murat Iyigun** and Yoram Weiss

Labor Supply, Wealth Dynamics, and Marriage Decisions
Maurizio Mazzocco and Shintaro Yamaguchi

Taxation, Aggregates and the Household
Nezih Guner, Remzi Kaygusuz and **Gustavo Ventura**

Session Two
FERTILITY, EDUCATION AND WAGES

Education, Family Composition, Fertility and Trend
Carlos Bethencourt and **Victor Rios-Rull**

The Baby Boom and World War II: The Role of Labor Market Experience
Matthias Doepke, Moshe Hazan and Yishay Maoz

A Quantitative Theory of the Gender Gap in Wages
Andres Erosa, Luisa Fuster and **Diego Restuccia**

PRESENTATION SUMMARIES

Culture as Learning: The Evolution of Female Labor Force Participation over a Century

by Raquel Fernandez

Women's labor force participation (LFP) has increased dramatically over the last century, and there is much debate about why this has occurred. Undoubtedly, cultural changes are at least partially responsible, but without a theory of why culture changes, one is left with only sunspots causing the switch among equilibria. Fernandez posits that cultural change may in fact be the evolution of beliefs over time as part of an intergenerational learning process. In particular, each generation of women both observes the labor decision of the generation before it and receives noisy private signals (e.g., the current prevailing wisdom from clinical psychologists) about the relative disutility of working in the market versus the home. Based on their public and private information, some percentage of women choose to work, with each subsequent generation receiving its own private signals, which it uses to update the inferred beliefs of its predecessors.

A model is presented with two basic settings: no learning and learning. In the former, only changes in earnings of men and women can explain why labor supply changed over time. In the latter, learning about the disutility of working brings more women to the labor force. When the number of women working is very low or very high, learning is slow, since the aggregate noise will be high. When the female LFP is about 50%, then intergenerational learning is rapid, and the period-to-period change in LFP will be large. The calibrated model without learning does a poor job of matching the female LFP data, grossly overestimating the amount of female LFP that should exist. By contrast, the calibrated model with learning is able to replicate the observed changes in female LFP. Specifically, the model with learning generates the S-shaped path for female LFP found in the data. Analysis of the model indicates that both the dynamic paths of beliefs and earnings played an important role in the transformation of women's work.

During the conference, in reference to the graph of white married female LFP, a participant asked whether the same pattern was observed for other groups of women. Fernandez indicated yes, the same S-shape is found. Later, she would note that one of her graduate students (Elizabeth Potamites) is examining the differences across race. Even controlling for marriage, black women historically work more than white women. Fernandez was asked whether we can in fact track if priors converge to beliefs of child psychologists. She acknowledged the noise involved in these transmissions of information, adding that in some sense,

one must wonder whose purpose is being served by the various strains of information. To wit, she cited a study that made the rounds in the press about the negative effects of daycare. That same study, she noted, also found children who went to daycare centers had higher reading and writing scores, but for whatever reason this finding was not as well publicized. A participant noted that in the model, (the true value of) the disutility of work is not changing over time, an assumption which ignores the effects of changes in household technology. Fernandez responded that she is not arguing the irrelevance of technology, only that research which focuses on technology may not consider the role the culture of beliefs plays or the degree to which people want to adopt the new technology.

Nature or Nurture? Learning and Female Labor Force Dynamics

by Alessandra Fogli and Laura Veldkamp

One of the more dramatic economic changes of the last century has been the rise in female labor force participation. With the bulk of the increase coming from married women with children, the authors present a model in which women's beliefs about whether to stay home to nurture their children evolve over time. Women learn the relative importance of nature versus nurture in determining children's outcomes, and the outcomes for children of employed women become signals to the subsequent generation, who will face a similar choice. This signal is noisy, since the combination of endowed ability and nurturing cannot be perfectly disentangled, but the model's Bayesian updating ensures that the aggregate beliefs converge to the truth.

The learning mechanism is central to recreating the empirically observed S-shape dynamic of women's LFP. In the model, when few women work, most observations are uninformative, and participation rises slowly. As information accumulates and the uncertainty about the nature-nurture trade-off declines, more women participate, and learning accelerates. Finally, as beliefs converge to the truth, new information affects women less. Learning slows down, and participation flattens out. The simulated time path of female LFP appears very similar to the data, slightly overpredicting the increase. Additionally, agents in the model respond to survey questions in a manner consistent with actual survey responses. What the model is unable to explain is why women's wages rose relative to men's after 1970 or why female labor supply elasticity declined as sharply as it did over the same time period.

During the presentation, Fogli was asked several questions relating to the nurture component. Can nurture be bought? She answered that nurture cannot be bought. It can be provided only by the child's mother. Is there a link between part-time work and nurturing? Fogli and her co-author take a stand, modeling the "average" working mother. She was asked why they did not estimate beliefs about nurture vs. nature from survey data, to which she noted there is too much heterogeneity in the survey data. As a potential refinement, a participant suggested accommodating for the fact that labor is non-linear in hours. In response to a comment pointing out that in practice a woman can delay when she enters the labor force, Fogli stated that by construction, their model only tracks women up to age 35; what happens after that age is not considered. A conference participant noted that in the model, wage elasticity is a function of beliefs, and suggested an obvious network from which agents may update beliefs is siblings: women could observe the outcomes of their sisters in order to extract information regarding the nature-nurture trade-off.

Gender Roles and Technological Progress

by Stefania Albanesi and Claudia Olivetti

Women's physiological ability to bear and nurture children has historically contributed to define a division of labor in which women work in the household while men work in the market. Until the early decades of the 20th century, women spent approximately 50% of their prime-age years either pregnant or nursing. Since that time, however, there have been not only innovations in child-bearing and child-rearing technologies but also a marked increase in the labor force participation of married females. The authors argue that by easing the physiological constraints associated with motherhood, progress in medical technologies contributed to a reduction in time spent by women on reproductive duties, providing the incentive to invest in market skills. Their hypothesis is centered principally on the introduction of 'humanized' infant formula and of new medications that reduced infant and maternal mortality rates: the former degendered the task of infant feeding, while the latter reduced the number of pregnancies required for a given completed fertility.

The authors present an overlapping generations model in which agents must determine how to divide time between production of household goods, infant goods (for women of child-bearing age), and market goods, with innovations in household and infant technologies shaping their decisions. The calibrated simulation replicates trends observed in the data, including labor force participation, adoption of new technology, and investment in market skills, though the accuracy of the predictions var-

ies. Several experiments are run to isolate the roles of declining prices of both household and infant technologies. The results suggest that time-saving innovations for the production of infant goods were essential for the rise in labor force participation of married women with children between 1920 and 1950, while the availability of time-saving general household technologies played a crucial role in accounting for the rise in female labor force participation between 1950 and 1970.

A conference participant asked whether breastfeeding rates should drop all at once after the introduction of formula. Albanesi answered no, as the breastfeeding rate depends on the price and rate of adoption of formula. In response to a question regarding the difference between a wet nurse and a care provider with formula, Albanesi noted that wet nurses were not necessarily reliable for feeding the baby. More generally, she stressed, the introduction of formula degendered a key task related to infant rearing. A participant noted that in the 1970s, breastfeeding became popular again, with a rise in breastfeeding but little change in work patterns. Albanesi explained that this could be result of lower fertility. In response to a question about where the hours savings are, Albanesi answered that hours are split according to relative wages. Participants suggested expanding the model to include income effects and marital sorting.

Why Are Married Men Working So Much?

by John Knowles

Per capita hours worked has increased over the past four decades in the U.S. The bulk of this increase is due to married women working more, as men have not significantly changed their labor supply. Over this same time period, the gender gap in wages has shrunk significantly. Standard unitary models of married couple households are unable to account for this dynamic of married women earning more with married men not increasing their leisure. With preferences given by a weighted sum of the utility of the spouses, these models can explain the rise in women's labor supply but also predict married men's labor supply should fall. The author argues that bargaining is essential to understanding the rise in per capita hours. In a simple extension of the standard model to allow for bargaining between spouses, the failure of husbands' paid labor to fall over time is explained by a negative trend in the bargaining position of married men relative to that of their wives. Married men's leisure fails to increase in response to the closing of the gender gap in wages since higher wages make it relatively easy for wives to walk away from the marriage, thus enhancing the wives' bargaining position.

The model is calibrated to match the data on home hours and leisure of married couples in the 1970s. The author finds that the model can explain half of the trend in per capita hours, with rising total factor productivity having virtually no effect on per capita hours. The recent rise in per capita hours is perfectly consistent with the stationary hours hypothesis of the standard macro models. The results suggest that the bargaining position of husbands has deteriorated with the closing of the gender gap in wages, that the decline of home-equipment prices plays a role in the rise in per-capita hours, and that the labor trends are consistent with stationarity along a balanced-growth path.

A conference participant noted that in the model, leisure is not complementary: agents do not care about their spouse's leisure. Knowles answered that doing otherwise would change only the magnitude, not the sign, of the change in utility. Asked why home production is critical to the model, Knowles explained that home production allows two sources for women out of which to substitute for market labor: leisure and home production. As such, home production is critical to understanding the bargaining position of spouses. A participant asked whether adding human capital solves the unitary model problem. Knowles pointed out that with bargaining, one can avoid the unitary model problem altogether. Rather than assuming outcomes are efficient (as in the model), it was suggested that Knowles endogenize the Pareto weights as a potential extension.

Women's Liberation: What Was in It for Men?

by Matthias Doepke and Michèle Tertilt

As observed in both cross-country and cross-state data, gender inequality has typically declined with economic development. Since it has always been men who have ceded control to women, the trend begs the question of why men would choose to do so. Some researchers have argued women's rights lead to a more efficient allocation of resources, thereby contributing to economic development, while others suggest that development itself causes gender equality. The authors of this paper argue that both directions of causality can occur contemporaneously. As the returns to human capital increase, men will want women to have more rights since women will make better investments in children, which in turn will accelerate growth.

With "rights" defined broadly as bargaining power, the authors model the men's choice to relinquish control as a trade-off between what rights men want for their daughters versus those they would want for their wives. While men would want no rights for their own wives, they would

prefer full rights for their daughters to insure them from being treated poorly by their future husbands. In a world where the human capital technology is sufficiently unproductive for not educating one's children to be optimal, the model demonstrates that, save for some extreme parameterizations, men will choose not to share power with women. As the returns to education increase, however, men with daughters will want both to educate their girls and to protect this investment, while men with sons will want other parents with daughters to invest sufficiently in their potential daughters-in-law. The model predicts that once returns to education and human capital have adequately increased, men will voluntarily choose to grant power to women, as the gains from their children's (and grandchildren's) improved outcomes will outweigh the losses from their newly empowered wife.

Additionally, fertility in the model falls when education becomes more productive, as women restrict the quantity of children they have in order to invest more time into improving the quality of children through education. As such, the model implies that an expansion of female rights should accompany the main phase of demographic transition. The authors note that despite the rise in women's rights, the model does not predict a corresponding rise in female labor force participation. The incentives for sharing power with women derive strictly from what happens at home, not in the market.

A conference participant commented that a low ratio of women to men may lead to advances in women's rights, as in areas with high female infanticide like China or in frontier states in the U.S. Tertilt acknowledged the economic intuition but noted that most countries exhibit a 50-50 split between females and males. Asked whether the women's rights movement mirrors slave emancipation in the sense that social or religious forces moved the issues forward, Tertilt admitted the possibility but pointed out that she and her co-author concentrate principally on the economic motivations of the movement. A participant questioned whether in the model there should be more children as women's rights increase. Not necessarily, Tertilt responded, since there is a quality-quantity tradeoff in the fertility decision. Tertilt was asked why parents do not simply lobby for compulsory education for their daughters. She answered that the goal of parents is the consumption of their daughter after marriage and as such, school and rights are complements. When asked why there is no marital sorting (better educated women find better husbands), Tertilt explained that sorting ensures the well-being of only one generation. It cannot ensure the well-being of grandchildren and beyond.

Explaining International Fertility Differences

by Rodolfo E. Manuelli and Ananth Seshadri

The average American family has 2.1 children and a life expectancy at age 1 of 78. By comparison, the average family in Europe has 1.5 children and a life expectancy of 78 while the average family in Niger has 7.4 children and a life expectancy of 51. In general, fertility across countries is negatively correlated with income, life expectancy, and schooling. To account for these variations in fertility, the authors extend the Becker-Barro framework to incorporate the decision to accumulate human capital (to determine earnings) and health capital (to determine life span). The authors find that differences in productivity and taxes explain most of the differences in fertility across countries.

In the model, the decision of how many children to have and how much to invest in each child is influenced by total factor productivity (TFP), the retirement age, taxes, and the timing of intergenerational transfers. Parents make investments in children with respect to the amount of schooling and health care to provide, with these early-age investments affecting the children for the duration of the children's lives. The calibrated results indicate that differences in TFP account for most of the large fertility differences between the U.S. and poorer nations. Higher TFP increases the investment in children's human and health capital. As the marginal cost of having children rises relative to consumption, fertility declines. The results further demonstrate that higher taxes on labor explain the decreased fertility in Europe versus the U.S. Higher taxes reduce the wage rate, implying lower consumption for the parent. The marginal cost of giving birth to a child relative to consumption increases and consequently fertility declines.

A conference participant commented that Seshadri and his co-author cast into doubt the Becker-Barro model. Seshadri explained that they add human capital accumulation to the Becker-Barro framework to see if they can match the data better. Participants commented that in the model: (i) children have constant returns to scale, in the sense that there is no discrimination in investments among one's children; (ii) the number of hours parents can allocate to work is not affected by the number of children; and (iii) the age at which an agent's children are born may vary across countries, which will affect outcomes. Seshadri confirmed these interpretations. A participant wanted clarification on the health capital component: Health capital is determined by parents, not the agents themselves? Agents can't spend money on their own health capital? Seshadri concurred, explaining that health capital is set when an

agent is young and cannot be altered thereafter. The reason for this formulation, he explained, is that he and his co-author wanted to endogenize life expectancy on some level. As a potential refinement, a participant suggested that age-wage profiles should be emphasized.

Public Goods, Transferable Utility and Divorce Laws

by Pierre-André Chiappori, Murat Iyigun, and Yoram Weiss

The authors revisit the Becker-Coase theorem (Becker, 1993), which states that since spouses are free to bargain with each other, the move from mutual consent to unilateral divorce should have no impact on the rates of marriage dissolution. Under Becker-Coase, while the allocation of resources is affected by divorce laws, the incidence of divorce should be invariant to them. The theorem depends crucially on the assumptions of transferable utility within marriage (TUM) and transferable utility upon divorce (TUD). The authors' main claim is that the assumption of transferable utility is unlikely to hold under both marriage and divorce.

Developing a model in which couples consume both public (e.g., a house) and private goods, the authors show that if marriage alters the way in which some goods are consumed, the Becker-Coase theorem holds only under strict quasilinearity. If both TUM and TUD do not hold, a couple's utility frontiers under marriage and divorce may intersect. The incidence of divorce will then depend on both the allocations within marriage and the distribution of property rights as defined by the prevailing legislation. In some cases, the switch from mutual consent to unilateral will, as expected, increase the probability of divorce. The authors demonstrate, however, that the opposite effect is also possible: a couple may be more likely to divorce under mutual consent than under a unilateral rule. This counterintuitive outcome could occur when a married couple faces a relatively equal distribution of income and wealth upon divorce. Under unilateral divorce, the spouse who is relatively unhappy in marriage can negotiate a new allocation within marriage which is superior to his/her outcome under divorce. Under mutual consent, the spouse who is relatively happy in marriage can negotiate a new allocation within divorce which is superior to his/her current situation.

Iyigun was asked what triggers divorce in the model. He responded that shocks to the value (+/-) of marriage will trigger divorce. A participant asked whether agents value leisure. In the model, Iyigun explained, there is no particular specification on utility other than its being semi-quasilinear: the model requires one good through which to transfer utility. A participant asked whether agents can arrange divorce allocations without/beyond the law. Iyigun answered yes, but he and his co-authors are agnostic as to how that (re)allocation occurs. Among the audience suggestions for further research were: (i) to examine evidence of divorce rates under communal (50/50) vs. equitable (judge decides) divorce laws; and (ii) to extend the model to consider home production, i.e., the sunk costs associated with certain household tasks.

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Labor Supply, Wealth Dynamics, and Marriage Decisions

by Maurizio Mazzocco and Shintaro Yamaguchi

Evidence from the Panel Study of Income Dynamics (PSID) suggests that household decisions on labor supply, savings, and marital decisions are all strongly linked. Married couples, for example, save at a substantially higher rate than unmarried individuals. Single women typically work more than married women, while married men typically work more than single men. In the years immediately prior to marriage, single women's working hours begin to taper off, presumably in anticipation of marriage, while the opposite is true for single men. With these trends in mind, the authors present a model of household behavior that attempts to mimic the patterns of labor supply, wealth accumulation, and marital status observed in the data. Agents in the model maximize utility subject to wages, accumulated human capital, savings, the number of children, and, if married, the match quality of their spouses.

Calibrated with data from the PSID, the model is able to match reasonably the pattern of labor supply observed in the data, with married men working more than unmarried men and unmarried women working more than married women. As men have higher wages, it is optimal for husbands to specialize in market production and for wives in household production. The arrival of children increases the degree of specialization within the household. The simulation is less effective at recreating trends in labor force participation. In particular, single men participate slightly more than married men in the simulated results, contrary to what is observed in the data. The model successfully replicates some of the features for wealth and consumption. Saving of single men is greater than saving of single women, as in the data, and savings of couples is slightly larger than twice that of unmarried men. However, the simulation overpredicts consumption for each group, perhaps explained by the lack of durable goods in the model.

During the presentation, a conference participant asked whether the authors condition on cohorts in their graphs. Mazzocco explained that weighting from cohorts is used in the construction of the comparison groups represented in the graphs. In response to the steep drop observed in female LFP in the year(s) prior to marriage, a participant noted that it appears women anticipate working less prior to marriage. Asked whether it is possible that single women draw from a different distribution of skills than married women, Mazzocco explained under that assumption, it is too easy to explain the transitions in LFP. With respect to men's LFP, the possibility of selection bias was raised, in the sense that men who work harder make better partners, to which Mazzocco explained that marriage is endogenous in the model. Whether a man gets married depends on his value outside marriage, so his wages affect his marriage outcome. As a potential refinement in the graphs, a participant suggested indexing against the time when agents have kids, not when they get married. Asked if there is any evidence about changes in work patterns – e.g., new jobs or part-time work – for women subsequent to marriage, Mazzocco answered that he and his co-author were looking into this. A participant suggested that the authors may want to separate cohabitation from the marriage statistics. Mazzocco concurred but noted that cohabitation represents only a small portion of the couples in the data. A participant inquired as to the "limited commitment" aspect of the model. Mazzocco explained that to be able to generate the rapid change in specialization upon marriage, one needs to use some avenue associated with the gains from marriage. The only way the gains from marriage can affect the way married couples specialize is if they have no commitment.

Taxation, Aggregates and the Household

by Nezih Guner, Remzi Kaygusuz and Gustavo Ventura

In much of the existing literature on tax reform, the decision-maker is typically an individual who decides how much to work and to save. Yet the current household structure in the U.S. no longer fits this single-earner household paradigm. In particular, a smaller percentage of the adult population is married while a higher percentage of married households features two earners. Under the current tax structure, a secondary earner is taxed at the primary earner's marginal rate. As such, the authors argue that taxation reform should be considered with respect to its effects on the household's decision to supply labor, as opposed to the individual's decision. They present a model in which gender and skill premia, labor force participation across skill groups, and the structure of marital sorting interact with changes in taxation in order to determine the effects on output, labor supply, and capital accumulation.

The model is calibrated such that effective tax rates, marital structure (who is single/who is married/who is married to whom), and the labor force participation of secondary earners match what is observed in the data. Experiments with the model indicate that replacing the current progressive income taxes with a proportional consumption tax increases steady state output by 10.5%, wages by 6.4%, labor force participation of secondary earners by 4.6%, and total hours by 4.2%. Under such a tax, married females account for about 51% of the total increase in hours; under a progressive consumption tax, the contribution of married females increases to 65.2%. The results suggest that the effects of tax reform can depend critically on who increases the labor supply. The results additionally imply that wage structure, skill distribution, and marital sorting can play important roles. The implications for reforms across other countries are clear: output gains from tax reforms to economies with lower levels of female labor force participation and a larger gender gap in wages are potentially larger than for the current U.S. economy.

During the presentation, a participant asked why production is assumed constant over the agent's life. Ventura agreed this was an issue. It was suggested that adding a transition could alleviate the problem. Ventura was asked why the authors chose a life-cycle model, as opposed to a static model. He responded that they needed to capture capital accumulation, which the static model would not permit. He was asked about how to incorporate transfers and credits into the tax rates of the model. He and his co-authors measure the effective tax rate, which accounts for such contingencies. A participant asked why the model predicts a higher elasticity of labor for women with respect to taxes. Ventura explained that this is due to the differential earning versus their spouses, as typically women are the secondary earners in the households. The stationary population assumption was called into question, to which Ventura noted that the alternative would be to model marriage decisions as endogeneous. A participant commented that in practice divorce rates are age-specific but are not so in the model. There were several questions regarding q, the cost in utility of both household members working. Where do you get q from the data? Ventura and his co-authors estimate the average q from household types. How do you learn the slope of q? The authors examine how LFP changes when a wife's wages go up conditionally on the wage rate of the husband. A participant suggested incorporating a gender-specific q.

Education, Family Composition, Fertility and Trend

by Carlos Bethencourt and José-Víctor Ríos-Rull

Total cohort fertility rates declined dramatically from 1985 to 2005, with fertility negatively correlated with education, particularly for females. Of the female cohort which was 50-54 in 2005, if both the woman and her husband were high school dropouts, their fertility was 2.82. For that same cohort, if the husband were a college graduate, fertility dropped to 1.92, while if the wife were a college graduate, fertility dropped even further, to 1.74. The authors additionally note that female hours worked increase with education and that children's educational attainment is highly correlated with their parents' educational levels. To explain why fertility is negatively correlated with education, the authors present a model that accounts for the joint behavior of fertility and investment in the cross-section.

Preliminary experiments using a baseline model are able to generate the decline in fertility with respect to husbands' education but not with respect to that of wives. An extended model allowing parents potentially to have stronger preferences for educated children is similarly unable to generate the decline in fertility with respect to women's education. The authors speculate on two possible refinements. The first is technology which improves the effectiveness with which people achieve the number of children they want (e.g., birth control). The second is network externalities, in the form of either the number of children or the level of education people desire.

A conference participant asked what the trade-off is in using up hours as a mother. Ríos-Rull explained that doing so affects negatively their children's probabilities of good outcomes. With regard to the apparent lack of consequence for having many children, Ríos-Rull clarified that in the model, educated women have fewer children. In one of the more animated discussions of the day, Ríos-Rull was asked how the weights are determined, to which he responded, "I use the ones until they look right. I keep working and working until I'm happy." A participant noted that this approach was functionally equivalent to minimizing the sum of square errors. Some potential caveats with the model were noted by the audience: (i) marginal tax rates have changed a lot for women at the top of the income distribution, which may be affecting the empirical results; and (ii) the network externality may be conditional on the number of children.

The Baby Boom and World War II: The Role of Labor Market Experience

by Matthias Doepke, Moshe Hazan and Yishay D. Maoz

Over the past century, fertility declined in the U.S. while female labor force participation increased. Though these developments have for the most part occurred gradually, the end of World War II marked the beginning of a baby boom during which fertility increased sharply. Two competing hypotheses have been proposed for the baby boom. The first, by Easterlin (1961), argues that the generation which grew up in the Depression was overwhelmed by their post-war prosperity and responded by increasing their demand for children. The timing of this explanation, however, is not quite right: the bulk of the baby boom was accounted for by young mothers, those who grew up primarily in the prosperous post-war period. The second hypothesis, by Greenwood, Seshadri, and Vandebroucke (2005), proposes that the widespread diffusion of household appliances such as washers for clothes and dishes freed up time that became available for raising more children. While this theory can help explain the rise in fertility at the beginning of the baby boom, it has trouble explaining the sharp decline in fertility at the end.

Noting that labor force participation increased for older women but decreased for younger women in the period immediately following the war, the authors propose a competing explanation for the baby boom: the one-time demand shock for women's labor during the war had a carryover effect upon its conclusion, with many war-era women continuing to work and consequently crowding out the younger generation of women, who chose to have more children instead. The authors' calibrated model is able to recreate the dynamics observed in the data, with fertility spiking after the demand shock and declining gradually thereafter. In terms of completed fertility, the model explains most of the increase during the baby boom.

The theorized connection between high mobilization of men for the war (creating the demand shock for female labor) and increased fertility in the postwar period is further examined at both the state and international levels. Across states, there is a clear positive relationship between mobilization rates and the increase in fertility during the 1950s. International evidence further supports the hypothesis: countries with similar war experiences to the U.S. demonstrate similar trends in total fertility in their respective post-war periods, while neutral countries typically display at most modest baby booms.

During the conference, a participant pointed out that women got into manufacturing jobs during the war and expressed some skepticism about the authors' thesis that these women would subsequently transition to (among other jobs) clerical positions, which were more desirable in the first place. Doepke acknowledged the issue but would later present data indicating the war-era female labor force continued to work in the post-war period. As a potential refinement, a participant suggested using the data gathered by Claudia Goldin, who shows that approximately 50% of the 1930s female labor force worked into the 1940s. Asked whether an income effect is working in the observed decline in male wages, Doepke answered yes, adding that he and his co-authors had not yet decomposed the decline. A participant asked if there is no growth in production. Doepke responded that currently the answer is no, but that such growth was forthcoming in a balanced-growth model. It was noted that in the model, the authors emphasize the work-versus-children tradeoff, but history shows decline in fertility began before work was a factor. Doepke concurred, conceding that the model is somewhat history-dependent.

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A Quantitative Theory of the Gender Gap in Wages

by Andrés Erosa, Luisa Fuller and Diego Restuccia

While the gender gap in wages in the U.S. labor market is well known, less known is the fact that this gap grows over the life cycle. The disparity in wages is accompanied by substantial differences in labor supply, due mostly to the impact of children on the labor decisions of women. The authors develop a quantitative life-cycle model of fertility, labor supply, and human capital accumulation decisions to assess the role of fertility choices on the gender differences in wages and labor supply. The theory assumes that the bearing and presence of children involves a forced reduction in hours of work that falls on females rather than males. Fertility lowers the lifetime intensity of market activity, reducing the incentives for human capital accumulation and wage growth. The paper may be considered to provide an explicit model for Mincer and Polacheck (1974), who had previously posited that women may face different incentives to accumulate human capital than men due to a higher relative value of non-market activities.

Examining data from the National Longitudinal Survey of Youth (NLSY79), the authors observe that in addition to facing lower wages than men, women are characterized by lower employment, fewer hours of work, and longer durations of non-employment spells than men. These gender differences in labor supply imply that by age 40, men have accumulated 24% more weeks of experience and 48% more hours than women. The calibrated model indicates that of the increase in the gender gap in wages between the ages of 20 and 40, 40% is due to the impact of children on the labor supply of females, 40% is due to the exogenous gender differences in hours of work, and 20% is due to exogenous differences in initial human capital. Young females spend less effort in accumulating human capital than experience-equivalent males because they anticipate working less in the future.

During the conference, Restuccia was asked about the effects of career interruptions associated with bearing children. He answered that the impact was two-fold: first, women accumulate less experience over a given period of time; and second, women invest less in human capital in expectation of having children. A participant asked why in the model agents differ in initial human capital. High initial human capital, Restuccia explained, means more future effort and/or lower cost of effort. Some comments from participants included: (i) if wages are non-linear, part of the wage ratio between men and women could be due to part time work; and (ii) employers will treat women differently based on expectation of their future labor supply. As a potential refinement, a participant suggested making the marriage choice endogenous in the model.

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José de Anchorena Visits LAEF

José de Anchorena, an advanced Ph.D. student at Carnegie Mellon University, spent the month of February 2007 as a visiting scholar at LAEF. Anchorena is currently working on three papers, all concerned with growth and development, and, in particular, with technology improvement.

One of Anchorena's papers is related to the experience of Argentina's economy in the last 30 years. In particular, it ties the investment-productivity puzzle, uncovered by Kydland and Zarazaga (2001, 2002), with the hypothesis of misalignment of the real exchange rate. The main innovation of the paper is to measure separately technology improvement in traded and non-traded goods, and to incorporate those measures into a general dynamic equilibrium framework.

Anchorena became interested in endogenous technology change due to the huge and volatile annual changes in measured technology levels. In his second paper, he attempts to explain simultaneously the time series of population growth rate and income per capita level for England between 1700 and 2000. The main innovations are to simulate numerically a model proposed by Lucas (2002) and to propose modifications to the model in order to match the evidence better.

The goal of Anchorena's third paper is to relate aggregate productivity levels with demographic variables. In particular, it asks how much of an incentive to increase productivity has been the reduction in household size. On the supply side, the reduction in household size has implied the substitution of market for home production (say, more lunch outside and less at home). On the demand side, the reduction in household size has implied the substitution of market for home consumption (say, more marketed entertainment). Both effects increased the market size of old and new goods and services, and the increased scale created a higher demand for technology improvement. The goal is to model these effects into an endogenous growth process and to determine if the evidence supports it or not. This paper was the main focus of Anchorena's research while in residence at LAEF.

While at LAEF, Anchorena presented a paper in the Economics Department seminar series, "Can We Replicate an Industrial Revolution?" This is the second of the papers described above.

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